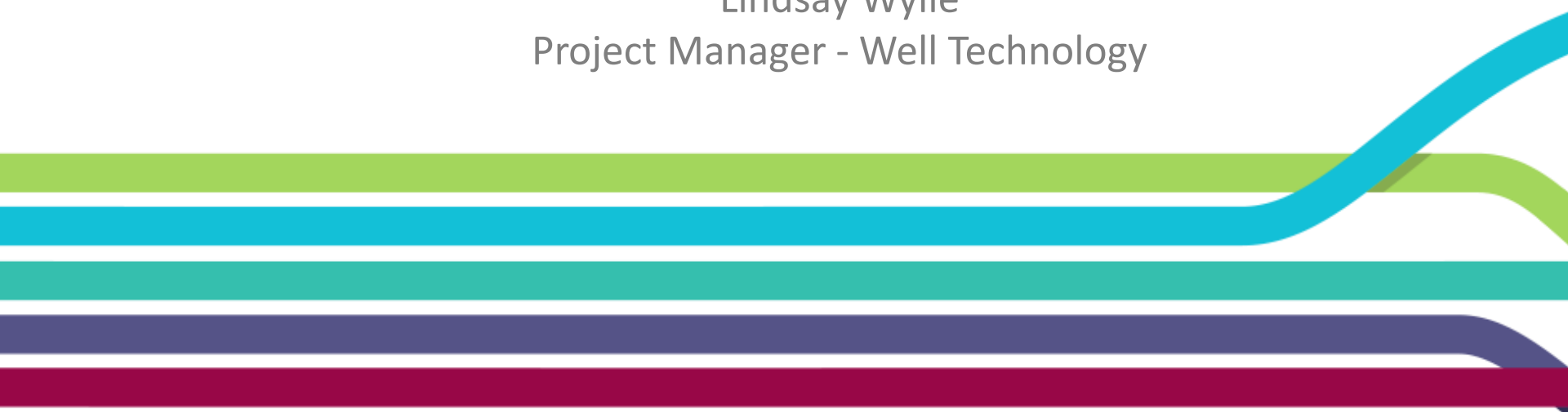


# XCLUDE™

## INDUCED FORMATION DAMAGE FOR WELLBORE ISOLATION

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Project Manager - Well Technology



# CCS – THE PROBLEM

Depleted oil and gas reservoirs offer potential storage option for CCS.

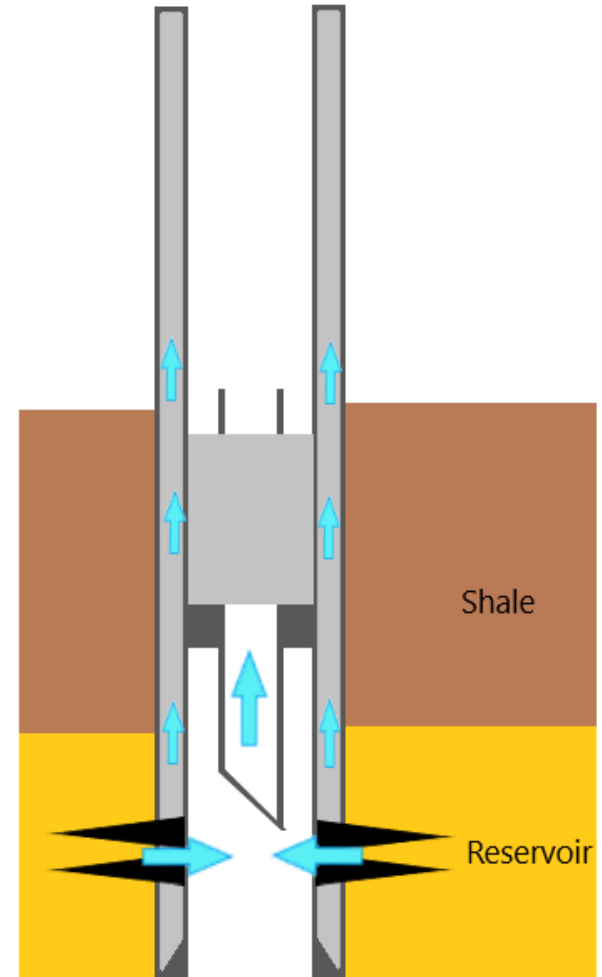
These fields already have many wells; some producing, some suspended, some abandoned.

Could we reuse the old infrastructure for CCS?

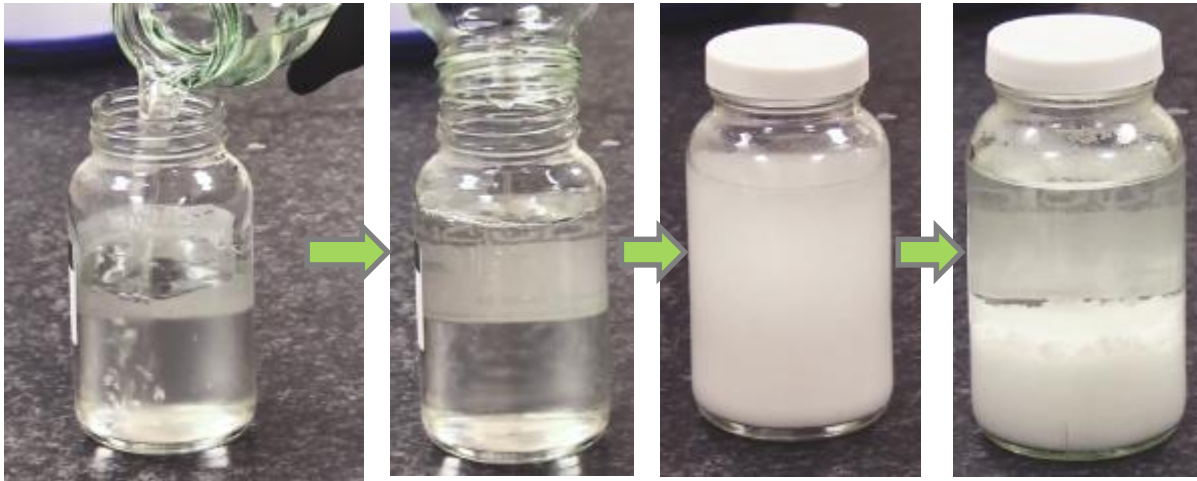
- Possibly, although may prove difficult.
- Wells were not designed for CO<sub>2</sub> injection (e.g. Portland cement)
- Integrity can be variable.

Similar issues with new CCS injection wells.

Require an alternative barrier material, resistant to CO<sub>2</sub>, which can prevent leaks behind casing and in wellbore.



# XCLUDE - INDUCED FORMATION DAMAGE



Sandpack Before Treatment



Sandpack After Treatment



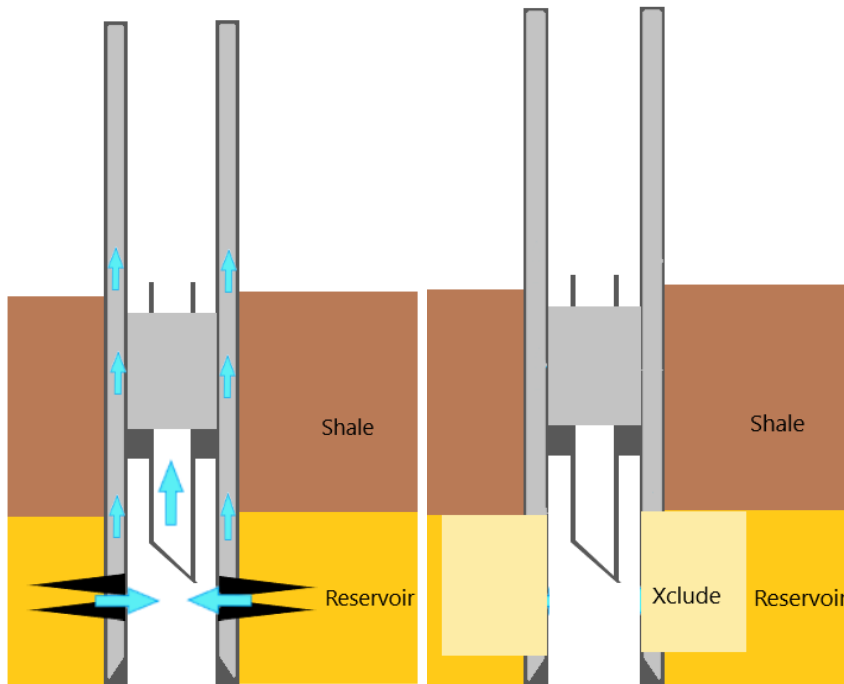
- Simple, well understood reaction and material
  - industry is familiar with calcium sulfate scale and loss of production it can cause
  - Insoluble in supercritical CO<sub>2</sub>
- Reaction is controlled until the fluids are in the formation
  - solid mineral forms in pore throats of rock to reduce permeability
- Independent coreflood testing by Heriot Watt University showed permeability reduction >99 %.

# HOW DOES THIS SOLVE THE PROBLEM?

## DURING WELL ABANDONMENT

Poor cement integrity in annulus or wellbore leads to CO<sub>2</sub> escape.

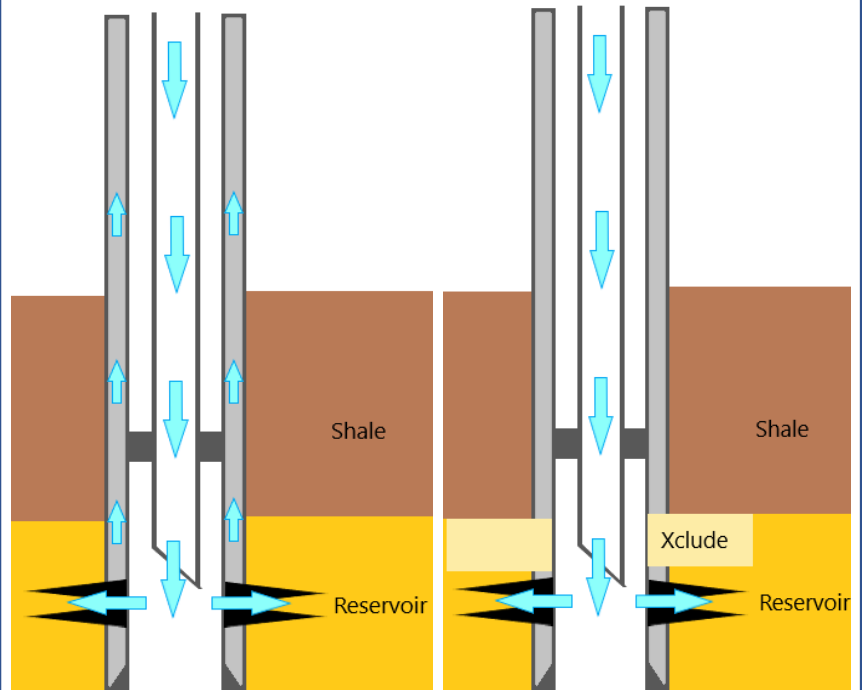
Abandon well by treating perfs with Xclude before placing wellbore plug.



## ANNULAR CEMENT ISSUES

Poor annular cement integrity leads to CO<sub>2</sub> escape and sustained casing pressure.

Perforate casing at top of reservoir and seal annulus and near wellbore formation with Xclude.



# SUMMARY AND BENEFITS OF XCLUDE



- Forms a stable mineral to reduce formation/microannuli permeability for zonal isolation or abandonment
- Uses non-hazardous, environmentally responsible chemicals
  - OCNS registered
- Can be applied using established technologies
  - Bullhead for well abandonment
  - “Perf and Xclude” for behind casing flow, e.g. through annular cement or microannuli
- Could facilitate reuse of redundant oil and gas infrastructure for CCS
  - Improved abandonment of any wells in CCS reservoir (oil and gas or CO<sub>2</sub> injection)
  - Seals leak paths in injection wells prior to use

