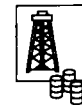


OIL & GAS TECHNOLOGY



European technology at the forefront of offshore oil and gas production

A SIGNIFICANT PROPORTION of the world's offshore oil and gas prospective reserves are located in water depths of 200m or more. As the accessible shallow-water fields become depleted, so cost-effective deepwater production solutions are becoming increasingly important.

The EC THERMIE Programme seeks within the hydrocarbons sector to promote energy technologies for exploration and production as part of the EC's overall strategy to secure the energy supply of the European Community and to maximise the exploitation of indigenous reserves.

The discoveries of potentially large oil and gas fields in areas such as the UK West of Shetlands Basin, the North-West Frontier of the European Continental Shelf, demand innovative approaches to the problems of development.



EDITORIAL

European companies in the hydrocarbons sector are tackling this challenge and are developing appropriate technologies, many with financial support from the THERMIE Programme.

Some of these technologies are described in this issue of the Newsletter, such as

deepwater mooring systems, floating production systems and innovative processing technologies.

These developmental solutions will not only open up new frontiers to oil and gas exploitation in Europe, but are also relevant in other deepwater hydrocarbons provinces in the world, particularly the Gulf of Mexico.

The potential transfer of European technology to the stable and mature market of the Gulf of Mexico is of importance to the Community's equipment and service industry.

Some of the innovative near-market technologies developed in the European Community and applicable to deepwater offshore fields will be exhibited on the EC booth at the Offshore Technology Conference and Exhibition in Houston, 3-6 May.

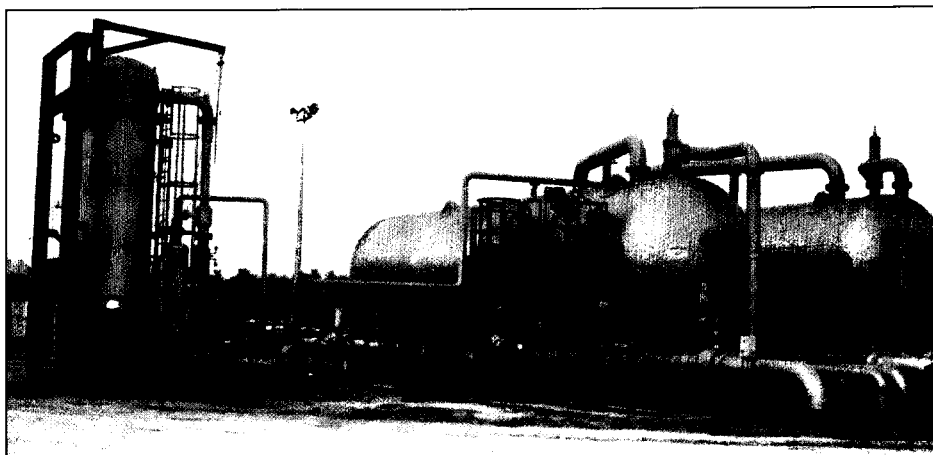
Half-size compact separator to reduce platform costs

OPERATORS developing smaller marginal fields in offshore regions need to reduce platform weight and size as an economic necessity.

Bertin et Cie of France has addressed this challenge with the development of its vertical three-phase Offshore Compact Separator (OCS), which provides the same through-put as a conventional horizontal separator, but at half the volume and weight.

This vertical separator concept is the appropriate answer to crude-oil separation problems on floating rigs and platforms, allowing substantial reduction in topsides weight and deck size and leading, therefore, to significant savings of overall investment costs.

The main technical concepts in designing a smaller separator include the use of vertical vessels to reduce the deck footprint area, and the implementation of custom-designed internals to speed the passage of fluids through the vessels and allow reduction of vessel volume.



The three-phase compact vertical separator (left) skid-mounted at Obagi field in Nigeria, for performance tests. Note its size compared with the conventional separator on the right of the picture.

A twelve-month qualification trial operation has just been successfully completed by the three-phase Offshore Compact Separator operated at the Olo field by Elf Nigeria, demonstrating the efficiency and reliability of the equipment.

The 1.3 million ECU development

project was supported by the Commission of European Communities under its THERMIE Programme to 40% of its value.

Bertin's Offshore Compact Separator (OCS) is now commercially available, exclusively marketed by NAT, of Rueil-Malmaison, France.

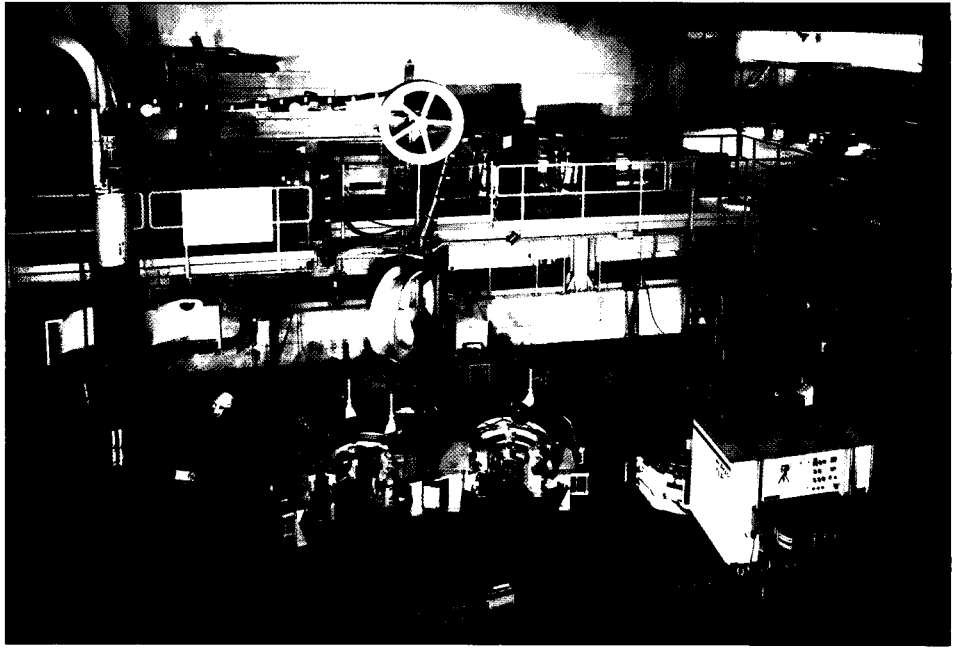
Welded tubular tendons for deepwater TLPs

AN INNOVATIVE TECHNOLOGY for Tension Leg Platform installation using welded tubulars has been developed by Agip of Italy to a preliminary industrial level, with a working prototype of the system for the installation of TLP tendons by welding them at the installation site having now been manufactured and tested.

The key areas for this development are: fast and reliable welding techniques, accurate Non-Destructive Evaluation techniques, and efficient and proven handling of tendons during installation.

The full development of this TLP technology for small fields in the Mediterranean waters will feed a significant market for deepwater fields worldwide, removing uncertainties and residual risks which restrict the use of this innovative installation procedure which is less costly and more reliable than the techniques currently adopted.

The 10 million ECU project was headed by Agip of Italy with the technical co-operation of ENI companies SAIPEM and



The working prototype of the welding and NDE systems in the Cortemaggiore Yard near Milan.

TEMAV, and received funding from the EC of 40% under the THERMIE Programme.

The industrialisation development of the

technology continues with a further phase, which also has received EC THERMIE Programme support.

Integrated approach to the stability evaluation of potential offshore sites

OFFSHORE FOUNDATIONS can fail from one or a number of causes of which slope, pre-existing failure planes, underconsolidation in fine-grained sediments and spontaneous liquefaction in sands loom large.

For many years it has been attempted to exploit geophysical measurements for the assessment of the structure and mechanical behaviour of seabed sediments in foundation studies.

A recent study carried out in a joint venture between Renard Centre of Marine Geology at Gent University (RCMG, Belgium) and Auger Geophysical Services at the University College of North Wales (Menai Bridge, UK) ran a programme structure composed of two main flowlines, a structural line and a sediment property line, merging into the integrated, 3D imaging of the seabed structure and properties.

Highlights were the development of a new shear wave sledge with modular hardware components and the confrontation of *in situ* refraction measurements with geotechnical laboratory testing, the analysis of the variation of the dynamic elastic moduli (small strain shear modulus and Young's modulus) with depth through resonant column testing, the downscaling of true 3D reflection seismics

to the geotechnical world through very high resolution data blocks (1m x 1m bins, 0.25 ms time slices) acquired with a catamaran-towed array of twelve streamers (the Seiscat system) and finally the interactive 3D imaging of complex faulted deformation patterns (GEOFOX).

Test areas were located in the southern

North Sea in areas of significant shallow structural deformations, both basement-induced and intraformational (faulted blocks and diapirs in Paleogene clays) and in the Irish Sea, especially in areas with shallow gas.

The total project value amounted to 950,000 ECU, of which 35% was provided by the EC under the THERMIE Programme.

DAMPS: Downtime Analysis for Marginal Field Production Systems

ENVIRONMENTAL DOWNTIME is a critical cause of offshore production downtime. DAMPS (Downtime Analysis for Marginal Field Production Systems) was thus developed with a practical approach to analyse and predict the downtime of offshore marginal fields operated via various types of floating production systems.

The project is now being extended to bring DAMPS to the stage where it will be of practical use to offshore operators and designers, Certifying Authorities, and government agencies.

Phase 2 incorporates model testing in 2D and 3D wave tanks, with motion analysis information utilised for various configurations to assist in tuning the environmental downtime software sub-routine one step further.

Preliminary 2D testing was carried out to identify basic response characteristics and critical motions, and these studies were then progressed to model 3D random sea states and multi-directional response modes.

EOLAS (The Irish Science and Technology Agency) manages the project carried out by partners Danish Hydraulic Institute/Danish Maritime Institute (Danish Offshore Laboratories DOL) and University College Cork Hydraulics and Maritime Research Laboratory, Ireland.

The project is now near completion, with a software package planned for finalisation in the autumn this year.

Both Phases were supported with EC funding under the THERMIE Programme, which contributed 35% to the 637,000 ECU total value of Phase 2.

Wet welding structural repairs in harsh North Sea conditions

SEMI-STRUCTURAL quality welds in deep water depths to 100 msw have been achieved in the harsh environmental conditions of the North Sea.

The development by GKSS and Stolt Comex Seaway under a THERMIE-backed project led to state-of-the-art welding technology significantly advanced for commercial application for structural repairs using ferritic electrodes.

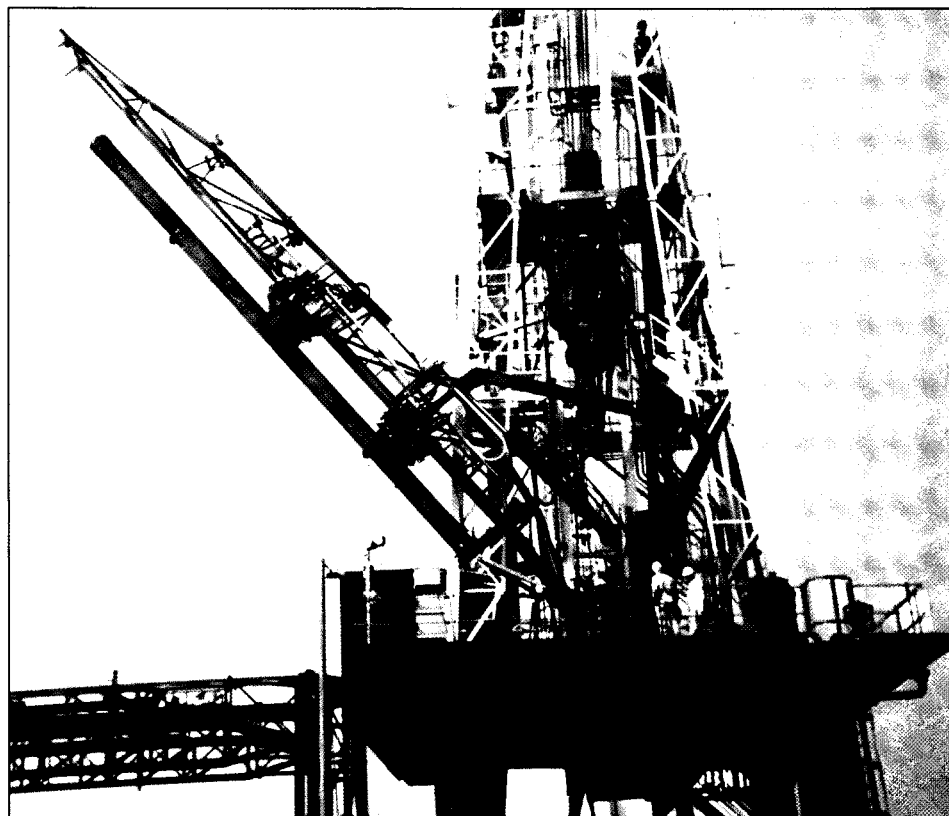
The problem of weldability of austenitic nickel-based stainless steel electrodes, however, was not solved during the term of that project, although considerable knowledge has been obtained. At present, austenitic electrodes work reasonably well down to 10-20 msw in all positions and to approximately 50-60 msw in the flat position.

A new THERMIE-sponsored project

launched by the same partners, with the University of Hamburg, is running a comprehensive investigation and advanced method testing programme to provide the necessary design data for wet welding, which includes: tackling the problem of wetability of austenitic electrodes; optimising joint design (root gap, integral backing strip, groove details); optimising doubler plate shape and design; fatigue and CTOD testing; testing in steels of Carbon Equivalent (CE) > 0.42%; and trials of improved electrode waterproofing systems.

The total value of this project is 6.25 million ECU, with the EC providing 40%.

RA-D: The drilling rig mechanised and automated



The handling boom of the RA-D rig rising up to offer the tubular section to the elevator.

THE DEMONSTRATION RIG built to the Strachan & Henshaw Rig Automation-Drilling (RA-D) concept is now being tested and commissioned for drilling operations at the International Drilling and Downhole Technology Centre in Aberdeen, Scotland.

This 1,000,000 lbs (454,000 kg) housing capacity rig demonstrates the total mechanised and automated drilling rig concept, adaptable for platforms, jack-ups, semi-submersibles, remote-area land rigs and removable and replaceable packaged modular rigs.

The rig shows not only weight savings of the order of 200 tonnes, manpower savings of seven men, and improvement in LTAs of forty per cent in applications offshore, but also significantly improved safety.

It breaks new ground by incorporating

automated drill string handling, casing handling and tubing handling in a single system.

Support from Amoco, BP, Shell, Statoil and several leading drilling contractors, including Smedulg, Sedco Forex, KCA and Kenting, ensured that the needs of the operator, the drilling contractor and the equipment supplier were fully satisfied.

The EC and OSO are also supporting this collaborative development, and the PSTI on behalf of the EC has recently helped to arrange workshops for key industry personnel to examine for themselves the operation of the rig (see report on page four).

The EC has provided 2 million ECU towards the 12.5 million ECU total value of this project through the THERMIE Programme.

New designs for deep water mooring

AN OPTIMISED design methodology for mooring lines for deep water applications (of the order of 2000m) has been developed and demonstrated through two successively completed projects.

The first one, carried out by the Department of Naval Architecture and Marine Engineering, National Technical University of Athens (NTUA), investigated several geometrical and mechanical parameters of mooring lines for deep water anchoring systems, with particular emphasis placed on the effect of submerged buoys attached along the line.

It was found that the buoys can be used as a more effective passive control scheme, compared to others which impose power or deck weight requirements.

These results formed the basis for the development of an optimisation algorithm for mooring systems, which, together with its validation through pilot experiments, were demonstrated during a second project, carried out in collaboration by NTUA and Tecnomare.

The pilot tests were conducted in a 25m deep lake. Two buoys were attached to the line, and special attention was paid in ensuring both static and dynamic similitude between full-scale and scaled-down configurations by inserting springs of appropriate stiffness along the line and adjusting its pretension level.

The experiments confirmed the optimisation algorithm, which is now available for commercial purposes.

The two projects had a total cost of 166,500 and 785,350 ECU respectively, 35% of which in each case was contributed by the EC under the THERMIE Programme.

OTC: Offshore Technology Conference

Houston USA • 3-6 May 1993

THE MAJOR oil and gas trade shows of the world play an important part in the EC's strategy for promoting the Community's innovative hydrocarbons technologies.

The EC has taken a large stand at this year's OTC and has invited eight European companies, many of them small- to medium-sized enterprises, to exhibit their

Offshore Europe • Aberdeen UK • 7-10 September 1993

THE European Commission is participating at Offshore Europe, the largest oil and gas trade exhibition within the European Community, and will have a stand which will enable up to eight European companies, which might otherwise not be able to take part in the

near-market technologies, which have been chosen to complement the deepwater offshore technology theme of the EC one-day workshop to be held on Friday, 30th April, at the Sheraton Astrodome Hotel.

Comex of France, Baker Jardine of the UK and Dutch company IHC Hydrohammer will present their latest developments at the workshop.

show, to demonstrate their near-market hydrocarbons technologies to a potential audience of over 30,000.

Commission officials and technical experts will be on hand to provide information on the THERMIE Programme and other EC activities.

CONFERENCE, EXHIBITION and WORKSHOP REPORTS

OMC '93 • Ravenna Italy

11-13 March 1993

DR ENZO MILLICH, a senior official of the European Community Directorate-General for Energy, gave a presentation

during the opening session of the conference on the EC THERMIE Programme to promote greater use of European energy technologies.

An EC stand at the accompanying

Rig Automation-Drilling Workshop • Aberdeen UK • 17 & 25 March 1993

THE WORKSHOP on Strachan & Henshaw's automated drilling rig, held at PSTI and the International Drilling & Downhole Technology Centre in

Aberdeen, UK, attracted a high level of interest from representatives of the oil companies and drilling contractors.

The technology, which is partially

EC Energy Centre to open in Tyumen

West Siberia • Summer 1993

TYUMEN is the capital of one of the most important oil provinces in the world; and the EC will open an Energy Centre there this summer to provide a valuable interface for the transfer of technology between the Community and the Russian oil industry.

To mark the occasion of the inauguration of the Energy Centre, the European Commission will hold a series of seminars on technologies for non-standard oil production and transportation problems, and on the development of low permeability terrigenous reservoirs. A poster exhibition will focus on onshore exploration and production techniques.

For further information please contact Michel Ningler of GEP-ASTEO, (see OPET details, this page).

exhibition further provided information on THERMIE, and a workshop on The Platine Project - Advanced Offshore Platforms was held in parallel to the conference, organised by the local EC OPET.

funded by the European Commission and is nearing completion of the proof of concept stage, was viewed onsite by over forty senior personnel from the industry.

The OPET Network: Organisations for the Promotion of Energy Technology

The EC's THERMIE Programme was launched in 1990 to encourage greater use of European energy technologies, and created the OPET Network as the prime means of promoting near-market innovative technologies and developing an industrial base within the Community's energy sector.

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 this newsletter please contact the appropriate office.

OPETs in the hydrocarbon sector: contact details

EAB: Energie-Anlagen Berlin GmbH, Flottwellstr 4-5, D-1000 Berlin 30
GERMANY Tel: +49 30 254 96 171 Fax: +49 30 254 96 100 Mr T Mierke

ENERGIUM 2000: Chemin du Stocquoy 1-3, 1300-Wavre
BELGIUM Tel: +32 10 45 60 75 Fax: +32 10 45 60 95 Mr G Liebecq

EUROPLAN: Consultants Européens pour la Technologie SARL,
Ophira 11, 630 Route des Dolines, F-06560 Valbonne
FRANCE Tel: +33 93 65 31 57 Fax: +33 93 95 83 71 Mr B Laurence

EVE: Ente Vasco de la Energia, Edificio Albia 1, San Vicente,
8-Planta 14, E-48001 Bilbao
SPAIN Tel: +34 4 423 5050 Fax: +34 4 424 9733 Mr J L Pena

FAST: Federazione delle Associazioni Scientifiche e Tecniche,
Piazza le Rodolfo Morandi 2, I - 20121 Milano
ITALY Tel: +39 2 7601 5672 Fax: +39 2 782 485 Ms P Perini

GEP-ASTEO: Tour Albert 1er, 65 Avenue de Colmar,
92507 Rueil-Malmaison Cedex
FRANCE Tel: +33 1 47 52 94 01 Fax: +33 1 47 52 90 44 Mr M Ningler

IECU: ICEU Leipzig GmbH, Auenstrasse 25, D-7010 Leipzig
GERMANY Tel: +49 341 29 46 02 Fax: +49 341 29 09 04 Mr A Schmidt

MWMT: Ministerium für Wirtschaft, Mittelstand und Technologie,
Referat 45, Feuerbachstrasse 24/25, D-1570 Potsdam
GERMANY Tel: +49 331 96 45 02/24 Fax: +49 341 96 45 92
Mr R Behnke

NOVEM: The Netherlands Agency for Energy and the Environment,
Swentiboldstraat, 21PO Box 17, NL-6130 AA Sittard
The NETHERLANDS Tel: +31 46 595 276 Fax: +31 46 528 260
Mr W Gerardu

PSTI: The Petroleum Science and Technology Institute,
Offshore Technology Park, Exploration Drive, Aberdeen AB23 8GX
UNITED KINGDOM Tel: +44 224 706 600 Fax: +44 224 706 601
Dr P Bigg

This Newsletter is produced by the Petroleum Science and Technology Institute for the Commission of European Communities.

For further information please contact:

Michael Pelling, Editor, PSTI, Offshore Technology Park, Exploration Drive, Aberdeen AB23 8GX, UK.
Tel: +44 224 706 600 Fax: +44 224 706 601

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