

# FLOPRO NT System Combats Abnormally Low Formation Pressure, High Permeability Conditions

“The FLOPRO\* NT system with an optimum particle size distribution of the bridging agent determined with the help of OPTIBRIDGE\* software and an efficient inhibition complex has allowed prevention of formation damage while drilling-in wells at the Chekanskaya area in the Carpathian region, Ukraine.”

Operator’s Chief Process Engineer

## Well Information

Location .....	Carpathian region, Ukraine
Interval drilled.....	1,050-1,148 ft (320–350 m)
Permeability .....	800-940 mD
Formation pressure gradients.....	0.3 to 0.35 g/cm <sup>3</sup> (2.5-2.9 lb/gal)
Completion type.....	146-mm casing, cemented down to the wellhead

## The Situation

Drilling wells at the Slavetskoye field and similar fields in the region is often accompanied by extreme mud losses to upper productive formations with irreversible damage. This is due to the fact that the productive formations have abnormally low formation pressures and high permeability. Core sample analyses and drilling case histories have revealed the tendency of the reservoir clay section to swell when there is insufficient inhibition in the wellbore fluid.

These complications result in formation damage, sometimes making the extraction of hydrocarbons completely impossible.

## The Solution

M-I SWACO specialists together with the customer studied the geological peculiarities of drilling into the productive formations. The integrated solution was to apply the FLOPRO NT reservoir drill-in fluid system. Studying the reservoir permeability and with the help of the OPTIBRIDGE software, calculated the optimum particle size distribution of the bridging agent to form a very low permeable barrier on the surface of reservoir pore channels. In addition, the fluid was inhibited by using potassium chloride (4-5% by weight) and 20-22 L/m<sup>3</sup> (0.02 – 0.022 bbl/bbl) of KLA-CURE\* organic shale hydration inhibitor.

## The Results

Using FLOPRO NT reservoir drill-in fluid (RDF) with an optimum particle size distribution of the bridging agent in combination with state-of-the-art shale hydration inhibitors helped to achieve the following excellent results when constructing the well and drilling-in the productive formation:

- Almost no mud losses to the productive formation
- Noticeably better well flow rate as compared to offset wells during production
- Much less time spent on getting the well to stable production
- Better technical and economic drilling parameters.

## The Details

The RDF formulation	
KLA-CURE	20-22 L/m <sup>3</sup>
FLO-VIS* Plus	3-4 kg/m <sup>3</sup>
FLO-TROL*	13- 15 kg/m <sup>3</sup>
Calcium Carbonate Fine	10-12 kg/m <sup>3</sup>
Calcium Carbonate Medium	28-32 kg/m <sup>3</sup>
Calcium Carbonate Coarse	39-42 kg/m <sup>3</sup>
RDF parameters	
Weight, g/cm <sup>3</sup>	Up to 1.14
Yield point, lb/100 ft <sup>2</sup>	16-24
Gel strength 10 sec/10 min, lb/100 ft <sup>2</sup>	8-11/10-15
Fluid loss, mL/30 min	5-6.5
KCl	4-5%

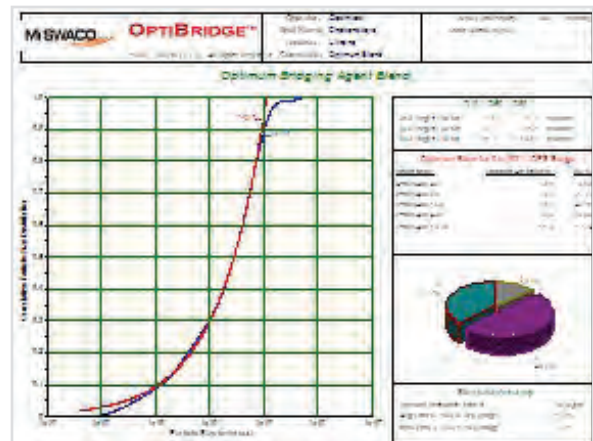


Figure 1 – OPTIBRIDGE calculation results

Table 1 – Mud formulation and parameters

The productive formations were drilled in after more than 328 ft (100 m) of drilling active clays. Work was performed on two wells; in both cases there were no mud losses to productive formation in contrast to offset wells.

### Questions? We'll be glad to answer them.

If you'd like to know more about the FLOPro NT reservoir drill-in fluid and how it's performing for our other customers, please call the M-I SWACO office nearest you.



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