Center for Research-Based Innovation
for
Integrated Operations
at
NTNU/SINTEF/IFE

Professor Jon Kleppe, NTNU
The objective of the new center is to develop new knowledge, methods and tools for the next generation Integrated Operations solutions.
Oil and Gas Production of the Past
Oil and Gas Production of the Future
<table>
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<th>MAIN RESEARCH PARTNERS</th>
<th>INDUSTRIAL PARTNERS</th>
<th>GOVERNMENT</th>
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<td>IFE Institute for Energy Technology</td>
<td>NTNU Innovation and Creativity</td>
<td>SINTEF</td>
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Budget: 40 million NOK per year for 5 – 8 years

Personnel
• 25 research scientists from NTNU/SINTEF/IFE
• 30 Ph.D. candidates (during 5 years period)
• 15 professors from NTNU
• Researchers from international leading universities
• Specialists from the industrial partners (pilot projects, workshops etc.)

Research facilities
• Research laboratories at NTNU/SINTEF/IFE in Trondheim, Bergen and Halden
• Pilot testing at oil companies and service companies
POTENTIAL VALUE OF INTEGRATED OPERATIONS on the Norwegian Continental Shelf

250,000,000,000 NOK increased NPV*

Required investment: 25,000,000,000 NOK

*Report from the Norwegian Oil Industry Association (April 2006)
The added value stems from

- Increased oil and gas recovery
- Accelerated production rate
- Reduced costs
- Extended life of fields
- Higher safety levels
The focus of the center will be on 4 major programs:

1) **Drilling and Well Construction,**
2) **Reservoir Management and Production Optimization,**
3) **Operation and Maintenance,** and
4) **Integration Across Disciplines**
Center Program 1: Drilling and Well Construction

- Drilling simulation and visualization in real time
- Model predictive control
- RT Diagnosis and Advisory
- Business cases
Center Program 2: Reservoir Management and Production Optimization

- Reservoir modeling
- Reservoir simulation
- Model predictive control
- Real time optimization
Center Program 3: Operations and Maintenance

- Technical performance measurements
- Real time maintenance and process control
- Operation support
- Business cases
Center Program 4: Integration Across Disciplines

- Work processes
- Communication and ICT systems
- Safety aspects of IO
The oil industry in Norway is currently investing heavily in IO in order to harvest the potentials estimated by OLF.
The oil industry in Norway is currently investing heavily in IO in order to harvest the potentials estimated by OLF.

Is there room for or need for contributions from universities and research institutes?
The three main research partners have around 7,000 employees and 20,000 students in virtually all areas of science and technology.
In a university and research institute setting, research and development may be more exploratory and longer term than in industry
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A good mix of experienced researchers and students may lead to unexpected results.
A close relationship between the researchers in the IO Center and the industry through pilot projects will ensure the relevance of the research in the center.
International “scouting” will be focussed on.

Close cooperation internationally will create synergies and prevent re-invention of the wheel.
Each program will have projects along the axes:

- Research
- Education
- Innovation
RESEARCH CHALLENGES FOR INTEGRATED OPERATIONS

Visualization

Data processing

Sensor technology and automation

Smarter decisions

Geographically dispersed teams

Wearable computing
THE FUTURE PETROLEUM ENGINEER

EDUCATIONAL CHALLENGES

TRADITIONAL UNIVERSITY EDUCATION

- Discipline oriented
  - Geology
  - Geophysics
  - Drilling
  - Production
  - Reservoir
  - Operations
  - Marine
  - ........

THE FUTURE PETROLEUM ENGINEER

- Integrated Operations:
  - Skills in teamwork – digital environment

- Discipline orientation

- Multi-disciplinary knowledge
EDUCATIONAL GOAL

During 5-year period:

• 150 Master candidates
• 30 Ph.D candidates
• 400 Continued education participants from the industry
GOALS FOR INNOVATION

The research activities in the IO Center shall lead to innovation in the petroleum industry.

- **Oil companies and suppliers**

  *Pilot projects*: New methods, work processes and information systems to be tested out in the companies.

  *Implementation of results*: implementation of new work processes and systems in the oil companies, new products and services from the supplier companies

- **New companies**

  The Center will contribute to the establishment of new technology companies based on research and innovation in the Center
The New Control Room for Integrated Operations at NTNU in Trondheim
Thank you!