

Hillsboro makes water treatment plant improvements

The city of Hillsboro has recently completed improvements to its water treatment plant. The raw water supply has been and will continue to be Marion Reservoir. The existing plant was first put into operation in 1982. All the structures of the existing plant were kept. The improvements were to provide better and more reliable process control, additional sedimentation and filtration, and better chemical addition for better water quality. These improvements were part of an overall upgrade of the water supply system that also included rehabilitation and painting of the elevated storage tank and replacing major water mains in Hillsboro.

A new rapid mix basin was constructed at the head of the plant. A new Acrison powder activated carbon (PAC) feeder was installed to feed PAC to the solid contact basins. New Watson-Marlow peristaltic solution pumps were installed to feed a prehydrolyzed aluminum salt as the primary coagulant. Peristaltic pumps were also installed to feed bentonite clay for the coagulation, flocculation, and sedimentation processes. Peristaltic pumps were also installed to feed a polyelectrolyte as a flocculent polymer to increase the size and strength of particle aggregates.

A new 225,000-gallon, steel, solids contact basin (SCB) was

constructed. This new basin is identical to the existing SCB. Covers were installed on both basins to reduce sunlight and the resultant algae growth in the basins.

feet by eight feet. Two additional filters of the same size were constructed and installed. New controls and new underdrains were installed for the three existing filters. The two new filters have

The existing plant was first put into operation in 1982. Most all existing structures and process of the existing plant were retained and these improvements will provide more reliable and better treatment of the water.

These basins are operated with high coagulant solids content in the center mixing chambers by control of the mixing speed and slowdown. The sludge levels in the chambers are kept at a minimum 75% settability level in a five-minute test with a goal of 80% - 85%. The city is concerned about removing algal toxins that are in the raw water. This high solids content is for reducing such toxins and the total organic carbon (TOC) in the water, and for providing clear, low turbidity water coming from the sedimentation portion of these basins and going to the filters.

The city's plant had three existing filters, each measuring 16

granular activated carbon (GAC) media above the sand. The GAC media is for the removal of TOC and algal toxins. Two new backwash pumps were installed for backwashing and cleaning the filter media.



*Pat McCool
Consultant*



The ribbon is cut and the new plant is officially open! Hillsboro Mayor Delores Dalke does the ribbon cutting honors as city official assisting include L to R: Lola Unruh, Jim Elliott, Brad Bartel, Bob Watson, Mayor Delores Dalke, Christy Wulf, Joel Klassen, Mike Ryan and Todd Vogt.

The filter effluent piping goes through a newly constructed 66 feet by 18 feet building on its way

to a newly constructed chlorine contact basin. This building is the only new building structure in this project. The building is attached to the existing plant building and provides general storage for the

contact time. The engineer and plant superintendent worked closely together during design so as to provide a greater amount of control with the three different locations for chlorination. This

serves the city of Hillsboro and the other serves the city of Peabody, Hillsboro's largest customer.

New chlorinators, a gas chlorine leak detector, associated



Above: Plant Superintendent and one of three plant operator/managers, Morgan Marler, discusses filter operations over the control panel with guests at the August 31 Hillsboro Water Plant open house.

Above right: Looking from the east, two covered solids contact basins stand together with the one on the right being all new construction.

will provide the operators much better control in lowering DBPs in the drinking water.

The water flows from the chlorine contact basin to two existing clearwells. One clearwell

injectors and piping were installed. A chlorine analyzer which samples after the contact basins, provides a signal to the chlorine smart valve to keep the chlorine residual constant. All the

present and room for additional chemical feeding equipment if such additions are needed in the future.

The filter effluent water goes to a newly constructed chlorine contact basin. The chlorine contact basin was designed so that the operators can determine the contact time so as to provide both adequate disinfection and low concentrations of disinfection byproducts (DBPs), specifically trihalomethanes (THMs) and haloacetic acids (HAAs).

Chlorine can be added at three different locations at the contact basin. Ammonia is added to the basin effluent to cease the formation of the DBPs. The plant previously used ammonia addition but there was not much flexibility in determining the free chlorine



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valves that control the water flow were replaced with electric actuated valves. A standby generator was installed to provide power during storm emergencies or whenever power is not available. The two

A very significant part of the project was that there was the emergency water line connection made to Marion County RWD 4. This connection will be able to supply water to either system from

Reservoir. With this, operators hope to reduce bacterial growths in the six-mile line to town and its associated problems.

The project engineer was Don Hellar in the Pratt office of Evans-Bierly-Hutchison, P.A. The general contractor was Utility Contractors, Inc. of Wichita. The contractor and plant personnel had weekly meetings to coordinate construction so as not to interfere with ongoing water production. Plant superintendent Morgan Marler stated that she was “pleasantly



Left: New to the plant is the powder activated carbon feeder. The unit's crane can lift the larger half-ton bulk bags of carbon, saving operator time.

Above: Solution tanks sit under the new efficient, long lasting peristaltic coagulant feed pumps.

Below: The new diesel aux power generator ensures plant operation even during a storm power outage.

Below Right: Situated near the front gate, the new concrete, chlorine contact basin allows for a more efficient disinfection process that uses less chlorine and complies with new EPA regulations regarding disinfection byproducts.

earthen lagoons for the backwash water and SCB sludge blowdown were cleaned.

A Sievers total organic carbon analyzer was provided for the laboratory and new furniture serves the plant office. A new computer and SCADA system were installed to monitor and control plant processes. The plant can now also be remotely monitored and controlled by the use of a new laptop computer. This is one job that “won’t be left at the office,” – but then, with the laptop many would-be emergencies will be avoided before they happen.



the other should a water supply disruption occur. There are many water suppliers that wish they had such a backup.

The city is continuing to improve its treatment of water. Presently, the city has just completed a hydrogen peroxide addition system at the city’s raw water pumping station at Marion

surprised” with the understanding that construction superintendent Ed Bender had of plant processes and, consequently, how well construction went without interfering with water production during construction.

Hillsboro water plant project guided by patience and expertise

by Dan Knupp

At one time the city of Hillsboro had a water problem. "The city's well-water during the late 70s was legendary for bad taste and odor. After obtaining the water right from Marion Reservoir in the early 80s, the city had a stable water supply and a plant was built to treat the water," Hillsboro City Administrator Steve Garrett explained. "But 25 years and new federal regs forced the city to start looking at plant changes." With assurances from USDA Rural Development for financing, the city moved into the planning process.

Planning

When the Hillsboro City Council started looking at plant expansion six years ago, many plans were debated before construction finally began last year on the \$3.5 million project. "The plan evolved through several lives of its own before approvals were made and construction started," Garrett noted. "Project engineer Don Hellar provided great design and engineering input. But also providing essential information was Morgan Marler, our water plant superintendent. Her technical experience lead the way, taking us in some tough non-traditional directions and giving us assurance that the plant could be operated correctly. This trust was key for planning and approval decisions made by the council."



Project goals

The first project goal for the city was to keep water prices as low as possible for Hillsboro residents and main customer, the city of Peabody.

"When first looking at the numbers we were scared to death that a rate increase might be significantly higher than the 15-cent increase just announced to customers. Economies of

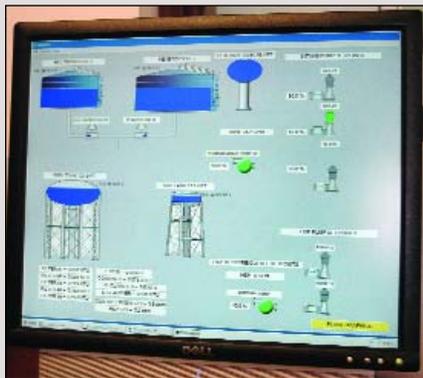
scale and plant efficiencies helped keep that increase low. This was good because we knew that in years to come, the Kansas Water Marketing Plan price for reservoir water should increase significantly. Down the road we'll have higher prices but not because of the plant expansion," Garrett explained.

A second goal was to anticipate future EPA rule changes in order to save money on associated capital expenses.

"Design features at the west end of the filter room included a 24-inch pipe standing 3-foot off the floor and space for future cabinetry to accommodate a UV disinfection process to satisfy those anticipated future EPA rules," Don Hellar, Evans-Bierly-Hutchison & Associates, P.A., said. "Moving into a UV process down the road should be much less expensive for taxpayers or ratepayers with these features in place."

Probably the most important end product of Hillsboro's water plant expansion was to achieve goals of not only water safety but increased production capacity. "The three million gallon per day plant capacity puts us in a unique position in west central Kansas. We have water to attract business and industry to both Hillsboro and Peabody," Garrett said. "We will begin a process to attract businesses to our communities to utilize our workers and our water."

As reported by the *Hillsboro Freepress*, Hillsboro Mayor Delores Dalke emphasized this, describing the community's positioning for growth by saying, "I truly believe the communities that are going to be the future of our state are the ones who have a plentiful water supply. In the western half of our state, there are many communities that are not as fortunate as we are to have a good supply of drinking water, as well as water for industry."



Top center: Hillsboro Water Treatment Plant, west elevation.

Above: Hillsboro water source, Marion Reservoir.

Left: Computer screen showing the new SCADA system monitoring water at different system locations.

Plant management – while working out the bugs

The fully automated plant has the capability of operation 24/7 without continuous operator attention. A new SCADA (Supervisory Control And Data Acquisition) system monitors water from the pump station at the reservoir to the finished treated water in the storage towers. Since starting operation earlier this summer, the three plant operators have been going through a shakedown period that has had them responding to an elevated number of SCADA alarms both on-site and at the home of the on-call operator when no one is at the plant.

"We've had over 420 alarms so far this month (September)," Morgan Marler, plant superintendent/operator said. "Each alarm does not necessarily affect water safety. Many are glitches in the matrix. Most are responses to a too finely tuned parameter and are part of the trial and error process to find an optimal setting. Each alarm

must be addressed, and while off-site we can use the laptop. For other problems it is necessary for you come to the plant and fix it before operation can resume," she added.

"The key to meeting regulations is consistency – an even flow of values in the water at all points of monitoring," Marler stated. "The



Don Hellar, PE, of the Evans-Bierly-Hutchison & Associates Pratt office, center, describes some of the Hillsboro plant's new features to guests at the August 31 open house.

SCADA system and the shakedown time will eventually help us find what the optimal level to monitor will be. That will make this a much easier plant to run than the old one."

Highlights of construction

For a project of this size with all systems undergoing major renovation or change – Marler summed it all up by saying, "A project like this should take crisis management to a new level!"

But according to many involved, that just didn't happen. "Our general contractor superintendent, Ed Bender, (Utility Contractors

Inc., Wichita) worked really well with subcontractors. They made sure things were done in the right order – plant shutdowns were minimal," she added.

Don Hellar, said in agreement, "For me, this was a 'once in a lifetime job' – everyone sort of clicked. They really got along well. When problems came up they were 'team solved,' vendors and city staff together, saving time and tempers."

"We even had budgeted to buy water from Marion RWD 4 for extended shutdowns," Marler explained. "But we didn't need to use it. The money was used elsewhere in the plant instead."

"My one big anxiety was when we took out the big 500,000 gallon tower for the rehab work. We had to use the smaller 80,000 gallon tower for the system during the 60 days of construction," Marler remembered. "But we were relieved – no glitches! We didn't need to use our backup water budget."

Plant superintendent Marler has both Class IV licenses in water and wastewater, plus considerable experience. But for her, even with a new plant in the process of working out the bugs, normality is creeping back into the routine.

"One of our operators tended a resignation the day after open house – he's going to Yellowstone to be a snowmobile tour guide." Everyday matters can't be stopped by major projects – hopefully by the time this is printed there will be a new water operator on the Hillsboro team.

"If anything, after all the construction and we get the plant bugs worked out, it'll be boring around here," Marler said – but quickly added, being a little more serious. "The council took a big gamble in building this plant. They not only built for the next set of regs but provided water capacity for growth – very progressive in their thinking, don't you think?"

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