

The Ghost in the Machine – Analytics, Automation and the Human Factor

Martin Ford's book titled "Rise of the Robots – Technology and the Threat of a Jobless Future" sheds light on an unsettling view of technology and its impact on the human race. Ford recounts the moment when IBM's Deep Blue computer defeated world chess champion Garry Kasparov in 1997.

Professor Stephen Hawking further spooked imaginative minds by saying "a rogue AI could be difficult to stop". Moore's Law also dictates that computing power doubles every 18 months. In automating knowledge, will we eventually hand over the keys of control to industrial artificial intelligence? How will data optimization diminish the role of humans in plants?

The need for innovation

The process manufacturing industry is at an inflection point. Companies need to be astute and capitalize on powerful trends impacting this multi-billion dollars' industry.

In the developed world, experienced chemical engineers are retiring in droves. However, the replacement pool of new engineers remains stringent, as college students are increasingly drawn to non-technical majors. On the other hand, emerging countries, such as China and India, are graduating an impressive number of young but inexperienced engineers. This necessitates the automation of knowledge to ensure that decades of experience are not lost when experienced engineers exit the industry. The captured knowledge also helps new engineers ramp up quickly in their work.

Another key trend for process manufacturers to grapple with is global industry volatility. For example, an environment of prolonged low crude oil prices in the past two years has necessitated the deployment of innovation to cope with rapidly fluctuating feedstock prices.

Companies should also capitalize on technology to maintain effective environment, health and safety (EH&S) practices. For example, pollution from heavy industries has impacted many parts of the world, including industrialized China. As a result, companies are now more interested in energy management, the use of natural gas and renewables. According

to The Abnormal Situation Management Consortium and the Control of Major Accidents Hazards (COMAH), while the incidence of major accidents has reduced, the impact created is much greater now when they actually occur. Thus, companies cannot afford to take safety for granted and should deploy to mitigate such occurrences.

Six smart steps to automate knowledge

In innovating towards a world beyond energy savings, AspenTech advocates asset optimization for process manufacturers to achieve sustained maximum profitability via operational excellence. With smart manufacturing in mind, firms can adopt six steps to automate knowledge.

First, smart flowsheets help manufacturers capitalize on feedstock opportunities by providing visual and intuitive feedback. As such, manufacturers gain agility with the ability to make better and faster decisions during volatile times. This saves time and money in the process.

Second, robust design optimization solves complex problems by enabling all dimensions of optimization to be considered across multiple cases. Factors to be considered include capital, energy, controllability, environmental impact, safety and yields for sustained profitability of the asset. These factors need to be considered against varying feedstock, changing seasons and different operating conditions. Thus, automating knowledge is a safer bet, compared to manual computation.

Third, it is crucial to connect the lifecycle, as manufacturers can reduce rework and save time by compressing the FEED stage to achieve a more stable design in detailed engineering. Currently, the front end engineering design (FEED) stage is a tangled network of data exchange with team members dispersed geographically. Data is captured in a disorganized manner and time is wasted, as the FEED stage only starts after the conceptual design is complete. Thus, AspenTech envisions a single, consistent data model of the asset.

Fourth, the adoption of unified production optimization ensures that models stay consistent and common. This streamlined thinking mitigates a complex environment, where multiple organizations across time and project scopes necessitate profit maximization. Currently, enterprises struggle with optimization across organizations, scope and time. Indeed, logical minds have preempted the need to accelerate collaborate workflows and drive asset optimization.

Fifth, it is crucial for maintenance optimization to be implemented. This is because while maintenance is completely integrated with operations, it is not always considered during the design phase, as domains between chemical engineering and maintenance tend to work in silos. If we can consider reliability upfront in conceptual design, process engineers will be able to optimize the design for maintenance and reduce total lifecycle costs. As such, the maintenance plan and strategy is now accelerated.

Sixth, prescriptive analytics helps transform data into actionable decision support. This is crucial, as process engineers spend a lot of time assembling data from different sources to extract useful information, in order to solve problems. Similarly, operators are often overloaded with data, alarms and operational responsibilities. This is because they do not have the tools to take advantage of performance improvement opportunities. With Aspen Asset Analytics, prescriptive analytics in a self-maintained mode at the enterprise level is a pinnacle goal.

The guardian angel in the system

While it is impossible to eliminate external challenges, process manufacturers can ramp up operational excellence to mitigate industry risks. McKinsey concurs that by aggressively standardizing and simplifying processes, companies can react to unforeseen events quickly. They are also in a better position to improve safety and productivity. Besides reducing the risk of human error, the automation

of repetitive technical decisions will also free up engineers to focus on more difficult analyses.

Martin Feldstein, professor of economics at Harvard University, sums it up, "Rapid technical change is not something new. We have experienced technological change that substitutes machines and computers for individual workers for many years. And yet, despite the ups and downs of the business cycle, the U.S. economy continues to return to full employment."

Certainly, it is clear that there is no ghost in the machine. Instead, you might find a guardian angel residing in the system, as automation helps humans perform better and ensures that analyses are better calculated. Indeed, this is more than a necessity in the world of process manufacturing today! ●



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