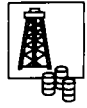


# OIL & GAS TECHNOLOGY



**THERMIE PROGRAMME:** promotion of energy technology in Europe

## Technology has a role to play in Europe's growing natural gas market

EUROPE is currently experiencing a dramatic increase in demand for natural gas. This is largely due to changes in the electricity generation business which sees natural gas as an attractive option for power generation, with significant environmental benefits over other fuels. As natural gas is introduced into more regions of the European Union so the demand will increase. As described in this issue of O&GTN, the introduction of natural gas to Portugal is expected to bring a significant increase in gas-fired co-generation systems.

As with oil, the increasing demand for gas will eventually lead to Europe becoming a net importer of gas to meet its growing demand. However, new technologies have a



### EDITORIAL

role to play in making sure that European Union reserves last as long as possible, reducing our dependence on other countries for our energy needs.

THERMIE funded projects are already

making their mark in the gas sector: a German company is using polymers to reduce water inflow and increase gas production with impressive results, while technology developed in France offers complete gas treatment from a single process unit. Both of these technologies are discussed in this issue of O&GTN.

New developments in natural gas technology will be exhibited at AERION '95, the 2nd International Gas Exhibition being held in Athens on 1-3 December. A wide range of technologies covering all aspects of the gas industry will be on show at the exhibition. The EC's THERMIE and SYNERGY Programmes will also participate.

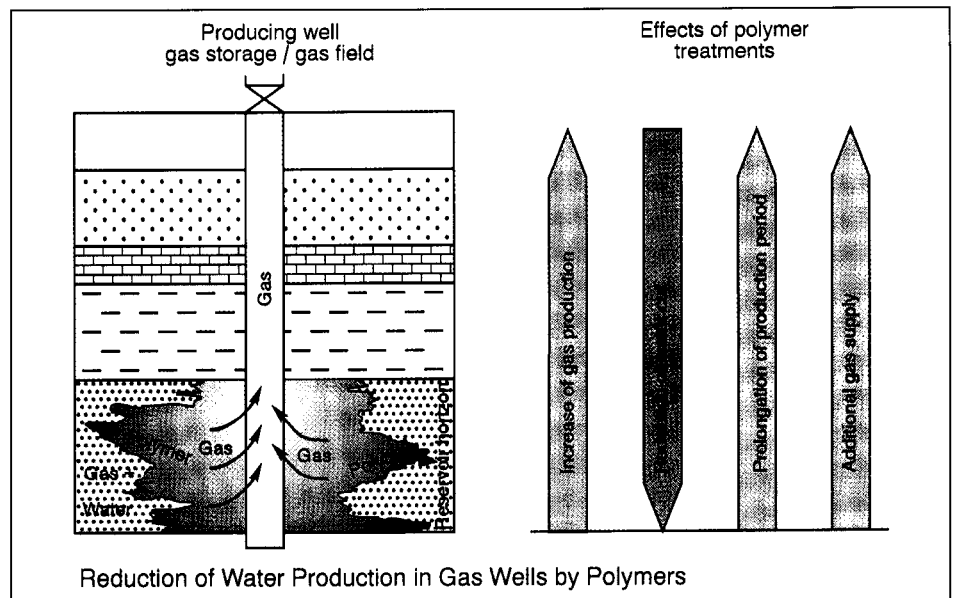
## Polymers improve productivity in water bearing gas wells

THE INFLOW OF WATER in aquifer gas storage increases during production periods and in gas fields water production rises particularly during the depletion phase. However, polymer solution injected in the near wellbore zone reduces the water inflow and increases gas production rate.

On the basis of laboratory and model developments, wells in selected gas storages and gas fields were treated. In the gas storage at Buchholz near Berlin, the daily gas production increased from 120,000 m<sup>3</sup> prior to treatment to 167,000 m<sup>3</sup> after. During each of the production periods following the treatment, approximately 2 to 3 million m<sup>3</sup> more gas was produced without premature water invasion.

A well with increased specific water production in storage at Kalle/Emsland was also treated resulting in improved gas injectivity. During the gas production period 1994/95 the water production decreased by 64% for nearly identical gas volumes.

Before treatment the water/gas ratio increased considerably in a well in the Salzwedel gas field. The production became discontinuous despite a bore-hole washing



and treatment with surfactant solution. All attempts to activate the well failed. After polymer treatment a gas production rate of 100,000 m<sup>3</sup>/d was achieved with a backflow of 1 - 2 m<sup>3</sup>/d water over a period of two years.

The best performing products for the treated wells were found to be anionic terpolymers and cationic copolymers on the

basis of their good injectability and their good water blocking effect.

The project, undertaken by DBI GUT Freiberg, ITE - TU Clausthal and IFP Paris, was supported by the THERMIE programme. The results are expected to generate huge interest as 20% - 30% of the world's gas producers are water bearing.

European Commission - Directorate-General for Energy DG XVII

033/1/27

## IFPEXOL – complete treatment for hydrocarbon gases

IFPEXOL, developed by the Institut Français du Pétrole with support from THERMIE, is a process technology which offers a complete treatment of wet, sour, condensable hydrocarbon gases in a single process unit. It is based on the freeze-point depression qualities of a methanol-based solvent coupled with its selectivity for hydrogen sulphide. The single-solvent process allows water, condensable hydrocarbons and acid gases to be efficiently removed in conventional cold processing equipment to whatever gas specifications are required.

IFPEXOL comprises two steps (IFPEX-1 and IFPEX-2) with either one able to stand alone if required. IFPEXOL can be used in the following applications:

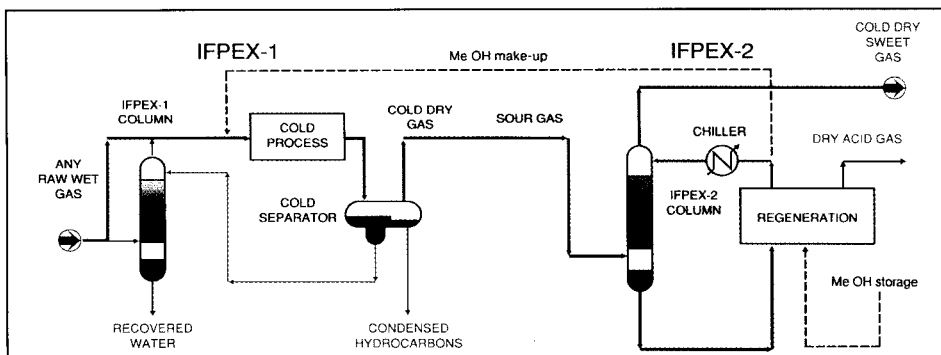
- wherever a cold process is needed or available
- revamping or extensions of existing facilities
- recovering LPG and heavier liquid components
- fuel gas conditioning for compression stations
- treatment of underground gas storage
- natural gas treatment for LNG plants
- treatment of coal bed methane.

In IFPEX-1 a slipstream of feed gas flows up a column in countercurrent contact with a descending waterladen methanol stream originating from the cold separator. The solvent is completely stripped out of the water by the rising feed gas. Meanwhile, the gas stream leaving the column has sufficient solvent content to prevent hydrates from forming during the subsequent pipeline transport and cold processing. Hydrocarbons, methanol and water condensed during the cold process are separated in the cold separator. The cold process reduces the gas temperature to the point where the water and/or condensable hydrocarbon dew point specification is reached.

With the water and hydrocarbon dew points adjusted in the IFPEX-1 step, the already-cold sour gas passes up a second column where it is contacted with a chilled descending solvent stream. The acid gases, notably H<sub>2</sub>S and CO<sub>2</sub> and other sulphur components, are absorbed in the methanol stream allowing the exiting gas to meet the sweet gas specifications. A conventional regeneration process desorbs the acid gas from the methanol which is recovered for recycle to the IFPEX-2 column.

If any water accumulates in the IFPEX-2 methanol stream, it is removed via the slip stream which purges the water with methanol as the make-up stream for the IFPEX-1 step.

The main features and benefits of IFPEX-1 and IFPEX-2 are shown in the Table. Further information on this project is available in flag brochure No. 122.



IFPEX-1		IFPEX-2	
<b>Features</b>	<b>Benefits</b>	<b>Features</b>	<b>Benefits</b>
<ul style="list-style-type: none"> <li>• No regeneration systems, no heater.</li> <li>• No venting of gas to atmosphere.</li> <li>• Low weight, small footprint: only a fraction of the feed gas needs to pass through the IFPEX-1 column.</li> <li>• Recovered water is essentially demineralized.</li> <li>• Easy, automatic operation.</li> </ul>	<ul style="list-style-type: none"> <li>• No air pollution.</li> <li>• Safety (no heat duty, no hot zones).</li> <li>• Facilitates water disposal or re-use.</li> <li>• No degradation, no corrosion, no foaming.</li> <li>• Ideal for offshore installations and confined spaces (only one small column needed).</li> </ul>	<ul style="list-style-type: none"> <li>• Conventional physical absorption and stripping.</li> <li>• Product gas and recovered acid gases are dry.</li> <li>• Release of acid gases can take place at pressures as high as 10 atmospheres.</li> <li>• Selective H<sub>2</sub>S absorption, but – non-selective hydro carbon co-absorption.</li> <li>• Inexpensive methanol is the single solvent for for both steps.</li> </ul>	<ul style="list-style-type: none"> <li>• No additional dehydration required.</li> <li>• Lower recompression duty in acid gas recovery (EOR projects).</li> <li>• Full H<sub>2</sub>S removal without alteration of the feed gas hydrocarbon composition.</li> <li>• No chemical degradation.</li> </ul>

## Well control – performance validation at the rig-site

For many years it has been a requirement for critical drilling rig personnel to be individually certified for competence in well



Rig operator making remote choke adjustments during simulated well control test at BP, Wytch Farm

control operations. However, it was still difficult to assess a rig crew's ability to operate appropriately during a real well control incident. In a project supported by the EC's THERMIE programme, Drilling Systems (UK) Ltd has developed a training simulator called RIGSIM which brings the benefits and sophistication of a classroom based training simulator to the rig site.

Rig gauges and indicators are made to respond to operator control actions of BOPs, mud pumps and choke valves as if the rig was experiencing a gas, water or oil kick influx. Rig crews are therefore able to go through the corrective procedures appropriate to a real well control situation.

The RIGSIM computer executes a mathematical model program which predicts the development of the influx as it is pumped, or migrates, to surface. Operation of rig controls by the crew is monitored by a

dedicated real-time, data acquisition system. Subsequently, all control actions are fed as data inputs to the RIGSIM simulation model which determines the effect these would have on the well. Rig instrumentation such as pressure gauges, stroke counters and volume totalisers are then driven in response, via a dedicated RIGSIM interface.

RIGSIM simulations can be activated and deactivated to fit in with rig production schedules. A suitable time-slot for undertaking such an exercise may be while

'waiting on cement' following a casing operation.

Ultimate simulation realism can be best attained in the actual work place. RIGSIM makes this possible so that both individual and team effectiveness can be validated and, where necessary, improved. Meanwhile, amongst all this activity, rig status remains totally safe.

The product is now commercially available through Drilling Systems (UK) Ltd.

### O&GTN on the World-Wide Web

O&GTN is available on the Internet for a trial period to gauge response to the electronic publication of the newsletter. Readers linked to the Internet can access O&GTN at the following world-wide address:

<http://www.psti.co.uk/opet/europub.html>

Requests to be put on the mailing list for the hard copy of the newsletter can be communicated directly to the editor via the Internet.

## CONFERENCE, EXHIBITION and WORKSHOP REPORTS

### EC workshops target China

As part of its activities to promote European hydrocarbon technology world-wide, the EC organised three THERMIE workshops in China, a country seen as being a potentially lucrative market. A workshop on **Enhancing Oil and Gas Drilling Technologies in China** (Champing, 7-10 March 1995), organised by BCEOM at the Petroleum University of China, attracted over 60 participants, mostly drilling managers from various oil producing areas as well as teachers and scientists working at the Petroleum University. The technologies presented at the Drilling workshop had been selected on the basis of recommendations made by CNPC (China National Petroleum Corporation). Five sessions led by European experts were held on PDC diamond bits, horizontal drilling, mud technology in deep drilling, logging and recording while drilling, and an overview of ultra-deep drilling, HT-HP technology.

A workshop on **European Technologies for the Upgrading of Existing Geophysical Data** (Beijing, 14-15 June 1995), organised by GOPA Consultants, attracted over 80 Chinese experts as well as 15 Mongolian experts and a number of representatives from western companies. The event generated a lot of interest as:

- there is a vast base of geophysical data in China collected over the past few decades;
- reprocessing old data can yield additional information;
- the old data is stored in a variety of formats in various states of degradation;
- China is seeking modern technology and approaches to improve its productivity.

The Chinese delegates expressed their eagerness to learn state-of-the-art reprocessing techniques and stated their willingness to work closely with any European Union company offering the appropriate expertise.

A workshop on **Improved Oil Recovery**

**and Enhanced Oil Recovery Technology** (Beijing, 15-16 June and Urumqi, 19-20 June 1995) was organised by COMERINT with assistance from the China National Petroleum Corporation (CNPC) and Xinjiang Institute of Technology (XIT). The high level experts from Austria, France (IFP) and Italy (AGIP) attracted over 100 delegates to each event. Great interest was shown in all the lectures and the advanced technical know-how of the European oil industry.

All of the workshops in China have been a great success and clearly show that the Chinese market is not only in great need of technical assistance but is also ready to receive it. Follow-up actions to all three events are currently being monitored by DGXVII. The workshop proceedings and the event reports are available from BCEOM, GOPA and COMERINT.

The EC stand at **Offshore Europe** (Aberdeen, 5-8 September 1995), Europe's premier oil and gas trade show, attracted around 1,200 visitors during the week. For the first time the EC stand included Swedish and Austrian representatives, both of which were demonstrating

technologies originally developed outside the oil and gas sector. The quality of visitors was higher than in previous years and all participants on the EC's stand reported good business contacts, some from as far away as Australasia.

An EC workshop on **Improved Reservoir Monitoring in HPHT Wells** (Delft, 12 September) which was held in conjunction with the OAPEC event on new technologies applied to hydrocarbon production (12-15 September), attracted 100 attendees of which 50 were from Arabic countries. Details of the event can be obtained from Guus Hutjes at IRO.

Approximately 1,500 people visited the EC stand at **Oil and Gas Tyumen** (12-15 September 1995), but there were far fewer serious enquiries than at the previous year's event. This was probably due to the timing of the event and next year's show will be held later in the year. While some EU companies have gained contracts through training programmes financed by TACIS, the main problem (especially for small companies) is receiving payment for the products and services they provide. However, Russia is still seen as a very attractive market for technologies developed in the European Union.



European Union stand at Offshore Europe, Aberdeen

## Portuguese industry looks forward to the arrival of gas

Portugal depends on imports for almost 94% of its energy supplies, of which 77% are oil. This excessive dependence has resulted in Portugal looking for new energy sources, with specific emphasis on natural gas.

Gas is now scheduled to be commercially available in 1997, arriving from North Africa via Gibraltar and Spain. Approximately 2.1 billion cubic metres of gas will be supplied each year.

At present the majority of Portuguese SMEs use thick fuel oil, as diesel is four times more expensive. This is one of the reasons why cogeneration technologies have been

relatively limited up to now. The introduction of natural gas is expected to immediately encourage:

- combined cycle power plant operation (such as the planned 900 MW plant at Tapada do Outeiro);
- co-generation system installations especially those with small gas turbogenerators.

To illustrate the attractiveness of co-generation projects using natural gas, a project carried out by Partex shows that annual energy savings of 14 million kWh worth approximately \$1.2 million could be

achieved; the payback period is 3 years, the Net Present Value (NPV) is \$5 million and the Internal Rate of Return (IRR) 30%.

The introduction of the natural gas distribution network in Portugal is therefore expected to:

- create opportunities for investment in the energy field resulting in important energy economies;
- reduce harmful emissions by using more environmentally friendly fuel;
- improve the competitiveness of Portugal's large industrial energy users by reducing fuel costs.

### Reader Reply Card

So far we have received an excellent response to the Reader Reply Card issued with Issue No.17, September 1995 of O&GTN. At present the newsletter is received in 170 different countries.

If you have not yet returned the reader reply card you should do so in the near future or send a fax to the Editor stating that you wish to continue receiving the newsletter. Current recipients from whom we receive no reply will be removed from our list.

### CONFERENCE, EXHIBITION and WORKSHOP DIARY

#### AERION '95, Athens, Greece 1-3 December 1995

AERION '95, the 2nd International Gas Exhibition, will feature a wide range of technologies covering all aspects of the gas industry. Sixty companies from Greece and abroad will exhibit at the event. Further details on the exhibition and parallel events can be obtained from John Panayiotopoulos at LDK Consultants (Tel: +30 1 856 3181 Fax: +30 1 861 7681).

#### Workshop on Pipeline Integrity and Rehabilitation, Tyumen, Russia January / February 1996

A series of workshops is planned to address the productivity and environmental situation in the oil and gas sector in Western Siberia and the CIS. The first workshop on pipeline integrity and rehabilitation will be held in Tyumen and will focus on pipeline management, leak detection and repair as well as corrosion protection. The event will be held on either 31 January or 1 February 1996.

Details can be obtained from Sam Malin or Stefan Drenkard of GOPA Consultants (Tel: +49 6172 930235 Fax: +49 6172 35046).

## JOULE-THERMIE: deadline for proposals - 1 February 1996

The JOULE-THERMIE Programme aims to improve the EU's energy security by supporting innovative technologies which will ensure durable and reliable energy services at affordable costs and conditions. In addition, emphasis is placed on technologies which reduce the environmental impact of energy production and use, particularly in relation to CO2 emissions.

The THERMIE part of the programme includes support for demonstration projects as well as other activities such as strategy, dissemination, preparatory, accompanying and support measures, concerted actions and technology

stimulation for SMEs. A total budget of 532 MECU is allocated for the THERMIE programme.

The current call for THERMIE demonstration projects was announced in September 1995 with a deadline for proposals of 1 February 1996. In the hydrocarbons part of the programme attention will focus on oil exploration, production, transport and natural gas. Specific emphasis within these broad categories is detailed in the THERMIE Information Brochure. Copies can be obtained from any of the organisations listed below.

## OPETS in the hydrocarbon sector: contact details

**BCEOM:** Société Française d'Ingénierie, Place des Frères Montgolfier, F-78286 Guyancourt Cédex

FRANCE Tel: +33 1 30 12 49 90 Fax: +33 1 30 12 10 95 Mr C Stratford

**CEEETA - PARTEX:** Calçada da Estrela, 82 - 1° DT°, P-1200 Lisbon

PORTUGAL Tel: +351 1 395 56 08 Fax: +351 1 395 24 90 Mr P Bollinger

**CESEN:** Piazza della Vittoria 11 A/8, I-16121 Genova

ITALY Tel: +39 10 576 9011 Fax: +39 10 541054 Ms M Fabianelli

**COWIconsult:** Consulting Engineers and Planners, Parallelvej 15, DK-2800 Lyngby

DENMARK Tel: +45 45 97 22 11 Fax: +45 45 97 22 12 Miss B Pedersen

**ECD:** Energy Centre Denmark, Suhmgsade 3, DK-1125 København K

DENMARK Tel: +45 33 11 83 00 Fax: +45 33 11 83 33 Ms H Hansen

**EVE:** Ente Vasco de la Energia, Edificio Albia 1, San Vicente, 8 - Planta 14, E-48001 Bilbao

SPAIN Tel: +34 4 423 50 50 Fax: +34 4 424 97 33 Mr J Reig

**FAST:** Federazione delle Associazioni Scientifiche e Tecniche, Piazzale Rodolfo Morandi 2, I-20121 Milano

ITALY Tel: +39 2 76 01 56 72 Fax: +39 2 78 24 85 Ms R Gandolfi

**GEP:** 45 rue Louis Blanc, La Défense 1 - Cédex 72, 92038 Paris la Défense

FRANCE Tel: +33 1 47 17 61 39 Fax: +33 1 47 17 67 47 Ms C Burlot

**GOPA:** Consultants, Hindenburgring 18, D-61348 Bad Homburg

GERMANY Tel: +49 6172 930 209 Fax: +49 6172 35046 Mr S Drenkard

**IRO:** Association of Dutch Suppliers in the Oil and Gas Industry, Engelandlaan 330, PO Box 7261, 2701 AG Zoetermeer

The NETHERLANDS Tel: +31 79 341 19 81 Fax: +31 79 341 97 64 Mr G Hutjes

**LDK:** Consultants, Engineers & Planners, 7 Sp Triantafyllou Str, GR-113 61 Athens

GREECE Tel: +30 1 856 3181 Fax: +30 1 861 76 81 Ms E Koulouvaris

**PSTI:** The Petroleum Science and Technology Institute, Offshore Technology Park, Exploration Drive, Aberdeen AB23 8GX

UNITED KINGDOM Tel: +44 1224 706 600 Fax: +44 1224 706 601 Miss J Kennedy

This Newsletter is produced by the Petroleum Science and Technology Institute for the European Commission.  
For further information please contact:

Jonathan Shackleton, Editor, O&GTN, PSTI, Offshore Technology Park, Exploration Drive, Aberdeen AB23 8GX, UK.  
Tel: +44 (0) 1224 706 600 Fax: +44 (0) 1224 706 601 E-mail: j.shackleton@psti.co.uk

Back numbers may be obtained by mailing or faxing your request to the Editor.

Articles may be freely quoted, with due acknowledgement to the EC Oil & Gas Technology Newsletter as the source.