



Improving Refinery Performance Through Digital Transformation

Achieving Greater Operational Availability and
Reduced Maintenance Costs while Managing
Operational Risk

The oil and gas industry has rarely experienced the kind of economic pressures currently challenging it. External pressures from a prolonged period of lower oil prices as well as competitive pressures and even shifting labor patterns have contributed to an environment in which financial efficiency is of unprecedented importance. This in turn is leading oil and gas companies to redouble their efforts to gain competitive advantage through efficiency improvements and streamlining of operations, while maintaining tolerable risk levels as per industry best practices and standards.

For refiners, one area in which advantage can be gained is operational performance and reliability. The 2016 International Study of Reliability and Maintenance Effectiveness (RAM Study) [link] by HSB Solomon Associates LLC (Solomon), shows that RAM performance is a significant financial differentiator. The Reliability and Maintenance (RAM) index combines maintenance and downtime costs into a single metric. RAM performance can be improved by companies choosing to make wise investments in reliability. The study found that such improvement requires persistent focus and takes on average about six years to achieve full benefits.

The Solomon study results also suggest that sustainable improvements start with an emphasis on reliability — rather than simply cutting costs. In fact, the study shows that “the difference in performance between the average of first quartile (Q1) and the

average of fourth quartile (Q4) has a cash value of about 8% of plant replacement value per year of operation” (See Figure 1). In an environment with such intense financial pressures, an 8 percent difference is often the difference between profits and losses.

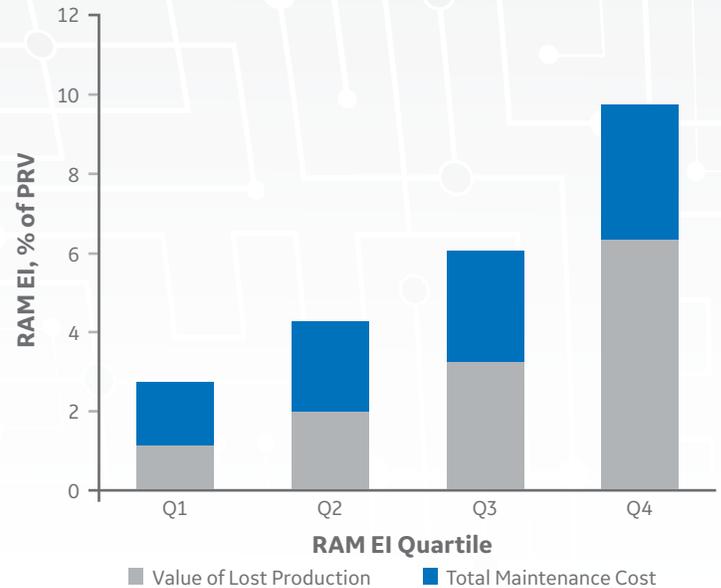


Figure 1: Performance Quartiles

“Reliability and Maintenance [RAM] performance is a significant financial differentiator”



Top RAM performance can also mean the difference between a high performing, predictable and safe operation, and an operation that is at greater risk of safety incidents and is constantly fighting a reactive battle against unexpected equipment failure.

Digital Transformation and RAM Effectiveness

Lowering maintenance costs has generally been seen as coming at the expense of asset availability and safety. Opting for maintenance cost reductions by doing less maintenance and delaying downtime often leads to unplanned downtime and higher costs. This kind of “reactive” maintenance approach typically increases costs due to more expensive, emergency maintenance and unplanned downtime.

Refiners further along the asset management maturity curve will make greater investments in planning and the resources necessary to proactively perform maintenance before failures occur. Such a program – often called preventative maintenance -- is based simply on time or throughput which, while helping to avoid unplanned downtime, can result in unnecessary maintenance activities and additional costs. Becoming more

predictive is preferred because it allows refiners to be more selective in their use of resources and avoid unnecessary work.

Digital transformation can resolve this conundrum for refiners, allowing them to be far more predictive and proactive in their maintenance through using data and analytics. By using digital technologies, operators get a near real-time view of asset health -- allowing them to foresee problems based on evidence and sensor readings rather than elapsed time or throughput. This enables much more precise, more data-driven decisions about what, where, and when to perform maintenance. Perfectly predictable operations may be an unattainable goal but striving for it saves operators money by avoiding both unnecessary maintenance and significant unplanned downtime.

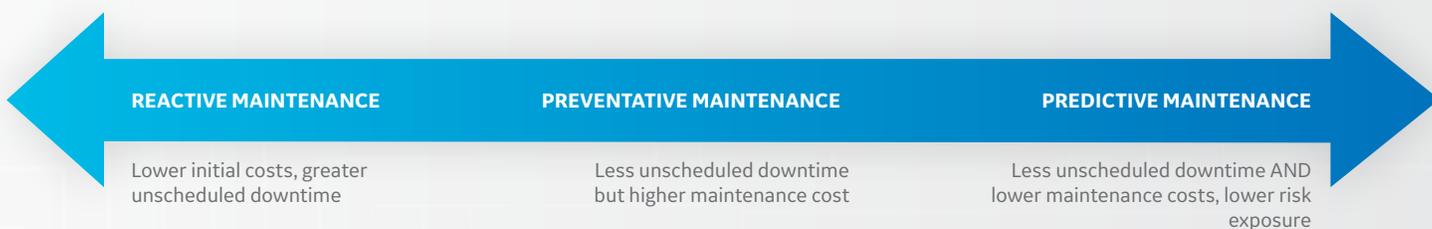


Figure 2: The Maintenance Spectrum

In addition, embedding best practices into a system which supports continuous and sustainable improvement, along with performance monitoring, will ensure asset management strategies are well designed and executed. These are all elements of Asset Performance Management (APM) – the foundation for digital transformation in refining.

The Solomon study clearly shows that RAM performance is a significant financial differentiator for refiners -- and that, with the appropriate investments and cultural change, both the costs of unplanned downtime and maintenance will go down. Refiners wishing to achieve higher performance levels must be willing to embrace the necessary process change as well as the effective use of digital technology.

It's Not Just About Technology. It's About Data-Driven Processes.

Digital transformation isn't just about implementing digital technologies, but process change independent of digital technology investment can only take you so far. Technology provides more precise data to inform better decisions, but unless companies implement changes to processes, workflow, and organizational culture they will fail to realize the full benefits of digital transformation. Companies need organizational discipline to ensure proper and accurate use of the generated data. To achieve optimal performance, both technology and process changes must be part of your organization's digital transformation efforts. Technology and process in the context of digital transformation are symbiotic; as the Solomon study concludes, *"better performers have clearly stated policies or processes to control the exploitation of technology."*

One of the benefits of digital transformation is that technology forces increased rigor and accountability in operational processes, ensuring that key asset data and historical performance are captured in plant-wide systems. These technologies systematize the processes necessary to identify a bad actor within a facility, understand failure modes, and discover patterns that humans can't usually discern. Not only is this data now available to operators, but it is easier to establish mechanisms that assure its application -- not just in making explicit or immediate decisions, but in codifying the insights from it into institutional knowledge and practice over time. This in turn leads to better return on technology investment as better use of data maximizes the value of technology spend. These well documented mechanisms and procedures driven by digital technologies help ensure that gains realized will not dissipate over time, either due to individuals' resistance or organizational inertia.

Cost Impact Over Time

The initial investment in digital transformation should not daunt any company seeking to achieve these benefits. The Solomon study concludes that "if a company invests in reliability there is a short-term increase in maintenance cost, followed by a sustained improvement in reliability and a subsequent reduction in cost as reliability improves." Digital technologies and the process of digital transformation greatly improve reliability and operational availability but can also significantly shorten the documented six-year process for improving RAM performance.

Operations can over time count on lower maintenance spend, reduced safety/EHS costs, increased asset availability, enhanced labor productivity and ultimately improved margins and earnings due to digital transformation. This effort is greatly enhanced with the use of digital technology, together with a clearly stated policy for controlling the use of this technology. Digital transformation also enables better tracking of reasons and costs for unplanned downtime -- allowing companies to more precisely and accurately budget for it over longer time periods, while simultaneously reducing its frequency.

Finally, the cash flow freed by a commitment to digital transformation can be deployed toward asset modernization, automation, optimization technologies and investment to improve refinery flexibility-- all of which are key differentiators in an increasingly margin-squeezed operating environment.

Conclusion

Digital technologies are a key enabler for operational performance improvements including improved operational availability, reduced maintenance costs, and improved safety. Digital Transformation initiatives by nature are silo-busting efforts aimed at targeting all functional areas including Finance, Operations, Engineering, Maintenance, and HSE. The broad nature of such an effort will ensure that strategies, tools and processes are widely disseminated across the plant and that there is a digital system of record to help define, measure and validate the success of a RAM improvement effort.



"If a company invests in reliability there is a short-term increase in maintenance cost, followed by a sustained improvement in reliability and a subsequent reduction in cost as reliability improves."

Digital technologies can alleviate many of the tedious, manual tracking processes associated with an improvement effort and ensure that scarce technical labor is invested towards maximizing return rather than emergencies and manual, time-intensive analysis.

The implications of such a shift will be felt across multiple functional areas:

- **Finance.** Plants will see significant financial benefits from reduced operating expenses due to higher availability, increased production, and optimized maintenance. Improved plant life reduces capital expenses and future amortization.
- **Engineering.** Data-driven decision making will lead to better decisions and improved designs for plant upgrades.
- **Maintenance and Operations.** Plants will experience a shift in the frequency and nature of activities performed by the maintenance department, as well as a lengthening of turnaround intervals.
- **Health, Safety and Environmental.** Plants not only perform at their best from a financial perspective, but also maintaining residual risks at the lowest practical levels, which may also promote positive financial impact by reduction of insurance premiums.



“Better performers have clearly stated policies or processes to control the exploitation of technology.”

- Solomon Reliability and Maintenance [RAM] Study

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Recommended reading

View Solomon's latest blog on Refining performance worldwide at <https://www.solomononline.com/>

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