Policy Research Initiative | Projet de recherche sur les politiques

SUSTAINABLE DEVELOPMENT

BRIEFING NOTE

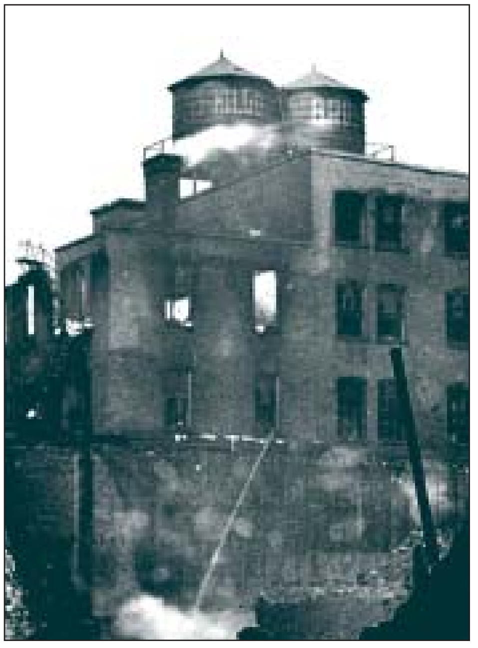
Wet Industry: An Opportunity for Strategic Municipal Water Demand Management

Highlights

- Municipal water systems must satisfy peak demand. This can lead to wasted capacity in off-peak hours and increase the per-unit cost of water services.
- Leamington, Ontario, manages its water services jointly with wet industry to shift industrial demand from peak to off-peak hours. Flattening the demand curve, this reduces per unit costs and the need to expand infrastructure.
- Raising water prices may also reduce peak demand, but industry may then relocate to other sites where costs are lower.

Background

Before 1962, water pressure in many Ontario municipal water systems fell during peak demand hours. Industries that needed water built their own water towers that filled overnight from municipal systems. This began to change in 1962, with the passage of the *Ontario Water Resources Act* (OWRA). Municipal water towers were built to balance system pressure, and reservoirs and water systems developed to ensure the ability to meet peak demand, for peak period use, and for fire safety. Industrial water towers disappeared as the municipalities assumed the cost of ensuring water availability and pressure during peak hours.



The water towers atop the Kilgour Brothers' paper and box factory marked the eastern reach of a blaze that leveled Toronto's wholesale district in 1904. Such industrial water towers have become rare in Ontario since the development of municipal water towers in the 1960s.

However, municipal water and sewer systems that focus on peak demand have a dilemma. High volume, underutilized systems add a fixed cost to water rates. Flattening the demand curve can solve this, but the residential demand curve is resistant to flattening as it involves the consumption habits of a large number of small consumers. Large industrial water users may be more tractable.

Some Approaches to Managing Industrial Demand for Municipal Water

In the early 1950s, the town of Exeter, Ontario, disproportionately assigned the cost of a municipal waterworks expansion to the local food processor. The plant closed and residential ratepayers picked up the slack until another processor was lured to the site several years later.

Canada

Similarly, in the early 1990s, municipalities in the Netherlands and Germany often disconnected services to industrial customers to meet conservation targets. Industry, especially the water-intensive food industry, responded with consolidation, resulting in unemployment, and because most of the cost of water service is fixed, there were runaway rate increases for residential ratepayers (Dick, 1999).

Toronto, Ontario, charges relatively high rates to all users, including wet industry. Although Toronto's food industry has grown, most of the large-scale food processors are gone, and the industry has cited high water prices as contributing to the decision to leave, close, or consolidate. Less water intensive, small, ethnic, and specialty food "assemblers" have replaced the larger employers.

The City of Sacramento, California, rewards companies that install water-efficient equipment with connection fee reductions of as much as 75 percent. Water and sewer efficiency reduces the manufacturer's cost of production, and in the long term, a company that begins with a culture of conservation may have a lower draw on all municipal services.

Hamilton, Ontario, treats water overnight and pumps it to uphill reservoirs above the Niagara Escarpment to supply the daytime needs of the city. This strategy shifts production and distribution costs to off-peak hours, but requires large high-elevation storage capacity that may not be available in flatter terrain.

Back to the Future: Leamington's Time Shifting Approach to Demand Management

Municipal Wet Industry Water Demand Management

There are three strategies for efficient water demand management (WDM):

- leak reduction;
- conservation; and
- peak load and trough management.

Each strategy plays a different role, and can target different classes of users.

Factors contributing to leakage (beyond old decayed infrastructure) may include a lack of measurement control and elevated system pressure due to dead-end lines or low off-peak demand. Lack of measurement control, and system decay can be remedied with metering and line maintenance. Elevated system pressure due to dead-end lines is a potential threat to public safety as bacteria can multiply in stagnant lines.

Many conservation programs, particularly those targeting wet industry, are ultimately inefficient, because reducing use without addressing time of use can lead to reducing off-peak use with little or no impact on peak use, which drives system capacity demands.

The Leamington Story

Leamington, Ontario, has one water treatment facility that was built in partnership with the H.J. Heinz Company of Canada, and which is owned by the municipalities of Leamington, Kingsville, Essex, and Lakeshore. In 1999, Leamington had approximately 7,150 residential accounts. Fifty-one percent of system capacity is allocated to non-residential users who account for 73 percent of all water use (Stantec, 1999).

Until the 1970s, food processing employed about 50 percent of Leamington's labour force. Food processing remains a leading employment sector, but is followed closely by the agriculture and the automotive sectors. This shift in employment patterns is crucial to Leamington's water strategy.

Leamington's WDM strategy has an hour-by-hour focus that measures production and distribution with an eye to flattening the entire demand curve. Leamington's water-treatment system capacity is 40 percent more efficient than Toronto's, despite having lower user fees (water and sewer combined rates of $0.6248/m^3 vs. $1.1599/m^3).

In the 1970s and 1980s, when the Leamington system reached its first capacity hurdles, Heinz limited itself to 20 percent of hourly system capacity. In the late 1990s, Leamington reached its next capacity hurdle, because of the rapid expansion of the greenhouse vegetable industry, now larger than the entire US greenhouse vegetable industry. This industry grew by 360 percent from 1996 to 2000, delivering more than $200 million worth of investment, and representing one quarter of Canada's greenhouse industry. This time, an industry-wide demand management solution was implemented to flatten Leamington's demand curve. This has since led to significant and voluntary water conservation action by agricultural ratepayers (Stantec, 1999).

Capacity Utilization

The Leamington system seeks to optimize capacity use by its wet industry customers to reduce the fixed costs of water production. Industry is encouraged (in some cases required) to install flow control and water storage equipment in new construction. Reservoir retrofits cost $100 to $125 per cubic metre. Greenhouse operations can manage their water load using a 24-hour draw with an engineered reservoir that holds 60 percent of the capacity of their daily requirements.

Water conservation is inherent to this type of system. With water recycling technology, a greenhouse farm can expand without impacting the municipal system. In Leamington, wet industry has shifted to drawing water 24/7, storing it during low use times for use during high use times. This has had the substantial side benefit of shifting the electricity load from peak rate times to low rate times. Leakage has also been reduced, as system pressures no longer rise during off-peak hours. These benefits reduce costs for all ratepayers.

Leamington's Water Demand Management Strategy

New municipal water demand from greenhouse or field irrigation expansion is controlled through the following strategy.

1. An $800 per ha water system access fee is charged for new greenhouse developments.
2. Reservoir installation reduces per ha flow requirements from up to 2.4 m^3/hour to 0.8 m^3/hour. Reservoir installation costs a one-time $100 to $120 per m^3.
3. Differential rate pricing for 2004 comes to $0.40/m^3 for compliant greenhouse operations. After 2004, non-compliant greenhouse operations will be charged $1.60/m^3.
4. Universal metering and alternating-day residential outdoor irrigation bans manage residential water use that is difficult to control under even optimum circumstances.
5. Water safety improvements include fully looped water mains to eliminate dead-end pressure and turbidity, applied to all industrial and agricultural connections. A carbon filtration unit at the Heinz intake assures water quality and has made Leamington the first municipality in Ontario to deliver water that meets Hazard Analysis and Critical Control Point (HACCP) (a food safety protocol) standards.

Future developments may include the following.

6. Current estimates indicate only 15 to 20 percent of hydroponic greenhouses are currently recycling their water; recycling and other stewardship initiatives could potentially enable the greenhouse industry to treble its size.
7. The current demand for field irrigation ranges between 10 and 20 percent of Leamington's peak demand. The development of private and parallel raw water systems for field irrigation could deliver 40 million litres per day for field irrigation at a significantly lower cost than treated water.

Conclusion

Water demand management requires accurate measurement, efficient production, and a balanced approach to conservation. Universal metering is essential for a municipal water system to measure and thus manage demand. As the largest single water users in many municipalities, wet industries are an obvious ally and target for water demand management. This group of high water-use ratepayers can be effectively managed to shift demand and increase system efficiency. The need for new water infrastructure projects could be deferred in many municipalities by flattening the demand curve, as done in Leamington.

Further reading:

Canada, Agriculture and Agri-Food Canada. 2002. "Introduction to the Greenhouse Industry."

Dick, Phil. 1999. *Focus on the Food Processing Industry.* Environmental Science and Engineering Publications Inc.

—. 2003. *Implementing and Planning Best Management Practices for Utility Efficiency in the Food Processing Industry.* IDU Bulletin 004. Food Industry Competitiveness Branch, Ontario Ministry of Agriculture and Food.

Leamington, Municipality of. 2000. Home page. <www.leamington.ca>.

Stantec Consulting Ltd., 1999. "Municipality of Leamington Watermain Distribution System Master Plan."

The author, Phil Dick, is an Investment Development Officer with the Province of Ontario. He can be contacted at:

Food Industry Division,
Ontario Ministry of Agriculture & Food,
1 Stone Road West, Guelph, ON   N1G 4Y2,
tel: 519 826.4385
email: phil.dick@omaf.gov.on.ca