

**Optimal gas plant operation (Institusjonsforankret strategisk prosjekt)****Applicant****Institution/company responsible for the project**

Institution /  
company  
(norwegian name) SINTEF  
\*

Faculty

Institute ICT (Information and Communication Technology)

Departement Applied Cybernetics

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City\* Trondheim

Country\* Norway

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Auditor

*Administrative responsibility* \_\_\_\_\_

First name\* Sture

Last name\* Holmstrøm

Position/title Research Director

Phone\* +4773594370

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Confirmation\*  The application has been approved by the Institution/company responsible for the project

**Project manager**

First name\* Ivar J.

Last name\* Halvorsen

Institution /  
company  
(norwegian name) SINTEF

Faculty

Institute ICT

Departement Applied Cybernetics

Address\* O.S. Bragstads plass 2D

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Position/title Senior Scientist

Academic degree Dr.ing

Preferred language Bokmål

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## Project info

### Project title

Project title\* Optimal Design And Operation of Gas Processing Plants

### Principal objective and sub-goals

The objective of this project is to increase the value of natural gas by better operation and design of processing plants for natural gas. This will be achieved by:

1. Improving the quality of plans by advanced optimization and scheduling.
2. Incorporating market information in plans and thereby achieving market focus on process control
3. Provide decision support tools that links the process control and business operation levels for use in the new emerging control centers
4. Create a framework for exchange and reuse of Process System Technology within the Gas Technology Centre at NTNU/SINTEF.

Measurable Goals:

1. Develop a demonstrator application that two selected cases
2. Supervise 3 PhDs
3. Write a tutorial paper that summarize the main contribution of new methodology
4. Develop a core software library for a generic model / optimizer interface
5. Acquire an industrial project based on this technology

### Project summary

The main issue in this project is to develop methodology for better market focus on process control and thereby improved operation.

Optimal operation of processing plants is a challenging area where new dynamic markets for gas components lead to a need for stronger analytical capabilities of decision support tools. Also the supply situation becomes more variable, as the gas companies responds to market opportunities. This leads to a situation where processing plants should be reconfigured more often as a consequence of changing environment. There is a need for better understanding of how to make plantwide plans and implement these through process management. Typically such decision support tools should combine both optimization and simulation capabilities. This is an area where little research has been done, and we wish to focus on developing new methodology for combining simulation and optimization.

The starting point in this project is the need for decision support as seen from the personnel in a plant operating company. This defines a set of tasks that requires optimization calculations, process calculations and measurement data handling.

The personnel in question can be plant operators, production planners, sales personnel, maintenance planners, process engineers, managements, etc.

This requires contribution and integration of several technical disciplines:

- Control engineering – process control, control structuring, model interfacing
- Industrial Economy - Description of economic mechanisms and environment, planning and scheduling
- Process engineering – Process knowledge, models, process design
- Applied mathematics –Optimization methods, efficient numerical methods, basic supplier to the above disciplines
- System integration – Framework/interface standards for system components

The Gas technology Centre at NTNU/SINTEF has resources within each of the required disciplines and one challenge is to integrate knowledge and tools.

## Placement

### Research Council funding division - supplementary info from applicant

Program / activity SIPSUP-TEK

Application type Institusjonsforankret strategisk prosjekt

Other relevant

programmes/activities

Discipline (s)/specialist field\* Optimisation, Process control, Industrial economy, Chemical engineering

If applying for additional funding, specify project number

Have any related applications been submitted to the Research Council and/or any other public financing scheme No

If yes, enter further information

Applicationform version: v3.5

## Project timetable

### Timetable

**Project period** From date (yyyymmdd)\* 20050101 To date (yyyymmdd)\* 20081231

### Main activities and milestones in the project period (year and quarter)

	<b>From</b>	<b>To</b>
Project management	2005 1	2008 4
Developing new methodology	2005 1	2008 4
System integration of demonstrator system	2005 1	2006 4
Case study 1	2005 3	2007 2
Case study 2	2006 4	2008 1
Dissemination of results	2005 1	2008 4
PhD	2005 3	2008 4

### Project publication plan

The results from the methodology activities, both at NTNU and SINTEF shall produce 2 papers/year. A tutorial paper shall be written with focus on system integration issues.

## Budget

### Cost plan (in NOK 1000)

	<b>2004</b>	<b>2005</b>	<b>2006</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>	<b>2011</b>	<b>Sum</b>
Personnel costs and indirect costs		3200	4800	4800	3200				16000
Purchase of R&D services									0
Equipment									0
Other operating costs		300	300	300	300				1200
<b>Totals</b>	0	3500	5100	5100	3500	0	0	0	17200
Specifications									

### Cost code (in NOK 1000)

	<b>2004</b>	<b>2005</b>	<b>2006</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>	<b>2011</b>	<b>Sum</b>
Business and industry									0
R&D Institute sector		2667	3385	3385	2667				12104

University sector	833	1715	1715	833					5096
Other sectors									0
Abroad									0
<b>Totals</b>	0	3500	5100	5100	3500	0	0	0	17200

### Funding plan (in NOK 1000)

	2004	2005	2006	2007	2008	2009	2010	2011	Sum
Own funding									0
International funding									0
Other public-sector funding									0
Other private funding									0
From Research Council		3500	5100	5100	3500				17200
<b>Totals</b>	0	3500	5100	5100	3500	0	0	0	17200
Specifications									

### Person for whom a fellowship/position is being sought

First name Last name Personal number  
1

#### Documentation for calculation of position

Type of fellowship From date (yyyymmdd) To date (yyyymmdd)  
Doctoral fellowship 20050701 20080630

	2004	2005	2006	2007	2008	2009	2010	2011
<b>Position-%</b>		50	100	100	50			

#### Documentation for calculation of overseas fellowships and guest researcher fellowship

Name	Carnegie Mellon	Travelling with family	No	Travelling expenses	12000
Address				<b>Period</b>	
City code				From date	(yyyymmdd)
City	Pittsburg				20070101
Country	USA			To date	(yyyymmdd)
					20070530

First name Last name Personal number  
2

#### Documentation for calculation of position

Type of fellowship From date (yyyymmdd) To date (yyyymmdd)  
Doctoral fellowship 20050701 20080630

	2004	2005	2006	2007	2008	2009	2010	2011
<b>Position-%</b>		50	100	100	50			

#### Documentation for calculation of overseas fellowships and guest researcher fellowship

Name	Caltech	Travelling with family	No	Travelling expenses	12000
Address				<b>Period</b>	
City code				From date	(yyyymmdd)
City	Los Angeles				
Country	USA			To date	(yyyymmdd)

First name Last name Personal number  
3

### Documentation for calculation of position

Type of fellowship From date (yyyymmdd) To date (yyyymmdd)  
Doctoral fellowship 20050701 20080630

	2004	2005	2006	2007	2008	2009	2010	2011
<b>Position-%</b>		50	100	100	50			

### Documentation for calculation of overseas fellowships and guest researcher fellowship

Name Travelling with family Travelling expenses

Address  
City code  
City  
Country

**Period**  
From date (yyyymmdd)  
To date (yyyymmdd)

### Allocations from the Research Council (in 1000 NOK)

	2004	2005	2006	2007	2008	2009	2010	2011	Sum
Student fellowships									0
Doctoral fellowships		833	1665	1665	833				4996
Post-doctoral fellowships									0
Fellowships for visiting researchers									0
Overseas fellowships			50	50					100
Researcher positions									0
Hourly-based salary including indirect costs									0
<b>Sum personnel costs and indirect costs</b>	0	833	1715	1715	833	0	0	0	5096
Purchase of R&D services		2667	3385	3385	2667				12104
Equipment type									0
Other operating expenses									0
<b>From Research Council</b>	0	3500	5100	5100	3500	0	0	0	17200

### Active partners

#### Active partners

	Institution/ company*	Responsible name	Responsible phone	Responsible email	Partners role*
1	SINTEF ICT	Ivar J. Halvorsen	73594387	ivar.j.halvorsen@sintef.no	executive
2	SINTEF Industrial Management	Frode Rømo	73591507	frode.romo@sintef.no	executive
	SINTEF				

3	Energy Research NTNU Dept of industrial economics .. NTNU Dept of Chemical Engineering NTNU Dept of Engineering Cybernetics	Maria Barrio	73593277	maria.barrio@sintef.no	executive
4		Asgeir Tomasgard	73591267	asgeir.tomasgard@sintef.no	executive
5		Sigurd Skogestad	73594154	skoge@chemeng.ntnu.no	executive
6		Bjarne A Foss	73594476	bjarne.anton.foss@itk.ntnu.no	executive

## Attachments

### Project description\*

Filename	Optimal design and operations final.pdf
Reference	ES155332_001_1_Projektbeskrivelse_20040622.pdf

### Curriculum vitae (CV) with list of publications\*

Filename	Halvorsen_I.pdf
Reference	ES155332_002_1_CV_20040622.pdf

Filename	CV_Tomasgard.pdf
Reference	ES155332_002_2_CV_20040622.pdf

Filename	rømo.pdf
Reference	ES155332_002_3_CV_20040622.pdf

Filename	MHovd.pdf
Reference	ES155332_002_4_CV_20040622.pdf

Filename	CV_Barrio_040615.pdf
Reference	ES155332_002_5_CV_20040622.pdf

Filename	CV Hanne_4siders_040614_ev.pdf
Reference	ES155332_002_6_CV_20040622.pdf

Filename	cv_Skogestad.pdf
Reference	ES155332_002_7_CV_20040622.pdf

Filename	foss.pdf
Reference	ES155332_002_8_CV_20040622.pdf

Filename	Lundteigen_MA.pdf
Reference	ES155332_002_9_CV_20040622.pdf

Filename	CV_ingrid_schjolberg.pdf
Reference	ES155332_002_10_CV_20040622.pdf

Filename	tk-cv-04.pdf
Reference	ES155332_002_11_CV_20040622.pdf

**Course marks (grades) (Doctoral and student fellowships)**

Filename

Reference

**Experts**

Filename Proposed\_reviwers.pdf

Reference ES155332\_005\_1\_Fagekspertes\_20040622.pdf

**Recommendation and invitation (overseas fellowship)**

Filename Support\_Gassco.pdf

Reference ES155332\_006\_1\_AnbefalingInvitasjon\_20040622.pdf

Filename Support\_Statoil\_Forskningscenter.pdf

Reference ES155332\_006\_2\_AnbefalingInvitasjon\_20040622.pdf

**Confirmation from active partner(s)**

Filename

Reference

**Other items**

Filename

Reference