Case Study: Risk Based Integrity Assessment

The Challenge
The remaining life of their chemical plant was one key motivator for BASF who partnered with Intertek on this project in order to ensure further safe operation. Our expertise in this field meant that we were able to implement RBI assessment that helped to meet the following objectives:

• Safe operating life
• To provide the client with a means of identifying already consumed lifetime or the relative risk that static equipment and piping in the unit posed to Health, Safety, and the Environment (HSE) considering process conditions, equipment design and metallurgy, inspection and maintenance history, and operating process parameters.
• To develop and recommend cost-effective integrity management (IM) plans (i.e., inspection and operating strategies) for the risk ranked items to minimize HSE risk and mitigate the consequences of failures should they occur.
• To transfer the risk assessment methodology and technology to client personnel.

The Solution
Using Intertek’s own proprietary API 580 compliant RDMIP™ assessment software, the Intertek team was able to determine the condition of the static equipment and evaluated the relative risk that the static equipment items and their associated piping posed to HSE. This was accomplished through a process of determining the likelihood of failure (LOF) of each item and the consequence of failure (COF) should the item fail. The LOF and COF values were implemented into a risk matrix.

The Result
Working in close co-operation with our client’s management personnel and engineering teams the assessment was performed using the following steps:

• Data was acquired and reviewed. This included review of inspection and maintenance records, plant design drawings, process data (temperature, pressure, chemistry) and interviews with plant personnel
• Development of Damage Mechanism Loop (DML) Diagrams to identify equipment and piping systems which were fabricated
from similar materials (e.g., carbon steel) and subject to the comparable process conditions.

• Risk ranking of static equipment and associated piping circuits.

• Development of Integrity Operating Window (IOWs) which define the operating process variables that must be maintained to avoid premature failure. The IOWs provide guidance to operations as to the safe and damage operational limits of equipment.

• Development of Integrity Management Plans that establish recommended inspection and maintenance techniques and recommended maintenance or inspection frequencies.

• Development of a Damage Mechanism Control Document (DMCD) to document and summarize the results obtained in the previous tasks.

The accomplishment of these tasks resulted in the following:

• It was figured out that the majority of the static equipment posed a low or moderate risk so that the focus could be directed to few items.

• A summary of inspection and failure history of static equipment.

• The identification of degradation mechanisms that could affect the unit static equipment and piping including those not previously considered.

• The identification of operating and design parameters that could significantly influence mechanical integrity.

The key recommendations arising from the assessment included:

• The existing regular external and internal inspection program can be supplemented by special inspection techniques.

• Investigation of the feasibility of using the documented results of the integrity assessment as basis for an improvement of the maintenance strategy with focus on inspections.

Ultimately, the key benefit from undertaking integrity assessments such as these is the alignment of resources for inspecting and maintaining equipment with the risk they pose.