Failure is not an option – creating a world that doesn't break down

By Robert Golightly 4 hours ago Feature

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In creating a world that doesn't break down, a huge $20B opportunity is on the table for the process industry to address. Astute manufacturers should focus on reducing unplanned downtime and increasing asset utilisation, as both processes represent the biggest opportunities for financial improvement in production operations.

Albert Einstein could well be alluding to smart manufacturing when he said: "If I had an hour to solve a problem and my life depended on it, I would use the first 55 minutes determining the proper question to ask, for once I know the proper question, I could solve the problem in less than five minutes."

The evolution of maintenance

In the past five decades, maintenance as a practice has evolved to better serve the manufacturing sector in the areas of reliability and availability. However, change is imminent. The current approaches, such as run-to-failure, calendar, usage-based, condition-based and reliability centred maintenance (RCM), are less than ideal.

Two key challenges remain. First, despite the increasing complexity of these maintenance initiatives, the exact science of when to conduct inspections and service the machines is less than scientific. Second, the current slew of maintenance methodologies focuses on wear and tear as the root cause of failure. This literally sidesteps the fact that 80 per cent of degradation and failure in mechanical equipment is process driven.

This view is further reinforced by Boeing, a company at the cradle of RCM and the aircraft industry. Boeing basically acknowledges that up to 85 per cent of all equipment failures happen on a time-random basis, no matter how much you inspect and service. ARC analyst, Peter Reynolds, gives a useful indication of what works by saying: "A useful prognostics solution is implemented when there is sound knowledge of the failure mechanisms that are likely to cause the degradations leading to eventual failures in the system."

However, the industry reality today is that in order to maximise profitability, processes tend to be operated as close to key limits as possible. This can be detrimental, as process excursions quickly place an asset in an undesirable operating point, where damage or excessive wear and tear to the asset occurs. This means that maintenance decisions need to be further mitigated by better understanding the impact on asset and process. A new generation of analytical capabilities is required to provide deeper insights into the asset, process and interaction between them. While operators need predictive solutions to red flag impending trouble, the software needs to be able to guide them away from trouble with prescriptive guidance. This requires the preferred solution provider to have deep domain and process expertise with the ability to extract data from design, production and maintenance systems.

The next generation Asset Performance Management (APM)

In the broader scheme of things, McKinsey & Co has observed: "...entirely new and more affordable manufacturing analytics methods and solutions – which provide easier access to data from multiple data sources, along with advanced modelling algorithms and easy-to-use visualisation approaches – could finally give manufacturers new ways to control and optimise all processes throughout their entire operations."

ARC Research Group further crystallises this view by saying: "With a good APM strategy, operations and maintenance groups become more collaborative, exchanging information to manage critical issues and operational constraints, while improving overall operating performance. Combining the information from traditionally separate operations and maintenance solutions improves the effectiveness of both areas, and offers new opportunities for managing risk and optimising performance."

In taking a step into the future of manufacturing, APM 2.0 incorporates the advanced analytics that predict issues and prescribe operator actions. With a holistic view of the process and asset, Aspen APM software suite combines asset analytics, reliability modelling and machine learning to analyse, understand and guide. Principles of data analytics and data science enable the reliability strategy, which includes machine learning. A dominant predictive analytics technology in information technology today, machine learning on manufacturing assets requires domain specific knowledge of chemical processes, mechanical assets and maintenance practices, etc.

For industrial prowess, machine learning needs to interpret and manage complex, problematic sensor and maintenance event data. Eventually, it can determine the operating conditions and patterns that can have a deleterious impact on the asset by capturing the patterns of process operation and merging them with failure information.

One of the world's largest plastics, chemical and refining companies, LyondellBasell, agrees that APM can unlock significant value, in saying: "AspenTech's new Asset Analytics contains a unique set of modelling and data science-based technologies. Utilising the additional process insight available from this promising new software solution brings with it the potential to operate closer to the true flooding limit on this tower. For a world scale olefins unit, this would be worth millions of dollars per year."

A system of success is long overdue

While predictive analytics can reduce downtime, disruption seldom happens in isolation. Instead, dozens of reliability, process and asset issues happen simultaneously. This presents a systemic problem for RCM, a current maintenance approach that conducts static assessments, by delaying the decision-making process.

As such, dynamic assessment is required, as new warnings need to be evaluated alongside other active conditions to prioritise and allocate resources. However, we cannot address everything at once. A system of success is mandatory to address problems and prioritise them, according to the level of risk they represent.

With Aspen APM software, each new alarm triggers a recalculation of risk profiles to guarantee that the most current financial and risk probability assessment is used.

However, to be thoroughly successful, companies need to adopt a holistic approach in implementation. First, they need to communicate their goals clearly. This helps in effective problem solving. Second, it is necessary for companies to genuinely embrace a data-driven world. Third, they need to differentiate between lagging and leading indicators, as well as how to respond accordingly. Fourth, the right mix of people, technology, strategy and solution is essential – along with the use of relevant case studies. Fifth, companies need to invest time and master the technology well. Sixth, the adopted analytics program needs to be well aligned with business goals. Seventh, companies need to deploy the appropriate software and hardware to solve problems. Eighth, companies need to execute well and with a keen sense of urgency. With operational excellence and profitability at stake, it is imperative that organisations are successful in developing the best asset performance strategy.

Indeed, failure is not an option – in creating a world that doesn't break down!