
CHIMEC

Performance.
Reliability.
Safety.

ETIP GEOTHERMAL INNOVATION DAYS

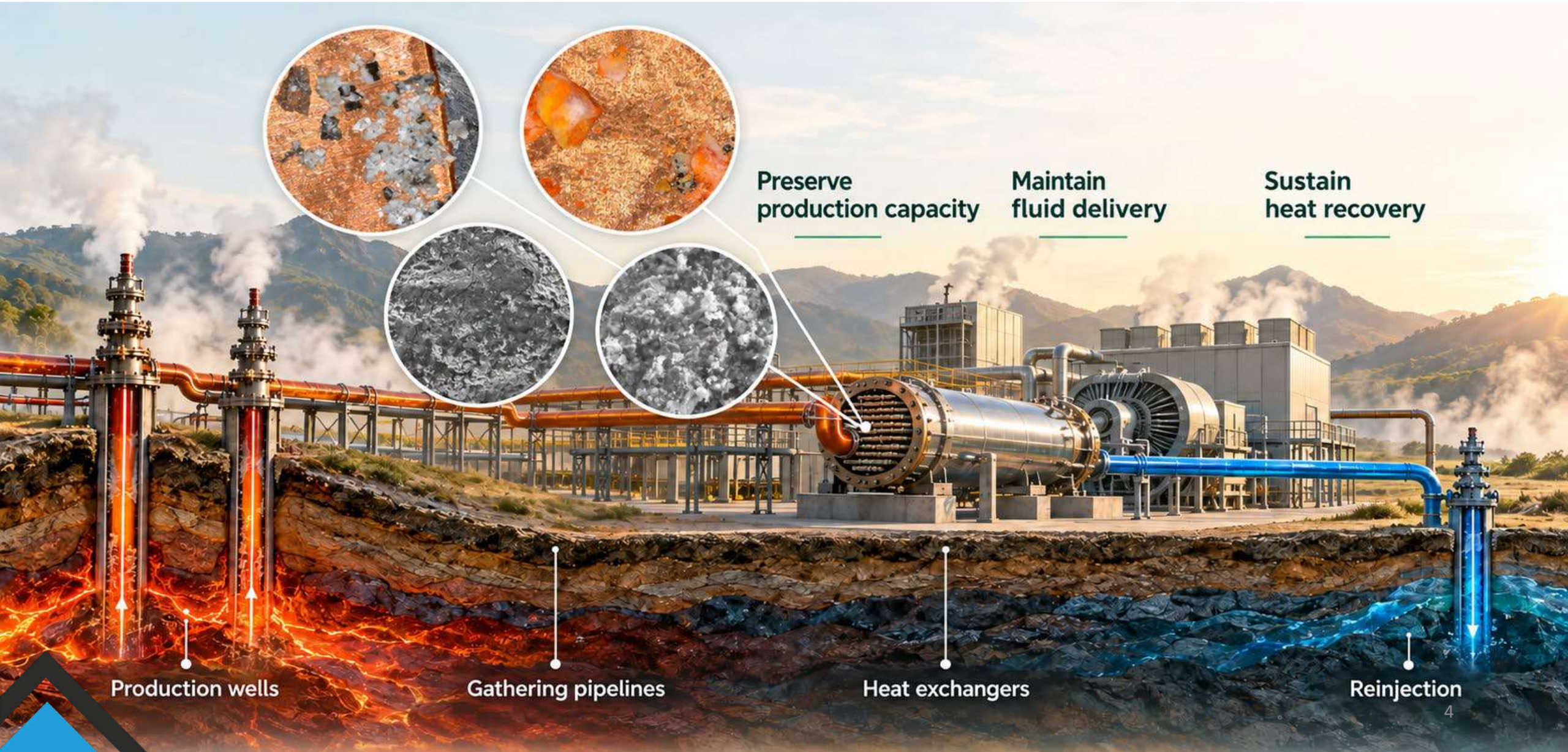
13th–14th October 2026

"SCALING" THE ENERGY TRANSITION: FROM OILFIELD SCALE INHIBITION TO GREENER GEOTHERMAL SOLUTIONS

Ernesto Petteruti – Marketing Manager

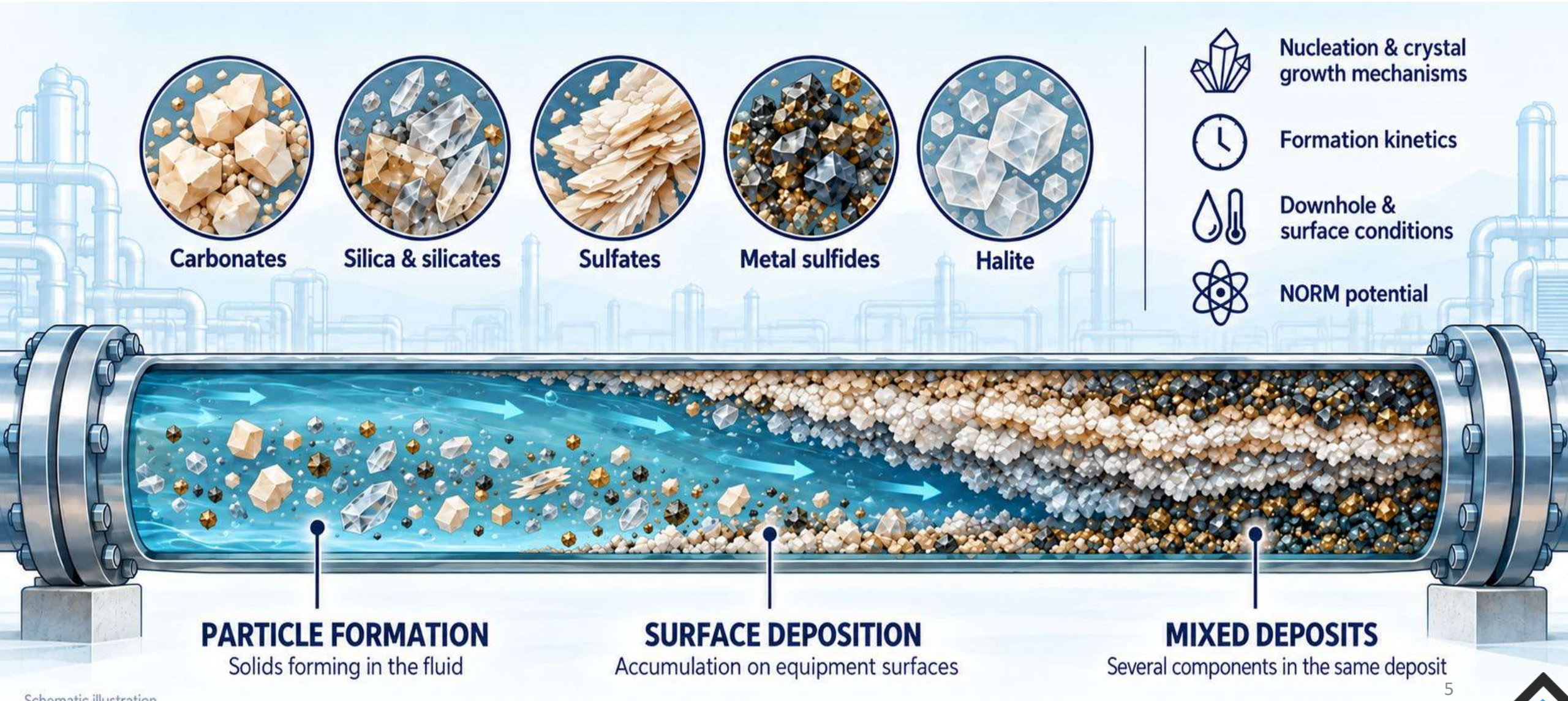
SCALE CONTROL ENABLES GEOTHERMAL PERFORMANCE

Transferring decades of oilfield production chemistry to geothermal challenges



THE COMPLEXITY OF GEOTHERMAL SCALING

Different deposits and changing conditions require tailored treatment



Schematic illustration

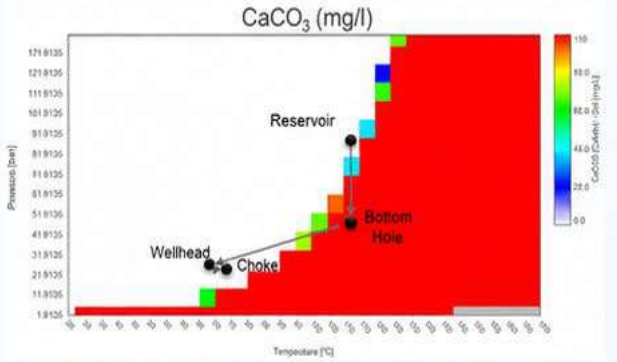
DESIGNING THE RIGHT SCALE INHIBITOR

Translating fluid chemistry and operating conditions into formulation requirements



FROM SCALING RISK TO CHEMICAL SELECTION

Predictive assessment and rigorous qualification under representative conditions



Predictive scale assessment

- Scale species
- Saturation conditions
- Test scenario

DYNAMIC SCALE LOOP



Candidate ranking • Dose response • MIC

Further assessment when needed

When representative DSL deposition is difficult to establish

JET IMPINGEMENT



Surface deposition under controlled flow

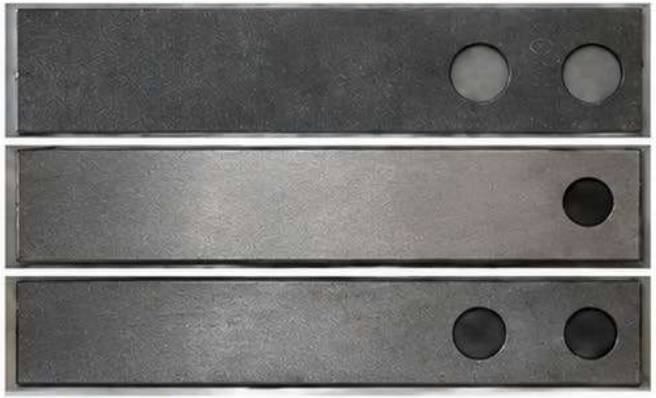
Representative test conditions → Defensible chemical selection

QUALIFYING THE CHEMICAL FOR RELIABLE APPLICATION

Stability, compatibility and injection integrity beyond scale inhibition

MATERIALS COMPATIBILITY

Assess the materials used in the application



- Metals, polymers and elastomers
- Relevant exposure conditions
- Material degradation and corrosivity

BRINE COMPATIBILITY

Assess interactions with geothermal fluids



- Representative geothermal brine
- Relevant concentrations, temperatures and contact times
- Precipitation, haze, gels and phase behaviour

CHEMICAL–CHEMICAL INTERACTION

Assess the complete treatment programme



- Scale and corrosion inhibitors
- Other chemicals used in the system
- Adverse interactions and solids formation

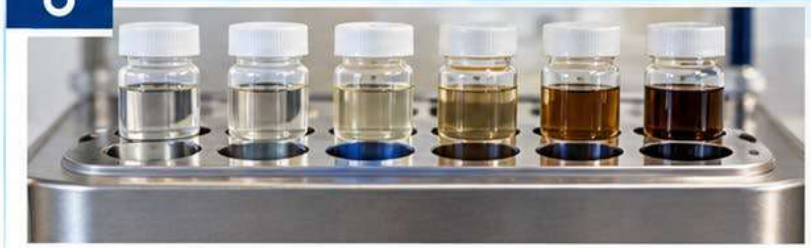
PROCESS-SIDE BEHAVIOUR

Check unwanted effects on operation



- Foaming tendency
- Fluid separation, where relevant
- Effects at the intended treatment dose

THERMAL STABILITY



- Ageing at relevant temperature and duration
- Solids formation and viscosity changes
- Retained inhibition performance

PSEUDO-SCALE AVOIDANCE

Prevent the treatment from creating new deposits

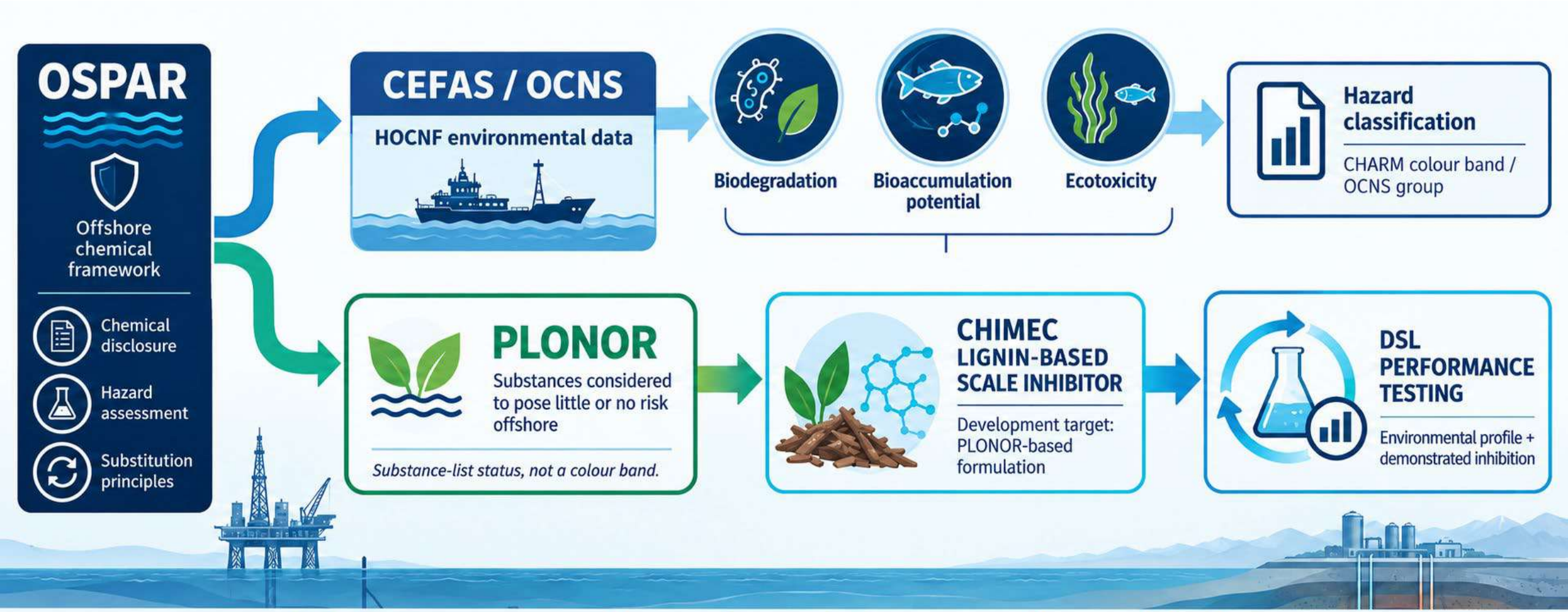


- Chemical–brine reactions
- Chemical–chemical interactions
- Thermal degradation products

Assess against the actual formulation and fluid chemistry

ENVIRONMENTAL PERFORMANCE BY DESIGN

Integrating environmental criteria into geothermal chemical selection



Offshore assessment experience informs geothermal design; application-specific qualification remains required.

ENGINEERING SUSTAINABLE SCALE CONTROL

Lignin-based chemistry assessed against established inhibitors under controlled test conditions



Renewable wood feedstock



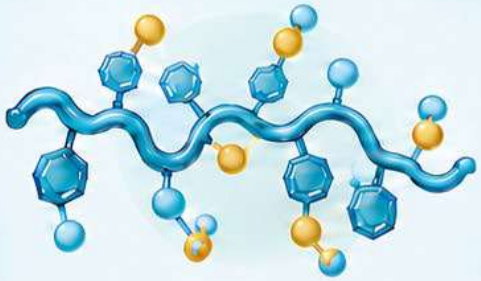
Sulfite biorefining



Cellulose co-product



Lignosulfonate recovery



Tailored scale-inhibitor active

Crystal-growth control • Dispersion

Bio-based lignosulfonate active • PLONOR status reported in supplier documentation

STATIC SCREENING



Tested: Lignin-based active

Benchmarks:

DETPMP + CHIMEC scale inhibitor

Same dose: 10 ppm

50°C • 24 h

$CaCO_3$ system

DSL SCENARIO A



140°C • 72 psi

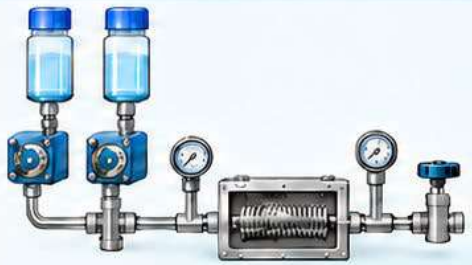
Ca^{2+}: 3,458 mg/L

HCO_3^-: 523 mg/L

Benchmark: CHIMEC inhibitor

CHIMEC reference conditions

DSL SCENARIO B



100°C • 1,200 psi

Ca^{2+}: 1,020 mg/L

HCO_3^-: 1,000 mg/L

Benchmark: DETPMP

ADIPEC reference conditions

Matched conditions within each scenario → Dose series → Reported MIC comparison

VALIDATING PERFORMANCE AND DOSAGE

Comparable static results and higher lignin-based dosage requirements under dynamic conditions

STATIC SCREENING
10 ppm • 50°C • 24 h
Calcium retention (%)

UNTREATED	DETPMP	LIGNIN-BASED	CHIMEC S.I.
61.30%	96.77%	96.77%	98.38%
0 ppm	10 ppm	10 ppm	10 ppm

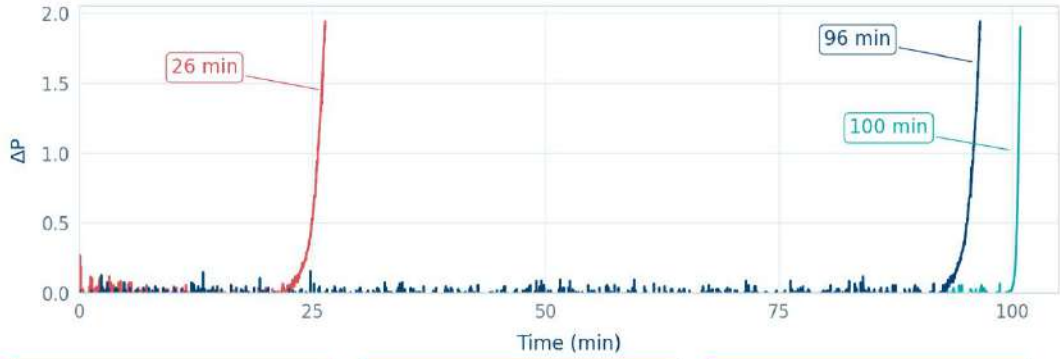
A DYNAMIC SCALE LOOP — 140°C • 72 psi
CHIMEC reference conditions



UNTREATED	CHIMEC S.I.	LIGNIN-BASED
0 ppm	7.5 ppm	30 ppm
19 min to block	117 min to block	83 min to block

Reported MIC: 30 vs 7.5 ppm • Blocking times differ

B DYNAMIC SCALE LOOP — 100°C • 1,200 psi
ADIPEC reference conditions



UNTREATED	DETPMP	LIGNIN-BASED
0 ppm	7 ppm	120 ppm
26 min to block	96 min to block	100 min to block

Lignin dose response: 50 ppm → 36 min | 100 ppm → 60 min

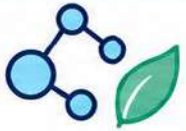
Comparable static screening → **Higher dynamic dose required** → **Performance • Cost • Environment**

CONCLUSIONS & WAY FORWARD

Turning oil & gas innovation into effective, lower-impact geothermal treatments

01  **Advanced oil & gas technologies** can accelerate geothermal treatment development.

02  **Mechanism-based selection**, representative testing and injection qualification support reliable application.

03  **Research into lower-impact chemistries** offers new opportunities for geothermal production.

04  **Lignin-based inhibition** was demonstrated in $CaCO_3$ laboratory tests, with higher doses and less favourable treatment economics.

05  **Renewable origin and a documented PLONOR profile** offer potential environmental advantages, to be assessed at the effective dose.

06  **Transfer technology and research capability** to balance performance, deployability, cost and environmental impact.