



Seven Keys to Bringing Agility, Resilience and Recovery to Today's Refineries

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Executive Summary

The energy industry has been hit hard by current global economic interruptions: rapid drops in demand, a changing mix of preferred products, plummeting crude prices, difficulty staffing essential production sites and fragile supply lines. This paper focuses on short-term actions companies can take now while reflecting on longer-term strategies as they gradually shift into recovery.

Refiners are faced with unprecedented volatility. Prices are extremely dynamic. Margins are very low. Demand for some products (diesel and naphtha) greatly exceeds demand for others (gasoline and jet fuel). Consequently, refinery operators are running business scenarios and alternative refinery plans almost daily — and looking ahead, risk and uncertainty remain high.

Challenged to rapidly move workforces into remote and work-from-home (WFH) scenarios, energy companies are re-examining their digital capabilities, and increasing their focus on digitalization as an essential long-term strategy.

In the short term, there are a number of actions related to digital technology that energy companies can take immediately. These actions are often based on technology that already exists within companies. Unfortunately, it's just as likely that the technology hasn't been deployed in a way that will best support remote and collaborative work environments. This paper provides insight into easy-to-implement strategies that businesses can initiate today as they look to operate with increased agility and responsiveness.

Digital technology largely exists within companies but has not yet been deployed in the most effective way to support the remote and collaborative work required in today's climate.



The Business Challenge: Volatile, Uncertain Times

Many respected economic forecasters believe energy demands will not fully recover for a minimum of one to three years. Industry watchers predict permanent changes in the roles of the workforce as on-the-ground teams become increasingly virtual or remote. Organizations are seriously considering how more work can be done remotely and with fewer crews in dangerous settings, in and around assets. Autonomous production is happening now as select companies are accelerating their digitalization strategy. But what does that mean in the short and medium term to a refinery that may not be that far along with their own digitalization?

In addition, energy and chemical businesses are likely to rethink global supply chains, which are today highly interdependent and just-in-time in nature. The sustainability focus — including decarbonization, circular economy and broader access to electricity and clean water — will resume with new urgency when things normalize, and this will drive regional refining and chemical markets. It will also impact the speed at which refineries transition their operations to incorporate chemicals and shift away from transportation fuels.

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Given the current climate, companies are looking at a range of questions, which have varying importance, depending on regional differences:

- Which are the most optimal CAPEX cuts in order to keep the business agile and ready to take advantage of opportunities during the recovery?
- How can I maximize my teams' effectiveness today using digitalization and enable long-term remote working?
- What is my turndown limit to keep plants running within safe limits and without damaging units and equipment?
- What is my optionality to shift as far as possible to diesel and minimize jet fuel and gasoline?
- What do my margins look like under a dizzying range of crude oil pricing scenarios?
- In new operating scenarios, do I degrade my catalyst faster; in the face of supply chain disruptions, should I be ordering future catalyst sooner?
- How do I utilize my existing tools to optimize production in a drastically different operating regime?
- How can I shift my supply chain dependencies across geographies, and what are the business and economic tradeoffs?

Digital as a Practical, Tactical Tool

How will today's companies most effectively contend with future business uncertainty? In a recent discussion, a Middle Eastern energy customer referred to digitalization as "a tactical lever in this environment." Many organizations have realized during the current disruption that they need to develop capabilities to automate operations as much as possible and enable remote experts to address production plans, needs and interruptions — but they are not as far along in digitally enabling their assets as they should be. So, amid the business uncertainty, several companies have assigned small teams to look at how they can accelerate this digitalization.

Seven Ways to Use Digital Now and Impact Your Business Tomorrow

There are short-term moves energy companies can make — and are currently making — to navigate the situation and prepare for future economic recovery. These include:



Rebalance CAPEX and OPEX spending. In the current business climate, it's vital that you balance capital costs to match the environment. You have put 20%, or as much as 30%, of your capital spending budget on hold. Now you need to assess for the next 12 months which projects you should defer and which are most strategic for your recovery and growth. Economic modeling and risk tools can rationalize your CAPEX portfolio into a series of scenarios, ranking them by impact on revenue and sustainability, as well as by financial risk and externalities. You can examine optionality of locations, timing and contracting and their impact on agility, workforce, cost and enterprise value. Using advanced economic cost and risk modeling you should be able to make these choices on a rational basis within 30 days.



Run more production scenarios, quickly and virtually. Production planning and scheduling tools are being creatively used by remote teams to react to and solve challenges related to supply chain, demand and pricing disruption. Production planning can be rapidly moved to the cloud for remote and WFH applications; users can access high-performance computing to run large numbers of scenarios to establish the optimum choices as business conditions change dynamically. Several of the largest

global refinery planning teams are running scenarios 12 hours a day, constantly adjusting the underlying model assumptions. Teams are using this approach to build future scenarios to plan for variable market and regional recoveries.

The key to success is agility. Agility is enabled with models that can quickly find a solution with a global optimum and can be continuously updated to capture the current extreme operating conditions. Digital twin models of refining units can be used to inform the planning model of operating scenarios as never before to:

- ensure plans are adjusted to be directionally correct
- identify safe operating turndown limits
- identify impact of deferred maintenance on asset safety and integrity



Improve collaboration among remote workers. With the need to minimize workers in plant settings, remote access is crucial. Visualization and workflow tools provide remote workers the ability to react to changes and collaboratively manage asset production. An Italian energy company is continuing urgent engineering work remotely with a front-end engineering collaboration tool that works as effectively from home as in the office. Asset health can be monitored remotely with prescriptive maintenance analytics to provide weeks of warning of



equipment trouble. Adaptive process control can also be managed and monitored remotely.

While remote working is not so much a technology challenge — as those capabilities are well established — it's critical that security and data protection remain a priority and are managed with sound practices and policies.



Adapt production to new operating conditions. When drastically turning down units, changing column cuts or operating under different process conditions, how do you optimize operations for safety, yield and energy? As mentioned, adaptive process control can be upgraded and deployed remotely. Self-tuning adaptive control can be adjusted quickly to align with new operating strategies and continue optimizing the key process units.



Maximize uptime, prevent downtime. As assets are being operated with the fewest possible on-site staff, routine inspection and maintenance have been deferred. Asset health analytics and monitoring tools forecast equipment failures and process upsets, providing one to eight weeks advance notice of failures, enabling asset owners to deploy small strike teams to avoid damage and downtime. This machine-learning-based prescriptive maintenance has already saved one global refiner millions of dollars by helping them avoid conditions that lead to equipment failure and improve plant uptime.



Optimize performance, reduce cost. In addition to helping with planning, digital twin models are beneficial in optimizing asset performance. With assets running at lower rates, modeling tools can be used to ensure that operating scenarios can proceed without damaging the

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asset. Examples include troubleshooting operations via online column models and monitoring heat exchanger performance and fouling with online models. Several global operators are using these models to determine cost and risk of deferring maintenance.

As with other software tools, remote staff can run digital twin models and advise onsite operators of the correct process changes to safely and reliably run units at low

turndown rates. These models can be used to monitor the status of equipment and units with respect to process safety, process integrity, emissions, energy use, fouling and degradation and yields.



Maintain sustainability efforts. Even with the current global economic environment, energy companies continue to focus on sustainability goals. Digitalization can be a real ally in this effort arming operating leaders with the technology to improve safety, protect the environment and maintain continuity.

As an example, Bharat Petroleum (BPCL) recently deployed an integrated digital twin model to optimize sulfur recovery. The solution, which encompassed AspenTech's adaptive process control software and connected simulation models, dramatically improved contaminant removal. In six months, the implementation resulted in a 90% reduction in sulfur emissions and significant economic value from recovered sulfur. In a related project, BPCL implemented a digital emissions monitoring and prediction system that allows its Kochi Refinery to effectively manage a rigorous and dynamic regulatory environment.





A Progressive Recovery

Agility and flexibility will be key in the energy industry as unpredictable oil and gas prices, as well as changing patterns of demand, remain front and center. Digitalization is not only a tactical tool, but more importantly, a strategic lever for making a refinery more agile and business owners more flexible.

Specific areas of digitalization create significant value quickly and enable companies to be extremely effective, whether using the technology on-site or via remote workers.

Beyond the short term, as AspenTech ties planning and scheduling closely to optimization and advanced process control, advanced planning technology will help ensure safe operations and margin capture in the future. The digital twins that can be implemented easily on highest economic value units — such as crude units, conversion units and preheat trains — provide optimization and insight, without putting onsite workers at increased risk or vulnerability.

From our position as a trusted partner to the energy industry, we have been working with companies globally to support teams who need remote access to AspenTech

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software to perform their daily mission-critical work. Many companies are evaluating how much of this current work scenario will remain permanent. AspenTech customer and training websites, as well as customer support systems, are available 24/7 to rapidly respond to companies and their teams who are operating remote or from home. In addition, we are committed to helping global customers accelerate their digitaliza-

tion strategies in the highest impact areas, as energy companies put increasing emphasis on these projects. These high-value areas will include margin capture, safe operations, agility in the face of uncertainty and sustainability.

Helping Companies Move Through Transitions

The energy industry is facing unprecedented challenges from an economic, production and workforce perspective. At AspenTech, we help the industries we serve, like energy, by optimizing their assets to run safer, greener, longer, faster — and with more sustainability and resilience to better handle ever-changing demands. We can help your business move successfully through the current market state and prepare for recovery.

Learn more at: <https://www.aspentech.com/en/solutions/covid-19-response>

AspenTech is a leading software supplier for optimizing asset performance. Our products thrive in complex, industrial environments where it is critical to optimize the asset design, operation and maintenance lifecycle. AspenTech uniquely combines decades of process modeling expertise with machine learning. Our purpose-built software platform automates knowledge work and builds sustainable competitive advantage by delivering high returns over the entire asset lifecycle. As a result, companies in capital-intensive industries can maximize uptime and push the limits of performance, running their assets faster, safer, longer and greener.

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