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OIL & GAS TECHNOLOGY

THERMIE PROGRAMME: promotion of energy technology in Europe

New standards set for safety and protection of the environment

SAFETY AND THE ENVIRONMENT have become key concerns of those companies in Europe involved with the exploitation of hydrocarbons.

A number of well-publicised disasters have highlighted the need for increased vigilance in all aspects of the upstream oil and gas industry, from exploration through production to transportation.

European companies are leading the way in developing technologies which will safeguard the environment and the safety of the workforce during petroleum exploration and production.

This issue of the Newsletter contains articles on pollution control modelling, enhancing the safety of divers using air and other mixtures, and on pipeline and riser safety evaluation. Other features cover inflammable gas detection, and permanent downhole pressure monitoring.

Most of the technologies highlighted in this newsletter are supported by THERMIE or by previous EC funding programmes, and these schemes -THERMIE in particular - give priority to projects having a positive impact on safety and the environment.

The technologies being developed and marketed by companies within the EC to prevent damage to the environment and loss of life are not only applicable to the North Sea and the Adriatic but are of direct relevance to the offshore and, in some cases, onshore industry worldwide.

The European industry has both the duty to focus on safety and environmental protection and the opportunity to export its technologies in this area to other oil-producing regions of the world.

EDITORIAL

International co-operation leads to safe diving techniques

SIMULATED DIVES in two separate projects in the UK have established safe procedures for diver intervention at 470m (1,530 feet) and for reducing the risk of the 'bends' in compressed-air dives, respectively.

Project Aurora '93, the deepest dive yet in the UK, approached the limit of practical operations for divers breathing a mix of helium and oxygen.

The project's objectives were to: demonstrate safe and cost-effective manned subsea intervention at 470 metres; enable diving contractors and equipment manufacturers to demonstrate procedures and technology developed for deep intervention; and to demonstrate the capability to undertake deep dive intervention.

Divers participating in the Project Aurora 470m-deep dive (courtesy of the National Hyperbaric Centre).

Scientific studies included any effects of deep diving on breathing, balance, intellect, the heart and the nervous system. The effects of excursions and decompression were also evaluated.

Initial conclusions are very positive with particularly successful compression profiles. Trials of bail-out and breathing equipment were also very successful, with all the participants meeting the most stringent international criteria for a minimum of 10 minutes emergency gas supply at depth.

Assessment of the results are expected to be made available by September 1993, and all equipment tested is, or will shortly be, commercially available to the industry.

Manned dive trials in the other project were aimed at reducing the risk to divers ascending from compressed-air dives of suffering from the 'bends', *ie* decompression sickness, by using helium and oxygen in the decompression.

The typical joint pains are easily treated, but nitrogen bubbles in the blood of divers may damage the brain and spinal cord by blocking small blood vessels and lead to long-term damage.

Advanced ultrasonic equipment and procedures developed by the SINTEF Group at the University of Trondheim were used, allowing the accurate monitoring of the diver's heart throughout all phases of the dive for the development of gas bubbles in the blood.

The trials have shown that it is not only safe to introduce helium in the decompression from

Commission of the European Communities - Directorate-General for Energy

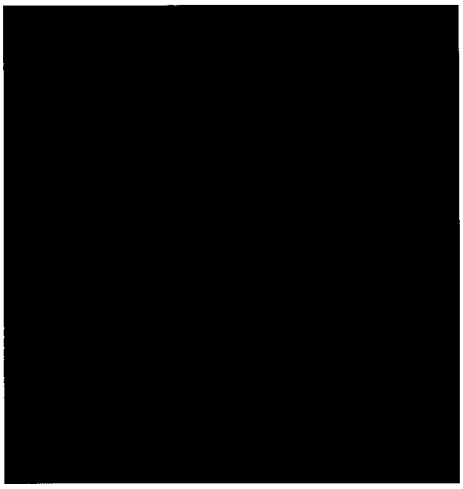
On-line modelling of offshore pollution and control procedures on PCs

HIGHLY ACCURATE 3D prediction models for routine and on-line forecasts of currents, waterlevels and dispersion of substances, drifters or sinkers and other parameters in the marine environment have been developed by HYDROMOD of Germany.

The systems automatically calculate precise forecasts of marine parameters for operation, safety, and protection of the marine environment, and can be configured for user-defined risk analysis, impact assessment, feasibility and case studies. Oil spills, for instance, can be predicted and their impact assessed almost immediately.

The OPMOD-PC systems comprise a durable, cost-saving, in-house alternative to conventional investigation and assessment methods of oceanographic, hydrographic, and hydrological parameters. They can be applied to almost any offshore and inland-water area of operation.

Input for the dispersion models can be supplied either by integrated pre-calculated case studies, routinely by delivery of forecasts via data-links, or by on-line computation on a work-station interfaced with monitoring or measurement devices.



The pathline of an oil slick for a case study off the South Korean coast near Kunsan, obtained during operation of a stand-alone HYDROMOD OPMOD-PC system for the prediction and assessment of oil spills. The system was compiled and supplied for training mariners, environmental engineers and offshore engineers.

All marine data and results are stored in a convenient manner for further evaluation, additional assessments, and statistics. They can be re-displayed in GIS-like procedures. The user of an OPMOD-system will achieve new dimensions of information density and prediction-quality of marine parameters which will considerably enhance operational planning, control, execution, safety, and environment protection. Moreover, expenses for traditional investigations and surveys can be reduced considerably.

This project is closely related to and partially funded under the EUREKA programme EUROMAR-OPMOD, which is currently carried out in co-operation with 11 institutions from 7 European countries. HYDROMOD-OPMOD-PC applications will be presented at Offshore Europe (see page 3); demonstration versions are available on diskettes.

Computer toolkit to evaluate subsea system and pipeline safety

SAFETY ASSESSMENT and evaluation has become an important consideration in the North Sea following recent major accidents, and the UK now requires safety cases to demonstrate that potential major hazards arising from the inventory of hydrocarbons in risers and pipelines have been identified and minimised.

Advanced Mechanics & Engineering Ltd responded to these new requirements through the development and use of a computer-based toolkit, PRISE, which combines the evaluation of hazards, defect growth and likelihood of detection, probabilities of failure and consequences.

Its detailed hazard and failure-likelihood models for subsea and pipeline systems make it possible to estimate the probability of occurrence of incidents, such as anchor dragging vessel impact with risers, or to estimate the probable extent of corrosion, growth of defects, *etc.*

The evaluation of the consequences of loss of containment at three levels - loss of structures and equipment; environmental effects; and loss of life - helps determine the implications of various options to deal with a particular form of failure.

The computer knowledge-based system - which incorporates the latest safety guidelines and regulations - determines risks and aids in the decision-making process.

This makes PRISE a valuable toolkit in safety assessments: given a hazard, it assesses damage potential, likelihood and consequences; given a defect, it assesses probability of failure, acceptability and remaining life; given an inspection philosophy, it assesses ability to maintain pipeline fitness-for-purpose.

To date it has been applied successfully to the assessment of hazards and risks associated with the development of a subsea well cluster and to the evaluation of risks associated with the operation of a major pipeline network.

The 0.57 million ECU development of PRISE was supported by the CEC under its THERMIE Programme to 40% of its value. The hazard models in PRISE were developed through support from the UK Health and Safety Executive.

The PRISE prototype toolkit is available for consultancy services through AME, and a joint industry proposal has been launched recently to extend the development of PRISE into a commercially available computer analysis toolkit.

International co-operation leads to safe diving techniques *continued from p1.*

air dives, but that it also has a positive effect on reducing the number of bubbles.

A dive to 40 metres for 60 minutes has been bubble-free in 20 divers, and in the final part of the study in a dive to 40 metres for 75 minutes - which is significantly longer than the current allowable limit - no bubbles could be found in any of the four divers.

Current air diving procedures often generate bubbles, but these trials show that the goal of a bubble-free dive may be achievable.

Once developed for commercial operations these decompression tables will be freely available for general use.

Both trials were carried out at the National Hyperbaric Centre (NHC) in Aberdeen, UK.

Some 34 companies, including operators, contractors, equipment manufacturers and scientific organisations from seven countries participated in the 1.6m ECU project Aurora, which was 35% funded by the EC's THERMIE Programme; and British Gas, the UK NHC and Health and Safety Executive, Shell/Esso and the European Community sponsored the 1.2m ECU bubble-reduction trials, with around 28% funded by the THERMIE Programme.

Fibreoptics methane detection system for offshore platforms

AN INNOVATIVE environmental methane gas detection system has been developed which offers an unprecedented combination of selectivity, sensitivity (integrated m.d.c. < 1000 ppm*m), speed (< 1 sec / cell) and baseline stability (1000 ppm*m upper limit in time and for environmental temperatures from -15°C to 40°C).

The system, called Gastrack, is controlled by an industrial computer with a user-friendly interface, and includes a series of open-path gas detection cells, each one composed of an emitter-receiver and a retroreflector.

The cells include few optical components, since the system is based on a central diode-laser spectrometer connected to each cell by a monomode optical fibre.

As a fibreoptics sensor, Gastrack has the advantage of being intrinsically safe and insensitive to electromagnetic interference. The equipment is eye-safe and does not require any field calibration.

The system main unit with three cells is to be tested for one year on board an Agip gas rig in the Adriatic Sea.

Gastrack was designed and manufactured by Tecsa (I) and Vuman Lasers (UK) with the help of Snamprogetti (UK) on application engineering and test installation design.

The 1.4m ECU project was supported by the EC to 40 % of its value.

New permanent downhole pressure gauge system provides direct reservoir monitoring

PETROLEUM ENGINEERS can now directly contact their offshore rigs and downhole pressure gauges anywhere in the world by using Schlumberger's new permanent gauge system.

The gauges are permanently installed in the wellbore with the production tubing, and an automatic control box on the rig acquires the gauges' measurements, stores them and communicates directly with the engineer's own office computer via standard data links or telephone lines.

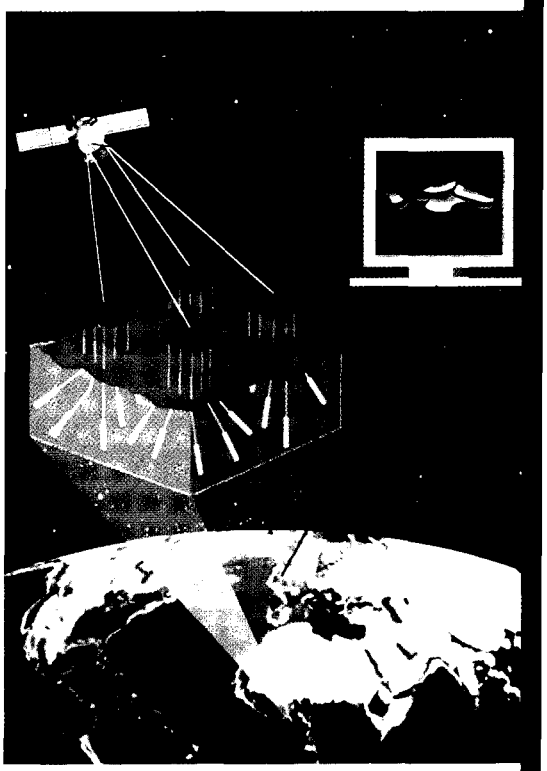
Information is vital for efficient and safe oil and gas production throughout the entire life cycle of a reservoir.

In the early phases, pressure gauges help to determine production potentials as well as the interconnection of each well into the reservoir.

Later, the permanent gauges routinely monitor production and provide an early warning of problems. Finally, permanent gauges help optimise expensive secondary recovery operations near the end of a field's productive life.

This new technology is based on a sapphire crystal sensor that is smaller and more rugged than quartz sensors and more stable than metal strain gauges.

The system can handle quartz pressure gauges as well as the new Schlumberger Permanent Sapphire Gauge, and also multiple gauges connected on the same cable.



This 1.49 million ECU project was completed by Etudes et Production Schlumberger (EPS) of France with 40% of funding from the EC under the THERMIE Programme, and field applications are under way in the North Sea.

CONFERENCE, EXHIBITION and WORKSHOP DIARY

Offshore Europe Conference & Exhibition • Aberdeen UK • 7-10 September 1993

THE COMMERCIAL IMPORTANCE to the European oil and gas industry of the Offshore Europe exhibition is recognised by the EC, which will have a large stand, number 1129, in the permanent exhibition hall (Red Zone) during the show.

Eight invited small to medium size enterprises on the EC booth will have the opportunity to market their new technologies which they might otherwise not have been able to promote at this major upstream hydrocarbons trade exhibition. The technologies being exhibited on the EC stand include quadruple completion, a new platform safety system, an innovatory valve, an IVF separator, concrete coating of marine linepipes, a hydraulic power swivel, explosive underwater cutting and a permanent pressure gauge system.

Officials of the European Commission will also be at hand to answer questions on the objectives of the THERMIE Programme, the possibilities of funding for demonstration projects and on the procedures to be followed when applying for financial aid.

Energy Centre Tyumen Workshops • September 1993

THE European Community's Energy Centre in Tyumen, Western Siberia has recently opened, and has planned two events for Autumn 1993.

Two technical workshops will focus on innovative techniques and technologies for the production and transportation of high viscosity oil, and the development of low productive horizons in heterogeneous permeability reservoirs.

A poster exhibition will focus on onshore oil and gas exploration and production techniques.

For further information please contact François Coquilhat of GEP (see OPET details, rear page).

AAPG International Conference & Exhibition

The Hague The Netherlands

17-20 October 1993

INNOVATIVE near-market oil and gas technologies from Europe, and the THERMIE Programme, will be promoted by the EC at this important exploration-orientated trade show.

As well as having a stand at the exhibition, the European Commission intends to host a parallel workshop in The Hague, which will demonstrate exploration software developed within the Community.

For further details please contact: Guus Hutjes of IRO in The Netherlands: Tel +31 79 411 981.

CONFERENCE, EXHIBITION and WORKSHOP REPORTS

Moscow International Oil & Gas Business '93 Conference and NEFTE-GAS '93 Moscow International Oil & Gas Exhibition • 20-23 April 1993

EC OFFICIAL Patrick Lambert, Head of Energy Co-operation with Eastern Europe and the former Soviet Union, spoke on *Partnership and co-operation between the EC and the Newly Independent States in the energy sector*, emphasising the importance of the European Energy Charter.

Perry Argyris, EC consultant, talked about *Oilfield equipment manufacturing joint ventures*, in which the message was that even though machinery and equipment is in place, success is dependent on people working in a team which effectively communicates.

The associated NEFTE-GAS '93 Moscow International Oil & Gas Exhibition was opened by Mr Yuri Shafranik, Russian Minister of Fuel and Energy and Chairman of Gasprom.

The EC stand, which presented the THERMIE programme and two technical projects financially supported by it - *Weltest 200* by Intera (UK), and *Sirius* by Dataid (France) - received many visitors, including key people from the Russian oil and gas industry and the Siberian oil fields.

Reader Reply Card

The Oil & Gas Technology Newsletter goes out to around 9,500 readers in 133 countries, promoting innovative European near-market technologies through the articles, information on conferences, exhibitions and workshops, and through contacts via the OPETs active in the hydrocarbons sector.

It is very necessary to keep the mailing list up to date for effective distribution, and a Reader Reply Card is enclosed with this issue of the Newsletter for this purpose.

Please complete and return the card, and help enable us to direct news of technological advances in the European oil and gas industry to where it will be most useful.

Thank you.

OTC : Houston USA

3-6 May 1993

The European Community's stand at OTC attracted an estimated 2,000 visitors, including such VIPs as Mr A Konoplyanik, Deputy Minister for Fuel and Energy of the Federal Government of Russia.

Most of the 8 participants on the EC booth were small European companies which would have found it difficult to take part in the exhibition without Community support. Many reported firm sales leads.

An associated THERMIE workshop focused on recent developments in European subsea technologies, with about 35 participants, representing major US and South American petroleum companies, attending presentations on deep diving, diverless intervention and safe structure decommissioning by Stolt Comex Seaway (France), the VASPS subsea separation and pumping project of Baker, Jardine and Associates (UK) and pile-driving techniques in deep water by IHC Hydrohammer (Netherlands).

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 actions include securing the energy supply, building an industrial base and improving the potential for exports, whilst at the same time enhancing safety and protecting the environment.

To achieve these objectives, the OPETs are involved in a range of activities including market studies, workshops, conferences, trade exhibitions and publications.

The activities of the OPET Network promote improved efficiency and competitiveness and contribute to European technology transfer, not only within the Single Market but also outside the European Community.

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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