PETROLEUM RESERVOIR ENGINEERING, CARBON CAPTURE & STORAGE

RESEARCH GROUP: Villiam Bortolotti, Paolo Macini, Ezio Mesini
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The research activity of the group concerns the study, the development and the use of numerical codes for the simulation of hydrocarbons and other underground fluids reservoirs, including the study and the modelling of pollutant transport in ground water.

Among other experimental research in the field of reservoir engineering, petrophysics and rock mechanics are the following:
- Non-Darcy flow in porous media, observed in gas wells when the fluids converging to the wellbore attains the velocity peculiar of turbulent flow. In that case the use of Darcy law would lead to inaccurate production performances evaluation.
- Measurement of rock compressibility at great depth, at confining pressure up to 150 MPa. The experimental apparatus has been designed to perform both static and dynamic measurements.
- EOR and wettability reversal studies, including lab studies on reservoir rock and fluid properties (interfacial tension, wettability, etc.). Flooding efficiency curves are obtained and used as a criterion to evaluate the performance of wettability reversal, which seems to improve oil recovery in fractured carbonate reservoirs, where oil cannot be economically produced.
- CCS application (reservoir assessment, site evaluation, injection modeling). The widespread application of CCS depends on technical maturity, costs, overall potential, diffusion and transfer of the technology to developing countries and their capacity to apply the technology, regulatory aspects, environmental issues and possible problems of public perception and acceptability.
- Hydraulic conductivity of rocks and soils, featuring experimental studies on the physico-chemical interactions occurring between saturating fluids and permeability of natural porous media. These studies are aimed to aid the design of waste disposal sites (with potential release of bottom liquids), including safety criteria management. Other theoretical and lab studies concern the relationships between petro-physical properties of porous media, with particular reference to the effects of grain size distribution and porosity on hydraulic conductivity of soils or loose formations.

Fig. 1. Drilling fluids testing facilities, Petroleum Engineering Lab (picture by P. Macini).

Fig. 2. Permeability measurements, Petroleum Engineering Lab (picture by P. Macini).

Fig. 3. Soxhlet extractor, Petroleum Engineering Lab (picture by P. Macini).
MAIN PUBLICATIONS


Bortolotti, V., Macini, P., Srisuriyachai F., Wettability Index of Carbonatic Reservoirs and EOR: Laboratory Study to Optimize Alkali and Surfactant Flooding, Paper SPE 131043, CPS/SPE International Oil & Gas Conf. and Exhib. in China., Beijing, 8-10 June 2010.


CONTACTS
villiam.bortolotti@unibo.it
paolo.macini@unibo.it
ezio.mesini@unibo.it