

**Water and Environmental Programs
Engineering Success Stories**

State: Arkansas

Borrower Name: City of Oppelo

Engineering Firm: Affiliated Engineers, Inc.

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Congressional Information: Rep. Asa Hutchinson

Counties: Conway

Keywords: Vacuum sewer, Pressure sewer

CITY OF OPPELO SEWER SYSTEM

Description of Problem/Issue:

Oppelo is a small community in Arkansas situated along a navigable river, near an interstate highway and within 50 miles of four economic boom towns. It had everything a town should have in order to grow -- a good water system, fire department, school, available land. Its only limitation was improper sewage disposal.

Soils in the area are composed of silt loams having severe limitations for septic tank absorption fields due to slow permeability and wetness. The county sanitarian's survey indicated that over 80% of all individual sewage disposal systems were malfunctioning. To end the potential health hazards caused by ponding of septic tank effluent in backyards, nearby ditches and streams, he recommended that a public sewerage system be constructed.

With this directive a group of citizens spearheaded an all-out campaign to generate support within the community. An engineering firm was selected to investigate solutions for correcting the problem. Soon thereafter, a financing package was put together that had the acceptance of its citizens and the project was underway.

Solution:

The lay of the community presented an interesting problem for the engineering firm. Oppelo's 300 sewer customers were spread out along two highways, over two miles north to south and almost three miles east to west. A traditional gravity sewer collection system would require ten pumping stations and deep sewer lines. A pressure sewer collection system would eliminate deep lines, but would be expensive. The engineer was looking for a solution that required few pumping stations, had shallow sewer lines,

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and was cost effective. What was finally presented was a combination system utilizing vacuum, gravity and pressure sewer collection lines.

The vacuum sewer system, which serves over 85% of the community allowed the city to install two vacuum sewer pumping stations, to utilize smaller sewer pipe sizes (3", 4", and 6"), to reduce sewer trench depth and even to allow sewage to flow up hill. Unlike gravity flow, vacuum sewer systems use differential air pressure to move the sewage. At the pumping station vacuum pumps maintain vacuum (16 to 20 inches of mercury) on the collection system. The vacuum system requires a normally closed vacuum/gravity interface valve at each entry point (residential/commercial establishment) to seal the lines so that vacuum is maintained. These valves, located in an underground pit, open when a predetermined amount of sewage accumulates. The resulting differential pressure between atmosphere and vacuum becomes the driving force that propels the sewage to the vacuum station. At the vacuum pump station sewage enters a collection tank. As this tank fills, sensors activate centrifugal sewage pumps to pump the sewage to the wastewater treatment facility.
