



Has Plant Digitalization Held Up to its Promise? Webinar – July 17, 2020 Questions and Answers

How the digital twins of the plant is planned to be kept up to date considering the changes that may be happening like feedstock or composition or operating parameters over the lifecycle of plant?

Thomas Heinzerling: *The digital twins that Linde is providing are designed in a way that they take into account typical changes of operating conditions (like change of feedstock composition). Independent of this Linde offers an ongoing tuning and update service for all their digital twins in order to make sure that the digital twin keeps reflecting the actual behavior of the plant even if the equipment is aging or the way how the plant is operated changes.*

Is it planned to engage outside engineering consultant for such engineering activities?

Scott Mayhew: *All public details can be found on www.shell.com.*

What is the current timing on the in-service date for Shell cracker?

Scott Mayhew: *All public details can be found on www.shell.com.*

What are three biggest challenges you see in the achievement of digital business transformation?

Thomas Heinzerling: *As I only have in depth experience with the process industry my answer relates to this industry specifically:*

- 1) *There are many players in the market that offer solutions that do not work or require maintenance efforts that compensate the benefits. Therefore, the trust of plant operators in this kind of solutions has been shattered*
- 2) *Initial steps towards digital transformation cost money and bear risks while the hard financial benefits might be limited. Therefore, typically it is difficult to create the initial business cases to get started.*
- 3) *Unless the business is disrupted by a crisis (e.g. Corona) there is not enough pain and momentum to take risks by trying new ways of working*

My understanding is that Shell cracker does not have storage for ethane. What will happen to ethane in case Shell cracker cannot take in any ethane temporarily? What is the expected utilization rate for the cracker?

Scott Mayhew: All public details can be found on www.shell.com.

How is digital twin different from traditional OTS simulators? What is the benefit of gathering so much data in digital twin?

Thomas Heinzerling: The digital twins that I was talking about, run in Realtime and produce a prediction about the behavior of the real plant in the immediate future using the current process values of the plant as starting point. OTS in contrary would run off-line independent of the real plant. We would only collect the process values of the plant that are required to understand the current condition of the plant and predict the behavior in the next hours, days or weeks.

For remote operations how do you evaluate risk differently for I/O required for process control vs. process monitoring?

Thomas Heinzerling: Process Monitoring: with current IT security tools and methods low risk (as long as we make sure data is only travelling from site to the monitoring center and not vice versa) Process Control: significant risk of hacker and malware attacks that must be mitigated with a dedicated and typically quite sophisticated IT security concept.

Deployment of AI requires huge efforts/investment, which includes tremendous domain knowledge plus data analytics/algorithms. The challenge tends to increase exponentially as scope/complexity of the 1st principle model increases. It also involves lots of risk should AI fail. Do you have any success stories in implementing AI in large-scale, say plant wide control/operations of a refinery or petrochemical plant?

Scott Mayhew: Similar to a number of businesses in Manufacturing, there are a number of efforts in place to further Artificial Intelligence and Machine Learning. All success stories in this space shared externally will be available on www.shell.com.