Centre for Research-based Innovation

SBBU - Centre for Drilling and Wells for Improved Recovery

Annual Report 2011

Table of Contents

Summary

The centre was started June 2011, and a number research activities were initiated in agreement with the sponsoring oil companies. Eight research projects have been started, giving good activity within all three research programs:

- P1: Safe and efficient drilling process
- P2: Drilling solutions for improved recovery
- P3: Well solutions for improved recovery

The centre has been organised with project managers and program managers reporting to the Centre Manager, who reports to a Board with representatives from all Industrial Partners, Research Partners and the Research Council. A Technical Committee has been established to give support to the Centre Manager and the Board. Also, reference groups have been established to give technical support and supervision within each research program.

Vision/objectives

The vision is to unlock petroleum resources through better drilling and well technology.

The objective is improved safety for people and the environment and value creation through better resource development and reduced cost.

Based on a dialogue with the oil companies the Centre focuses on the following areas:

- Drilling process efficiency
- Drilling solutions for improved recovery
- Well solutions for improved recovery

The Centre will provide continuous competence development for oil company staff in collaboration with the oil companies.

We aim to ensure that the developed technology and solutions will be commercially available in the market in cooperation with the service industry and suppliers.

Research plan/strategy

Collaborative innovation

The vision and objectives require a collaborate environment between the oil industry and the R&D community. The basis for the R&D and innovation activities is the active contribution from all partners to this collaborative environment. The focus and activities will evolve in a continued process during the life of the Centre.

The Centre shall be a leading international R&D and competence environment for development of drilling and well technology.

Way to the market and the commercialization strategy

The way to the market will be developed through associated projects outside the Centre's activities.

Realisation of R&D results are intended performed through associated projects, which will aim at a targeted development and qualification process in cooperation with the service industry and smaller companies (SMEs) in order to produce commercially available products/services.

R&D coordination

Special attention will be given to careful coordination of the Centre's activities in relation to the other R&D activities at the four R&D partners.

All open R&D results from the current portfolios will systematically be made available to the SBBU.

The R&D partners shall avoid unintended duplication of activities.

Academy

The Centre will organize projects for MSc and PhD students to work on industry defined topics.

The Centre will also include structured competence development in collaboration with and for the oil companies.

PhD students and Post docs will be educated at the University of Stavanger and NTNU.

Our target is to achieve 40% female scholarship holders.

	P1	P2	P3	Sum
PhDs UiS/NTNU	4	4	4	12
Post docs UiS/NTNU	2	2	2	6
MSc UiS/NTNU	40	30	40	110
Academy "Diplomas"	50	50	50	150

The Academy Diplomas is a structured competence development (course) in collaboration with and for the oil company's staff.

Organisation

Centre for research based innovation

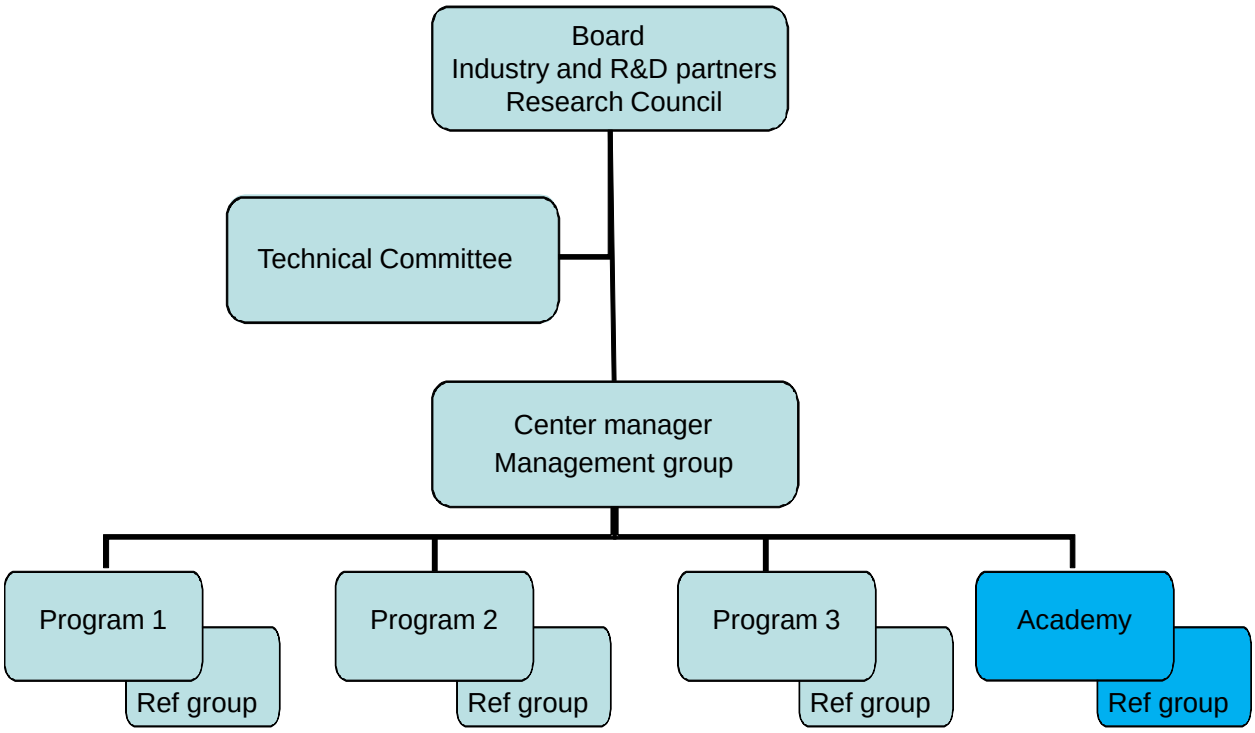
The Centre is one of 21 centres for research based innovation funded by the Research Council of Norway.

The purpose of the Centres for Research-based Innovation (SFI) is to build up and strengthen Norwegian research groups that work in close collaboration with partners from innovative industry and innovative public enterprises.

The main objective for the Centres for Research-based Innovation (SFI) is to enhance the capability of the business sector to innovate by focusing on long-term research based on forging close alliances between research-intensive enterprises and prominent research groups. The SFI scheme will:

- Encourage enterprises to innovate by placing stronger emphasis on long-term research and by making it attractive for enterprises that work on the international arena to establish R&D activities in Norway.
- Facilitate active alliances between innovative enterprises and prominent research groups.
- Promote the development of industrially oriented research groups that are on the cutting edge of international research and are part of strong international networks.
- Stimulate researcher training in fields of importance to the business community, and encourage the transfer of research-based knowledge and technology.

Organisation diagram



Research Partners

IRIS
SINTEF Petroleum Research
NTNU
UiS

Industrial Partners

ConocoPhillips
Det norske oljeselskap
Statoil
Talisman
Total
Wintershall

Board

The Board is the decision making body of the Centre, and shall monitor the execution of the Centre. The Board shall seek to make sure that the intentions and plans that form the basis for the Contract are fulfilled, and that the objectives and deliverables that follow from the Centre description and the annual Work Program are realised within the approved timeframe. The Board shall further ensure a good cooperation between the Centre Responsible and the other Parties.

The Board shall consist of one member from each Party and an observer from the Research Council.

Centre Responsible

The Centre Responsible is in charge of the progress and performance of the Centre in accordance with the Consortium Agreement and the Contract. As a part of such responsibility the Centre Responsible shall make sure that the intentions and plans that form the basis for the Contract are fulfilled, and that the objectives and deliverables that follows from the Work Program are realised within the approved timeframe.

SBBU Manager

The Centre Manager is in charge of the progress and performance of the Centre on behalf of the Centre Responsible.

The Centre Manager is further responsible for:

a) Preparation of a draft of the annual Work Program for approval by the Board.
b) Monitoring the progress and use of resources in the Centre with respect to the Centre description and the approved annual Work Program, and control the Parties' compliance with their obligations to this Consortium Agreement and the Contract.
c) Promptly reporting deviations of progress and/or use of resources to the Board and propose measures to relief such deviations.
d) Preparation of meetings, suggesting decisions, preparation of the agenda and writing the minutes of meetings of the Board, as well as control of the implementation of decisions.
e) Prompt transmission of documents and information connected with the Centre to the Parties.
f) Keeping an updated list of contact persons with all Parties.

Technical Committee (TC)

Mandate:

- *The TC is the technical advisory body of the Board.*
- *TC to recommend on the prioritization of the proposed projects.*
- *TC should also recommend new or alternative activities.*

The active involvement of the TC/Reference groups is essential to the effective guiding of the R&D and the acceptance of the results in the field.

The TC recommendations are presented to the Board by the Centre management.

Reference groups

Reference groups with technical specialists from the oil companies are established for each research program and the SBBU academy for advise and supervision. When required, reference groups may be established for individual projects. Meetings will be organised as required.

Program managers

Position/function

- Responsible for the program development and progress
    - Development of the program description and goals
    - Initiation and development of new projects
    - Encourage and facilitate innovation processes
    - Encourage and facilitate associated projects
    - Follow-up and quality assurance across projects and programs
    - Knowledge sharing across projects and programs
    - Contribute to the Centre budget process and priorities
    - Coordination in relation to technical committee and reference groups
    - Effective organising and use of reference groups
- Contribute to initiation and coordination of PhD, MSc students and Post Docs
- Contribute to international cooperation
- Encourage publication

Project managers

Responsible for project execution according to procedures at SINTEF/IRIS.
Emphasis shall be given to:

- Customer focus
- Knowledge sharing across projects and programs
- Facilitate innovation
- Contribute to establish associated projects

Scientific activities and results

During 2011 research projects were kicked off within all three research programs:

- P1: Safe and efficient drilling process
- P2: Drilling solutions for improved recovery
- P3: Well solutions for improved recovery

Projects started:

Program 1: Safe and efficient drilling process

P1.3: ROP (Rate of Penetration) Management and Improvement
P1.4: Formation integrity

Program 2: Drilling solutions for improved recovery

P2.1: Deep imaging and geo-steering during drilling
P2.2: Flexible earth model

Program 3: Well solutions for improved recovery

P3.1: Slender well technology
P3.2: Life cycle well integrity
P3.3: Improved Plugging and Abandonment (P&A)
P3.4: Water shut-off and intelligent completion

Main activities and results for each project

P1.3: ROP (Rate of Penetration) Management and Improvement

Parts of a system for monitoring of cuttings transport in the wells have been completed.

P1.4: Formation integrity

Selection of focus areas and planning of next year's activities.

P2.1 Deep imaging and geo-steering during drilling

An overview of present methods and practices within deep imaging and geo-steering of oil and gas wells was outlined.

P2.2: Flexible earth model

Improvements were made to facilitate more effective developments within update and management of geological structures during drilling.

P3.1: Slender well technology

Experiences and enabling technologies for slender wells have been collected and initial work performed on casing/liner design, well integrity, expandable liner hanger and well hydraulics.

P3.2: Life cycle well integrity

An overview of industry standing and practices has been completed as well as reporting key challenges within well integrity.

P3.3: Improved Plugging and Abandonment (P&A)

An overview of industry standing and practices has been completed as well as reporting key challenges within well plugging and abandonment. A description of P&A well categorization has been written based on UK Oil & Gas Guidelines.

P3.4: Production optimisation through use of water shut-offs and intelligent well completions

An overview of industry standing and practices within water shut-off of oil wells with high water production has been written. The reported review summary is focused on Intelligent Well Completions used to manage the water producing intervals, wellbore mechanical methods for isolating dedicated water-producing intervals, and chemical methods where permeability reducing fluids are injected into the formation aiming at providing a deep-reservoir placement for controlling water movement into the formation.

International cooperation

After start-up June 2011 the following contacts were made during 2011:

Mines Paris Tech: Scientific cooperation within drilling mechanics for the project *P1.3 Rate of penetration management and improvement.*

University of Austin at Texas: Co-supervision of PhD student starting 2012 in project *P2.1 Deep imaging and geo-steering during drilling.*

During 2012 further international contacts will be established.

Recruitment

One PhD student was engaged November 2011, for the project *P3.2 Life cycle well integrity*.

It is planned to engage a number of PhD and MSc students and a few Post docs during 2012.

Communication and dissemination activities

The first results will be released on conferences and in papers during 2012.

Attachments

Appendix 1 – Personnel
Appendix 2 – Accounts
Appendix 3 – Publications

Appendix 1 – Personnel

Key Researchers					
Name	**Institution**	**Main research area**			
Helga Gjeraldstveit	IRIS	Computer modelling			
Fionn Iversen	IRIS	Drilling physics			
Erich Suter	IRIS	Computer modelling			
Erlend H. Vefring	IRIS	Drilling physics			
Jostein Sørbø	IRIS	Drilling technology			
Øystein Lund Bø	IRIS	Drilling physics			
Jimmy Baringbing	IRIS	Risk analysis			
Dimitrios Hatzignatiou	IRIS	Reservoir engineering			
Arne Stavland	IRIS	Reservoir physics			
Ove Sævereid	IRIS	Computer modelling			
Eric Cayeux	IRIS	Computer modelling			
Thor Syvert Frøytland	IRIS	Drilling physics			
Benoit Daireaux	IRIS	Computer modelling			
Erik Dvergsnes	IRIS	Drilling physics			
Svein Brekke	IRIS	Computer modelling			
Helmer André Friis	IRIS	Computer modelling			
Geir Nævland	IRIS	Reservoir modelling			
Eric Patrick Ford	IRIS	Risk analysis			
Øystein Arild	IRIS	Risk analysis			
Bjarne Aas	IRIS	Drilling physics			
Kjell Kåre Fjelde	UiS	Drilling physics			
Bernt Aadnøy	UiS	Drilling engineering			
Helge Hodne	UiS	Fluid mechanics			
Reidar Bratvold	UiS	Reservoir technology			
Terje Kårstad	UiS	Computer science			
Aljerandro Escalona	UiS	Geology			
Hans Martin Helset	SINTEF	Reservoir physics			
Knut Steinar Bjørkevoll	SINTEF	Well flow modelling			
Idar Larsen	SINTEF	Rock mechanics			
Olav-Magnar Nes	SINTEF	Rock mechanics			
Inge M. Carlsen	SINTEF	Drilling and well technology			
Torbjørn Vrålstad	SINTEF	Well integrity			
Nils Totland	SINTEF	Well integrity			
Malin Torsæter	SINTEF	Well integrity			
Velaug Myrseth Oltedal	SINTEF	Well integrity			
Johnny Petersen	SINTEF	Computer modelling			
Bjørnar Lund	SINTEF	Drilling physics			
Tor Stein Ølberg	SINTEF	Drilling operations			
Erling Fjær	SINTEF	Rock mechanics			
Pierre Cerasi	SINTEF	Rock mechanics			
Alexandre V. Lavrov	SINTEF	Rock mechanics			
Jørn F. Stenebråten	SINTEF	Rock mechanics			
Roar Nybø	SINTEF	Computer modelling			
Michael Jordan	SINTEF	Seismics			
Anouar Romdane	SINTEF	Seismics			
Matthias Daszinnies	SINTEF	Basin modelling			
Børge Arntsen	NTNU	Applied geophysics			
Sigbjørn Sangesland	NTNU	Drilling engineering			
Pål Skalle	NTNU	Drilling engineering			
Rune M. Holt	NTNU	Rock mechanics			

Visiting Researchers					
Name	Affiliation	Nationality	Sex M/F	Duration	Topic
N/A					
Postdoctoral researchers with financial support from the Centre budget					
Name	Nationality	Period	Sex M/F	Topic	
N/A					
Postdoctoral researchers working on projects in the centre with financial support from other sources					
Name	Nationality	Period	Sex M/F	Topic	
N/A					
PhD students with financial support from the Centre budget					
Name	Nationality	Period	Sex M/F	Topic	
Jesus Alberto De Andrade Correlia	Venezuelan & Portugese	2011-14	M	Well integrity	
PhD students working on projects in the centre with financial support from other sources					
Name	Funding	Nationality	Period	Sex M/F	Topic
N/A					
Master degrees					
Name	Sex M/F	Topic			
N/A					

Appendix 2 – Accounts

- All figures in 1000 NOK

Funding	
	Amount
The Research Council	4882
IRIS	250
Research Partners	258
Enterprise partners	4882
Public partners	
SUM	**10272**
Costs	
IRIS	4896
Research Partners	4876
Enterprise partners	
Public partners	
Equipment	500
	10272

Appendix 3 – Publications

No publication registered in start-up year.