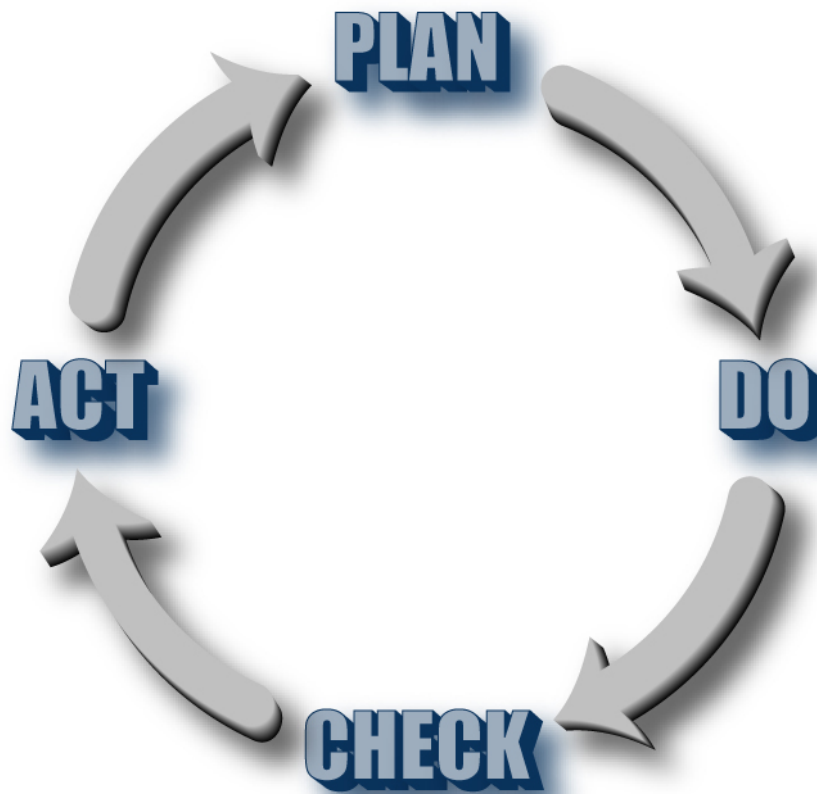


Continual Improvement in Utility Management: A Framework for Integration

January 2004



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The views expressed in the guide are those of the Integrating Management Systems Design Team. EPA made comments and suggestions that were included in the document to improve its accuracy. EPA does not endorse any products or commercial services mentioned in the report.

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Foreword

Dear Colleagues:

Water and wastewater utility managers today face a variety of management challenges. They must address aging infrastructure while grant monies decline and rate payer capacity is constrained, respond to new and more stringent regulatory requirements, meet increasing public expectations for service costs, environmental performance, and transparency; and plan for changing work force demographics. To respond to these challenges, utility managers have been examining and utilizing a variety of management initiatives including asset management techniques, environmental management systems, best practices assessments (such as QualServe, the APWA Management Accreditation Program, and the Partnership for Safe Water), and strategic business planning tools (such as the Balanced Scorecard). While these initiatives have proven individually very useful, there is a strong sense that, taken together, they present utility managers with a confusing array of choices and have generated a sense of “initiative overload” rather than a coherent picture of management improvement opportunities. Unfortunately, it has not been particularly clear when and how best to use the management initiatives available to us and, in particular, how these tools relate to one another.

This Guide was funded through a cooperative agreement with the U.S. Environmental Protection Agency (EPA), and sponsored by the Association of Metropolitan Sewerage Agencies (AMSA), EPA, and the Water Environment Federation (WEF). It is based on the findings and recommendations from an earlier research project (Phase I Management System Integration Project) supported by a workgroup composed of nine water and wastewater utility managers and four advisors from consulting firms. The Phase I Project examined 15 separate management initiatives - including Asset Management, ISO 14001, the National Biosolids Partnership’s Environmental Management System Program, the American Public Works Association Management Accreditation Program, EPA’s Environmental Management System Initiative for Local Governments, Balanced Scorecard, and QualServe - to determine the benefits of and options for integrating them under a continual improvement – “Plan, Do, Check, Act” - management system framework. The Workgroup concluded that it is feasible and desirable to integrate the management initiatives in the context of a continual improvement management system framework. The Workgroup believed that continual improvement management system frameworks provide a well established and proven management approach that provides distinct advantages over conventional utility management practices. The Workgroup further believed that there was a strong need to provide utility managers with clear direction on the interrelationship of the many management initiatives and to identify strategies for effectively integrating initiatives to meet utility objectives.

We believe this guide fills an important resource gap for utility managers. Although substantial implementation guidance exists for individual management initiatives, the available materials do not address how to effectively integrate them. The Guide responds to that need by providing a roadmap showing how the management initiatives interrelate and how a utility can best approach integrating them in the context of a continual improvement management system framework. The Guide explores what is, for our industry, relatively new territory – the use of a continual improvement management system

framework to support integrated and strategically aligned utility management. Utilities throughout the United States (U.S.) and abroad have adopted individual management initiatives, but it is only very recently that utilities have begun looking to integrate initiatives in a continual improvement management system framework to drive performance improvement simultaneously in multiple areas, such as environmental, financial, quality, safety, and human resources.

We appreciate the input that we have received from the more than thirty utility managers who reviewed or contributed in other ways to the development of this guide. Their input has helped us develop a practical document that water and wastewater utility managers and staff interested in pursuing an integrated approach can use effectively, and we encourage them to do so.

The information in this guide can also be useful for utility managers in identifying opportunities for improving or strengthening an existing continual improvement management system.

The results of current integration efforts have been very encouraging with a variety of important, concrete benefits identified. The continual improvement framework has provided a proven basis for defining, achieving, communicating, and receiving recognition for high performance outcomes on an enterprise-wide basis. Utilities adopting an integrated continual improvement management framework have generated efficient and consistent productivity improvements related to service and operations across the entire scope of operations and have engendered enhanced teamwork and highly effective staff development. We hope this Guide will increase your awareness of these benefits, motivate you to embrace continual improvement management, and enable you to make efficient use of the management initiatives available to our industry.



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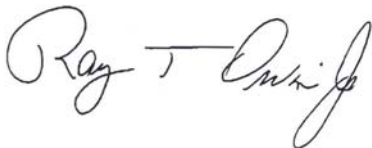
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Introduction

15 Performance Improvement Initiatives

- APWA Management Accreditation Program
- Asset Management
- AWWA Proposed Accreditation Program
- Balanced Scorecard
- Bid-to-Goal
- Capacity, Management, Operation, and Maintenance Programs (CMOM)
- EPA EMS Initiative for Local Government
- Governmental Accounting Standards Board Statement #34 (GASB-34)
- International Organization for Standardization (ISO) 14001
- ISO 9001
- Malcolm Baldrige National Quality Program
- National Biosolids Partnership EMS for Biosolids
- OSHA Voluntary Protection Program
- Partnership for Safe Water
- QualServe

Key Utility Management Areas:

- Environmental performance
- Safety and health: public and occupational
- Quality: process quality, product quality, customer service quality, and service level
- Financial performance: operations and capital assets
- Human resources and skill development

Background on Utility Performance Improvement Initiatives

Utilities are using a variety of management initiatives – i.e., management systems, voluntary programs, guidance books and manuals, benchmarking programs, and best practices – to improve utility performance in management areas such as safety, quality, finances, human resources, and environment. This guide examines 15 different management initiatives available to water and wastewater utilities, each designed to help improve performance (see box at left).

Some of these initiatives specifically support performance improvement at water and/or wastewater utilities; others support all types of organizations.¹ The initiatives overlap quite substantially, covering individually or in combination the entire drinking water, wastewater treatment, and stormwater value chains.² The initiatives further address all key management areas to which utilities typically direct attention and resources: environmental performance; safety and health; quality; financial performance; and human resources and skill development.

Each of the initiatives support some or all of the elements of a continual improvement management system framework – the *plan, do, check, act* cycle - with some initiatives supporting certain elements more directly than others. The initiatives can be loosely grouped into one of three types, based on their focus:

- > Best management practices;
- > Strategic business planning support tools; and
- > Continual improvement management system frameworks.

¹ Appendix C provides a complete profile for each of the 15 initiatives. Appendix B provides references for further information about each initiative.

² The drinking water value chain includes: source/intake control; disinfection; sediment removal and filtration; corrosion control and fluoridation; and distribution systems. The wastewater treatment value chain includes: wastewater collection, stormwater, and pretreatment; wastewater treatment and solids generation; polishing and effluent discharge; solids stabilization, conditioning, and handling; and biosolids transportation and disposition.

Drivers for Management Change

Utility managers identify a number of drivers for adopting performance improvement initiatives.

- > Many utilities have an aging or aged infrastructure (e.g., many facilities are nearing the end of their design life). Utility managers are facing a need for increased investment in infrastructure maintenance and replacement. On top of the increased need, there is a major decline in available grant money and other forms of financial support. This combination is forcing utility managers to think about how to do more with less, or how to better justify the need for additional funding.
- > Utility managers are facing a variety of new or potential regulatory requirements (e.g., prevention of combined sewer overflows and/or sanitary sewer overflows, total maximum daily loads, Endangered Species Act, GASB-34). Utility managers perceive greater stringency and increased complexity and scope of these new/potential requirements.
- > Utilities are encountering increased public expectations in the areas of service, costs, environmental performance, and transparency. Utility managers also report a greater public awareness and concern about environmental and public health impacts combined with increased expectations for public involvement and access to information.
- > Public utilities in the U.S. and abroad are feeling competitiveness pressures from private entities. These pressures drive the need to improve productivity and control costs and for clearer standards and performance measures.
- > Changing demographics in the work force and the impending departure of a significant portion of organizations' intellectual capital has increased the need for well-documented and reproducible work policies and procedures.

These drivers, individually or in combination, are leading utility managers to think about how to manage differently and to examine existing initiatives to support change. Despite the challenges these drivers pose, an increasing number of utilities are seeing benefits from a greater focus on utility management. This guide is intended to aid utility managers to do an even better job managing their organizations.

Challenges to Initiative Adoption

There are many examples demonstrating that the initiatives are beneficial. Benefits include: continual improvement in targeted management areas; enhanced operational consistency and reliability; improved teamwork, interdepartmental coordination, and employee awareness; and critical customer responsiveness and recognition. At the same time, utility managers express a sense of “initiative overload” and a lack of clarity about how initiatives interrelate and how they should best be used, individually or in combination, to meet utility objectives.

Participation levels indicate that even the most successful initiatives are reaching only a small portion of utilities nation-wide. Of the thousands of water and wastewater utilities nationwide, the following are approximate numbers of participants in the programs researched: 250 for Partnership for Safe Water; 53 for the NBP EMS Program; 116 for QualServe; 12 accredited for the APWA Management Accreditation, with 34 applications for accreditation; and 32 for the EPA EMS Initiative for Local Government. These numbers reinforce the belief that “initiative overload”, as well as lack of clarity of how initiatives interrelate, present challenges that are inhibiting utility managers from fully utilizing the available initiatives.

It is common for management improvement initiatives to be implemented consecutively with little explanation or understanding among the staff about how the initiatives relate to one another or can leverage gains realized. This leads to a relatively high level of skepticism and a perspective that managers are pursuing a “flavor of the month” approach to improvement efforts. A consistent philosophy or system, based upon repeatable elements such as the “plan, do, check, act” cycle, can help connect initiatives and build a sustainable program. This guide provides guidance on how initiatives interrelate and identifies strategies and approaches for best using them in combination to meet utility objectives and drive consistent performance improvement.

Contents of this Guide

This guide has four primary purposes:

1. To help utility managers understand how the available management initiatives relate to each other;

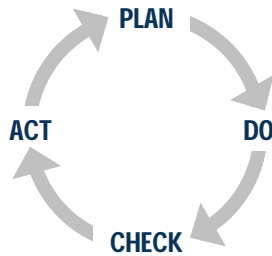
2. To help utility managers integrate various management initiatives they are now engaged in under the umbrella of a continual improvement management system framework based on the plan-do-check-act approach;
3. To help utility managers understand the basic elements of various management initiatives and their interrelationships in order to make the process of integration more efficient; and
4. To provide information on the potential benefits of integration.

The remainder of this guide includes the following.

- > Chapter 1 introduces continual improvement management system frameworks and the concept of their use as a means for integrating initiatives.
- > Chapter 2 describes the relationships among the performance improvement initiatives and how utility managers can use them to create a continual improvement management system framework.
- > Chapter 3 provides guidance on approaches for integrating initiatives, including utility case examples.
- > Chapter 4 provides a detailed description of integration opportunities with examples from four selected management initiatives.

1 Continual Improvement Management System Frameworks – An Overview

1.1 Background on Continual Improvement Management Systems



Continual Improvement Management System Framework

Continual improvement management systems are built around the total quality management framework of “plan, do, check, act”. These systems provide a set of standard procedures and steps to support systemic, consistent, continual improvement of management areas. The management areas a utility must focus on and effectively balance include environmental performance, safety and health, quality, financial performance, and human resources.

In recent years, public utilities and local governments in the U.S. and abroad have begun utilizing continual improvement management systems particularly in the context of improving environmental and asset performance. Over 50 wastewater utilities are in the process of implementing an environmental management system (EMS) under the National Biosolids Partnership’s program. Approximately three-dozen local government agencies are implementing environmental management systems as part of EPA’s EMS Initiative for Local Government, and close to one-dozen U.S. public utilities have adopted and been certified to the ISO 14001 EMS standard. Other continual improvement management system-based initiatives receiving attention from utilities include the approach proposed by the Association of Metropolitan Sewerage Agency’s (AMSA’s) guidebook “Managing Public Infrastructure Assets”, the ISO 9002 Quality Management System Standard, and the Occupational Safety and Health Agency (OSHA) Voluntary Protection Program.

1.1.1 Elements of a Continual Improvement Management System Framework

Management initiatives utilizing the continual improvement management system framework share a core set of elements critical to institutionalizing a culture of continual improvement and consistent performance success. Typically, they are designed to affect performance improvement in a single management area. Management areas include environmental performance; public and occupational health and safety; process, product, and service quality; operational and capital asset financial performance; and human

Elements of a Continual Improvement Management System Framework

Plan

- Management commitment
- Policy statement
- Assessment of areas for performance improvement
- Legal and other requirements
- Objectives and targets
- Management programs for performance improvement

Do

- Structure, roles, and responsibilities
- Training, awareness, and competence
- Communications – internal and external
- Document management
- Operational controls

Check

- Measuring and monitoring
- Auditing
- Reporting
- Management review

Act

- Corrective and preventive action
- Change management

resources and skill development. For example, the EPA EMS for Local Government Initiative is focused on environmental performance, while Asset Management is focused on capital asset performance.

The continual improvement management system-based initiatives – such as ISO 14001, ISO 9002, OSHA Voluntary Protection Program, NBP EMS for Biosolids, EPA EMS for Local Government Initiative, and Asset Management – exhibit substantial consistency among their components and underlying logic, regardless of which management area(s) they support. Not only does each of the continual improvement management system-based initiatives have four high-level components - Plan, Do, Check, and Act - each includes a similar set of more detailed elements.

Plan

The purpose of the plan component and its elements are to: establish management commitment; prepare a written policy statement of commitment that is driven by and consistent with the organization's overall mission and/or vision; identify areas in need of performance improvement; identify legal requirements and other voluntary commitments; establish objectives and targets and related performance metrics; and develop management programs for achieving performance improvement.

The orientation of the planning elements will differ by the management area(s) supported by the continual improvement management system framework. For example, in a continual improvement management system framework focusing on environmental performance improvement, objectives and targets will be focused on the management of environmental impacts. Alternatively, for a continual improvement management system framework focusing on capital assets, the planning elements will target infrastructure performance.

In the area of planning, each of the continual improvement management system-based initiatives addresses:

- > Management commitment;
- > Policy statement;
- > Assessing areas for performance improvement;
- > Identifying legal and/or other voluntary requirements;
- > Setting objectives and targets; and

- > Developing plans for achieving objectives and targets, including identifying roles and responsibilities and establishing metrics for measuring progress towards goals and objectives.

Do

The purpose of the do or implementation component is to align operational and administrative practices, procedures, and processes; communications programs (internal and external); and employee training programs with the policy, objectives, and targets established during planning.

The management area(s) selected will determine the nature of the implementation component elements. For example, in a continual improvement management system framework focusing on quality, the employee training program and other implementation elements will be oriented around quality management. Alternatively, in a continual improvement management system framework focusing on safety and health, these elements will be oriented around management of occupational and public safety and health.

Each of the continual improvement management system-based initiatives supports the implementation component in a similar manner although they focus individually on different management areas. They provide the following implementation elements:

- > Training, awareness, and competence;
- > Internal and external communications;
- > Document management; and
- > Operational controls.

Check

The purpose of the check component is to align procedures and processes for the regular, ongoing monitoring of organizational performance with the policy, objectives, and targets established during planning. The check component includes elements designed to establish and align: techniques for measuring performance and progress against goals and objectives; management system audit procedures; performance reporting formats and procedures; and management review processes.

The continual improvement management system-based initiatives support the checking component by providing the elements that establish:

- > Monitoring and measuring activities;
- > Internal audits;
- > Performance and audit result reports; and
- > Management reviews.

Act

The act component establishes procedures and processes for making regular improvements to operations and the management system, based on the data and evaluations generated in the checking stage.

The continual improvement management system-based initiatives support acting by providing an approach for:

- > Developing corrective and preventive actions; and
- > Making adjustments to performance goals, management system elements, operations, and policies on a regular and ongoing basis.

1.2 How Continual Improvement Management System Frameworks Differ from Conventional Utility Management

There are a number of ways that continual improvement management system frameworks differ from conventional utility management approaches. Notably, continual improvement-based systems stress measurable objectives and targets, establish explicit standard operating and administrative procedures, **and require that performance be checked through on-going monitoring and measurement, periodic audits, and management review.**

Most organizations have business planning processes that cover planning and implementation (plan and do), but can fall short on monitoring progress and making management decisions based on real outcomes (check and act). This is a key advantage of the continual improvement management system framework and why utilities in the U.S., Europe, and Australia are beginning to shift from traditional business planning and management-by-objectives to this form of management.

As with planning, many of the do or implementation elements cover activities that are typically conducted as part of conventional utility management efforts. For example, all utilities have employee training programs in place. They cover on-the-job safety issues

and/or include operator certification. However, incorporation into a continual improvement management system typically requires that the training program is fully integrated with other management system elements and explicitly tied to objectives and targets.

The City of Charleston Commissioners of Public Works has found that standardization of training, document control, measuring and monitoring, and reporting through EMS implementation has improved its performance under the Partnership for Safe Water.

Additionally, continual improvement management system frameworks typically drive a greater degree of process and procedural standardization and documentation than may have existed under a conventional management approach. The ability to change in response to changing circumstances is provided for in the checking and acting portions of the cycle and thus, increased standardization also supports flexibility.

A continual improvement management system framework can also produce an organizational cultural shift in that routine assessment of business practices and changes needed for improvement becomes a regular part of doing business. The continual improvement effort can also enhance inter-departmental teamwork by aligning functions across the organization in support of objectives and targets.

1.2.1 Potential Benefits of a Shift to a Continual Improvement Management System Framework

Utility managers identify a number of benefits from implementing a continual improvement management system. These benefits include the following.

- > **Continual improvement in targeted management areas:** environmental performance, quality (process, product, customer service, and service level); safety and health (public and occupational); financial performance (operations and capital assets); and human resources and skill development. Sydney Water Corporation's staff believe that an Integrated Management System has helped produce: 70% reduction in total phosphorus load discharged; 80% reduction of ammonia-nitrogen load discharged; 30% reduction in total nitrogen load discharged; and 25% reduction in operating costs.
- > **Enhanced operational consistency and reliability.** The City of San Diego Metropolitan Wastewater Department's EMS has increased institutional knowledge and memory, creating more consistency and reliability in the long-term. Managers from other utilities cite this benefit as being an important given the increased rates of staff turnover and retirements.

Integration opportunities grouped by component of the continual improvement management system framework

Plan

- Management commitment
- Vision
- Policy statements
- Assessing areas for performance improvement
- Legal and other requirements
- Objectives and targets
- Management programs for performance improvement

Do

- Training, awareness, and competence
- Communication—internal and external
- Document management
- Emergency preparedness and response
- Operational control

Check

- Measuring and monitoring
- Auditing
- Reporting
- Management review

Act

- Corrective and preventive action
- Change management

- > **Improved teamwork, interdepartmental coordination, and employee awareness.** The Louisville and Jefferson County, KY Metropolitan Sewerage District, a utility participating in EMS for Local Government Initiative, is finding broader staff buy-in and greater staff understanding of how the environment is “everybody’s job”. The utility has found that more explicitly defining and documenting roles and responsibilities has increased employee understanding about roles and increased their sense of accountability. The management system has also improved internal communications.

- > **Critical customer responsiveness and recognition.** The Western Carolina Regional Sewer Authority, which is integrating its NBP EMS for Biosolids with CMOM, has found that by combining efforts, its public education program better informs the public of all organizational programs and agendas. The public is well aware of new capital improvement projects and the benefits of the biosolids programs. The public education program improves agency relations with the community about all facets of the organization, including biosolids.

The case examples provided in Chapter 4 of this guide provide additional examples of how some utilities are responding to the drivers described above and experiencing these benefits.

1.3 Introduction to Integration Opportunities

Continual improvement management system frameworks have a set of common elements and structure, regardless of which management area(s) they support. Similarities in purpose and structure between the many management initiatives available to water and wastewater utilities create opportunities to integrate at any of the elements common to the initiatives. This guide refers to these opportunities as “integration opportunities”.

The integration opportunities found under each component of the continual improvement management system framework are listed in the box at left. As could be expected, this list is very similar to the list of elements under the continual improvement management system framework (see text box on page 6). Diagram 1 (on page 13) depicts the relationships, or process flow, of the integration opportunities in a continual improvement management system framework.

Integrating management initiatives can amplify the benefits associated with a continual improvement management system framework (see Chapter 1 for a discussion of benefits) and has provided the following additional benefits.

Two primary benefits of integration

- Integration helps a utility to more effectively and strategically align improvements across a full range of management areas.
- Integration enables a utility to leverage the continual improvement management infrastructure established to support an individual management area.

- > Integration helps utilities more effectively and strategically align improvements across a full range of management areas. It helps utilities develop a coordinated management program that provides a clear sense of priorities and interrelationships on which to base staff roles and responsibilities and resource allocation.
- > Integration enables a utility to leverage the continual improvement management infrastructure (such as document control and communication procedures) established to support an individual management area. Utilities find that, once established to support a single management area (e.g., environmental performance under an EMS), the continual improvement management procedures can be easily adapted to incorporate additional management areas. More streamlined operations and decision-making, simplified employee training, consolidated and consistent communications, and substantial cost efficiencies for overall utility management result.

1.3.1 Key Integration Opportunities for Strategic Alignment

Although there can be gains in terms of both efficiencies and strategic alignment for each of the integration opportunities, utilities have identified certain integration opportunities as more important to strategic alignment. **The integration opportunities most critical to effective strategic alignment are:**

- > Establishing policy statements;
- > Assessing areas for performance improvement;
- > Setting measurable objectives and targets;
- > Developing management programs for performance improvement;
- > Measuring and monitoring; and
- > Conducting management review.

These six opportunities fall primarily under the planning and checking components of the continual improvement management system framework. Integration is important at these opportunities because:

- > Planning elements, such as assessing areas for improvement and establishing objectives and targets, address what an organization wants to accomplish. These accomplishments must be consistent to avoid potentially working at cross purposes.
- > The management programs for performance improvement shape the implementation elements. It is important that implementation elements such as communications, training, and operational control, provide a consistent message and direction to employees. These elements are more likely to be consistent if the policies and plans that guide them are integrated.
- > Checking and acting focus on reviewing and modifying plans and the activities that flow from them. These elements must also be strategically coordinated to avoid the potential for working at cross purposes.

Failure to integrate at these points could result in resource allocations that are not coordinated or sufficient to meet desired management areas.

1.3.2 Integration Opportunities for Leveraging Infrastructure

Any of the integration opportunities can allow the management system infrastructure from one initiative to support another. For example, if a utility develops a document control system for its EMS, it can leverage that same document control system for materials associated with other management initiatives, such as CMOM, PSW, or AMP.

2 Understanding Relationships among Utility Management Improvement Initiatives

In addition to implementing individual initiatives, utility managers are identifying opportunities to integrate them to take advantage of their overlapping purpose and/or structure and to embed them in a well-established and proven continual improvement management approach. Using any one of the continual improvement management system frameworks can provide the backbone for integrating the initiatives and provide a structure into which the desired combination of initiatives can nest.

Such an approach will support leveraging and integrating any of the variety of management initiatives to provide water and wastewater utilities with the ability to organize, direct, and adjust internal resources to achieve performance improvements and good management practices. When properly combined or integrated, the management initiatives provide a utility with a complete management package guided by a concrete business plan, supported by knowledge of best practices, and maintained through a continual improvement management framework.

A fully integrated management system framework supports performance improvement in all management areas of importance to the organization.

This complete management package, or fully integrated management system framework, supports performance improvement in all key areas. The “plan, do, check, act” framework of continual improvement management can be adapted to support the needs, priorities, and circumstances of the implementing organization.

Each of the initiatives, to a greater or lesser degree, support some or all of the elements of a continual improvement management system framework. Based on the elements they support most strongly, the initiatives can be loosely grouped into three types:

- > Best management practices;
- > Strategic business planning support tools; and
- > Continual improvement management system frameworks.

Here are just a few examples of each type of initiative and what they can provide in the context of a continual improvement management system framework.

- > Best practice initiatives such as those provided by the American Public Works Association's Management Accreditation Program help utilities improve administration, management, maintenance, and operations. Similarly, benchmarking initiatives such as QualServe and the Partnership for Safe Water help utilities understand how their operations rank in comparison to industry standards and where opportunities for improvement exist.
- > Business planning support initiatives, such as the Balanced Scorecard, provide an approach to identifying measurable objectives and targets and balancing priorities and resource commitments across the full range of utility management areas.
- > Continual improvement management system frameworks such as the NBP EMS Program, the EMS for Local Government Initiative, ISO 14001, and ISO 9000 provide the complete plan-do-check-act framework for building a continual improvement management system.

It is important to note that each of the management initiatives individually support improvement of utility management irrespective of a utility's interest in developing an overall, integrated management system framework.

Table 1 shows how each initiative can contribute to a continual improvement management system framework. It provides information on the key features of each initiative and which continual management system framework components and management areas they support. This table is designed to summarize the general characteristics of the initiatives and is not intended to be an authoritative reference on the initiatives.

Table 1: Characterization of Management System Initiatives

- E = Environmental Performance
- S = Safety and Health: Public and Occupational
- Q = Quality: Process Quality, Product Quality, Customer Service Quality, and Service Level
- F = Financial Performance: Operational, Assets
- H = Human Resources and Skill Development

1, 2, 3 indicate relative strength, with 1 being the strongest, of each initiative in supporting the continual improvement management system framework components. This table is designed to summarize general characteristics and is not intended to be an authoritative reference on the initiatives.

Initiative	Management Area(s) Supported					Key Features	Continual Improvement Management System Framework Components			
	E	S	Q	F	H		Plan	Do	Check	Act
APWA Management Accreditation Program	X	X	X	X	X	Supports self and peer-based assessments of conformance with APWA recommended practices.	1	1	2	3
Asset Management	X		X	X		Provides an approach to develop an infrastructure investment strategy that supports capacity needs.	1	1	2	2
AWWA Proposed Accreditation Program ³	X	X	X	X	X	Proposed accreditation program based on conformance with standards for water and wastewater utility operations (standards not yet developed).	1	1	3	3
Balanced Scorecard			X	X	X	Provides a high-level planning tool for balancing across management areas.	1	2	3	3
Bid-to-Goal				X		Provides an approach for evaluating operations against private sector benchmarks.	1	1	3	3
CMOM	X	X				Provides an approach for improving capacity, management, operation, and maintenance programs for sewage collection systems and wastewater treatment plants.	1	1	2	2
EPA EMS for Local Government Initiative	X					Supports establishment of a continual improvement management system, based on ISO 14001. Directed at local government operations.	1	1	1	1
GASB-34				X		Provides accounting standards for local and state governments, requiring full accrual accounting (reporting the value of infrastructure assets).	1	1	3	3

² The AWWA Accreditation Program is under development and may or may not cover all management areas.

Initiative	Management Area(s) Supported					Key Features	Continual Improvement Management System Framework Components			
	E	S	Q	F	H		Plan	Do	Check	Act
ISO 14001	X					Supports establishment of a continual improvement management system focused on environmental performance. Is not specifically-tailored to water / wastewater treatment utilities.	1	1	1	1
ISO 9002			X			Supports establishment of a continual improvement management system focused on quality. Is not specifically-tailored to water / wastewater treatment utilities.	1	1	1	1
Malcolm Baldrige National Quality Program			X	X	X	Award program recognizing performance in leadership, strategic planning, customer & market focus, and information & analysis. Not tailored to utilities.	3	1	3	3
NBP EMS for Biosolids Program	X		X			Supports establishment of a continual improvement management system - industry tailored EMS loosely based on ISO 14001 standard. Focused on biosolids value chain within wastewater treatment operations. Has enhanced public participation & communications elements.	1	1	1	1
OSHA Voluntary Protection Program		X				Supports establishment of a continual improvement management system focused on occupational safety and health. Is not specifically-tailored to water / wastewater treatment utilities.	1	1	1	1
Partnership for Safe Water	X					Supports benchmarking of drinking water turbidity and provides beyond-compliance turbidity goals.	1	2	1	3
QualServe	X	X	X	X	X	Supports a high-level evaluation of all aspects of utility operations.	1	2	2	3

2.1 Drivers for Integrating Management Initiatives

Drivers for utilities to consider integrating management initiatives under the continual improvement management system framework include the following.

- > Utilities are facing increasing expectations with respect to performance in a number of areas, including environment,

customer service, assets, and financial performance. The continual improvement plan-do-check-act cycle is a well established and proven approach for achieving performance improvement. Utilities can integrate initiatives with a plan-do-check-act cycle to balance performance improvement in multiple areas of importance to the organization.

- > Utilities are acutely aware of the need to balance decisions between multiple management areas such as environmental and financial goals. Utilities that have developed a management system with a single management area focus, such as an EMS, have found the need to supplement these with strategic business planning tools to provide a path for balancing decisions.

- > Utility managers are looking to understand the connections between performance improvement initiatives. It is common for individual performance improvement initiatives to be implemented sequentially without an understanding among utility staff about how the initiatives relate or how gains realized can be leveraged. This has led to a certain degree of skepticism and a perspective that managers are pursuing a “flavor of the month” approach to improvement efforts. Incorporating initiatives into an integrated management system framework can demonstrate how individual initiatives can be an important component of the utility’s overall performance.

2.2 How the Initiatives Integrate with the Continual Improvement Management System Framework

Table 1 characterizes how the 15 initiatives support the continual improvement management system framework components. The initiatives support different elements of a continual improvement management system framework. For example, strategic planning initiatives, such as the Balanced Scorecard, support planning elements such as setting objectives and targets. Best practice initiatives, like QualServe and the APWA Management Accreditation Program, can support planning elements such as assessing areas for performance improvement, and with implementing, in adopting best management practices. Management system initiatives, such as ISO 9000 and the NBP EMS for Biosolids, provide the continual improvement management system framework.

An organization can start with any of the different initiatives to build up to a continual improvement management system framework supporting all management areas of importance to the organization.

- > For example, a utility could start by planning, to determine first where it wants to go, and then implement a continual improvement management system framework to support the plans.
- > Or, a utility could start with a focused continual improvement management system such as the NBP EMS for Biosolids and then expand its scope to include additional operations. The NBP EMS program provides best management practices for biosolids management. After expanding the management system framework scope to include additional operations, the utility could build in best management practices for the additional operations.
- > Additionally, a utility could start by adopting industry best management practices with an initiative such as the APWA Management Accreditation Program, and then tie these practices to strategic business plans. This can be done through the adoption of a continual improvement management system framework.

Any of these entry points, whether strategic business planning, best management practices, or continual improvement management system frameworks, can lead a utility to the development of an integrated management system that supports all management areas of importance to the utility.

Chapter 3 provides further description of how utilities can integrate initiatives, including some examples from utilities that have started down these paths. Chapter 4 of this guide provides more detail of how to approach integration at each of the integration opportunities, using examples from four of the 15 initiatives.

2.3 The Versatility of Integration Approaches

Utilities are taking a variety of approaches to integrating management initiatives, based on circumstances and needs. Some utilities are implementing a continual improvement management system framework in phases, starting with a particular initiative and

Because drinking water and wastewater utility operations are primarily focused on environmental and public health impacts, utility managers will find that EMS represent a natural starting point for introducing a continual improvement management system into a utility.

adding others over time. For example, some utilities begin with utility planning initiatives, such as QualServe, and then add in elements of doing, checking, and acting. This approach allows utilities to build a better understanding of where improvement may be needed and develop a case for eventually implementing a continual improvement management system framework. Other utilities are beginning with a continual improvement management system that supports a single management area – often an EMS – and then incorporating additional management areas.

Using either approach, utility managers can use the management initiatives to provide components of a continual improvement management system framework. The initiatives can be leveraged by integration to move the utility in the direction of a continual improvement management system framework that supports all management areas of importance to the utility.

Conditions such as organizational size and type may affect the approach. For example, larger utilities are likely to have more resources. However, they also tend to have more complex organizations and layers of bureaucracy, which can slow implementation. Smaller utilities may be more resource constrained, but have less bureaucracy and thus, may actually be able to enact real change more quickly and develop and integrate management initiatives, possibly even simultaneously.

Strategic business plans play an important role by helping an organization determine what are its needs and priorities for performance improvement that can be embedded in a continual improvement management system framework.

Strategic business plans play an important role by helping to identify needs and priorities for performance improvement that can be embedded in a continual improvement management system framework. Many utilities already have a strategic business plan. Some are beginning to connect the needs and priorities (high-level business goals) identified in the strategic business plan with a continual improvement management system framework.

Chapter 3 of this guide elaborates further on different implementation approaches utilities are using to integrate management initiatives. It also contains six utility case examples. The approaches and examples described in Chapter 3 demonstrate a variety of incremental or phased approaches to developing an integrated management system framework. However, it is possible that an organization might develop and implement a continual improvement management system that is integrated (i.e., addresses multiple management areas) from the start.

3 How to Integrate - Practical Considerations

3.1 Getting Started

One challenge to implementing and integrating management initiatives is determining where to start. Utilities are using a variety of approaches – each is equally valid and leads to the implementation of a continual improvement management system framework covering multiple management areas and with an enterprise-wide scope. The right place to start depends on what is already in place and what is important to an organization.

This chapter describes how utilities can approach integration of management initiatives and gives case examples describing approaches used by six different utilities.

3.1.1 Critical Success Factors

Utility managers consulted in the preparation of this guide consistently identified the following critical success factors for continual improvement management system implementation and maintenance.

- > A strategic business plan with a limited number (e.g., 5-10) of measurable objectives to clearly focus organizational priorities and direction.
- > Management commitment to ensure adequate resources are in place for management system planning, implementation, and maintenance.
- > Connection to budget processes to ensure that organizational priorities receive necessary resources.
- > Awareness of best management practices to help the utility understand where it is in relation to industry standards.
- > Effective internal and external communications to ensure that employees understand the organization's vision and that interested parties understand the organization's progress towards performance improvement.
- > Training programs to give employees the skills required to do their jobs and support management improvement.

- > Employee “buy-in”, involvement, and feedback to promote ownership and commitment to success.
- > Effective use of information (e.g., data management) to support monitoring, measuring, and reporting activities and data gathering activities required when conducting assessments for areas of performance improvement.
- > Explicit checking and acting activities that effectively “close the loop” on performance levels and support the development and maintenance of a continual improvement culture.

Effectively integrating management initiatives within a continual improvement management system framework both depends on these success factors, as well as establishes an organizational environment in which the initiatives are most apt to flourish. An absence of any of these critical factors may hinder successful implementation and maintenance of the management system. For example, the management system might not be effectively implemented if there is a lack of employee understanding, or it might disintegrate from lack of commitment or resources. The key question is, how does an organization get started down this path? The answer is one step at a time, but beginning with a clear sense of the end (an enterprise-wide continual improvement management system framework) in mind.

3.1.2 Management System Scope

Two Ways of Thinking about Scope

- **Fence Line:** those operations and facilities encompassed by the management system
- **Management Areas:** environment, quality, safety, etc.

A first step in establishing a continual improvement management system framework is to define its scope. There are two ways of defining scope. This first is “fence line” – listing which operations and facilities will be covered by the management system. The other is management areas – identifying the utility performance areas the management system will address.

Several management initiatives define the fence line based on the concept of “value chain”. For example, the NBP EMS focuses on the biosolids value chain, or those operations which affect the production and management of biosolids. Not all wastewater treatment operations are covered by this Biosolids EMS, only those that relate to biosolids. Capacity, Maintenance, Operations and Management programs (CMOM) also use the value chain concept, but focus on those facilities and operations that play a role in the prevention of sanitary sewer overflows.

The 15 management initiatives do not have the same scope, though many do overlap to varying degrees in either the management areas

It is not necessary that all performance improvement initiatives have the same scope. Effective integration, however, will require that the scope of the overall continual improvement management system encompass the individual management initiatives the utility is undertaking.

they address or the utility operations / processes to which they can apply. Between some, there is no overlap. For example, Partnership for Safe Water (PSW) focuses on drinking water turbidity levels and therefore encompasses business functions that influence drinking water turbidity (e.g., sedimentation, flocculation). CMOM focuses on sanitary sewer overflows and those facilities and operations that can prevent sanitary sewer overflows. A utility implementing both PSW and CMOM will find that these initiatives have a distinctly separate scope.

Effective integration, however, will require that the scope of the overall continual improvement management system framework encompass the individual management initiatives an organization is undertaking. For example, a joint water and wastewater utility might choose to integrate both CMOM and PSW within an overall environmental management system. In this case, the EMS scope would encompass CMOM and PSW and also address other environmental aspects important to the organization.

3.1.3 Cross-Functional or Interdepartmental Team

Another early activity in implementing a continual improvement management system framework is establishing a cross-functional or interdepartmental team that includes all of the business functions included in the scope of the management system. The role of this team is to identify and assess issues, opportunities, and processes.

The Santa Clara Valley Water District has formed an Asset Management Team representing all divisions within the District. They believe it is likely that their EMS development would involve a cross-functional team that would include many of the same people who make up the current AMP team.

Most of the management initiatives examined in the guide either explicitly call for or would be well supported by the establishment of a cross-functional team. A utility implementing multiple initiatives will find it likely that such teams will have highly overlapping participation, including representatives from engineering, finance, human resources, maintenance, purchasing, and operations. This overlap signals a clear opportunity for leveraging a single cross-functional team to support multiple management initiatives, or at a minimum, an opportunity to leverage standard practices for team formation and operations.

An organization that has implemented one management initiative can broaden the existing team by incorporating additional business functions and by changing the scope and responsibilities of the team. For example, a cross-functional team developed for an EMS can be utilized for an asset management program with the addition of representatives (if necessary) from capital planning and finance.

To manage workload, a cross-functional team may need to establish subgroups focused on individual management areas, such as environmental performance, or on individual initiatives. Effective integration, however, will require that the overall team is clear that its role is to support integration. This will require, in particular, that the team ensure that assessments are conducted in a coordinated if not an integrated fashion and that objectives and targets and associated management programs are strategically consistent.

EMS standards such as ISO 14001 require that organizations appoint a management representative to oversee the development and implementation of an EMS. Having a senior management representative on the cross-functional team can help address conflicts between team members who represent different business units, report to different managers, and potentially have a different sense of priorities.

3.1.4 Initial Assessment of Existing Management System Components

When developing a continual improvement management system framework, most organizations conduct an assessment of existing management system components. This is often called a “gap analysis” when done for EMS. In the context of integration, a utility should identify where management system components already exist, and where they might already support integration.

Utilities should look for opportunities to leverage management system procedures to support the management system framework. For example, if an organization has already developed a continual improvement employee training procedure, the organization should examine the procedure to determine what modifications might be necessary to support an integrated approach.

A utility could use a table such as the following (table 2) to identify existing management system components, and where they might support integration. For those components that do not support multiple management areas, it will be important to determine changes necessary to support integration. Chapter 4 of this Guide can also be helpful in supporting an assessment of existing management components.

Table 2: Assessment of Existing Management System Components

	Component Does not Exist	Component Supports Single Management Area	Component Supports Multiple Areas
PLAN			
Management commitment			
Vision			
Policy statements			
Assessing areas for performance improvement			
Legal and other requirements			
Objectives and targets			
Management programs for performance improvement			
DO			
Training, awareness, and competence			
Communication			
Document control			
Emergency preparedness and response			
Operational control			
CHECK			
Measuring and monitoring			
Reporting			
Management review			
Auditing			
ACT			
Corrective and preventive action			
Change management			

3.2 Sequencing and Phased Approaches to Integrating Management Initiatives

Phased or Incremental Development Approaches

- Starting with planning and self-assessing
- Expanding the system to cover additional operations
- Leveraging infrastructure and Increasing management areas

Most utilities phase the development and integration of management initiatives. Most are fully implementing one initiative before approaching the next and considering integration.

Examples of how various management initiatives can be integrated in sequence are discussed here. However, there are many different approaches to integration in the context of a continual improvement management system framework. The examples represent just a few options. As the later utility case examples highlight, organizations

may utilize several of these approaches in the process of developing a continual improvement management system framework and integrating management initiatives.

3.2.1 Starting by Planning and Self-Assessing

One approach to integration is to start with one of the initiatives that support utility planning, and then add in elements of doing, checking, and acting. Organizations that may not yet have the management commitment, resources, or other critical success factors in place to develop and implement a continual improvement management system framework may want to start this way. In these circumstances, the approach may be to build a better understanding of where improvement may be needed and develop a case for eventually implementing a continual improvement management system framework.

Organizations that have gone through a self-assessment and peer review process, such as those provided by QualServe, the APWA Program, or the Malcolm Baldrige Award Program, have already taken a substantial step in identifying the areas for desired improvement around which a continual improvement system could be built.

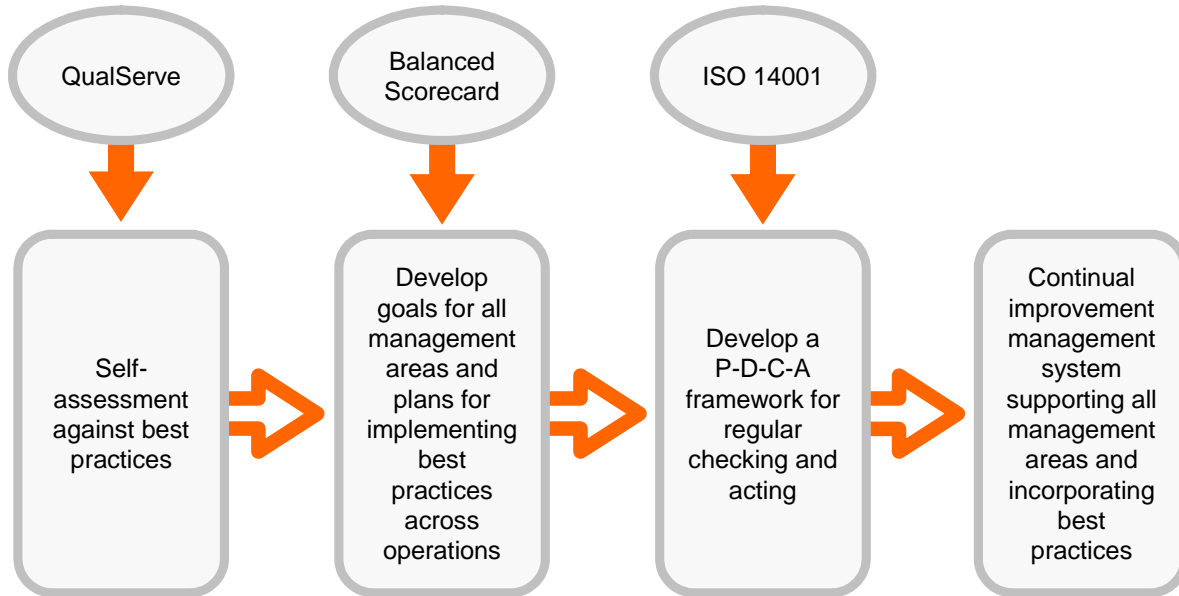
For example, an organization could start with an initiative that supports planning and self-assessing, such as QualServe or the APWA Management Accreditation Program, to identify areas for improvement. A utility could also use CMOM to conduct an evaluation of collection system and treatment capacity needs to prevent sanitary sewer / combined sewer overflows. Once an organization has identified improvement opportunities, it could use these to develop plans for implementing change and to drive a need for checking on performance goals and acting to make adjustments to meet those goals. A continual improvement management system framework, such as an EMS, can then be used to support systematic, consistent implementation.

An organization can also draw on various initiatives that support planning while it is developing an EMS (rather than as a separate step from developing an EMS). For example, a utility could incorporate the turbidity performance targets of the Partnership for Safe Water into its EMS performance objectives and targets. (See Charleston CPW case example.) A utility could utilize Asset Management to determine a financial strategy for meeting asset

requirements that will support the capacity needs, goals, and targets as determined during the planning phase.

The following is a graphical depiction of one approach to starting by planning and self-assessing.

Figure 1: Starting by Planning and Self-Assessing



3.2.2 Expanding the System to Cover Additional Operations

See the case examples on the Albany, Oregon Public Works Department and Sydney Water Corporation for descriptions of how utilities are expanding systems to cover additional operations.

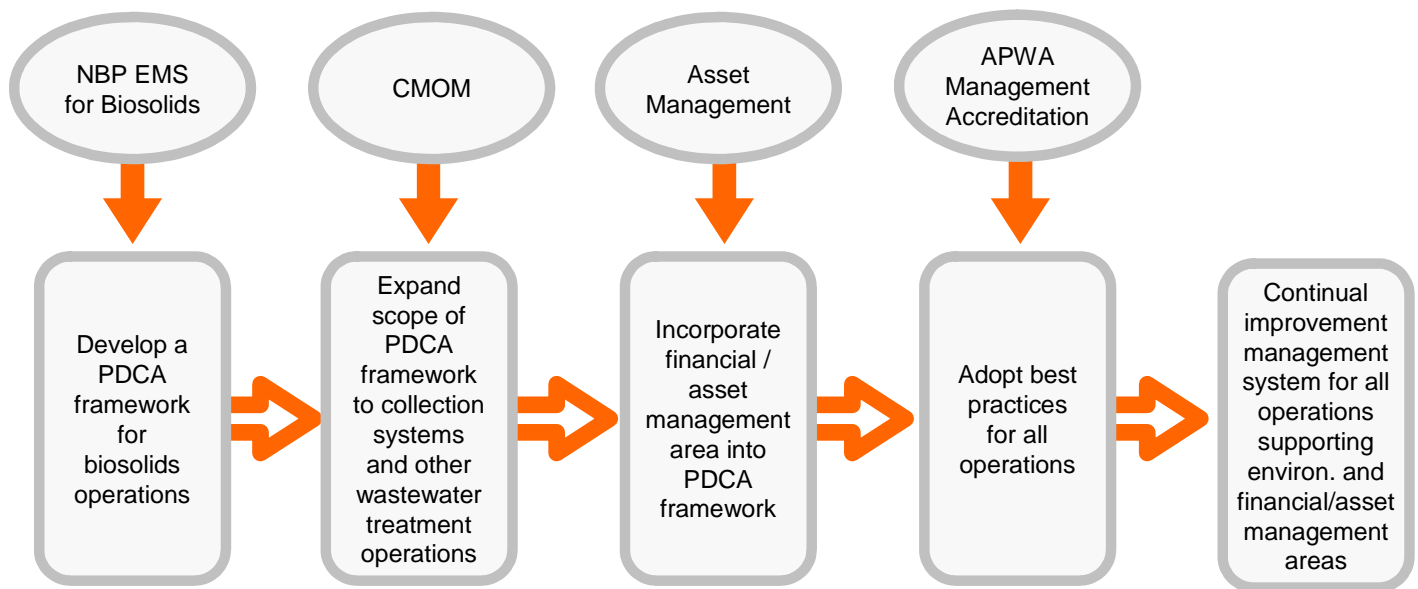
Another approach to integrating initiatives in the context of a continual improvement management system framework is to start with a single business unit or part of the value chain and expand incrementally. This approach allows for starting small, learning lessons, and building upon success. There are a number of ways an organization could expand along the value chain, limited only by the scope of the organization's operations.

One approach would be to implement the National Biosolids Partnership EMS for Biosolids, which focuses on the biosolids value chain, and then expand the elements of the EMS to other operations. This expansion in value chain moves the management area focus from biosolids to the environmental aspects of all operations.

A number of information sources on industry best practices can be used to help an organization tailor the implementation components of its EMS as it expands along the value chain. These include the NBP Program’s National Manual of Good Practice, QualServe, and the APWA Management Accreditation Program.

The following is a graphical depiction of one approach to incrementally expanding the system to cover additional operations.

Figure 2: Expanding the System to Cover Additional Operations



3.2.3 Leveraging Infrastructure and Increasing Management Areas

Some utilities have expanded a continual improvement management system that has a single management area focus to include other management areas. Organizations taking this approach have found that, although they experience benefits from their continual improvement management system, their system has not covered all of the important areas for which they manage. An advantage of this approach is that it allows an organization to establish some degree of comfort and experience with a continual improvement management system before incorporating other management areas.

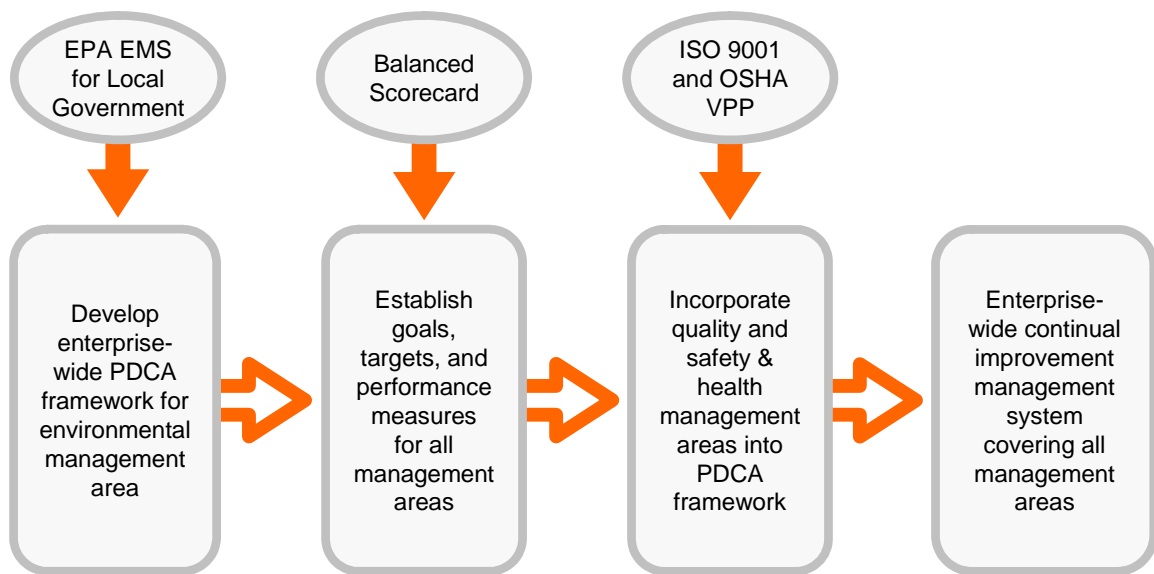
One way to expand an established continual improvement management system would be to use Balanced Scorecard to create a

broader management vision and policy. For example, The City of Eugene’s Wastewater Division began by implementing ISO 14001 and is now utilizing the Balanced Scorecard to develop a vision, goals, and objectives for expanding its EMS to include other management areas. (See case example below for further description of Eugene’s approach.)

A variety of management initiatives, including CMOM and Asset Management, could also be used during planning to set objectives that focus on additional management areas. For example, Sydney Water Corporation in Australia began by implementing an ISO 14001 EMS. The organization then added to their management system framework quality elements by drawing on ISO 9001 and human resources elements by drawing on an Australian occupational health and safety standard. (See case example below for further description on Sydney Water’s approach.)

The following is a graphical depiction of one approach to leveraging infrastructure and increasing management areas.

Figure 3: Leveraging Infrastructure and Increasing Management Areas



3.3 Addressing Barriers to Continual Improvement Management System Adoption

Utility managers identify a number of real or perceived barriers that have the potential to impede the adoption and maintenance of a continual improvement management system framework. Utility managers also identify a variety of potential methods and/or incentives for overcoming those barriers.

Barrier

Implementing a management system framework requires substantial, upfront resources and time.

Responses

- > A number of leveraging opportunities now exist. Because implementation of a management system framework is no longer “bleeding edge”, utilities can draw on the work of those who have “paved the way”. This has allowed for the cost and complexity of management system implementation to come down. Further, a number of handbooks, guidance documents, and presentations can help prevent utilities from having to “reinvent the wheel”.
- > Specific utility management initiatives can help tailor the continual improvement management system to the utility. The tools can substantially lower the burden of introducing a continual improvement management system into a utility by providing concrete planning methods and concrete guidance on best practices, procedures, and/or performance levels.
- > Utilities can phase in a management system framework, starting with one plant or with one department and expanding, as they are able.

Barrier

Need to provide justification for resources, however:

- > *It is difficult to quantify benefits;*
- > *Benefits often are not seen until long after development and implementation costs are incurred;*
- > *There are no clear requirements (e.g., adopting a management system is voluntary); and*

- > *Conventional “plan and do” management is producing “satisfactory” results.*

Response

- > *A number of clear benefits do exist and are being articulated by the early adopters of continual improvement management systems (see benefits discussion in section 1.2.1).*

Barrier

A general reluctance to change exists and implementing a management system framework requires a substantial culture shift for managers, staff, and board members.

Responses

- > *Promoting “best in class” status and best management practices will encourage peers who are less likely to change.*
- > *Incorporating management system concepts into operator training courses will introduce staff to these concepts.*
- > *Clearly presenting benefits to decision makers may also be helpful.*
- > *Instituting ideas of continual improvement may require a long-term shift in thinking (not a “revolutionary change”).*

Barrier

A management system framework generates increased paperwork associated with documenting the program.

Response

- > *Documentation provides reproducible policies and procedures that are useful when utilities face changing workforce demographics and turnover of intellectual capital.*

Barrier

A management system framework generates closer scrutiny (increased liability), creates more transparent performance goals, and results in more explicit operational evaluations.

Responses

- > *Increased transparency can build confidence with outside audiences.*
- > *Increased transparency can provide an opportunity to demonstrate “a job well done”.*

3.4 Case Examples

3.4.1 Charleston, South Carolina Commissioners of Public Works (CPW)

Background

Charleston CPW is a municipal corporation that provides both water and wastewater treatment services to the City of Charleston, SC and portions of the greater Charleston Metropolitan Area. The wastewater utility has a 36.5 million gallon per day (mgd) (130 million liters per day [ml/d]) wastewater treatment plant with 525 miles (844 km) of wastewater infrastructure. The water utility serves a customer population of 450,000 with a 118 mgd (446 ml/d) water treatment plant and 1,400 miles (2253 km) of water distribution infrastructure.

Charleston CPW has an ISO 14001 company-wide registration for its EMS, has an approved Partnership for Safe Water (PSW) program, has completed a Balanced Scorecard system development, and is approximately 90 percent through implementing CMOM.

Integrating Management Initiatives

Charleston CPW first developed an ISO 14001 EMS for the water distribution division. This ISO 14001 EMS was expanded to cover all of the agency's divisions. Initially, separate ISO registrations were maintained for the different divisions. Eventually, however, all of the EMSs were incorporated into one ISO registered EMS. Charleston CPW followed the development approach of expanding operations, described above.

*The first point of integration for Charleston CPW was identifying **Partnership for Safe Water** as a voluntary requirement under their EMS Legal and Other Requirements identification.*

The first point of integration between management initiatives occurred as an EMS was developed for the water division. Charleston CPW had been a member of PSW since 1996. PSW was identified as a voluntary requirement under the EMS Legal and Other Requirements. PSW's specific targets were built into EMS objectives and targets, and PSW technical guidelines were incorporated into EMS operational controls for meeting designated drinking water targets.

Charleston CPW has experienced the following benefits from PSW and ISO 14001 EMS integration.

The City of Charleston CPW has found that standardization of training, document control, measuring and monitoring, and reporting, through EMS implementation has improved its performance under the Partnership for Safe Water.

- > Integration increased the focus on filter maintenance and improving those activities to support PSW. Charleston CPW found that existing equipment was not sufficient to detect the very low turbidity measurements (less than .1 NTU) required for PSW. As a result, CPW has upgraded some of the measuring equipment and has improved filter maintenance to exceed the 95 percent at .1 NTU requirements of PSW. Currently, CPW is achieving .1 NTU 98 percent of the time.
- > CPW found that EMS implementation drove increased consistency between operators by documenting and standardizing SOPs under EMS operational control and by integrating the computerized maintenance management system (CMMS). This increased consistency and alignment of the CMMS has led to greater consistency of performance, as is demonstrated in the 98 percent achievement of .1 NTU.
- > PSW performance has also improved as a result of the standardization of other elements, such as training, document control, measuring and monitoring, and reporting, which were formalized as part of EMS implementation. CPW has used the PSW requirements for reporting and has made the measurement and reporting tools the same for both EMS and PSW.

The primary benefit of integration that Charleston CPW has experienced with CMOM and EMS is that the EMS already had put in place the majority of what was needed for implementing CMOM.

Charleston CPW has also integrated its EMS and CMOM program, which is about 90 percent complete. For ISO auditing and registration purposes, CPW has not yet officially integrated the CMOM program into the EMS. Rather, they are currently running in parallel, with integration occurring at strategic points.

Charleston CPW has found that by having an EMS in place, the majority of what was needed for implementing CMOM was also in place. CPW had already identified SSOs as part of EMS significant environmental aspects analysis. Elements needed for CMOM that were not already addressed by the EMS included: preparing a written description of the CMOM program, incorporating some additional SOPs (e.g., for the electrical components of the pump stations), incorporating CMOM signage and posting requirements under EMS Legal and Other Requirements, pulling together schedules for maintenance and rehabilitation / repair of assets, and adding an SSO response component to the EMS Emergency Response and Preparedness Plan.

Charleston CPW has also almost completed developing a Balanced Scorecard (BSC) and has found integration opportunities between

For more information on Charleston CPW's approach to EMS and CMOM integration see "Laying the Foundation: An environmental management system is a great first step in launching a CMOM program" by Rick Bickerstaff, Adrian Williams, and John Cook, [Water Environment and Technology](#), March 2003.

BSC and the EMS. BSC has helped coordinate existing strategic planning processes and EMS, as it focuses on a company wide strategic direction first and then helps set measures for the strategic plan.

Balanced Scorecard helped Charleston CPW develop performance measures in areas that the EMS did not cover. BSC has helped set targets that, while not significant from an environmental perspective, are significant from the corporate management perspective.

All of the important objectives from CPW's strategic plan, including environmental objectives from the EMS and SSO objectives from the CMOM program, have been included under BSC. Use of BSC has also helped prepare measures for knowing how the utility is performing with respect to those objectives. The environmental objectives and targets, and the objectives and targets that are non-environmental, are being supported by EMS infrastructure (e.g., through standardization of SOPs, better training, etc.) but are not seen as part of the EMS for audit purposes. The EMS provides elements of implementing, checking, and acting to support all of the objectives and targets developed under BSC.

Charleston CPW has found the following benefits from integrating BSC with the EMS.

- > BSC has provided connectivity that has supported effective use of frontline staff by helping them to understand the corporate objectives and how divisional objectives support these.
- > BSC helped develop performance measures in areas that the EMS did not cover. BSC has helped set targets that while not significant from an environmental perspective, are significant from the corporate management perspective.
- > BSC has helped prioritize between objectives and targets and this has fostered effective budget development.

For more information on Charleston CPW's management initiative implementation and integration efforts, contact John Cook, Assistant General Manager at cookjb@charlestoncpw.com

Table 6 (next page) depicts the integration opportunities Charleston CPW has identified between ISO 14001, CMOM, PSW, and BSC.

Table 6: Charleston CPW Integration Opportunities for ISO 14001, CMOM, Partnership for Safe Water, and Balanced Scorecard

ISO 14001	CMOM	Partnership for Safe Water	Balanced Scorecard
PLAN			
Management commitment	←		
Policy statement	←		
Assessment of areas for performance improvement	←	←	←
Legal and other requirements	←	←	
Objectives and targets	←	←	←
Management programs for performance improvement	←	←	←
DO			
Structure, roles, and responsibilities	←	←	
Training, awareness, and competence	←	←	
Communications – internal and external	←	←	
Document management	←	←	
Operational controls	←	←	
Emergency Preparedness and response	←	←	
CHECK			
Measuring and monitoring	←	←	
Auditing	←		
Reporting	←	←	
Management review	←		
ACT			
Corrective and preventive action	←		
Change management			

3.4.2 City of Eugene, Oregon Public Works Department

Background

The City of Eugene, Oregon Public Works Department includes parks/open space, transportation (airport and streets), stormwater, wastewater treatment, and natural resource stewardship. The entire Department is participating in the APWA Management Accreditation Program. The Wastewater Division of the Department has developed an ISO 14001 EMS that has been registered since September 2000 and is in the process of implementing Balanced Scorecard (BSC).

The services of the Wastewater Division include operating a 100-acre (40.5 ha) regional Water Pollution Control Facility and 49 pumping stations, treating 38 mgd (144 ml/d) of wastewater; processing 49.8 million gallons (188.5 ml) of biosolids annually at the 154-acre (62.3 ha) Biosolids Management Facility, and administering an industrial pretreatment program that monitors the wastes of 39 local industries.

Integrating Management Initiatives

The Wastewater Division began by implementing ISO 14001 and is now utilizing BSC to develop goals and objectives for expanding its EMS to other management areas. The Wastewater Division moved to BSC, in part, because managers believed that the EMS did not sufficiently address certain financial components of environmental areas. For example, the Wastewater Division found it did not have a strong basis for balancing the cost of making an operational change or new capital investment with the benefit of meeting an environmental objective.

As part of developing BSC, the Wastewater Division developed a single vision statement and made all its policies consistent with the vision. The vision statement explicitly reflects the four BSC perspectives of customer, financial, internal business processes, and learning and growth.

“The protection of public health and the environment shall be our highest priority and this will be evident in everything we do. We will carefully consider cost efficiency and effectiveness in all of our work. We recognize that flexibility and change are essential for improvement. Our division shall be a challenging

and desirable place to work and we recognize that individual growth and development enhance our success. We will be responsive and accountable to the public we serve and will remain to be their preferred service provider.”

The Wastewater Division is in the process of developing objectives and targets to match the four quadrants of BSC (financial, customer, learning and growth, and internal business processes). Developing objectives and targets for each BSC quadrant has helped the Division identify gaps in the EMS objectives and targets. For example, BSC requires the Division to define its customers. The Division does not have direct contact with customers (local sanitary connections, as well as billing and other administrative services are not the responsibility of the Wastewater Division) and so had not identified its customer base as part of EMS planning. Under the customer perspective quadrant of BSC, the Wastewater Division is now developing objectives that are important to customers such as minimizing odors.

The Division also identified, through developing BSC objectives and targets, a gap in safety issues in the EMS. The Division is considering incorporating safety into the EMS, based on the clear connections between environment and safety. The Division is incorporating other EMS objectives into the BSC quadrant to which they most strongly relate. For example, controlling and reducing influent mercury fits in the BSC quadrant for internal business processes.

The Division cites increased transparency of the operation and capital budgeting process as one benefit of integration. Core performance measures have been identified for each program area in the Division and these measures will be fed into the annual budgeting process.

The Division has been able to leverage the existing infrastructure of the EMS to support BSC components. The development of duplicate document control systems, for example, has been avoided. To support ISO 14001 registration, the Division has developed an intranet-based documentation system, allowing all staff access to information, procedures, forms, policies, etc. The same measuring and monitoring system will be used to track progress on all objectives and targets derived from the BSC.

For more information on Eugene's management initiative implementation and integration efforts, contact Peter Ruffier, Wastewater Division Director at Peter.J.Ruffier@ci.eugene.or.us

The Wastewater Division is currently trying to integrate the best practices defined in the APWA Management Accreditation Program and are finding that this work links with EMS and BSC activities. The APWA Program helps confirm interpretations of best practices and ensures that none are overlooked.

3.4.3 City of Albany, Oregon Public Works Department

The NBP EMS provided the continual improvement framework, the documentation opportunity, and the “how to” roadmap for continual improvement that staff could understand in this “fenced” area of the organization.

—Diane Dennis, City of Albany
Public Works Director

Background

The City of Albany, Oregon Public Works Department (PWD) provides drinking water, wastewater collection and treatment, transportation, and stormwater drainage services to 41,650 residents. The Albany PWD manages 4 drinking water reservoirs, an 18-mile canal (29 km), 5 pump stations, an 18 mgd (68 ml/d) water treatment plant, 220 miles (354 km) of water mains, 1 wastewater treatment plant with an average 9 mgd and maximum 20 mgd (average 34 ml/d, maximum 76 ml/d), 180 miles (289 km) of collection system pipes, and 18 pump stations.

The PWD has developed a National Biosolids Partnership (NBP) EMS that covers the wastewater treatment plant and biosolids management operations. The PWD is implementing components of CMOM for the collections system and wastewater treatment plant and components of Asset Management for the entire Department. The PWD is participating in the APWA Management Accreditation Program and adopting the APWA best management practices.

Integrating Management Initiatives

The PWD is systematically transitioning from Management-by-Objectives (MBO) to a plan-do-check-act management system approach. The PWD is incrementally expanding the EMS framework developed for NBP to include all operations. This will expand and strengthen the current MBO approach by incorporating systematic follow-up (checking and acting). The PWD is looking to incorporate other management areas, not just environment, into the management system framework.

Implementation Approach

The PWD’s approach for expansion and integration will follow a step-wise, incremental path. First, all environmental aspects of wastewater treatment (beyond biosolids) will be incorporated into a continual improvement management system framework, including adding the “technical” components of CMOM and asset

management. Next, drinking water operations will be incorporated, and then eventually other divisions (such as transportation) will be incorporated. The scope of the EMS will expand in terms of both fenceline and management areas.

For more information on Albany PWD's management initiative implementation and integration efforts, contact Diane Dennis, Public Works Director at dtaniguchi-dennis@ci.albany.or.us

As the EMS scope is expanded, the PWD will utilize vision and goals determined for the city (set by the City Council each January) as the basis for balancing financial and other objectives. The PWD establishes objectives and targets based on balancing customer service, environment, financial, utility business processes, and human aspects (a Balanced Scorecard-like approach). The EMS framework will provide the needed continual improvement cycle to more actively check and act on objectives and targets established under MBO. This is the primary benefit Albany PWD is seeking in making the transition from MBO to plan-do-check-act. In addition, process documentation and standardization will improve consistency and performance.

Because of third party auditing, the PWD will keep a discreet NBP EMS and use the EMS framework (plan-do-check-act) to support other divisions, as well as other management area goals and objectives. Some elements will be standardized - for example only one document control approach will serve the entire department. For other elements, different divisions may have individualized procedures, integrating only where activities cross division boundaries.

3.4.4 Sydney Water Corporation, Sydney, Australia

Background

Sydney Water Corporation has a legislative requirement and is licensed by the State Government to provide drinking water and wastewater treatment services to more than four million customers in the greater Sydney Region. The wastewater process captures, transports, and treats approximately 1,200 ml/d (320 mgd) through 22,000 km (13,670 miles) of pipes, 659 Pumping Stations, and 30 Sewage Treatment Plants. The wastewater process involves primary, secondary, and tertiary treatment plants. Approximately ninety percent of the flow is treated at the coast and discharged to the ocean, with the remainder (10 percent) treated at 17 tertiary treatment plants that discharge to the Hawkesbury Nepean River. Sydney Water Corporation (SWC) is also responsible for the beneficial use of biosolids and effluent. Over the last five years, SWC has averaged beneficial use of 99 percent of the biosolids

captured with 100 percent beneficially used in 02/03 financial year. SWC also beneficially reuses approximately 35ml/day (9 mgd) of reclaimed and recycled water.

Integrating Management Initiatives

SWC's Wastewater Operations has developed a Wastewater Integrated Management System (WW-IMS) that is ISO 14001 certified and compliant with the requirements of relevant clauses of ISO 9001 and Sydney Water Corporations' Occupational Health and Safety System. The WW-IMS currently covers all 30 treatment plants and the wastewater collection network (pipes and pumping stations) and associated activities.

IMS Development Approach

SWC has implemented the WW-IMS in stages, expanding over time in terms of both the fenceline, or number of facilities covered, and the management areas addressed. The WW-IMS has been developed in the following stages.

- > In 1996, an ISO 14001 EMS, with elements of quality and safety included, was developed for one sewage treatment plant. This EMS was certified to the ISO 9001 and 14001 standards. Effluent from the plant is used in homes for toilet flushing and garden watering. This activity required extra monitoring due to the increased liabilities involved and provided the driver for initial management system implementation.
- > Next, two additional treatment plants developed ISO 14001 certified EMS. With three separate EMS in place, SWC adopted a more uniform approach, electing to use a single management system, rather than a series of independent systems that were slightly different for each plant.
- > Between 1998 and 2001, SWC's plant management team developed an ISO 14001 certified management system that covered all 30 sewage treatment plants and incorporated relevant clauses of ISO 9001 and the Corporation's Occupational Health and Safety System. ISO 14001 provided the basic management system framework that was expanded to include the other areas of occupational safety and health and quality. This phase also included building in the management of biosolids under the same management system.

- > Most recently, the management system has been expanded to encompass a process-based approach, building in the wastewater collections network (thus, encompassing the entire Wastewater Operations business unit) and certain environmentally critical components of the following other wastewater business units: Planning, Maintenance, Trade Waste, and Reporting.

SWC has identified the following additional steps for future WW-IMS expansion.

- > Incorporate all remaining functions of the wastewater business units (Planning, Maintenance, Trade Waste, and Reporting).
- > Certify each additional business unit in the WW-IMS to the most relevant standard for that business unit. All business units will maintain an integrated approach and contain environmental, safety, and quality components. However, they will be certified to different standards. SWC has already identified which standard to apply by using a risk based approach that identified what the greatest risk was in each business unit. The treatment facilities will maintain ISO 14001 certification, for example, and the maintenance division will achieve ISO 9001.

Standardized and Specialized Procedures of the WW-IMS

A team of management representatives developed the WW-IMS. The role of the team was to define which procedures should be standardized across all areas to avoid unnecessary duplication, and which procedures must be specialized for different business units. The following procedures are standardized across all business units.

- > Procedures for environmental safety aspects and impacts assessments.
- > Procedures for setting objectives and targets.
- > Administrative procedures for training, awareness and competence; communication; document control; records management; asset commissioning; purchasing; site induction; maintenance management; and reporting.
- > Cross-business workflow procedures for environmentally critical processes that have shared responsibilities across a number of business units (this is to ensure the links between each area of responsibility are effective and efficient, and there is a common understanding of the process across business units).

- > Standardized operating procedures (SOPs) for key monitoring and measuring activities, such as equipment calibration.
- > Procedures for conducting management review.
- > Standard administrative procedures for nonconformance and corrective action.
- > A common audit standard administration procedure.

The following procedures are tailored for different business units (or even different facilities within the business units) under the WW-IMS.

- > Operational procedures.
- > Annual aspects and impacts assessments.
- > Workflow procedures for measuring and monitoring, such as daily plant readings and laboratory testing.

The policy statements; setting objectives, targets and performance measures; and management review activities have a mixed approach that include corporate-wide and individualized activities.

- > The WW-IMS policy statement covers all of the requirements of ISO 14001 and ISO 9001, commitment to compliance, pollution prevention, and continual improvement, elements of safety, and strategic documents. The wastewater business units have found it helpful to have one overarching policy that incorporates all of their requirements and commitments. However, each individual plant or business unit can develop a commitment statement, based on the WW-IMS policy, to include their individual issues. The specific requirement of the policy, apart from meeting the mandatory requirements, is to make it meaningful to those using the system.
- > Sydney Water Corporation has a 5-year Corporate Plan that includes objectives, targets, and performance measures for expenditure, safety, and environmental performance. The Corporate Plan is updated annually.

Objectives, targets, and performance measures in the Corporate Plan that are relevant to each division are incorporated, through an iterative process, into individual divisional plans and business unit plans. The division-level business plans contain a Balanced Scorecard of key objectives and targets covering such items as

EPA licenses and customer satisfaction (a community consulting committee provides input on customer perspectives at an enterprise-wide level). Progress on these deliverables is checked monthly via Balanced Scorecard and quarterly at specific review sessions.

Individual business unit plans also incorporate input from additional sources, other than the Corporate Plan, such as the environmental and safety aspects and impacts ranking, legal and other requirements, and asset management / improvement plans. Many of these inputs are specific to each business unit. The business unit plans are reviewed quarterly, after audits. Management review examines the results of the audits, progress on actions, objectives, and targets, appropriateness of documentation, as well as reviewing the ongoing suitability of the system.

For more information on Sydney Water Corporation's integrated management system, visit the website at www.sydneywater.com.au

IMS Benefits

Sydney Water Corporation identifies the following benefits from developing its Wastewater Integrated Management System.

- > Improved cross business links.
- > Improved efficiency, consistency, and reliability in meeting of objectives.
- > Improved ownership and skills transfer between staff.
- > Time saving and improved ability to locate current documents.
- > Maintaining environmental performance improvements, including the reduction of ammonia, phosphorous, and nitrogen loading in effluent discharged.
- > Reduction of operating costs and achievement of cost efficiencies.
- > Quality improvements, including greater consistency in biosolids and effluent quality.
- > Consistency and replicability of operating procedures through standardization and documentation.

3.4.5 Santa Clara Valley Water District, California

Background

The Santa Clara Valley Water District (District) is a special district responsible for managing Santa Clara County's drinking water resources, coordinating flood protection, and serving as steward of the county's more than 700 miles (1120 km) of streams and

reservoirs. The District encompasses all of the county's 1,300 square miles (3370 km²) and serves the area's 15 cities and 1.8 million residents. The District is a wholesale supplier of water to 13 local water retail agencies, which in turn provide drinking water to most of the county's communities. The District operates 3 water treatment plants with a total capacity of approximately 210 mgd (795 ml/d), 10 reservoirs, 3 large pump stations, and 134 miles (214 km) of large diameter pipes.

Integrating Management Initiatives

Asset Management Program Implementation Approach in a Glance

- Incremental expansion of AMP fenceline
- Utilizing mix of consultant, cross-functional team, and stakeholder group
- Considering development of and integration with an ISO 14001 EMS

Asset Management Program

The Santa Clara Valley Water District is approximately 10 months into the development of an Asset Management Program (AMP). The District is taking an incremental development approach to their AMP by beginning with one Division, Water Utility Operations, and then later considering if and how to incorporate other parts of the District into the AMP. This approach resulted from management's belief that it could be too big of an effort to cover the entire District in its first attempt at developing an AMP.

The Water Utility Operations Division is utilizing consultant help in developing the AMP. The consultant has provided some asset management tools including funding scenario and planning software applications and a condition/risk assessment database. The database communicates with the funding scenario software and a computerized maintenance management system (CMMS).

The Water Utility Operations Division has formed an AMP team representing all divisions within the District. The AMP team reports to the executive management team, which is responsible for determining certain objectives such as service and risk levels. The Water Utility Operations Division also interacts with a broad group of stakeholders, including the water retailers, for input on items such as desired service and risk levels.

The main short-term goal for the Water Utility Operations Division's AMP is to develop information systems and procedures necessary to better document and manage maintenance activities. In addition, the AMP will provide input to the Capital Program, and establish long term funding projections for equipment overhaul and replacement activities which will be incorporated into the District's overall funding plan. To achieve this end, the focus has been on developing overhaul and renewal plans, an asset inventory, more complete

implementation of the CMMS, and the addition of computerized financial planning and condition assessment applications.

The Division has completed an asset inventory. In conducting the asset inventory, the Division categorized all equipment into 16 different types. For each type of equipment, a classification of attributes, such as size, power, and other attributes was developed for identifying equipment type. This “Asset Template” was created within the CMMS and is an example of the focus on improving the CMMS utilization. Asset templates are used when new “equipment records” are created in the CMMS database (which also functions as an asset registry). The templates ensure consistent data entry so queries can be made with a high confidence level that all equipment of concern is being considered.

The District believes the combination of an asset management program and an EMS will help provide a way to balance competing objectives and provide an explanation of why certain actions are important.

In addition to being assigned to a category, each piece of equipment is assigned a unique numerical identifier in the catalog. This number is used to reference the same piece of equipment in the CMMS, the condition assessment module, the funding planning software, as well as the catalog. The Water Utility Operations Division is in the process of loading the data collected during the inventory phase of the project into these systems.

ISO 14001

The CEO of the District is committed to establishing the organization as a “green agency”. As a step in that direction, the CEO has identified the adoption of ISO 14001 as a high priority initiative to be deployed District-wide. It is likely that EMS development would involve a cross-functional team including many of the members of the current AMP team.

District management finds that an EMS is becoming important with the need to adapt to changes in regulations and make policy-level decisions about environmental performance. For example, the District faces choices such as whether or not preparation of a California Environmental Quality Act (CEQA) document is necessary for taking a pipeline out of service. CEQA documentation is costly and can reasonably exceed the actual cost of the maintenance activity.

In facing decisions such as these, the District wants to be able to take a programmatic approach to making decisions and determining what level of environmental performance is desired given cost and other factors. The District believes the combination of an asset

management program and an EMS will help provide a way to balance competing objectives and explain why certain actions are important.

Through AMP development, the District is identifying the relationships between activities and decisions for maintaining assets and environmental impacts. The District sees a key integration point between the AMP condition assessment and rehabilitation/renewal choices with environmental objectives. Choices made in developing the rehabilitation/renewal schedules, such as desired risk level, are reflective of established environmental (and other) performance goals.

For more information on Santa Clara Valley Water District's management initiative implementation and integration efforts, contact Alan Zeisbrich, Senior Project Manager at azeisbrich@valleywater.org.

Recognizing the connections between asset management decisions and the environment, the District will soon be launching a Programmatic Environmental Investigative Report (EIR). The EIR will examine the schedule for asset construction and rehabilitation programs and identify the associated environmental impacts. This will allow the District to plan and know when environmental impact statements will need to be prepared. The EIR will allow the District to make clear decisions about the environment from a programmatic perspective, rather than on a case-by-case basis.

3.4.6 Western Carolina Regional Sewer Authority

Background

Western Carolina Regional Sewer Authority provides wastewater treatment services to over 104,000 industrial, commercial and residential customers in Greenville County and parts of Anderson, Spartanburg, and Laurens Counties in South Carolina. Western Carolina currently operates and maintains 300 miles (480 km) of major sewer trunk lines. The agency owns and operates 12 wastewater treatment plants and three small wastewater package plants, which treat an average flow of approximately 42 mgd (160 ml/d). Wastewater is collected from 17 sewer sub-districts and municipalities that independently construct and maintain their sewer collection lines.

Integrating Management Initiatives

Western Carolina has adopted programs to increase organizational efficiency, including CMOM and the NBP EMS. CMOM, incorporated during the late 1990's, was implemented to increase the agency's ability to protect public health and water, provide

customers with efficient and effective services, and maximize the effective life of infrastructure. The implementation of CMOM required the development of a variety of programs and standard operating procedures.

During the implementation of the NBP EMS, Western Carolina discovered a variety of similarities between the program requirements of the EMS and CMOM. After reviewing these thoroughly, Western Carolina concluded that with minor modifications, many elements of the CMOM program could be used to meet the requirements of the NBP EMS. Three of the major elements that Western Carolina focused on during the integration of the CMOM and the EMS were an Emergency Preparedness and Response program, a Communication and Public Outreach program, and a Documentation and Document Control program.

Emergency Preparedness and Response

CMOM development required the creation of a Contingency Planning Process to ensure a procedural response to emergencies or abnormal conditions that can negatively impact the environment. The NBP EMS requires a similar Emergency Preparedness and Response program. Although the CMOM program focuses on the wastewater and collections systems, it includes details that could easily be adapted to accommodate the requirements of the NBP EMS Emergency Preparedness and Response program. By combining efforts, each program can produce a unified, agency-wide emergency response team, with only minimal differences.

- > All emergency personnel can be trained on general response at one time, rather than defining and teaching two different Emergency Response techniques. The distinct differences between the two programs are focused on during individual sessions.
- > By using the same documentation practices there is an agency-wide understanding of the documentation and procedures.
- > The emergency response team communications system allows for a universal understanding of procedures throughout the organization.
- > By combining efforts in the training and implementation of the emergency response team and the Contingency Planning

Process, there will be an abundant number of members to respond, without overloading the program.

Communication and Public Outreach

The CMOM and the NBP EMS require a public education program. Combining public education efforts has resulted in the following benefits.

- > The public education program informs the public of all organizational programs and agendas. The public is well aware of new capital improvement projects and the benefits of the biosolids program.
- > The public education program improves agency relations with the community about all facets of the organization.
- > The tools used to inform the public, such as annual reports, bill stuffers, press release program etc., can be used to promote general organization issues as well as the NBP EMS. This avoids the cost and time to create multiple communication avenues.

Documentation and Document Control

CMOM calls for precise documentation procedures that can be used throughout the organization. The NBP EMS also requires procedures and practices to ensure proper documentation of biosolids management activities and EMS elements. Consolidating efforts and adjusting the current documentation processes created through the CMOM program will yield the following benefits.

- > Using the documentation procedures and practices in place for the CMOM program provides an umbrella framework that can be used throughout the organization, just as a manual.
- > Integrating documentation processes from CMOM into the NBP EMS establishes a set of standard procedures, protocols, and formats for document creation, approval, identification, and efficiency. This standardization allows for an agency-wide understanding of the documentation process.
- > Since the inception of its biosolids management program, Western Carolina has received numerous national, regional, and state awards. With the conjunction of the NBP EMS and the CMOM organizational practices, Western Carolina can continue to improve consistency and the quality of its biosolids materials.

For more information on Western Carolina Regional Sewer Authority's management initiative implementation and integration efforts, contact Ray Orvin, Executive Director at Rorvin@wcrsa.org

By instituting the integrated management system concept into the development and structuring process of the NBP EMS, Western Carolina has eliminated the duplication of program elements and, overall, improved its organizational programs. Western Carolina will continue to use this concept to further its efforts in insuring substantial management and organizational improvement.

4 Integration Opportunities – Examples with Four Initiatives

Chapters 1 and 2 of this guide provided an introduction to 15 management initiatives and explored their interrelationships in the context of a continual improvement management system framework. Chapter 3 introduced specific areas of management initiative integration, explored six key integration opportunities to drive strategic alignment, and provided case examples of how organizations are approaching, and what benefits they are seeing from, integration within a continual improvement management system framework.

Chapter 4 provides a detailed articulation of the 18 integration opportunities in the plan-do-check-act cycle by focusing on the relations among four of the 15 management initiatives - environmental management systems (using the ISO 14001 EMS standard); asset management programs (AMP); Capacity, Management, Operations, and Maintenance Programs (CMOM); and the Partnership for Safe Water (PSW). These four initiatives were selected because together they provide an opportunity to explore the full range of integration opportunities, establish an integration approach that can be readily adapted to many other management initiatives, and address management areas of critical, current significance to both water and wastewater utilities.

This chapter, by design, covers the details of the 18 integration opportunities. It is geared to assisting management initiative implementers, such as a utility's asset management project team leader, to understand the mechanics of integration within a continual improvement management system framework. As well, this chapter can be useful in the context of a self-assessment for identifying opportunities for improvement or steps in the PDCA cycle that could be strengthened. The material has been prepared to be as specific and comprehensive as current integration experience allows. It looks to address an implementer's need to understand how to approach integration rather than just what integration is.

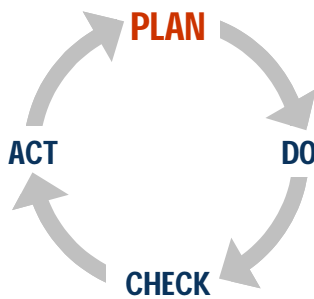
This text can best be approached in two steps: a quick “flip through” to gain a general understanding of the material provided and a detailed reading of the text when specifically planning and working

out the details of (e.g., preparing a project workplan) how to move forward with integration.

To aid implementers' ability to hone quickly in on integration opportunities identified as critical to effective strategic alignment (in Chapter 2), the guide uses the symbol depicted below.



4.1 Plan



The planning component of the continual improvement framework relates to determining where the organization identifies areas for improvement, setting measurable goals for improvement, and making plans to achieve them.

The planning component of the continual improvement cycle provides the following integration opportunities.

- > Management commitment
- > Vision
- > Policy statements
- > Assessing areas for performance improvement
- > Defining legal and other requirements
- > Setting objectives and targets
- > Developing management programs for performance improvement

What level of management is considered “top” for making the commitment to integration?

- Management level must be consistent with the scope of the management system.
- Management must be able to make decisions and commitments about staff and budget to ensure that adequate resources are dedicated to implement the system and enable performance improvements.

4.1.1 Management Commitment

The very first step to the development of any management initiative is explicit top management commitment to the initiative. EMS, PSW, and CMOM all require a written and signed statement of commitment.

Management commitment is also the critical first step to integrating management initiatives. Because most management initiatives are

by nature focused on a specific management area (e.g., EMS focuses on environment, AMP on assets), integration will require an explicit decision and commitment by the utility to do so.

To establish and support integration, management commitment should include a clear statement from the utility's top management. This statement should articulate commitments both to pursue performance improvements in the selected management areas by implementing selected management initiatives and a clear statement to pursue integration.

A sample management commitment statement supporting integrating management initiatives in the context of a continual improvement management system framework is given below.

“OUR COMMITMENT

We will together develop, implement, maintain and continuously improve a Wastewater Integrated Management System (WW-IMS) complying with the requirements of ISO 14001, relevant clauses of ISO 9001 and SWC's OHS&R System.”

Sydney Water Corporation

Example - Identifying Top Management

The City of Eugene, Oregon's Public Works Department has implemented an EMS for its Wastewater Treatment Division. The Director of the Wastewater Treatment Division could be identified as top management as that would meet the two conditions identified above. However, since the EMS for the Wastewater Treatment Division interacts with other divisions (such as Human Resources for the training elements), it has been important that the Director of the entire Public Works Department also make a commitment to implementing and maintaining the EMS.

4.1.2 Vision

Because the core function of water and wastewater utilities is inherently environmental in nature (i.e., providing clean water), it is likely that an existing utility mission statement is consistent with the policies and commitments of an EMS.

Many utilities have a mission statement and a strategic plan that convey a vision of what the organization is, does, and wants to be. Utilities that already have a mission statement and strategic plan should revisit these to ensure they are consistent with and/or broadly encompassing of commitments made to implementing and integrating management initiatives.

Although none of the four selected management initiatives require a high-level mission statement, such a statement will be critical to establishing a clear focus for individual and integrated management efforts. The organization's vision, as reflected in the mission

- **Who is important to the organization?**
Examples: satisfied customers, empowered employees
- **What is the organization's primary purpose?**
Example: to provide safe drinking water
- **What is important to the organization?**
Examples: stable rates, customer service
- **What does the organization want to look like in the next 3, 5, or 10 years?**
Examples: best in class facility, state-of-the-art operations
- **What does the organization want to accomplish?**
Examples: energy self-sufficiency.

statement, can help managers explain the reason for developing an integrated continual improvement management system framework and it can help managers choose the tools or programs that will best achieve their vision.

The mission statement can also allow managers to connect current initiatives to the vision and explain to employees, customers, elected officials, and others why the utility is launching an initiative or making an investment decision. This helps prevent the new initiative from being seen as just another “flavor-of-the-day”. Instead, it can be shown to be an important component of supporting the utility’s overall direction.

Although a mission statement is likely to be set by the organization’s top management, it is important that input be sought from other stakeholders, such as employees, regulators, elected officials, customers, and environmental and community groups. In developing a mission statement, it can be helpful for a utility to consider a number of questions (see text box). In answering these questions, an organization can develop a mission statement that will effectively support integration.

Example Mission Statement—Charleston CPW, SC

To be a customer focused leader in the water and waste water industry, and to:

- > *provide the highest quality of service at the lowest possible cost;*
- > *provide safe and abundant drinking water;*
- > *protect the quality of the water environment;*
- > *provide superior wastewater treatment; and,*
- > *enhance the climate for long-term economic growth and community development.*



4.1.3 Policy Statements

A policy statement lays out the utility’s commitment to continual improvement in a given management area. For example, an EMS policy articulates a commitment to environmental performance. A policy statement serves as a reference point for setting specific objectives and targets for performance improvement in the relevant management area.

Selected Management Initiatives

Each of the selected management initiatives either requires or will benefit from the development of a policy statement, laying out the organization's commitments.

Environmental Policy: Eugene, OR Wastewater Division

"The Wastewater Division is committed to continual improvement of its environmental performance, and to provide sound stewardship of the environment, consistent with the Division's mission."

It is important to examine existing or formulate new management initiative-specific policies to address any potential inconsistencies between them. It is not necessary or, in most cases desirable, to create a single, combined policy.

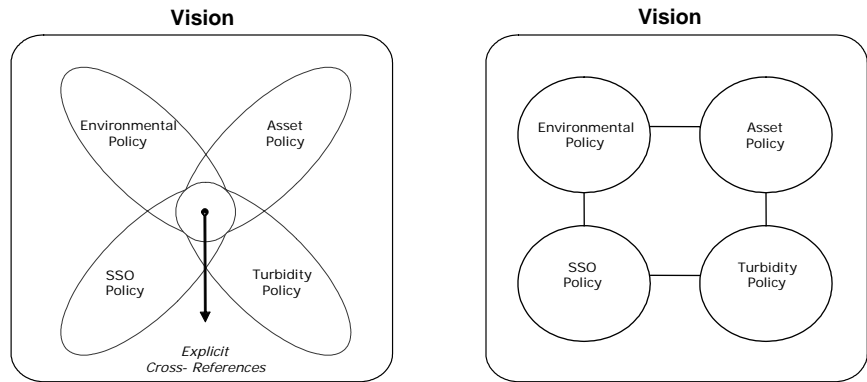
- > **EMS:** EMS requires development of an Environmental Policy to communicate the environmental vision of the organization. The policy will typically reflect three key commitments: continual improvement; prevention of pollution; and compliance with relevant laws and regulations.
- > **CMOM:** CMOM does not require a policy statement. However, the stated purpose of developing a CMOM is to "properly manage, operate, and maintain, at all times, all parts of the collection system that you own or over which you have operational control" and to "provide adequate capacity to convey base flows and peak flows for all parts of the collection system you own or over which you have operational control". This is the implied policy statement of an organization embarking on CMOM.
- > **AMP:** A utility's asset management program should be driven by a set of asset management policies that reflect a commitment to continual improvement. AMP policies should include: a policy to renew and replace assets in a cost-efficient manner that maximizes opportunities to reduce costs through strategic intervention where this will reduce overall life-cycle costs compared to running assets to failure; and a policy of excellence in service to customers.
- > **PSW:** No policy statement is mandated by PSW. However, the signed commitment required upon entry to PSW implies development of an organizational policy of commitment to improving drinking water safety and quality.

Integration Opportunities

When integrating management initiatives into a continual improvement framework, a utility does not need to create, and will probably be best served by avoiding, a single, combined policy statement. That is the role of a vision or mission statement, which should be broad and encompassing of the policy statements.

Policy statements can be drafted to explicitly cross-reference one another. Or, the policy statements can sit side-by-side, without

explicit reference, each remaining distinct. Although cross-referencing policy statements is one way to avoid inconsistencies and clearly establish the relationship among them, there are reasons to



A. Policies Cross-Referenced

B. Policies Side-by-Side

consider keeping them distinct. For instance, organizations that find a third party audit is important may want to keep a distinct set of policy statements – one for each management initiative. Integrating an AMP policy, for example, with an EMS policy could lead EMS auditors to examine the AMP.

How to Approach Integration

In addition to cross-checking management initiative-specific policy statements for inconsistencies, utilities will also want to examine other policies to find and resolve any inconsistencies. For example, procurement policies might require purchasing “least cost” supplies, while the environmental policy might require the purchase of supplies that are made of recycled material. These two policies will conflict if recycled material supplies are not also least cost. Reviewing all policy commitments in advance can help avoid this type problem by resolving policy conflicts in advance and determining the organization’s highest priorities.



4.1.4 Assessing Areas for Performance Improvement

Planning under a continual improvement management system framework requires that a utility assess where performance improvements are most needed. Each of the selected initiatives provides an approach to prioritizing performance improvements within their focus area.

For example, EMS planning requires that a utility conduct an environmental aspects assessment and ask “how do we impact the environment and how can we improve environmental performance?” CMOM planning requires that a utility conduct an SSO assessment and ask “how often and where are we having SSOs and what can we do to prevent them?”

Conducting assessments for performance improvement are critical for an organization to understand how it is performing (and where), and therefore, what areas need improvement. These areas identified for improvement are then “fed” into the process for setting specific objectives and targets.

Selected Management Initiatives

In their approach for assessing performance improvement, each of the four selected initiatives provides the following:

- > A basis for the assessment (i.e., the entity, such as a pumping station in the collection system, for which information is gathered and organized);
- > Data gathering activities (to generate the relevant “attributes” or characteristics of the selected entity) and analytical methods for conducting assessments; and
- > A set of criteria for determining the significance or importance of the analytical findings.

Each of the four management initiatives utilizes a very similar “**basis**” of assessment. The organization is divided into units of operation and/or equipment (see box left). These units form the basis, or are the entities of interest for which the assessment is conducted.

Each of the four initiatives require **data gathering activities and analytical methods** that generate specific information associated with the entities of interest (e.g., asset management units for AMP), as well as information to support an overall view of organizational performance in the area of interest.

- > EMS: Organizations collect data about potential environmental impacts. These environmental impacts are associated with selected environmental aspects. Potential environmental impacts include:

Basis for Assessment

- **EMS** - environmental aspects, which are operational units, products, services, and activities of an organization that can interact with the environment
- **AMP** - asset management units, which are individual pieces or groups of assets having the same replacement value, condition, and capital renewal / replacement schedules; or a functional system whose components can be evaluated together as a single asset
- **PSW** - business units, equipment, and practices associated with turbidity levels
- **CMOM** - facilities and conditions that contribute to the prevention of SSOs

- materials, energy, water, and other resources used by the organization;
- releases to the air, water, or land;
- wastes, scrap, or off-spec materials generation and disposal;
- characteristics or attributes of the products or services that could result in impact to the environment (through their intended use, end-of-life management, etc.);
- land or infrastructure interactions with the environment (e.g., building energy use); and/or
- activities that might lead to accidental releases (e.g., chemical storage).

Assessments

EMS: EMS planning requires that an organization identify and assess its environmental aspects and the potential or real environmental impacts associated with those aspects.

AMP: Under AMP, a utility must conduct an asset inventory, an asset condition assessment, and an asset risk/failure analysis. An asset management program, and the supporting analysis, is organized around (i.e., uses as its basis) asset management units (AMUs).

CMOM: With CMOM, utilities look at the SSO “value chain” or where and how facilities and conditions contribute to the prevention of SSOs. This typically translates into focusing on components of the collection system such as connections, pipes, pumping stations, etc.

PSW: For PSW, a utility examines business units, equipment, and practices associated with turbidity levels for raw water and treated drinking water.

- > AMP: The data collected for each asset management unit (AMU) during the asset inventory will typically include: size/capacity; construction materials; location; installation date; original cost; replacement cost; condition assessment; performance assessment; original service life; and estimate of remaining useful life.

Data generated for each AMU to support the asset condition assessment will typically include: extent and type of current deficiencies; repairs needed; cost to complete repairs; current operating and maintenance costs; current performance and utilization; remaining useful life; and a condition rating.

- > CMOM: Under CMOM the data collected and performance evaluation undertaken will typically include the following:
 - determining base and peak flows;
 - determining current collection and treatment systems capacity for conveying base and peak flows;
 - identifying capacity deficiencies leading to SSOs;
 - locating collection system areas and/or treatment facilities contributing to SSOs;
 - characterizing the SSOs (e.g., frequency, location, and type);
 - evaluating the lifecycle costs of collection system components and treatment facilities;
 - inventorying maintenance facilities, emergency equipment, and replacement parts; and
 - mapping the collections system (potentially using GIS).
- > PSW: PSW requires the identification of factors limiting turbidity performance, such as operational unit processes,

maintenance processes, administrative processes, and plant design.

Each of the four initiatives has a set of given **criteria for determining the significance or importance** of what is being assessed.

- > **EMS:** EMS planning requires identification of environmental impacts associated with environmental aspects and which aspects are “significant”. EMS guidance typically identifies the following criteria for determining significance:
 - actual or potential impacts;
 - beneficial or damaging impacts;
 - magnitude or degree of impacts;
 - frequency or likelihood of impacts;
 - duration and geographic area of impacts;
 - parts of the environment that might be affected (e.g., air, water, land, flora, fauna);
 - if the impact is regulated in some manner; and
 - interested parties’ concerns about impacts.

- > **AMP:** AMP requires the prioritizing of assets for inclusion in the asset inventory, assigning performance standards, and setting expectations for maintenance, renewal, and replacement. These are driven by the following review criteria:
 - cost;
 - mission criticality;
 - health and safety;
 - regulatory; and
 - public relations.

Asset management options and specific AMU performance targets are anchored by risk/failure analysis. The risk/failure analysis is largely driven by estimating the probability (frequency) and severity of risk.

- > **CMOM:** Developing a CMOM program requires that a utility establish performance improvement priorities that translate into specific capacity investment and system maintenance activities. The criteria used to establish these priorities typically include:
 - location of the SSOs relative to sensitive receptors;
 - frequency of SSOs at different locations; and
 - severity of the SSOs in terms of extent and impacts.

- > PSW: Under PSW, the primary criteria for evaluating turbidity data and performance improvements are turbidity levels. PSW requires consistently maintaining turbidity levels at or below federal drinking water treatment standards.

Integration Opportunities

There are three opportunities for integration under assessing areas for performance improvement. These are: 1) the basis for conducting the evaluations, 2) data collection, and 3) prioritization criteria. These are described further below.

Basis for Assessment

As described above, each of the four selected initiatives requires that a utility identify key business units, in terms of equipment (or assets) and business processes, that serve as the basis for conducting the performance assessment. This similarity in the basis used for assessment indicates potential for a high degree of overlap in the assessments.

In a fully integrated approach, a utility would use the same business units (i.e., equipment and processes) as the assessment basis for all of the initiatives it chooses to integrate. For example, an organization could identify “drinking water distribution” as the business process or activity and the physical “distribution system” as the associated equipment or assets.

There are several benefits to using the same basis for conducting assessments. Not only is it more efficient, but there is a potential for increased alignment in setting objectives and targets, since this requires prioritizing between potential improvements in different management areas.

However, because of the differences in focus of the four selected management initiatives, an organization may not find it practical or feasible to utilize a completely standardized basis for conducting the assessments. For example, an organization might group together as an asset management unit all collection system pipes of a similar age and function, while under CMOM an organization might prefer to group together collection system pipes by geography, based on the location of SSOs. Creative use of database architecture can potentially reconcile these different needs in a straight forward manner with attributes like function, age, and geographic location attached to collection pipe entities. This will allow sorting the database to support both the AMP and CMOM needs.

Data Collection

To conduct the assessments necessary for each of its initiatives, a utility will need to collect a variety of data about its business processes and associated equipment. In planning an EMS, the data will focus on environmental impacts. For CMOM planning, the data will focus on capacity for peak flow conveyance and contributions to SSOs. Table 3 provides examples of data that will be collected for business processes and equipment under each of the four initiatives.

Table 3: Examples of data collected for assessments.

EMS	AMP	CMOM	PSW
Environmental impacts, such as:	> Capacity	> Capacity for conveying base and peak flows	> Filter profiles (raw, settled, and combined filter effluent)
> Materials and energy used	> Location	> If contributing to SSOs	> Capacity
> Emissions	> Condition	> Location, frequency, and severity of SSOs	> Frequency and severity of turbidity spikes
> Potential risk of spills or accidental releases (severity, frequency, proximity to populations)	> Replacement, repair, rehab costs	> Lifecycle costs	
	> Risk failure (severity and frequency)	> Proximity to sensitive populations	

Table 3 indicates that there is some overlap of data collection for the four selected management initiatives. Thus, a utility would realize efficiency benefits from integrating (or at least coordinating) data collection. An integrated or coordinated approach, such as the use of a single data system, would prevent duplicative data being collected to satisfy the needs of multiple initiatives.

Prioritization Criteria

Each of the four selected management initiatives provides a set of criteria for determining significance or priorities. In some cases, these criteria overlap (e.g., importance to external stakeholders, regulatory implications, environmental and human health risks). Developing a consistent methodology for applying criteria across each of the individual assessments will ensure reasonable consistency of how the criteria influence the emergence of priorities from each of the management initiative areas. For example, if asset management analysis places a very low weight on public concerns, but EMS analysis places a very high weight on these, a discontinuity in priorities will almost certainly exist. At times, this difference in weight may make perfect sense. However, it will be necessary to

explicitly articulate why this is the case if decisions about priorities are to be effectively made.

How to Approach Integration

The following describes how to approach integrating performance improvement assessments at each of the three opportunities.

Basis for Assessment

To utilize the same basis for conducting the assessments, an organization should define what are the core business units, including key business processes and equipment. An organization that has already implemented one of the four initiatives can build upon the basis used for that assessment. For example, an organization that has implemented an AMP could use the asset management units and their associated business processes as the basis to begin evaluating environmental aspects under an EMS.

Data Collection

Utilities will realize efficiency benefits from integrating (or at least coordinating) data collection. An integrated or coordinated approach, such as the use of a single data system, will help prevent duplicative data collection. An organization should determine what information will be collected for each assessment that must be conducted. This way, efforts can be consolidated and information collected one time only. For example, information collected on capacity, location, and lifecycle costs of equipment for CMOM can also be used for AMP. Similarly, data collected on water quality for PSW could be used to assess environmental impacts for an EMS.

Prioritization Criteria

The key to integrating assessment criteria is to ensure that where criteria overlap among assessments a consistent method is used for applying them. The best point at which to establish consistency will be in designing an analytical approach. It will be at this point that evaluation criteria are selected and defined and methods for applying them are established. Some criteria that are likely to overlap for multiple initiatives include: risk (severity and frequency of risk); cost effectiveness; geography or location (proximity to public or sensitive populations, proximity to receiving waters); regulations; and interested parties' concerns.

Charleston CPW identifies Partnership for Safe Water under its EMS legal and other requirements for “drinking water quality” at the Hanahan Water Treatment Plant.

4.1.5 Legal and Other Requirements

Planning for a continual improvement management system framework requires that an organization explicitly identify, track, document, and communicate applicable legal and other requirements, and ensure that these are factored into the organization’s objectives and targets. Legal requirements typically include: federal, state, and local requirements; standards in locations where the organization sells products/services; and permit conditions. Other requirements might include: organization-specific codes; local ordinances; and other industry codes (such as generally applicable accounting standards) or the standards of programs to which the organization voluntarily subscribes.

Each of the selected management initiatives will require procedures for identifying and staying current with legal and other requirements and for incorporating these into objectives and targets. An integrated approach would use the same procedures for identifying, tracking, documenting, and communicating all legal and other requirements.

Utilities that have already established these procedures could readily apply them to legal and other requirements associated with other management initiatives or areas to avoid redundant activities and make the overall system much more cost effective. For example, under an EMS, an organization might establish a routine practice of reviewing the Federal Register to help identify emerging environmental regulatory requirements. When integrating asset management or CMOM into a continual improvement management system, this same review could be used for tracking emerging requirements in these areas.

Although the same procedures for identifying, tracking, documenting, and communicating legal and other requirements should be used to support multiple initiatives and management areas, it is likely that the information would be used by different departments and individuals. Although there may be some overlap, it is likely that where legal and other requirements are tracked, what the applicable legal and other requirements are, and who is responsible for utility compliance with the legal and other requirements, will be different for different initiatives and management areas. For example, requirements related to financial accounting systems that might be relevant for asset management would be communicated to and implemented by financial and accounting staff. Occupational safety and health requirements would

be communicated to and implemented by human resources and/or operational staff. The key to integration is implementing consistent procedures for identifying, tracking, documenting, and communicating legal and other requirements.



**Terminology:
Goals, Objectives, Targets,
and Performance Measures**

The terms goals and objectives are often used interchangeably. Targets and performance measures are also used interchangeably.

Most EMS standards use and define the terms objectives, targets, and performance measures the following way:

- Objectives are overall, environmental goals that an organization sets out to achieve
- Targets are measurable and quantifiable actions required to meet objectives
- Performance measures indicate progress towards performance improvement

4.1.6 Objectives and Targets

Objectives and targets act as the backbone of continual improvement management system frameworks and play a prominent and critical role in each of the four management initiatives. Objectives and targets are the place where an organization's assessment efforts, such as the environmental impacts assessment under an EMS, come together to establish organizational priorities. They establish the baseline against which an organization measures success and drive an organization's operational, human resource, and financial needs and priorities.

To be effective, an organization must define objectives and targets that are practical and quantifiable and when setting objectives and targets, will typically need to consider:

- > existing high-level organizational priorities (such as those reflected in a mission or vision statement and/or resulting from strategic planning efforts);
- > the products of assessments that identify areas for improvement (such as an Asset Management Conditions Assessment);
- > legal requirements;
- > views of interested parties (e.g., customer needs); and
- > financial, technical, and human resource capacity.

Selected Management Initiatives

Each of the management initiatives addressed in this guide call for the development of explicit objectives and targets and linkage of these to financial and human resources in a management program or action plans.

- > **EMS:** EMS objectives and targets are focused on improving environmental performance and derive primarily from the significant environmental aspects identified during the environmental aspects analysis. Objectives and targets typically will also reflect legal requirements and interested party priorities and take into consideration financial, technical, and human resource capacity.

There are no standard environmental objectives that make sense for all organizations. These objectives typically encompass the ecological and human health related impacts to air, land, and water of an organization’s processes, activities, and/or products. Objectives set under an EMS are of the following types: performance based; compliance based; project based; and management activity based. Targets are measurable/quantifiable performance requirements that must be met to achieve objectives.

Table 4: Examples of EMS objectives and targets

Objectives	Associated Targets
Reduce enterprise energy consumption	Reduce annual electrical power consumption of pump stations by 5%
Reduce consumption of natural resources	95% of all paper goods purchased will be made from material with a minimum of 30% post-consumer recycled content
Improve quality of treated wastewater effluent	Reduce wastewater facility influent mercury loading by 10% in 5 years

- > **CMOM:** Objectives and targets for CMOM focus on the reduction of sanitary sewer overflows. These objectives and targets must reflect a utility’s analysis of SSO-related conditions, legal and other requirements, and will typically include a careful review of utility financial and technical capacity. Objectives and targets may also reflect community concerns and related input, as well as regulatory agency interests.

Under CMOM, a utility must identify and prioritize short and long term objectives, including addressing structural deficiencies and enhancing system capacity. A utility must also develop and establish performance standards (targets) to measure progress towards objectives.

Table 5: Examples of CMOM Objectives and Targets

Objectives	Associated Targets
Reduce overflows in city park	> Build parallel relief sewer by fall of 20XX
Reduce overflows at Main St. Pump Station	> Implement rehabilitation program by end of 20XX
Improve preparedness for power outages during ice storms	> Form an Emergency Preparedness Strategy Team in next 2 months. > Evaluate probability of natural and man-made disasters that might occur, within 4 months. > Prepare written plan to address top three risks within next 12 months.
Raise the effectiveness of maintenance resources utilized for the Collection System	> Evaluate Computerized Maintenance Management Systems, CMMS, on market and obtain best for agency in next 6 months. > Identify manholes, structures, and facilities that require excessive maintenance, or contribute to violations and prioritize their repair or replacements in 2 years.
Ensure capacity in Collection System and treatment facilities for long-term growth of the community.	> Develop a Master Facility Plan, MFP, for a 20 year planning period in 18 months. > Develop a financial plan to support the MFP within 9 months of completion.

- > **AMP:** An asset management program will establish objectives and targets related to accomplishing the agency’s asset management mission, ranked by priority. Overall, setting objectives will derive from establishing a target condition and associated service level for assets. These objectives will reflect the results of a detailed asset condition assessment and a review of asset failure risks. The objectives will also consider legal requirements, quality and environmental performance priorities, and financial, technical, and human resource capacity.

Areas in which specific AMP targets are typically established include: defining corrective and planned rehabilitation and renewal actions; developing asset performance standards; and determining the level of planned maintenance. These targets, which dictate the performance levels of individual assets, are based on performance criteria such as return on investment, restoration of original asset function, increase level of performance beyond original asset, and upgrade asset to meet new standards.

Example AMP objectives

Maintain assets at current condition; upgrade average asset condition; support extending service and responding to new regulatory requirements; and/or increase ability to monitor and understand asset conditions.

Example AMP targets

Addressing deficiencies that result from historical funding shortfalls within an X- year time frame; ensuring that less than 5 percent of the system is deficient with respect to operating capabilities and performance standards; recommended inspection intervals; anticipated interval for major and minor maintenance; and recommended renewal or replacement intervals.

- > **PSW:** Objectives and targets derived from PSW focus on improving drinking water quality, with a particular focus on turbidity. Unlike the other management initiatives, PSW participation specifically commits a utility to maintaining turbidity levels at or below federal Surface Water Treatment Rule levels of .3 NTU 95 percent of the time, and sets a performance target for utilities at .1 NTU 95 percent of the time. Utilities do, however, set self-derived, specific performance goals for sedimentation basins, filters, disinfection, and other specific operations, maintenance, and design activities.

Example PSW Targets

Individual Sedimentation Basin Performance

- > *Settled water turbidity less than 1.0 NTU 95 percent of time when raw water turbidity is less than or equal to 10 NTU*
- > *Settled water turbidity is less than 2.0 NTU 95 percent of time when raw water turbidity is greater than 10 NTU*

Individual Filter Performance

- > *Filtered water turbidity less than .1 NTU 95 percent of time based on values recorded at 15 minute time intervals*
 - > *Maximum filtered water turbidity equal to or less than .3 NTU*
 - > *Maximum backwash recovery period of 15 minutes*
-

Integration Opportunities

The four management initiatives create two important integration opportunities related to objectives and targets: harmonizing the objectives and targets; and coordinating/aligning the management system used to develop, track, report, and evolve the objectives and targets.

Harmonizing Objectives and Targets

The objectives and targets for each of the management initiatives reflect a high degree of interdependence to the extent that a failure to harmonize can represent a substantial threat to success with any one

of the management initiatives. For example, a utility developing a CMOM program in response to SSO-related problems would likely also recognize SSOs as a significant environmental aspect under an EMS. It is also likely that any CMOM or EMS related performance objectives will have substantial implications for the capacity and maintenance of the utility's collection system, thus creating an important asset management priority.

In general, CMOM, EMS, and PSW objectives and targets will hold important asset management-related implications, while AMP objectives and targets can represent either a constraint on or opportunity for accomplishing CMOM, EMS, and/or PSW objectives. Because of this high degree of interdependence, setting objectives and targets for any one of these management initiatives in isolation will run the risk of establishing performance objectives that will work at cross purposes. Or, at minimum, an organization could miss the opportunity to synergistically relate objectives, targets, and associated management program efforts. Setting objectives and targets in isolation can also lead to a larger workload with sets of tasks that staff can not perform simultaneously.

Coordinating/Aligning Processes

A second integration opportunity relates to the process a utility uses to develop, communicate, and evolve objectives and targets. Each of the individual management initiatives follows very similar objectives and targets development and continual improvement paths. Objectives and targets should be reviewed and updated annually, in advance of the annual budgeting process.

Once established, the objectives and targets will be translated into a "management program" that the organization will consider for funding during the next budget cycle. For objectives that receive funding, implementation and the performance of the associated management program will need to be tracked and communicated throughout the year.

This similarity of process creates an important opportunity for an organization to develop an integrated objectives and targets development process including reviewing legal and other requirements, obtaining input from interested parties, and examining the financial, technical, and human resource capacity of the organization. Each of the management initiatives requires or would benefit from these processes, and the overlap creates the opportunity to obtain "double duty" from each. For example, if the utility

establishes a community advisory panel to support setting objectives and targets for its EMS, this same panel could be used for addressing Asset Management related objectives and targets.

During management program development and budgeting, alignment of objectives and targets is critical. At both of these points, presenting a coherent strategy with clearly established links between the objectives will provide for better, more focused and more likely resource allocations.

Finally, objectives and targets will need to be tracked and communicated. This will require establishing some form of system to list, record performance against, analyze, and prepare reports related to the objectives and targets. Tracking systems of this type will typically have a fairly standard, flexible, and straightforward architecture enabling use across a broad array of objectives and targets. Using the same system for all of the objectives and targets can also allow for preparation of consolidated performance reports that clearly show the relationship among objectives and provide audiences with an integrated view of utility performance.

How to Approach Integration

As indicated earlier, the most critical aspect of integrating objectives and targets is ensuring they are developed and implemented in harmony. This will require an explicit exercise to understand the interdependence of objectives, establish priorities, and align priority objectives in advance of budget discussions.

Utilities may already have an annual objectives reconciliation process that works well and that can be applied directly to the individual objectives emerging from these management initiatives. In the absence of such a process, or if there is a sense that the existing process may be inadequate to drive a full alignment of goals, a utility can implement the steps listed below.

Step 1: Establish An Integration Team. This team should draw, at minimum, on decision makers from each of the relevant operational and functional areas of the organization critical to the success of meeting the preliminary objectives.

Step 2: Create A Consolidated List of Proposed Objectives and Targets And Decide On A Systematic Process To Evaluate Them. The consolidated list should include actual objectives and targets along with a characterization of their key drivers (e.g., do they relate

to a regulatory requirement, are they tied to an agency policy, do they reflect an area of high concern from interested parties, etc.).

The organization must also utilize some form of systematic process to compare and prioritize objectives. Depending on the size and complexity of the issues, appropriate approaches could include:

- > voting methods;
- > a weighted matrix approach; or
- > a decision science method, such as multi-attribute utility analysis.

These methods have been detailed in a variety of literature sources (e.g., the prioritization step instructions in “A Capital Planning Strategy Manual, 2001, by Beaudet et al, American Water Works Association Research Foundation and American Water Works Association).

Step 3: Conduct A Meeting of the Integration Team. Typically, this meeting will require anywhere from one to two days.

- > The first third of the meeting should focus on understanding the full range of proposed objectives, discussing the interdependence among objectives, and highlighting key areas of consistency, synergy, and/or discontinuity.
- > The second third of the meeting should focus on establishing priorities utilizing the previously selected systematic evaluation method(s).
- > The final third of the meeting should focus on identifying the broad outline of the management program(s) needed to support the selected objectives and planning how to integrate the objectives and associated management program(s) with the annual budget process.

The management program(s) outline will be provided to the team or individual teams responsible for developing the preliminary objectives for completion of the program(s) (see integration section covering Management Program Development).

Step 4: Include Harmonized Objectives and Targets and Associated Management Program(s) In the Budget Process. To maintain alignment and the cohesiveness of the objectives and targets, it will be critical that the results of the integration meeting and ensuing work on the management program(s) be included in a cohesive fashion in the budget process. This will ensure that budget decisions consider the interdependence among objectives and that the

implications of under-funding any portion of the package will be quite clear.

Organizations Have Their Own Processes for Setting Objectives and Targets: Example from Albany, Oregon

Albany has a City-wide vision and mission coupled with community goals and objectives that are set by the City Council annually (each January). The Public Works Department then integrates these City Council goals and objectives into other objectives the Department sets for itself each year. The Department program budgets are created, based on the Departmental objectives, and finalized by May for the next fiscal year.

The Public Works Department goals and objectives are translated into specific utility (Water/Wastewater/Storm Drainage/Transportation) objectives. These utility objectives are translated into specific objectives and targets for the individual programs. For example: The Water Utility is comprised of two core programs Water Distribution and Water Treatment. Shared programs for Engineering Services, Environmental Services, Financial & IT, HR, Community Services, and Utility Planning serve the entire Department. The specific objectives and targets are integrated across customer service, environmental, financial, utility business process, and human aspects, as they relate to each of the utilities, as well as the specific programs. Therefore, the individual program objectives and targets are a set integrated from the above (City Council / Department / Utility / Programs) in response to meeting the requirements of initiatives such as CMOM, the Safe Drinking Water Act Surface Water Rules, Asset Management, and APWA Best Management Practices.



4.1.8 Management Programs for Performance Improvement (Who, What, and When for Achieving Objectives and Targets)

Management programs for performance improvement are a critical element of planning. They describe exactly how an organization will achieve the performance improvements identified in the objectives and targets. Management programs should identify specific:

- > Roles and responsibilities for achieving objectives and targets;
- > Activities for achieving objectives and targets; and
- > Schedules for completing activities.

Selected Management Initiatives

All four of the selected management initiatives require written management programs or action plans that define roles and responsibilities, activities, and schedules for achieving objectives and targets. Several of the selected management initiatives have additional requirements related to organizational structure, roles, and responsibilities. For example, CMOM and EMS require documentation of the organizational structure. PSW, CMOM, and

EMS require that specific roles be called out (e.g., communications coordinator, management representative).

- > EMS: EMS implementation requires development of an environmental program, or programs, for achieving objectives and targets. The program must identify who is responsible, what activities are necessary, and the relevant time frames for achieving objectives and targets.

EMS implementation also requires that the definition of an organizational structure and appointment of a management representative responsible for ensuring that the EMS is established and implemented and that performance progress is reported to top management.

- > CMOM: CMOM requires that a utility develop capital improvement plans that establish priorities for short and long-term rehabilitation (repair and replace) actions to address structural deficiencies and enhance system capacity. CMOM also requires that a utility identify administrative, operations, maintenance, and communications positions or persons responsible for implementing all actions in capital improvement plans, including the lines of authority using an organizational chart or similar document.
- > AMP: AMP requires a utility to: translate objectives and targets into specific, quantifiable actions that can be programmed and tracked; assign specific people to manage and execute each required program activity; and establish and track the progress of each critical activity that is part of the identified strategy.

The AMP will include both a maintenance management system (MMS) and an asset renewal and replacement strategy (RRS). The MMS will provide preventative and predictive maintenance scheduling based on historical information, manufacturer's recommendations, and/or industry standards. The RRS will focus on activities that restore or replace an existing asset toward its original size, condition, or capacity.

- > PSW: PSW requires that a utility develop written action plans that address performance limiting factors. In developing the action plans, utilities are expected to: rank and prioritize performance limiting factors; identify who is responsible for

each action in the plan; and establish timeframes for completing activities identified in the plans.

Two specific roles must be filled.

- Program Coordinator, responsible for ensuring that PSW commitments are completed (including overseeing data collection, self-assessment, and action plans).
- Communications Coordinator, responsible for overseeing the education of employees and customers about PSW and ensuring that the utility is recognized for its participation in and accomplishments under PSW.

Integration Opportunities

There are opportunities for integration around all pieces of the management programs: structure; roles and responsibilities; activities; and timeframes.

Structure, Roles, and Responsibilities

Integration opportunities around structure, roles, and responsibilities involve leveraging existing roles to eliminate redundancy and to address capacity issues. For structure, an organization could utilize a single chart describing the organizational structure and roles and responsibilities for all initiatives.

At the City of Albany, OR Public Works Dept., management coordinates action plans across all divisions as part of annual planning. This coordination between divisions helps avoid situations such as the transportation division laying down new pavement on major arterials and six months later the drinking water division digging up new pavement to replace water mains. Failure to coordinate improvements plans can lead to cost inefficiencies and frustrate employees and customers.

For specific roles and responsibilities, opportunities exist to leverage existing roles or to coordinate similar roles to reduce redundancy. For example, an organization might consider appointing just one Communications Coordinator for both EMS and PSW. Or, an organization might already have a Communications Coordinator who can be assigned specific responsibilities to meet the needs of new management initiatives.

In the context of integrating roles and responsibilities, opportunities also exist to manage human resource capacity issues associated with assigning responsibilities for implementing the management programs. For example, it will be important for utility management to know if one division is responsible for implementing multiple management programs. Looking across the roles and responsibilities associated with multiple management programs can help managers identify and address the potential for overloading staff capacity.

Activities and Timeframes

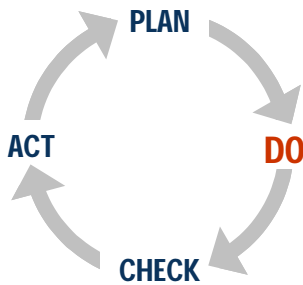
Ensuring activities and their associated timeframes across all activities in the improvement programs are coordinated and compatible can be achieved through integration. If objectives and targets have been fully harmonized, the need for management program coordination should be at a fairly detailed level (i.e., their purpose should be to support objectives and targets that are already strategically aligned.) Utility managers should consider how various management programs and activities interact. For example, would switching to vegetable based lubricants to meet EMS objectives affect the equipment maintenance schedules utilized in the CMOM or AMP? These potential conflicts need to be addressed prior to implementation so that employees have clear direction and an understanding of priorities.

How to Approach Integration

Utilizing a cross-functional integration team or management team can help ensure that management programs are harmonized. The team should look across the different management programs to find opportunities to leverage roles and responsibilities and to address potential capacity issues. The team should examine the programs for potential incompatibilities in the activities and timeframes of different programs.

For example, at the Albany PWD, management coordinates action plans across all divisions as part of annual planning. This coordination between divisions helps avoid situations such as the transportation division laying down new pavement on major arterials and six months later the drinking water division digging up the new pavement to replace water mains. Failure to coordinate management programs and their activities can lead to cost inefficiencies and frustrated employees and customers.

4.2 Do



The implementing component of the continual improvement framework addresses a series of basic management functions that ensure the organization’s performance objectives are supported by knowledgeable and capable staff, clear and consistent documentation, and standard operational and administrative control requirements. The specific management system elements that provide integration opportunities under the implementing component are:

- > Training, awareness, and competence;
- > Communication—internal and external;
- > Document management;
- > Emergency preparedness and response; and
- > Operational control.

4.2.1 Training, Awareness, and Competence

Continual improvement management systems place substantial emphasis on training, awareness, and competence. This emphasis derives from the recognition that, ultimately, the behaviors and decisions of individuals within the organization control the fate of both the management system and the performance it will deliver.

Training, awareness, and competence activities under continual improvement management systems such as EMS will typically have two components: content; and procedures. The content component focuses on ensuring staff are knowledgeable and aware of relevant policies, the relationship of their work activities to the relevant management area (e.g., asset conditions), key management system roles and responsibilities, procedures that apply to their work, and potential consequences of not following procedures. The procedure component establishes the training-related activities - such as keeping a training log - that ensure staff are trained in the right way at the right time. The procedure component also establishes training activity documentation (e.g., training logs) critical to supporting management system auditing.

Although staff are not all likely to receive the same training content (e.g., training on the financial aspects of asset management is likely to focus on accounting staff, while training on environmental impacts is likely to focus on operations staff), the content component of training does present opportunities for integration. For example,

an operational activity such as maintenance procedures has implications for both asset management and environmental performance. Procedures for the proper handling of hazardous materials have implications for occupational safety and health, as well as environmental performance. An integrated training program would address these procedures as they relate to all management areas, and not provide separate, redundant training sessions.

The procedural component of training also holds integration opportunities. Training procedures and formats can be readily applied to the full range of training activities conducted. This will not only avoid the inefficiency of operating more than one training procedure, but also drive consistency across the organization. This will support both internal and external auditing.

The audiences for communications typically include:

- employees
- consultants / contractors
- regulators
- local residents
- customers (residential and industrial rate payers)
- community, environmental, and advocacy groups
- elected officials
- vendors and suppliers
- developers
- governing bodies and commissions
- bond rating agencies
- auditors

CMOM and EMS both require that an organization develop a complaint response and tracking system. When developing a complaint hotline for external audiences, multiple areas of concern should be considered. Setting up a separate hotline to address just one area (e.g., only for SSOs) could be potentially inefficient and confusing to external audiences.

4.2.2 Communications – External and Internal

Effective employee and external interested party involvement is deemed critical to the development and implementation of continual improvement management systems. The cornerstone of effective involvement is communication.

Internal communication efforts and associated procedures are essential for motivating employees, gaining acceptance for objectives and targets and the overall continual improvement management approach, explaining policies, ensuring roles and responsibilities are well understood, communicating performance, and identifying continual improvement opportunities. Employees must understand what, why, and how the organization intends to accomplish performance improvements. Employees must also understand how their role and responsibilities relate to achieving performance improvements.

External communications to a variety of audiences are also important. Organizations implementing a continual improvement management system will look for input from various audiences on what is important with respect to performance improvements. An organization will also want to communicate its policies, objectives, and performance achievements to external audiences and be prepared to communicate with relevant audiences about emergency situations.

Organizations implementing any one of the four selected management initiatives will need to review and refine existing communications. In this context, the communications element

presents four important integration opportunities: Audience Identification and Management; Message Development and Management; Communication Methods Selection and Deployment; and Communications Procedures Development and Implementation.

Audience

Using a consistent approach to identifying audiences, maintaining relevant audience information (e.g., handling contact information consistently and in one place), and coordinating contact activity (e.g., avoiding multiple contacts to the same organization or individuals on overlapping topics) will enable an organization to maintain a cohesive and efficient communications effort.

CMOM and PSW require the development of notification procedures for SSO (CMOM) and water quality (PSW) emergencies.

Utility managers should review and identify those audiences, messages, and methods for which integration is both needed and presents the best opportunities. In most cases, internal communications processes, complaint tracking and response, and significant external communications initiatives (such as establishing/interacting with a community advisory committee, holding an annual open house, or quarterly Board meetings) will all be places where integration will be helpful if not critical.

Message

Message development and management present an obvious integration opportunity given the high overlap of relevant audiences and the high interdependence of the objectives and targets among the management initiatives.

For external communications, integrated messages, in particular, can help to highlight constraints, opportunities, and trade offs among the objectives and targets derived for each management initiative. For example, an integrated message about SSO, EMS, and AMP objectives could show SSOs as a clear environmental performance priority while AMP objectives could indicate the financial and operational commitments available for improving performance.

Communications Methods

Each of the management initiatives will require selecting and deploying communications methods. Integrating both internal and external communications methods will be both more efficient and effective.

Table 5: Communication methods

Internal Communication Methods	External Communication Methods
<ul style="list-style-type: none"> > Newsletters > Staff meetings > Staff trainings > Bulletin boards > Email > Staff retreats 	<ul style="list-style-type: none"> > Public tours > Open house > Press releases > One-on-one meetings/briefings > Hotlines > Brochures, flyers, inserts > Performance reports > Websites > Advisory groups > Public meetings

For example, if the organization selects quarterly staff meetings to communicate and review EMS objectives and targets progress, the same format (and possibly the same meeting) can be used to discuss AMP, CMOM, and/or PSW objectives and targets. Similarly, an organization using a bulletin board for employee communications can use the board for conveying information about multiple initiatives.

Communications Procedures

Under a continual improvement management system, communications need to be supported by an explicit set of procedures. These procedures define the scope of communications, spell out key roles and responsibilities, and identify and establish the basic functions for key communications activities (e.g., complaint tracking and response). Integrated communications procedures will help to ensure clarity and consistency, critical attributes of any effective communication system.

4.2.3 Documentation and Document Management

Documentation and document management refer to how and what information the management system captures (documents) and how the management system provides access to the information and ensures it is up to date.

All continual improvement management systems are organized with a management system manual. This manual provides a description of how the management system elements fit together, describes the procedures that support the management system (e.g., training and communications procedures), and either covers directly or provides

clear references to other important documents such as emergency response plans.

Beyond the management system manual and the procedures addressed there, individual management areas will have fairly tailored documentation needs. For example, an EMS will need documentation of the results of the environmental aspects analysis while an AMP will require documentation of the asset condition assessment.

Document management within a continual improvement management system entails the adoption of a formal document control procedure to facilitate consistent storage, retrieval, and updating. Document management procedures should assign responsibility and authority for preparing and changing documents and establish a system by which updates are consistently made and recorded.

Integration of documentation and document management holds the potential to substantially streamline the continual improvement management system. Maintaining a single, consolidated management system manual provides the centerpiece of an integration effort via a centralized location for the system description and procedures. However, if an organization's plans include using external auditors for any one management area (e.g., environmental performance) it may be necessary to maintain separate system manuals for each area (e.g., an EMS manual).

Opportunities may exist for integrating other documentation, though this will need to be approached on a case-by-case basis. Likely opportunities for integration include sampling, monitoring, and maintenance records, job descriptions, training records, and equipment calibration records. Each of these is required under EMS, CMOM, AMP, and PSW. A consistent, integrated approach to this documentation will not only be administratively efficient, but will likely substantially aid clarity of communication with responsible staff.

The document management system will represent an important and probably necessary integration opportunity. Such systems, once established for one management area, can be readily expanded to include additional documentation. The absence of a single, one time – one place document management system will undermine the basic purpose of document management – to ensure consistency, clarity,

and reliability for document access and updates. Adoption of the single system will not only better preserve the system's purpose but also result in substantial organizational efficiencies.

4.2.4 Emergency Preparedness and Response

Utilities are likely to have a high degree of familiarity and experience with emergency preparedness and response. Typically, the implementation of an EMS and/or CMOM will drive updates and refinements to, rather than the entirely new creation of, an emergency preparedness and response plan.

EMS, CMOM, and PSW require the development, documentation, and implementation of an emergency preparedness and response plan. This common requirement supports integration and the likelihood that a utility would maintain more than one emergency preparedness and response plan is very low.

An EMS will typically require that the emergency preparedness and response plans address:

- > potential emergency situations;
- > hazardous materials used on site;
- > key organizational responsibilities;
- > arrangements with local emergency support providers;
- > emergency response procedures, including communication procedures;
- > locations and types of emergency response equipment;
- > maintenance of emergency response equipment;
- > training and testing of personnel;
- > testing of alarm and public address systems; and
- > evacuation routes, exit map, and assembly points.

CMOM requires highly similar coverage but brings a more SSO-specific focus to each of the plan areas. CMOM can thus be viewed as requiring a situation-specific portion of an overall EMS emergency response plan. Addressing drinking water safety incidents under PSW can be viewed similarly.

AMP and PSW require, during the planning stage, that an organization conduct risk analysis that are likely relevant to the development of or updates to emergency preparedness and response plans. Asset failure analysis or turbidity-related failure scenarios will likely have produced data relevant to assessing the potential for and

consequences of accidents or emergencies. These data can be used to develop a more effective plan and ultimately reduce recovery time and costs related to such incidents.

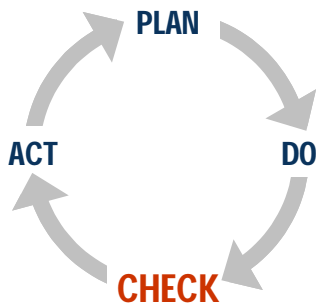
4.2.5 Operational Control

Operational Control is the deepest level within the organization that the continual improvement management system reaches. It is at this level that performance improvement plans and programs are translated into specific operational activities and operational control procedures. These activities and procedures – carried out consistently – ensure that equipment and processes operate in conformance with management system expectations and performance objectives and targets. Coordination between employee training programs and operational control is important to ensure that activities and procedures are carried out consistently.

Operational control will present some degree of opportunity for integration. In particular, whenever the achievement of objectives and targets from different management areas involve the same equipment or processes, integration opportunities arise. For example, all four of the management initiatives involve developing specifications for when and how equipment will receive maintenance. In this context, the desirability of integration is obvious – a failure to integrate will result in more than one, potentially inconsistent, set of maintenance requirements for the same equipment.

- > In effect, integration at the operational control level “closes-the-loop” with the integration undertaken at the objectives and targets level. The integration ensures that the harmonized objectives and targets are supported, where overlap occurs, by harmonized operational controls. In addition to equipment maintenance, other areas of likely overlap among two or more of the initiatives include:
 - requirements and standards for the installation of new equipment;
 - requirements and standards for rehabilitation and repair;
 - procedures and standards for inspecting and testing equipment;
 - safety procedures; and
 - requirements and standards for operating equipment.

4.3 Check



The checking component of the continual improvement framework focuses on knowing how the management system is performing. This section covers each of the integration points related to checking.

- > Measuring and monitoring
- > Reporting
- > Management review
- > Auditing

4.3.1 Measuring and Monitoring



Measuring and monitoring relates to routinely monitoring what an organization does day-to-day and periodically measuring progress towards objectives and targets. Without objective, quantifiable data collected through measuring and monitoring activities, an organization will have a difficult time assessing where it is with respect to objectives and targets and making change management decisions. Furthermore, in the absence of measuring and monitoring activities, an organization will have difficulty identifying areas that require corrective action and analyzing the root cause of problems.

Selected Management Initiatives

Each of the selected management initiatives requires measuring and monitoring activities to track key operations/activities and assess progress towards objectives and targets.

- > EMS: EMS requires procedures to:
 - Monitor key characteristics of operations and activities that can have significant environmental impacts an/or compliance consequences;
 - Track performance;
 - Check progress on meeting objectives;
 - Calibrate and maintain monitoring equipment; and
 - Periodically evaluate compliance with applicable laws and regulations, through internal audits.
- > CMOM: CMOM requires that an organization:
 - Measure water quality (routine, investigative, and after spills) through testing downstream water intakes;
 - Inspect and test new facilities and collection system components;

- Collect and track data on performance measures;
 - Maintain up-to-date maps of the collections system;
 - Track overflow occurrences, work orders associated with system problems, and information on noncompliance events caused by high volume flows; and
 - Document operation and maintenance preventative measures.
- > AMP: An AMP requires that a utility develop systems to track the performance of assets and to track and benchmark the costs of both planned and performed emergency maintenance for each asset. AMP also requires an up-to-date electronic inventory of collection/distribution system and treatment plant assets. This inventory must include acquisition and cost information, ongoing cost logs that track the maintenance and repair requirements of strategic assets, and historical data on the system's construction and rehabilitation costs.
- > PSW: PSW requires an organization to measure and monitor:
- Turbidity levels;
 - Implementation of improvement action plans; and
 - Performance improvements (progress towards objectives and targets).

Integration Opportunities

Integration opportunities exist for coordinating data that is collected through measuring and monitoring activities, including the following.

- > Data collected through ongoing day-to-day monitoring activities, such as data on receiving water quality for EMS and CMOM.
- > Data about equipment calibration and maintenance. EMS, AMP, and CMOM all require tracking data on equipment calibration and maintenance.
- > Asset maps. CMOM and AMP require maps of collection and/or distribution system assets.
- > Progress towards objectives and targets. There may be some information about progress on objectives and targets that will be applicable to more than one management initiative. For example, if an EMS has an objective about SSOs, then progress on SSO objectives could apply to both CMOM and EMS. However,

given the focus on different management areas of the initiatives, there may be limited opportunity to coordinate information on objectives and targets progress.

Before building any new data collection systems, a utility should review what is already in place. Chances are that many utilities are already collecting a substantial portion of the data needed for existing compliance and other reporting purposes.

How to Approach Integration

Utility managers should both define measuring and monitoring needs for each initiative and look across the initiatives to identify information necessary for more than one initiative. Where possible, utilities will want to utilize the same equipment and processes for collecting and tracking data. For example:

- > Many utilities use computerized systems (e.g., SCADA, laboratory systems) for collecting data on day-to-day activities and operational performance. These computerized systems provide the opportunity to collect data in one place to meet the needs of multiple initiatives.
- > Many utilities have a maintenance management system (potentially computerized) to provide information on equipment maintenance and calibration for EMS, AMP, and CMOM.
- > Utilities can use GIS and/or other mapping systems to develop asset maps for both CMOM and AMP.
- > Utilities can develop standardized, utility-wide formats for tracking and reporting progress on objectives and targets. Consistent formats will make management review easier.

4.3.2 Reporting

Each of the management initiatives requires some type of formal reporting about performance. For example, EMS requires the preparation of internal and third party (if applicable) audit reports. PSW requires annual reports on turbidity levels, as well as progress towards objectives and targets.

The management initiatives tend to require reports that use specific formats, communicate different information, and address different audiences. As a result, there may be limited opportunities for integration.

Reports to the public about progress on objectives and targets and planned improvements present a clear opportunity for integration. Materials prepared for management review, which cover progress towards objectives and targets and results of internal audits and reviews, present another opportunity for integration.

Reporting: An Example

The San Diego Metropolitan Wastewater Department (MWWD) tracks performance indicators related to departmental business goals. Information is compiled quarterly into a "MWWD Performance Indicators Report" that supports the Management Team's decision-making efforts and helps guide input to the annual Strategic Plan update. The report includes information on performance indicators for business goals in the following areas.

Systems Operation and Maintenance

- Wastewater Treatment Plant's Flows
- Point Loma Flow & Effluent Quality
- North City Water Reclamation Plant
- Metro Biosolids Center
- Major Pump Stations
- Energy
- Sewer Spills
- Sewer Main Cleaning
- Sewer Main Replacement
- Sewer Back-up Claims
- Notice of Violations and Fines
- Vehicle Maintenance
- Vehicle Accidents
- Industrial User Compliance Rates

Capital Asset Management

- Construction Cost Growth
- CIP Cash Flow

High Performing Work Team

- Overtime Usage & Vacancy Rates
- Sick Leave Usage
- Recordable Injuries
- Workers' Compensation Claims
- Incidence Rate
- Performance Evaluations
- Supervisor Initiated Rewards
- Grievances

Fiscal Management

- Sewer Fund Revenues
- Current Year Monitoring
- Resources / Operations & Maintenance

Customer Service

- Information & Organizational Support

4.3.3 Auditing

Auditing, whether conducted internally or by an outside party (such as a private third party, peer, or regulator), is critical to performance assessment, reinforcement, and continual improvement. Results of audits should be linked to the corrective and preventive action processes, so that identified systems gaps or deficiencies are corrected in a timely fashion.

Two integration opportunities exist under auditing:

- > Systems audit training and implementation; and
- > Audit teams.

Systems Audit Training and Implementation

Conducting any internal management system audit requires that staff be trained on how to conduct systems audits. Utilities can provide integrated training in systems audit processes and techniques, regardless of the management areas of the system(s) to be audited. Audit training developed for one continual improvement management system can be readily transferred to other management initiatives. Additionally, a utility can look to develop systems audit expertise among a core group of internal auditors. These individuals will then have the audit skills needed to support systems auditing of any management area.

Audit Team

Utilities can conduct an integrated audit in the form of a single audit that covers multiple management areas and meets the requirements of multiple management initiatives. The practicality of this will depend on the breadth of operations and the number of management areas covered by the initiatives. The use of an audit team that includes trained systems auditors combined with management area experts (e.g., financial analysts for asset management or collections system operations and maintenance staff for CMOM) could provide the breadth of knowledge required to cover all of the operations and areas in an integrated management system.

Utilities can also utilize audit teams to conduct a series of audits, each focused on an individual management area. In this case, a utility would team the individuals trained in systems auditing with experts from the management area of relevance to the specific audit.

4.3.4 Management Review



Management review is a critical component of any continual improvement management system. It is the point at which senior management is made aware of performance accomplishments and deficiencies, system strengths and weaknesses, and needed adjustments to the management system to address changing circumstances and sustain continual improvement.

Management review entails a regular cycle (e.g., quarterly) of meetings at which individuals directly involved in monitoring system performance (those with specific performance information) inform those empowered to make decisions and allocate resources. These meetings are critical to the constant cycle of review and renewal central to continual improvement.

Selected Management Initiatives

Management review is a critical explicit or implicit element of each of the selected management initiatives. The success of each depends on on-going management attentiveness. Because the initiatives address high profile and resource intensive management areas, they are likely to represent high management priorities.

- > EMS: EMS explicitly requires an organization to close the continual improvement loop with a management review. The management review will typically include examining:
 - Suitability, adequacy, and effectiveness of the environmental policy and objectives;
 - Progress towards objectives and targets;
 - Nonconformances identified during audits;
 - Status of corrective and preventive action plans;
 - Results of key measuring and monitoring activities; and
 - Incidences of environmental noncompliance.

- > CMOM: CMOM requires regular review and updates to the utility's rehabilitation and capital improvement plans and procedures. These review and update efforts draw on information related to overflow occurrences, work orders associated with system problems, noncompliance events caused by high volume flows, and performance related SSO-based objectives and targets.

- > AMP: AMP involves an on-going assessment of and adjustment to a utility's predictive and preventative maintenance protocol and its rehabilitation and renewal strategy. These adjustments typically involve changes to both short and long-term capital asset plans and shifts in financial resource requirements. They are made by management based on observed rates of asset deterioration and associated costs and failure potential and future plans for expansion or changes in service that may require modifying, replacing, or eliminating an asset.

- > PSW: PSW does not contain an explicit management review element. The program, however, does include on-going review, presumably by senior utility management, of turbidity-related performance, performance related to goals for sedimentation basins, filters, disinfection, and other selected operational areas, and progress on implementation of improvement action plans.

PSW also requires the preparation and submission of an annual report reflecting this information.

Integration Opportunities

Management review creates both the opportunity and the need for integration. Needs and opportunities emerge in three areas: senior management participation; coordination of revisions to objectives/targets and associated management programs; and procedures for management review.

Sydney Water Corporation has developed a single management system procedure for management review. This procedure is used by all business units. However, the content of the management review varies for each business unit as each has different environmental objectives and targets, safety issues, assets to manage, etc.

Senior Management Participation

Review by senior members of the management team is either required or expected for each of the management initiatives. In medium to large utilities, this will include a limited number of individuals such as department/division heads and the utility deputy and executive directors. In small utilities, management review may involve only one or two individuals whose responsibilities cover a broad array of functions including executive director, operations head, and chief financial officer.

The overlap in senior management participation to support management review for each of the initiatives establishes an obvious need to efficiently utilize management's time. Integration of the management review element can address this by establishing a single management review team with responsibilities across initiatives.

Coordination of Revisions to Objectives/Targets and Associated Management Programs

Integration of objectives and targets and the associated management programs during the planning phase of the continual improvement management system has been previously identified as key to effective strategic alignment. Management review is the point in the continual improvement process that the need and direction for revisions to both of these elements takes place. As such, an integrated management review process is not only desirable but necessary to effectively maintain the previously established alignment.

Procedures for Management Review

A procedure for management review will typically involve identifying the management review cycle (e.g., quarterly), the agenda items to cover at each management review meeting, and how

decisions and actions will be communicated and incorporated as changes to the management system. An integrated management review approach will require an integrated management review procedure. This procedure will ensure that the meeting agenda encompasses the full range of management areas included in the system and that decisions are delivered and actions items undertaken in a coordinated fashion.

How to Approach Integration

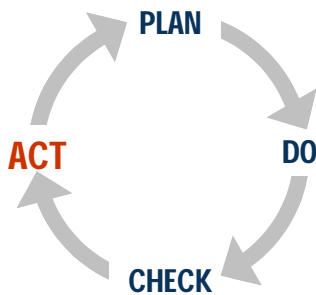
Effectively integrating the management review approach should be relatively straightforward. The key is to ensure the management review includes the right people discussing the right things – basic effective meeting management. To establish the management review team, a utility will need to review the scope of the continual improvement management system and be attentive to any particular areas of emphasis that result from the incorporation of individual management initiatives. Management system scope will inform the key departments and other organizational areas that must participate in the review.

Over time, to the extent the scope of the management system expands, an organization will need to periodically review and likely enlarge management review participation. For example, expanding the management system scope from just a focus on environmental performance to include asset management would drive the need to include a representative from financial planning.

At a certain point, expansion of the management system to multiple management areas may create the need to establish subgroups within the management review team, particularly in larger organizations. This would address a situation where the management review agenda becomes too complex or too long for clear or efficient oversight by the full group. It will be important, however, to ensure that subgroup review, including decisions and action items, remain coordinated by the full management review team.

Enabling the integrated management review will require the development of an integrated management review procedure. As discussed above, this procedure will need to establish the integrated nature of the management review by laying out agenda items fully reflective of the management system scope, identifying review participation consistent with scope, and establishing communication and other review follow-up actions compatible with the needs of the integrated system.

4.4 Act



Acting is the final step in the continual improvement management system process. It is the point at which system and operational performance - as documented during the checking step - are reflected in management system adjustments. These adjustments can span all aspects of the management system from policies and objectives and targets to operational controls. Two integration opportunities reside under this component of the management system:

- > Corrective and preventive action; and
- > Change management.

4.4.1 Corrective and Preventive Action

Continual improvement management system frameworks utilize explicit corrective action procedures to ensure system deficiencies and operational variances are identified, investigated, and corrected in a timely fashion. These procedures ensure an organization resolves the immediate problem, investigates the causes and whether these exist in other parts of the organization, and takes steps to prevent recurrences. Procedures typically involve identifying the type of documentation that will support corrective action (e.g., a corrective action notice), how the organization will track the corrective actions to completion (e.g., a notice tracking data system), who is responsible for initiating, addressing, and closing a corrective action, and verifying the effectiveness of corrective action.

On-going monitoring, routine audits, and direct operator observation are typical modes through which the need for corrective action is identified. To the extent that analysis of the problem (through root cause analysis) identifies the need for management system change, this information will typically flow into the management review process for further input, decision(s), and action.

All four of the selected management initiatives require a systemic approach for adjusting operational controls and procedures on the basis of identified operational condition and performance changes. For example, under an AMP, asset failures (including unexpected degraded performance) will drive examination of and possible adjustment to the relevant asset management unit's predictive and preventative maintenance protocol.

The use of a standard corrective action procedure (e.g., one instituted to support EMS implementation) should support all of the corrective action needs of the organization. To ensure that the intent to integrate under this element is clear, it will be important to modify the scope of any existing corrective action procedures to include the additional management areas (e.g., the scope of a corrective procedure for EMS will be environmental problems, but will not cover, unless specifically modified, asset management unit failures that do not have environmental consequences).

4.4.2 Change Management

Continual improvement management systems require change management procedures to ensure the system remains relevant and effective as operations, processes, and equipment change and evolve. Change management procedures identify changes and then aid the existing management system to adapt to effectively cover the change. Changes that typically require a management system response include additions/deletions of equipment or processes, additions/deletions of regulatory requirements, and changes in the general operating environment of the organization (e.g., internal reorganizations, bonding capacity reductions, shifts in public acceptance, etc.).

As with corrective action, an organization can use a single set of change management procedures to support multiple performance improvement initiatives and the associated management areas. To support this integration, however, the organization will need to ensure that the scope of the change management procedures explicitly address the complete range of relevant management areas. Moreover, the organization will need to ensure that the change management procedure establishes a protocol for reviewing and responding to each change from the perspective of each management area. This will ensure that all relevant objectives and targets, management programs, and operational controls are adjusted consistent with the change (i.e., that the proposed changes is consistent with the organization's policies and that it has been evaluated against the objectives and targets).

Appendices



Appendix A: Frequently Used Acronyms

AMP – Asset Management Program

AMSA – Association of Metropolitan Sewerage Agencies

APWA – American Public Works Association

AWWA – American Water Works Association

BSC – Balanced Scorecard

CMOM – Capacity Management, Operations, and Maintenance

EMS – Environmental Management System

EPA – Environmental Protection Agency

GASB – Governmental Accounting Standards Board

ISO – International Organization of Standardization

MBO – Management by Objectives

NBP – National Biosolids Partnership

PSW – Partnership for Safe Water

SSO – Sanitary Sewer Overflow

WEF – Water Environment Federation



Appendix B: Additional Reference Materials

Asset Management

"Management Public Infrastructure Assets to Minimize Cost and Maximize Performance", Association of Metropolitan Sewerage Agencies, 2002. (Available at www.amsa-cleanwater.org)

"The Gap in Water and Wastewater Infrastructure and the Changing Face of Utility Management", Steve Albee, US Environmental Protection Agency, 2003.

"Thinking, Getting & Staying Competitive: A Public Sector Handbook", Association of Metropolitan Sewerage Agencies and Association of Metropolitan Water Agencies, 1998, (Available at www.amsa-cleanwater.org)

CMOM

"CMOM Utility Self-Audit Review", EPA Region 4, February 29, 2000.

"Guide for Conducting Evaluations of Municipal Wastewater Collection System Operations and Maintenance Management Programs", EPA Region 4, October 1996.

"Laying the Foundation: An environmental management system is a great first step in launching a CMOM program" by Rick Bickerstaff, Adrian Williams, and John Cook, Water Environment and Technology, March 2003.

EMS

"An EMS Troubleshooters' Guide for Local Governments", GETF, October 2002. (Available at www.peercenter.net)

"EMS: An Implementation Guide for Small and Medium-Sized Organizations", NSF-ISR, January 2001. (Available at www.peercenter.net)

"EMS: Do They Improve Performance", University of North Carolina, January 2003. (Available at <http://ndems.cas.unc.edu/>)

Integrating Management Initiatives

"Moving Toward Comprehensive Utility Management Systems – Report of the Environmental Management Systems (EMS) for Public Utilities Integration Project", 2002, available at <http://www.wef.org/pdffiles/EMSfinalreport.pdf>

Performance Measurement

"Developing and Implementing a Performance Measurement System: Volume I" Water Environment Research Foundation, 2000.

"Translating Strategy into Action- The Balanced Scorecard" by Kaplan and Norton, Boston, MA: Harvard University Press, 1996.



Appendix C: Characterization of Management Initiatives Researched

Asset Management (AMSA Asset Management Handbook – “Managing Public Infrastructure Assets to Minimize Cost and Maximize Performance”) - <http://www.amsa-cleanwater.org>

Asset Management provides an approach for utilities to develop an infrastructure investment strategy that will support capacity needs. Asset Management methods can be applied to evaluate capacity needs in light of current infrastructure and support a utility’s development of an infrastructure investment strategy that is fully integrated with and supportive of overall utility performance objectives. Asset Management will also make transparent the mid- and long-term financial requirements for achieving performance objectives.

In this regard, Asset Management provides a supplement to any continual improvement management system by driving a specific focus on and providing methods for evaluating needs with respect to the financial requirements of maintaining the reliability of costs and delivering the capacity needed to support utility performance objectives. Specifically, Asset Management can support planning by providing an approach for:

- > Articulating a strategic foundation related to the utility’s mission and goals;
- > Developing, monitoring, and reviewing asset conditions, as well as performance and risk measurements and targets;
- > Integrating maintenance and replacement with capital requirements for growth, service improvements, and compliance; and
- > Assessing and communicating the service, financial, and risk implications of alternative asset-related decisions.

Asset Management can support the implementation component of a continual improvement management system by providing an approach to align maintenance elements with goals and objectives and linking the Asset Management program with strategy development, financial planning, business process design, and internal and external communication programs. Asset Management also provides an approach for developing a maintenance management system (maintenance policies, practices, and procedures) for meeting long-term strategies for the best mix of investments in repair, rehabilitation, and replacement to get the most useful life out of assets at lowest overall cost.

To successfully achieve the Asset Management objectives of providing high quality service at a minimum cost and risk, an Asset Management program must include substantial checking (e.g., performance measurement and evaluation) and acting (e.g., review and improvement). Linking the planning and implementing components of Asset Management with a continual improvement management system framework can provide an approach to the necessary checking and acting components. Utilities have implemented advanced Asset Management programs to support continual improvement by developing

their own measurements, auditing procedures, reporting procedures, management reviews, and improvement plans.

Participants – Wastewater utilities

Sponsors – AMSA in partnership with WEF, AWWA, AMWA

Overarching Program Type – Continual improvement approach for managing infrastructure capital assets based on self-defined performance goals, asset identification and evaluation, risk management and capital planning

Drivers – (For water and wastewater utilities) Aging infrastructure of water and wastewater systems and need to plan for infrastructure maintenance and replacement

Goals and Desired Areas – Provision of desired service levels while minimizing the costs of operation (e.g., high quality customer service provision at minimum cost and risk)

Benefits – Optimized performance, reduced risk, minimized costs

Steps and Requirements

- > Articulate a strategic foundation related to the utility’s mission and goals
- > Develop, monitor, and review asset condition, performance and risk measurements and targets
- > Integrate maintenance and replacement with capital requirements for growth, service improvements, and compliance
- > Assess and communicate the service, financial, and risk implications of alternative asset related decisions
- > Link the asset management program with strategy development, financial planning and reporting, business process design, and internal and external communications programs

American Public Works Association (APWA) Management Accreditation Program -

<http://www.apwa.net/>

The American Public Works Association (APWA) Management Accreditation Program is a planning tool that can be used in the context of a management system framework to provide an approach for: assessing existing policies, practices, and procedures; identifying deficiencies that need correction; establishing goals for complying with recommended practices (recommended by APWA); and developing strategic plans to meet goals and correct deficiencies. The program provides a “Works Management Practices Manual” that is used as the basis for self-assessing policies, practices, and procedures, and developing plans for improvement. Like QualServe, the APWA Program covers all utility management areas including financials, quality, impacts/risk (environment and health and safety management), and human resources.

To receive program accreditation, organizations must develop plans for how to improve policies, practices, and procedures to meet goals and implement recommended best practices. The implementation of a management system framework can be a way to systemically implement the plans for improving policies, practices, and procedures and align best practices with policies, goals, and targets.

The APWA Program can support the checking component of a management system framework by using the evaluative tools provided as one way of checking on or evaluating current practices. Furthermore, the program’s three-year cycle of accreditation is built on the concept of continual improvement in that

organizations are required to submit annual reports indicating changes that have been made to improve policies, practices, and procedures. As such, utility managers could link these requirements of the APWA Program with the reporting and management review elements of a continual improvement management system framework.

Participants – Public works agencies

Sponsors – American Public Works Association (APWA)

Overarching Program Type – Voluntary, peer-based certification program, practice-based, continual improvement system

Drivers – Provide a means of formally verifying and recognizing public works agencies for compliance with recommended management practices

Goals and Desired Areas – Improved public works performance and provision of services, increased professionalism, impetus for self-improvement

Benefits – APWA recognition, improved effectiveness, clarified budget needs, identification of operation and management needs, team work and staff development, interdepartmental coordination, improved communications

Steps and Requirements

- > Document practices and use recommended practices manual to assess existing policies, practices, and procedures and to identify deficiencies that need correction
- > Establish goals for complying with recommended practices
- > Develop a strategic plan to meet those goals and correct deficiencies and present the plan at a public meeting
- > Once improvements are implemented, submit documentation demonstrating agency compliance with all applicable practices to the Accreditation Council who will determine if the agency is ready for an on-site assessment
- > Receive on-site assessment performed by public works practitioners
- > Receive accreditation form the Accreditation Council (three year re-accreditation cycle)
- > Submit annual reports to retain accreditation

American Water Works Association (AWWA) Proposed Accreditation Program -

<http://www.awwa.org>

The AWWA Proposed Accreditation Program, as currently envisioned, would support the implementation component of a management system by providing a series of standards for water and wastewater utility operations. These standards would provide guidance on operational-level utility best practices that could be incorporated into the operational procedures, practices, and processes of a management system framework. A utility manager could adopt and implement any or all of the utility operations standards, depending on their utility's scope of operations (e.g., a wastewater treatment utility would only be interested in operational best practices that apply to wastewater treatment and not those that apply to drinking water) and management areas on which their management system is focused.

Participants – Water treatment, wastewater treatment, and combined utilities

Sponsors – AWWA

Overarching Program Type – Voluntary certification (independent third party), based on standards for water and wastewater utility operation and management (standards under development)

Drivers – Increased expectations about service from customers, stakeholder interest in proven utility efficiency and efficacy, heightened regulatory requirements, closer public scrutiny of tap water quality issues, tightening budgets and increasing pressure to reduce costs, greater concern about environmental issues among consumers

Goals and Desired Areas – Provide recognition for quality management practices

Benefits – AWWA recognition and certification, improvement of operations effectiveness and management efficiency, financial benefits as utilities become better investment risks, increased customer satisfaction

Steps and Requirements – Under development

Balanced Scorecard

The Balanced Scorecard is a high-level planning tool. Balanced Scorecard seeks to align measures with strategies in order to track progress, reinforce accountability, and prioritize improvement opportunities. Balanced Scorecard integrates four related perspectives: finance; customers; internal processes; and learning and growth.

The Balanced Scorecard can be used to support the planning component of a continual improvement management system framework by providing an approach for looking across management areas simultaneously to create a single, all-encompassing vision and strategy. Utility managers who have implemented one of the management system frameworks could utilize Balanced Scorecard in developing the vision, goals, and objectives for expansion to include other management areas. Alternatively, utility managers could utilize the Balanced Scorecard, before implementing a management system, to determine how a management system framework might best support the overall organization vision, goals, and objectives.

Although the Balanced Scorecard lacks explicit elements for checking and acting, connecting the Balanced Scorecard to a management system framework allows a utility to monitor/measure against performance targets, establish a regular review cycle for checking performance, and re-evaluate their vision, strategies, and policies.

Participants – Any organization

Sponsors – N.A.

Overarching Program Type - Voluntary, performance measurement planning tool.

Drivers – Provide a new way to measure performance (rather than external accounting data), based on a balance of perspectives.

Goals and Desired Areas - Align key performance measures with strategy at all levels of an organization, facilitate communications and understanding of business goals at strategies at all levels of an organization, and provide feedback and learning.

Benefits - Performance measures incorporated into manageable metrics, strategic planning and budgeting processes integrated, identification of best practices in an organization.

Steps and Requirements:

- > Identify high-level vision and strategies for achieving the vision.
- > Use 4 Balanced Scorecard perspectives (financial, customer, internal processes, and learning and innovation) to translate the vision into a clear set of objectives.
- > Translate objectives into clear performance measures at the business unit level.
- > Evaluate performance against the scorecard.
- > Update and maintain the scorecard.

Bid-to-Goal

Bid-to-Goal is a service improvement and cost saving planning tool. Utility managers wanting to focus on the bid process and confronting privatization pressures might utilize Bid-to-Goal. Bid-to-Goal provides an approach for establishing goals that are reflective of the level of savings needed to be competitive with potential private proposals. As such, Bid-to-Goal could be used in the planning phase of developing a management system framework.

Bid-to-Goal provides an approach for developing a strategy that focuses on the hitting of a savings goal rather than using managed competition. Public employees meet that savings goal via a detailed offering, or a memorandum of understanding (MOU), much like that of the private sector service agreement. During the term of the agreement, which could run five to six years (with options to extend), performance discrepancies could trigger an automatic bidding process.

Three factors lead to the development of Bid-to-Goal.

- > First, it can take time to implement the changes needed to become competitive. Bid-to-Goal has the potential to link firm performance criteria with phased progress.
- > Second, many communities have launched business planning and competitiveness programs that feature open-ended processes. They are open-ended in that they provide no clear direction as to the results that are expected once the plans are submitted. The detailed self-analyses by public agencies are compiled in public documents that could seriously undermine the ability to bid successfully in managed competition. Bid-to-Goal requires detailed self-examination and the production of a business plan after the community has committed to firm requisites for acceptance.
- > Third, there is growing reluctance among the major contract operations companies to participate in managed competition. They are not likely to bid if they do not believe they can provide the service for less than the municipal entity. For communities focused on the goal of achieving significant savings without impacting the quality of service, Bid-to-Goal provides an opportunity for public employees to demonstrate, over a reasonable period of time, that they can reach optimum levels. If the public employees fail to reach their goals, they can be precluded from participation, thus attracting private companies into a bidding pool.

There are specific criteria that must be developed as the basis for awarding the MOU including:

- > A goal reflecting the level of savings needed to be competitive with potential private proposals (assuming that private companies charge for profit and other private sector costs);
- > A scope of work describing the level of service, including safety margins desired by the community, in exchange for a service fee; and

- > A firm schedule for submitting a jointly signed offering (management and labor) and for accomplishing the savings and performance promised under the MOU.

The goal must be matched to a specific scope of services with performance parameters detailed in the MOU. The goal represents the minimum savings required to comply with the process; however, incentives can be built into the service agreement to encourage additional savings to the community. Gain sharing programs can be used to provide incentives as well as to establish the basis for the accumulation of reserve funds and money that could play a similar role as a performance bond.

The time allowed for the development of a public offering is typically limited to less than one year (from the beginning of the Bid-to-Goal process) in order to provide a strong incentive for action. If the offering is not submitted within the time allotted, the community can solicit bids from the private sector.

Participants – Public agencies

Sponsors – N.A.

Overarching Program Type – Voluntary, service improvement and cost savings planning tool.

Drivers – Improve service delivery using public employee labor-management collaboration.

Goals and Desired Areas – Achieve operational savings and level of service modifications that are comparable or better to solutions offered by the private sector.

Benefits – Provides an innovative route to savings and efficiency; rewards ratepayers; retains community control of investments, encourages partnership of participants.

Steps and Requirements:

- > Establish a goal reflecting the level of savings needed to be competitive with potential private proposals.
- > Determine the scope of work describing the level of service including safety margins desired by the community, in exchange for a service fee.
- > Provide a schedule for submitting a jointly signed offering (management and labor) and for accomplishing the savings and performance promised under the MOU.
- > Execute a service agreement that is implementation driven and evaluated based on terms and conditions of a detailed service agreement.

Capacity, Management, Operation and Maintenance Programs (CMOM) – <http://epa.gov>

CMOM objectives are derived from a desire to improve sewer system operation and maintenance. When wastewater systems are not properly managed, operated, or maintained, the National Pollutant Discharge Elimination System (NPDES) permit limits can be exceeded at the associated treatment plants, and sanitary sewer overflows (SSOs) can occur from the collection/transmission systems. The infrastructure investments can deteriorate, with degraded water quality as a possible area. NPDES permittees are familiar with the permit regulations and requirements. In some utilities, however, the sewer system has been maintained by a department separate from the wastewater treatment authority, and that may have had limited knowledge of the permit conditions.

The CMOM program as developed by U.S. EPA's Region IV emphasizes that good operation and maintenance is a function of good management. The capacity aspect of the program stresses: proper

installation of new and rehabilitated lines; inter-jurisdictional agreements for wastewater services; requirements for the implementation of an information management system; capacity assurance; development of overflow response and emergency operations plans; an assessment of the system's physical conditions; and a determination of which components need repair. CMOM also requires training, a summary of the management program, and periodic audits to determine the effectiveness of the program.

Utility managers that want to focus on the capacity of collections systems and treatment facilities could use CMOM as a blueprint. CMOM can be linked with an existing management system framework, or used to develop a basic “plan, do, check, act” framework focused on managing the capacity of collections systems and treatment facilities.

In either approach, CMOM can be used in the planning stage of a continual improvement management system to assess the capacity of collections systems and treatment facilities to treat peak flows and maintain compliance with permit requirements.

CMOM can support implementation of a continual improvement management system by providing an approach for:

- > Optimizing collection systems and treatment facility operations;
- > Implementing and enforcing sewer use ordinances or other legally binding documents;
- > Maintaining information management systems that contain timely information for system operation and maintenance;
- > Providing adequate preventative and routine maintenance, and for continual review and update of procedures;
- > Ensuring all feasible steps are taken to stop and mitigate the impacts of SSOs and that an overflow response plan is prepared; and
- > Providing employee training on the CMOM program.

CMOM provides an approach for checking by establishing continual review of preventative and maintenance procedures, periodic review of CMOM program procedures, and tracking of performance indicators. CMOM supports the acting component by establishing regular updates to preventative and maintenance procedures and CMOM program procedures. CMOM also supports acting through audits as part of the NPDES permit application (currently required by EPA Region 4).

Participants – Municipal sanitary sewer collection systems

Sponsors – US EPA

Overarching Program Type – Tool for evaluating and prioritizing efforts to identify and correct performance-limiting situations in the collections system. In EPA Region 4, CMOM has been incorporated as a regulatory requirement. These requirements have not yet been adopted by EPA overall. In Region 4, as part of the NPDES permit application, permittees must conduct an audit evaluating the CMOM and its compliance with the CMOM general standards.

Drivers – Aging infrastructure, history of inadequate investment in infrastructure maintenance and repair, risks to community of not providing an effective sanitary sewer collection system (sanitary sewer overflows or SSOs)

Goals and Desired Areas – Reduced health and environmental risks by increasing the investment in managing, operating and maintaining sanitary sewer collection systems and ensuring adequate capacity is provided (increased investment leads to lowered occurrence of sanitary sewer overflows)

Benefits – Leverage planning required by CMOM for getting budget approval for improvements•

Steps and Requirements

- > Provide adequate maintenance facilities and equipment, identify critical parts needed for system operations, maintain an adequate inventory or replacement parts
- > Implement and enforce sewer use ordinances or other legally binding documents
- > Maintain information management systems that contain timely information for system operation and maintenance
- > Provide adequate preventative and routine maintenance, and continually review and update procedures
- > Ensure all feasible steps are taken to stop and mitigate the impacts of SSOs and develop an overflow response plan
- > Assess current system physical condition
- >
- > Determine capacity of current collections system and satellite collection systems to meet base and peak flows, identify measures for providing additional capacity or reducing flows (as necessary to meet peak flows)
- > Assess capacity of treatment facility to treat peak flows and maintain compliance with permit requirements, identify measures for providing additional capacity or reducing flows (as necessary to meet peak flows), optimize treatment facility operation
- > Ensure proper installation of new sewers and connections and assess their capacity to meet peak flows
- > Provide employee training on the CMOM program
- > Develop and track performance indicators
- > Review and update CMOM program procedures periodically
- > Conduct an audit, appropriate to size of system and number of SSOs and submit a report of the audit as part of the NPDES permit application

EPA EMS for Local Government Initiative – <http://epa.gov>

The EPA EMS for Local Government Initiative is based on the ISO 14001 environmental management system standard. As such, this initiative provides an approach for all of the management system components in the same manner as ISO 14001.

Participants – Local government entities (broader than water / wastewater treatment)

Sponsors – US EPA

Overarching Program Type – Pilot project to assist local governments develop and implement an EMS, ISO certification encouraged but not required

Drivers – Strong management tool to help improve environmental performance, pollution prevention, and regulatory compliance

Goals and Desired Areas – Positive effect on environmental performance and compliance

Benefits – Improved environmental awareness, improved environmental performance (reduced impacts), improved efficiency, increased accountability within the agency

Steps and Requirements

- > Receive training and technical assistance
- > Develop and implement an EMS (see ISO 14001 for EMS development and implementation steps)

The Governmental Accounting Standards Board Statement #34 (GASB-34) – <http://www.gasb.org>

The Governmental Accounting Standards Board (GASB) adopted in June 1999 a new accounting standard that affects the way local and state governments report their finances. Statement 34 (GASB-34) mandates that governments change to a system of full accrual accounting, or accounting that focuses on the flow of economic assets and recognizes costs as committed resources, regardless of when the expenditures are made. The new standards provide significant changes in the information provided in the organization's annual financial report, including the first ever requirement to report the value of the organization's infrastructure assets. GASB-34 affects all state and local governments that issue financial reports in conformity with generally accepted accounting principles.

GASB-34 has provided an alternative to the historic cost, less depreciation reporting method for infrastructure assets, called the modified approach. Agencies that have a comprehensive asset management system that includes an inventory, condition assessment, and a predictive maintenance/repair/restoration/replacement component will be allowed to forgo the required financial accounting for infrastructure assets. As such, the relationship of GASB-34 to the components of a management system may be described similarly to Asset Management.

The new requirements become effective based on the size of the reporting agency (city, county, township, not just the public works or infrastructure agency). Agencies with annual revenues exceeding \$100 million will start using the new standard beginning June 15, 2001; between \$10 million and \$100 million, the new rules will take effect June 15, 2002; and for those under \$10 million, the law will take effect in June, 2003.

Participants – Local government agencies

Sponsors – Governmental Accounting Standards Board (GASB)

Overarching Program Type – Requirement to implement asset management and report asset depreciation

Drivers – See asset management

Goals and Desired Areas – See asset management

Benefits – See asset management

Steps and Requirements – See asset management bottom up approach

International Organization of Standardization (ISO) 14001 Environmental Management System Standard - <http://www.iso.org>

ISO 14001 is an internationally recognized EMS standard that can be utilized by any industrial sector or type of organization. ISO 14001 is built around the plan-do-check-act cycle of continual improvement.

ISO 14001 provides an approach for the self-identification of environmental policy, impacts, performance goals, and objectives, with the expectation that the minimum performance target is beyond environmental regulatory compliance.

ISO 14001 provides the following elements for environmental performance improvement:

- > Establishing an organizational environmental policy;
- > Identifying environmental aspects (activities, products, or services which can interact with the environment) by characterizing waste streams (air, effluent, solid / hazardous waste) and identifying environmental requirements (regulatory and other voluntary commitments);
- > Identifying environmental impacts associated with environmental aspects;
- > Identifying which functional units are associated with the impacts;
- > Setting environmental objectives and targets (with associated metrics) for controlling and reducing impacts;
- > Identifying business units or individuals responsible for achieving objectives and targets;
- > Developing action plans and time lines for achieving objectives and targets;
- > Establishing operational and maintenance management controls;
- > Establishing emergency procedures;
- > Conducting measuring and monitoring activities;
- > Taking corrective and preventive actions, and
- > Conducting management review.

Organizations that implement ISO 14001 determine how to establish operational policies, practices, and procedures that align with organizational objectives and targets for environmental performance improvement. Some industry sectors have developed industry-specific best policies, practices, and procedures to complement ISO 14001 implementation.

Because drinking water and wastewater utility operations are primarily focused on environmental and public health impacts, utility managers will find that EMS represent a natural starting point for introducing a continual improvement management system into a utility.

Participants – Any private or public sector entities

Sponsors – International Standards Organization

Overarching Program Type – Voluntary, procedures based, environmental management system, third party certification optional

Drivers – Provide an international standard for environmental management

Goals and Desired Areas – Support environmental protection and prevent pollution while meeting socioeconomic needs

Benefits – Reduced environmental impacts, integration of environmental management and business functions

Steps and Requirements

- > Establish environmental policy
- > Identify environmental aspects (activities, products, or services which can interact with the environment)

- Characterizing waste streams (air, effluent, solid / hazardous waste)
- Identifying environmental requirements (regulatory and other voluntary commitments)
- > Identify environmental impacts associated with those environmental aspects
- > Identify which functional units are associated with those impacts
- > Set environmental objectives and targets (with associated metrics) for reducing impacts (Note: specific performance objectives and targets, beyond meeting regulatory requirements, are not provided by ISO 14001, but an approach for setting them is.)
- > Identify business units or individuals responsible for achieving objectives and targets
- > Establish and document procedures to meet targets and objectives and manage environmental impacts
- > Measure and evaluate performance against established objectives and targets
- > Conduct a management review to ensure overall environmental performance and improvement
- > Optional – Apply for third party verification and ISO certification of the EMS

ISO 9002 Quality Management System Standard - <http://www.iso.org>

ISO 9002 is an internationally recognized quality management system standard that can be utilized by any industrial sector or type of organization. ISO 9002 provides for the self-identification of Quality policy and objectives.

ISO 9002 provides an approach and methods for quality performance planning. ISO 9002 provides the following unique planning elements:

- > Establishing quality policy and objectives;
- > Identifying quality requirements (although not levels); and
- > Defining and documenting how quality requirements should be met (e.g., establishment of quality plans).

As with ISO 14001, organizations that implement ISO 9002 determine how to establish operational policies, practices, and procedures that align with organizational objectives and targets for quality management. As well, some industry sectors have developed industry-specific best policies, practices, and procedures to complement ISO 9002 implementation.

Note: ISO 9002 is the quality management system standard for organizations that do not carry out design and development (those are covered by 9001) and is appropriate for water and wastewater utilities.

Participants – Any private or public sector entities

Sponsors – International Standards Organization

Overarching Program Type – Voluntary, procedures based, quality management system, third party certification optional

Drivers – Provide an international standard for quality management

Goals and Desired Areas – Improved product quality

Benefits – Improved product quality, integration of quality management and business functions

Steps and Requirements

- > Establish quality policy and objectives

- > Identify quality requirements (Note: Like ISO 14001, specific performance objectives and targets are not provided, but an approach for setting them is)
- > Define and document how quality requirements should be met (e.g., establishment of quality plans)
- > Set quality procedures
- > Measure and evaluate performance against established objectives and targets
- > Conduct a management review to ensure overall performance and improvement
- > Optional – Apply for third party verification and ISO certification

Malcolm Baldrige National Quality Program - <http://www.quality.nist.gov/index.html>

The Malcolm Baldrige National Quality Award has been the centerpiece of the Baldrige National Quality Program since 1988. It is an award presented annually in recognition of performance excellence of US-based or headquartered companies and organizations. The focus of the Baldrige Program is an organization's overall performance management system. Award-winners have become recognized role models and have shared their strategies with other organizations.

The Baldrige criteria for performance excellence consist of financial and non-financial perspectives. The criteria form a framework, which is adaptable to any organization, for improving overall performance. The following categories make up the criteria for the Baldrige system.

- > *Leadership* - How the organization is guided, how its responsibilities are addressed to the public, and how good citizenship is practiced by the senior executives.
- > *Strategic Planning* - How the strategic directions of the organization are set, and how the key action plans are determined.
- > *Customer and Market Focus* - How the organization's requirements and expectations of customers and markets are determined.
- > *Information and Analysis* - How the management, effective use, and analysis of data and information are carried out in order to support the organization's key processes and performance management system.

The Malcolm Baldrige National Quality Program criteria can support the implementation component of a continual improvement management system by defining, at a high-level, good management practices.

Participants – Private and public for-profit businesses headquartered in the U.S. (manufacturing, service, and small businesses); and for profit and not-for-profit public, private, and government education and health care organizations.

Sponsor – National Institute of Standards and Technology (NIST)

Overarching Program Type – Voluntary, awards program based on 7 categories of criteria that define, at a high-level, good management practices.

Drivers – Establish a standard of excellence for high-quality management that would help U.S. organizations achieve world-class quality and enhance U.S. competitiveness.

Goals and Desired Areas – Continuous improvement in the delivery of products and/or services, greater customer satisfaction and response to stakeholders.

Benefits – Baldrige Award recognition, better employee relations, higher productivity, greater customer satisfaction, increased market share, and improved profitability.

Steps and Requirements

- > Companies prepare and submit the eligibility certification and application to examiners who review the applications to determine, based on the 7 categories of award criteria, which applicants will receive site visits.
- > Examiners conduct on-site verification and clarification of the application package, review pertinent records and data, and conduct interviews with executives and employees.
- > Judges review the site visit reports and application packages and present Award recipient recommendations to the Director of NIST and the Secretary of Commerce.
- > Examiners submit feedback reports to each applicant containing descriptions of strengths and opportunities for improvements in each of the 7 categories.
- > Secretary of Commerce makes final award determinations.

National Biosolids Partnership (NBP) EMS for Biosolids - <http://www.biosolids.org>

The NBP EMS for Biosolids also includes the planning elements provided by the other management system frameworks. However, rather than focus on environmental impacts broadly, as does ISO 14001, the NBP EMS for Biosolids is specifically focused on those impacts that relate to biosolids management, and is thus designed for use by wastewater treatment utilities that create and manage biosolids. Because of its specific focus, utility managers concerned with biosolids areas may utilize the NBP EMS for Biosolids in one of two ways. Utility managers could adopt the biosolids specific elements and pull them into another management system framework, such as ISO 14001. The Metropolitan Wastewater District in San Diego has adopted this approach. Or, a manager could implement the NBP EMS for Biosolids as the basis for establishing the continual improvement management system framework within the utility. Several dozen utilities across the country participating in the NBP EMS for Biosolids Program are taking this approach.

The NBP EMS for Biosolids provides implementation component elements similar to ISO 14001. However, since the NBP EMS for Biosolids is specifically focused on biosolids management, elements related to the establishment of operational procedures are limited to the specific business units associated with biosolids management. The NBP EMS for Biosolids also has additional requirements associated with public participation and communications. One of the most significant differences of the NBP EMS for Biosolids from ISO 14001 is that the NBP Program provides a National Manual of Good Practices. In this regard, the NBP EMS for Biosolids provides specific guidance and direction on the use of operational-level good practices related to biosolids production and management. ISO 14001, on the other hand, does not provide direction on best practices, as it is not industry-specific like the NBP EMS for Biosolids (specific to wastewater treatment utilities).

A unique aspect of the NBP EMS for Biosolids is that it supports the checking component by providing elements that establish specific reporting formats and procedures associated with performance and audit reports.

Participants – Wastewater treatment organizations that are responsible for the full biosolids management value chain (e.g., from collections and pretreatment to final biosolids disposition)

Sponsors – National Biosolids Partnership (AMSA, WEF, EPA)

Overarching Program Type – Voluntary, procedure-based environmental management system that incorporates best practices and continuous improvement towards performance goals, independent certification

Drivers – Improve public perceptions of biosolids management practices, especially the land application of biosolids for agricultural purposes

Goals and Desired Areas – Increased public acceptance of environmentally sound biosolids management practices

Benefits – NBP recognition, increased public acceptance, institutional memory improved through documentation of procedures, improved operational efficiency

Steps and Requirements

- > Establish a biosolids policy that commits the agency to the 10 principles in the Code of Good Practice
- > Plan and implement an EMS (identify critical control points and associated environmental impacts, set goals and objectives based on legal/other requirements and public input, establish and document procedures to meet goals and objectives, measure and evaluate performance against established goals and objectives)
- > Operate the EMS for 6 months and conduct a self-audit
- > Apply for and receive third party verification
- > Receive NBP recognition
- > Annual cycle of management review, self-audit, corrective actions, reports, third party interim audits
- > Re-verification (5 year cycle)

Note: Like the ISO management system standards, the NBP EMS for Biosolids does not dictate specific performance goals and targets. However, the NBP's program requires a commitment, through the "Code of Good Practice", to go beyond regulatory compliance.

Occupational Safety and Health Agency Voluntary Protection Program (OSHA VPP)-

<http://www.osha.gov/oshprogs/vpp/>

This is a voluntary program of the Occupational Safety and Health Administration. OSHA VPP provides an approach and methods for occupational safety and health planning. Specifically, OSHA VPP supports:

- > Developing occupational safety and health policy, goals, and objectives; and
- > Conducting worksite safety analysis.

With respect to the implementation component, OSHA VPP establishes safety / hazard prevention and control procedures (includes substantial employee involvement requirements). OSHA VPP supports the checking component by providing an approach to establish procedures for reporting safety concerns. As well, OSHA VPP provides an approach for self-inspection and accident investigation, which are similar to measuring/monitoring and corrective action elements of the other management system frameworks.

Participants – Any private or public sector entities that are regulated by OSHA

Sponsors – OSHA

Overarching Program Type – Voluntary, procedures based, occupational safety and health management system

Drivers – management tool to promote effective occupational safety and health programs

Goals and Desired Areas – protect workers from occupational safety and health hazards

Benefits – decreased costs in workmen’s compensation and lost work time, increased production, improved employee morale, reduced employee injury rates, OSHA recognition

Steps and Requirements

- > Management and labor statement of commitment
- > Develop occupational safety and health policy, goals, and objectives
- > Conduct worksite safety analysis
- > Establish safety / hazard prevention and control procedures (includes substantial employee involvement requirements)
- > Report safety concerns
- > Receive OSHA verification of meeting program criteria
- > Receive periodic OSHA reassessments (every three years for Star recognition)

Partnership for Safe Water - <http://www.awwa.org/partnership>

The Partnership for Safe Water is a voluntary performance program that incorporates benchmarking through data collection. The Partnership for Safe Water program provides specific targets for drinking water turbidity that are more stringent than federal regulations for safe drinking water.

Utility managers who want to focus on decreasing drinking water turbidity can implement the Partnership for Safe Water by: adopting turbidity performance targets; collecting turbidity data to benchmark utility performance; evaluating unit treatment processes and other factors (such as financial resource support) that may limit performance; and continuing an annual cycle of making improvements and collecting turbidity data. How a utility increases turbidity performance through adjustment of policies and practices is up to the individual utility – Partnership for Safe Water does not provide best practices in this regard. In the context of a management system framework, the targets provided by the Partnership for Safe Water can be directly incorporated into the process of setting goals and objectives.

Participants – Drinking water utilities providing treated surface water

Sponsors – AWWA, ASDWA, AMWA, NAWC, AWWARF, EPA

Overarching Program Type – Voluntary, performance based, benchmarking and self-assessment

Drivers – Prevent performance problems and increase public confidence in the safety of their drinking water

Goals and Desired Areas – Increased drinking water safety through continual improvement in water treatment plant performance. Exceeding Federal regulations for safe drinking water and providing a consistent level of performance

Benefits – Receipt of Partnership recognition, increased self-awareness about treatment capacity and performance levels, data to support capital planning

Steps and Requirements

- > Declare commitment
- > Collect and submit 12 months of turbidity data to provide a benchmark of utility performance
- > Conduct a self-assessment
- > Annual cycle of collecting and reporting data, making improvements

QualServe - <http://www.awwa.org/Science/qualserve/qualserv.cfm>

QualServe provides an approach for utilities to perform a high-level evaluation of all aspects of utility operations. QualServe covers all utility management areas including financials, quality, impacts/risk (environment, health and safety management), and human resources. Utility managers can implement QualServe to prepare a baseline or benchmark of where it is starting from, which can be utilized in the process of setting strategic direction and policy, as well as in setting organizational goals and objectives. In this fashion, QualServe can support the planning phase of developing a management system framework. However, while QualServe provides insights to an organization on where opportunities for improvement exist, it does not provide specific guidance or direction on how to implement those improvements. As such, a utility could take advantage of the lessons learned from QualServe by linking them with a management system framework that includes systemic implementation of improvement plans.

Although not specifically designed to support monitoring/measuring, auditing, or corrective/preventive actions, QualServe can support the checking component of a management system framework by using the evaluative tools provided by the program as one way of assessing current practices.

Participants – Water treatment, wastewater treatment, and combined utilities

Sponsors – American Water Works Association (AWWA) and WEF

Overarching Program Type – Voluntary, practice-based, qualitative assessment of procedures and practices through self-assessment and peer-based review

Drivers – Help utilities improve service across the entire scope of its operation

Goals and Desired Areas – Continual improvement of service

Benefits – QualServe recognition, increased self-awareness about practices, opportunities for improvement identified through the QualServe process can be leveraged in the capital improvement planning process

Steps and Requirements

- > Participate in employee survey
- > Provide organizational information for the peer review team (e.g., organizational charts, permit information, planning documents, etc.)
- > Meet with peer review team to discuss strengths and opportunities
- > Receive peer review report
- > Conduct an “out-briefing” to staff on results of the peer review report

