Combine the power of digital twins with cloud-based collaboration

TIM SHIRE, KBC

Increasing oil prices are reducing the relative feedstock and energy cost advantages that refiners and petrochemicals producers have recently enjoyed. With these high costs and a growing scarcity of skilled staff, a fundamental shift in mindset toward plant operations and maintenance is required to ensure organizational resilience. Accordingly, the desire to achieve enhanced cost structures through innovation in operating models and digitalization has intensified.

Historically, refineries annually purchase thousands of hours of professional consulting services for troubleshooting and optimization under technical service agreements. Under these agreements, third-party subject matter experts are made available and charged on a time and material basis, acting as an extended member of the plant's technical team.

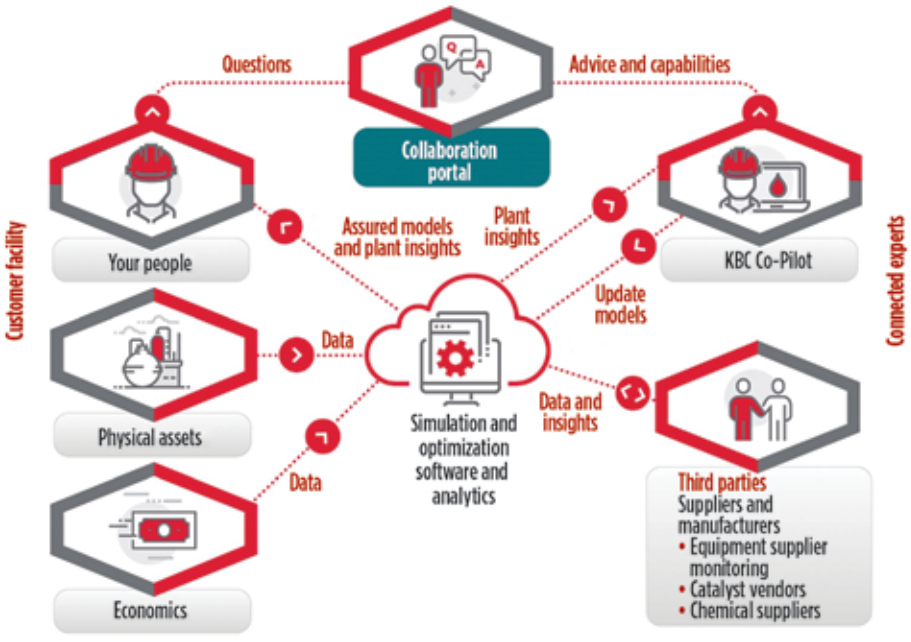

FIG. 1. Digitally replicating live plant operating data and economic data in the cloud allows KBC to provide remote advice and assistance for improving plant operations.

These services are, for the most part, provided to reactively address plant issues. While these arrangements work well in some instances, cost containment of services is often an issue, as are the lack of proactive advice and assurance of outcomes. Customers have historically paid for these inputs in the form of service hour billings, but the outcomes remain uncertain.

However, outcome-as-a-service offerings are becoming prevalent. For example, consumers no longer buy CDs, but instead subscribe to online streaming services with "all you can eat" listening. In the electricity generation segment, major equipment vendors have moved from selling gas turbines to selling "power by the hour." The proliferation of these subscription-based service models has been enabled by significant improvements in technology.

This outcome-as-a-service model is now being applied to ensure plant performance in industrial settings, delivering operational excellence (OpX®) as a service through the cloud. This type of approach provides the ability to achieve plant troubleshooting and optimization objectives more efficiently and effectively.

To confirm the functionality of these types of commercially-advantaged approaches, the service provider must have a high degree of technical expertise with respect to refinery operations, and battle-tested capabilities for online streaming and management of operations and maintenance data. The service provider must also have efficient, automated algorithms and technology to process the information and generate insights.

Digital twins in the cloud. The KBC Co-Pilot Program® accomplishes this by creating high-fidelity, molecular-enabled (kinetic) digital twins of refinery and petrochemical plants in the cloud (FIG. 1). The digital twin in the cloud gathers data from the plant's distributed control systems, historians and labs, as well as from other sources such as feedstock and energy pricing. The data is constantly monitored and analyzed by deep subject matter experts (SMEs) with decades of worldwide plant troubleshooting and optimization experience to create insights for improving plant performance in real-time through highly-robust, cloud-based data sharing.

The program also provides predictive capabilities, which improve upon purely reactive approaches. The molecular-enabled, digital twin can calculate equipment health parameters that cannot be directly measured by sensors, enabling the identification and mitigation of potential issues before they constrain or impact performance.

Reactive and proactive advice and recommendations are provided through an online, cyber-secured collaboration portal, allowing for real-time discussion and exchange of ideas among multiple external experts and plant-based engineering, operations, maintenance and planning groups. Advice and recommendations can also be pushed out to plant personnel through emails and texts, and by sending data and information to existing plant control and monitoring systems.

These types of service agreements apply to day-to-day operations and have longer-term positive impacts on maintenance and asset integrity, circling back to production planning and enabling the plant to achieve its full potential at all times, in the most efficient way possible.

To learn more about the KBC Co-Pilot Program and to meet the KBC team, visit the company's hospitality suite Sunday and Monday nights. ●

Tim Shire is the Product Manager for the KBC Co-Pilot Program, cloud-based simulation and expert support to ensure asset performance. He began his career as an engineer in utilities design for an engineering, procurement and construction company before joining KBC in 2006, where he worked initially as an energy efficiency consultant. He has worked on a range of global projects in the oil refining, petrochemicals, gas and LNG segments. Starting in 2014, Mr. Shire led KBC's consulting innovation program, and was Product Manager for KBC's suite of energy software. He holds BS and MS degrees in chemical engineering from the University of Cambridge, UK.