

## Pushing the Reliability Envelope: Digital Optimization for the “Always On” Refinery

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2018 will be a year of change in the refining business. One constant will be the focus on increased reliability, which is one of the most important priorities for many refinery organizations. One top-quartile refinery operator summarized their focus on reliability as "...reduction in unplanned events with associated increase in availability of the units to capture market opportunity. Reliability also allows us to focus on proactive improvements rather than on reactive issues."

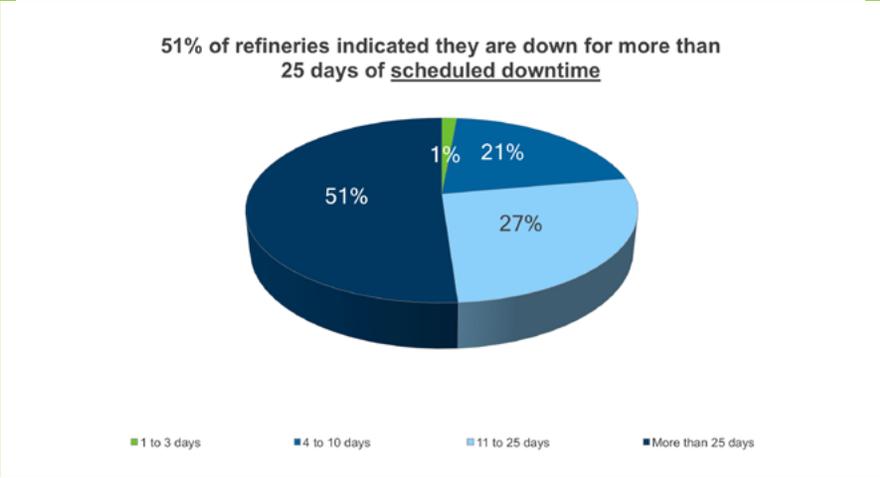


Figure 1: Average annual scheduled downtime of refineries operated by respondents surveyed by AspenTech in the fall of 2017

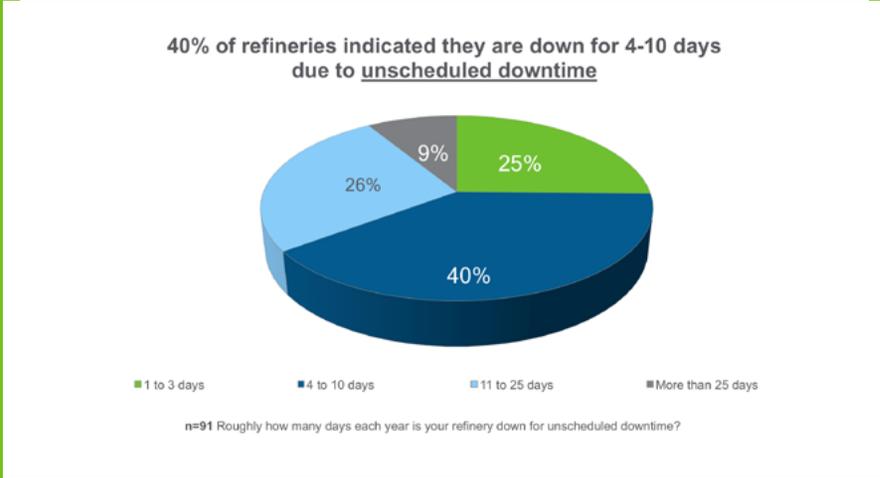


Figure 2: Average annual unplanned downtime of refineries operated by respondents surveyed by AspenTech in the fall of 2017

# Downtime in Today's Environment

***But is downtime a real issue requiring a solution?***

AspenTech recently conducted a study of 240 downstream customers and confirmed what most people know — namely that improving reliability is a key refining objective. And the performance of different refining operations varies widely. While 51 percent of respondents report average yearly planned downtime of 25 days or greater, 22 percent report a much lower average of 10 days or less (see Figure 1).

When we look at unplanned downtime, the answers also point to an operational excellence challenge that should be addressed. Thirty-four percent of respondents report unplanned downtime of over 11 days per year, while an additional 40 percent report four to 10 days of unplanned downtime in an average year (see Figure 2).

For a high-throughput refinery, one unplanned (or planned) day of downtime can put \$4 million USD or more of revenue in jeopardy against that refinery's monthly plan. Clearly then, a razor-sharp focus on refinery availability — or, more broadly, reliability — is strategic.

# Reliability in the Framework of Asset Optimization

Reliability can be, and often is, looked at in isolation. We, however, view reliability as one key leg of the asset optimization “stool.” We see high-performing process manufacturing organizations pursuing asset optimization in a framework which encompasses the total asset lifecycle, involving the design-operate-maintain continuum (see Figure 3). Each aspect impacts the other, and improving overall asset lifecycle performance will naturally improve reliability.

There are several ways to attack reliability. One is through better design, which can be achieved via improved operational feedback, which is facilitated through digitalization and integration. Data from operations, over time, when properly analyzed, can identify the equipment, process units and designs which operate with the best reliability and performance. Fed back into design, this can lead to design for reliability — or more specifically, re-use of the most reliable designs which have already been executed. A second approach is to employ modeling to understand where conditions for low reliability are being created, and to look at alternative process operating cases which will achieve higher reliability. This applies particularly in areas such as corrosion, and understanding the causative process factors thereof, rather than simply monitoring metal degradation. A third approach is through probabilistic, enterprise reliability modeling, which can identify the “pressure points” where, in your specific interconnected process manufacturing and supply chain system, investment will have the highest reliability and profitability returns.

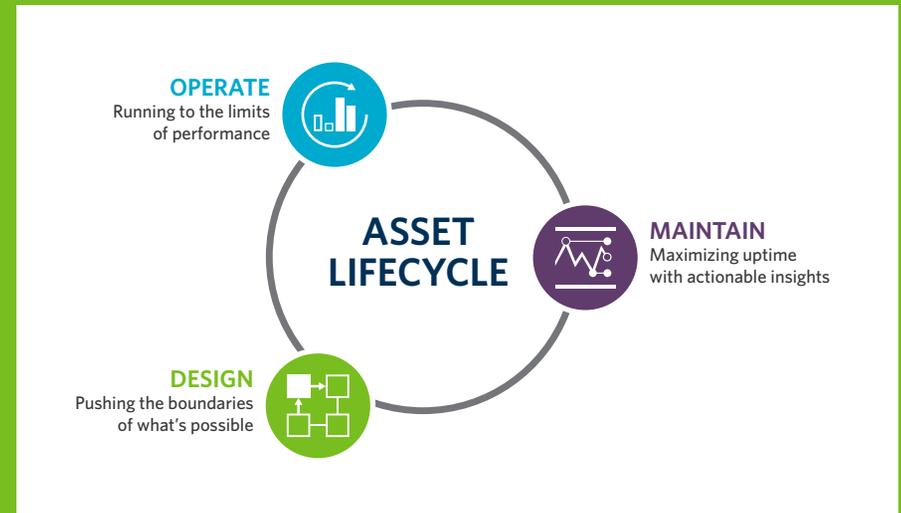
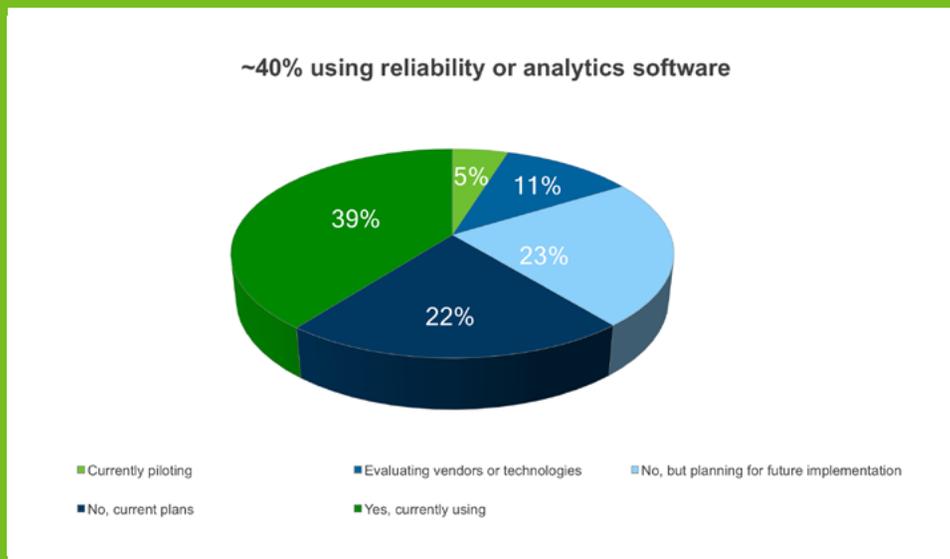


Figure 3: Reliability is one of the three components of asset lifecycle optimization

Several of the largest and most successful process manufacturing organizations across the globe, in both the chemicals and refining sectors, now use enterprise reliability modeling (specifically the Aspen Fidelis Reliability™ system) when making decisions on capital expenditures (CAPEX) for plant improvements and repairs. Two of these organizations publicly acknowledged their strategic use of this approach at the AspenTech OPTIMIZE™ 2017 global conference, held in April 2017 in Houston, Texas.

This approach has taken hold so quickly that 40 percent of downstream organizations today report that they are beginning to use rigorous reliability or analytics software in their operations (see Figure 4).

Figure 4: Companies (surveyed by AspenTech in the fall of 2017) reporting use of digital technology in search of improved equipment uptime



## Value to Be Returned by Addressing Reliability

Why are these organizations focusing digitalization efforts on downstream refinery operations reliability? Companies believe that through a focus on technologies such as machine learning (for example, Aspen Mtell®), they will better be able to predict equipment failure and to prescribe preventative and maintenance actions. And they believe they will be able to do so long enough in advance to improve plant uptime. In fact, 40 percent of companies believe that this area of focused digitalization can save 16 percent or more of operating expenses (OPEX), as shown in Figure 5.

There was some general agreement as to the major process equipment and units most likely to constitute the benefits that they reported (shown in Figure 6), led off by compressors, pumps and heat exchangers.

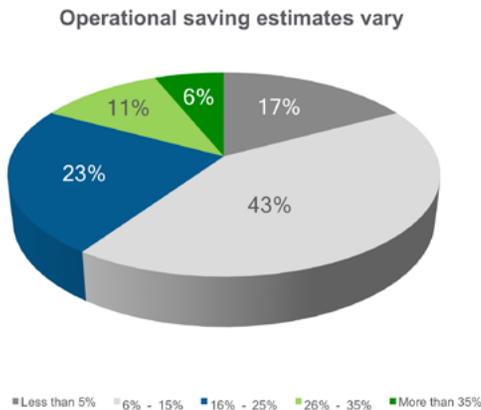


Figure 5: Forecasted refinery OPEX savings reported by companies surveyed by AspenTech in fall 2017

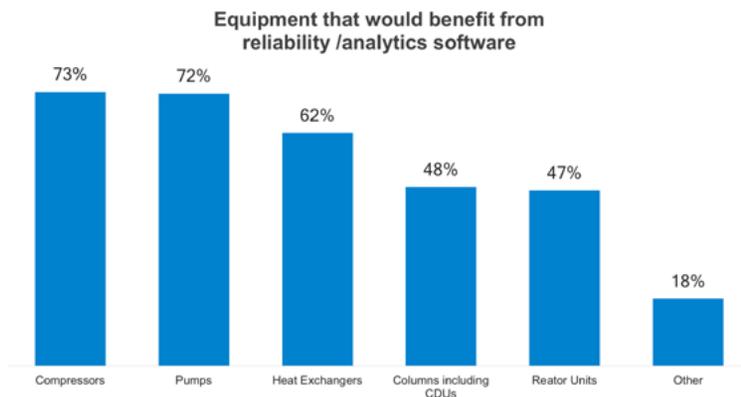


Figure 6: Equipment that will account for the largest prescriptive maintenance refinery benefits

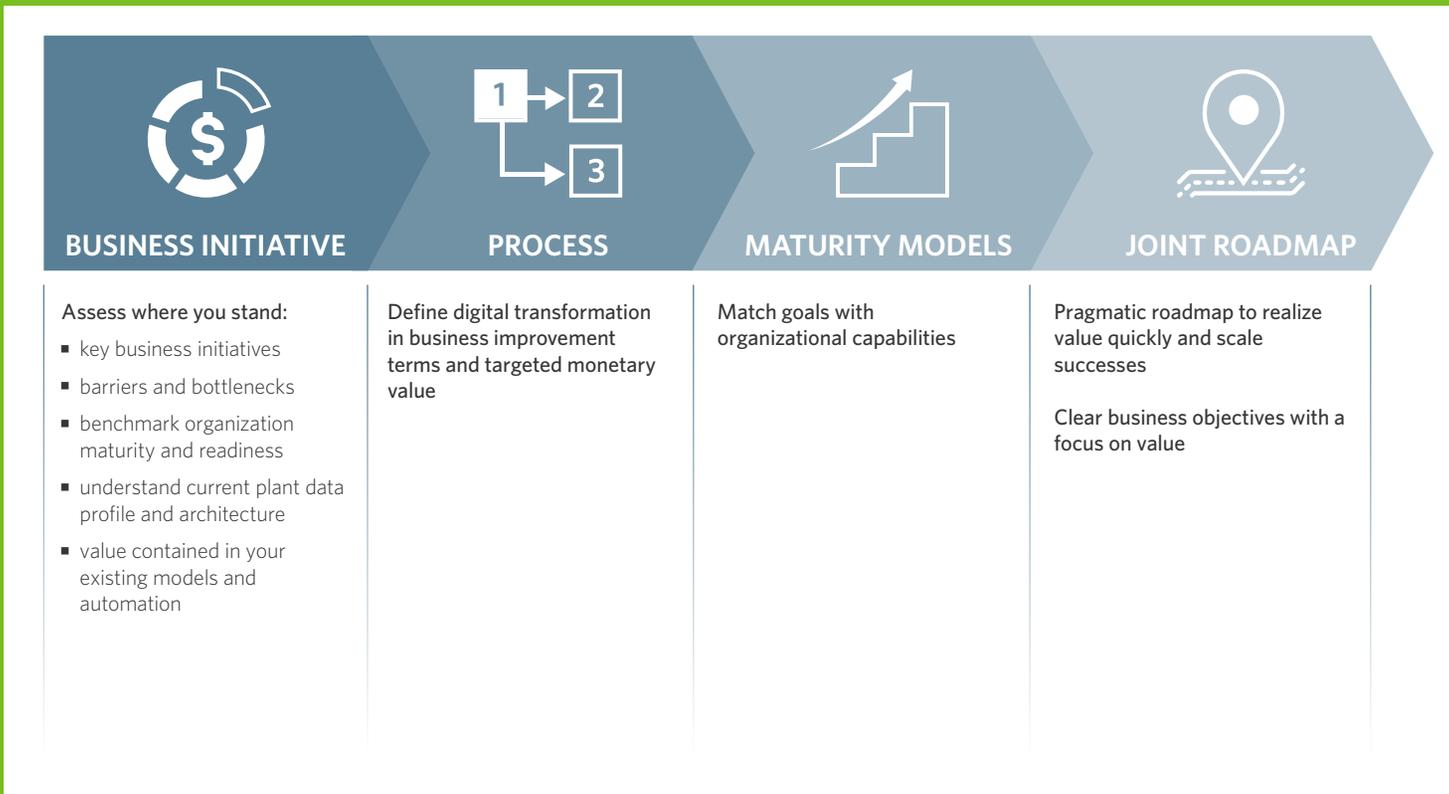


Figure 7: Creating the solution roadmap that is right for your organization

## Next Steps

2018 will be a key year, as leading organizations move from the hype and buzz into the implementation of real projects.

Reliability and machine learning are easy areas to move forward on, because the efficacy of a solution for a refining organization can be easily tested and proved with a historical data set of process performance and equipment and unit failure events.

The key is to define a pragmatic technology roadmap for your company that will realize value quickly, and from which initial success can be scaled.

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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