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AspenTech Aims to Optimize Asset Performance in Industrial Process Plants

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Summary

Three years ago, Antonio Pietri, President and CEO of AspenTech, announced the company's intention to pursue a new industrial strategy. At the company's Global Users conference in Houston, Mr. Pietri announced new activities around asset optimization, analytics, and Big Data. For the past 36 years, AspenTech has been successfully growing its portfolio of industry-specific applications for process engineering simulation, advanced process control, process optimization, and supply chain activities. Now, with its latest initiative, AspenTech aims to optimize overall asset performance in industrial process plants.

AspenTech has opened a new chapter in asset performance management in process manufacturing plants. Its novel approach takes a fresh look at asset performance and how optimizing it requires the participation of plant operations and maintenance groups.

AspenTech has opened a new chapter in manufacturing technology. Its novel asset performance approach takes a fresh look at the role of the maintenance function in its customers' industrial process plants and the operating department's participation. The vision brings together the company's expertise and proven track record in process optimization, engineering simulation, and data management with an infusion of machine learning and other disruptive technologies. According to AspenTech, its objective is clear: by continuously improving the performance of all assets in an industrial lifecycle with less expertise, customers can autonomously push equipment to the safest, most profitable operating limits. By combining emerging and proven technologies to drive operational excellence, industrial companies can "democratize" decision-making to redefine what is possible.

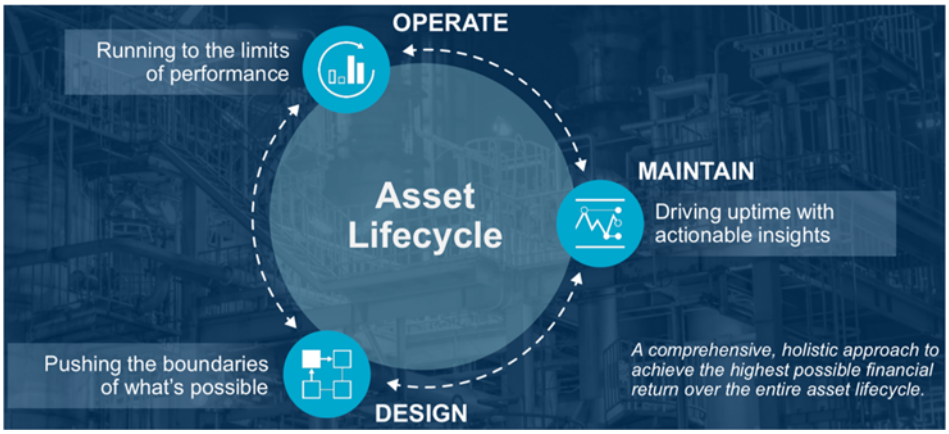
According to ARC Advisory Group research, AspenTech has been a market leader in both process engineering simulation, advanced process control (APC), and real-time optimization for many years. This begs the question why the company has entered the asset performance space, particularly when there are already several well-entrenched players here. The answer became clear during a recent meeting ARC had with Mr. Pietri at AspenTech's headquarters in Bedford, Massachusetts.

Mr. Pietri explained that while its customers praised AspenTech for its world-class process optimization tools, many expressed that poor asset performance was hampering their overall business performance. In other words, industrial customers cannot optimize the process and improve profit margins when assets fail to live up to expectations and intended reliability. Process downtime and poor process performance are very high priorities. This was the spark that ignited the new AspenTech direction.

AspenTech's deep process expertise and knowledge of the fundamental chemistry, equipment properties, and science - combined with new asset management capabilities - has enabled it to focus on asset lifecycle optimization. This new focus has also changed the company's profile and willingness to partner with other industry leaders, including Emerson Process Management. Emerson's global process expertise and large local business partner (LBP) network will help bring AspenTech's solutions to market.

What Is Asset Lifecycle Optimization?

AspenTech defines asset lifecycle optimization as a comprehensive, holistic approach to achieve the highest possible financial return over the entire asset



AspenTech Definition of Asset Lifecycle Optimization

lifecycle. This is achieved by pushing the boundaries of what is possible in process design, running to the limits of operating performance, and driving uptime through actionable insights for maintenance. In some instances, these insights can justify run-to-failure for certain assets.

According to Mr. Pietri, now that end users realize that a technology disruption is in progress, AspenTech has seen a new level of interest in asset optimization from its customers across multiple industry verticals. Use cases and proof points now look to disruptive artificial intelligence and machine learning technologies to help optimize assets across the design/operate/maintain lifecycle. However, he noted that technology alone never wins; especially with a technology perceived to be as complex as machine learning. Consequently, the AspenTech approach focuses on applications with simple deployment methodologies and work processes that align precisely with current customers' skills and competencies. This is achieved through a simple abstraction of machine learning technology for this application. Significantly, the approach brings together process engineering, operational, and maintenance knowledge.

Machine Learning as a Disruptor to Maintenance and Operations

Machine learning has emerged as a disruptor in industrial environments largely due to its ability to help identify patterns, probabilities, and correlations in Big Data to enable work processes to become more predictive. End users in oil & gas, chemicals, and other asset-intensive industries are drowning in their own data. Machine learning algorithms can help them formulate outcomes based on patterns and anomalies present in process and machine data. These patterns are difficult to detect with conventional data analytics, often because plant staff don't have the time, expertise, or computing resources needed to search for them.

The use of machine learning algorithms in particular is helpful in formulating outcomes based on patterns and anomalies that are present in process and machine data. These patterns are difficult to detect with conventional data analytics, often because plant staff don't have the time, expertise, or computing resources needed to search for them.

AspenTech can provide abstraction of machine mechanisms, allowing mechanical and process engineers to implement complex analytical solutions rapidly and effectively, without needing deep machine learning skills. By converging process and mechanical equipment data with insights from the

process and maintenance engineers who understand both the process dynamics and the static and rotating assets, they can identify previously invisible correlations to support proactive operational and maintenance practices.

As ARC has previously reported, reliability studies have shown that more than 82 percent of asset failures are random in nature. ARC research also shows that less than 3 to 5 percent of maintenance practices in industrial plants today are proactive. One reason is that while the process behavior and its contribution to asset degradation and failure need to be understood, maintenance experts have limited time, process insights, and skills to understand and interpret the process data that affects the reliability and longevity of the assets. It's reasonable to assume that an effective, "low-touch" machine learning solution that domain experts can use to examine process behavior could change this.

Confusion in the APM Marketplace

Most asset performance management (APM) solutions have been created to largely satisfy the maintenance function. These solutions typically include condition monitoring, predictive maintenance, asset integrity management, and reliability-centered maintenance; and often involve asset health data collection, visualization, and analytics.

In fact, effective APM requires information sharing and application integration among operations and maintenance to provide a comprehensive view of production, asset performance, and product quality. APM improves integration between production management (making the product) and asset management (ensuring the capability to produce). With effective APM, goals and objectives become more clearly communicated and shared. The ramifications of APM extend into business processes, technology, and creating value by helping decision makers understand the tradeoffs between the cost of running to failure versus the lost profit.

The confusion in the APM market revolves around whether traditional solutions are truly predictive in nature. These systems are built using simple rules and threshold alerts that typically focus on basic condition monitoring of rotating equipment and often do not consider the full spectrum of possible asset failures, including failures associated with process dynamics.

The more comprehensive science of prognostics is based on analyzing failure modes, detecting early signs of wear and aging, and fault conditions. This requires a sound knowledge of the failure mechanisms that are likely to cause the degradations leading to eventual failures in the system. While useful for certain assets, condition monitoring and prognostics approaches tend to have a relatively narrow scope of data analysis, typically limited to temperature, vibration, and fluid (lubricant) analyses.

While widely employed for decades, both prognostics and condition-based monitoring are still reactive approaches. Consequently, many companies struggle with making significant improvements in predicting failures and extending the life of critical assets.

However, variability in process conditions upstream and downstream of the asset and changes in temperature and composition of the process fluid have a huge impact on assets. Pushing an asset beyond its safety and design envelope can lead to non-mechanical wear-and-tear failures. For example, liquid carry-over has been deemed the "silent killer" of compressors, where barely perceptible symptoms can cause pitting and depositions on the impeller blades that can lead to imbalance, bearing damage, and catastrophic failure.

The recent application of machine learning, Big Data, and analytics to asset performance management in process plants has created the opportunity to look at the data sets across process variables and asset health with greater precision. However, to afford the level of protection necessary requires detailed inspection of not only data from the machine itself, but also of the upstream process conditions that can cause equipment degradation, damage, and failure equipment. Many inspections experts believe that process variability (or "process abuse") is a large part of the cause for the 82 percent of failures identified as "random" in many reliability studies.

Conclusion

Unlike some solution providers that have dabbled in the Industrial IoT and analytics technology space, AspenTech is starting from the business end of the equation; attempting to identify the most important Industrial IoT applications that can deliver value.

AspenTech aims to change the industry paradigm with a set of industry-specific applications for asset lifecycle optimization that can draw upon the company's proven strengths in engineering simulation, optimization, and

supply chain. The maintenance department has been the "custodian" of maintenance activity for decades. Now, AspenTech is asking the operating department to step up and play its part in asset performance to influence uptime and profitability.

AspenTech, which began as a fledgling startup company out of the Massachusetts Institute of Technology (MIT), has grown to become a global leader in process engineering simulation and process optimization. Now, thanks to internal development efforts, partnerships, and a series of well-targeted acquisitions, the company is well positioned to deliver on its vision to help optimize asset performance across the asset-intensive industries. Since June 2016, the company has made the following key acquisitions:

Company	Business Area	Acquisition Date
Fidelis Group	System asset reliability software.	June 2016
ProSensus	ProMV multivariate analytics technology.	September 2016
Mtell	Predictive and prescriptive analytics maintenance technology	October 2016
Inprocess	Operator training simulator (OTS) software	April 2017
RtTech Software	Cloud-based software and edge connectivity assets	December 2017
Apex Optimization	Generic Dynamic Optimization Technology (GDOT)	February 2018

Recent Acquisitions Expand AspenTech Solution Capabilities

AspenTech is looking to help improve reliability and uptime by incorporating AI to "embed" the engineer into the simulation. In addition, for supply chain planning applications, where constraints are not always well understood or conventional data modeling techniques not adequate to help evaluate new opportunities, AI could help produce a better schedule.

ARC believes that technology disruptions alone will not be adequate to enable the process and other asset-intensive industries like power, metals & mining, and transportation to move to the next level of performance. The domain knowledge of plant engineers, operations people, and maintenance staffs – as well as that of leading technology suppliers - will be equally important. But, as AspenTech appears to grasp with its new asset lifecycle

optimization direction, it's important to move analytics away from the exclusive domain of data scientists and put these important tools in the hands of the dedicated people who actually design, operate, and maintain the plants.

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