

Pressure Reducing Valves Optimize Detroit Water's Distribution System



The City of Farmington Hills is the second largest city in Oakland County, Michigan, with a population of over 80,000. Most of the city has excellent water pressure and adequate fire protection, but as the name suggests, the hilly terrain presents some pressure challenges in certain areas.

With roughly 468 miles in its water distribution system, the city uses an average of 8.6 MGD from the [Detroit Water and Sewerage Department](#) (DWSD). DWSD offers reduced rates for communities that can reduce their maximum day and/or peak hour demands. While the city's average daily consumption is good, their peak hour factor of 4.4 and maximum day of 21 MGD comes at a high cost.

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Pressure Reducing Valves Offer Potential Solution

[OHM Advisors](#), an integrated engineering, architecture and planning firm, was brought in to identify areas of concern and develop a long-term water system sustainability plan. In the process, they identified nine areas that had pressure concerns. When pressure is too high, leakage rates go up, and when it is too low, fire protection is compromised. “It was critical that these areas be addressed first,” said Jody Caldwell, chief engineer, for [Oakland County Water Resource Commission](#).

The desired operating pressure for a water system is 50-80 PSI, with the state-required minimum normal working pressure of 35 PSI. To ensure fire protection, the required minimum is 20 PSI during emergencies. In order to hit these targets, [Kennedy Industries](#) suggested two styles of pressure reducing valves (PRV) to be installed in five different points in the distribution system, ranging in size from 6” to 24”.



Pressure reducing valve provides remote SCADA control of flow and pressure. (Courtesy Singer Valve)

The first type of PRV provided remote SCADA control of flow and pressure. In the event there is a loss of power or SCADA control, there is a pressure-reducing override, ensuring pressure is maintained through the system. Oakland County and OHM also wanted the valve to have the ability to be fully open in the event of low pressure differential across the valve. The valve-opening pilot on the low inlet pressure setting ensures the valve can go to a full-open position on low inlet pressure to maintain fire flow and operating pressures in the system. The valve was also fitted with upstream and downstream pressure transducers, also tied into SCADA to provide for this functionality.

The second type of PRV implemented in the system was equipped with two pressure-reducing pilot controls with different set points. Through SCADA control, Oakland County has the ability to select which pressure-reducing set point at which the system should be maintained. In addition, the ability to lower the pressure in off-peak usage time, typically nighttime hours and non-summer conditions, has reduced the utilities non-revenue water loss and pipe breakage.



PRV with two pressure-reducing pilot controls. (Courtesy Singer Valve)

All valves are outfitted with a single-point electromagnetic flowmeter that is built into the valve and guarantees an accuracy of 2 percent of reading throughout the specified velocity range. This enables Oakland County to measure flow into each of the corresponding pressure zones, track usage and detect pipe breakage. It also allows the county to control and regulate the flow from the supplier, DWSD, during the peak flow hours. Further, it allows the city to fill its tank at off-peak hours, and then control the total draw/flow by reducing flow to districts as needed.

Pressure Reducing Valves Exceed Application Requirements

“The valves have exceeded the county’s expectations by allowing [it] to smoothly and effortlessly control flow rates within a 20 GPM dead band,” says Carrie Cox, Assistant Chief Engineer for Oakland County.

With the construction of the 3 million gallon storage tank and accompanying controls, peak demands on DWSD could also be reduced, resulting in an annual savings of \$3.3 million.

An added benefit of the control system is that with an elevated storage tank in the city’s Northwest District, DWSD can automatically feed over half the city in the event of an emergency or loss of water supply from DWSD. Recently, DWSD had a power issue at a nearby facility that is the main feed into the city. Working together, the control valves and storage tank continued to provide the desired water pressure to the city’s customers. Residents did not notice any pressure changes, even though DWSD supply pressures were as low as 20 PSI. The seamless operations of the five control valves averted a situation that, before their installation, could have resulted in a system-wide precautionary boil water advisory.

“We received several low supply pressure alarms, yet our system’s pressure barely changed,” says Dave Brown, Pump Maintenance Supervisor II for Oakland County. “We were glad we had the storage tank and control valves on

[that] morning.”

The results have already been very successful. The ability to tightly control usage has allowed Oakland County to renegotiate its rates from its supplier, providing an annual rate savings of \$3.3 million. The \$16 million project is projected to pay for itself in six to seven years.

Mark Magda is general manager for Singer Valve. He has extensive knowledge of installation, start-up and specifying automatic control valves for a wide variety of applications for potable, reclaimed and wastewater with control valves ranging through 48” in size.

Keith Sikaitis is a sales manager for Kennedy Industries, a Michigan-based pump, valve, control, & specialty products supplier to the municipal market.

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