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Integrity Operating Windows

By Michael J. Humphries, Ph.D.

Integrity Operating Windows establish a safe operating regime for equipment and can be used to trigger a Management of Change review of any changes that might reduce equipment integrity. They can also define limits beyond which short term operation is possible, and to set a safe operating period beyond which corrective action is required. The API is currently developing a recommended practice on Integrity Operating Windows.

Carmagen Engineering, Inc. recently developed integrity operating windows for several units at a US refinery. The potential damage mechanisms for every vessel on the units were evaluated. For each applicable damage mechanism, limits were established to ensure that the service life of the equipment would be acceptable. In many cases, the limits were related to the composition of the process stream because of its impact on corrosion. In other cases, the limits were set by pressure or temperature, both because of a corrosion impact and an effect on mechanical properties.

The end product included a listing of all pressure vessels with their operating limits, and a list of process monitoring points and the limits required for them. A program of stream sampling was also identified for cases where corrosion was dependent on parameters not routinely monitored for process purposes.

About the Author

Mike Humphries has over 40 years experience as a Materials Engineer in the power generation and petroleum industries, including both the refining and pipeline sectors. His areas of specialty include corrosion, metallurgy, materials engineering, pipeline engineering, heavy wall vessel fabrication, water treating, inspection, and general fabrication.

Please contact Vince Carucci (vcarucci@carmagen.com) if you'd like more information on Carmagen's expertise in this area.

Work Highlights

Fired Equipment / Heat Exchangers

- In a multi-year activity, performed engineering design reviews of fired equipment and heat exchangers being provided for a major refinery clean fuels project being engineered in the US for a client in the Middle East. This work involved review of contractor and equipment supplier design details and calculations with respect to their conformance to the owner's specifications. Recommendations were made to correct deviations that were identified.

Process, Operations & Safety

- Provided process support to a refiner to investigate option benefits to upgrade their FCC reactor system with various riser cracking design improvements, and helped prepare the request for proposal to technology licensors. Assisted in the evaluation of licensor proposals/selection, and continuing review of the yield model/basis, and process liaison/support associated with the revamp design package.
- Provided data collection and analysis for risk assessment effort at client's refinery.
- Performed a fluid coker cyclone fouling mitigation study, including review/assessment of operating data, that resulted in recommendations for improvement.