INTERNATIONAL APPROACH TO WATER LOSS REDUCTION IN HALIFAX, NOVA SCOTIA, CANADA

Kenneth J. Brothers, P. Eng., Chair, IWA Water Loss Task Force
Contact: kenb@hrwc.ns.ca

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The Halifax Regional Water Commission was created in 1996 as a result of a Provincial amalgamation of three former water utilities in the Halifax metropolitan area. Each of the former water utilities had reported water losses quite differently. The new Halifax Regional Water Commission reviewed the water loss reporting information and found that significant inconsistencies were present in the reporting procedures.

The utility undertook a comprehensive industry assessment of the available strategies for assessing and reducing system water losses. The International Water Association Standard Water Balance and corresponding strategies were adopted by the Commission in 2000. The international approach to water loss reduction as applied in Halifax, and significant loss reduction results were achieved using international standards and strategies.

The IWA approach quickly identified that standard terminology used in the utility, and throughout North America, is not the same as the terms are applied internationally. The utility adopted many of the standard terminologies used internationally such as system input (production or system input feeds), active leak control, the adoption of “reported” and “unreported” leaks in its administrative process, district metered areas, and pressure management areas in describing the zones throughout the system. Several new concepts were adopted including the fixed and variable area discharge paths known as FAVAD, and component analysis of burst and background leakage estimates (BABE), in calculating unavoidable losses from small undetectable background losses and unavoidable burst run times.

The Infrastructure Leakage Index (ILI) was also adopted as the leakage measurement metric. The ILI is a ratio of the calculated annual unavoidable real loss (background losses and unavoidable losses) to the calculated annual real losses, derived from the standard water balance. The utility adopted this index for a more comprehensive assessment of the system leakage condition, described as a ratio of real losses over the lowest technical achievable loss level. The ILI can also be used as a utility comparison to assess the system condition and leakage performance on a national and international basis. The strength of this leakage performance measurement and the comprehensiveness of the international approach to water loss assessment and strategies were overriding factors in the Commission adopting the international approach to water loss assessment and management.

IWA & AWWA Standard Water Balance
- Top Down Assessment -

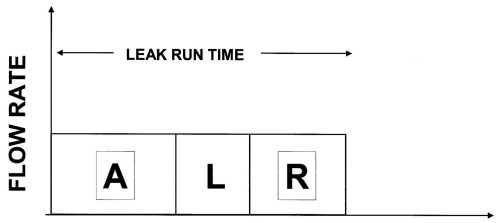
<table>
<tr><td rowspan="8">System Input Volume</td><td rowspan="4">Authorised Consumption</td><td rowspan="2">Billed Authorised Consumption</td><td>Billed Metered Consumption</td><td rowspan="2">Revenue Water</td></tr>
<tr><td>Billed Unmetered Consumption</td></tr>
<tr><td rowspan="2">Unbilled Authorised Consumption</td><td>Unbilled Metered Consumption</td><td rowspan="4">Non Revenue Water</td></tr>
<tr><td>Unbilled Unmetered Consumption</td></tr>
<tr><td rowspan="4">Water Losses</td><td rowspan="2">Apparent Losses</td><td>Unauthorised Consumption</td></tr>
<tr><td>Customer Meter Inaccuracies</td></tr>
<tr><td rowspan="3">Real Losses</td><td>Leakage on Transmission & Distribution Mains</td></tr>
<tr><td>Leakage and Overflows at Reservoirs</td></tr>
<tr><td>Leakage on Service Connections up to metering point</td></tr>
</table>

The real water loss reduction strategy of the Halifax Regional Water Commission has historically included best practice acoustic leak detection procedures, sectorization and SCADA monitoring processes and noise correlator technologies for leak identification. Although significant investments have been made in these areas, the utility did not have the right measurement tools to assess the ultimate goals of leakage or determine the cost effective investments in water loss control. The IWA performance measurement ILI provided the minimum technical lowest level of leakage that could be achieved in the utility.

Understanding leakage concepts and the extent of water losses calculated from leakage run time can be used to estimate the total amount of water lost. The total volume, and corresponding lost value, can be calculated by multiplying the water flow rate from a leak times the total leakage run time. The total leakage run time comprises of three components; the awareness time of the leak, the location time for pinpointing, and the repair time. The importance of minimizing the known leakage run time has a significant effect on the total amount of water lost in any system leak. This factor is most important in the service line leakage run time, which has traditionally been overlooked in the North American context.

Leak Run Time Awareness

Leak Volume *Loss = (A+ L+R) Time x Flow Rate*



RUN TIME = *Awareness + Location + Repair*

The IWA advocates four leakage management activities, these include pressure management, active leak control, speed and quality of leak repairs, and pipeline and asset management in the system. These four activities have a direct effect on water system losses. Each of these activities has a number of tactics that can be applied to effectively reduce real water losses.

In addition to the four leakage management activities it is important to apply additional concepts to reduce leakage run time. Supervisory Control and Data Acquisition Systems (SCADA) used with district metered area master metering systems can provide night flow information to assess system leakage. These tools can be used to further establish best achievable benchmarks in system night flows and provide useful information in determining changes in system or sector flow rates that may indicate leakage.

Night flow analysis information is very important to determine the extent of any remaining leaks in the system. SCADA night flow information can be analyzed and we can calculate the estimated night use by residential customers, measure the exceptional night users of industry, calculate the unavoidable background losses of the system, and thereby calculate the amount of actual leakage remaining in the system. This component analysis utilizes proven international strategies for water leakage assessment that can be applied in systems worldwide.

The utility's investment in water loss control can be assessed in terms of the recaptured volume and corresponding value of this lost water. The extent of leak detection activity can be economically compared to the level of anticipated recaptured volume and value of water to balance the cost of leakage detection (intervention) with the volume of water and corresponding value of lost water. The optimum, or economic level of leakage, can be achieved when the intervention costs equates to the total sum of water value lost. The economic assessment should impact the utility's decision to either increase leak detection or intervention strategies or reduce leak detection frequencies in some sectors.

The ILI can also be used for comparative assessment of system leakage performance to other utilities utilizing the same standard water audit and infrastructure leakage index calculation to compare leakage performance.

Halifax Regions Result	ILI 1999 / 00	ILI 2000 / 01	ILI 2001 / 02	ILI 2002 / 03	ILI 2003 / 04 Trend
Central	1.6	1.2	1.0	1.0	1.0
East	4.4	4.5	2.9	3.1	3.0
West	11.7	11.7	11.5	9.2	7.2
Regional	6.4	6.3	5.5	4.7	4.1

The Halifax Regional Water Commission had three former utilities that had diverse leakage results. The application of the Standard Water Balance, four strategies for loss reduction, and goal setting has achieved remarkable reductions in overall water losses. The utility can now claim world-class performance in several areas and has learned how to apply the best strategies in water loss reduction to other areas experiencing higher loss. The sustained track record in water loss reduction has provided staff with the confidence to achieve improved results in all areas of the utility operation.

The IWA Water Loss Task Force contact list has grown to over 70 participants in 30 countries world wide. If you wish to get connected with the Water Loss Task Force, or for information on upcoming events and Water Loss Task Force information, please contact Kenneth J. Brothers, Chair, Water Loss Task Force, at kenb@hrwc.ns.ca .

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