# Avoiding Unnecessary Repairs in Pipeline Girth Welds Using the New ECA Procedure – Stage 1

**PUBLISHABLE SUMMARY**

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## Background

The new version of BS 7910, published at the end of 2013, allows more detailed consideration of yield behaviour, residual stress distribution, weld strength overmatching, and crack tip constraint conditions than the previous (2005) procedure. Stage 1 of this project involved carrying out a number of case studies to explore the implications for greater flaw tolerance of each new factor within the ECA, and allowed sponsors the chance to fully explore these with a degree of thoroughness beyond that possible when ECAs are carried out under the tight deadlines associated with a typical pipelay project schedule. A new FEA tool which rapidly generates FEA meshes using a CrackWISE® compatible interface was used to validate and enhance the assessments made. Subsequent stages will be used to validate the approach using small- and full-scale testing, numerical modelling and residual stress measurement of girth welds supplied by sponsors.

Some additional factors of particular significance to pipeline ECA (for example, the models assumed for crack driving force and plastic collapse, the treatment of embedded flaws, the influence of misalignment) will also be considered, and a comparison made between analyses to the old BS 7910:2005, the new BS 7910:2013, Option 2 of API 1104 Appendix A and DNV-OS-F101 Annex A.

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## Objectives

- Demonstrate the potential for reducing conservatism in ECA using the new features of fracture assessment in BS 7910:2013 with fundamental case studies of interest to sponsors
- Define the detailed scope of work for Stages 2 and 3

## Project Outcome

- A bound report containing all the work of Stage 1 of the project
- A detailed proposal for Stages 2 and 3 at the finish of Stage 1

## Benefits

When installing and operating pipelines where there are issues such as high axial stress, fatigue loading and environmental effects, a very detailed ECA is needed. Any measures which allow the procedure to permit larger tolerable flaws will reduce the girth weld repair rate and the associated costs and delays during pipeline installation.

This project allowed sponsors the chance to fully explore the implications of new methods within BS 7910 for pipeline ECA with a thoroughness which would not be possible when project-specific ECAs are required with tight deadlines ahead of pipelaying.

## Participants

The Sponsor Group comprised:

- Subsea 7
- ConocoPhillips
- Chevron
- TWI

## Scope of Work

In this stage, comparisons of the new BS 7910 ECA procedure with that in the 2005 version, as well as with other procedures, eg DNV-OS-F101,and API 579-1/ASME FFS-1 were made using the geometries and materials of interest to the sponsors.

## Price and Duration

The project had a duration of 1 Year and a budget of £60,000. The fee for companies wishing to access the results by buying-back into the project is £15,000.

## Further Information

For further information on how a Joint Industry Project (JIP) runs please visit:

http://www.twi-global.com/services/research-and-consultancy/joint-industry-projects/

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