

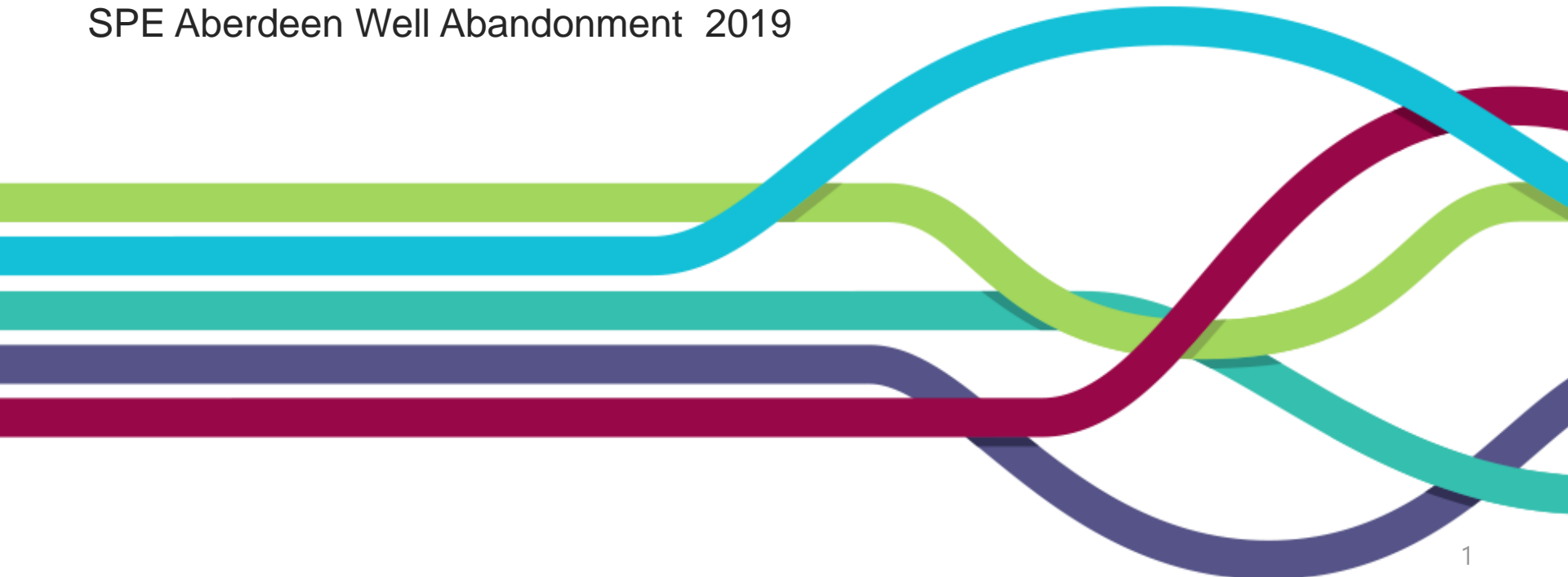


Queen's Award for International Trade 2015

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Creating Scale to isolate the reservoir during Well Abandonment
Paddy Collins Aubin Group

SPE Aberdeen Well Abandonment 2019



CREATING A BARRIER IN THE RESERVOIR



A barrier in the reservoir would

- Prevent inflow of fluid into the well
- Lowers risk
- Reduces rig time
- Lets us “get on the well”
- Allow’s P&A on difficult wells
- Retains well bore access

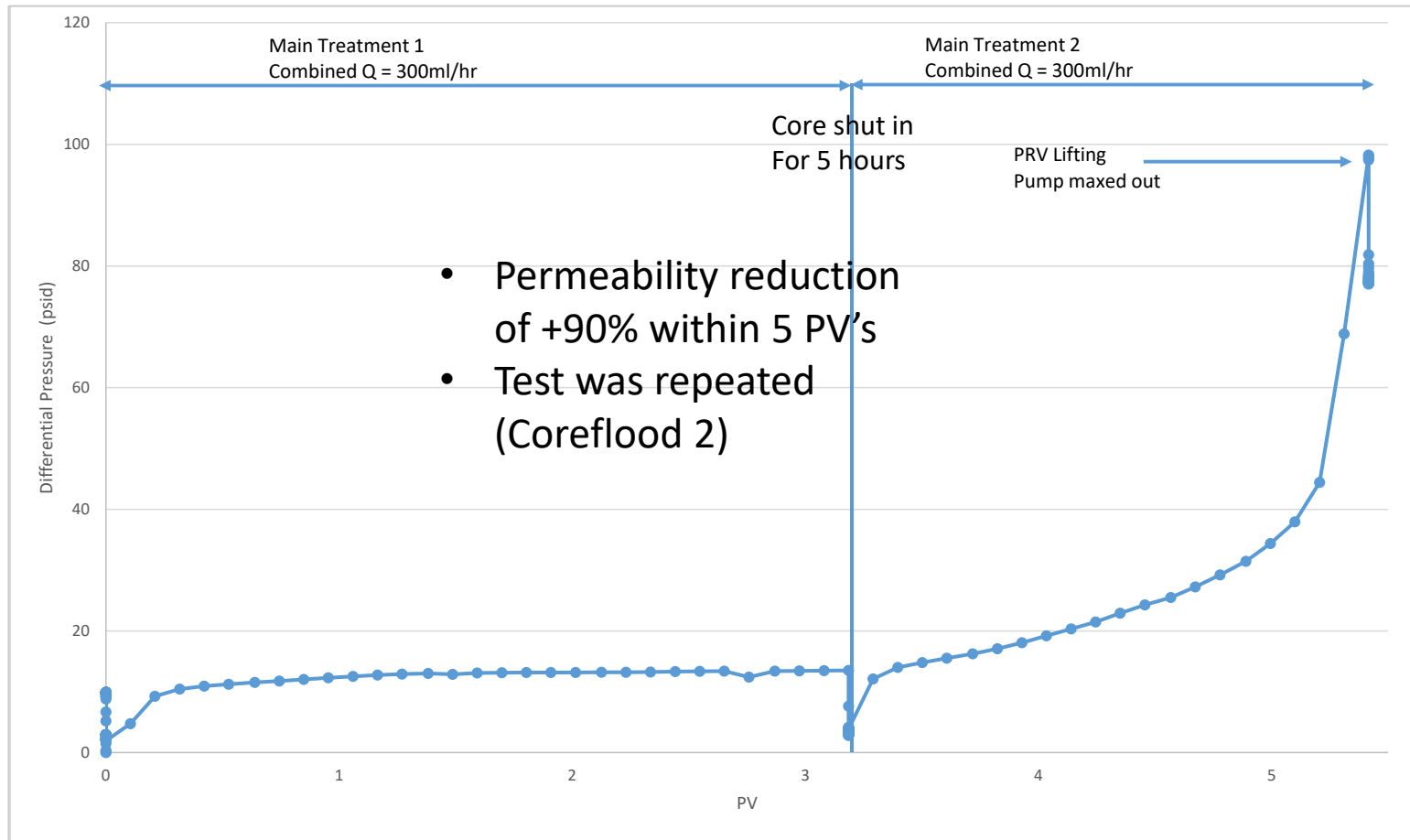
USING SCALE TO CREATE A BARRIER IN THE RESERVOIR

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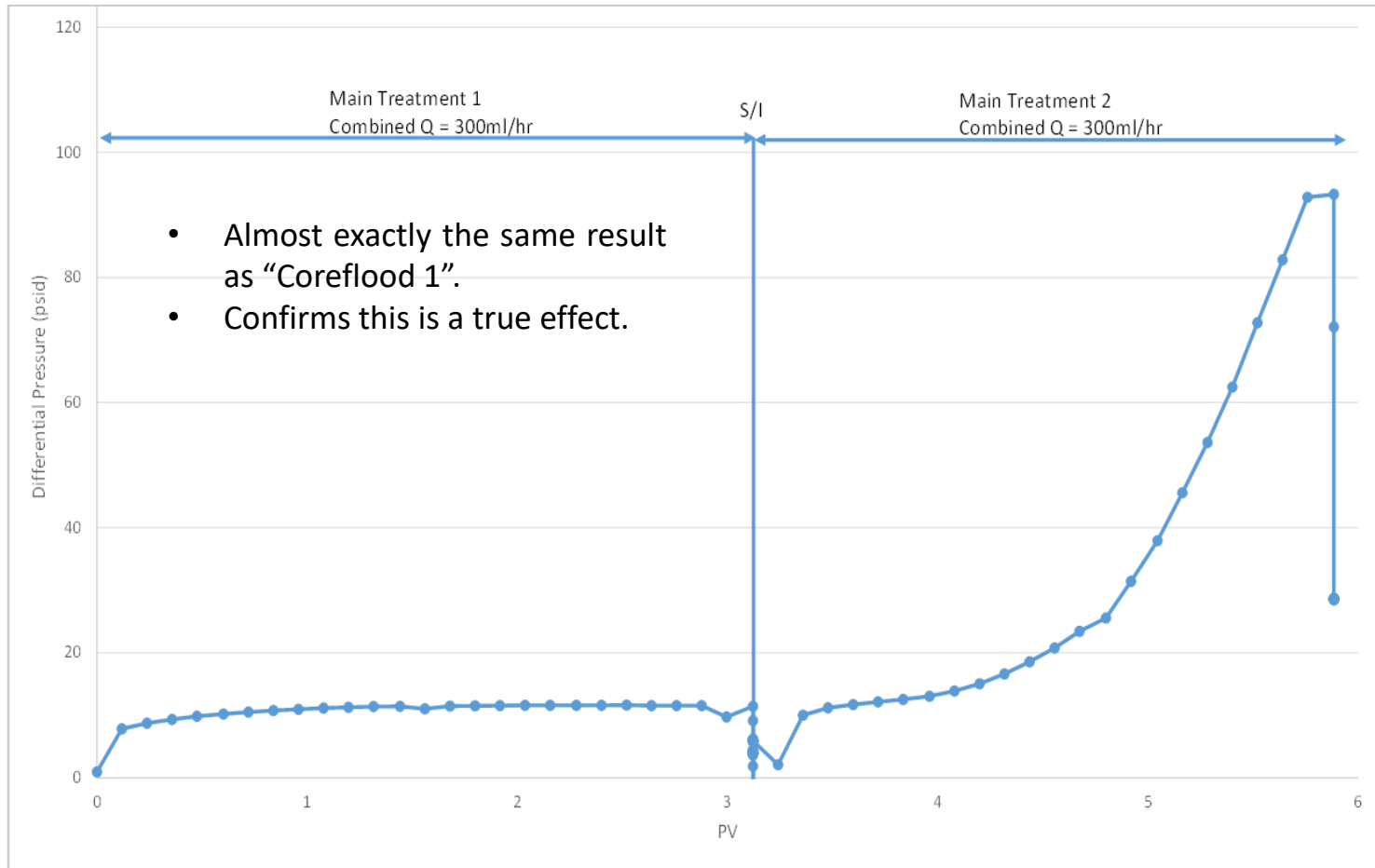


- All components are non hazardous environmentally acceptable .
- Simple, well understood reaction using cheap, readily available materials.
- Fluids are bullheaded and self diverting
- Reaction is controlled until the fluids are in the reservoir.
- Scale reaction is not reversible and a solid mineral is precipitated in the reservoir reducing/blocking permeability in pore throats.
- Independently tested at Heriot Watt University through OGIC

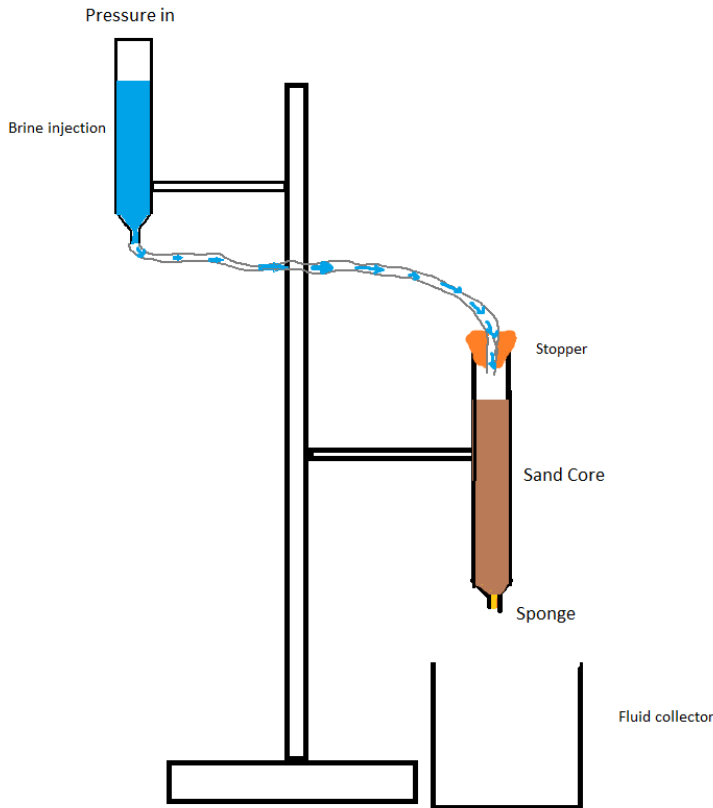
COREFLOOD TESTING – COREFLOOD 1



COREFLOOD TESTING – COREFLOOD 2



SANDPACK TESTING



Pressure was applied using a syringe. Fluid passed through sized building sand – reproduces gravel packs or high permeability zones

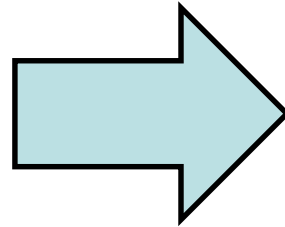
Repeated Heriot Watt treatment procedure:

- **1st treatment** – 50 mL preflush
- **2nd treatment** – 80 mL [$\text{Ca}^{2+} + \text{SO}_4^{2-} + \text{SI}$] solution.
- **3rd treatment** – 20 mL [$\text{Ca}^{2+} + \text{SO}_4^{2-} + \text{SI}$] solution.

SANDPACK TESTING -
24 HOURS POST-TREATMENT

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Before



After



SANDPACK TESTING - RESULTS

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1st treatment – 50 mL preflush

- All fluid passed through with no change

2nd treatment – 80 mL Xclude solution.

- 50 mL of solution passed through the syringe easily.
- Last 30 mL did not pass through and was removed.

3rd treatment – 20 mL Xclude solution

- Fluid flow was completely restricted.



WILL XCLUDE FORM IF LEFT IN TUBING?



Figure 1: *Perspex tubing after 24 hours.*



Figure 2: *Appearance of scale after 3 days.*

XCLUDE TREATMENT DESIGN



- Stage 1: Injectivity test
- Stage 2: Initial Xclude treatment
- Stage 3: Shut in well
- Stage 4: Second Xclude treatment
- Stage 5: Post flush



Benefits



- Simple, low risk approach to P&A.
- Uses non-hazardous chemicals to form a stable mineral, creating a barrier in the reservoir.
- Compatible with Well Intervention technologies
- Does not need a rig, chemicals are applied by bullhead, saving significant time and money
- Can be applied using standard tools and techniques