More oil and gas fields around the world are coming to the end of their life cycle, while simultaneously over 400 nuclear reactors worldwide have been retired from operation. With this in mind, it is safe to say that decommissioning activity will be growing significantly during the upcoming years in both oil and gas and power industries. Having access to up-to-date engineering information can help both offshore and nuclear operators to significantly speed up the decommissioning projects, improve safety and enable reselling or reuse of parts of the existing asset.

**Ageing Facilities Worldwide**

Almost GBP17 billion will be invested in the deconstruction of oil and gas installations, rigs, wells, pipelines and other pieces of subsea infrastructure in the North Sea between now and 2024. Simultaneously, at least 23 decommissioning projects will happen in the Norwegian Continental Shelf over the next decade, with 284 wells set to be deconstructed, along with 360 kilometres of pipeline and 14 oil platforms. [1] In addition, the offshore decommissioning market is expected to grow globally 20% between 2015-2020.

When considering the maturity of North Sea assets, the abundance of investment in decommissioning activities hardly comes as a surprise: the average asset age at North Sea is estimated to be 25 years, with more than 245 assets being older than 30 years. [2] Over the past years, the offshore industry has sought to extend the life cycle of their assets, and as technology has developed to enable this, many offshore facilities are remaining in service beyond their originally planned life span. This poses challenges for decommissioning as assets, equipment and the overall facility are subject to the effects of ageing, including limited availability of up-to-date engineering information, and an as-built model of the facility.

At the same time, a growing amount of nuclear facilities, including approximately 110 commercial power reactors, 46 experimental or prototype reactors, over 250 research reactors and a number of fuel cycle facilities have been retired from operation. [3] The older nuclear plants were designed for 30 years of service, whilst the newer facilities are expected to be operational up to 60 years.

Hans Kouwer from Intergraph® Process, Power & Marine discusses the outlook of the decommissioning industry, and the ways insightful engineering information can drive safety and efficiency in decommissioning projects.

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*Factual asset information is crucial for safe decommissioning of offshore facilities (photo: Shutterstock)*
Decommissioning IM

years. Especially with the older nuclear facilities, it is likely for the original documentation of the plant to be in paper format, scattered between different locations, making it difficult to have an as-built representation of the facility available for decommissioning.

Decommissioning Challenges

The first challenge for an owner operator is to be able to determine the residual value of the asset. This is essential as it enables selecting of the right decommissioning approach, and steps that need to be taken during the process. The second challenge is to determine best decommissioning strategy, which includes finding a suitable decommissioning partner. Engineering and design information as well as maintenance and operation records including inspection reports are key to address these challenges.

Decommissioning projects tend to be expensive, time-consuming, and often above budget due to the complex safety, environmental, and governmental regulations that both the external service provider and owner operator need to meet. Companies involved in decommissioning need to find the right balance among health and safety, environmental, technological, and economic regulations.

The decommissioning challenges are similar between offshore and nuclear facilities, one clear differentiator being the level of audit and regulatory compliance, as the operators need to adhere to different standards.

Offshore Decommissioning

After an offshore facility comes to the end of its lifetime, and a suitable decommissioning partner is found, the first project step is to isolate the platform from its source. The second step is the demolition of the platform. This can be done in two different ways:

• Immediate dismantling: This enables the facility to be removed from regulatory control fairly quickly after shut-down or termination of regulated activities. This way, final dismantling or decontamination activities can begin within a few months or years, depending on the facility. Following removal from regulatory control, the site is then available for re-use.

• Safe enclosure or deferred dismantling: This approach postpones the final removal of controls for a longer period, usually 40 to 60 years. The facility is placed into a safe storage configuration until the eventual dismantling and decontamination activities occur after residual radioactivity has decayed.

• Entombed: This option entails placing the facility into a condition that will allow the remaining on-site radioactive material to remain on-site without ever totally removing it. This option usually involves reducing the size of the area where the radioactive material is located and then encasing the facility in a long-lived structure such as concrete, that will last for a period of time to ensure the remaining radioactivity is no longer of concern. [3]

For all the approaches mentioned above, access to up-to-date, correct as-built documentation of the facility is crucial to ensure safe and compliant decommissioning execution.

Often enough, engineering information that is needed for safe decommissioning is not available for various reasons. Data and documents may have been created over decades of the facility’s life cycle, or have been sourced from various contractors using different design and data management tools and standards. Some of the documents may only exist in hard-copy, and there may be dozens of versions (or even multiple copies of the same version) of any given document in various locations, making it unclear which version accurately represents the current configuration.

As a result, information is difficult to find when it is needed to ensure safe, efficient, and compliant decommissioning of a nuclear plant, or an offshore facility.

Overcoming Engineering Information Challenges

Luckily, recent breakthroughs in information management (IM) and high-definition surveying (HDS) technologies offer an easy, practical approach to overcome the asset information challenges met at the decommissioning phase. Modern engineering software solutions, such as Intergraph’s SmartPlant® Enterprise for Owner Operators and SmartPlant Fusion, enable owner operators to rapidly capture, organise, and link documents and information to create an up-to-date, virtual representation of their physical asset. This can sound like a complex process, but is actually a straightforward procedure.

Document Discovery

First step in organising asset information for decommissioning is to “teach” the software where to look...
for documents and how to extract available information about the document type and classifications from folder and file naming conventions. After brief manual tagging, the software can repeatedly crawl these file locations, searching for new or updated files to ensure all the relevant information is captured.

Master Identification
When duplicates or multiple revisions of the same document are found, engineering judgment may be required to determine which document best represents the current configuration of the facility. A smarter software can make this easier for the offshore operator by providing special tools to identify duplicate files and to display side-by-side or overlay comparison of documents.

Content Discovery and Tag Attribution
Intelligent information management software, such as SmartPlant Fusion, uses various readers to examine and extract the content of the documents. Dedicated readers are used for each document type: drawings, documents, 3D models, and laser scans.

It also possible to use an image reader for bitmap images (such as PDFs), which employs optical character recognition (OCR) technology to produce searchable text. This enables operators to tag, organise, and check traditionally “unreadable” documents, such as images and PDFs to create an integrated, factual overview of the engineering documentation to be passed on to the decommissioning company.

Importing from Databases
The database reader can import information from databases, datasheets, registers, and Microsoft® Excel® spreadsheets. This is a powerful capability as this enables owner operators to import tags and tag attributes from various sources, including engineering design tools or in-house databases such as content management and maintenance management systems.

This information can be compared quickly for inconsistencies and then be consolidated. This enables the operator to create an integrated as-built model of the existing facility, which is required during the decommissioning phase.

Inconsistency and Completeness Reporting
For creating an accurate overview of all the relevant engineering documentation, it is essential to identify inconsistencies between the various disciplines. With Incomplete software, users can report on inconsistencies of tag attributes from various data source captured. The software provides the capability to report on document completeness. Based on the classification of the captured documents and loaded tags, users can define rules that determine the completeness of document delivery.

Data Visualisation and Management
With a centralised information management portal, such as Intergraph Smart™ Enterprise Portal, offshore operators can quickly find the documents they are looking for, even if they are not sure where to look. The intuitive user interface demonstrates the relationship between various tags and documents with other facility information. The Portal runs in a web browser, enabling effortless sharing of documentation and information with external parties, including decommissioning specialists.

Bringing in the Benefits
Accurate, up-to-date engineering information can have drastic positive effect on a decommissioning project. The benefits include:
- Ability to determine the current value and condition of the facility. Knowing this enables the owner operator to choose the correct decommissioning strategy and partner.
- Improved compliancy to health, safety and environmental regulations. This can be ensured by having a current overview of the latest inspection and certification.
- Lowered decommissioning cost. Having factual and up-to-date documentation of the facility will lower the cost of the decommissioning contract as the overall project time will be shortened.

References

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