



Advancing Profitability and Sustainability with APM 4.0

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It's No Longer Just About the Bottom Line

For decades, when it came to business, the prevailing attitude was that executives' main goals should be to maximize performance and ensure stockholders earn the best possible return on their investments. Today, those goals are far more complex. While the public recognizes corporations are in the business of making money, profitability exists alongside a host of other questions—from how a company impacts the environment to the treatment of employees to their ethical and philanthropic efforts. As the need to reduce the impact of climate change drives new initiatives, companies are working to differentiate themselves from competitors as they work to solve the dual challenge: meeting the growing demand for resources from a growing population with increasing standards of living while also meeting climate, energy and carbon reduction goals.

How can organizations strike the delicate balance needed to drive both profitability and sustainability goals? Part of the answer lies in their ability to achieve operational excellence, and that can be heavily impacted

by the performance of the plant assets and the production process itself. A new wave of digitally-enabled technologies, dubbed Asset Performance Management (APM) 4.0, is making that easier than ever. The best APM solutions leverage a combination of AI, machine learning and simpler rules-based, condition-based monitoring, allowing companies to drive forward their business goals and gain a critical advantage over competitors. Though not a silver bullet to tackle every problem, APM 4.0 can play a crucial role in digitalization efforts, especially for asset-intensive industries.

As they focus on operational excellence to address the dual challenge, companies must be cognizant of the way efficiencies work hand in hand to advance sustainability targets. By pairing multiple operational and digitalization tools—for instance, performance management software and supply chain optimization—companies can develop comprehensive solutions that not only increase profits, but also deliver end-to-end sustainability benefits.

Financial benefits from this approach can be huge. It's estimated that across all manufacturing sectors, breakdowns and unplanned downtime cost manufacturers

more than \$1T USD/year, with some large manufacturers losing well over \$100K USD/hour. One European manufacturer has suggested that for most companies, unplanned maintenance can add up to as much as 15 percent gross margin losses, and even best-in-class performers still see losses between four and five percent. Additionally, not all losses are asset related. Product quality and yield losses are often related to process problems in the system. The potential financial gains from solving each of these problems, though, only scratch the surface. Unexpected breakdowns, emergency shutdowns and processes running outside recommended parameters are often accompanied by environmental and safety issues. In some cases, emergency shutdowns can release more carbon in a single incident than is released in a year of normal operation, so avoiding such incidents helps assure sustainable operations.





Strategies for Improving Profitability and Sustainability with APM

As you look to APM solutions to advance both your operational excellence and sustainability initiatives, there are several key strategies you should consider:

Defeating Downtime: Keeping Equipment Running at Peak Efficiency

Manufacturers' goal of reducing or eliminating unplanned downtime is not a new one. Often, though, the approach has been piecemeal and inefficient, relying on personnel who do rounds to conduct costly, time-consuming manual inspections at set intervals. Organizations have also long turned to a range of metrics — like recordable environmental and safety incidents, the number of days since the last incident or the number of safety incident near misses — as a way to target areas for efficiency improvements. Such “lagging” indicators, though, only capture incidents

that have already happened, and don't have any influence on potential future incidents. As a result, companies are locked into a reactive mindset, making it difficult (if not impossible) to anticipate equipment failures and the potential environmental impacts that may come with them.



Digitalization initiatives with predictive and prescriptive maintenance solutions allow firms to be far more proactive, analyzing vast amounts of data collected from sensors and other sources, then using those “leading” indicators to predict process

degradation and equipment failure — often weeks or months in advance, with greater than 90 percent accuracy. With predictive maintenance applications, firms can examine equipment more comprehensively, in more detail and far more often (every few minutes as opposed to once a week or once a month) than a human can. Human inspections can then



be limited only to mandated inspections, saving money, and—because personnel spend less time walking the plant—reducing the likelihood of injury.

Analytical solutions also deliver companies an invaluable resource—time. By predicting failures before they happen, APM solutions reduce the need for organizations to make rush decisions or repair assets in the heat of an emergency. With the benefit of time, companies can determine the optimal time to perform maintenance based on a host of factors, from maintenance certifications to financial impacts and more. Such planned maintenance programs also help drive business goals such as reducing inventory and spare parts costs by allowing companies to order parts when they're needed, reducing the need for rush or overnight shipping charges, and afford additional time to negotiate prices across vendors. By allowing companies to create orderly, safe plans for how and when to take a piece



LG Chem

LG Chem, a South Korean chemical manufacturer, deployed a prescriptive analytics solution with predictive Degradation Agents as a part of a comprehensive worldwide digitalization program to increase reliability and avoid unplanned shutdowns. At one site, thanks to the ease and speed of deployment and its staff's technology adoption, LG Chem realized \$3.6M USD benefits in a year by avoiding production losses.



SARAS

Sardeolica produces electricity from three wind farms in eastern Sardinia. The company applied a predictive maintenance solution across 57 wind turbines at its 250GWh wind farm to predict gearbox and generator degradation before failures occurred with the goal of reducing maintenance costs and extending the useful life of the wind turbines. With early warnings of imminent failures between two to five months, Sardeolica was able to transform its maintenance program to schedule service before failures within low-wind periods, resulting in easier repairs, increased production and a 10 percent reduction in maintenance costs per year.



GSK, a leading global pharmaceutical company, deployed a predictive and prescriptive maintenance solution to improve robustness of supply chains by preventing equipment downtime. With 35 days of advance warning of potential issues, GSK benefitted by avoiding lost batches and reducing lifecycle maintenance costs 50 percent, resulting in tens of millions of dollars in savings.



Braskem Idesa applied process quality analytics to increase time between reactor cleanings by 20 percent, all with existing data. Models were online within weeks to alert to conditions that contribute to accelerated reactor fouling as well as predict when future cleaning would be needed, enabling advanced planning.

of equipment offline, and how and when to return it to service ensures minimal disruption in operation, APM solutions can deliver both significant cost savings and sustainability benefits.

From chemicals to metals & mining to renewable energy to pharmaceuticals and more, the benefits of APM 4.0 solutions stretch across all asset-intensive industries.

Preserve Resources, Optimize Output and Reduce Waste

It is imperative, both for the bottom line and for customers, that process manufacturers deliver optimal product yield and quality. As they work to meet those demands, however, executives are also looking for new ways to minimize the use of resources, including raw materials and energy, and reduce waste without sacrificing product yield and quality.

The challenge is that literally hundreds of different factors in the manufacturing process can impact yield and quality, especially energy consumption and process degradation. Consistently determining which of those factors are most critical and which should be monitored

and adjusted is dramatically easier with APM and other digital tools.

To sort through vast amounts of “messy” data, process engineers, scientists, lab technicians and operators can turn to product and process quality analytics applications, which can help identify those factors that have the greatest effect in reducing off-spec product, helping ensure companies hit their production targets. Predictive capabilities can help spotlight complex process deviations before they impact the end-product quality, or when asset issues such as reactor fouling may be affecting process availability. To help reduce reliance on lab tests for heavily regulated industries, real-time release testing and analysis at the spectral level can be employed.

In addition to ensuring product quality while minimizing resource spend, such applications can help companies reduce raw material requirements, generate less waste and lower energy consumption during production.

An **international bulk chemicals producer** used process quality analytics that sorted through two and a half years of ethylene furnace data. The automated analysis identified specific process adjustments which, when implemented, reduced fuel gas consumption by a significant 1.4-4.3 kg/ hr per furnace per day.

An **international petrochemical producer** used continuous process optimization to predict critical efficiency factors, resulting in a 10 percent increase in steam compressor efficiency without sacrificing product quality or yield.

Essentially, product and process quality analytics systems allow companies to get the most and best production from a plant without additional CAPEX or OPEX investments. The benefits are substantial, but there are still scenarios where CAPEX and OPEX spend may be required. The ability to weigh the risk, cost and potential reward of different plant and enterprise decisions is the next step in system performance optimization.

Understanding Expenses Up Front for Better Decision-Making

Manufacturing executives are typically very cost and risk aware, and often expect to have a roadmap of where money will be spent, as well as an understanding that it is being spent in a



way that will assure lifetime return on assets. CAPEX and OPEX may include a vast range of asset changes. Adding redundant equipment, removing bottlenecks by upgrading to larger or more efficient equipment, increasing capacity for feed, intermediate or finished product

storage and adjusting spare parts inventory are just a few examples. Before appropriating CAPEX or OPEX funds for new projects, industry leaders often look for qualitative and quantitative assessments of the new expected value, the total cost and potential risks or roadblocks.

System performance, quantification and risk analysis solutions with the use of “what if” scenarios can streamline the decision-making process to help executives get maximum return on investment in the shortest time. During plant construction, simulations can identify possible constraints in the overall design, and can quantify the costs and associated benefits of different design decisions. By allowing executives to consider the impact of various decisions, including adding buffer capacity or adjusting supply chain configurations, simulations can be used to assess the reliability of the design and optimize the lifecycle cost. The real value, though, is in continuously using these “what if” simulations during operations.

A **global petrochemical company** wanted to account for all elements impacting demurrage without relying on complex spreadsheets or custom coding. Making more timely logistics

changes meant including events such as batch size changes and planned downtime. Using a system performance modeling solution, the firm can now easily run “what if” models for port logistics and enact changes, resulting in savings of over \$3M USD/year in demurrage expenses.

The reality is that even the best plant design may require operational changes, and without the proper context around financial, production or environmental risk, it can be challenging to develop appropriate mitigation or optimization strategies. System performance simulations enable owner-operators and plant managers to weigh the impact of different decisions as they work to keep the plant running at optimum

efficiency while meeting production goals. What if a particular asset is run to failure? What if operators do an immediate intervention and preventative maintenance? What if the number of spare parts on hand is reduced? Each scenario can be viewed in relation to the others and across all functions (from supply chain to operations to forecasting and more), enabling more informed and effective decision-making that maximizes the overall benefits of each action.

A **Latin American pipeline company** used a system-wide modeling solution to outline the impacts of costs and risks in maintenance strategies. The application studied three different maintenance mitigation scenarios:

immediate repair, delayed repair and run-to-failure. The computations estimated the impact for each scenario on spare parts inventory, capacity and use of redundant equipment to define a low-risk, minimal-cost mitigation choice, resulting in \$7M USD in protected value to date.

APM applications can do this by reviewing the interoperation of assets in a processing group, across an operating unit, a whole plant and even multiple plants.



Tailor APM to Your Organization

Companies must be careful to ensure any analytics solution aligns with fundamental business goals, including performance, quality, sustainability and net product output. By starting with a clear understanding of the goals, understanding the business objectives, identifying data requirements and carefully selecting the appropriate applications—firms can avoid falling into the technological trap of creating an “answer in search of a problem.”

Their reasons for investing in APM solutions may be different, but in doing so every company is aiming for the same target—to increase product yields and quality while also being mindful of their impact on people and the planet.

If they hope to hit those targets, though, it is important for firms to understand that these solutions must be tied to real business objectives such as improving operational excellence and increasing product yield, while minimizing waste and improving sustainability performance. These are just a few real-world examples that should be pursued rather than simply investing in additional technology as a solution to every problem.

There is no doubt that APM solutions can have a transformational impact on business, but success requires measured consideration, with companies choosing the right applications, technology and infrastructure to tackle today's challenges and the scalability to address tomorrow's issues as they arise.





About AspenTech

Aspen Technology, Inc. (NASDAQ:AZPN) is a global software leader helping industries at the forefront of the world's dual challenge meet the increasing demand for resources from a rapidly growing population in a profitable and sustainable manner. AspenTech solutions address complex environments where it is critical to optimize the asset design, operation and maintenance lifecycle. Through our unique combination of deep domain expertise and innovation, customers in capital-intensive industries can run their assets safer, greener, longer and faster to improve their profitability and operational excellence.

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