

Topsides 4.0 Webinar Q&A

15 November 2017

Topsides 4.0

1. Is there a higher level of alarm analysis to guide or initiate operational decisions that may not be triggered or recognized in the traditional human interface?

The Intelligent Monitoring component in the Topsides 4.0 solution identifies deviations from normal operations before the alarm limits set in the control system are exceeded. This allows for remedial actions or planned maintenance before the alarm condition or failure occurs. The solution does not prescribe what remedial action should be taken. This is an area for future development.

2. Is VSAT used for communication in Topsides 4.0?

The Ivar Aasen case study that was shared in the webinar benefited from a fiber network in the Norwegian North Sea. Where that is not available, VSAT can be used. For condition monitoring standard VSAT is sufficient. For remote operations, a redundant VSAT connection with low latency is required. These solutions are now at the point where they are technically and economically viable.

3. What software hosts the data in the Topsides 4.0 solution?

The software that contributes to Topsides4.0 is:

- Data Hub: COMOS
- Plant Twin: COMOS Walkinside
- Process Twin: SIMIT control emulation
3rd party dynamic process models, like HYSIS, UniSim, etc.
- Intelligent Monitoring: MindSphere OF (Offshore), as an evolution of XHQ
- Historian: As used by the customer

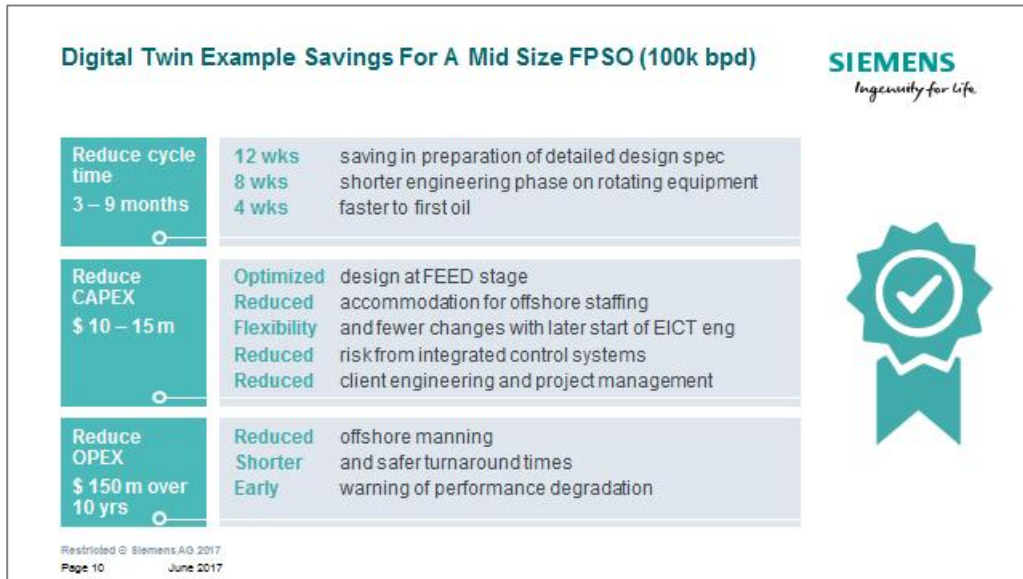
In future Siemens MindSphere will become the single customer portal to the Topsides 4.0 Intelligent Digital Twin.

4. Are 3D models used in the Topsides 4.0 solution?

The Plant Twin (COMOS Walkinside) allows the fast rendering of large 3D CAD models, from whichever commercially available CAD system is used by the customer.

5. What is the percentage of CAPEX savings that are achieved by implementing Topsides 4.0 in a Greenfield project?

This varies from project to project, depending on the digital maturity of the customer prior to the implementation of Topsides 4.0. The biggest saving is not necessarily in CAPEX, but in project cycle time and risk, and in OPEX. The areas where benefits were delivered on previous projects are shown below.



6. Given that the general processes on production platforms have many commonalities, what cut and paste potential is there?

The biggest efficiency gain re deliver from:

- Automated engineering of rotating equipment with configurators
- COMOS as EICT engineering tool, with the associated workflow for configuring the ICSS, historian and intelligent monitoring (engineer once, spawn multiple solutions).

Although there is commonality in topsides processes, the Plant and Process Twins are exact replicas of the specific facility, so there is less opportunity for cut and paste than may be expected. There is more opportunity for cut and paste in Intelligent Monitoring, but since that is largely auto generated to start with, cut and paste does not add a huge amount of value.

7. How does Topsides 4.0 contribute to HSSE requirements and specifically human safety on a Topsides asset?

The EICT design establishes a secure and reliable system architecture to enable safe operation of the topsides facility from an onshore control center. This enables companies to adopt low offshore manning strategies, exposing fewer people to risk. In addition, the Plant Twin (COMOS Walkinside) provides a safe virtual environment for planning and training in construction and maintenance activities, hazops and evacuation procedures.

8. Has COMOS software been used to bring together the engineering tools for the Topsides 4.0 project and how has this benefitted the customer?

COMOS is the underlying data hub for Topsides 4.0, as well as the engineering tool used by Siemens for the EICT. From in-house experience we have seen a huge reduction in engineering effort, directly attributable to COMOS as engineering tool.

9. Please clarify if a digital twin of an existing (legacy) asset could be created retrospectively?

We can deliver Topsides 4.0 for brownfields facilities, but the cost and effort to retrofit the solution is substantially higher than when the digital twins are developed right from the concept phase as a standard project deliverable.

10. Does digitalization provide benefits for maintenance of the steel structure or coating as well?

Yes, it will. We have not yet included this in the solution, but the architecture of Topsides 4.0 allows any type of monitoring application to be slotted in. Drone inspections with image analysis will be an option for digitalizing maintenance of steel structures and coating.

11. What specific savings have already been achieved?

Although Topsides4.0 is new, it is based on underlying components with a long history in O&G. Refer to the figure in question 5 for a summary of real savings achieved. Not all benefits will apply equally to all projects, so it will be best to work through the benefit areas together to quantify the value for your project.

Although not quantified, AkerBP are publically speaking to the qualified benefits they are seeing on the Ivar Aasen field.

Example: Remote Operations of the Ivar Aasen Field (AkerBP)



Challenge

- Operating offshore production platform in a harsh environment and remote location
- Minimum offshore operational team
- Leverage onshore key expertise
- Condition monitoring to ensure asset uptime and efficient maintenance campaigns

Solution

- Fully integrated Electrical, Automation and Digital solution
- Onshore operations center for seamless remote operations
- Advanced condition monitoring of critical equipment
- Expert support based on real time big data and analytics
- Lifecycle process simulation and training software

Benefits:

- Fewer people on the platform
- Lower OPEX
- Increased recovery

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12. As all data are stored in the “cloud” by an external service, how do you ensure that the data is protected for external businesses and competitors?

The Topsides4.0 solution we deliver today runs on premise and it is compliant with cyber security standards.

In future Topsides 4.0 will also be available as a cloud solution on MindSphere for both private and public cloud deployment. Data security and privacy is a prerequisite for all MindSphere users and it is built natively into the MindSphere platform.

13. What EPC's are already implementing Topsides 4.0 or parts of this solution?

We only recently launched Topsides 4.0 and don't currently have an EPC that is implementing the full concept. We have a strong track record on the individual components of Topsides 4.0, both with end users and EPCs. Examples of EPCs and Engineering companies are:

Rotating equipment configurators	– KBR, Aker Solutions
COMOS	– KBR, Aker Solutions
Process Twin	– Technip
Plant Twin	– Total E&P, Engie E&P
Intelligent Monitoring	– Not typically part of EPC scope

14. What is the difference between Siemens and other suppliers when it comes to Topsides 4.0/ digitalization solutions? Why should I choose Siemens?

The level of data, workflow and application integration in Topsides 4.0, from Concept onwards, is not offered by other suppliers. The combination of our PLM tools, automation & electrical solutions and intelligent monitoring combined with the in depth OEM knowledge of our own products makes it difficult for other to offer a comparable solution to Topsides 4.0

Aker BP/Ivar Aasen

1. What generation of subsea controls has the Ivar Aasen platform have and are these current generation or older (5-15 years old)?

For the Ivar Aasen project there are currently no subsea controls

2. Is there a real time risk measurement when a critical piece of equipment is under maintenance or there is a process disruption?

Currently not implemented but are being looked into.

3. Does Aker BP also monitor wellhead and Xmas tree equipment and if so to which level are the monitoring sensors provided by Siemens or is the data fed into the Siemens system?

We do have a separate package for monitoring of X-mas trees but we could have built it in this system as well, all the sensors are available in the overall system.

4. How do you handle inconsistent or missing engineering data when developing a Topsides 4.0 solution or on the Ivar Aasen platform?

If and when inconsistencies are identified we try to rectify them as soon as possible.

5. Who is owner of the data that is stored in the cloud for installation, and how do you ensure ownership of the data by contract?

AkerBP is the owner of all data and we do not share everything but limit the sharing by grouping tags belonging to a specific vendor.

6. Does Aker BP see this system as being a future standard and is Aker BP already working with Siemens on advanced systems?

This is just a start for the next project. Remember the specs for this system was written 5 years ago and we know so much more today about what is possible than what we did back then.

Digitalization

1. How would you describe the biggest differences between the concept "Digitalization" and the "Integrated Operation Initiatives" that were "hot" some years ago?

Integrated Operations was a subset of Digitalization. It focused on the Operate and Maintain phases of the asset lifecycle and was most often retrofitted to brownfields facilities. Our approach to Digitalization is to deploy it right from the concept phase of an asset. That makes the implementation and adoption much easier and improves the ROI significantly.

Developments in computing power and in learning algorithms have enabled analytics that were simply not possible in the era of Integrated Operations. This makes predictive maintenance of complex equipment and systems a reality.

2. Are the algorithms for automation and predictive maintenance developed by Siemens or by the OEMs? Do you see continuous update of the algorithms to be performed?

The quality of monitoring algorithms is improving exponentially and Topsides 4.0 will continuously evolve to make use of these improvements. Today we apply a variety of analytic techniques:

- Instrument diagnostics (HART), plus
- Standard statistics and thermodynamics for simpler asset types (vendor agnostic), plus
- Multivariable data models for more complex asset types (vendor agnostic), plus
- Self learning algorithms, (vendor agnostic), plus
- OEM services for critical machines like rotating equipment (vendor specific)

For Ivar Aasen we asked the different vendors to provide details on how to monitor their own equipment, some of this is implemented in the solution.

We do not subscribe to the idea that algorithms can fully replace subject matter expertise, but over time more analysis will become fully automated

3. What impact does digitalization have with respect to source supply chains in future collaborations? Is there a possibility to switch from one sub supplier to another, for example with regard to electrical equipment such as transformers? Are long term partnerships with sub suppliers the "only" option?

In a mature market, price competition and vendor rotation is standard practice, but Digitalization is only at the start of the adoption S-curve. The pace of development is staggering. Whatever digital solution is deployed today, it will very likely be obsolete in 2 years' time. At this time digitalization cannot be a once off price driven decision. A partnership environment and open, scalable solutions are necessary to manage the pace of change.

It is clear that supply chains will become increasingly integrated to reduce end-to-end inventory and improve responsiveness.

4. Most of the time as a contractor, we are required to use different software, such as Aveva or SmartPlant. How can we best adapt to digitalization, from an internal perspective as a contractor or subcontractor to be more efficient and respond to developments in the pre feed and feed stages?

For the Ivar Aasen project we used both SPI and Aveva. Both these tools have benefitted us greatly but looking ahead we can clearly see the benefit of a more integrated engineering solution.

There are multiple ways to exchange data with other systems. Especially in the Pre-FEED and FEED phase generic formats are in use. These generic formats are: DGN (Microstation), DWG (AutoCAD), DXF, Excel, etc. Assuming the source system is COMOS, a direct interface to PDMS or E3D from AVEVA is available. The ISO 15926 connector and Proteus (XMpLant) could be used in addition. Please refer to the COMOS Interface Library section in the online brochure COMOS Interfaces <http://w3.siemens.com/mcms/plant-engineering-software/en/comos-platform/comos-interface-library/Pages/Default.aspx> for further information.