

Cleaning wastewater force mains

KRWA's work with municipal or other wastewater collection systems frequently involves addressing problems associated with plugged force mains. A force main is a pipeline to transfer wastewater from a lower to higher elevation. Force mains are installed to prevent excessive excavation depths and expensive sewer pipeline construction costs. A simple description is that a force main is a wastewater pipeline, with a pump forcing the wastewater to the treatment facility. Typically, a sewer force main is made of either ductile iron pipe or it may also be made of PVC or other poly materials.

A recent report by Jerry Hemeyer, the wastewater technician for South Dakota Association of Rural Water Systems, summarized a project where Hemeyer assisted with the pigging of a 5,200-foot force main. The project was in the small community of Corona, in northeastern South Dakota. Corona has a population of only 60 people. The original concern that was registered from the community was that one of the city's lift stations operated continuously, creating significant costs for electricity. Also with a high ground water table, city officials were concerned that sewage might start to backup into homes.

Hemeyer's report in *The ServiceLine*, a publication of the South Dakota Association may be of interest to Kansas Lifeline readers. Hemeyer noted that it was determined that to clean the

force main, they would need in excess of 4,000 gallons of water to push the pigs through the line. With a goal of having the pig

would be approximately 40 minutes. "At 22 PSI through a 2.5-inch fire hose, a little over 100 gallons per minute should be

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travel at 2.5 to 5 feet per second, a flow rate of 100 to 200 gallons per minute would be required. Two fire trucks and a 3,000-gallon drop tank were brought out to the site to provide the water and pressure to force the pig through the main.

achieved," Hemeyer stated. He and the town mayor went to the lagoon to retrieve the poly pig. But checking the manhole located at the lagoon, the flow was less than 20 gpm. So the pressure was increased from the fire truck to 50 psi; there was very little change in



This photo shows a sample of various poly pigs that KRWA keeps available for projects. The pigs can be fabricated for any pipe size. A variety of coatings can be applied, depending on the specific needs of the project involved.

It was also determined that at 2.5 feet per second, the travel time for the pig to exit the main

flow rate. The pressure was then increased to 90 psi with no change in flow.

New Marysville force main built with features to accommodate pigging

by Charlie Schwindamann



Marysville utility employee, Richard Kyle, stands next to the 16-inch wye used to introduce the poly pig for cleaning the Marysville force main. Valves allow the force main to be shut off so no back flow will come from the force main.

The Marysville, Kansas wastewater utility installed a new lift station and force main due to the placement of a flood levy and railroad by-pass project that was completed in 2004. Wilson and Company Engineers, Salina, Kan., was the consultant on this portion of the project.

The new lift station was constructed at 3rd and Walnut streets because the old lift station, built in 1997, would be on the river-side of the levy in an unprotected area prone to flooding. The U.S. Army Corps of Engineers specifications did not allow for pipelines to be located under the levy so the old gravity sewer main was also removed. The new force main is installed on the bridge

that crosses the Big Blue River and avoids traversing the levy.

The force main receives waste from three 1500 gpm submersible pumps. Due to head pressure, each pumps closer to 1350 gpm each. They are manifold together into a 14-inch force main.

The average daily flow through the main is 300,000 gallons. Daily, each pump operates for approximately 1.1 hours. The city keeps a record of the pump hours. This helps determine if the force main is becoming blocked or if there is a pump problem. The pump hours of operation will gradually increase as the main becomes restricted or the impellers or the pumps experience gradual wear that affects performance.

A 16-inch wye was installed to better accommodate efficient placement of the poly pig when a pigging procedure is required.

Wilson and Company recommend pigging the force main every five years to ensure better flow. Since installation in 2004 the new force main is yet to experience the first pigging.

The new force main from the lift station to the lagoon system is more than two miles in length and travels uphill. During a pigging operation, supplemental water would be provided from a nearby fire hydrant. The main's pumps would be used to force the pig through the line during a pigging operation.

Installation of a wye and valves on a waste system force main will nearly always save time and money in the long run when pigging is needed. The pigging procedure is likely to reduce pumping costs, as demonstrated in the related article that discusses a project for the very small community of Corona, South Dakota.

Most small systems do not have a valve and wye system to allow for the introduction of "pigs." If your system is planning on upgrading or replacing a lift station, I would recommend budgeting to include the installation of necessary valves and fittings to accommodate pigging of the force main.

After 60 minutes of pumping, Hemeyer's article states, "the solids become so heavy that the eight-inch gravity line going into the lagoon could not handle the flow. The six foot deep manhole filled with the thick sludge, overflowing into the lagoon. After 90 minutes the pig finally arrived. Immediately after the pig's arrival, the fire truck operator called on the radio to tell us the pressure had dropped. The fire truck continue to flush out the force main for five minutes after the pig arrived."

Because of the amount of solids pushed from the line, the workers decided to run the pig through the line a second time. This run required a travel time of only 36 minutes with pressure from the fire truck at only 25 psi. Sludge only appeared briefly prior to the exit of the pig on this second run.

Hemeyer's article reported that following the pigging of the force main, the lift station pump

was operating 1.5 minutes and then shutting down for 15 minutes, with a pumping rate of 130 gpm. Several month's later, the South Dakota Association shared with readers the savings

attach the fire hose. The two foam pigs cost \$8; water supply and use of fire trucks and city labor force were also involved.

Many water systems in Kansas have had very successful

KRWA has provided assistance to numerous rural water districts and cities with such projects and has documented energy savings in conjunction with the systems' professional consultants also confirming the results.

the town was realizing in electrical costs. Due to the cleaning of the force main, the electrical costs were reduced by a projected savings of \$1,293 per year. This was an 86% decrease compared to operations prior to the pigging project.

The cost of the pigging was approximately \$100, most due to the need to construct a flange to

experiences with pigging of pipelines to improve water quality and flow rates and to reduce energy use. KRWA has provided assistance to numerous rural water districts and cities with such projects and has documented energy savings in conjunction with the systems' professional consultants also confirming the results. The report on the results of the Corona, South Dakota wastewater project demonstrated how significant savings could be also achieved on a small wastewater system. The town of Corona thanks the South Dakota Rural Water Association for providing the leadership and assistance to accomplish the project. The town now has \$1200 a year to put to a more productive use.

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November 8 & 9	Competent Person for Trenching, Confined Space Entry	Lyons	w/www	\$80.00
November 13 - 17	Backflow Prevention-Cross Connection Control Course	Dodge City	w/www	\$200.00
November 13 - 17	Backflow Prevention-Cross Connection Control Course RECERTIFICATION	Dodge City	w/www	\$75.00
November 15 & 16	Programmable Logic Controllers: Application, Function and Benefits	Hutchinson	w/www	No Charge
December 5	Water Rights & Source Water Protection	Stafford	w	No Charge
December 6 & 7	Motors and Drives	Seneca	w/www	No Charge
Jan 8-12, 2007	Backflow Prevention-Cross Connection Control Course	Gardner	w/www	\$200.00
Jan 8-12, 2007	Backflow Prevention-Cross Connection Control Course RECERTIFICATION	Gardner	w/www	\$75.00
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