Bridging the information gap between the real and virtual worlds

Darrell Knight, senior vice president for global accounts at FutureOn®, plots the course of the future of the digital twin

Nascent digital twin technology is poised to revolutionize how real-world operations are reflected in the digital oilfield in real time.

A digital twin, sometimes called a digital shadow, is a virtual replica of an oil and gas company's physical assets. The digital twin can be used from the planning stages of a field through to the end of the field's decommissioning and abandonment.

Currently, the oil and gas industry creates digital twins for fields, vessels and platforms, as well as for all the individual pieces of equipment necessary for managing the many aspects of hydrocarbon production.

Such twins can be static, or dynamic. A static twin is only updated manually as new information is available or when documents are created or revised. FutureOn's Field Activity Planner (FieldAP) is an example of a static digital twin that digitally represents the field layout and its equipment data.

A dynamic digital twin is updated automatically in real-time, such as via sensors connected to the Internet of Things (IoT). FutureOn's FieldTwin is a dynamic digital twin that is a real-time, data-driven visual representation of a field.

It incorporates real-time data through IoT sensors connected to equipment in the field. In essence, the digital field twin is a repository of smart and connected data that can be leveraged in multiple use cases and monitored in real time.

In many ways, FieldAP is a blueprint of the field, accurate as long as it's been manually modified with the most recent information, while FieldTwin serves as a single source of real-time truth about field, ambient and operating conditions.

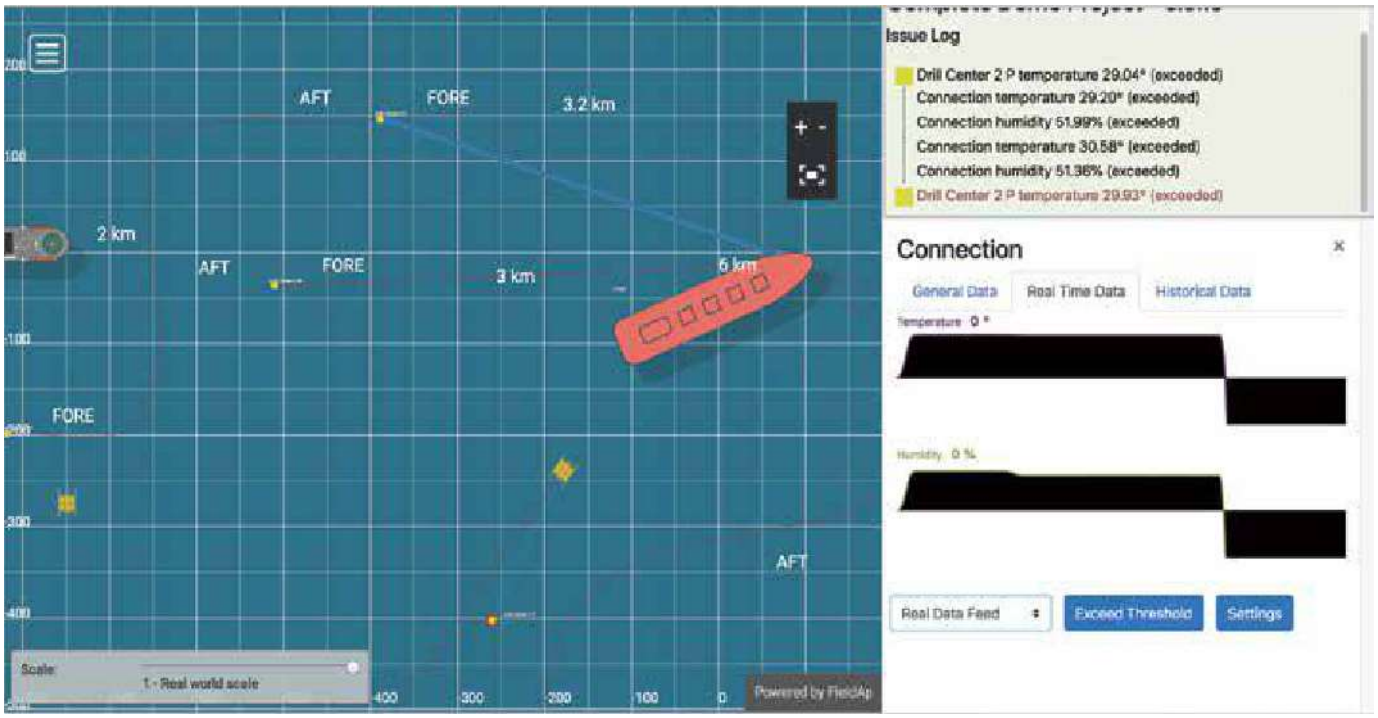
A real-time digital replica of an oil and gas company's physical assets makes it possible to critically assess and interact with equipment. FieldTwin provides the foundation for accepting the vast flow of data from the IoT sensors and raising alerts about the status of equipment before it fails and causes non-planned down time.

FieldTwin can be embedded as an interactive object within any web-based operational dashboard. Users can access it globally via any device. Dashboards that are user- and content-sensitive can be easily configured. Because the FieldTwin is intrinsically smart, any aspect of the virtual field can be connected to workflows to speed and improve operational decision making.

IoT sensors placed throughout the facility collect ambient conditional data, such as temperature, humidity, gases and pressures. They transmit the data in real-time to a platform in the cloud, such as FieldTwin. For example, a sensor may record a significant change in pressure, temperature or humidity. Depending on the parameters set for the equipment, the sensor may trigger an alert that equipment may need to be inspected and potentially maintained before the equipment in question breaks and brings operations to a halt.

The sensors can generate and report vast quantities of data every second, which makes it critical that the receiving platform is capable of processing the information. Through artificial intelligence, FieldTwin can "learn" what is normal for a specific field or piece of equipment and only flag anomalous conditions, such as those that exceed a specified threshold. The aggregated information can be analyzed against operations or business data, or other contextual data, to yield actionable insights.

Some companies working offshore have started cutting-edge pilot projects to bring IoT sensing technologies into their projects.



Currently, IoT sensors are expensive, but as the technology improves and component prices drop, offshore companies will increasingly turn to sensors to provide information about their equipment in the field.

Such an investment will minimize unplanned nonproductive time, save time and resources, reduce risk and prevent delays.

The digital twin is relevant from the planning stages of the field all the way through decommissioning and abandonment.

Use cases include:

- asset integrity alerts;
- maintenance efficiency by providing immediate and easy access to all relevant documents;
- production tracking through links to real-time operational flow data;
- identification of custody transfer issues;
- and predictive analytics when linked to machine learning algorithms, plus many more.

There are many possible uses because FieldTwin starts with a true digital representation of the field with all the assets embedded with actionable metadata.

As a data visualization platform, FieldTwin provides real-time information about the status of equipment in the field in order to optimize assets. Over time, the system can identify unacceptable trends in equipment functionality or changes in production rates. It can issue alerts and instantly provide relevant documents to take the guesswork out of maintenance.

Access to this information can completely transform how asset managers run their inspection, maintenance and repair programs for offshore assets. The system can also provide an evolving digital profile of the field in question.

In terms of monitoring production, the information sent to the digital twin from the sensors can provide operational flow data in real time and identify custody transfer issues.

A true digital representation of a field, with all assets embedded with actionable metadata, can transform the way project managers design, develop, staff and manage risks in their fields all the way through the end of the field's life cycle. The digital twin gives project managers the power to see the field from the desktop. ■