



RISER INTEGRITY MANAGEMENT

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ENSURING SAFE FLEXIBLE RISER OPERATIONS

KONGSBERG is an independent provider dedicated to developing and offering asset integrity assurance solutions for risers, umbilicals and wellhead systems in particular. We are an industry leader in engineering with in depth knowledge of top-tensioned risers, flexible risers, umbilicals and wellheads from all engineering perspectives. Our strength when offering integrity solutions is that we understand the physical structures to which the solutions are applied and have a considerable expertise within structural analysis and integrity assessment.

Riser Integrity Management (RIM) for flexible risers

For almost two decades we have performed in-situ inspections and assessments for major oil companies, focusing on flexible riser integrity. We have developed tailor-made tools to support these services using our engineering expertise.

Furthermore, we provide dissection and failure investigations for flexible risers and jumpers. These investigations are conducted by specialists with extensive experience from riser design and operation of risers.

Examples of the RIM services we provide:

- Risk assessments of risers in operation
- Status assessments of flexible risers
- Annual status reporting of riser condition
- Establishment of inspection programs
- Re-certification of flexible risers, flowlines and umbilicals
- Dissection and failure investigations of flexible risers
- Life time extension analysis (LTE)

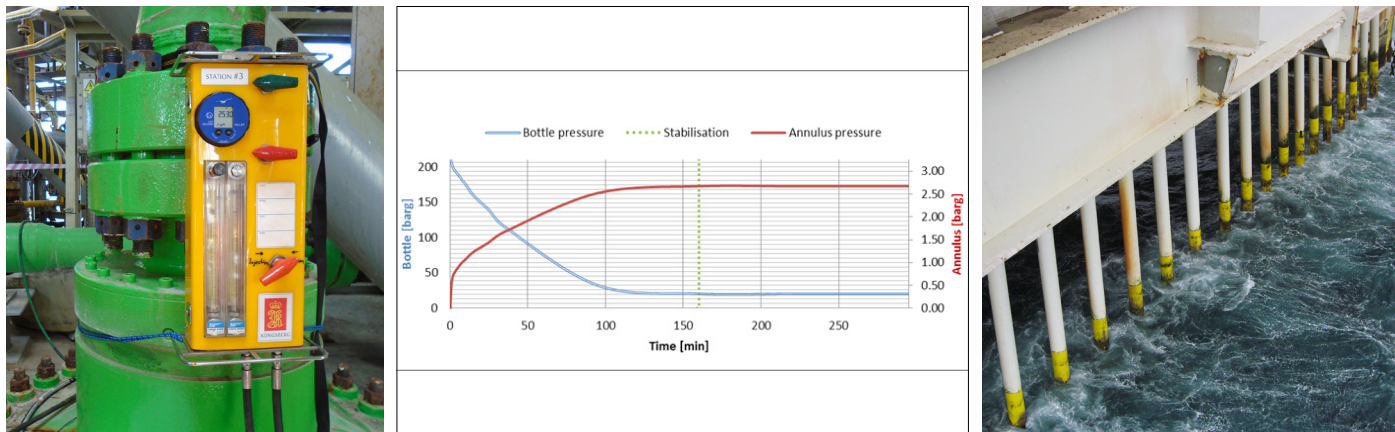
Annulus testing

Offshore testing of flexible risers has become accepted in the industry as a key element in condition and integrity monitoring of flexible pipes. Some of the most common failure modes may be detected at an earlier stage and preventive action taken to avoid propagating failure. KONGSBERG offers both positive pressure testing with nitrogen as well as vacuum testing.

The general objective of annulus testing is to identify possible liquid in the riser annulus. Monitoring the annulus is important

since liquid and gas contamination of the annulus can reduce the riser's fatigue life considerably. The testing can also reveal damage to pressure barrier and outer sheath.

KONGSBERG can also provide Annulus Vent Monitoring Systems and a range of solutions from the very basic to more complex instrumentation to detect changes in annulus volume and gas vent conditions.

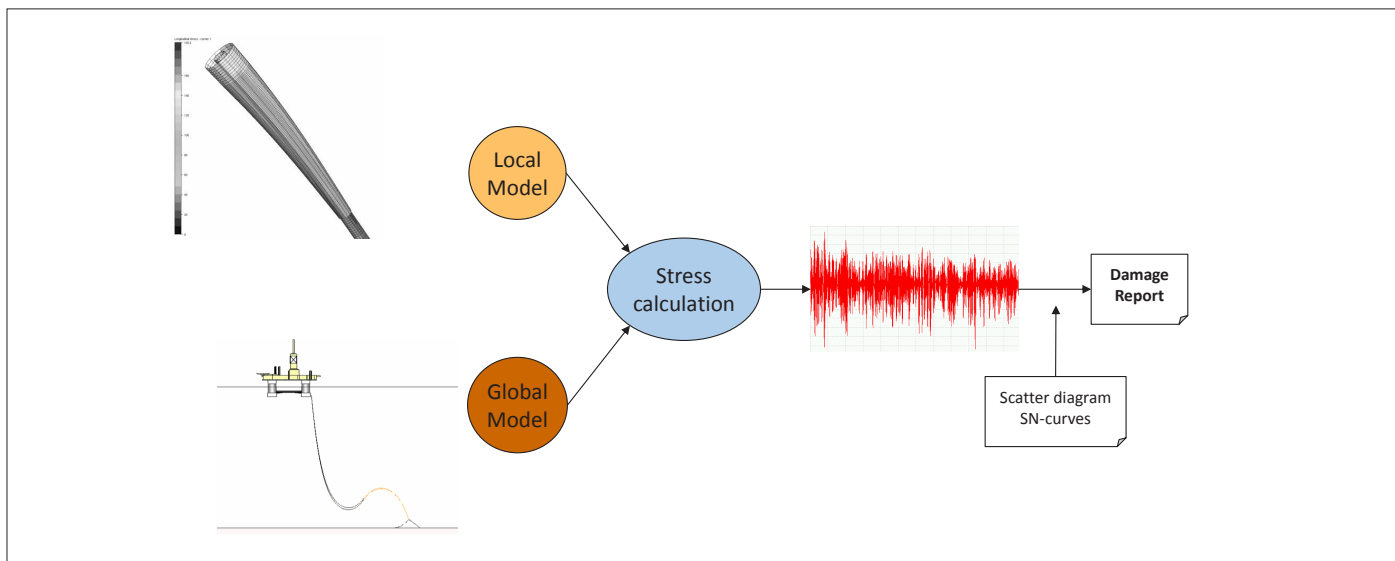


Flexible Riser Life Time Extension

KONGSBERG possesses latest methods, analysis tools and competence for dynamic response analyses and subsequent fatigue analyses of flexible risers.

With KONGSBERG in-house Flexstress™ application, we are able to efficiently perform fatigue analysis of tensile armour wires in flexible risers for scatter diagrams containing a large number of irregular wave sea states. This approach will provide accurate fatigue results removing excessive conservatism maximizing the potential for life extension.

Life time extension studies are performed based on collected environmental and operational data as input to the fatigue analysis as well as for evaluation of polymer material deterioration. The operational history of the riser should preferably contain historical data for temperature, pressure, bore fluid composition, annulus condition and other factors that are known to impact the design life of the riser.



Specifications subject to change without any further notice.