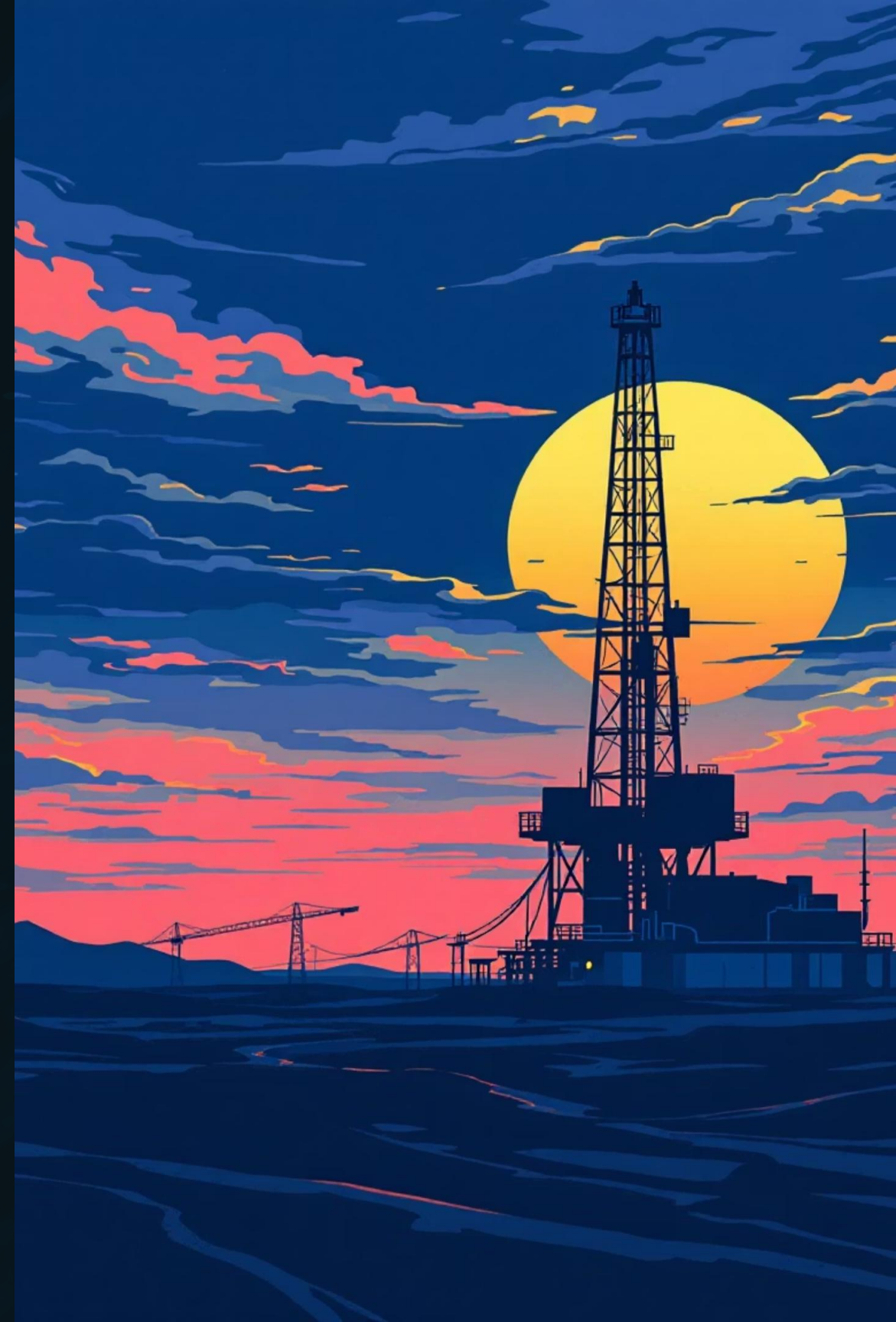


Protocol300i: Optimizing Heavy Oil Production through Viscosity Reduction

Prepared by: Artem Verba

Kazakhstan, 2025



Baseline Oil Viscosity

Measurement Method

Brookfield DV-II+ HB (Spindle No.3, 100 RPM)

Test Temperature — 25 °C

Baseline Viscosity

21,360 cP

Heavy crude oil requires special treatment



Oil Viscosity after Surfactant Addition



Oil Viscosity after Adding Karpitol

Measurement Method: Brookfield DV-II+ HB (Spindle No.3, 100 RPM)

Test Temperature — 25 °C

Viscosity: 20,160 – 21,760 cP



Oil Viscosity after Adding Protocol300i

Measurement Method: Brookfield DV-II+ HB (Spindle No.3, 100 RPM)

Test Temperature — 25 °C

Viscosity: 5,280 – 5,680 cP

* (value outside spindle measurement range)

Reduced Oil Viscosity after Adding Protocol300i



4,880 cP

Minimum Viscosity
under optimal measurement conditions

75%

Viscosity Reduction
compared to the baseline value



Oil Viscosity after Adding Protocol300i

Measurement Method: Brookfield DV-II+ HB (Spindle No.4, 100 RPM)

Test Temperature — 25 °C

Viscosity: 4,880 – 5,600 cP

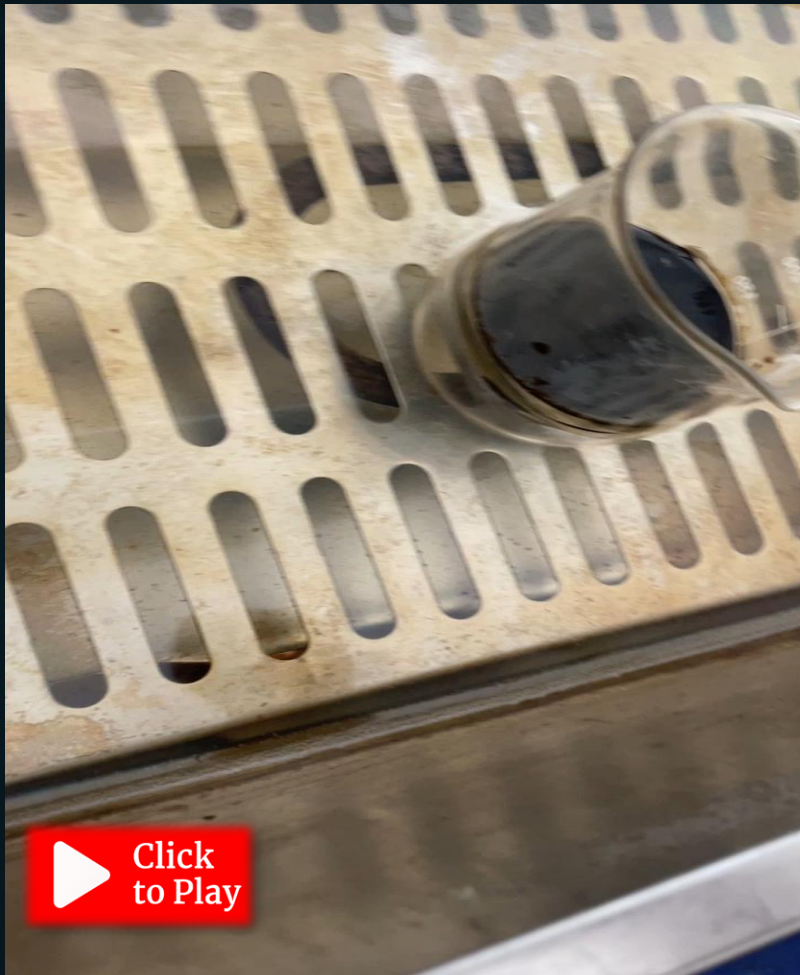
(value within spindle measurement range)

Oil Viscosity after Adding Protocol300i

50 ml of crude oil + 30 ml of Protocol300i concentrate

Effect: the oil becomes as fluid as water

Reduction of Interfacial Tension (IFT)



1

Karpatol

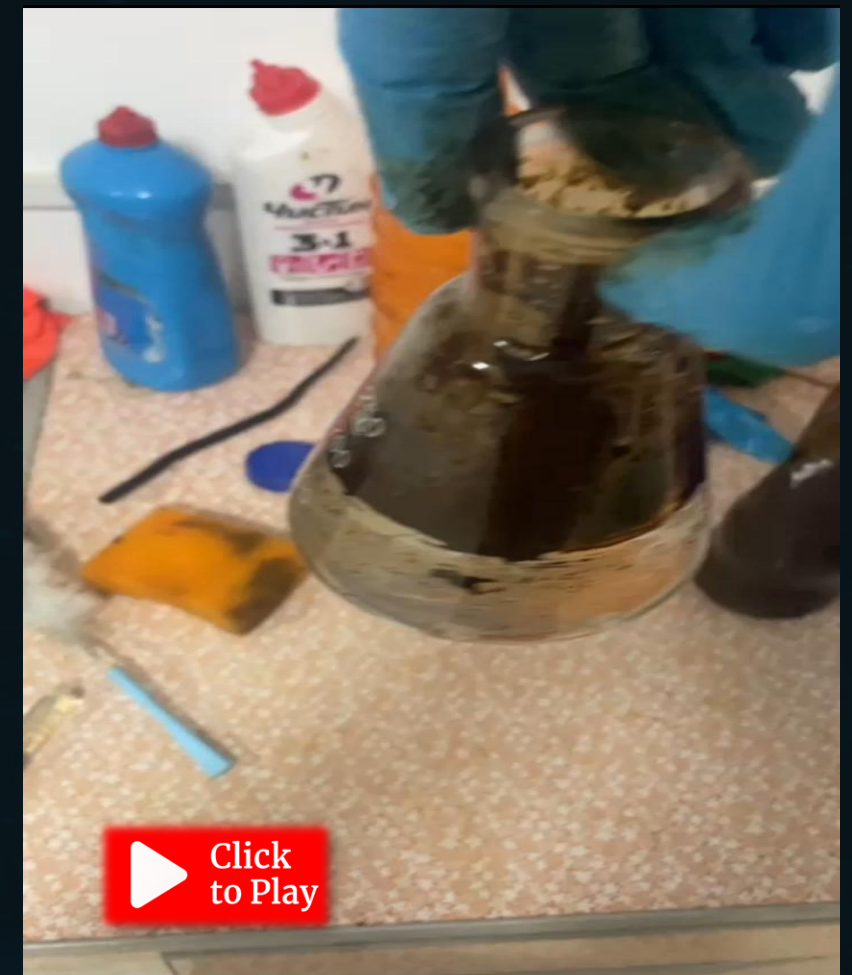
Oil film disruption



2

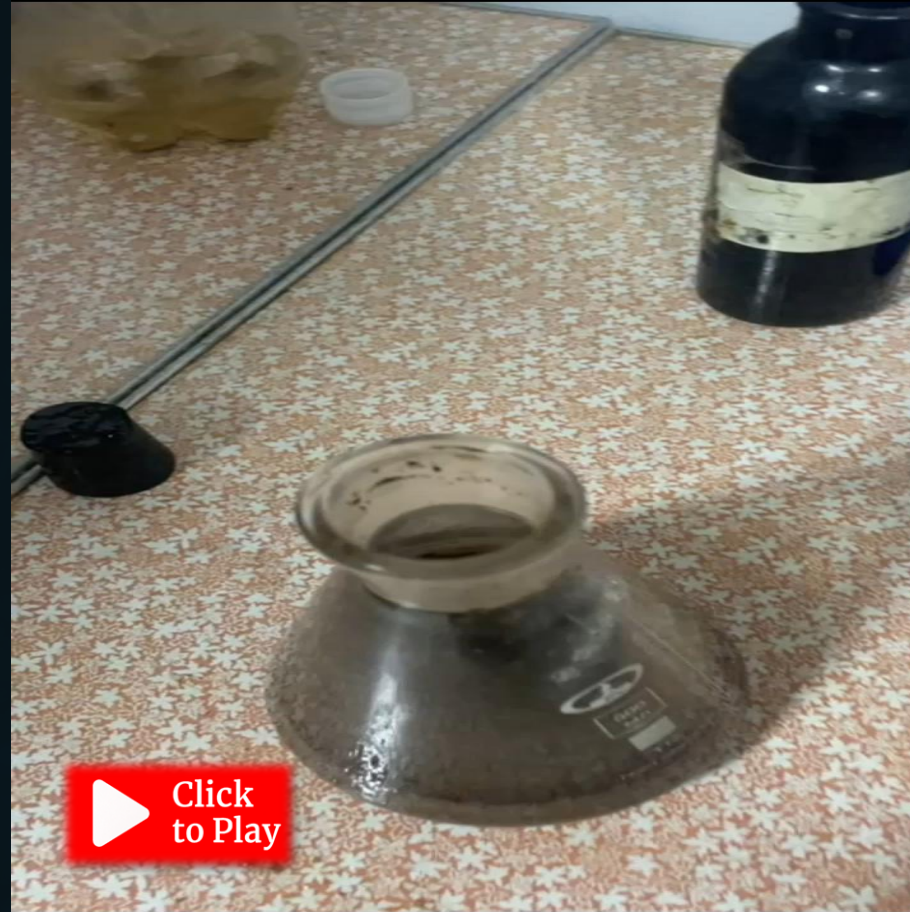
Protocol300i

Oil film disruption



In both cases, oil film rupture on the water surface is observed.

Oil-Washing Capacity of Protocol300i



01

Initial State

Formation water + crude oil

02

After Adding Protocol300i

The vessel walls remain clean, oil does not adhere

❑ Protocol300i demonstrates excellent oil-washing capacity, enabling the removal of residual oil from reservoir rock

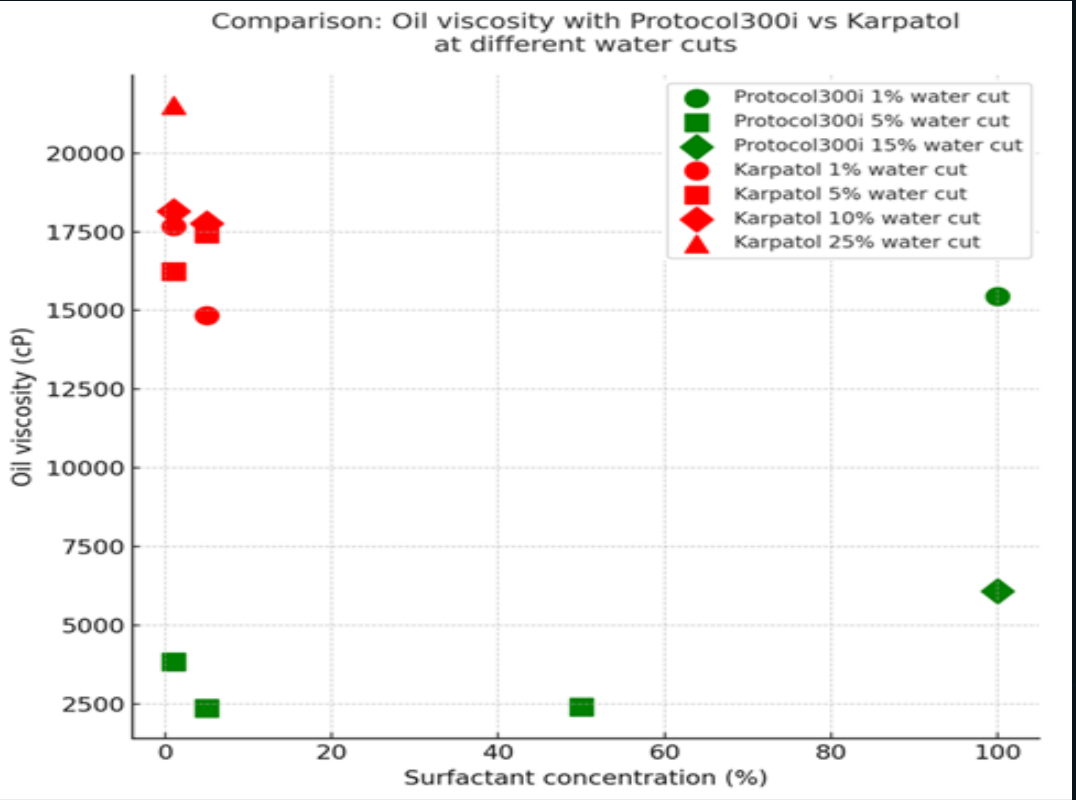
Comparative Efficiency of Surfactant Concentrations

% Water Cut	1% Protocol300i	5% Protocol300i	10% Protocol300i	100% Protocol300i
1%	-	n/a	-	15,440
5%	3,840	n/a	-	2,400
10%	-	n/a	1,920 – 2,800	5,840 – 6,320

Oil Viscosity (cP) at Different Surfactant Concentrations of Protocol300i

% Water Cut	1% Karpatol	5% Karpatol
1%	15,200 – 17,680	14,480
5%	16,160 – 16,800	17,440
10%	18,080 – 20,160	17,760
25%	21,520 -21,480	-

Oil Viscosity (cP) at Different Surfactant Concentrations of Karpatol



Baseline Oil Viscosity — 21,360 cP

These results demonstrate that Protocol300i consistently outperforms Karpatol, achieving much greater viscosity reduction even at lower concentrations. This highlights its strong potential for practical application in enhanced oil recovery.

Conclusion

The tests demonstrated that **Protocol300i provides significantly higher efficiency in reducing oil viscosity compared to Karpatol**, even at lower surfactant concentrations.

Additional effects were confirmed:

- substantial reduction of interfacial tension;
- excellent oil-washing capacity (removal of oil from vessel surfaces), indicating strong potential for residual oil removal from reservoir rock during near-wellbore treatments.

Therefore, **Protocol300i can be considered not only as a promising solution for enhancing heavy oil production, but also as an effective alternative to Karpatol for near-wellbore treatments aimed at increasing the oil recovery factor (EOR).**

Further research is required to refine optimal concentrations and to validate Protocol300i performance on core samples.