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MODELING OF ASPHALTENE PRECIPITATION: A FLOW ASSURANCE PROBLEM

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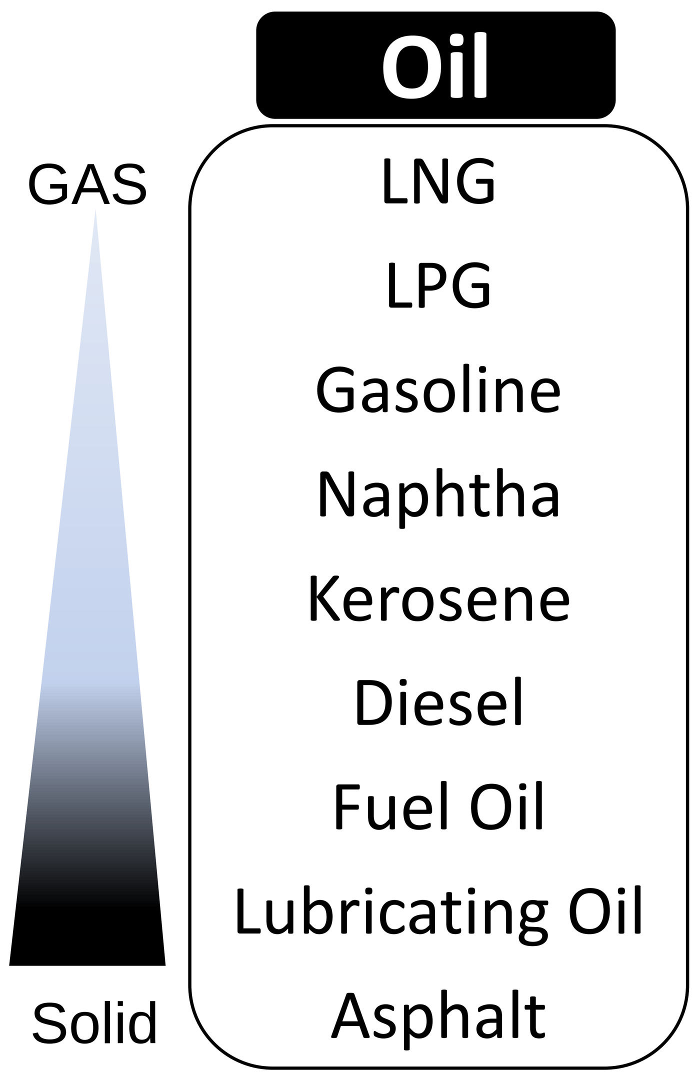
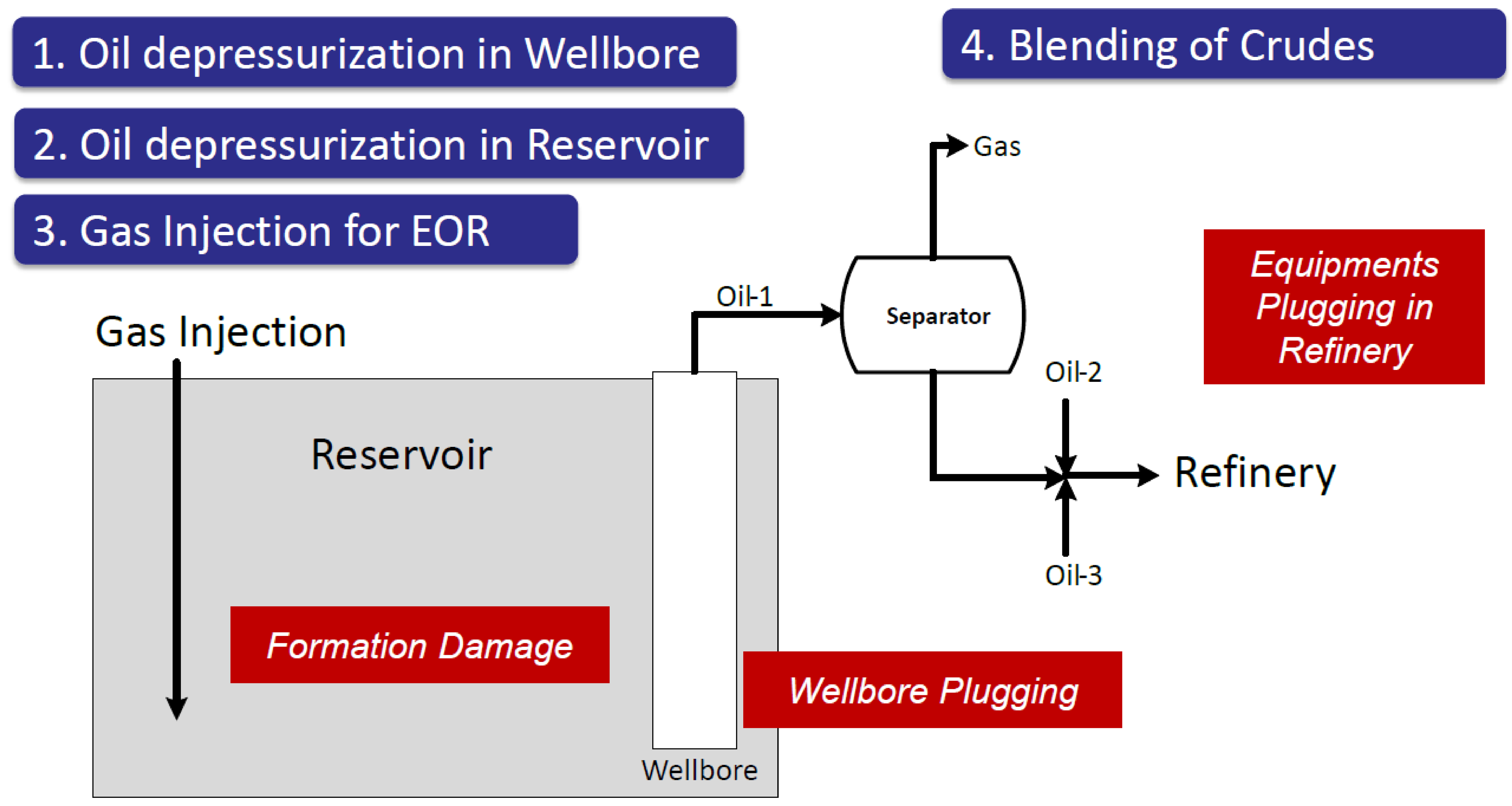
1. INTRODUCTION

❖ Asphaltene blocks pores/pipes like Cholesterol blocks blood vessels



Pipe with Asphaltene Deposition



2. OBJECTIVES

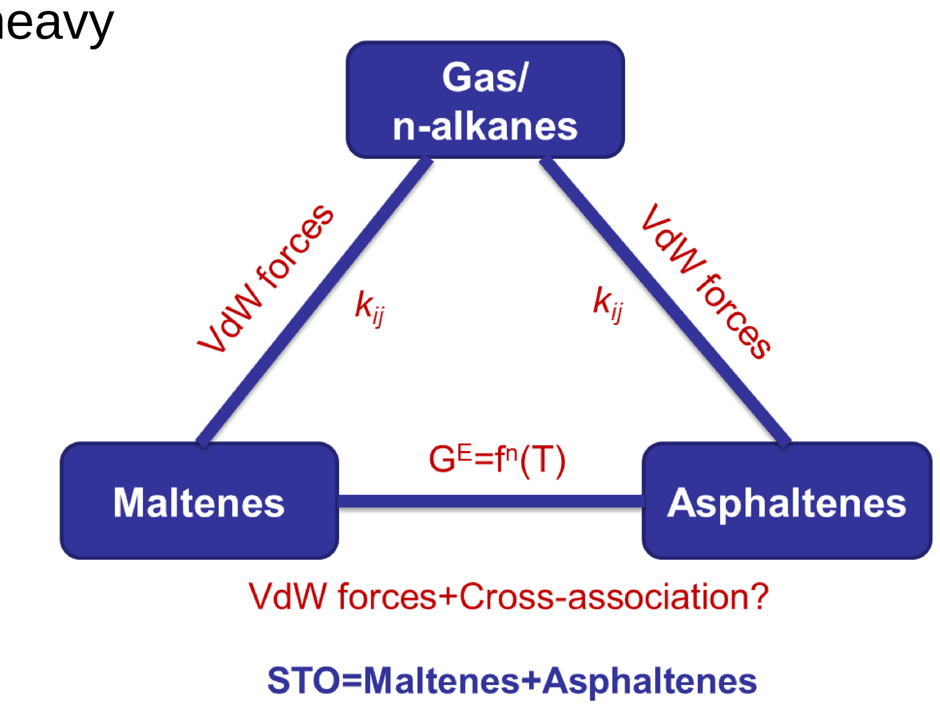
- ❖ Create simple, fast and accurate model to predict asphaltene precipitation conditions.
- ❖ Validate the model with numerous experimental data from literature.
- ❖ Compare the model using both CPA and PC-SAFT equations of state.

3. PROPOSED MODELING APPROACH WITH CPA AND PC-SAFT

- ❖ STO contains only two components, heavy component & asphaltene.
- ❖ Heavy component (HC)= Saturates + Aromatics + Resins.

$$Z^{CPA} = 1 + Z^{SRK} + Z^{Assoc}$$

$$Z^{PCSAFT} = 1 + Z^{HS} + Z^{Chain} + Z^{Disp} + Z^{Assoc}$$



4. RESULTS

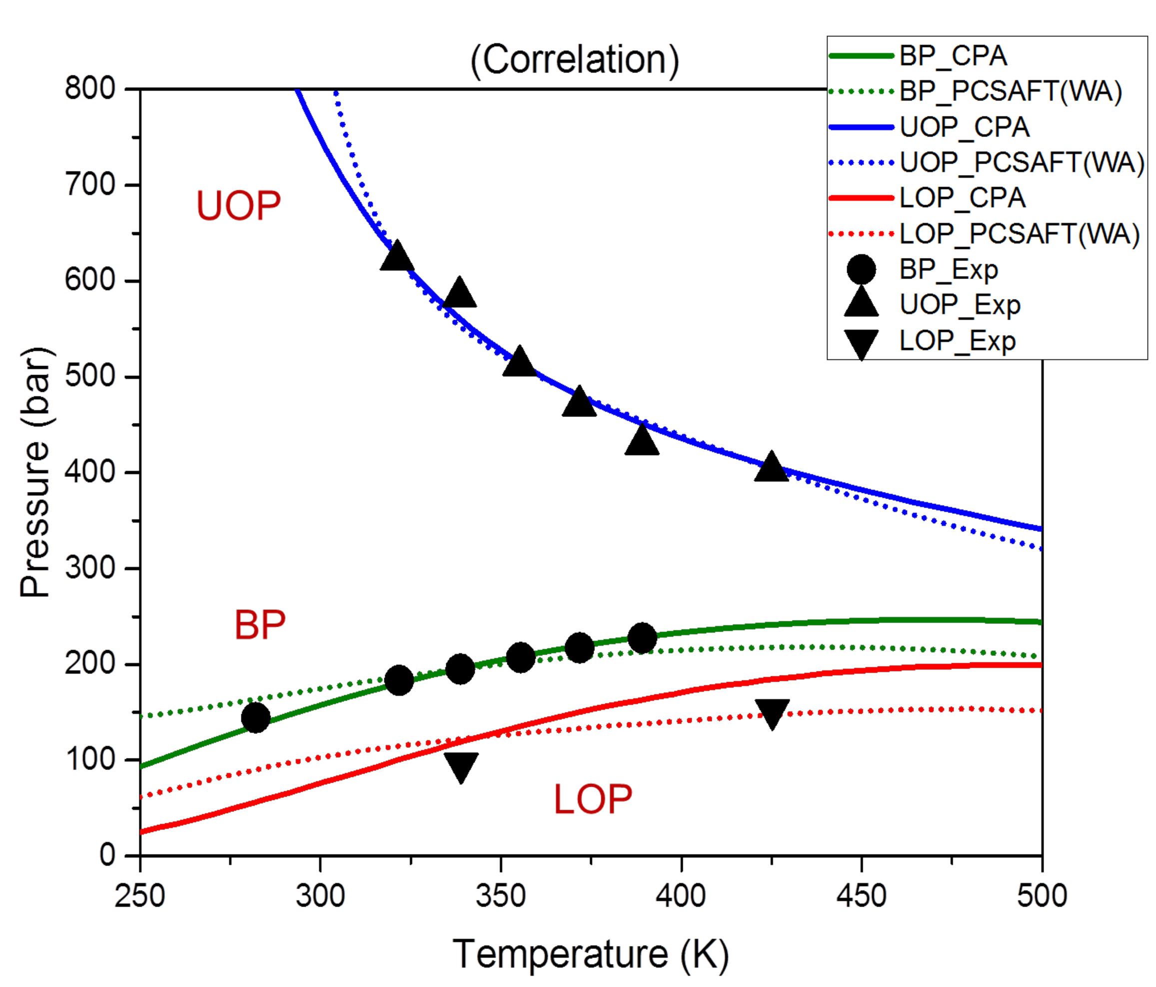


Figure 1: Fluid-1 [5]: experimental data from Kabir et al [1].

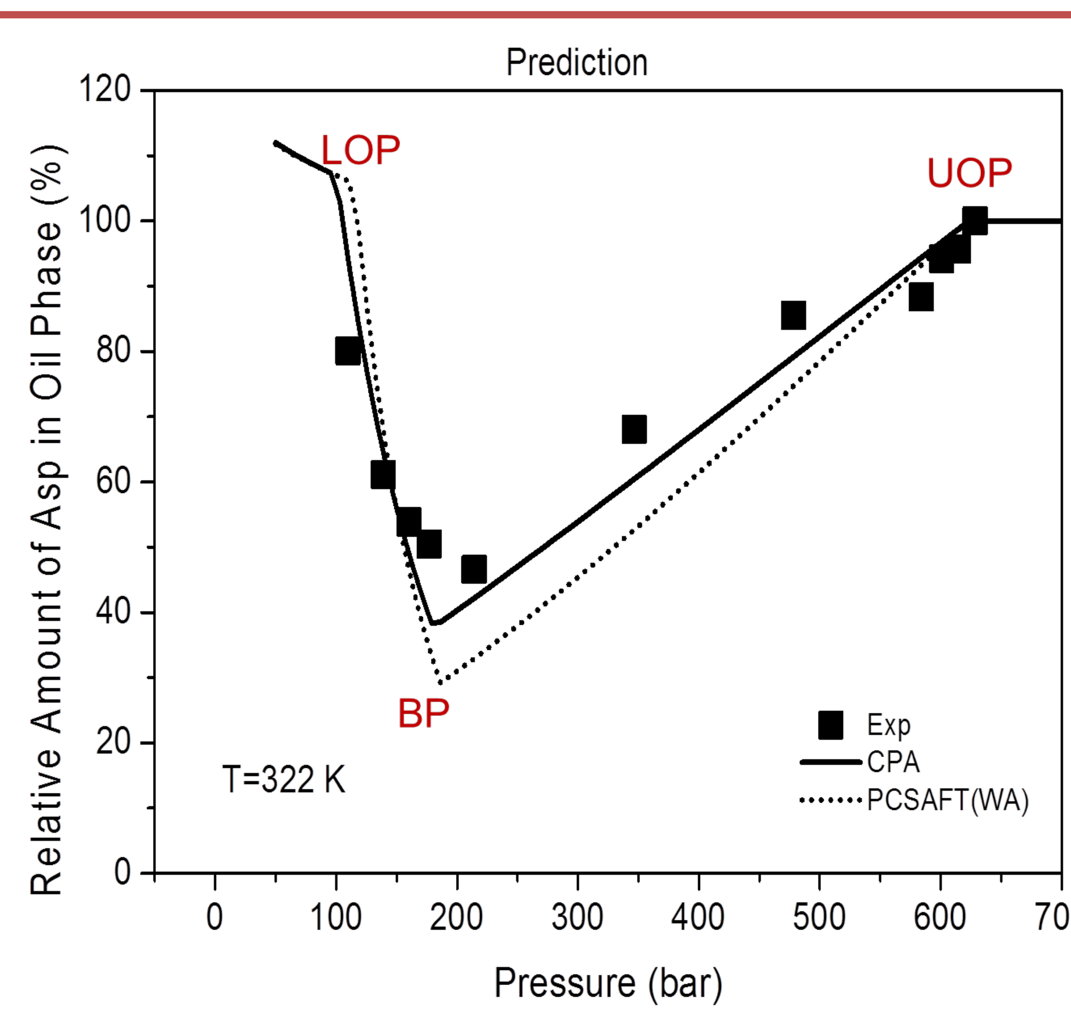


Figure 2: Fluid-1 [5]: experimental data from Kabir et al [1].

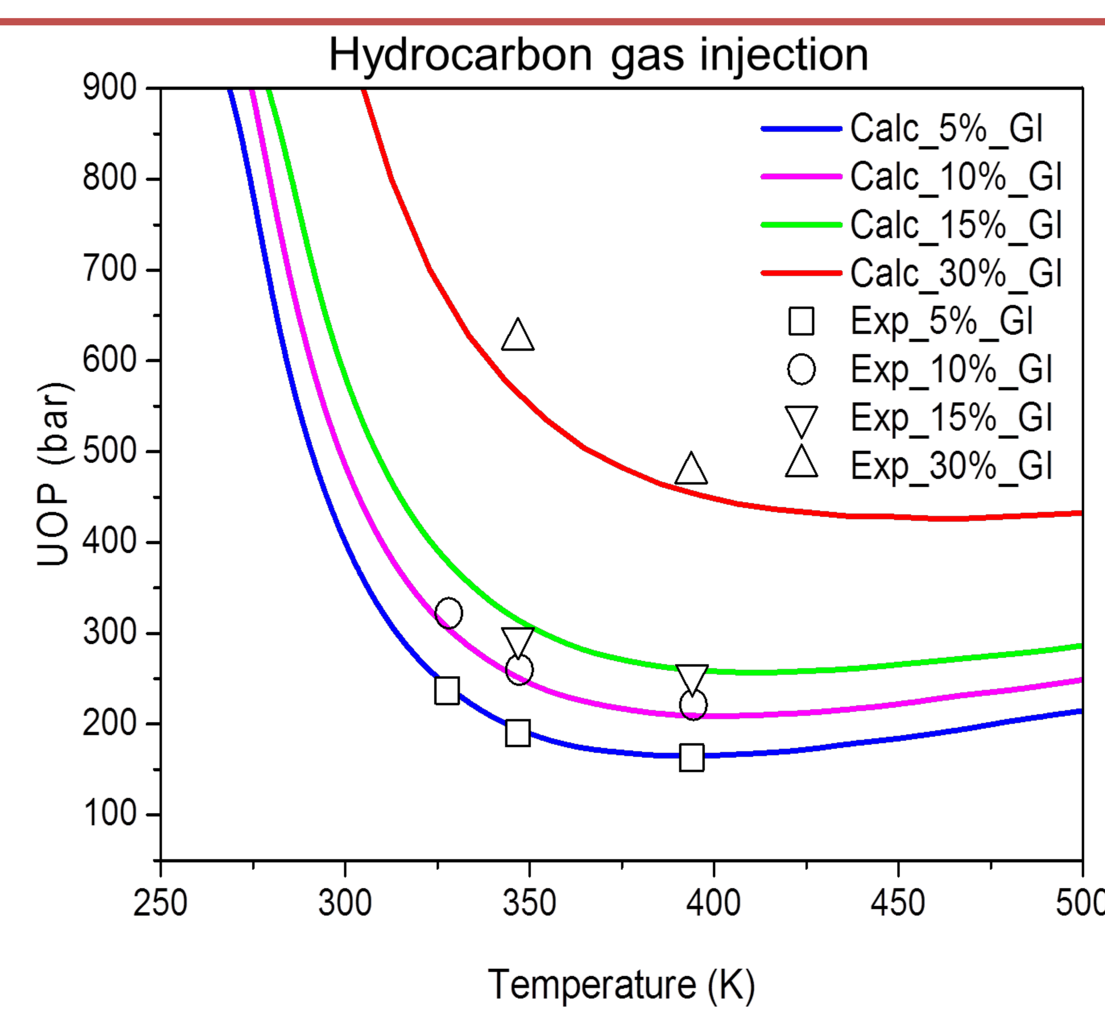


Figure 3: Fluid-2 [4]: experimental data from Punnapala et al [2].

5. CONCLUSIONS

- ❖ Simple, accurate and fast modeling approach is developed with CPA & PC-SAFT (WA) equations of state.
- ❖ Model is validated against an extensive set of data of 17 fluids from literature.
- ❖ Both CPA and PC-SAFT equations of state can predict gas injection and depressurization effects.

6. ACKNOWLEDGEMENT

❖ Consortium: BP(UK), STATOIL, PETROBRAS

ABBREVIATION

BP	=	*Bubble Pressure*
CPA	=	*Cubic Plus Association*
LOP	=	*Lower Onset Pressure*
PC-SAFT	=	*Perturbed Chain Statistical Associating Fluid Theory*
STO	=	*Stock Tank Oil*
UOP	=	*Upper Onset Pressure*

7. REFERENCES

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2. Punnapala S. et al, Fuel (108) (2013) 417-429.
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