PI Quick scan – Management summary (public)

Process:

Shell's SMPO process was reviewed in the frame of a Process Intensification Quick scan. For the session a team was formed with SMPO process technologists and design experts from Shell, and external PI experts. In an open atmosphere the chemistry of the process, the line up of the unit and the design optimisations were discussed. Basis for the discussion was technology knowledge as available to-date and this had been made available as preread to the meeting. Being a 4 hour session only and the SMPO process being a highly complex technology, the objective of the session was to pinpoint areas in the process where PI may bring improvements.

The added value from this Scan may arise from confronting two different bodies of knowledge:

- The knowledge base of Shell SMPO.
- The knowledge base of the PI Quick Scan team w.r.t. about 60 different PI-technologies.

Results

In its present state this process is the result of years of continuous improvement, redesign and thorough analysis carried out repeatedly by various engineering teams. The team is therefore looking at a matured and very well optimized process that seems to have reached the final part of its S-curve of development.

In the opinion of the PI experts, the overall potency of the SMPO process for Process Intensification has been judged as:

Low for the short/medium term and average to high for the long term.

This statement was based on the following observations

Reaction sections

Limited conversion and selectivity of the reaction to EBHP has a large impact on the complexity and costs of the MSPO process. Increasing reactor performance here would have a large pay out. The PI experts see potential for improvement of the hydrodynamics of these reactors. In the longer term an intensified and safer PI reactor concept, if identified, could bring down SMPO manufacturing costs.

The reaction to PO can be optimised by reducing the temperature increase over the reactors. A number of ideas with currently unclear practical implications has been generated here.

Separation sections

The separation sections will become significantly smaller when reactor perfomance upstream has been improved. In the short term PI may be of help in solving the typical operational issues related to phase separation and the column yielding EBHP.
In the medium to long term, the improvements PI can offer here are dependent on what is the new set of requirements that result from operating an intensified EBHP synthesis step. Since the amount of byproducts formed is expected to reduce significantly this may imply a simplification of this part of the process: fewer units and combined operation.

Concluding.

The PI quick scan revealed a number of areas where improvements could be possible. In order to make recommendations for process improvements, a more detailed PI scan is required. Shell Moerdijk has decided not to continue with this activity.