Operational and Structural Alignments to Achieve Sustained Success in a Water Loss Reduction Program

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Keywords: Leakage run time; Organizational alignment; Responsibility and Accountability

During the past 20 years, the WLTF and WLSG have developed world class analytical tools to help utilities assess how much water is lost, where it is lost and how to find it. Standard terminology, best practices in loss reduction and prediction models for leakage rates and break reduction have been developed. The effects of pressure on losses and control methods have been studied. Marvelous advances in scientific methods have enabled utilities to predict and assess water losses, allowing them to provide the direction necessary to reduce and control water loss volumes. So why does there continue to be a world-wide problem with leakage?

This paper will provide an example of a recent water loss control program that was implemented in Canada which attempted to apply many of the IWA methods to reduce leakage, using superior quality equipment with trained staff and yet still experienced high water loss volumes for many years. Water losses were assessed using the Standard Water Balance and leak detection consultants conducted surveys, resulting reduced losses initially, only to return to previous leakage levels within 6 months to one year later.

How to break the leakage cycle…

All the assessments and projections on leakage volumes, system condition or break rates, and pressure reduction opportunities will not result in reduced or sustained lower levels of leakage in municipally operated water systems. The daily utility focus must be on a simple motto and priority action directive, that is: for all facets of water system operation and procedures, to focus on "*Reducing Leakage Run Time*". The following process should be reviewed to ensure minimum turn-around times, to effectively reduce leakage run time:

- Monitor system inputs and zone meters to be aware of leakage occurrence
- Communicate quickly to leak detection teams of where and how much water is lost or leak flow rate increases
- Respond quickly to locate and pinpoint breaks and leaks to reduce leak run time
- Ensure organizational work order processes to repair divisions or contractors are expedited and have established turn around repair times with service level agreements
- Communication protocol in place to advise of repair completion, triggering a recheck of leak zones to ensure no additional leakage is present and providing quality assurance of completed repairs

As pragmatic as these processes may appear, it is striking how few utilities have any communication standard operating procedure (SOP) to monitor and communicate to designated staff where losses or increases in flows have occurred or who, and when this

information should be communicated and whom towards. The overall absence of a communication strategy and SOP is fundamental in increasing leakage run time. Additionally, any knowledge of the effects of leakage run time and corresponding volume of water lost has not been communicated to staff or assigned accountability to responsible staff for repair activities or management of repair contractors.

Organizational Design: The Alignment of Responsibility and Accountability

The adaption of the key strategies contained in "The First Ninety Days in Government: Critical Success Strategies for New Public Managers at All Levels" (Daly, Watkins, 2006), provides the framework to establish critically aligned organizational structure in order to achieve sustained success. These elements are the sequential alignment of **Strategy, Organizational Structure, Systems (Processes and Enterprise Systems), Skills and Culture**. The adaption of these concepts in water loss management provides the necessary organizational framework to address many of the institutional barriers within public water utilities that continually prevent program success.

Strategy: The senior management support for a water loss reduction strategy complete with objectives/targets and KPIs is essential for success. How much is lost, where is it lost, why is it lost and selection of the appropriate water loss reduction activity (Water Losses in Distribution Networks; Farley and Trow, 2003) are key elements to a water loss strategy. The system metering, sectorization, scada monitoring, timely capital investments and support staff resources also form part of the broader water loss reduction strategy and must be considered from a timing and operational procedural development perspective.

Structure: The existing Organizational Structure should be assessed and adjusted for optimal effectiveness in achieving the strategy outcomes and service delivery, focusing on *Reducing Leakage Run Time*. The structure should ensure alignment for responsibility and accountability to direct and delegate the staff, determine work priority, equipment and resources to achieve the strategic objectives and timelines. Many utilities do not have aligned structure and responsibilities, which results in shifts in control or decision making to other divisions which have other operational priorities (not water loss reduction focused) and correspondingly are not held accountable for established turn-around times in communication, action, response or repairs. Misalignment of responsibility and accountability in a water loss control program is the Achilles heel of a responsive utility organization.

Systems: Utility operating systems focused on reducing leakage run time and water loss management should establish standard operating procedures for:

- Daily water production results, documentation, and communication to all staff involved in a water loss control program
- System sector metering, SCADA information (daily volumes, minimum night flows and pressure) assessment, daily variances monitoring procedures and information communication paths

- Leak detection crew priority deployment criteria, protocols, work review and reporting processes
- Pinpointed leaks or associated field repairs or investigation/ follow-up works protocols, including what is located, where it is, what it is (projected), and other field or utility located infrastructure complications
- Repair work order processes: Daily preparation, to whom, in selected process/ system, timelines for completion
- Communication processes to management and leak detection crews to advise of leak repair, size or type of break and repair date
- Leak zone recheck process and resulting communication to management

Skills: Staff delegated responsibility for management and accountability for results are advised of strategic objectives and have the required education and training consistent to meet the assigned tasks and objectives. Each level in the organization may have different skill sets and education levels needed to achieve the assigned responsibilities. Alignment and knowledge of the required education and training required is essential to achieve desired outcomes.

Culture: Senior management leadership is required to engage the entire water organization, with a focus on cross divisional KPIs and leakage reduction objectives. A team approach with common objectives is a formula to create organizational momentum and cooperation to achieve the strategic results and targets. Communication of results and celebration of successes can underscore the importance of a focusing on *reducing leakage run times*.

Application and Results:

A recent partnership was established with a regional municipality managing several water systems that had been experiencing sustained high water losses at these levels for many years. Water loss KPIs ranging from ILI of 16, 11, 6.8 and 6.7 in various systems resulted in significantly reducing system losses through the development of a water loss reduction strategy, review of the organizational alignment to identify barriers and gaps in processes, determination of repair service levels, analysis of system flow information and communication procedures, with a focus on reducing timelines from awareness, response and repair and rechecks perspectives. Advances in leak detection procedures and documentation were also key to the loss reductions achieved.

Initial system assessment Water Balances were conducted to determine accurate system losses. A focused approach on *reducing leakage run time*, improved skills training, turnaround repair timelines and communication processes resulted in significant and sustained reduced losses, as assessed from reduced system input volumes. Results are depicted in Chart 1.

Chart 1: Real Loss Reductions in 2016 - 2017

Four Regional Systems	Initial ILI 2016/2017	Initial Avg. Daily System Input: MIGD (MLD)	Target avg. daily input @ ILI ~ 4 MIGD (MLD)	Lowest Avg. day input/ 2017 MIGD (MLD)	Avg. Day Input Objective @ ILI ~ (2.5 - 3) MIGD (MLD)
Pottle System	16	2.64 (12 ML)	1.477 (6.7 ML)	1.475 * (6.69 ML)	1.4 (6.3 ML)
Sydney	6.8	3.13 (14.2ML)	2.62 (11.9 ML)	2.53 * (11.49 ML)	2.47 (11.2 ML)
New Waterford	11.2	1.4 (6.36 ML)	.889 (4 ML)	.773 * (3.5 ML)	.843 (3.83 ML)
Glace Bay	6.7	1.9 (8.63 ML)	1.6 (7.26 ML)	1.6 * (7.26 ML)	1.57 (7.13 ML)

* **Initial average daily system input targets achieved**

The Municipalities' initial loss reduction targets for all systems was established as an ILI = 4 to be achieved by 2019. New Waterford loss reduction goal was achieved within 6 months. Sydney system objective was exceeded in less than 1 year. The Glace Bay system has good loss reductions in the early implementation in 2017. The Pottle system, clearly the most challenging of the systems from a leakage management perspective with an initial ILI of 16, has significant loss reductions, reduced by more than ½ real loss volumes within 6 months through an aggressive loss reduction program implementation.

The reductions arise from aggressive leak detection and focus on responsive repair of leaks when pinpointed. The systems leakage backlog, i.e. the long time running unreported breaks, has been substantially addressed. The challenge now is to re-focus attention to effective and responsive awareness to leakage, leak locate action and final repair processes in the utility. Past experiences have shown that this is the arena where the leakage battle can be lost.

Sustained loss reduction requires a utility wide focus to reduce leakage and the volume of water lost to it. Proper organizational alignment, senior management delegated authority to staff with the management responsibility and accountability to minimize leakage run time in

their assigned areas of scope underscores the pragmatic approach to reducing water system losses. The water loss reductions achieved in this regional municipality speaks volumes to the importance of the application of the organizational alignment and focused approach to reduce system water losses.

References:

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2. Daly, P.H.; Watkins, M. (2006); “The First 90 Days in Government”; Harvard Business School Publishing; 978-1-59139-955-1(ISBN 13)