

SUITABILITY, SAFETY & EFFECTIVENESS: RISK-REDUCING ANALYSES START HERE.

The demand for CO₂ sequestration in oil reservoirs, coal seams, and deep saline aquifers continues to grow. **Weatherford Laboratories** is the science resource you want on your side as this environmental initiative expands in key areas around the world.

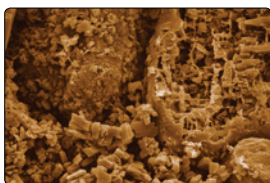
Our exemplary understanding of CO₂ sequestration stems from the industry's strongest background in core analysis and laboratory testing. It lets us offer significant assistance in determining how much CO₂ can be stored in specified geological formations. In addition, our experience with large-scale composite core stacks results in accurate displacement testing, yielding lab models that closely represent the reservoirs being evaluated.

Weatherford Laboratories' people and processes quantify data to more precisely categorize subsurface structures and identify good primary and backup shale seals. You get greater definition of a basin's sequestration potential and better assessments of a specific site's integrity and safety.

HISTORY

Experience

- Over 200 core displacement tests in the area of sequestration testing and evaluation
- Numerous reservoirs screened for acid gas injection
- Government-sponsored research in over 20 reservoir applications



Patents/Papers

- Patent 6,412,559 "Process for Recovering Methane and/or Sequestering Fluid" (July, 2002)
- Over 15 recent technical papers on acid gas sequestration and containment

Notable Projects

- Acid gas sequestration for the Alberta, Canada government in the Keg River area
- Design of CO₂ injection into the EnCana Weyburn field

ON THE CUTTING EDGE OF "GREEN" CO₂ SEQUESTRATION INITIATIVES.

Characterizing Sequestration Zone Candidates

- Establishes target intervals that have suitable storage capacity/flow properties to accept CO₂ gas

Scaling and Containment Capacity

- Evaluates the cap rock above sequestration zones to ensure that leakage potential is minimized

Acid Gas Transport Properties

- Measures exact downhole condition viscosity, density and phase condition of acid gases

Cement and Wellbore Packer Evaluation with Acid Gases

- Evaluates the short and long term mechanical integrity of abandoned well casing, tubing strings and cement sheaths

Acid Gas Subsurface Transport Properties

- Quantifies all parameters of acid gas to be injected; viscosity, density and phase behavior

Finding Formation Damage Mechanisms with Acid Gas Injection

- Identifies root causes of injectivity impairment with potential remediation options

CO₂ Sorption Characteristics

- Determines the sequestration capacity as the direct sorption properties of CO₂ are understood at reservoir conditions

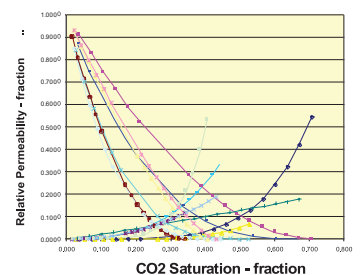
Sequestration Prediction, Monitoring and Verification

- Provides oversight and evaluation of CO₂ sequestration projects

INNOVATIONS

Processes

Lab equipment procedures for HPHT reservoir evaluation of CO₂ injection operations in situ at reservoir conditions



Equipment

Optimization of Cambridge electro-magnetic viscometer for gas-phase viscosity measurements at pressures to 20,000 psi and temperatures to 400°F

Honors

Co-authored many publications with Dr. Stefan Bachu who won the Nobel prize, along with Al Gore, for his work in CO₂ sequestration and capture studies

TURNKEY SERVICES SUPPORT YOUR CO₂ SEQUESTRATION PLAYS.

WELLSITE

- Wellsite Personnel for Core Stabilization, Packaging & Transport
- Aluminum 4x4x4 Core Transport Containers
- Portable Wellsite Gamma
- Wellsite Plug Drilling for Saturation Studies



CORE PROCESSING

- Specialized Slabbing Techniques to Optimize Photography and Sedimentological Studies
- Specialized Plugging Techniques to Preserve As-Received Saturations
- Proprietary Procedures to Minimize Evaporation



PHOTOGRAPHY

- High Resolution Core Photography in Multiple Formats

CORE STORAGE & VIEWING

- Core Storage Facilities at 5 Temperatures Ranging from Ambient to Dry Ice
- State-of-the-Art Core Viewing Rooms



PROJECT MANAGEMENT

- Secured Client Websites for Data Retrieval & Archival
- CoreTrac™: Internal Management Information System for Project Tracking, Accessible Worldwide

CO₂ SEQUESTRATION LABORATORY TESTS

GEOLOGY

- CT Scanning and Evaluation
- Scanning Electron Microscopy (SEM)
- X-Ray Diffraction (XRD)
- Bulk & Clay Mineralogy
- Detailed Core & Fracture Descriptions
- Thin Section Preparation
- Thin Section Analysis
- EPI Fluorescence Microscopy

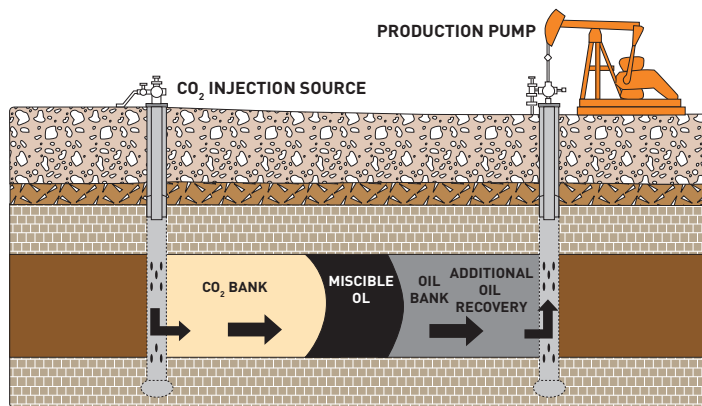
ADVANCED CORE ANALYSIS

- Preliminary Fluids Analysis of Separator & Bottom Hole Samples
- Recombination of Separator Samples
- Rising Bubble Apparatus (RBA) for Minimum Miscibility Scoping
- Slim Tube Testing
- Pressure Composition Diagram
- Multi-Contact Ternary Phase Diagram
- Reservoir Conditions Interfacial Tension Measurements (IFT)
- Constant IFT Relative Permeability Measurements

- Equation of State Modeling
- Threshold Pressure Testing
- High Pressure Mercury Injection Capillary Pressure
- Gas Displacement Flooding at Reservoir Conditions

ROCK MECHANICS

- Unconfined and Triaxial Compressive Strength Tests
- Static Young's Modulus and Poisson's Ratio
- Mohr-Coulomb Failure Analysis
- Acoustic (Ultrasonic) Velocity Test
- Compressional (P) and Shear (S) Wave Velocities (1MHz)
- Dynamic Elastic Parameters



EXPECT MORE FROM WEATHERFORD LABORATORIES.

At Weatherford Laboratories, we hold fast to Higher Standards. Our purpose is to continually push past conventional solutions to find new and better ways to optimize oil and gas production.

With 38 laboratories around the globe, our team raises the bar for wellsite sampling, core management services, geochemical analyses, and evaluation of traditional and unconventional reservoirs.

At Weatherford Laboratories, we expect more from ourselves so you can expect more from us.

38

LABORATORY LOCATIONS

18

COUNTRIES

1

WORLDWIDE RESOURCE

38 LABORATORY LOCATIONS IN 18 COUNTRIES

NORTH AMERICA

Canada
United States

EUROPE

Norway
United Kingdom

LATIN AMERICA

Brazil
Mexico
Trinidad
Venezuela

MIDDLE EAST / NORTH AFRICA

Kuwait
Libya
Oman
Saudi Arabia
United Arab Emirates

ASIA PACIFIC

Australia
India
Malaysia
Thailand
New Zealand

For contact information, please visit our website:
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