WTIA OzWeld School of Welding Technology

SWT-51

Subsea Pipeline Engineering

Four-Day Course ~ 21-24 September 2009
Perth, Western Australia

Professor Andrew Palmer
Centre for Offshore Research and Engineering
National University of Singapore

Dr Roger King
Consultant, United Kingdom

Mr Eric Jas
Atteris Pty Ltd, Australia

WTIA
Welding Technology Institute of Australia
Research, Education, Technical Support & Information

OZWELD

Technology Forum proudly supported by the WTIA National Diffusion Networks Project Sponsors

WTIA – Celebrating 20 years of service to Australian industry in 2009

About the course

SUBSEA PIPELINES ARE THE ARTERIES of the offshore industry, and around the world more than 180,000 km are in service. Part of almost every project, they often form a large component of project cost. The course will provide a complete and up-to-date coverage of the subject, and will take delegates through pre-design and route selection, detailed design, construction, operation and maintenance. The course is extensively illustrated by case studies, with particular emphasis on Australian conditions and experience. It includes a tutored design exercise in which participants work in groups.

The course does not require the participants to have previous experience of the subject, but this is not a superficial familiarisation overview. The lecturers bring to the course a long experience of industry projects, in many parts of the world and under varied conditions. The technology is far from static, and the lecturers will discuss new developments and ideas for the future, which offer ways of reducing costs without compromising safety or operability.

Places will be strictly limited to ensure maximum involvement. Participants will receive a full set of course notes and a copy of the latest edition of the lecturers' book Subsea Pipeline Engineering.

Who should attend?

ENGINEERS FROM OIL AND GAS companies, construction companies, pipe and service suppliers and regulatory authorities with responsibility for, or interest in, subsea pipeline design, construction, inspection, maintenance and repair. Those who are newly qualified, have recently moved into pipeline engineering, or hold broad responsibilities that include pipelines will also find the course of great value.

Documentation

THE COURSE NOTES PROVIDED TO each participant will consist of copies of all the slide presentations, together with a copy of the monograph Subsea Pipeline Engineering by Andrew Palmer and Roger King, published by Pennwell.

WTIA Targeting Skills Needs in Regions (TSNR) Project for the Pipeline Industry

AS PART OF ITS NATIONAL SKILLS CAMPAIGN, A NATION-WIDE ROLL OUT of the strategies and outputs of the Targeting Skills Needs in Regions (TSNR) Project, WTIA is bringing the two leading experts in the world back to Western Australia for the third time to transfer their knowledge of, and experience in, the specialised area of Subsea Pipeline Engineering.

The Western Australian Government supports the development of a technically advanced oil and gas industry in Western Australia and is committed to establishing the State as a subsea, oil and gas centre of excellence, servicing Australia and the Asia Pacific region.

This event contributes to the knowledge base needed in Australia to support the marine pipeline industry to overcome the many challenges faced. It is supported by members of the WTIA SMART Gas Pipeline Industry Group and WTIA Technical Panel 7 Pipelines.

For further information about the TSNR Project, the WTIA National Diffusion Networks Project, SMART TechNet Project and OzWeld Technology Support Centres Network please contact the WTIA Tel:+61 (0)2 9748 4443, Fax: +61 (0)2 9748 2858 or visit our website www.wtia.com.au

The speakers

Prof Andrew Palmer

ANDREW PALMER is Keppel Chair Professor in the Centre for Offshore Research and Engineering at the National University of Singapore. His career has been divided equally between engineering practice at RJ Brown and Associates and Andrew Palmer and Associates, and university research and teaching at Cambridge, Harvard, UMIST and Singapore.

He is a Fellow of the Royal Society, a Fellow of the Royal Academy of Engineering and a Fellow of the Institution of Civil Engineers. He has been engaged in marine pipeline engineering for 38 years, and has written three books and more than 200 scientific papers and technical articles on pipelines, geotechnics, structures, ice and Arctic engineering. He has an active practice as a consultant and expert witness.

Dr Roger King

ROGER KING has over 30 years' experience of corrosion in the oil, gas, civil and nuclear industries. He has specialist knowledge of sweet and sour corrosion and its prevention by chemical inhibition, monitoring of corrosion, microbiological corrosion and the design of efficient cathodic-protection systems for flowlines, structures and seabed installations. He has been an independent consultant since September 1989 and prior to this was a founder member of the Corrosion and Protection Centre Industrial Service (CAPCIS) at the University of Manchester Institute of Science and Technology (UMIST).

Mr Eric Jas

ERIC JAS is Managing Director of Atteris Pty Ltd, an engineering company which specialises in offshore pipeline engineering design and project management, based in Perth Western Australia. With 24 years of pipeline design and construction experience, Eric brings a wealth of knowledge and expertise in the fields of offshore pipelines to the industry.

Subsea Pipeline Engineering

Course Outline

Day 1 – Monday 21 September

8.30 **Registration and Coffee**

9.00 **Welcome and Introduction**

9.30 Design overview and introduction to marine pipeline construction (Palmer)
Introduction to design sequence and its interaction with the different topics covered in the course. Film on construction and connection of an offshore pipeline.

10.30 **Morning Tea Break**

10.45 **Route Selection** *(Palmer)*
Principles of route selection. Constraints imposed by oceanographic, geotechnical, environmental, safety and political factors. Case studies from Canada, Spain, Tanzania.

12.00 **Introduction to design exercise** *(Palmer/King)*
The design exercise is a pipeline system off the coast of the USA. It presents several route selection, design and construction problems. Participants will work in small groups, and will select the system design and route, and carry out preliminary design and assessment for construction methods.

12.15 **Lunch**

13.00 **Design exercise phase 1** *(Palmer/King)*
Configuration and route selection.

14.30 **Presentation of conclusions of Phase 1 of design exercise** *(Palmer/King)*
Participants present their choices of route.

15.00 **Afternoon Tea Break**

15.15 **Marine Environment** *(Palmer)*
Waves; currents: tide, storm surge, loop currents; seabed geotechnics; biology. Case Studies

16.45 **Close of Day One**

Day 2 – Tuesday 22 September

8.30 **Carbon steel line pipe** *(King)*
Fabrication of API pipe. Increasing the strength of pipeline steel. Balancing strength, toughness and weldability.

9.30 **Increasing corrosion resistance** *(King)*
Increasing the corrosion resistance of carbon steels. Limitations of use of solid corrosion resistant alloys. Internally clad pipe. Flexible pipe.

10.30 **Morning Tea Break**

10.45 **Design for stability** *(Palmer)*
Hydrodynamic forces in steady and unsteady flow. Lateral resistance. RP E305 and new RP F109. Software. Case studies. Interaction with seabed instability.

12.00 **Spans** *(Palmer)*
Description of span occurrence. Need not to exaggerate problem. Analysis: vortex-induced vibration, overstress, hooking. Case study. Span monitoring and correction.

12.45 **Lunch**

13.30 **Hydraulics and flow assurance** *(Palmer)*
Single-phase flow, oil and gas; calculation of pressure drop and effect on optimal line size; influence of compressibility, temperature change and profile, two phase flow; flow regimes, correlations, profile effects, terrain-induced slugging, slugging in risers. Hydrates and wax.

14.30 **Materials for sour service** *(King)*
Pipeline steels for sour service: sulfide stress cracking and HIC. Appropriate specification of pipe material.

15.30 **Afternoon Tea Break**

15.45 **Design for strength** *(Palmer)*
Internal pressure, code requirements. External pressure; bending; bending buckling; collapse and buckle propagation; denting and gouging; allowable strain design; impact damage.

16:45 **Close of Day Two**

Day 3 – Wednesday 23 September

8:15 **Coffee**

8.30 **Internal corrosion** *(King)*
Sweet corrosion mechanisms: pitting and mesa attack. Evaluating a suitable corrosion allowance. Effects of flow on corrosion. Corrosion inhibition.

9.30 **External corrosion and coatings** *(King)*
Coating for submarine pipelines: enamels, FBE, triple coats, extruded coatings and elastomers. Inspection of coating integrity. Field joints.

10.15 **Morning Tea Break**

10.30 **Cathodic protection** *(King)*
Conjoint protection by coating and cathodic protection. Mechanism of CP. Design of sacrificial anode systems. Thermal effects on CP performance. Interactions between CP Systems.

11.15 **Lateral and upheaval buckling** *(Palmer)*
Upheaval buckling onshore; driving force; analysis; alternative approaches to control of upheaval; case study of lateral buckling; ongoing studies.

12.00 **Lunch**

12.45 **Pipelaying** *(Palmer)*
Alternative construction techniques. Laybarge S-Lay and J-Lay. Reeling. Surface, mid-depth and bottom tow. Videos illustrating alternatives.

14.00 **Codes**
Historical background. Use and misuse of codes. Alternative approaches to codes. Limit states. Code calibration. Recent developments: DNV OS F101 2007 and ISO.

14.30 **Microbiological corrosion** *(King)*
Sulphate-reducing bacteria. Microbiological corrosion mechanisms. Evaluation of the severity of the problem. Housekeeping and treatment.

15.00 **Afternoon Tea Break**

15.15 **Design exercise phase 2** *(Palmer/King)*
Continuing the exercise begun on day 1, participants work in teams to decide the pipeline diameters, materials, wall thicknesses, coating, cathodic protection, construction method, shore crossing design, and recommendations for the next stage of the project.

16.45 **Conclusions of design exercise** *(Palmer/King)*
Participants present their designs. The lecturers critique the participants' design, support the discussion with additional calculations.

17.15 **Close of Day 3**

Day 4 – Thursday 24 September

8.30 **Pipeline shore approaches and landfalls** *(Jas)*
Site selection, surveys, open cut, cofferdam, HDD, tunneling, shore-pull and tow-outs. Illustrated with case histories

10.30 **Morning Tea Break**

10.45 **Monitoring and inspection** *(King)*
Inspection before and during installation and commissioning. Inspection in service. Intelligent pigging. Corrosion monitoring. Analysis of corrosion monitoring data.

11.45 **Welding** *(King)*
Welding of carbon manganese pipeline steels. Welding of duplex and clad pipe. Inspection of welds.

12.45 **Lunch**

13.30 **Trenching and secondary stabilisation** *(Jas)*
Trenching, seabed liquefaction and scour, self-burial, rock dumping and discrete anchors. Illustrated with case histories

15.30 **Decommissioning** *(Palmer)*
Legal, environmental and financial background. Legislations. Decay mechanisms. Alternative strategies: stabilisation, recovery, re-use.

16.00 **Afternoon Tea Break**

16.15 **Current and future developments** *(Palmer / King / Jas)*
Progress in marine pipelines: new concepts, materials, construction techniques, weld methods

17.00 **Review and discussion**

17.15 **Presentation of certificates**

17.30 **Close of Course**

Subsea Pipeline Engineering
Registration Form

WTIA, PO Box 6165, Silverwater, NSW 1811 • ABN: 69 003 696 526
Ph: (02) 9748 4443 • Fx: (02) 9748 2858 • E: info@wtia.com.au

Surname	First Name
Company Name	Position
Address	
Suburb	
State	Postcode
Email	
Ph	Fx

☐ I have specific dietary requirements

☐ I do not wish any photograph of me to be published by the WTIA

Venue: Confirmation of booking and venue details will be sent to delegates upon registration

Fees: $3,300* WTIA / APPEA / APIA Members $3,850* Non-Members

**Fees include GST, course notes, coffee / tea and light lunch each day*

Membership Number: *You must quote your membership number to receive the discount fee*

Method of Payment:

All payments should be made payable to WTIA

☐ Cheque / Money Order ☐ VISA

☐ MasterCard ☐ Funds Transfer

Cardholder's Name

Card Number

Expiry Date / Amount

Signature Date

Funds may be transferred to the following account details. Please return a remittance advice to fax: 02 9748 2858 or email c.houllis@wtia.com.au

Welding Technology Institute of Australia
Account No: 1009 1589, BSB: 062194
Bank: Commonwealth Bank of Australia
Branch: Lidcombe NSW

IMPORTANT NOTICE: Cancellations received within 25 working days of the course, 100% of the fees will be charged. Replacement delegates may be sent however, in lieu of those cancelled. WTIA reserves the right to cancel courses due to insufficient registrations or other reasons beyond their control. WTIA also reserves the right to refuse registrations.