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Recent Developments of EOR Features

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Outline

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➢EOR Challenges

➢INTERSECT Overview

➢INTERSECT EOR Functionalities

➢Conclusion

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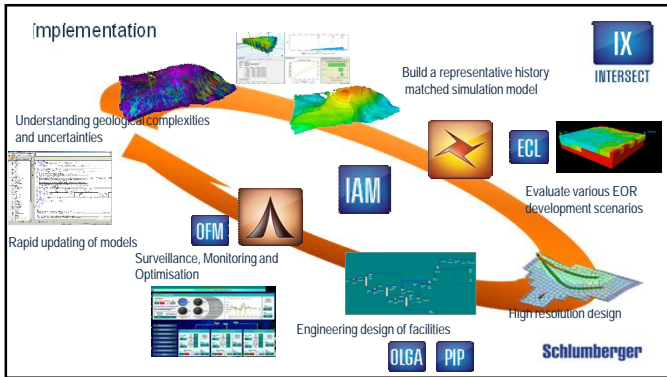
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EOR modelling Challenges

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- Asset Maturity with low recovery
- EOR from Day 1 as a possible alternate
- EOR Implementation Challenges
  - Design/Run/Interpret : Lab, Pilot, Field
  - Understanding underlying physical and chemical processes with multiple interaction (rock, fluid, chemicals)
  - Multiresolution model by keeping to min compromises suit run time
  - Monitoring plan design, execution, feedback learn/adapt
  - Model updates
- EOR missing records on failing projects (we can learn a lot !)
- NPV !
- Do modelling can help in such complex situation ?

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Implementation

Understanding geological complexities and uncertainties

Rapid updating of models

Surveillance, Monitoring and Optimisation

Build a representative history matched simulation model

Evaluate various EOR development scenarios

Engineering design of facilities

High resolution design
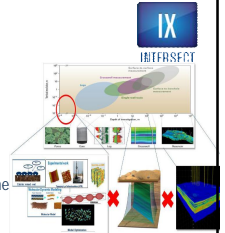
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- Representative High Resolution Modeling of
  - Geology
  - Physics
  - Asset
- Enabled by fast and scalable reservoir simulation
- Petrel RE simulation environment

*** Mark of Chevron, Total and Schlumberger*

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Fast and Scalable reservoir simulation

Fit for purpose solver

- Formulation Agnostic – (BO, COMP, T)
- Adaptive Multi-grid solver (CPR-AMG) for all processes
- Grid Agnostic
- Unique and Robust well Model
- Brine and chemical are components

Flexible domain decomposition

- Runs parallel by design

FM is design for single and multiple reservoirs/Network

Time Discretization

- IMPES, IMPSAT, AIM, FULLIMP, AIM_IMPES, AIM_IMPSAT
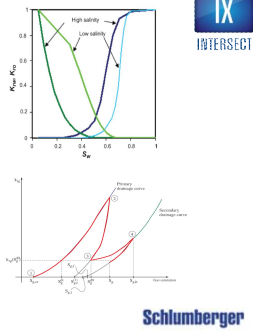

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Brine IX Advanced Features Summary

- Compatible with Polymers
- A flexible unifications of single and multi-components brines models
- Incorporates advanced physical assumptions
- Allows to simulate a user's defined brine systems (e.g., NaCl brine with different pH)
- Essential to different applications

(e.g., EOR,CO2 sequestration, Demulsification, Solubility)
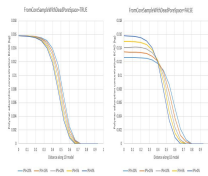

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Other Mechanisms

- Low salinity water flooding is an important enhanced oil recovery mechanism
- WAG Hysterisis


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Extended polymer model

- New polymer adsorption option
  INTERSECT support additional option to switch from using the effective pore volume for polymer flooding to just a pore volume in adsorption term allowing for direct input from the lab experiments
- Support for a polymer mixing parameter
  Todd-Longstaff mixing parameter has been implemented for polymer viscosity calculations
- Brine and Polymer compatibility with aquifers
  Brine and polymer models are now compatible with analytical and numerical aquifers

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Simulation Polymer Workflow

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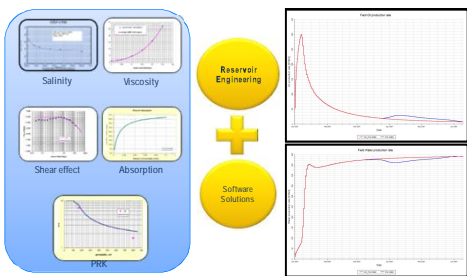
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Conclusion and Way forward

- IX has a unique a robust formulation for all recovery processes
- IX EOR implementation is much more realistic and can be directly calibrated from experimental data
- IX has UTECHEM implementation with a serious well Model
- IX is grid and formulation agnostic
- IX is designed to run parallel with excellent scalability with default tight tuning
- IX is not an ECLIPSE CLONE (neither at code level nor at user level)
- IX perform a thorough data quality check and log issues to the user
- IX outperforms other simulators for several EOR processes including high resolution context
- ASP will be complete by 2017

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- Do modelling can help in such complex situation ?
  - yes provided relevant implementation with NO compromises in numerical solution

Thank you very much

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