

Statistical Modelling of Pipeline Performance

PREDICTION REQUIREMENTS

The AESL pipeline condition assessment process requires the external inspection of the pipeline and its environment at selected locations. Statistical modelling is then used to predict the condition of long lengths of pipeline. This allows pipeline assessment where full pipeline inspection is financially or operationally impractical..

Predictions on the current pipeline performance capability are based on the assessed pipe wall condition, and loading regimes. Future performance predictions are based on calculated pipe deterioration rates.

Alternative failure modes are considered, each having specific critical defect types. Metallic pipe can suffer from through wall pitting, fracture and structural failure depending on the pipe wall deterioration, material properties and applied loading.



FRACTURED PIPE

INSPECTION AND STATISTICAL MODELLING

Pipe wall inspections identify and sizing the appropriate defects types. For ferrous pipe AESL use patented High Flux magnetic tools to map and size defects. Ultra-sonic inspection is used for pipe wall thickness measurement and to calibrate defect-sizing algorithms.

Inspection outputs identify defects within a defined geometric grid on the pipe wall allowing statistical prediction of significant individual and patterns of defects along the pipeline. Using the same grid during coating inspection allows the influence of coating condition on future corrosion to be assessed.



COATING ANALYSIS

The statistical models applied to provide predictions are based on published methods but AESL have developed these to provide pipeline performance predictions. Independent academic statisticians validate the statistical modelling techniques applied. Currently models are available to predict the:

- Size and population of the deepest pits
- The likelihood of through wall pitting, now and in future
- The likely number of perforations now and in future
- The likelihood of failure caused by significant structural defects

Work is on-going to the refining statistical modelling techniques.

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