Tweaking Torrington's Combined RO Plant

Torrington, Wyoming is a farm community located in the fertile North Platte River basin. The water department recently completed a new water plant to provide high quality water to town residents. In the past, Torrington utilized remote wells with a small Reverse Osmosis (RO) filter system at each well. With the new water system, new wells were drilled at the golf course, and all four of the small RO units were relocated to the central water plant (WTP). The challenge for the control system was keeping the correct flow from four wells on variable frequency drives (VFD's), through four RO skids each with VFD control, and distributed through four high service pumps on VFDs. To use an analogy, **balancing this system was a bit like trying to drive a car with 12 different gas pedals!**

Here is a short list of the components:

- 3 golf course wells and one backup well, each controlled with Motorola Moscad radio telemetry units (RTU) and VFD pump speed control.
- 4 RO skids of various sizes controlled with Allen Bradley SLC programmable logic controllers and VFD flow control.
- Large pipe gallery, with a continuously variable valve, for blending permeate water with well water.
- 2 finished water "blend" tanks at WTP.
- 1 permeate tank to rinse RO filters.
- 4 high service pumps with VFDs.
- 4 potable water tanks in distribution system.
- 2 booster stations

New Torrington WTP
Showing Four RO skids

Scott Coulson, from Timber Line Electric and Control, explaining some of the control details that needed to be calculated for proper control, stated "The system demand needed to be coordinated with the level of the 'blend' tanks at the water plant, the flow rates from the wells, and the blending rate of permeate water with well water. The central computer is the only point where all of this data comes together."

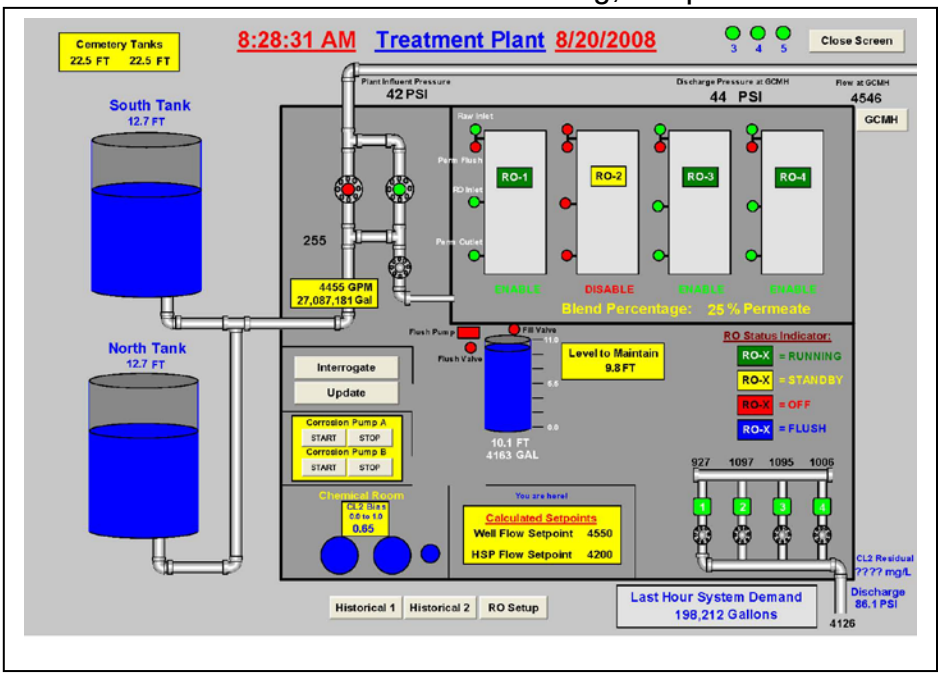
The following calculations were required:

1. Total system demand based on hourly calculations of water volume in distribution tanks and totals from all four high service pump flow meters.
2. Flow capacity of the RO units currently "in service", with allowance for 25% loss to concentrate waste, a variable depending on water quality.

3. Blending rates between well water and permeate, usually set at 3:1.
4. Well production to match system demand.
5. High service pump flow cannot significantly exceed well or plant capacity.
6. Permeate tank must be refilled after each RO flush cycle.

Tom Troxel, manager of the Torrington Water Department, noted "It helps to have your staff involved in the final product. Our operators Chris Powell and Jeff Craig helped to think out all of the 'What if?' scenarios with the various flow controls such as, 'What if one of RO units shuts down during a high-demand event?' Jeff also helped to design the graphics for the computerized display. This makes them very 'user-friendly' for the operator on duty."

Coulson further observed: "Once the plant was complete, the 'tweaking' of flow rates became a priority. Now that all the RO skids are in one building, the process is a bit easier to manage because of the buffering capacity of the blend tanks. It also allows us to have one point of demand to turn on the wells and RO skids. With the computer acting as the driver controlling the '12 gas pedals', the adjusted system will now provide good quality water with consistent flow."



The final steps to finish this plant were data-logging, reporting, and recreating data back-ups. As Troxel and his team tried out the new system, he noted, "Without the assistance and knowledge of the entire Timber Line Team, this plant would probably not be operational today. It is my recommendation to all water districts to ***have your instrumentation integrator involved with any project, small or large, from the initial design, to construction meetings and start-up.*** If you are lucky enough to have a really good integrator, they can bring a lot of value and expertise to your projects, and save you time and money."