MIRECOL – DEVELOPING CORRECTIVE MEASURES FOR CO₂ STORAGE

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CURRENTLY AVAILABLE TECHNIQUES

Existing techniques
- Pressure management = suspend injection
- Back production of CO₂
- Well remediation techniques
MIRECOL OBJECTIVE

- To develop a toolbox of techniques available to mitigate / remediate undesired migration or leakage of CO₂
  - Support the definition of corrective measures plans
  - Help building confidence in deep subsurface storage of CO₂
CORRECTIVE MEASURES

- MiReCOL: near-reservoir action
- In reservoir: flow control
- In or near faults: fault properties control
- In or near wells: casing, cement, string, etc

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<tr>
<th>Foam injection for flow diversion</th>
<th>Gel injection as a sealant</th>
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<td>Immobilization of CO2 with solid reaction products</td>
<td>Foam injection as a sealant</td>
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<td>Combined water injection and production</td>
<td>Polymer resin for squeezing</td>
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<td>Lowering reservoir pressure using nanoparticles</td>
<td>Near-surface remediation</td>
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<td>Flow diversion to nearby compartment</td>
<td>Venting the well</td>
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<td>Water injection</td>
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<td>Relief well for a leak through formation (external leak)</td>
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<td>Replace leaked completion string</td>
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<td>Squeeze cementing for an annulus leak</td>
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<td>Internal / external casing patch</td>
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Remediation with 2 hydraulic fractures

- One 2-inch lateral of 100m long: unintended migration stopped after 130 days.

Remediation with deviated well

**DIVERSION OF CO₂ TO NEARBY RESERVOIR COMPARTMENTS**
SURFACTANT INJECTION INTO FAULT

Imperial College
FOAM INJECTION TO STOP A LEAK

IFPEN, TNO
SUCCESS RATES
PERFORMANCE INDICATORS

Accelerating convective mixing

Injection scenario adaptation
RESULTS OF THE PROJECT: CORRECTIVE MEASURES TOOL

- Web-based tool: advises on suitability of remediation and mitigation options for a specific site and a specific leakage scenario
  - Tool informs operators, regulators
  - Provides first assessment of options available to operator to remediate or mitigate undesired migration in or leakage from storage complex

Example of input & output from web-based MiReCOL corrective measures tool
CONCLUSION

The EU FP7 MiReCOL project:

- Studied a large number of existing and potentially useful techniques to correct a ‘significant irregularity’ in CO₂ storage projects
- Focus was on remediation in or near the reservoir
- Generated a database of scenarios for each technique
- Built an interactive webtool that opens this database for operators and regulators
- Combined all reports and results into online handbook

Project website

- [www.mirecol-co2.eu](http://www.mirecol-co2.eu) (project results)
- [Tool.mirecol-co2.eu](http://Tool.mirecol-co2.eu) (web tool)
Mitigation and Remediation of CO$_2$ Leakage

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THANK YOU FOR YOUR ATTENTION

Take a look: TIME.TNO.NL