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From Loss Control to Long Term Isolation: Field Experience with Dynamic Self-Sealing Barriers in Land and Offshore Wells

EPG dynamic barriers deployed in 30+ land and offshore wells for loss control and permanent isolation.

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Innovative, field proven solutions.

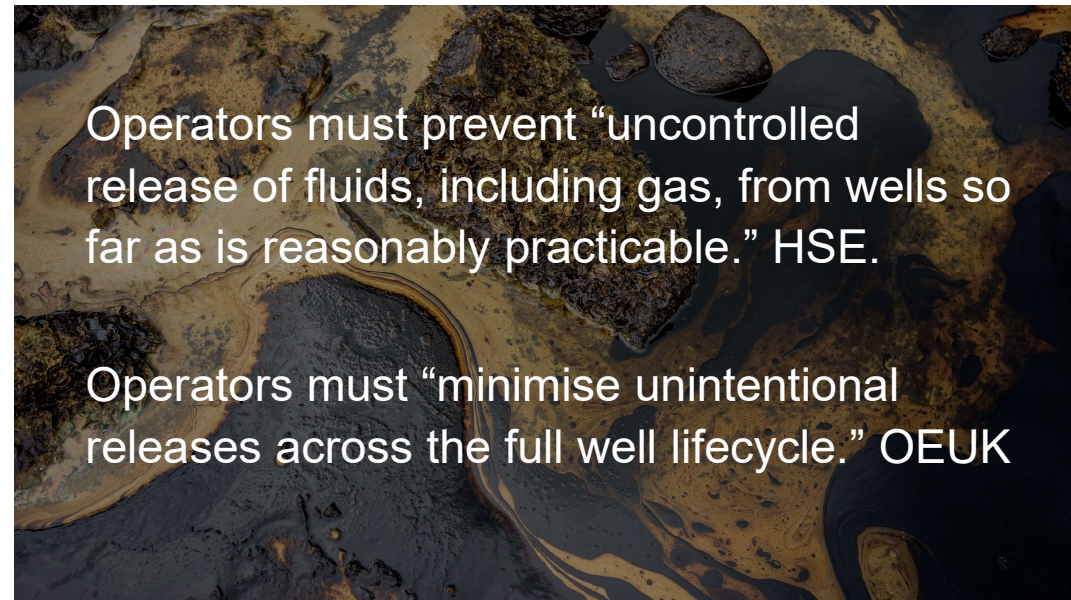


Well Integrity Failures – Why We Must Improve

Traditional methods are must improve

- Legacy wells were not designed with decom / CCUS end-states or alternative barriers in mind
- Wellbores provide a conduit to surface
- Cement is traditional structural & sealing material
 - Cement has high failure rates
 - Gas can form a flow path before it sets
 - Cement shrinks and cracks

Loss of integrity leads to emissions to atmosphere, and contamination of land/water table



A Different Approach

Dynamic Barrier Materials

- **EPG: Expanding Polymer Grain**
- **A dynamic, fast acting, impermeable, flexible and self-healing barrier**
- Blocks leak paths in seconds
 - Cut rig/equipment time, enable cement to work properly
- Fluid deployed, using standard industry equipment
- Small volumes required, small footprint
- Maintains seal under cycling pressure and temperature; self-heals micro-damage under confinement.
- Environmentally friendly material
- Low cost, high value



Fine, dry, EPG particles



Mixed in a carrier fluid



React with second fluid to create dynamic plug

Field Portfolio at a Glance

30+ wells treated (onshore/offshore) across US, Australia, New Zealand, Romania.

Applications:

- Severe loss control and total-loss curing
- SCP and micro-annulus remediation
- Perf-and-squeeze/formation squeeze
- Horizontal zonal isolation
- Plug and milled-window repair.

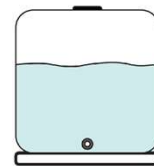
EPG volumes typically <200–1,000 kg and total operation times of 3–6 hours in most jobs.



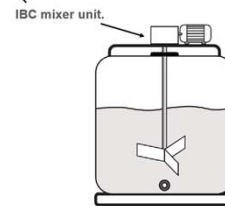
Rig-up from Chevron Barrow Island work, Australia



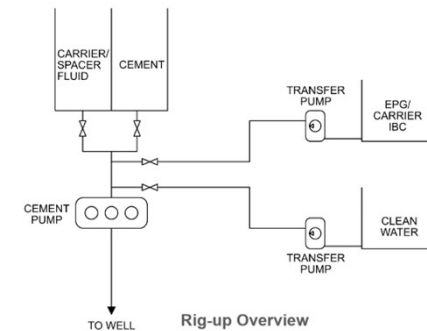
Assure EPG can be mixed in IBC's & tied into fluid end of pump.



IBC with spacer fluid.



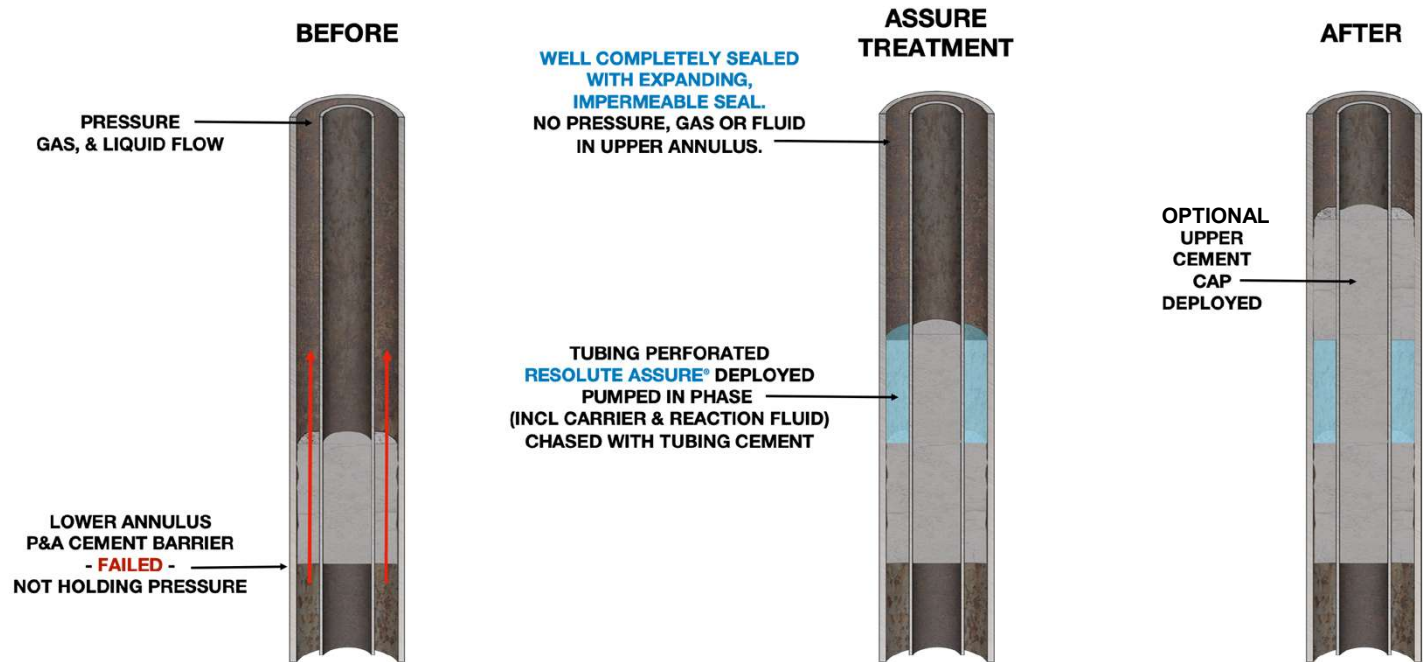
IBC with carrier fluid and EPG. Blended with IBC mixer unit.



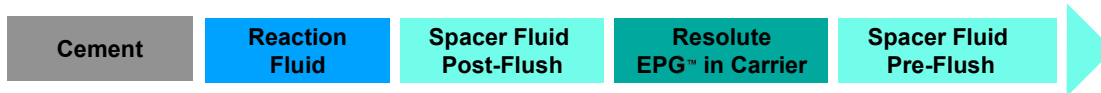
P&A SCP Annular Seal

Case History: Sustained Casing Pressure. Gas Shut-off.

- Rapid **500 psi** SCP build-up confirmed failed annular isolation.
- EPG was pumped from surface using a standard fluid sequence.
- Gas flow and pressure build-up were **stopped**.
- The annulus was stabilised without escalating to more invasive intervention.



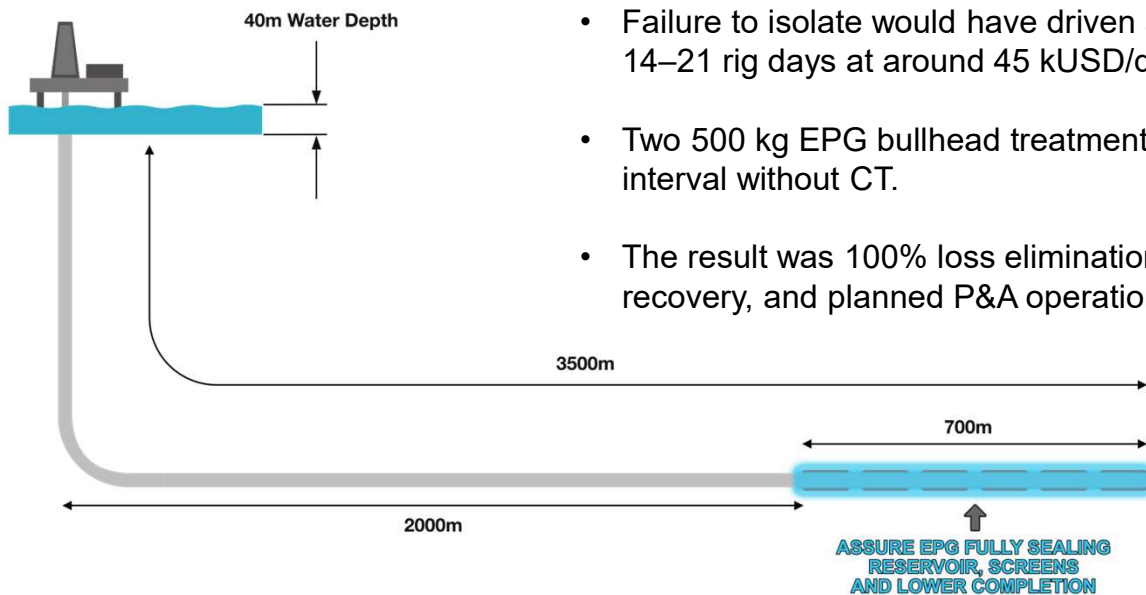
PUMPING PHASES



Horizontal Well P&A

Case History: Total Loss Isolation Enabling Regulator-Compliant Abandonment

- A non-producing horizontal well was taking severe whole losses of about 600 bbl/hr across a 700 m section, preventing maintenance of a full fluid column.
- ESP completion blocked CT or wireline access, while conventional cement squeeze was ineffective in the horizontal geometry.
- Failure to isolate would have driven a contingency plan involving multi-string section milling, adding 14–21 rig days at around 45 kUSD/day.
- Two 500 kg EPG bullhead treatments were pumped from surface at about 6 bbl/min, treating the full interval without CT.
- The result was 100% loss elimination, a successful pressure test to 1100 psi for 1 hour, safe ESP recovery, and planned P&A operations completed on schedule



Result

- ✓ Avoided 14–21 rig days.
- ✓ Restored full fluid column.
- ✓ Enabled regulator-compliant abandonment.

PUMPING PHASES



Failed Bridge Plug/Cement Repair

Case History: Cement Repair, Bridge Plug Repair, Gas Shut-Off, Well Suspension, P&A, Emission Prevention.



- Suspended wells commonly fail at the plug-and-cement interface, creating leak paths that are difficult to repair without major re-entry work.
- In this case, EPG was deployed to re-establish sealing around the failed bridge plug and degraded cement.
- The treatment targeted the leak path directly rather than relying on additional cement placement into an unstable flow regime.
- This type of repair can reinstate integrity in shut-in or suspended wells and reduce the need for more invasive contingency operations.
- It also illustrates the broader dual-barrier concept: use a dynamic barrier to stop movement, then retain or restore the structural barrier system around it.

Conclusions

- 30+ wells show dynamic barriers can move from loss control to permanent isolation support across land and offshore operations.
- EPG has repeatedly sealed flow paths, restored pressure control, and enabled compliant P&A operations in wells where cement alone was insufficient.
- Small volumes and rapid placement can cut repeat remedial work, reduce rig time, and avoid higher-risk intervention scopes.
- Used with cement, dynamic barriers strengthen dual-barrier designs and improve confidence in long-term annular and plug isolation.
- The technology is now moving from successful field application toward broader acceptance within UKCS decommissioning and environmental approval pathways.

Thank You



Iain Lees
Managing Director
iain@resolute-energy.com
+44 7449756262

Emma Lees
Subsurface Director
emma@resolute-energy.com
+44 7817373741

Stuart Greig
Operations Manager
stuart@resolute-energy.com
+44 7860245733

Scott Petrie
Business Development Manager
scott@resolute-energy.com
+44 7391769444

Unit 5-6, Spurryhillock Industrial Estate, Stonehaven, Scotland AB39 2NH
www.resolute-energy.com

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Winners of the 2025 EIC/NZTC Innovation Award



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