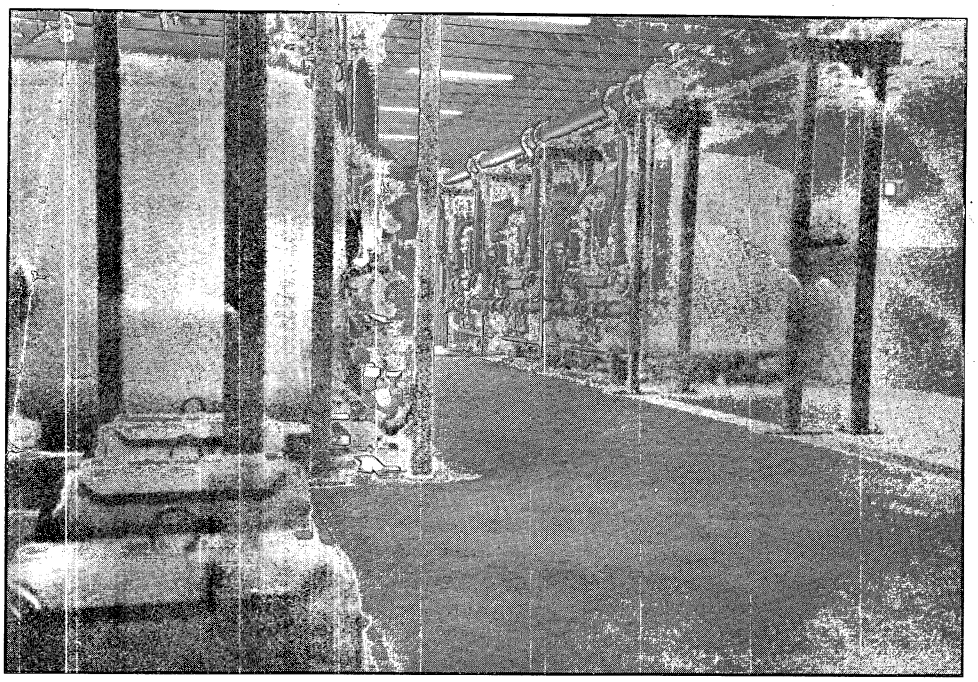


Water treatment plant serving 2,000 residents of western Carteret County in northeastern North Carolina

Resin Technology Solves Well Water Problems

By Brian Larson

Clean, clear water that has no strange odors and doesn't stain fixtures or clothing is taken for granted by people with city water. To enjoy the same advantage, more than 2,000 residents of western Carteret County living along Route 24 in northeastern North Carolina got together to form their own water company, the West Carteret Water Corp., a non-profit corporation.

Residents were concerned because their well water contained excessive amounts of iron, hardness, color, and hydrogen sulfide gas and thus smelled and tasted foul, stained plumbing fixtures and clothing, and was difficult to lather. Their goal was clean, clear water that met North Carolina and U.S. Environmental Protection Agency (EPA) water standards, including those for carcinogens. Their solution was a water treatment plant using Thermax's Tulsion A-72MP decolorizing anion ion exchange and T-42 softening resin technologies.

To learn whether or not a homogenous macroporous styrene Type I strong base anion resin would remove the colored tannins from the area's water, Culligan performed tests with several of their water softeners using a layer of styrene strong base decolorizing resin. The results were positive.

Granulated activated carbon (GAC) was tested, but the colored tannins broke through rapidly. This indicated that GAC would not be economically feasible for the removal of the tannins found in the area's water.

A New Water Source Was Located

The West Carteret Water Corp. received permission from the Federal government to drill test wells located in the nearby Croatan National Forest. The location chosen was a mile from Highway 24; the wells were drilled down to the Castle Hayne Aquifer. The three 284-foot wells, 2,000 feet apart, are each capable of producing 550 gallons per minute. (See Table 1 for an analysis of the water in the three wells.)

In Phase I of this project, an elevated tank, 176 feet high with a 600,000 gallon capacity and 73 miles of water line were constructed and installed. The largest main is 12 inches and the smallest is two inches.

A Treatment Plant Was Designed

Before the well water reaches the consumers, it travels through a water treatment facility. The water is first aerated to remove any hydrogen sulfide gas (H_2S) and

iron. Then, at least 70 gallons of every 100 aerated gallons are sent to ion exchange softening vessels to remove calcium, magnesium, and other metal cations. These vessels also act as a further filtering medium for the precipitated iron and elemental sulphur.

Fifty of the 70 gallons are decolorized by ion exchange and adsorption. This is the first municipal water treatment facility in the United States where a Type I strong-base resin is being used to remove colored tannins. The remaining 20 gallons bypass colorization.

The three separate waters are then blended, chlorinated and pumped to the elevated storage tank where the waters may be adjusted in their blending to meet various consumer tastes and/or government regulations.

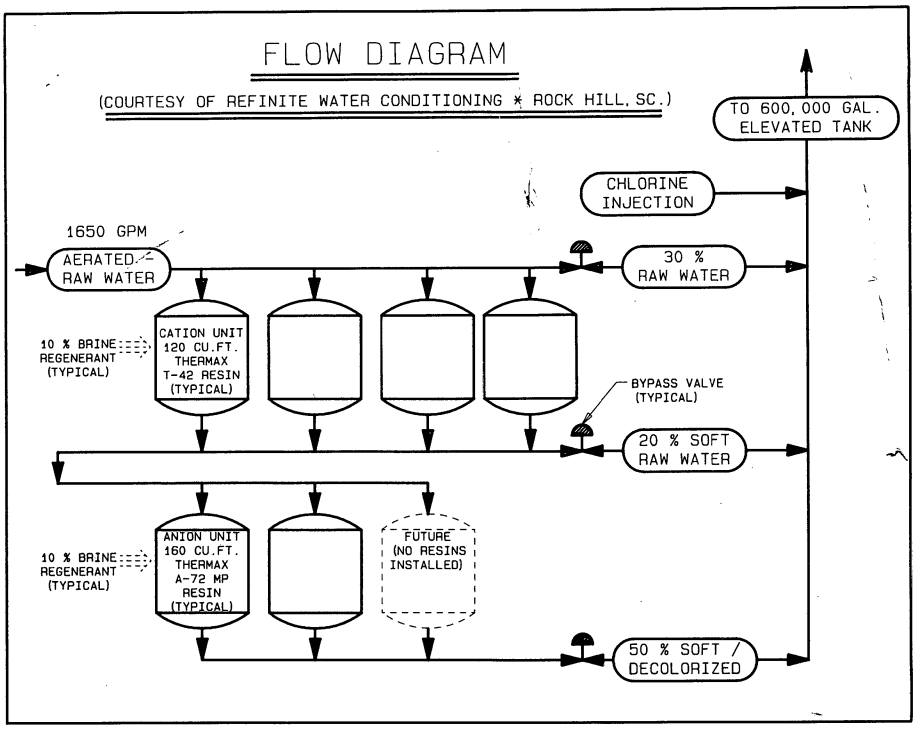
Both the softening resin and the decolorizing anion resin are easily regenerated with salt (NaCl). When the softening and decolorizing resins no longer provide the needed service runs, they may be disposed of in a landfill or in a trash-to-energy incinerator. Regeneration effluents are sand-filtered and diluted before being released into the bay salt water.

To prevent corrosion with current piping in the homes, the water is not totally softened. Some residences continue to use their own water softeners for total softening.

The Approach Was Cost-Effective

The West Carteret County user-owned central water system, with the current capacity to treat 600,000 gallons per day, is operated by one plant manager whose responsibilities include plant operation and maintenance as well as field service. No other operating and maintenance staff are required.

Design and construction of the system, including test and production wells, distribution pipes, storage tank, and treatment plant, cost $5.5 million. The majority of the incurred expenses were financed by a 40-year loan from the Farmers Home Administration which is being repaid



from water users' fees.

The fee for becoming a corporation member during the project's first phase was $50, including the cost of a water meter. About 2,400 of the approximately 6,000 potential customers signed up during the first phase. After Phase I, the membership fee increased to $250 and finally to $400.

The cost to the resident to connect to the meter is about $1.50 per foot of ditch and pipeline. The monthly fee is $10.50 for the first 2,000 gallons and $3.50 per thousand gallons up to 8,000 gallons, at which point a discount is applied.

Because the new water lines supply 75 pounds of water pressure to homes with pipes accustomed to handling 35 pounds of water pressure, the Corporation recommends that all users install a pressure regulating valve as an optional expense to save water and prevent possibly costly water damage bills.

Setting up a central water system provided an unanticipated cost savings for all county residents. Until the corporation installed 43 fire hydrants along and near Route 24, no fire hydrants existed along this 18 miles of state highway. The installation of the fire hydrants has reduced fire insurance premiums for all county residents.

Table1
Averaged Water Analysis For Three Samples

Turbity, ntu	0.51
Calcium, mg/l	106.
Potassium, mg/l	1.68
Chloride, mg/l	11
Iron, mg/l	0.092
Magnesium, mg/l	6.94
Total Hardness, mg/l	261
Color, units	20
pH	7.3
Alkalinity, mg/l	248

Operation/Maintenance Simple And Affordable

The success of the plant start-up is primarily due to the technical and personal competence of the operations manager. Because the plant is almost entirely automated, operation and maintenance for the most part involve regulating the water mix and ensuring that the resins are regenerated as needed.

The current service run of the decolorizing vessels is approaching four million gallons. The capacity of Tulsion A-72MP for treating this 20-25 units colored tannin water is 50,000 gallons per cubic foot (6,684 bed volumes).

This throughput exceeds the anticipated capacity of the resin.

The longevity of the resin for this application will most likely be more than the initial expected usage of a three-to-five-year life cycle. The life cycle of the decolorizing resin in this application will vary depending upon the quality of the source water and how it is handled by the operator.

New Water Meets User, State, and USEPA Standards

Corporation members began enjoying the use of the "new" water from their taps on Aug. 28, 1991. Because most organics are removed prior to chlorination, the formation of cancer-causing trihalomethanes (THMs) is eliminated. The water produced by the West Carteret Water Corp. (see Table 2 for analysis) contains 0.0613 THMs, which is below the 0.10 ppm North Carolina state standard.

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Table 2

Analysis of West Carteret Water

	Results	Allowable Limits
Chloroform, mg/l	0.0560	0.100
Bromoform, mg/l	<0.0010	0.100
Bromodichloromethane, mg/l	0.0053	0.100
Chlorodibromomethane, mg/l	<0.0010	0.100
Total Trihalomethanes, mg/l	0.0613	0.100

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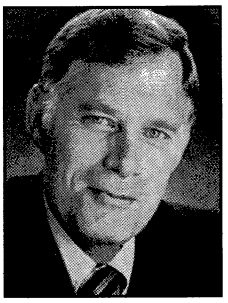
About The Author



Brian Larson, marketing manager for Thermax Ltd., has 20 years experience in domestic and industrial water ion exchange treatment processes. He holds Bachelor and Master degrees from California State University in Sacramento.

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