SST GROUP

SUCCESS STORY

MATURE FIELD
LOW PRODUCTION RATE

stream-tracer.com

Challenges

Reduce energy consumptions

Eliminate paraffin-wax deposits at low production rate well

Low fluid temperature on top of the well

Solution

Stream Tracer™ IT heating system

Results

Increased fluid temperature from 7 to 23 degrees

Reduced energy consumption up to 47% for 12 months

STREAM TRACER™ TECHNOLOGY SUCCESSFULLY REPLACES SERIES-RESISTANCE DOWNHOLE HEATING SYSTEM

Key results

Stream Tracer™ technology reduced the cost for eliminating of hydrocarbon solid deposits in mature oil well up to 1.8 times

Location

Russia, Perm Region

Overview

The development of the field located in Perm Region was started in 1999. The reduced production volume caused by the reservoir decreased energy resulted both in conversion of the well to pump operation and aggravation of waxing issues in tubing string and discharge line. To protect the well having flow rate from 50 to 88 barrels of fluid per day, the field operator has been using an integrated method involving both continuous heating of tubing string lift by KGn-type cable, placed into the pipe and monthly hot oiling of the well. As a result of high energy consumption of electric heating system and oil loss during hot oiling of the well the operator had to start looking for more efficient technologies for the well protection from hydrocarbons deposits.

CHALLENGES FOR OPERATION IN DIFFICULT CLIMATIC CONDITIONS

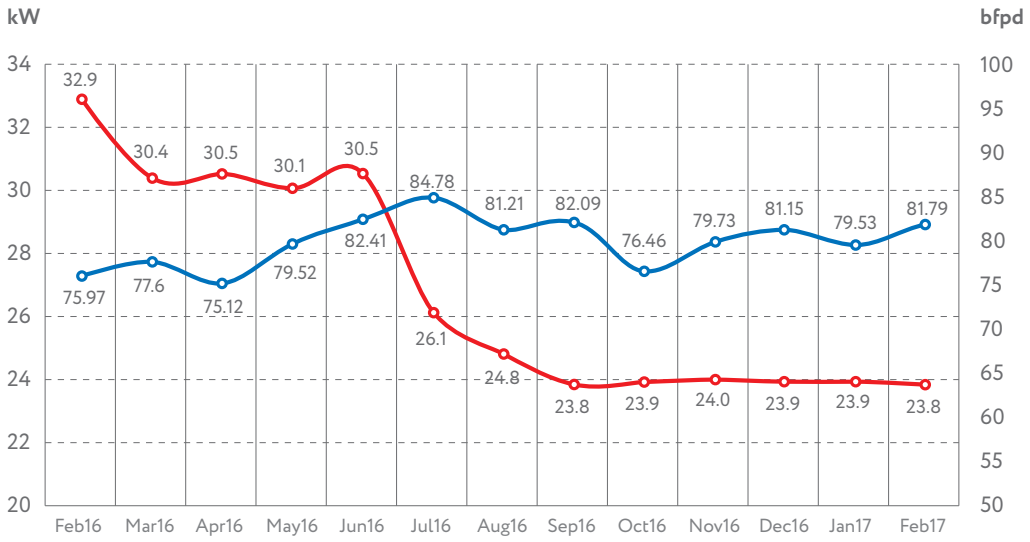
Rather difficult engineering problem is to be solved to heat the low flow wells. A pressure drop while lifting and low flow rate lead to considerable fluid temperature loss under its moving from reservoir to well head. A fluid temperature is decreasing from the bottomhole zone temperature till the wax saturation limit at depths from 1,500 to 600 m. The use of the series-resistance heating cable having a constant heating capacity along the entire length leads to fluid overheating in the lower part of the heating zone. However, the fluid temperature is dropped lower than wax appearance one when it approaches the well head due to low flow rate, low reservoir temperature, considerable heat losses in permafrost soils and not enough capacity of the resistive cable. The requirement of reduction of electrical energy consumption and maintaining the fluid temperature above wax saturation point along the entire depth of the tubing string became the main challenges of the project.

THE HEATER DESIGN TUNING TO MAXIMIZE ENERGY EFFICIENCY

For heating of the well Stream Tracer™ IT system was chosen by the reason of its innovative heater with a variable power lengthwise. SST Group engineering team carried out vast front-end engineering works. The studies of the fluid properties performed in laboratory conditions clarified key parameters of the temperature to be maintained. Based on mathematic simulation of the well performance under different conditions the basic modes of heat balance were determined for the well capacity from 50 to 88 bfpd. To maintain the fluid temperature above wax saturation point of 17 °C the 1,020 m heater with 3 heat-emitting zones was chosen. Power-length ratio of the working zones were 30 W/m in the bottom part and 45 W/m in the top one, the length of the high power zone was much less than the one of the low-power zone. The total design capacity of electrical heating system was 37.1 kW, which was 26% lower than actual capacity of the earlier used system.

STREAM TRACER™ TECHNOLOGY STEADILY INCREASES OIL PRODUCTION AND REDUCES COSTS

The system was commissioned at the beginning of 2016. The fluid temperature at the wellhead reached design set volume of 23 °C during first 3 days. The energy saving exceeded design figures and approached 30% already in the first 4 months. When the well approached the heat equilibrium condition the heating rate was reduced to 24 kW by using power supply and control system with a wide heating power regulation band. The unique patterns of the control system operation in the mode of maintaining a given temperature of fluid at the wellhead let us approach hourly average energy consumption over the rolling year equals 26.8 kW. Average power of heating and production rate data through the first year presented at the figure below.



Average power of heating and production rate per month

During the system operation there were no one case of oil production outage caused by wax formation in the tubing or by the necessity of additional treatments. That yields some rise in terms of total annual production volumes per rolling year.

> The costs budgeted by the customer for fighting with wax deposits were decreased by 47%.