

# AVEVA Supports Ground-breaking Sour Oil & Gas Project in Oman

## Petroleum Development Oman unlocks the benefits of Information Management at the Harweel oilfield

Having critical information scattered in various repositories and systems across an organisation is a familiar problem across the plant industries, and one which Petroleum Development Oman (PDO) was determined to overcome.

With information assets comprising documents and drawings in a variety of formats, tag information, instrumentation data and maintenance information, AVEVA NET™ was the obvious solution.

PDO decided to roll out the technology on one of their most complex facilities, Harweel, a sour oil & gas project in the south of Oman.

### Audrey Sequier

Marketing Manager Middle East & Africa, AVEVA

This miscible gas injection project is one of the most complex undertakings PDO has ever attempted, so the stakes were high. With the solution now fully deployed, PDO can readily quantify the significant benefits achieved. We spoke with Mr Sadiq Al Lawati, Head of Business Improvement IM, PDO, to learn more about the roll-out and how it has created a comprehensive Information Management solution for efficient, safer working, both at Harweel and across the organisation.

The original problems were not unique to PDO. Maintenance work was trapped in a reactive cycle, as keeping track of maintenance changes over time was difficult and time-consuming. Information could unknowingly be out of date or inaccurate, as there were no standards against which it could be checked.

And although PDO's engineers rose to the challenge by learning to use the variety of different systems, they were nevertheless frustrated by spending a lot of time searching for and checking information before they could perform any tasks.

PDO recognised that not only did such inefficient working increase OPEX costs, there were also obvious safety implications. 'There was no quick and intelligent way of aggregating all of the information,' explained Mr Al Lawati. 'There were no relationships, just disconnected bits of data floating in cyberspace. Obviously, if I am planning maintenance work on a specific piece of equipment, such as a valve, I want to know everything about it: its maintenance history, relevant P&IDs, what else that valve is near, accessibility, supplier information – everything. Finding even time-critical information piece by piece was laborious and slow.'



Mr Sadiq Al Lawati, Head of Business Improvement IM, PDO. Photograph courtesy of PDO.

For safety reasons also, PDO needed to ensure that the Operations & Maintenance team worked with up-to-date information; decisions based on inaccurate information could endanger the plant and the engineers working within it. This is especially important for such technically challenging projects as the Harweel oilfield.

Another constant challenge was to keep as-built drawings updated after modification work. 'You can't update something if you can't find it,' Mr Al Lawati, noted ruefully. 'It was also difficult to circulate certain types of information, especially information like 3D models and drawings, to all the various stakeholders in the organisation.'

#### Harweel: no room for error

Sulphur is a common by-product of deep oil & gas wells, usually in the form of hydrogen sulphide, an extremely corrosive and poisonous gas. Hydrocarbons with a hydrogen sulphide content above 500 parts per million (ppm) are known as sour reservoirs; in Oman such reservoirs, including the Al Noor, Birba and Harweel fields, are in the south of the country.

At Harweel, the hydrogen sulphide is collected and pumped back into the well at extremely high pressure, around 500 bar. No manufacturer offers a compressor capable of pumping hydrogen sulphide at this pressure, so the compressor at Harweel is a purpose-built unit.<sup>1</sup>

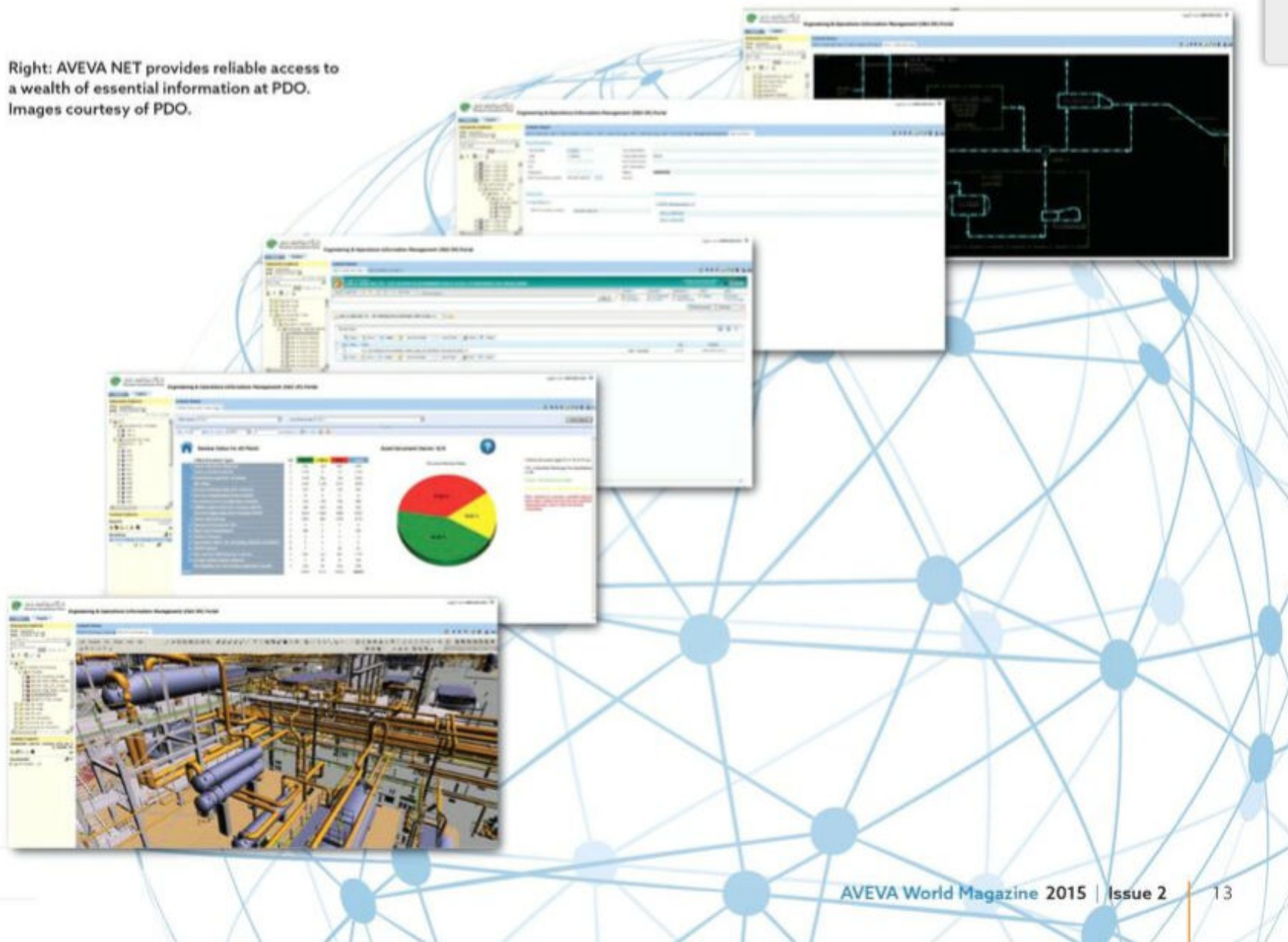
<sup>1</sup>Technical details from PDO publication Al Manhal, issue one 2014, pp. 2-5.

This high pressure forces the gas to mix with the oil, making it less viscous, which increases the oil production rate, so there is a considerable financial incentive to overcome the technical challenges. Hydrogen sulphide would make short work of conventional steel piping, so at Harweel the flow lines are made from corrosion-resistant glass-reinforced epoxy (GRE). And to handle a pressure of 500 bar they have massively thick walls, some 40 cm thick.

GRE pipes can only be made in straight lengths; bends must be made of corrosion-resistant alloys. Such specialised materials are expensive. A single 27-metre length of corrosion-resistant alloy pipe costs as much as a new Ferrari, so CAPEX costs are considerable. The alternative approach, adding chemicals to the gas to enable standard piping to be used, may save capital costs but increases operating costs, and requires highly effective supply chain management.

Conventionally, valves and pipes are joined by flanges, which are potential sources of leaks. While this is not necessarily serious in a normal facility, at Harweel a single drop of this hazardous mixture presents a serious Health & Safety threat. To avoid this, the valves are actually welded into place, having first been lined with a special corrosion-resistant alloy to make them last longer – a first for the industry. Nevertheless, with 500-bar pressures to withstand, even welded joints are potential weak points, so a rigorous condition monitoring programme is essential and weld information must be both reliable and readily accessible. ▶▶

Right: AVEVA NET provides reliable access to a wealth of essential information at PDO. Images courtesy of PDO.



## Education and implementation

AVEVA NET was implemented in the space of a year at PDO's FEED office, in order to help new projects coming online to efficiently manage data and documents from the outset; deployment at Harweel quickly followed.

AVEVA NET is part of AVEVA's Asset Visualisation solution, which turns data from multiple information sources and systems into 'actionable information' improving operational safety, asset information integrity and reducing risk. A true information portal for operations, asset visualisation provides a rapid, contextualised and easy-to-use view of the entire digital asset, providing access to the right information, in the right place, at the right time.

The safe and efficient operation of complex assets relies on the accessibility and validity of huge volumes of data. Asset visualisation provides the core functionalities to meet this. It enables users to capture, connect, access, visualise and assess data from all possible sources: documents, drawings, registers, 3D models, laser scans and operations databases.

System implementation went smoothly and involved out-of-the-box integration with AVEVA PDMS™, intelligent tag index building capability, hotspotting of drawings and 3D models, and browser-based 3D and 2D visualisation, including the visualisation of tag data, documents and tag cross references. All oil & gas projects are challenging, but Harweel is in a class of its own. It is rare for Information Management to be so conspicuously safety critical. AVEVA NET enables the effective monitoring of pipe and weld health through accurate and detailed visualisation of asset information.

At PDO, technicians, engineers, maintenance coordinators and production coordinators were given hands-on training in the use and capabilities of AVEVA NET before its deployment. At the same time, the AVEVA team rolled out across the entire organisation an 'As-Built Search & Critical Documents Dashboard', a custom search engine built on AVEVA NET's Reporting Services module.

The as-built search engine was built on the E&O IM portal using its powerful reporting SSRS tool, utilising the existing Livelink and Assai document control system gateways. This enables PDO's Projects and Asset Operations teams to easily and quickly access as-built documents. This search tool provided PDO with its first-ever 'single point of search' mechanism for retrieving all of its as-built documents and drawings. By January 2015 the search engine had already indexed half a million as-built documents.

The critical documents search dashboard is facility specific, enabling users in the facility to quickly and easily access its Tier 1 and Tier 2 safety- and production-critical documents. It provides intuitive navigation and access to documents based on their types and related disciplines. The dashboard's other core functionality is that it lists each document's owner, responsible for its review and updating, and provides a quick snapshot of document review status.

'The Assets and Project teams really appreciate the way these search and dashboard tools provide one point of contact through which they can access all required information,' commented Mr Al Lawati. 'They find it very reassuring to be able to find critical documentation from a single interface in a quick and intuitive way.'

'The users' reaction was very positive,' added Mr Al Lawati. 'For the first time in PDO's history, they could access and navigate across the digital version of a plant. They were impressed and excited by the potential of this new tool and came up with many different suggestions for more use cases. We didn't need to spend much time convincing people; buy-in was almost immediate.'

AVEVA NET now manages not only Harweel's 3D models, hotspotted 2D process schematics, as-built documents and instrumentation data but also a wide range of other business- and safety-critical Engineering & Design information.

## Fantastic Return On Investment

PDO was able to enjoy early ROI through the rapid set-up of gateways and connector templates, which rapidly unlocked the benefits of the technology. Before AVEVA NET, there was no practical way to maintain logical or systematic relationships between varied information types. Now, a maintenance engineer can search for a tag and not only find all its related information, such as process drawings, manuals, specifications and maintenance history, but also know that the information is reliable. Previously, tasks such as this would take considerable time and effort.

PDO conservatively estimates that its new As-Built Search & Critical Documents Dashboard saves about 5% of the time spent searching for information. With around 1,000 active users, each working 200 days in a year, this frees up 10,000 man-days per year which can be put to more productive use.

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## The Future

With such clear and immediate benefits, PDO is committed to extending its use of AVEVA NET. 'Our selection of AVEVA NET has proved to be a major contribution to PDO's drive to provide its people with smarter tools and a safe working environment,' said Mr Al Lawati. 'We are pushing ahead to roll out AVEVA NET to more projects. By the end of 2015 its usage will have become part of PDO's core business processes.'

## About PDO

Petroleum Development Oman is the Sultanate's foremost exploration and production company, accounting for more than 70% of the country's crude oil production and nearly all of its natural gas supply. The company is owned jointly by the Government of Oman (60%), Royal Dutch Shell (34%), Total (4%) and Partex (2%). The first economic oil find was made in 1962, and the first oil exported in 1967.

To find out more, visit: [www.pdo.co.om](http://www.pdo.co.om)

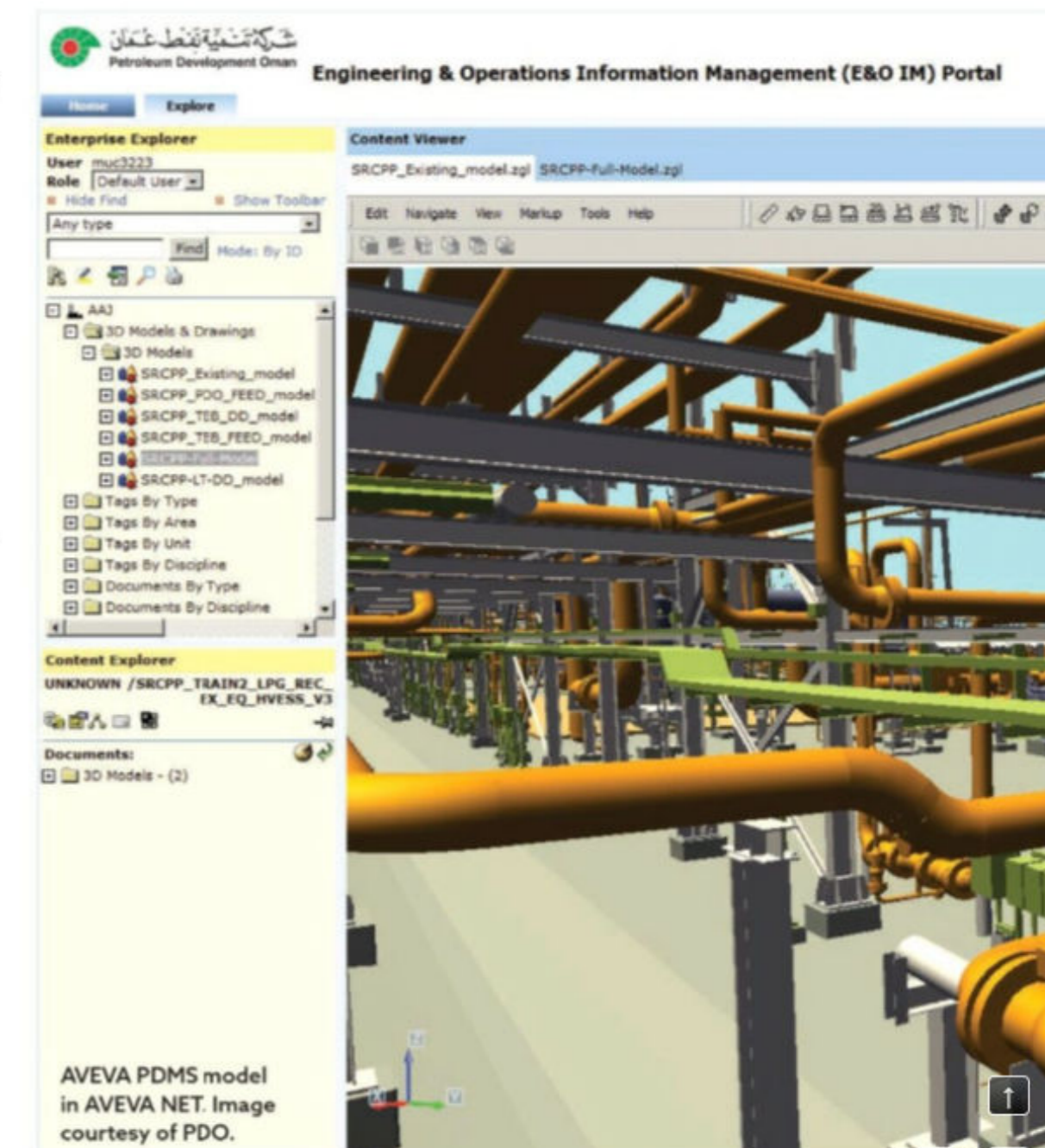
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E&O IM Portal Team, PDO. Left to right: Lau Hui Leong, Sourji Rajan Balakrishnan, Abbas Al Lawati. Photograph courtesy of PDO.



AVEVA PDMS model in AVEVA NET. Image courtesy of PDO.