

APPLICATION NOTE

Steam Injection for Oil Recovery

INTRODUCTION

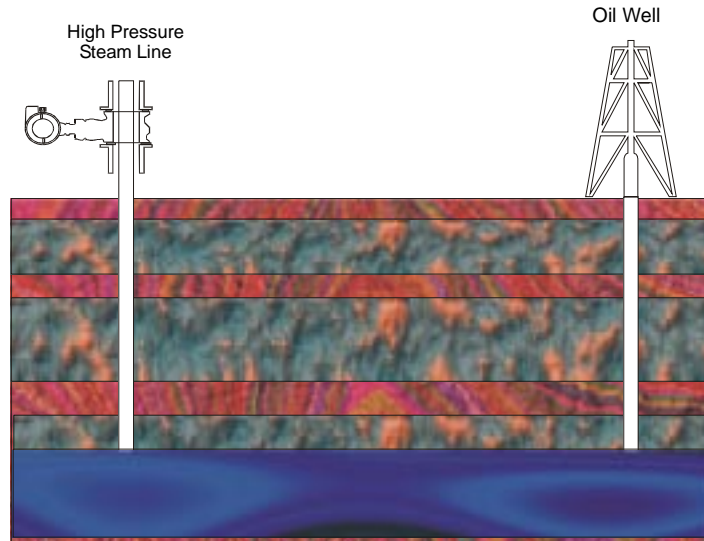
It is estimated that almost two-third's of oil discovered in the United States lies unrecovered -- trapped in porous formations. There are approximately 500,000 abandoned wells containing such oil. Because of this fact oil companies are constantly pursuing methods for the recovery of this oil.

One of these methods for oil recovery involves injecting steam, surfactants, and non-compressible gas into an oil zone to drive oil through the zone to production wells. This steam mixture is injected at a maximum rate of two million SCF per acre per day. This injection method creates sufficient velocity to emulsify trapped oil into a foam that is then swept to the recovery well.

In one test case this process increased the production rate of one well from 17 Barrels per day to 72 Barrels per day. This cost effective technology makes a tremendous contribution to recovering additional oil from abandoned oil wells as well as improve primary recovery of operating oil fields.

APPLICATION

Recently we were approached with an opportunity to provide a vortex shedding flowmeter to a large oil producing customer on the North Slope of Alaska. The application was for steam and water injection for oil recovery on a new oil field site. These were high pressure lines typically requiring ANSI class 1500 lb rated flanges. Most of these line sizes are 1.5 inch ID (inner diameter). The North Slope is a harsh environment. The temperature rating required for this installation is -50 deg F. The customer had



used orifice plates and DP transmitters at other sites for these measurements. These devices required a heated structure or enclosure for protection against freezing of impulse lines. This is obviously very costly, particularly if the structure lost heat.

SOLUTION

Yokogawa's solution was to offer our Yewflo vortex shedding flowmeter for this application. Yewflo is an excellent choice for the measurement of injected steam or water to the well. In addition to all of the inherent advantages vortex meters enjoy over orifice plate/transmitter installations, using a vortex meter in this installation required no heated structure for the meter environment. This represented a significant cost savings to the customer. For this application we supplied 2" 1500 lb ANSI flanged vortex meters. (Because of the increased body thickness required for a 1500 lb ANSI rating, a 2" 1500 lb ANSI meter body actually has a 1.5" ID). These meters are installed and in

operation and more are scheduled to be installed.

YEFWLO ADVANTAGES

- No moving parts
- Nothing to clog or freeze (impulse lines)
- Inherently linear
- High turn-down (30:1)
- Sizes .5 to 16 inches
- High pressure rating of 1500 lb ANSI
- Low cost of ownership

