BETTER PIPELINE INTEGRITY DECISIONS START HERE
HOW MUCH USEFUL LIFE IS LEFT IN YOUR PIPELINE?

When axial cracks initiate, prediction of remaining life is critical to continued safe operation. Battelle has developed a more accurate way to predict axial crack growth so you can make effective repair and replacement decisions and reduce costs through optimization of re-inspection intervals and hydrostatic tests.
Battelle PipeAssess PI™ Axial Crack Assessment is an innovative software application that uses physics-based and empirically derived modeling to estimate remaining pipeline life and predict axial crack growth under various operating scenarios.

PipeAssess PI™ can be used for all standard oil and gas transmission and distribution line-pipe sizes and grades. With PipeAssess PI™, you can:
- Evaluate remaining life of pipelines with preexisting axial crack-like flaws
- Predict the growth of axial cracks and model fracture risk under various operating conditions
- Make informed, evidence-based decisions for repair, replacement and maintenance of aging infrastructure
- Optimize the appropriate re-inspection or hydrostatic test intervals
- Reduce the frequency of hydrostatic testing while addressing current Department of Transportation (DOT) requirements for assessment of liquid and gas pipelines
- Prepare to meet future regulations for pipeline integrity management

**A MORE ECONOMICAL APPROACH TO INTEGRITY MANAGEMENT**

The PipeAssess PI™ software incorporates user-defined hydrostatic test conditions, operating pressure profiles and attribute inputs such as pipe geometry, material properties and crack geometry (from In-Line Inspection and/or In-the-Ditch Non-Destructive Examination). The crack growth physics revolve around long-established J-tearing theory within elastic-plastic material behavior and Paris Law behavior for fatigue. The time-dependent crack growth under a simulated hydrostatic test conditions utilizes Ramberg-Osgood constitutive model. These fracture mechanics models, along with state-of-the-art stress-intensity factor solutions, provide a more complete and accurate life prediction than is possible with traditional software solutions. That means less frequent hydrostatic tests and fewer shutdowns, which leads to lower operating expenses. PipeAssess PI™ will help you make better decisions to meet the U.S. DOT assessment requirements with the fewest disruptions to operations.

**PIPELINE INTEGRITY MANAGEMENT MADE EASY**

Battelle PipeAssess PI™ Axial Crack Assessment is a user-friendly, highly customizable alternative to traditional software packages. Battelle has designed an easy-to-navigate Graphical User Interface (GUI), input guidance and data visualization tools to ensure accuracy of inputs. These features aid in operator understanding and interpretation of the results for more effective decision making. As fluctuations in your operating conditions occur, you can run the analysis as often as you like to determine how your pipeline failure risk changes with time. Efficient algorithms promote rapid computation of results.

- Input wizards lead you down the path to choose the right inputs, even if you’re not sure of the crack type
- The software automatically screens for erroneous data and flags problem inputs and results
- Data visualization tools provide clear, understandable results to help operators understand how different variables impact failure risk

**High Level Overview of PipeAssess PI™ Capability**

1. Input Initial Anomaly
2. Apply Loading Type
3. Employ Crack Growth Physics
4. Produce Outputs
**HOW IT WORKS**

Battelle PipeAssess PI™ Axial Crack Assessment provides highly reliable modeling and prediction for axial crack growth in all standard line-pipe sizes and grades, including pipes made of brittle, quasi-brittle and ductile steels. PipeAssess PI™ can be used to model growth of many types of axial crack geometries and scenarios typical to electric resistance welded (ERW) and flash welded (FW) pipe:

- Cold weld
- Hook crack
- Selective seam weld corrosion
- Coalescing cracks

The software considers multiple mechanisms for growth, including time-dependent cracking during hydrotects as well as fatigue cracking due to pressure cycles. A help wizard is available to guide the user in proper crack geometry selection and provide explanation of the remaining inputs.

**SOFTWARE OUTPUTS AND VISUALIZATION**

PipeAssess PI™ is not limited to just ductile crack growth. Multiple failure modes are assessed for each case, including ductile tearing, net section collapse and ultimate material limit. PipeAssess PI™ calculates:

- Instantaneous failure pressure for a given crack size
- Family of critical crack sizes (depths and lengths) that lead to failure
- Crack growth as a function of operational time
- Failure pressure as a function of operational time

**USER INPUTS**

Users input basic data about the pipeline, defect and operating conditions into the software, including:

- Pipe geometry and material properties
- Crack geometry from ILI or In-the-Ditch NDE
- Operating conditions, including explicit pressure as a function of time and any explicit hydrotect loading profiles
Data visualizations give operators clear, unambiguous results, including failure pressure, crack growth rates and more.

How does PipeAssess PI™ stack up against the competition?

<table>
<thead>
<tr>
<th>LOADS</th>
<th>PipeAssess PI™</th>
<th>Alt. Commercial Models</th>
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<tr>
<td>Internal Operating Pressure</td>
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<th>CRACK TYPES</th>
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<td>Hook Cracks</td>
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<tr>
<td>SSWC</td>
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<tr>
<td>Multiple Cracks</td>
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<table>
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<tr>
<th>OUTPUTS</th>
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<tr>
<td>Probabilistic Results</td>
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Our innovative software addresses most of the industry’s most difficult pipeline integrity challenges.

Ready to learn more?
Contact us for a demo or licensing information.

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