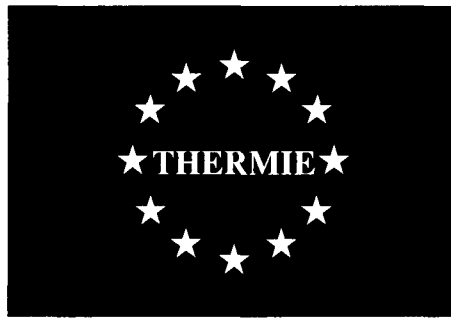


# TECHNOLOGY

## Opportunities grow for the EC's oil & gas industry in Eastern Europe

WHILE EUROPE has confirmed its role as a leader in developing and applying new technologies in the oil and gas sector, the changes in Eastern Europe have opened up major new horizons for the European Community industry.



Message from Mr C S Maniopoulos, Director-General for Energy Commission of the European Communities

The EC has recognised the political importance of these changes and the need to play a leading role through the European Energy Charter and the Technical Assistance Programmes to the Commonwealth of Independent States (TACIS) and Eastern European countries (PHARE).

The forthcoming EC symposium on *Oil and Gas Technology in a Wider Europe*, to be held in Berlin, 3-5 November (see page 3), will present European technological

development achievements; build a dialogue with Eastern Europeans to determine their needs and discuss future co-operation; and focus the attention of Community specialists on future requirements for the promotion of energy technology.

This symposium will illustrate the vital role of the EC's THERMIE programme for Community energy policies and confirm the strength of the Community industry in the oil and gas sector.

I invite you to actively participate in this important conference.

## World first quadruple completion - San Marco No.2 Well, Italy

THE MULTI-LAYER San Marco gas reservoir, Central Italy, can claim a world first with the quadruple completion of its No.2 drilled well.

The first well showed 60-70 sand levels, each a few metres thick, and was completed as dual selective on five levels,

with two 2 3/8" production strings in 7" casing.

No.2 well was quadruple completed in April this year in a 9 5/8" cased hole with four 2 3/8" production strings, to reduce the total number of wells needed for exploitation of the field. The well is S-shaped, has a maximum angle of 17° at 512 metres, and encounters the twelve production zones at depths between 1,993m and 2,308m.

French company MOTI worked with Edison Gas of Italy to design and build the quadruple completion system, with a retrievable packer at the top, isolation modules with inflatable packers to separate the twelve zones, and an anchor at the bottom.

Production is selective, with sliding sleeves installed on each of two opposite strings at each level: A and C, or B and D. Each string can then produce or circulate from each of six alternate levels.

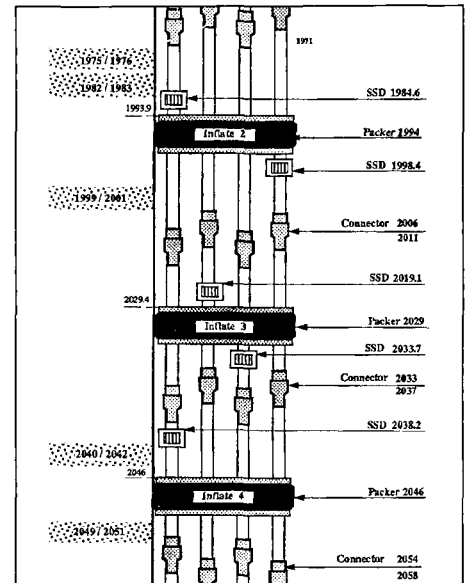
All completion operations have been successful and all the equipment and tools worked satisfactorily as planned. Two strings were put on stream in early

September, with the other two due to be put on stream at the end of October.

The total value of the project is 1,670,000 ECU, of which 40% was contributed by the EC under the THERMIE programme. Edison Gas is the operator, with Elf a partner at 50%.



Quadruple packer



Isolation modules

## EUROSLIM: Slimhole drilling for economic and rapid information update

A NEW DRILLING SYSTEM, designed by Belgian company Diamant Boart Stratabit in conjunction with French company Forasol, incorporates existing oil and mining technologies to provide onshore exploration managers with cheaper, faster and better quality information.

The mining-type drill string allows core samples of good quality to be pulled out very quickly by wire, and is adapted to handle unconsolidated formations, oil-type high-torque PDC bits and core heads, and oil-type fluids. A core analysis site unit will also be available.

Recent oil-type muds have a rheology compatible with the new hole structure.

Measuring and piloting instruments on the rig are being developed according to new parameters which will vary much more quickly than in conventional drilling - enhanced precision and reaction rate are therefore essential.

The oil-type drilling rig is especially designed for slimhole parameters and equipment, and will have a working depth

of 3,500m, the final diameter being  $4\frac{3}{8}$ " or, as an additional option,  $3\frac{3}{8}$ ".

The projected reduction in drilling costs with this equipment will range from thirty per cent in the case of sites with easy access, to fifty per cent in the case of sites where access is difficult.

EC funding under the THERMIE programme of this project has contributed 1.7 million ECU out of the total costs of 11.1 million ECU; the complete system will be available mid-1993, after full scale tests have been successfully completed at the end of this year.

## Gamma density log interpretation enhanced

GAMMA DENSITY SONDES are considered to be the most accurate of the available logging devices in the determination of porosity. A precision of better than 0.02 gm/cc (corresponding to 1 Porosity Unit) is generally claimed. However, it is not uncommon to find discrepancies between logs in the same hole from different service companies amounting to several porosity units.

AEA Petroleum Services of the UK has initiated a programme to enhance understanding of both open hole and MWD logging tools in a controlled environment and to validate a Monte Carlo computer code (MCBEND). This code can then be used to

compute tool responses under the less favourable conditions (washouts, mudcakes, etc) experienced in many holes.

Six calibration blocks have been installed in APS's EUROPA building in Aberdeen, UK, alongside the test pits constructed for neutron porosity and pulsed neutron tool calibration.

These new facilities, comprising aluminium, graphite, gabbro limestone, marble, magnesium and sandstone cover a wide range of electron densities, and will become available in service mode during 1993.

The MCBEND code was modified to handle gamma density tools under a previous research programme and validated for a generic experimental tool. The validation is now being extended for selected operational tools (both open hole and MWD) for both the controlled EUROPA environment and for real well situations.

The MCBEND code is available now for lease and includes validated capability to model neutron porosity and pulsed neutron logging tools (developed under a separate EC-supported programme), in addition to gamma density tools.

The total budget for this project is 718,000 ECU, of which the EC provided 40% under the THERMIE programme.

## Seismic inversion for accurate depth imaging

THE TRANSFORMATION of seismic data by seismic inversion is designed to give an accurate *depth* image of the subsurface, including the greatest possible detail on stratigraphic and structural features, and, above all, rock and pore parameters.

The DELSI project aims to develop a software package for seismic inversion based on innovative algorithms released by the laboratory of Seismics and Acoustics of the Delft University of Technology. Initially, the software development carried out by The TNO Institute of Applied Geoscience and TOTAL includes the following modules which are part of a new generation of seismic processing methods (the DELPHI scheme):

- Surface-related multiple elimination.
- Controlled illumination of target zones (pre-stack migration).

Development of subsequent modules - elastic decomposition, stratigraphic inversion, macro modelling and lithologic inversion - will be considered in due course, when the related research is at a sufficiently mature stage.

The software will be implemented according to well-established IEEE software engineering procedures and will be extensively tested and used for case studies with real data. Results of this work will be fed back to optimise the software product.

Moreover, the results obtained with the DELSI software will be compared with results obtained using conventional, commercially available, processing software.

The surface-related multiple elimination module will be available in early 1993, and at the conclusion of development, in mid-1994, partners will be sought to exploit the package commercially.

The overall cost of this three-year project is 411,000 ECU, to which the EC contributed 40% under the THERMIE programme.

## Subsea maintenance by remote intervention

REDUCED COSTS of subsea field development have been the major objective of a project to design, manufacture and test equipment for the remote maintenance of subsea production equipment.

The Integrated Intervention Systems for Subsea Production Equipment (IISPE) includes purpose-designed interfaces to optimise the use of ROV-based intervention techniques.

An ROV-deployed tool skid is utilised to conduct valve operating and override, sensor change out, grease injection and hot stab tasks. Heavier tasks, such as the replacement of the control pod, production choke and 5 inch valve, are conducted using a remotely operated tool (ROT).

The designs, which are suitable for use

on single satellite trees, through to cluster and template developments, also allow diver intervention to be conducted. The system interfaces with a range of ROVs, allowing rapid deployment for field maintenance or emergency repairs, and is now available for use with the latest generation of subsea production systems.

The IISPE project was conducted by SISL, a joint venture company between Stolt Comex Seaway and ABB Vetco Gray, both of the UK. The project was sponsored both technically and financially by BP, Conoco, Elf Enterprise, Phillips, Shell, Texaco and Total.

The project value was 3 million ECU, with 35% contributed by the EC under its THERMIE programme.

## Extended multiphase flow modelling for oil and gas pipe networks

**IMPROVED PREDICTIVE TOOLS** for the development of multiphase production systems are being produced by AlfaPi of Greece and AEA Petroleum Services of the UK by extending and developing existing knowledge of multiphase flow analysis in hydrocarbons fluid systems.

The modelling methods, data banks and advanced computer-assisted techniques applied are based on sound scientific

approaches to real industry systems, and deal specifically with oil-water-gas and gas-liquid-solids flows of industrial interest with activities in transient and steady two-phase flow in pipes.

Suitable models and correlations for oil-water-gas have already been coded and exist as a suite of routines for testing against experimental data. Measured results of three-phase flows are stored in a data bank

to be extended by data taken on the WASP rig (at Imperial College, London) and are used for the validation of the codes.

In a similar way the gas-liquid-solids flow model will be coded and tested against experimental and published data. In the transient two-phase flow code novel algorithmic and software tools for the prediction of phase change and fluid properties will be introduced.

Other important features such as the prediction of discrete slug flow characteristics, and annular flow analysis, will be considered.

A code for fluid dynamic analysis of two-phase flow in complex pipe networks will also be created, based on existing experience in the analysis of single-phase flow in pipe networks.

Several stand-alone computational modules used or generated during the project evolution have already been utilised in industrial applications in the natural gas and oil industry both in the UK and Greece.

These modules and the data bases are essential ingredients of an integrated computational multiphase flow dynamics system, part of which is covered by the project objectives.

This 1.2 million ECU project will be completed next year, with the full predictive tools commercially available at the end of 1993. Support under the EC THERMIE programme amounted to 40% of the total cost.

## Suction piles hold unmanned platform in place

**AN UNMANNED** lightweight platform has been designed in Denmark, in which the traditionally driven piles are replaced by suction piles.

This suction pile platform concept, of a monotower supported on a three-legged sub-base, will offer lower costs for oil production at sea, and is being developed by Rambøll, Hannemann & Højlung, in conjunction with the Danish Geoteknisk Institut.

The suction piles consist of large tubes closed on top, and maintain a low pressure compared with the surrounding ambient water pressure, whereby the piles are sucked down into the sea bed. They can be utilised both for installation of the platform and to increase the pull-out resistance.

The platform is primarily intended for marginally economic areas, although the technology will possibly find more widespread use in the future.

The principal purpose of this recently

completed project was to quantify the suction piles' mode of operation and develop a platform that utilises this optimally. Work concentrated on tabulating geotechnical calculation models which describe the interaction between the suction piles and the earth, as well as dynamic models for ship collision.

Analogously geotechnical model experiments with suction piles in sand and clay have been carried out. Later analyses included the installation of the platform and re-use, as well as cost calculations.

No unforeseen problems have emerged from the conceptual design, but tests will be conducted in the North Sea to verify laboratory results before the system is made commercially available.

Financial support was given by Norsk Hydro and the Danish Ministry of Energy, with 35% of the total 630,000 ECU budget contributed by the EC under the THERMIE programme.

## CONFERENCE & EXHIBITION DIARY

### EUROPEC '92: European Petroleum Conference and Exhibition • Cannes France • 16-18 Nov 1992

**THE EUROPEAN COMMUNITY** will exhibit this November at EUROPEC '92, the Society of Petroleum Engineers' premier European petroleum industry conference and exhibition, in order to promote its THERMIE programme amongst a concentrated but wide-ranging audience of professional engineers and managers from all over Europe.

Parallel to the exhibition, an important conference on Moving the Frontiers - Sharing Solutions will be held.

The conference technical programme will emphasise solutions to the drilling and production challenges of the next decade, and will include technical sessions on drilling technology, mud and cement, stimulation and fracturing, well completion, reservoir characterisation,

reservoir surveillance, horizontal wells, safety and environment, case histories, improved recovery methods, subsea and marginal field development, computer applications, facilities and pipeline

technology, and research and laboratory investigation.

*For further information, please contact: Ms Paola Perini: OPET Co-ordinator, FAST (see OPET details on rear page).*

### Oil & Gas Technology in a Wider Europe 4th EC Symposium • Berlin Germany • 3-5 November 1992

**EVERY FOUR YEARS** the EC organises a symposium to present the latest upstream oil and gas technology developed within the Community. The symposium this November is being held on the eastern borders of the Community, in Berlin, to emphasise the potential for technology transfer and collaboration with the new democracies of Central and Eastern Europe. The symposium will provide an

excellent opportunity to meet representatives of the East European oil and gas industry and to hear about the latest technological developments within the Community.

*For further details of registration and information on the full social and accompanying persons' programme please contact: Miss Jane Kennedy, PSTI (see OPET details on rear page).*

### **EC Pavilion at Offshore South-East Asia exhibition • 1-4 December 1992 • Singapore**

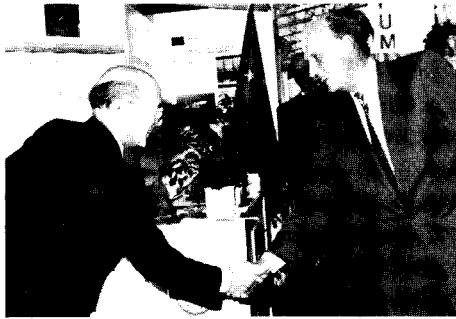
THE EC STAND will be the largest at this exhibition, with more than 120 companies from the UK, Italy, Netherlands, Germany, France, Belgium, Denmark and Spain, showing the latest European offshore industry technology.

The OSEA trade fair has a reputation as the major international event for this industry in the region and attracts visitors not only from Singapore and the neighbouring ASEAN countries, but also from Asia, Japan, the USA and Australia.

The EC will also take part in the OSEA conference. Next to papers from individual EC companies and institutions, a keynote speaker from the Commission of the EC will elaborate on energy technology co-operation in the European Community.

## CONFERENCE and EXHIBITION REPORT

### **ONS: Offshore Northern Seas • Stavanger Norway • 25-28 August 1992**



*HM King Harald V of Norway (right) greeted by Aneurin Ryhs Hughes, head of the EC delegation in Norway, at the EC stand*

THE European Community presence at the Offshore Northern Seas (ONS) exhibition in Stavanger aroused a high level of interest amongst the nearly 30,000 visitors to the show.

The stand was honoured by a visit from HM King Harald V during the royal tour at the inauguration of the conference, while the list of VIP visitors included Mr Tim Eggar, UK Minister for Energy.

Eight companies from various Member States of the Community had booths on the EC stand, as part of the Commission's

policy both to promote the technologies being supported by the THERMIE Programme, and to encourage the participation at trade shows of small- to medium-sized enterprises which may not otherwise be able to exhibit.

The record number of visitors and delegates to ONS exposed most of the participants on the stand to a range of contacts to which they had not previously had access, enabling some of the companies to conclude trade deals and others to open discussions on new joint ventures.

### **OPET - Organisations for the promotion of energy technology**

THE ROLE of the EC'S OPET Network is to encourage within Europe the development of an energy strategy and the implementation of innovative technology. The Network also fosters the growth of smaller enterprises and cross-border collaboration within the Community.

The benefits for Europe which follow

from these activities include securing the energy supply, building an industrial base and improving the potential for exports, whilst at the same time protecting the environment.

The OPET Network has been strengthened recently by the addition of GEP-ASTEO, whose special responsibility

is the promotion of European hydrocarbons technology in Eastern Europe and the former Soviet Union.

OPETs are there to help and advise. For further information on technologies described in the articles in this newsletter please contact the appropriate office.

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