



## The Penspen Group Profile

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P E N S P E N

### Pipeline Industry Training Courses



Head Office, Penspen Group

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The Penspen Group has provided engineering and management services to the oil and gas industry worldwide for over 55 years. Penspen has no ownership ties with operators, contractors or suppliers and therefore can offer a truly independent, best practice service.

Penspen has undertaken over 8000 projects in almost every country in the world and has tackled almost every conceivable challenge from the economic evaluation of pipelines in developing nations and complex integrated design and construct contracts, to limit-state design of pipelines in deep water.

Penspen has an international network of offices and offers unequalled onshore pipeline and facilities design, integrity management and rehabilitation, training, instrumentation and control, pipeline operation and maintenance through GreyStar, and submarine pipelines and structures.

Specialist services are provided individually or can be integrated for large complex world-class onshore and offshore projects. Typical projects include transmission pipelines, metering, pressure control, compressor and pump stations, civil and military aviation fuelling systems, instrumentation and SCADA systems, offshore pipelines, risers and manifolds and integrity and operability studies.

In addition to engineering and project management, Penspen provides extensive training services, which cover every aspect of pipeline design, operation, maintenance and emergency response.

We place great emphasis on and take pride in the personal care and quality of the services we provide to our clients, partners, suppliers and subcontractors.

We look forward to being of service to you.

David Stanley

Chief Executive Officer



# World Leaders in Pipeline Training

Penspen Integrity delivers training courses worldwide in the fields of onshore and offshore pipeline engineering and pipeline integrity management. Our trainers are highly experienced in training, with extensive university lecturing experience as well as many years experience in the pipeline industry.

Penspen has trained over 4000 people and has run public and private training courses in many countries, including UK, Austria, Netherlands, The Czech Republic, Romania, Hungary, Kazakhstan, USA, Canada, Mexico, Bolivia, Brazil, Venezuela, Colombia, Argentina, Ecuador, the UAE, Australia, and Malaysia.

Penspen trains all nationalities, presenting courses in English or through simultaneous translation. Penspen also offer courses in Spanish, and other languages upon request. Courses can be custom-designed for client's needs, or selected from a series of standard public courses. Please contact us for further details: [integrity.training@penspen.com](mailto:integrity.training@penspen.com)



"Through my role in Penspen Integrity, as Knowledge and Training Manager, I trust I can assist you and your company with a suitable training programme, as an investment in staff development. Please do not hesitate to contact the Integrity Training team to discuss your training needs".

Michelle Unger

## Courses

[Pipeline Defect Assessment \(PDAC\)](#)

[PDAC via Online Distance Learning](#)

[Onshore Pipeline Engineering](#)

[Practical Pipeline Pigging](#)

[Subsea Pipeline Engineering](#)

[Pipeline Risk Assessment & Management](#)

[Offshore Pipeline Legislation](#)

[Onshore Pipeline Legislation](#)

Penspen also offer courses on: Cathodic Protection and Coating • Advanced Cathodic Protection • DCVG/CIPS • Ethics in Engineering. Details upon request.



# Penspen and Academia

## Penspen and Northumbria University

Penspen and Northumbria University have collaborated to launch a fully-accredited Online Distance Learning Postgraduate Certificate in Pipeline Integrity Management. The partnership is lead by Penspen's Team in Newcastle upon Tyne.

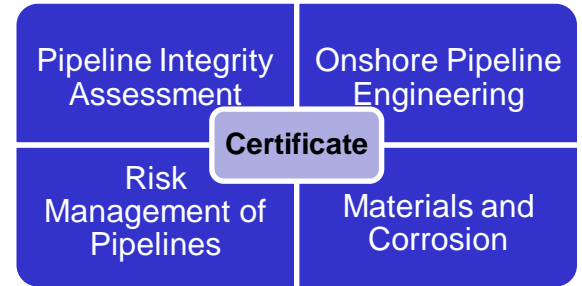
The course's unique advantage is that it is fully flexible, with students able to learn via a dedicated online training website which can be accessed by students across the globe. Course materials are delivered by online-enhanced tutorials, case studies and fully interactive quizzes, to be used as a self-evaluation tool.

On completion of the course, students will have relevant skills in dealing with the special problems facing pipelines: assessing pipeline damage, assessing risk, and corrosion problems, as well as general knowledge in pipeline engineering. The course presents a holistic view of pipeline integrity, which ensures students understand the history, theory, and foundations of the technologies they will use.

The programme is a collaboration between the School of Computing Engineering & Information Sciences, and Penspen Ltd., UK. Penspen provide all e-learning materials and academic tutors.

[Read More](#)

For those not wishing to pursue a university-accredited qualification, the same programme is delivered directly via Penspen. [Read More](#)



*"The skills crisis in pipeline engineering is a real and pressing issue which needs addressing with more fully accredited training courses which are accessible from work/home in order that students can determine their own learning schedule. We are delighted to have teamed up with Northumbria University to produce this online distance learning programme which we hope will be a solid first step to addressing the increasing skills gap."*

Professor Phil Hopkins, Penspen

## Penspen and Newcastle University

**Penspen has collaborated with the launch of two MSc programmes at Newcastle University. Consultants and Senior Engineers from Penspen's Newcastle office currently lecture on these two successful Master Programmes.**

### The MSc in Pipeline Engineering

A course collaboratively designed by industry and academia to meet the specific requirements of the oil and gas sector, covering both high-pressure offshore and onshore pipelines. Delivered by both industry and academic experts in the fields of pipeline engineering, offshore engineering, chemical engineering, materials science and civil engineering, it is a unique, up-to-date and multi-disciplinary course.

### The MSc in Subsea Engineering and Management

The MSc in Subsea Engineering and Management is a programme designed for engineers wanting to increase their skills and knowledge of subsea engineering to masters' level. It has been developed in conjunction with firms in the subsea industry and comprises multi-disciplinary teaching, site visits, industrially based projects and visiting industrial lecturers to enhance the relevance and effectiveness of the course.

## Contact the Integrity Training Team

[integrity.training@penspen.com](mailto:integrity.training@penspen.com)

+44 (0) 191 238 2200

# Lecturers



**Professor Phil Hopkins** has over 30 years experience in pipeline and marine engineering. Previously Managing Director of Andrew Palmer & Associates, Phil is now a Director of Penspen as well as Visiting Professor at Newcastle University, UK. He has worked with most of the major oil and gas companies and pipeline companies around the world providing consultancy on management, business, design, maintenance, inspection, risk analysis and safety, and failure investigations in Europe, Asia, North America, and the Middle East. Phil has served on many national and international committees, including the British Standards Institution, the European Pipeline Research Group (co-chairman), the American Gas Association's Pipeline Research Council International, and the DNV Pipeline Committee, and is currently a member of the ASME Pipeline Committee (Chairman in 2006). He is internationally renowned as a trainer in Pipeline Integrity, and regularly presents courses in North and South America, West and East Europe, and the Middle and Far East.



**Michelle Unger** is the Knowledge and Training Manager for Penspen Integrity based in the Newcastle upon Tyne office. She has over 15 years experience of lecturing, research and engineering consultancy. She joined Penspen in 2001 and as a Senior Engineer she focused in the area of pipeline integrity. Michelle has specific knowledge in pipeline defect assessment, fitness-for-purpose assessment, integrity management systems, risk management and pipeline audits. Michelle was also a member of the development team of the MSc in Subsea Engineering and Management at Newcastle University, where she is an Associate member of staff, and lectures on their MSc in Pipeline Engineering. She has previously lectured at the University of Los Andes in Bogotá, Colombia, and continues to lecture on Pipeline Defect Assessment in Latin America. Michelle is a Fellow of the Higher Education Academy, and holds a Postgraduate Certificate in Advanced Studies and Academic Practice.



**Roland Palmer-Jones** is Head of Pipeline Integrity at Penspen. He has previously worked with the pipeline engineering consultants, Andrew Palmer and Associates (APA), as well as in the Research and Technology Division of British Gas. Roland is a Chartered Mechanical Engineer with more than 20 years experience in the oil and gas industry, the majority dedicated to pipeline integrity. He is also a visiting lecturer at Newcastle University, UK, on the Masters Programme in Pipeline Engineering. Roland has provided pipeline integrity consultancy services to onshore and offshore pipeline operators around the world, ranging from small companies operating just one pipeline to large national oil companies, and the international majors. He is the author of numerous papers on pipeline topics, and has presented training courses all over the world.



**Susannah Turner** is a Consultant at Penspen Integrity, a graduate of the University of Cambridge and a Chartered Member of the Institute of Mechanical Engineers. She has 18 years experience in the Oil & Gas Industry having worked in pipeline operations, consultancy and research. Experience and skills include pipeline integrity assessment, risk and reliability methods, pipeline management, offshore pipeline inspection, pipeline design, decision-making strategies, and maintenance and inspection planning. Susannah's recent work has concentrated on pipeline integrity and risk management strategies, having developed risk-based inspection methodologies and strategies for a number of pipeline operators. Susannah also has qualifications and experience in education and training.



**André Gonçalves** is a Senior Pipeline Integrity Engineer with extensive experience in the integrity management of onshore and offshore oil and gas pipelines. André has worked on a wide range of pipeline integrity projects for numerous operators around the world. André's experience includes the detailed assessment of pipeline defects, pipeline risk based inspection, inspection planning, pipeline pigging and pigging technology, pipeline repair, and pipeline fracture control. André is an experienced lecturer and has delivered numerous training courses in pipeline engineering topics including pipeline defect assessment, on-line inspection, and inspection of unpiggable pipelines. As well as in English, André is fluent in Portuguese, Spanish and Italian.

# Lecturers

**Dr Roger King** has over 40 years experience in corrosion engineering in the North Sea, Middle East, Far East and Australian oil and gas production industry. He has specialist knowledge of sweet and mildly soured corrosion and its prevention by chemical inhibition, monitoring of corrosion, microbiological corrosion and the design of efficient cathodic protection systems for onshore and offshore pipelines, structures and seabed installations. He has published over 80 papers on these corrosion topics.



**Professor Andrew Palmer** is Keppel Chair Professor in the Center for Offshore Research and Engineering of the Department of Civil Engineering of the National University of Singapore. He is a Fellow of the Royal Society, a Fellow of the Royal Academy of Engineering, a Fellow of the Institution of Civil Engineers, and a Chartered Engineer. He has divided his career equally between practice as a consulting engineer and university teaching. In 1985 he founded Andrew Palmer and Associates, a company of consulting engineers who specialise in marine pipelines. In 1996 he returned to research and university teaching as Research Professor of Petroleum Engineering at Cambridge University in England. He was a Visiting Professor in the Division of Engineering and Applied Sciences at Harvard University, 2002-03. He is the author of four books and more than 220 papers on pipelines, offshore engineering, geotechnics and ice. He has an active consulting practice, and was Chairman of the DNV Pipelines Committee from 2007 until 2010.



**Dr David Eyre** is a Principal Consultant for Penspen Integrity, and has over 30 years of experience in corrosion, coatings and materials selection. David's experience includes the development of corrosion management strategies, corrosion management procedures, materials selection, design of cathodic protection systems and pipeline rehabilitation. David has been involved in a number of training courses and has worked and lectured in many countries.



**John Simon** is Head of Inspection Consultancy for Penspen Integrity has specific knowledge of Pigging Operations for both onshore and offshore pipelines and worked in Pipeline Operations & Maintenance, Pigging Product Development, Business Management and Pigging Business Development. John has held senior manager positions and has 25 years international experience including Planning, Engineering Studies, Supervision and Project Management of Pipeline Pigging operations for Oil, Gas and Product pipelines. John has provided training for pigging and was a developer of the Practical Pigging Training Course.



**Graham Goodfellow** is Head of Risk & Reliability for Penspen Integrity, and a graduate of the University of Oxford with 18 years experience in pipeline quantitative risk assessment, structural integrity assessment and the development of risk and reliability based asset management strategies for mechanical and structural systems in the oil & gas and other industries. He has worked for the research and pipeline operations departments of British Gas and in general structural integrity consultancy before joining Penspen in January 2001 as Head of Risk & Reliability in Penspen Integrity based in Newcastle upon Tyne. Graham is a member of UKOPA Risk Assessment Working Group and contributor to the development of IGEM/TD/2 and PD 8010-3 on application of pipeline QRA.



**Dennis Keen** is a Principal Consultant for Penspen Integrity, and has over 33 years experience in both the onshore and offshore gas and pipeline industry as a pipeline constructor and operator as well as in depth experience as a Safety Regulator with the Department of Energy and the Health and Safety Executive. His key strengths are a comprehensive knowledge of UK Health and Safety Law, management and quality systems, with particular emphasis on pipeline integrity management.



# Pipeline Defect Assessment (PDAC)



## Objective & Overview

Many oil and gas pipelines are at, or nearing, the end of their design life but they still have many years of production left. Pipeline infrastructure will need to perform for many more decades, as world demand for oil and gas will increase up to 2020. Many transmission pipelines are now "middle aged" in pipeline terms, and even the best designed and maintained pipeline will become defective as it progresses through its design life. Operators need to be aware of the effect these defects will have on their pipeline, and - more importantly - be able to assess their significance in terms of the continuing integrity of the pipeline.

The increasing use of high technology maintenance (for example, intelligent pigs) is helping pipeline owners to assess the condition of their lines, and if these modern maintenance methods are combined with modern defect assessment methods, they can provide a very powerful, and cost-effective, tool. These methods will range from simple, quick assessment methods, to the more detailed —fitness for purpose— analysis. The course is highly interactive and takes the form of lectures, workshops, and case studies. This course will:

- Cover methods available to assess the significance of defects detected in onshore and offshore pipelines.
- Introduce simple analytical methods used to assess Internal and External Corrosion, Dents and Gouges, Cracks (e.g. SCC), Weld Defects and Fatigue.
- Include worked examples where attendees will calculate the significance of defects in pipelines and set intelligent pig inspection levels.

The course is unique as it is a holistic approach to defect assessment, and hence ensures that the attendee appreciates all aspects of the subject, including repair and risk management.

## Who Should Attend

Pipeline managers • engineers • designers involved with the maintenance • inspection • repair of pipelines

## Lecturers

Phil Hopkins • Roland Palmer-Jones • Michelle Unger • Susannah Turner • André Gonçalves

## Testimonials

**"Thanks to Prof Hopkins and Mr. Gonçalves for the course. The knowledge gained from this session will help us to make intelligent decisions, with the ultimate benefit for the fitness and integrity of our pipelines"**

**"This course should be a requirement for engineers that are new to the gas business."**

**"...A very informative course. I just wish I had this exposure 15 years ago."**

**South Africa July 2011**

**"Roland Palmer-Jones was great! Great speaker, very knowledgeable and helpful!"**

**Houston June 2011**

# PDAC via Online Distance Learning

## Objective & Overview

Penspen now offer the Pipeline Defect Assessment Course via online distance learning for those wishing to study more flexibly, and from work/home.

The methods presented enable students to understand and apply the theory and practice of pipeline integrity engineering in a work-based environment, aiming to produce highly skilled and professional graduates in key aspects of pipeline integrity - in particular ensuring the continued safety of ageing pipelines.

On completion of the course students will have relevant skills in dealing with the problems facing pipelines: assessing pipeline damage, assessing risk and corrosion problems as well as having a good foundation understanding of pipeline engineering. The course presents a holistic view of pipeline integrity, which ensures students understand the history, theory, and foundations of the technologies they will use.



## Delivery

The course is presented by online distance learning enhanced tutorials, which include case studies and fully interactive quizzes, to be used as a self-evaluation tool. Penspen provide all e-learning materials and academic tutors.

A screenshot of a web browser displaying an online learning module. The browser title is "Class 2 Introduction to Oil and Gas and Pipelines - Windows Internet Explorer". The address bar shows a URL from penspen.com. The page content includes a navigation menu on the left with categories like "Outline", "Thumbnails", "Notes", and "Search". The main content area is titled "'CRUDE' OIL: What is it?" and contains a bulleted list of facts about crude oil. Below the text are two images: one showing a close-up of a black, viscous liquid being poured, and another showing a person's face in profile, looking at a glowing orange liquid in a glass. The page number "19" is visible in the bottom right corner of the content area.

**“There is a shortage of skilled pipeline engineers in the world today, and as pipelines continue to age there is an increasing need for pipeline engineers with specific skills in pipeline integrity. This is the first course of its kind and a market-leader, its development primarily driven by the skills-crisis within the industry”.**

**Professor Phil Hopkins**

## Additional Information

There will also be opportunities to meet the tutors by attending complementary Master Classes and Residential Courses (there is a fee associated with this). Please contact [integrity.training@penspen.com](mailto:integrity.training@penspen.com) for further information.

Additionally, there is a collaborative programme between Northumbria University's School of Computing Engineering & Information Sciences, and Penspen Ltd., UK. Students are enrolled at Northumbria University and formal assessment takes place by examination and coursework at the end of each module of the course.

[Read More](#)

# Pipeline Defect Assessment Programme



## Day one

### Introduction to Basic Pipeline Engineering Principles

- Basic pipeline design principles
- Stresses in pipelines
- Routing of pipelines
- Basic pipeline operating and maintenance parameters
- Maintenance and inspection methods

### Introduction to Pipeline Defects – Why Pipelines Fail

- How safe are pipelines?
- How often do they fail? What causes pipelines to fail?
- Pipeline risks. History of pipeline defect assessment

### Introduction to Fundamental Pipeline Defect Failure

- Relationships
- Why pipeline defects fail
- Fundamental failure relationships
- Explanation of key parameters

### How to Assess Corrosion Defects

- Introduction to basic theory, background, strengths and weaknesses
- Methods to assess corrosion
- ASME B31.G, RSTRENG, DNV methods
- Interacting defects
- Universal curves for assessing corrosion defects.

## Day two

### Workshop: Corrosion Assessment using Fitness for Purpose

#### How to Assess Gouges and Dents

- Introduction to basic theory
- Methods to assess gouges and dents
- Problems with fatigue loadings
- Worked examples

#### Workshop: Dent Assessment

#### How to Assess Cracks and Weld Defects

- Basic theory, the problems with cracks in pipelines
- Stress corrosion cracking (low and high pH)
- Assessing defects in pipeline girth welds
- Assessing non planar defects in welds
- The EPRG girth weld defect guidelines

#### Setting Intelligent Pig Inspection Levels

- Pigs - where they came from and what they can do
- Basic theory
- What pigs can detect
- What operators want to detect
- Setting intelligent pig inspection levels

#### Workshop: Setting Intelligent Pig Inspection Levels

## Day three

### Pipeline Repair and Rehabilitation

- Response to discovering defects
- What are the cost implications?
- Types of repair and rehabilitation methods
- Grinding
- Weld deposition
- Shells (including epoxy-filled)
- Composite wraps
- Cut outs
- Mechanical clamps/connectors
- Repair and rehabilitation strategy

### Risk Management & Setting Inspection & Maintenance Priorities

- What is risk analysis?
- How to incorporate defect assessments and significance into quantitative and qualitative risk analyses
- How defect assessments assist with risk analyses
- Prioritisation schemes

#### Workshop: Setting Priorities

#### Award of Certificates of Attendance

# Onshore Pipeline Engineering



## Objective & Overview

There are millions of kilometres of onshore oil and gas pipelines around the world. As the industry expands and new staff are introduced into it, there is an increasing need for a full appreciation of the engineering design of pipelines. Additionally, many staff in the pipeline industry have not received basic pipeline engineering training, and some staff are only exposed to specialised areas. This course is a formal introduction to pipeline engineering.

## Who Should Attend

Engineers who are new to the pipeline business:

Pipeline Engineers • Pipeline Construction Engineers • Project Managers • Maintenance Engineers • Contractors • Supervisors • Inspectors • Operators • Equipment Suppliers • Inspection and Quality Engineers • Pipeline Design Engineers • Engineers who require a wider appreciation of onshore pipeline engineering

## Lecturers

Professor Phil Hopkins • Dr Roger King

## Testimonials

**“Great training – thank you! Will recommend it to other young engineers. Wish I had this training during my 1<sup>st</sup> and 2<sup>nd</sup> year of work in off gas”**

**“I liked the examples of real world application”**

**“Great course and very applicable. The modern twist is very refreshing”**

Houston, March 2011

**“Very good course; great details and kept everyone’s attention through the entire week”**

Houston, March 2010



## Contact the Integrity Training Team

[integrity.training@penspen.com](mailto:integrity.training@penspen.com)

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[www.penspen.com](http://www.penspen.com)

# Onshore Pipeline Engineering Programme



## Day one

### Pipeline Engineering Basics

Basics of Oil and Gas  
The Petroleum Industry  
Introduction to Pipelines  
Basic pipeline and material parameters  
Pipeline Safety  
History of Pipelines

### Pipeline Materials Selection

Steels used for Line pipe  
Compositional Limitations, Mechanical Properties, Grades  
Fabrication of Line pipe – Seamless, Longitudinal Welded, ERW, Spiral  
Toughness and Weldability  
Improving Corrosion Resistance  
Solid Corrosion Resistant Alloy Pipe  
Internally Clad Pipe  
New Materials

### Pipeline Design

Legislation and regulations  
Development of pipeline design codes  
Design Process  
Detailed design:

- product categorisation
- locating pipelines
- design pressures, factors, and stressing

Pipeline Crossings  
Pipeline Valves

## Day two

### Other Pipeline Design Considerations

Surges/overpressures  
Bends  
Pipe protection  
Fracture control  
Fluids and Hydraulics

### Pipeline Welding

Basics of Welding  
Types of Welding Processes  
Effects on Line pipe of the Welding Process  
Welding Procedures  
Inspection of Welds

### Design Exercise Part 1

### Pipeline Routing and Construction

Basics of routing  
Classification schemes  
Easements and rights of way  
Legislation and permits  
Routeing methodologies  
Pipeline construction

### Internal Pipeline Corrosion

Why Pipes Corrode  
Sweet Corrosion, Sour Corrosion, Microbiological Corrosion  
Cracking Mechanisms  
Calculating Corrosion Rates  
Effect of Flow on Corrosion  
Water Injection Pipelines

## Day three

### Monitoring of Internal Pipeline Corrosion

Inhibition of Corrosion  
Biocide Treatment of Pipelines  
Monitoring Internal Corrosion  
Supplementary Inspection Techniques

### Pipeline Testing, Operation, Inspection

Pressure Testing  
Batching  
Incorrect operation  
Control Systems, Leak Detection  
Inspection and monitoring of operational pipelines

### Pipeline Project Control

Management  
Scheduling and resource planning  
Execution  
Contracting strategies

### External Pipeline Corrosion and its Prevention

External Corrosion in Soils  
Coatings and their Application  
Field Joints  
Interaction of Coatings and Cathodic Protection

### Design Exercise Part 2

## Day four

### Cathodic Protection

How Cathodic Protection Works  
Monitoring of CP at Test Points  
Full Line Surveys with CIPS and Instant Off Surveys  
Coating Surveys using Pearson and DCVG Techniques  
Interference from Third Party Lines and DC/AC systems

### Utility and Intelligent (Smart) Pig Inspection

The History of Internal Inspection  
Why 'Pig'?  
Types of Pig  
The History of Internal Inspection  
Why 'Pig'?  
Types of Pig  
Intelligent (Smart) Pigs:

- Metal loss (MFL, UT)
- Geometry
- Mapping
- Crack detection

What do they find and how accurate are they?  
Pigs versus Hydrotest

### Pipeline Equipment and Systems

Hydraulic tools  
Equipment – pumps, compressors, motors, pressure control devices  
SCADA  
Leak detection

## Day five

### Pipeline Engineers

Responsibilities, duties and ethical behaviour

### Pipeline Repair

Pipeline Defects  
Pressure reductions prior to repair  
Repair methods:

- Grinding
- Weld deposition
- Sleeves
- Clamps
- Hot tapping
- Composite wraps

### Pipeline Integrity Management

Risk and risk analysis  
Integrity management methods:

- API 1160
- ASME B31.8S

Class tutorial – risk analysis of 3 pipelines

**Close at 1.00pm with Question and Answer Session**

# Practical Pipeline Pigging

## Objective & Overview

**Practical Pipeline Pigging is a focused 5 day course that combines practical exercises running a range of pigs in a test loop with detailed lectures on pig types, pigging operations, in line inspection technology (ILI) and inspection data.**

**The course is ideal for engineers and technical personnel who are both new to, or experienced in pigging. The course is of particular interest to those who are involved in the processes of pig selection, planning pigging projects, supervising pigging operations or project management of pigging activities. The syllabus covers: proving, cleaning, In Line Inspection pigging and associated activities.**

**The course is currently run in Brazil (Rio de Janeiro) and USA (Houston) with plans to extend in to Europe.**



## Lecturers

John Simon • André Gonçalves

## Pipeline Pigging Operations

Penspen also deliver a theory based course on an in-house basis, providing an overview of all pigging operations from the planning required to run a pig through to the launch and receive. Please request further details from the Integrity Training Team: [integrity.training@penspen.com](mailto:integrity.training@penspen.com)

## Testimonials

**"A very complete course showing all the aspects of the process and eliminating a lot of related doubts"**

**"Fantastic!! I learnt a lot; the lectures were well balanced from beginning to end"**

**"I felt confident about the lecturers and their experience"**

**"Wonderful; it's a complete basic course, nice simulations and marvellous staff"**

**Rio de Janeiro, Sep 2011**

## Additional Information

The Practical Pipeline Pigging course includes workshop talks and demonstrations of various pig set ups and the pig preparations required prior to running in a pipeline. The course is five days long and structured to link the theory and written detail (as shown in the lecture programme) with actual practical sessions at the test loop. Each day of the course has both theory and practical elements and is designed to demonstrate how a typical program for a pigging project is planned and undertaken right through to inspection data reports and feature location.

The aim is to provide information on pig types and technology and give an overview of ILI data reporting, whilst also providing details of pipeline preparation, project planning, procedures (such as how to launch and receive pigs), general operations and safety related to pigging activities. Activities at the loop include; running a range of different pigs (proving through to ILI), tracking and feature location.

Pig design, methods and pigging philosophy are also explained, together with guidance on the type of documentation and information required when planning and running a pigging campaign.

# Practical Pipeline Pigging Programme



## Day one

### Introduction & History of Pigging

- What is a 'Pig'?
- Development and reasons for use
- Different types of pig

### Pig Traps

- What are they
- Why do we need them
- Different Types
- Trap doors
- Procedures for operation

### Launch & Receive of Pigs

- Equipment
- How the pipe work and trap design are set for pigging.
- Procedures to launch a pig
- Safety
- Lifting and loading

### PRACTICAL

## Day two

### When & Why do you Pig

- Construction, Maintenance, Inspection

### Review of Utility Pigs

- Types & Uses; Selection of Pigs
- Internal coating
- Objectives
- Duration; length of run
- Pig efficiency
- The unknown; dust, dirt, wax
- Transmitters and Tracking

### Feasibility and assessment processes for pigging projects

- Piping Aspects; pig selection and feasibility
- Presence and types of pig traps
- Alternatives to pig traps?
- Temporary or Permanent
- Pipeline Bends, Tees and Valves
- Special fittings
- Distance
- Multiple diameters
- Current and future special pigs designs

## Day three

### Operational Conditions; effects on Pig Selection and Feasibility

- Pressure, Flow rate and Temperature
- Dust, debris, Wax

### Developing a Cleaning & Proving Pig Program Plan Considerations

- Type of product
- Last cleaning run
- Type of debris/ deposits/ waste
- The basics needed to carry out a pig run
- How many runs will be needed
- Types of pig to be used and in which order
- Issues to consider
- Frequency of pig runs

### PRACTICAL

### Planning a Pigging Project up to and including Inspection Pigging

- Priority of Pipelines
- Risk Assessments
- Budgets, Engineering and Manpower

### HSE during Pigging Projects

- Environmental and Safety Aspects
- Waste Handling
- NORM
- H2S
- Venting Restrictions
- Noise
- Purging
- Cleaning & Washing Pigs after a pig run
- Pyrophoric Dust
- Other contaminants.
- Pig Speed

### Inspection Tools

- The need to inspect
- Different ILI tools
- Choosing your ILI tool
- Setting Inspection Levels

### PRACTICAL

## Day four

### Pig Running

- Ancillary Equipment
- Loading & Extraction Trays
- Pushers and Extractors Signalling
- Types and Application

### Tracking

- Why we need to.
- Different trackers
- Tracking Onshore
- Tracking Subsea

### Stuck pig

- How it can happen
- Consequences and actions for removal of a stuck Pig

### Documentation and Record Keeping

- Maintenance of cleaning pigs, Spares, Quantities
- Record keeping of pig runs.
- Feedback documents, QA and performance management of pigs

### Pig Inspection Data Reports

- Understanding what they say
- Defects
- What actions are required?

### PRACTICAL

## Day five

### Planning and carrying out Verification digs

- How to measure location
- Site safety for excavations
- Planning the work
- Cleaning pipe surface
- Measuring defects (equipment to use)

### Overview of Unpiggable Pipelines

- What makes them unpiggable
- How could they be inspected.
- Pigging Offline
- Tethered Pigs
- Crawlers

### PRACTICAL

# Subsea Pipeline Engineering

## Objective & Overview

The course will provide a complete and up-to-date overview of the area of Subsea Pipeline Engineering, taking delegates through the pre-design phase, design, construction, installation, operation and maintenance. It will give a complete picture of the work of design engineers and pipeline construction companies, using actual case studies from around the world to highlight the topics discussed.

While the course requires no previous experience, this is not a superficial overview. The lecturers are experts in their fields and have vast experience in lecturing on the subject of Subsea Pipeline Engineering. Places will be strictly limited to ensure maximum individual attention.



## Who Should Attend

Engineers from oil & gas companies • construction companies • pipe and service suppliers • regulatory authorities • who are newly qualified • have recently moved into pipeline engineering • hold broad responsibilities that include pipelines

## Lecturers

Professor Andrew Palmer • Dr Roger King

## Testimonials

**"Very informative in many areas of pipeline engineering. A good overview to pipelines for junior engineers as well as being detailed in areas for the more experienced."**

**"Very useful. Good overview of the pipeline topic from all perspectives and the case studies were useful."**

***"Good overall presentation of subjects. Well structured and organised lectures."***

Aberdeen, February 2004



A recent course in the Middle East

## Contact the Integrity Training Team

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# Subsea Pipeline Engineering Programme



## Day one

### Overview – Subsea Pipeline System Configuration

Objectives of the course  
Introduction to the design sequence and its interaction with the different topics covered in the course  
Film on construction and connection of an offshore pipeline

### Route Selection

Principles of route selection  
Constraints imposed by oceanographic, geotechnical, environmental, safety and political factors  
Fishing and shipping interactions  
Case studies from Canada, Spain, England, Gulf of Mexico

### Shore Approaches and Landfall

Influence of coastal topography, geotechnics, tides and waves  
Alternative construction techniques  
Horizontal drilling and tunnels  
Case studies  
Films on construction of landfalls

### Marine Pipeline Construction

Construction methods: laybarge, S-Lay and J-Lay  
Reelship  
Bundles  
Mid-depth tow, bottom tow and surface tow  
Contract strategies  
Advantages and disadvantages of the different methods

### Hydraulics and Flow Assurance

Single-phase flow of 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  
Surge  
Flow assurance: hydrates and wax

## Day two

### Materials Selection

Manufacturing Procedure Specification and Manufacturing Procedure Quality Testing  
Increasing the strength of pipeline steel.  
Balancing strength, toughness and weldability.  
Fabrication of API pipe.  
Appropriate specification of pipe material.

### Increasing Corrosion Resistance

Methods of improving corrosion resistance  
Evaluating corrosion resistance  
Available solid corrosion resistant alloys  
Methods of fabrication of clad pipe  
Welding of clad pipe

### Flexible Pipe

Uses for flexible pipe.  
Fabrication: carcass, liner, pressure containment, armoring, sheath, end connectors  
Lengths of pipe sections  
Internal and external corrosion prevention  
Failure modes of flexible pipes  
Inspection of flexible pipe

### Pipeline Materials for Sour Service

Pipeline steel for sour service: sulfide stress cracking, HIC, SOHIC.  
Application of ISO 15156/NACE-MR0175  
Appropriate specification of pipe material.

### Design Exercise Phase 1:

Route selection  
Pipeline diameter

### Pipeline Structural Analysis

Design for internal and external pressure  
Allowable strain design  
Code requirements  
Bending, buckling, collapse and buckle propagation  
Denting and gouging  
Impact damage

## Day three

### Design for Stability

Hydrodynamic forces on pipelines in steady and unsteady flow.  
Lateral resistance.  
Design for stability  
Interaction with seabed instability  
RPE305 recommended practice.

### Internal Corrosion and Its Prevention

Sweet corrosion mechanisms: pitting and mesa attack  
Impact of hydrogen sulphide  
Moderators of corrosion  
Effects of flow on corrosion.  
Models for prediction of corrosion rates  
Evaluating a suitable corrosion allowance  
Corrosion inhibition and its relation to flow morphology.

### External Corrosion and Its Prevention

Interaction of cathodic protection with coating systems  
Coatings for risers  
Coating for submarine pipelines: enamels, FBE, triple coats, extruded coatings and elastomers  
Inspection of coating integrity  
Concrete weight coatings  
Field joints and infills

### Cathodic Protection

Mechanism of CP  
Design of sacrificial anode CP systems  
Thermal effects on CP performance  
Interactions between CP systems.

### Risers

Riser design and assessment  
Pipeline tie-ins and spools  
Connection methods

### Mishaps, Risk and Repair

Failure incidents  
Case studies: incidents during construction, inherent defects, external factors, old age Integrity management  
Repair techniques, case studies of repair after incidents described

## Day four

### Marine Environment

- Design currents
- Waves
- Geotechnics
- Earthquakes.

### Design Exercise Phase 2:

- Material selection, wall thickness, corrosion allowance
- Coating and field joints
- Stability and weight coating
- Cathodic protection
- Landfall

### Upheaval and Lateral Buckling

- Driving force for upheaval and lateral buckling
- Analysis of the risk of buckling
- Alternative design and construction options to eliminate problems
- Pipeline surveys
- Case study of lateral buckling.

### Insulation

- Need for thermal insulation
- Types of insulation
- Conductive Heat Transfer
- Convective Heat Transfer
- Interaction with other design factors.

### Trenching and Burial

- Alternative Construction methods
- Trenching and burial methods: jetting, mechanical cutting, ploughing, dredging, backfill, rock dumping
- Case studies and construction films

### Span Assessment and Correction

- Description of span occurrence and possible systems
- Vortex-excited oscillation, overstress, hooking
- Analysis
- Span monitoring and correction

## Day five

### Design Codes

- Trends in code development
- Limit state design
- API RP-1111 and DnV OS-F101
- Attempts to prepare unified codes

### Microbiological Corrosion

- Microbiological corrosion mechanisms
- Sulfate-reducing bacteria
- Evaluation of the problem
- Seawater injection pipelines
- Housekeeping and corrosion control treatments

### Internal Inspection and Corrosion Monitoring

- Inspection prior to and during installation and commissioning
- Inspection in service
- Inspection of risers
- Intelligent pigging
- Alternative subsea inspection techniques
- Corrosion monitoring
- Analysis of corrosion monitoring data

### Welding

- Welding of carbon manganese pipeline steels
- Automatic welding
- Welding of duplex and clad pipe
- Inspection of welds

### Decommissioning

- Legal framework and legislation
- Decay mechanisms, re-use, methods of recovery, alternatives to recovery
- Disposal of materials
- Costs

### Current and Future Developments

- Alternative methods of joining pipe
- New materials
- Development of design methods and procedures
- New methods of pipeline installation

# Pipeline Risk Assessment & Management



## Objective & Overview

The course introduces the concepts of hazard and risk assessment, and will present the methods available to assess and control risk in gas transmission and distribution, and oil pipelines. The course will consider the methods available for the identification of threats and failure modes, the analysis of risk using qualitative and quantitative methods, methods of risk control, and the assessment of risk acceptability. Regulatory issues and risk management strategies will also be covered.

The course will provide attendees with a broad overview of risk concepts and definitions and an understanding of quantitative and qualitative risk analysis, assessment and management techniques for hazardous pipelines.

## Who Should Attend

Pipeline engineers • designers who require knowledge of risk assessment and management.

This course is suitable for both managers and engineers involved in risk assessment and management, or engineers who require a good, broad, understanding of these topics.

## Lecturers

Graham Goodfellow • Susannah Turner

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## Day one

### Intro & Welcome

Intro to Lecturers  
Domestics  
Course Agenda  
Course Objectives

### Pipeline Safety in Context

Statistics comparison  
Recent pipeline failures

### Basics of Hazard and Risk Assessment

Concepts and Definitions

- What is a hazard, risk, etc?
- What are risk analysis, risk assessment and risk management?

Why do we need risk assessment for pipelines?

What to expect from a risk assessment

### Risk Assessment Methods

Introduction to the different risk approaches;

- Qualitative
- Semi-quantitative
- Quantitative

Code approaches to risk assessment

## Day two

### Failure Frequency and Consequence Assessment

How to determine pipeline failure frequency  
Safety, Environmental Financial and other consequences  
Review of safety consequence assessment methods

### Risk Calculation and Risk Acceptability

How to calculate risk

- Individual and Societal

How to present risk

Transects, FN curves and cumulative graphs

Risk acceptance and concepts

- Voluntary and involuntary risks
- Individual and societal risk acceptance

Regulatory style and risk acceptance: UK, ASME, API

The risk acceptance decision process

ALARP

Cost-benefit analysis

Decision Theory

### Pipeline Risk Management Methods

Control and mitigation of risk

- Design (including structural reliability analysis)
- Operation
- Inspection

Risk Management

### Pipeline Risk Management Systems

Review of risk management systems for pipelines

- Back ground and theory
- Codes – B31.8S , API 1160, etc.
- Best practice and performance indicators

### Risk Management Tutorial

# Offshore & Onshore Pipeline Legislation



***"It is vital that those involved with offshore pipelines understand exactly what the law says and how the regulatory authorities interpret and implement the law. So often, people have an understanding based on inaccurate anecdotal information picked up on the job. This course explains precisely what the legal duties are and what is required to ensure compliance. Ignorance is no defence."***

**Dennis Keen, Principal Consultant & Lecturer**

## Objective & Overview

The aim of both courses is to provide those whose work involves them in the planning, design, construction, commissioning, operations, inspection, maintenance or abandonment of pipelines with an understanding of the UK legislation in respect of these activities.

The courses address all planning and abandonment, major accident hazard and environmental protection legislation relevant to pipelines in the UK. The roles of the principal regulatory authorities including the Department for Energy and Climate Change, the Health and Safety Executive, the Marine Management Organisation/Marine Scotland, Environment Agency, Scottish Environmental Protection Agency are discussed.

The course describes the principle Acts and Regulations that must be complied with. For offshore these include the Petroleum Act, the Pipelines Safety Regulations, the Safety Case Regulations, The Food and Environmental Protection Act, The Marine and Coastal Access Act/Marine Scotland Act while the Onshore course addresses the Pipelines Act, the Pressure Systems Safety Regulations and the Environment Act. The various processes that must be completed in order to gain the necessary authorisations and ensure legal compliance are detailed.

## Who Should Attend

Pipeline engineers • Designers and operators involved in the planning design, construction, commissioning, operations, inspection, maintenance and abandonment of offshore/onshore pipelines, who must ensure that such activities comply with legal duties • Managers and engineers involved in the day to day pipeline activities • Managers and engineers who require a good, broad, understanding of these topics.

## Additional Information

Some offshore pipeline operators operate pipelines that terminate at a site onshore. The onshore section is normally less than 1 mile long, however still attracts onshore duties. As such, Penspen offers an extended offshore course that also addresses what operators need to know in relation to onshore regulations. Penspen therefore offers 3 separate courses dependent upon your requirements:

- Onshore course – 1 day
- Offshore course – 1 day
- Extended offshore including onshore aspects – 1.5 days.

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# Offshore Pipeline Legislation Programme



## Introduction

### An Overview

#### The Planning and Abandonment Regime

- The Principal Acts and Regulations
- The Role of the DECC
- The Role of the Marine Management Organisation/Marine Scotland

#### The Safety Regime

- The Principal Acts and Regulations
- The role of the HSE

#### The Environment Regime

- The Principal Acts and Regulations
- The Role of the DEFRA, SERAD, EA and SEPA

### What is a pipeline?

#### The Petroleum Act 1998

#### The Offshore Installations (Management and Administration) Regulations 1995

#### Pipelines Safety Regulations 1996

## Constructing a New Offshore Pipeline

### Getting Permission to Build the Pipeline

#### The Offshore Petroleum Production and Pipelines (Assessment of Environmental Effects) Regulations 1999

- The need for an Environmental Statement
- PON 15a, PON 15c and PON 16

#### The Petroleum Act 1998

- Pipeline Works Authorisation
- The PWA Application Process
  - Format
    - Admiralty Charts
    - Table A and Schematic

- Public Consultation - other oil companies and pipeline operators, the fishermen
- Government Consultation - HSE, DEFRA, SERAD, Crown Estates etc.
- Objections

#### The Marine and Coastal Access Act 2009/Marine Scotland Act 2010

- The Consent Process

#### Getting Permission to Pre-dredge, to Place Articles on the Seabed and to Discharge Substances into the Sea

#### The Marine and Coastal Access Act 2009/Marine Scotland Act 2010

- Consents to Deposit Articles

#### Offshore Chemical Regulations 2000

- Consents to Discharge Substances

#### Designing and Building the Pipeline Safely

#### The Health and Safety at Work etc. Act 1974, the Health and Safety at Work etc. Act 1974 Application Outside Great Britain Order 1995 and the Offshore Safety Act 1992

- Duties on employers, the self employed, the employed and the owners of premises
- Duties on designers and installers

#### Management of Health and Safety at Work Regulations, SI 3242, 1999

- Risk analysis and health surveillance

#### Pipelines Safety Regulations 1996

- The General Duties
  - Design
  - Safety systems
  - Access
  - Materials
  - Construction and installation
- Major Accident Hazard pipelines
- The additional duties
  - Riser ESD valves
  - The Major Accident Prevention Document
  - The notification procedure

Provision and Use of Work Equipment Regulations, SI 2306, 1998

Offshore Installations (Safety Case) Regulations 1992

- The integration of the SCR and PSR
- The Safety Case and MAPD interface
- The Verification Scheme

Prevention of Fire and Explosion, and Emergency Response Regulations 1995

- The integration of PFEER and PSR

Offshore Installations and Wells (Design and Construction, etc.) Regulations 1996

## Operating an Offshore Pipeline

Operating the Pipeline Safely

Pipelines Safety Regulations 1996

- The General Duties
  - Safe Operating Limits
  - Work on a pipeline
  - Maintenance
  - Damaging a pipeline
  - Prevention of damage
  - Co-operation
- The additional duties
  - The Major Accident Prevention Document
  - The notification procedure

Provision and Use of Work Equipment Regulations, SI 2306, 1998

The Submarine Telegraph Act 1885

Dealing with Emergencies

Pipelines Safety Regulations 1996

- The General Duties
  - Incidents and emergencies
- The additional duties
  - Emergency Procedures

The Merchant Shipping (Oil Pollution Preparedness, Response and Co-operation Convention) Regulations 1998

- Oil Spill Contingency Plans

The Reporting of Injuries, Deaths and Dangerous Occurrences Regulations 1995

Protecting the Environment

The Marine and Coastal Access Act 2009/Marine Scotland Act 2010

The Control of Pollution Act 1974

Waste Management Licensing Regulations 1994

## Decommissioning an Offshore Pipeline

Getting Authorisation to Decommission

Who is responsible

The Abandonment Plan

Comparative Assessment

- Technical Options
- Risks to personnel
- Impact on the environment
- Risk to other users of the sea
- Costs

Consultation

Decommissioning a Pipeline Safely

Health and Safety at Work Act

Pipelines Safety Regulations

Control of Pollution Act 1974

Waste Management Licensing Regulations

# Onshore Pipeline Legislation Programme



## Introduction

### An Overview

#### The Planning and Abandonment Regime

- The Principal Acts and Regulations
- The Role of the DECC
- The Role of the Local Authorities

#### The Safety Regime

- The Principal Acts and Regulations
- The role of the HSE

#### The Environment Regime

- The Principal Acts and Regulations
- The Role of the DEFRA, SERAD, EA and SEPA

### What is a pipeline?

#### The Pipelines Act 1962

#### Pipelines Safety Regulations 1996

#### Health and Safety at etc, Act 1974 (Application outside Great Britain) Order 2001, SI 2127

## Constructing a New Onshore Pipeline

### Getting Permission to Build the Pipeline

#### The Pipeline Works (Environmental Impact Assessment) Regulations, SI 1928, 2000

- The contents of an Environmental Statement
- Getting approval of an Environmental Statement

#### The Pipelines Act 1962

- Pipeline Construction Authorisation
  - The PCA Application Process
  - Contents
  - Public Consultation
  - Government Consultation - HSE, EA, SEPA, Highways etc.
  - Objections

#### Town and Country Planning Act 1990

- Planning Permission

#### Waste management

#### Environmental Protection Act 1990

#### Getting Permission to Dispose of Test Water

#### Control of Pollution Act 1974

#### Designing and Building the Pipeline Safely

#### The Health and Safety at Work etc. Act 1974

- Duties on employers, the self employed, the employed and the owners of premises
- Duties on designers and installers

#### Management of Health and Safety at Work Regulations, SI 3242, 1999

- Risk analysis and health surveillance

#### Pipelines Safety Regulations 1996

- The General Duties
  - Design
  - Safety systems
  - Access
  - Materials
  - Construction and installation
- Major Accident Hazard pipelines
- The additional duties
  - Riser ESD valves
  - The Major Accident Prevention Document
  - The notification procedure

#### Provision and Use of Work Equipment Regulations, SI 2306, 1998

#### Pressure Systems Safety Regulations, No 128, 2000

Control of Major Accident Hazards Regulations, SI 743, 1999

- The integration of the COMAH and PSR
- The Safety Report and MAPD interface
- The Verification Scheme

The Construction (Design and Management) Regulations, SI 3140, 1994

- The responsible persons
- The duties

## Operating an Onshore Pipeline

Operating the Pipeline Safely

Pipelines Safety Regulations 1996

- The General Duties
  - Safe Operating Limits
  - Work on a pipeline
  - Maintenance
  - Damaging a pipeline
  - Prevention of damage
  - Co-operation
- The additional duties
  - The Major Accident Prevention Document
  - The notification procedure

Provision and Use of Work Equipment Regulations, SI 2306, 1998

Pressure Systems Safety Regulations, No 128, 2000

- Independent Competent Persons
- Written Schemes of Examination
- Deferrals

Dealing with Emergencies

Pipelines Safety Regulations 1996

- The General Duties
  - Incidents and emergencies

- The additional duties
  - Emergency Procedures

The Reporting of Injuries, Deaths and Dangerous Occurrences Regulations 1995

Protecting the Environment

The Control of Pollution Act 1974

Environmental Protection Act 1990

Environment Act 1995

Waste Management Licensing Regulations 1994

## Decommissioning an Onshore Pipeline

Getting Authorisation to Decommission

Who is responsible?

Decommissioning a Pipeline Safely

Health and Safety at Work Act

Pipelines Safety Regulations

Control of Pollution Act 1974

Waste Management Licensing Regulations

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