Evaluation of Wax Deposition and its Control during Production of Alaska North Slope Oils

DE-FC26-00NT41248 3.05.01

Program

This project was awarded funding in an FY2005 solicitation, conducted under DOE's financial assistance to the University of Alaska-Fairbanks (UAF) through Cooperative Agreement DE-FC26-01NT41248 with UAF's Arctic Energy Technology Development Laboratory (AETDL) for research, development, and deployment of energy technologies that address problems with Arctic energy production and use.

Project Goal

The project goal is to develop a computer predictive model for wax deposition that is specific to Alaskan North Slope (ANS) oilfields. The predictive model then would be used to identify the most effective methods for preventing wax deposition in ANS reservoirs and operations.

The project is to address wax deposition problems during oil production from ANS fields. Experimental and simulation studies are to be conducted to quantify and determine the control techniques for field applications including:

- Evaluating the mechanisms and environments leading to wax deposition in candidate wells of selected ANS oilfields.
- Developing user-friendly models for predicting wax deposition and quantifying its effects on oil production.
- Designing methods and techniques for preventing and controlling wax deposition using the information learned.

Performers

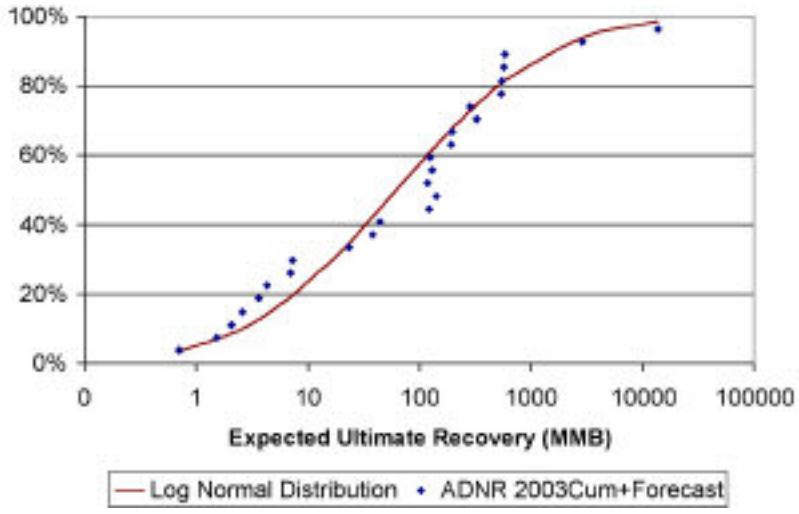
University of Alaska
Fairbanks, AK

ConocoPhillips Alaska, Inc.
Anchorage, AK

University of Kansas
Lawrence, KS

Project Results

The project got under way in September 2005.



Future ANS oil resource discoveries likely to result in smaller accumulations.

Benefits

Alaska's North Slope is a unique petroleum province in the United States. It is underlain by thick permafrost, which is a tremendous heat sink for produced fluids. The slope is a very high-cost petroleum production province, giving production operations there a high economic threshold compared with other U.S. onshore fields. Solving the wax deposition problem in producing wells could significantly reduce the economic limit and spur development of smaller accumulations of ANS oil resources.

Background

Alaska's North Slope holds some of the United States' largest oil and gas reserves. Due to its unique environment and thick permafrost, the resulting high cost of ANS production limits development and extraction of the huge resource.

Paraffinic hydrocarbons (wax) can deposit from crude oil and form a solid during production or anywhere in the producing system when conditions change due to temperature and pressure. Wax usually forms by nucleation, in the presence of a seed crystal of paraffin or other solid material commonly found in crude oils, which results in a rapid growth (deposition) of paraffins around the seed. Wax deposition can easily reduce production by more than 25% and increase operating costs significantly. Wax deposition occurs more readily in wells that produce at lower rates and leads to reduced oil production and increased well downtime, resulting in costly well workovers in one of the harshest working environments on earth. Solving wax deposition problems in producing wells could significantly reduce the economic limit and spur development of smaller accumulations of ANS reserves.

Production rates for ANS individual wells are declining. Most ANS reservoirs are mature, and production rates are expected to decline substantially. Economic development of future ANS discoveries will require new technologies.

The Alaska Department of Natural Resource predicts future ANS discoveries are likely to be smaller reservoirs—less than 100 million barrels in oil resources, implying lower production rates. Low production rates will result in lower-temperature fluids in the wellbore and thus increased potential for paraffin deposition. If the ANS wellhead production temperature is below 90º F., wax starts to deposit in tubing.

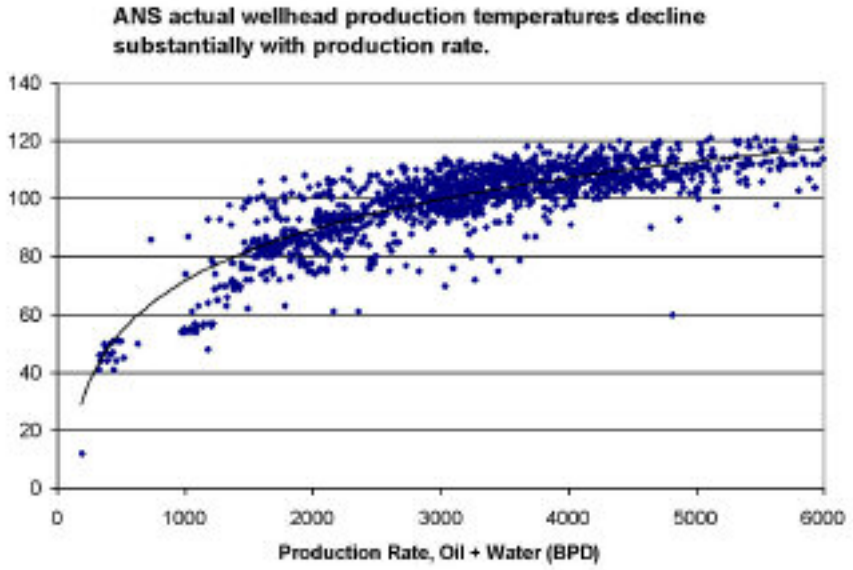
Project Summary

Although wax deposition is a commonly encountered problem in production operations, there is no universally effective treat-

ment for the problem. Treatment methods are usually highly case-dependent, requiring the proper identification of the mechanisms for wax deposition and the development of a predictive technique that is specific for the target field. Due to the unique ANS production environment, a properly designed and implemented treatment method for preventing wax deposition is essential to cost-effective production in ANS reservoirs.

Current Status (October 2005)

Project began September 1, 2005.



Wax deposition in tubing at 90º F for an ANS field.

Project Start: September 1, 2005
Project End: September 30, 2008

Anticipated DOE Contribution: $1,124,000
Performer Contribution: $361,036 (24.3% of total)

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