

Low Water Pressure Creates a High-Pressure Situation

By Chuck Carey

The town of Erwin, Tenn., is a small rural community located on the state's upper northeast border, in the valley between Asheville, N.C., and Johnson City, Tenn. Erwin is home to a number of businesses, including the world headquarters of NN, Inc. (formerly NN Ball & Roller).

A fire sprinkler protection system gets a flow boost from a new pumping station

On March 12, 2000, NN had a fire at its plant, resulting in a loss of \$17 million. The company had no internal fire sprinkler protection system installed at the time of the fire and the "soft side" of the plant was a total loss. NN's insurance underwriter gave notice that either NN must install a fire sprinkler system or have their fire insurance coverage dropped.

Under Pressure

NN's senior management became concerned when they discovered that the current water pressure could not support the fire sprinkler system they needed to install. The water pressure at that time showed a static pressure

be used for fire protection and would not provide any other benefit to the plant or surrounding community.

Initially, Erwin Utilities did not think it would be able to solve the problem, and there was even some discussion of the possibility that NN would need to relocate its entire operation outside the Erwin area. The mayor of Erwin was under pressure because he realized that the town could lose not only the plant but also hundreds of jobs. This would have a big economic impact on this small community. The mayor presented the pressure problem to Howard Brown, Erwin Utilities' general manager. Brown, a professional engineer with many years of experience, said he thought that he may be able to provide a solution to the problem.

Developing a Plan

Brown met with people at NN to understand what the requirements were for a new sprinkler system. As he set about designing this new booster pump station, he realized that four different problems could be solved with the one new booster station:

- The fire flow requirements for the NN plant could be met;
- An old booster pumping station used for filling an existing 50,000-gal water storage tank could be retired;
- The new booster station could be used to pump water to a new storage tank that Howard was planning to build to upgrade the water pressure south of town; and
- The water pressure on Tipton Street and in its vicinity could be upgraded by connecting the area to the line going to the 50,000-gal tank.

Brown created a working computer model of his design so that he could demonstrate to NN, the insurance underwriter, mayor and state that his design would work. The computer model demonstrated how the booster pumping station could provide the fire flow requirements for the NN plant and pump water to storage tanks in two different areas of the water system.

It also showed how it would work under different conditions (i.e., power outages and fluctuating water demand loads on the system). Brown wanted to make sure that in the case of a power outage, the control valves would automatically open so that there would still be water pressure from the two storage tanks to provide fire protection to the plant.

Awarding a Contract

Once the state approved Brown's design, he put the drawings and specifications out for bid. SynchroFlo, Inc., Norcross, Ga., was the successful bidder and was awarded the contract to build the new booster pumping station. SynchroFlo is a pump station manufacturer with more than 25 years experience in delivering pump systems for commercial, industrial and municipal systems.



(no flow) of 39 psi and a maximum flow of 920 gal per minute (gpm), whereas the insurance underwriter's requirements were 131-psi static pressure and 1,500-gpm maximum flow to provide the pressure necessary to support an effective fire sprinkler system.

The water pressure problem was due to the plant being located at the highest elevation permitted in the low-pressure zone of the Erwin water system. The water pressure is determined by the difference in elevation between the water surface in the storage tank and the elevation of the customer's facilities, minus any pressure loss due to the water flowing through the pipes and fittings. This created the problem for NN, Inc. The existing tanks for the low-pressure zone were not able to provide the increased water pressure needed to support the required sprinkler system.

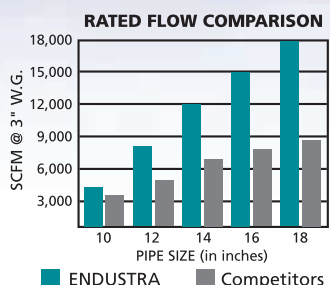
NN considered building its own water storage tank with fire pumps to provide the pressure needed for the sprinkler system. However, this would have been costly to build and maintain and if the fire pumps failed to operate, there would be no water available for fire protection. Plus, water in the tank could only

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David Romaine with SyncroFlo's municipal group was assigned this project and immediately started working with Brown to review the drawings and specifications and discuss the requirements. SyncroFlo was selected over other companies because it could deliver exactly what Brown had requested. SyncroFlo not only delivered the system under budget but also within the time constraints required.

SyncroFlo delivered a prefabricated pumping station that can produce 1,500 gpm at a 144-psi discharge pressure. It included three end-suction centrifugal pumps, two electronic flowmeters, four pressure transducers, two actuator-driven control valves, a control panel, variable frequency drives (VFDs) and instrumentation and programmable logic controller (PLC)-driven control logic. Brown sized the pumps large enough to work without the existing water tanks. He specified three 500-gpm pumps, which can produce 1,500 gpm, or 2.2 mgd.

Design Provides Reliability

The water tanks and the pumps back each other up in case one fails. The system is designed to keep the pressure up with the VFDs that were installed. The variable speed aspect adjusts the motor speed to maintain the set-point pressure for either fire-flow or tank-filling operation.

The plans and specifications called for the control valve actuators to fail-open. This means that with loss of power, the actuators allow the control valves to move to the full-open position. Romaine was able to find a fail-open valves/actuator assembly, which worked exactly as called for.

Each discharge connection has its own flow-meter and control valve. This allows water to be pumped to the NN plant for fire protection or to either of the two storage tanks, or water can flow from one tank to the other tank. As designed, either the pump station can provide the fire flow requirements for the NN plant with both tanks out of service, or the pump station and both tanks can work together to provide the flow requirements for the plant, or the two tanks can provide the requirements for the plant with the pump station out of service.

Problems Solved, Pressure Off

For this project, SyncroFlo had the capabilities at its plant to test the system under operating conditions before shipping it. The company also could deliver a prefabricated packaged and tested system that Erwin Utilities was able to install itself, saving time and money.

Brown said another advantage of working with SyncroFlo was the quality of people he worked with, especially Romaine. About four years had passed since Romaine came on site to help with the initial installation of the booster pump station when he received a call from Brown that the Luttrell Street water tank was finally installed. Romaine offered to come back and tweak the controller programming to accommodate the new water tank. No additional hardware was required to handle the new tank, and the system has been working fine since the day it was originally installed.

Romaine said that SyncroFlo's goal is to provide clients with a low cost of ownership, total ownership of responsibility for the system, engineering and thinking outside the box to provide the best possible solution.

The system that was designed and delivered provides all the water pressure that everyone needs for now and the foreseeable future. Now that the water pressure is up, the political pressure is down for the Erwin Utilities general manager. **WWD**

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