UKOPA 2014

UNITED KINGDOM ONSHORE PIPELINE OPERATORS' ASSOCIATION
AN AUTHORITATIVE VOICE FOR UK PIPELINE OPERATORS.

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NEWSLETTER

CHAIRMAN'S **FOREWORD**

Welcome to our UKOPA 2014 Newsletter where we want to share the results of our recent work and plans for the future. Within this newsletter you will read about a number of work programmes UKOPA members have been actively engaged in during the year. The aim of UKOPA is first and foremost to promote the safe operation and maintenance of onshore pipelines in the United Kingdom. We provide a forum for discussion and sharing of best practice to ensure standards and legislation meets this aim.

I would like to take this opportunity to thank the many people involved in the execution of the work programmes for their input in ensuring pipelines do remain the safest method of transporting high pressure hydrocarbon liquids and gasses in the UK.

I would also like to thank Helen Berry of the Health and Safety Executive (HSE), who has written an article in this newsletter about the interaction between HSE and UKOPA. We engage regularly with the HSE and are pleased to have the independent regulator as a member of our Infringement Working Group. We are continuing to support educational development in the pipeline sector and I would like to congratulate Chris Rodgerson on winning the UKOPA prize in the Newcastle University Pipeline Engineering MSc course.

Looking ahead, at the time of writing we are busy preparing for our technical seminar planned in May 2014 where the theme will be pipeline defect assessment and repair. Our main UKOPA meetings are planned for October this year and February 2015, and each of the UKOPA working groups have a range of work programmes and meetings planned in the coming year.

We encourage you to visit our website ***www.ukopa.co.uk*** to find further information and the publications and papers prepared by UKOPA members. We also encourage any feedback.

Roger Ellis
Chairman, UKOPA

HSE AND UKOPA
WORKING TOGETHER FOR SAFER PIPELINES

by Helen Berry, HSE, HID Energy Division – Gas & Pipelines

The principal risk associated with the operation of pipelines is from loss of containment of gas or flammable fluids, leading to a fire and/or explosion. Although these events are rare, and fortunately to date there has not been a major accident associated with a pipeline in Great Britain, the risk is ever present, as experiences abroad have proven.

A particularly serious incident occurred at Ghislenghien in Belgium in 2004 when a high-pressure transmission pipeline failed, releasing gas that subsequently ignited. The resulting explosion and fire led to 24 deaths and more than 120 people were injured.

The immediate cause of the accident was that the pipeline had been weakened by damage caused during third party construction work, but shortcomings in emergency planning and response were also identified-many of the dead were members of the emergency services.

The tragic events at Ghislenghien are a powerful reminder that there is no room for either HSE or the industry to be complacent. UKOPA has shown a strong commitment to playing its part in ensuring the safe operation of pipelines in Great Britain. In this respect, UKOPA's strategy is closely aligned to that of the HSE and there is a history of close partnership working between us. One of my roles is to represent HSE on the UKOPA Infringement Working Group (IWG). Infringements are events where damage is, or could have been, caused to a pipeline or its coating during activities such as excavation, boring and ditch digging.

HSE takes a strong interest in the prevention of infringements because they are a potential cause of a major pipeline accident. The IWG collects data on infringements to identify areas and activities where the risks are highest. This allows prioritised preventative action to be taken by UKOPA members.

The IWG also provides a forum in which pipeline operators can share experiences and lessons learned and I am always struck by the openness of UKOPA members and their willingness to support one another's efforts to improve performance.

I am particularly pleased to be involved in a planned UKOPA IWG 'best practice' workshop. This aims to promote a better understanding of existing good and best practice and will help both the pipeline industry and HSE to push for improvements where they can reasonably be made.

I am also hoping that there will be an opportunity to find out about innovations that may have the potential to reduce the risks of infringement still further.

UKOPA also carries out work in other areas that HSE recognises as valuable in the effective control of pipeline risks.

Inspector Helen Berry, Principal Inspector Jim Stancliffe and Inspector Mike Potter - HID Energy Division - Gas & Pipelines.

These include:

- Collecting pipeline fault data to inform risk assessment work
- Developing risk and hazard assessment methodologies to better understand operational risks
- Defining worker competency requirements for the onshore pipeline industry
- Improving the pipeline data available to those involved in land use planning decision-making
- Supporting the development of pipeline emergency plans

Along with other HSE and UKOPA priorities and work streams, these make up the agenda of annual UKOPA-HSE strategy meetings. These meetings allow us to align our plans and assist one another where possible. In this way HSE and UKOPA are striving to ensure that we continue to work well together to deliver our shared health and safety goals.

Further information on pipelines health and safety is available on HSE's website at: ***http://www.hse.gov.uk/pipelines/index.htm***

CAPTURING POPULATION DENSITY DATA

UKOPA took to the skies to produce the striking image on the front of this newsletter. But this wasn't a pleasure flight, it was part of UKOPA's efforts to produce a current pipeline societal risk model.

Such work requires very specific population density figures, and the most effective way of gathering real-world evidence of any building's position, type and condition along a cross-country linear asset is to carry out a hi-res aerial photographic survey. The aerial data capture element of the project uses a variety of aircraft. For predominantly cross-country routes, a fixed-wing aircraft may be appropriate, whereas for the more intricate lines most commonly found in urban areas a twin-engine helicopter is more useful.

Carrying out a population density survey.

Ideally, a client pipeline patrol aircraft should be used because the pilot and crew will be very familiar with the intricacies of flying that particular route.

Whatever aircraft is best suited to the data capture exercise, they are all fitted with a CAA-approved belly mount, which houses a high-resolution digital stills camera (40 Megapixel), an Inertial Measurement Unit (IMU) and a Differential GPS (DGPS). Thousands of images are taken on each route and these, along with IMU and DGPS data, are then processed.

The next stage of producing a pipeline societal risk model is to put the images produced through a three-stage process to ensure quality and consistency, cleaning of the images and providing accurate geo-referencing, which essentially turns the images into oblique maps that are used for data analysis.

Data analysis is the process used to identify buildings, whether they are used or disused and whether they lie within the defined building proximity distance (BPD). Ultimately, every building within the BPD buffer is identified, categorised and entered into a database forming the basis from which analysis starts.

To enhance that analysis, population data is derived from these aerial oblique maps and integrated with mapping software to derive populations in the various sectors around a pipeline. This data is then used to feed the societal risk model.

Most of the output from the data analysis is in map format. The first level of mapping is a thematic population map. For every metre along the length of the pipeline, the system generates a population density with a specific radius, which either falls into high (above 2.5 persons per hectare) or low (below). The result is a pipeline centreline clearly showing the extents of the high population.

Not only that, the maps produced provide a critical overview of the pipeline length and is a powerful tool for showing areas of interest. A further requirement for the societal risk study is often to split the pipeline populations into boxes of 100 metre sections, both around the pipeline and at varying distances from the centreline, Each of these 'boxes' has its corresponding population logged by the system, the results of which also feed into the societal risk model.

All this data is not just a snapshot in time, but a reusable resource. This is because once the first set of data has been captured, subsequent surveys are much more efficient to carry out because it is possible to compare the data from the initial survey with the new survey and identify areas of change.

PIPELINE SLEEVES

UKOPA's Risk Assessment and Integrity Working Group (RAIWG) identified pipeline sleeves as a potential issue for all pipeline operators. Despite the UK's good record in this field, incidents in the USA have arisen. UKOPA has set up a sub-group to develop and agree a UKOPA strategy for managing pipeline sleeves, covering good practice for maintenance, inspection and remediation.

Across member organisations, pipeline sleeves of different types and different annular fills have historically been used to provide both pressure containment in the event of pipeline failure and additional protection at crossings and to assist in the construction process.

The main threat to the part of a pipeline protected by a sleeve is the integrity of the carrier pipe within the sleeve.

A report was prepared identifying a 'Ranking Scheme for Prioritisation of Pipeline Sleeves' and a spreadsheet was developed to automate the risk ranking of pipeline sleeves.

A Sleeve Management Strategy has been developed, which includes maintenance algorithms for nitrogen filled sleeves and sleeves containing annular fill other than nitrogen. This document is being updated to include testing and monitoring techniques, clearing of shorted sleeves and inspection tools that are recommended.

Another area identified for further research is that of sleeves that are on pipelines that can be In-Line Inspected (ILI). A scope of work has been developed to review a number of ILI reports that have sleeves. These reports will be interrogated to identify any sleeved areas of pipelines that show potential for problems and these will be compared with the risk-ranking algorithm. If there is correlation then the results could be used to help identify sleeves on non-ILI pipelines that should be prioritised for review.

To find out more, please contact the subgroup via the UKOPA secretary at ***secretary@ukopa.co.uk***

Remedial work to pipeline sleeves.

UKOPA EMERGENCY PLANNING DISTANCES

UKOPA members help local authorities fulfil their duty to develop emergency plans for Major Accident Hazard Pipelines (MAHP). UKOPA has produced three documents to assist in providing expert advice.

UKOPA/11/0034 – Guidance on Testing of Pipeline Emergency Response Plans; UKOPA/11/0035 – Major Accident Pipeline Emergency Response Template; and UKOPA/11/0036 Major Accident Pipeline Emergency Response Plan Testing. All are available on the UKOPA website www.ukopa.co.uk/emergency-planners and will soon be joined by a UKOPA 'Good Practice' guide for all pipeline products.

The Emergency Planning Working Group (EPWG) and Risk Assessment and Integrity Working Group (RAIWG) are working to provide UKOPA groups with guidance. This has been developed with the help of experts, who have been reviewing and calculating Emergency Planning Distances for all pipeline products and pressure ranges. This will be issued and made available via the UKOPA website.

Local authorities are responsible for providing hazard distances within their emergency plans with information and guidance from the pipeline operators, while local planning departments should also consider these distances when considering new developments in the vicinity of pipelines.

Many gas pipeline operators provide two hazard distances – the Emergency Planning Distance and the Maximum Thermal Hazard Range. The latter applying a very unlikely event of an incident occurring as a result of an ignited full bore pipeline rupture. Local Authorities develop their baseline plans around the consequences of a pipeline leak with sufficient flexibility to allow them to extend the Emergency Planning Distance to deal with events resulting in Maximum Thermal Hazard Ranges.

UKOPA is producing the Emergency Planning Good Practice document for use by the Pipeline Emergency Response Officer (PERO), who advises the emergency services on the required hazard and exclusion zone around a pipeline.

The aftermath of a pipeline rupture.

UKOPA REVIEW OF EXTERNAL STRESS CORROSION CRACKING

Why might external Stress Corrosion Cracking (SCC) occur? How can pipeline operators guard against it? UKOPA has recently sponsored a technical review so that its members can better understand the conditions under which this type of potentially catastrophic failure takes place.

Although there is no known evidence of external SCC occurring on a pipeline in the UK, there have been incidents of external SCC in other countries around the world. The report highlights the conditions under which SCC may occur and the measures that pipeline operators could take to reduce the possibilities.

The study reviewed:

- Where SCC may be found
- The frequency and consequence of SCC-related failures
- How SCC can be detected and characterised
- The susceptibility parameters for SCC to occur
- The tools that exist for detecting SCC and their reliability

The study reported that there were effectively two forms of SCC that operators need to guard against – High pH SCC and Near Neutral pH SCC.

High pH SCC was first found in the USA in the 1960s under field-applied tape, coal tar enamel and asphalt coatings, and is most frequently observed as inter-granular cracking.

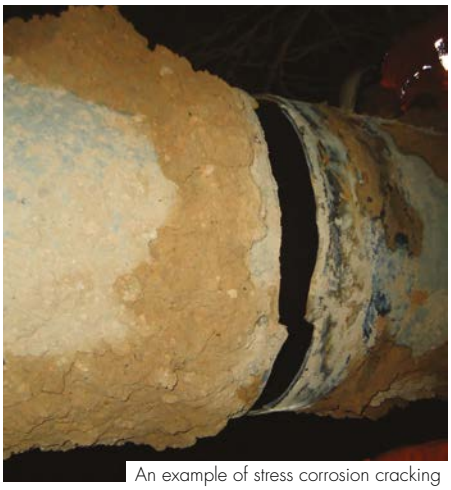
Near Neutral pH SCC was first experienced in Canada in 1985 on tape-wrapped pipelines. In this case, the cracking occurs in a trans-granular manner under near neutral conditions.

Both types of SCC occur where the pipeline coating has disbonded. In the case of High pH SCC it is still receiving cathodic protection, but in the case of Near Neutral SCC the cathodic protection is being shielded.

The report highlighted that there were no product loss incidents reported by UKOPA between 1962 and 2011 that were associated with external SCC. This represented more than 811,000km years of pipeline operation.

More conservative engineering approaches in the UK and more stringent construction practices are believed to be contributing factors as to why external SCC has not occurred in the UK. High standards employed during coating application and high standards of cathodic protection (CP) management are also believed to be factors.

The study concluded that hydrostatic testing is likely to remain the predominant technique for monitoring the integrity of pipelines known or suspected of containing longitudinal SCC.



An example of stress corrosion cracking

In-line Inspection crack detection tools, intended to run in the gas phase, are not considered sufficiently sensitive to reliably locate and size SCC. Ultrasonic ILI tools – which operate in liquid lines or in a liquid slug in gas lines – have, however, been proved to have good reliability and accuracy.

A copy of the report can be obtained by UKOPA members from the UKOPA website.

UKOPA DENT MANAGEMENT STRATEGY

UKOPA is updating its Dent Management Strategy (DMS) following work by the RAIWG to develop a more comprehensive set of assessment rules since the original Dent Assessment Algorithms were published in 2010. The study included:

1. Assessment of dents in conjunction with corrosion damage:

This work aimed to define an acceptable limit for corrosion that can be accounted for in a fatigue assessment and does not impact on the static assessment. A study into the assessments of dents in conjunction with corrosion damage concluded that the dent plus corrosion acceptance limits, currently defined in the UKOPA DMS as 6% outside diameter dent depth and 20% wall thickness corrosion depth, are justified, in being greater than those specified in current pipeline codes. The study reviewed most of the recent industry guidance and research work undertaken on combined dent plus corrosion work with supporting finite element analyses (FEA), and demonstrated justification of the UKOPA limits. The UKOPA DMS is to be updated to take account of the results of this study.

2. Development of dent stress concentration factor (SCF) equations and assessment of the application of standard SN fatigue rules for the assessment of a dent:

Reviewing and comparing a number of published dent fatigue methodologies confirmed that the fatigue methodology currently used in the UKOPA DMS is conservative and predicts low fatigue lives in comparison with other methodologies. Work was carried out to compile and compare SCFs calculated using FEA and fatigue calculations. This work concluded that the dent fatigue methodology gives predictions that compare with full-scale fatigue tests, and the UKOPA DMS is to be updated to recommend this methodology. Further work is to be carried out using UKOPA member pipeline data.

3. A review of the dent depth and toughness limits for the acceptability of dents associated with weld:

This part of the project was split into three areas and covered:

A review of recent international work covering dents on welds, in particular welds of unknown quality, concluded that existing guidance in use is conservative; best practice guidance is given in existing publications (but requires weld quality and toughness to be known).

There is no assessment method for welds of poor quality and future assessment methods are likely to be based on FEA.

Additional guidance is needed to take account of: dents associated with welds having shorter fatigue lives; the acceptable depth for a dent associated with a weld is less than a dent in plain pipe; there is no evidence for changing the current depth acceptability limit of 2% outside diameter for dents associated with welds;

Pipelines transporting liquids are more susceptible to fatigue at dents and the dent shape has a significant effect on SCF.

There were also findings from the Kiefner and Leewis review for Pipeline Research Council International that needed to be taken into account. These include that there is no single equation or expression currently available that is capable of predicting the safe operating limit or time to failure of a dent from mechanical damage that is simple and accurate; simple models tend to be inaccurate and conservative as a result of excessive simplification of a complex problem. Complex procedural approaches combining FEA and facture mechanics will continue to evolve as further research is carried out.

The UKOPA DMS is being revised to incorporate the project findings and will be made available to UKOPA members.