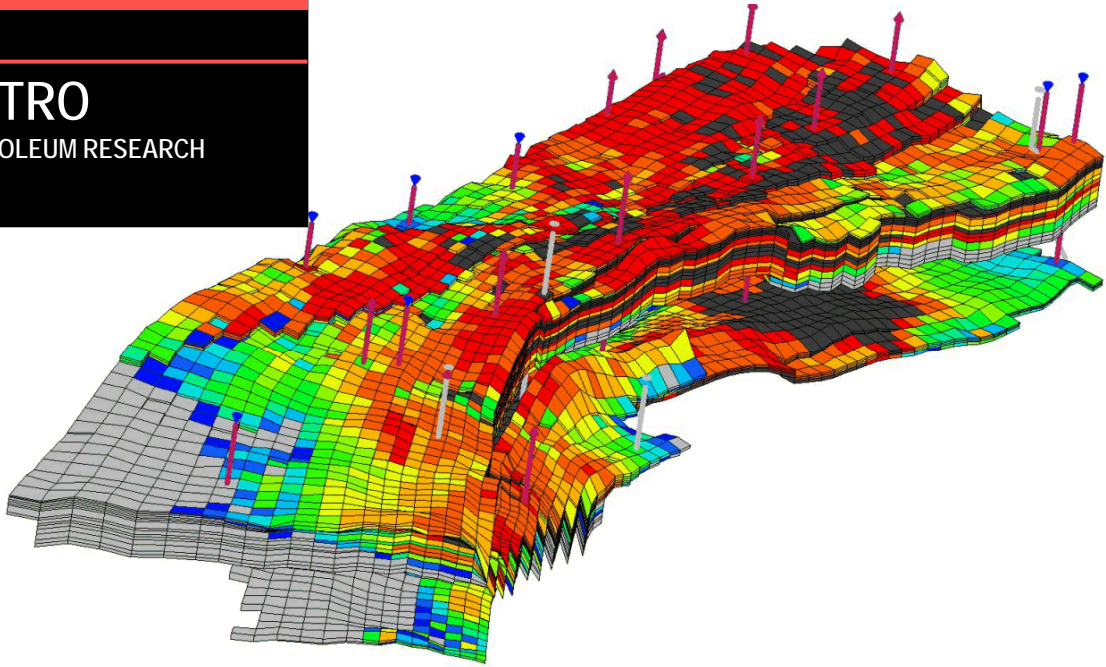


PETRO

PETROLEUM RESEARCH



Department for

RESERVOIR AND EXPLORATION TECHNOLOGY

- Research and development of experimental and theoretical methods in tracer technology for monitoring of petroleum reservoirs in well-to-well studies of fluid flow (injection water and injection gas) and in mass transport studies in wells and process plants.
- Implementation of these methods in field operations world-wide.

ACTIVITIES

The department's main activities include research and development projects and offering of specialized service operations based on this research to the industry within specific areas of energy and environmental technology. We have a particular focus on improved oil recovery and optimized reservoir management. Crucial in this field are the following technologies and activities:

Tracer technology, radiochemistry, applied nuclear technology, chemical and radiochemical analyses, modelling and simulation of fluid (and tracer) flows in porous media, geostatistic, reservoir modelling specialities and specialities within geophysics.

CAPACITY

The department's ability to perform research and development, as well as specialized service operations in the field, at an advanced level, is funded on close contact with Norwegian and international industry clients and academic institutions. IFE has over the years kept a close cooperation with national and international oil companies on further development of tracer technology for reservoir examinations. Manpower- and instrumental capacity is constantly built up to meet expected demands of capacity, flexibility and quality from the oil companies, who are our main customers.

CUSTOMERS

A combination of basic and applied research in well-sized industry projects, together with demonstrations of developed technologies in complete field examinations, has made IFE an internationally well-reputed institution within field-related tracer technology. We have particularly emphasized the importance of developing technology for use in well-to-well examinations, and our methods today represent state-of-the art. Norwegian and international oil companies are among our most important collaboration partners, sponsors and customers during the last 15 years. Examples of these are: Amerada Hess, BP, Conoco-Phillips, Cepsa, Mobil, Norsk Hydro, Petrobras, PDVSA, Statoil, Total, Wintershall, etc.

RESEARCH

IFE performs basic and applied research within reservoir- and exploration technology. This research is of experimental and theoretical nature. A considerable selection of modern laboratory instrumentation and tailor-made laboratories make possible projects within fields like increased oil recovery, reservoir evaluation, smart wells, studies and surveillance of process equipment and methods for tracer based control of multiphase transportation.



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DEPARTMENTS AT IFE

HALDEN

COMPUTERISED OPERATION SUPPORT SYSTEMS
DATA PRODUCTION AND EVALUATION
EXPERIMENT ENGINEERING
INDUSTRIAL PSYCHOLOGY
OPERATION CENTRES
RADIATION PROTECTION
REACTOR OPERATION AND ENGINEERING
TEST RIG DESIGN AND PRODUCTION
VISUAL INTERFACE TECHNOLOGIES
NUCLEAR MATERIALS TECHNOLOGY
ICT RISK AND DEPENDABILITY

KJELLER

ENERGY SYSTEMS
PHYSICS
ISOTOPE LABORATORIES
MATERIALS AND CORROSION TECHNOLOGY
EL. BEAM WELDING/MECHANICAL WORKSHOP
HEALTH AND SAFETY
ENVIRONMENTAL TECHNOLOGY
PROCESS AND FLUID FLOW TECHNOLOGY
REACTOR OPERATION
RESERVOIR AND EXPLORATION TECHNOLOGY

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Tracer Analysis

Section Head:
Claus Galdiga

Field Studies

Section Head:
Sven Kr. Hartvig

Reservoir Modelling

Section Head:
Jiri Müller

RESERVOIR AND EXPLORATION TECHNOLOGY

FURTHER MAJOR ACTIVITIES

NANO-Tracers

A new Strategic Institute Program (SIP) named "New functional tracers based on nanotechnology and radiotracer generators" with the purpose to develop functional nano-sized particle tracers which can be functionalized to become lipophilic or hydrophilic and also have the property to react on external stimuli such as pH, temperature etc. The particles are analyzed by laser-induced fluorescence or by radioanalytical techniques when they are labelled with a radioactive atom.

Tracer development for interwell examinations – The "Tracer Club"

The main development of tracer technology for interwell examinations has taken place in the so called "Tracer Club" here at IFE. This is a joint industry program (JIP) between IFE and several oil companies. Since 1991 the IFE "Tracer Club" has gone through different phases, each of them with a definite name. The present phase, which is from 2002-2007 is called "ReTrac - tracer technology in advanced reservoir evaluation programs". The program comprises development of new tracer methods within general tracer technology, reservoir monitoring and well monitoring. This program is now about to be followed by the new "TracEOR" (2008-2012) which will focus somewhat more on tracer technology for enhanced oil recovery operations.

Process studies by means of nuclear methods and tracer technology

1. The new SIP also includes development of radiotracer generators for short-lived radiotracers based on radionuclide generator principles.
2. Studies of transport and liquid accumulation in transportation pipelines for wet gas.
3. Studies of efficiency and operational parameters in separators and scrubbers.

Flow assurance- scale problems

1. Lab. studies of kinetics and effect of inhibitors for precipitation of carbonate and sulphate scale.
2. Lab. experiments and modelling of CaCO₃ precipitations, cooperation with NTNU, SINTEF and Statoil.

Enhanced Oil Recovery

Laboratory studies on the potential use of CO₂ (supercritical or not) in combination with polymer and surfactants to improve mobility ratio and sweep efficiencies.

Reservoir- og well-related modelling

1. Modelling and simulation of well-to-well tracer transport in water and gas injections.
2. Development of near-well models for studies of scaling and inhibition in near-well zones.

Field activities

The department has continuously a number of field examinations running. Areas:

1. Well-to-well tracer studies of injection fluids (flow fields and flow volumes).
2. Studies of operations in wells (leakages, fluid infiltrations in cores, etc.).
3. Studies of downstream processes (separators, scrubbers, transportation pipelines for wet gas, etc.).



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