INTEGRATED OPERATIONS

Digital oil fields

Field of the future (BP)

Smart fields (Shell)

i fields (Chevron)

e-field
Mission statement

- A leading international research center for Integrated Operations in the Petroleum Industry

- Contribute to better and faster decisions through enhanced integration of information, systems and people
Why - Goals

- Improved safety for people, environment and asset value
- Contribute to increased value creation
What - Deliverables

- **Knowledge**
  - Qualified human resources to the industry (PhD and MSc)
  - Publications and reports
  - Conferences, workshops & seminars
  - Continued competence development for companies and research institutions

- **Methods, processes and tools**
  - Developed through R&D
  - Field tested
  - Handbooks and training courses

- **Support to implementation**
  - through associated projects
Who – Actors/participants

- Center participants - "Triangle"
  - Research institutions
  - Suppliers
  - Operators

- Collaborating partners
  - International research partners

- Associated projects
  - Center participants
  - Other companies/institutions
  - SMEs
1. INVOLVEMENT OF USER PARTNERS; INNOVATION ASPECTS
R&D AND INNOVATION MODEL FOR THE IO CENTER

CO-OPERATIVE, NON-COMPETITIVE ARENA

- Gap analysis
- Road maps
- R&D
- Technology verification
  - Field testing
- Transfer of knowledge to the industry
- Education and training
- Publication

COMMERCIAL / COMPETITIVE ARENA

- R&D Institutions
- IO Center
- Suppliers
- Oil companies
- Implementation of results in business processes
- Contract R&D Associated projects, JIP’s
RIGHTS AND OPPORTUNITIES FOR MEMBERS IN THE IO CENTER

- Free right to use all project results in your normal operations, including commercial exploitation, development of products and services offered to third parties.

- Transfer of knowledge from the project to your company: in-house training, workshops, seminars and courses.

- Researchers from the IO Center can work in in-house projects in your company for typically 1-3 months to transfer knowledge and methods. Separate R&D contracts can be established for extended development projects.

- Participation in a network of oil companies, suppliers and R&D institutions, for developing ideas for future IO and launching new JIP’s.

- A seat in the Board of the IO Center
  Meets twice a year and defines the work packages through annual operational plans and budgets.

- 4 seats (one for each program) in the Technical Committee
  Meets twice per year, goes through the R&D portfolio and gives recommendations to the Board.

- One or more Pilot projects in your organization; on tasks specified in agreement with your company.

- Industrial Master student projects, recruitment opportunities.
INTEGRATED OPERATIONS

Smarter decisions

INCREASED PRODUCTION
ENHANCED OIL AND GAS RECOVERY
REDUCED COSTS
IMPROVED SAFETY ENVIRONMENTAL PROTECTION
1. INTEGRATION OF PROCESSES

RESERVOIR MANAGEMENT
PRODUCTION MANAGEMENT

DRILLING AND
WELL MAINTENANCE

OPERATION AND
MAINTENANCE

2. INTEGRATION OF PEOPLE

3. INTEGRATION OF TECHNOLOGY/INFORMATION SYSTEMS

Smarter decisions
Integration of knowledge domains through decision processes

- Reservoir management and production optimization
- Drilling, completion and well integrity
- Operation and maintenance

Integration of different types of information

Integration/interface between models

Integration/exchange of data between acquisition systems
RESEARCH CHALLENGES FOR INTEGRATED OPERATIONS

Integrated planning and execution

Smarter decisions

Decision processes across disciplines and organizational boundaries

Visualization Communication

Data acquisition Communication

Data processing, modeling, prediction

Decision support
Center Programs

INTEGRATION OF INFORMATION

Center Program 1: Drilling and Well Construction

INTEGRATION OF COMPETENCE

Center Program 2: Reservoir Management and Production Optimization

INTEGRATION OF DECISIONS

Center Program 3: Operation and Maintenance

Center Program 4: New Work Processes and Enabling Technologies

Specialized Disciplines:
- Seismic
- Geology
- Reservoir
- Drilling
- Monitoring
- Subsea
- Production
- Operation
- Gas technology
- Marine technology
- Logistics
- Maintenance technology

Enablers
- ICT
- Monitoring
- Data transmission
- Predictive control
- Visualization
- Work processes
- Integrated teams
- Semantic web
- MTO
- Safety technology
- Reliability
- Business models
Phase II (2012 -2014) Overview of proposed projects

**Discipline Area 1**
Drilling and well construction

**Discipline Area 2**
Reservoir Management and Production Optimization

**Discipline Area 3**
Operation and Maintenance

**Discipline Area 4**
Work Processes, Teamwork and Collaboration Technologies

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**Integrated decision processes**

**IO 1 - IO Teamwork and Capabilities**

**IO 2 - Integrated Planning and Logistics**

**IO 3 - Proactive Management of Safety and Environment**

**IO 4 –Production and Performance Optimization**

**Better tools and methods for IO**

**T1 – IO Aspects for Safe and Efficient Drilling**

**T2 –Closed Loop Reservoir Management**

**T3 –System Integrity and Dynamic Risk Assessment**

Management, information exchange and networking
Program 1. Drilling and Well Construction

• Real Time Drilling Simulator
  • Prototype demonstration based on Hydro well (Hydro, Gaz de France, Total)
  • Pilot project Total, post drilling Hans, planning of Victoria wells
    ▪ Managed Pressure Drilling/Model predictive control
  ▪ Diagnosis and Decision support
  ▪ Utilization of Increased Bandwidth from borehole
  ▪ Work processes and training simulator

«Make the invisible visible»
«Make the impossible possible»
Program 2: Reservoir Management and Production Optimization

Reservoir model updating
Case Halten Nordland, Norne (StatoilHydro)
- 4D seismic analysis
- Fast model updating

Production optimization
Case project StatoilHydro Troll Oil
production/Kongsberg FMC Flow manager

Model based optimization
Program 3: Operation and Maintenance

Condition Monitoring

- Assessment of MTBF based on OREDA data
- Estimation of residual life

Detection
Diagnosis
Prognosis
Maintenance planning

Integrated Planning

Pilot project ConocoPhillips, Ekofisk

Modifications & Maintenance
Logistics
Drilling & Well
Production
Process

© Norsk Hydro
Programme 4:
New work processes and enabling technologies

- FUTURE COLLABORATION ENVIRONMENT
- NEW WORK PROCESSES AND DECISION MAKING
- SAFETY, SECURITY AND RESILIENCE IN IO
The New Control Room for Integrated Operations at NTNU in Trondheim
THE ANNUAL IO CONFERENCE IN TRONDHEIM

Next conference:
SEPTEMBER 13-14 2011, TRONDHEIM  http://www.ioconf.no

IO 11, 7th INTERNATIONAL CONFERENCE ON INTEGRATED OPERATIONS IN THE PETROLEUM INDUSTRY

From IO 09 September 29-30, 2009
GOVERNANCE MODEL

Board
One seat for each partner

Center Manager
Operational Manager

Core Team
Center Manager/Operational Manager/
Project coordinator
4 Program managers

Technical Committee

Project teams
Project teams
Project teams
Project teams (#1 – 15)
RESOURCES

Annual budget: 7 million USD per year (40 million NOK) 5 +3 years

Personnel resources
• 60 research scientists from NTNU/SINTEF/IFE (16 man years)
• 15 Ph.D. candidates (during 5 years period)
• 2 Postdoc’s
• 10 professors
• 4 experts from international leading universities
• Operating experience and technology from the industrial partners (pilot projects, workshops etc.)

Research facilities
• Research laboratories at NTNU/SINTEF/IFE in Trondheim, Bergen and Halden

Field data and field testing
• Sub surface and process data from oil and gas fields operated by industrial partners
• Observation of work processes
• Background technology from R&D and industrial partners
• Field testing of new technology
Program 1 Drilling and Well Construction
Program 2 Reservoir Management and Production Optimization
Program 3 Operation and Maintenance
Program 4 New Work Processes and Enabling Technology
General Projects
Management and Administration
Contingency
Collaboration Room IFE
Integrated Operation Support Center Test-bed – MTO
The IO Center team
CONTACT

Professor Jon Kleppe, Ph.D, Center Manager
Phone: + 47 918 97 300, + 47 73 59 49 33
Email: jon.kleppe@ntnu.no
Postal address: Department of Petroleum Engineering and Geophysics, S. P. Andersens v. 15, 7491 Trondheim, Norway

Jon Lippe, Operational Manager
Phone: + 47 918 97 033, + 47 73 59 02 33
Email: jon.lippe@ntnu.no
Postal address: Department of Petroleum Engineering and Geophysics, S. P. Andersens v. 15, 7491 Trondheim, Norway

Arild N. Nystad, Ph.D, Innovation & industrial relations
Phone: + 47 913 22 497, + 47 51 56 71 11
Email: arild.nystad@petromanagement.com
PetroManagement AS, P.O.Box 252 Sentrum, Haakon VII's gt. 8 (10th floor), 4002 Stavanger, Norway

www.iocenter.no