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Refinery maintenance: the growing emphasis on cost

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Jun 2012

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With refining margins under pressure, GTForum asks consultants and turnaround managers about the most effective means to keep maintenance costs in check

In a recent poll conducted by GTForum, preliminary results indicated that of those respondents identifying themselves as working for an independent refiner, integrated oil company or national oil company, 41.5% said that if refining margins continue to persist at their current low levels, their companies will have to soon reassess or reduce their current level of exposure to oil refining. Given this pressure on revenue, one would expect that refiners would increase their focus on reducing costs and one possible target is the costs arising from maintenance and turnarounds.

"People are not saying costs have increased dramatically, but that reducing costs [has become] dramatically important," says Yoav Ziv, vice-president, marketing, Realization Technologies, San Jose, California.

When asked how current conditions in the European market may have changed the relative importance of maintenance costs and availability, Attila Szekeres, Mol's head of refining turnaround management, based in Hungary, says "the cost issue is more important than ever before", while noting the importance of considering overall costs, not just those from paid-for services, but also the costs that could potentially arise from lower-quality execution in the form of unplanned shutdowns and urgent repairs.

Ziv sees part of this trend coming from overcapacity in the market, which has reduced the benefits of high availability. However, he says refiners are still keen to prevent schedule slippage when it comes to turnarounds, due to the need to reserve inventories of products and intermediates. "If they are delayed, they need to purchase alternative products in the fuel market... this is where they become easy prey for everyone." Consequently, Ziv says it is still important for turnaround lengths to be predictable.

In the US, maintenance costs are expected to rise due to environmental regulations, which have required the installation of new seals and sniffers to reduce seal leakage rates, according to Michael Creecy, vice-president for oil and gas business, SKF, San Francisco. "Because of more restrictive environmental regulations, the cost of parts and the associated maintenance has gone up, and I think that will continue," Creecy says.

Szekeres says Mol is seeing some upward pressure on maintenance costs, "but this is not significant", adding that a contributing factor is that sometimes diesel lines need to be run at maximum capacity, while gasoline units are sometimes under-utilised, even to the point where they are in a stop-and-go operational mode.

Szekeres also stresses the importance of fully understanding availability requirements from a market perspective. "Sometimes we see that a unit could be down longer without any negative impact on the bottom line or it might even be better to keep it offline for longer... sometimes the opposite is true, where we can get an unplanned benefit from bringing a unit back to operation earlier than initially planned. This requires much closer communication between maintenance and business people."

Ziv at Realization Technologies says performing a turnaround 25% faster can cut its total costs by around 12–13% – an attractive proposition, even for European refineries that currently do not benefit from additional uptime to the same extent as those in less mature markets. Realization claims that "projects can be finished 20–50% faster by reducing multi-tasking".

"What we've found... is that while there are many external issues and problems in projects, most of the waste actually comes from internal behaviour done by project managers and task managers, which causes their teams to multitask. Multitasking happens when priorities get out of sync and, when this happens, not only are task-doers spread thin across many tasks (and are less effective), support functions, managers and experts also have much more on their plates at any given time, which makes their response times longer and their ability to resolve issues lower. This makes projects take much longer than they should," says Ziv.

Ziv makes the point that resource pooling is another powerful tool for speeding up turnarounds: "Resource pooling allows you to take advantage of downtime in one area and use those resources in an uptime area. Sometimes we see that, because of the organisation of silos in a company, you could have a huge shortage in one area and idle people sitting in another area."

When asked if independent refiners have ever pooled maintenance and turnaround resources as a means of generating economies of scale and ensuring that individual turnaround teams have less time between projects, Ziv says that it is very rare and he does not know if it is being actively pursued. However, he says that "it might be very valuable for the industry".

One strategy that Mol is currently pursuing, as part of its cost-reduction efforts, is that of turnaround cycle extension, based on risk-based work selection (RBWS) and 'equipment strategies'. Szekeres says that this is a huge task, but Mol has already seen good results in this area. One of the aims of RBWS is to improve quantitative risk assessment and it requires a good, well-maintained and rapidly updated database. Mol is currently focusing on data uploading and cleaning.

Elina Herrala, refinery manager at Neste Oil's Naantali refinery in Finland, which has recently completed a major turnaround "largely on-time and on-budget", says thorough planning is an important means of ensuring such projects are carried out as efficiently and cost-effectively as possible.

"We have a very strict budget and we plan thoroughly, years beforehand. As a result, we are sure about the [project] scope for any single year before we start. During turnaround projects, we compare progress to the plan on a daily basis and adhere strictly to it. This one of the major ways to keep on-budget," says Herrala.

One area where refiners can save money is by becoming proactive when it comes to maintenance, says Creecy. He also notes that many refiners could benefit from performing a rigorous criticality analysis, because "when the operators first sit down and look at all the technical drawings of a new refinery, they typically say that 75% of the equipment is critical. When my company does a study, it typically turns out that 33% of equipment is critical, with only 5% being critical for production reasons". This means that a significant amount of money is spent unnecessarily, with workers working overtime to get non-critical equipment back up. "It is something that the refinery has done for 20–25 years and it hasn't changed."

Creecy says proper identification of critical equipment can lead to significant benefits for a refinery's purchasing department and spare-part inventory management. "We have gone into warehouses and performed spare parts optimisation and saved on average around 50% of what is in the warehouse. Refiners often have parts in their warehouse they do not need and don't have parts that they do need, because requirements are often based on gut feelings rather than analysis." He also says that in a lot of cases, inadequate planning leads to a lot of rework. "Sometimes they will have a rotating equipment engineer go out and work on a pump and then the next day, an electrician will go out and work on the motor that's right next to it... we have saved a lot of money in developing a proper planning and scheduling process throughout the whole plant."

One issue Ziv is keen to emphasise is the need for constant reinforcement when creating operational efficiencies. "Just like with any practice in which you are trying to educate people, you need to constantly renew it and review it and teach people and, whenever new managers are brought in, they need to be introduced, and so on."

"It is a bit like government campaigns aimed at reducing smoking. If you want to have sustainable results you need to constantly repeat the messages. You have to constantly talk about it. There is a tendency to always go back to old habits. Organisations that want high performance need to be involved in preserving the messages and the right behaviour, even to the extent of changing their compensation structures to be based on the behaviour that is required," Ziv says.

This is something Creecy sees as an important barrier to better working practices: "To change the way that a 55-year-old man that has been working in a refinery for 30 years does his job is very difficult, because this is a very conservative business and people do not want someone coming in and completely changing the way that they've been planning their work... Changing the culture has to come from the top... because people don't always follow through, a lot of really good recommendations are

wasted." Like Ziv, Creecy sees changing the compensation structure as a key means of changing working practices and the culture within a maintenance department.

"In my experience, there are two distinct types of problems. There are large companies that have multiple turnarounds at any given time and they struggle with obtaining the amount of people and skills needed to perform the turnaround and are lacking skilled vendors. But even engineers are sometimes scarce and there the problem is: how do I exploit my workforce better?"

"On the other hand, you have the independent refiners and their problem is very different. They have, let's say, a turnaround every year, or every two years, and their problem is how to keep the people between the turnarounds and how to ensure that they don't lose their skills over this period," says Ziv.

In Mol's case, Szekeres says the company's refineries have different turnaround cycles. Turnaround teams from different refineries visit each other during the preparation and execution phases to learn from each other and to assist with key tasks. In addition, Mol's turnaround team has to prepare detailed turnaround strategies for all main units as part of its goal of extending cycle times. "This gives them enough of a workload and challenges... so far I cannot see them getting bored."

This is a technique also employed by Neste Oil. During its recent major turnaround at the Naantali refinery, maintenance staff from Neste's other refinery and units provided hands-on assistance, according to Herrala. They were also able to gain valuable experience and learn from other workers.

Creecy says one of the big drivers behind the shift towards refining companies sub-contracting their maintenance is the high average age of workers in the refining sector and this is increasing refiners' focus on cost, while reducing their interest in planning preventative maintenance. He is also concerned that the shift away from downstream integration, combined with recent refinery sales, is bringing in small companies with little or no prior knowledge of refining, which might increase the emphasis on maintenance costs and lead to a more reactive approach.

Szekeres says Mol is addressing the issue of skill retention through the use of competency mapping, so that any gaps can be identified and addressed, coupled with rotating maintenance personnel between sites. Mol also has young talent programmes, which will help to replenish any personnel losses in its maintenance teams.

One further cultural issue that Creecy identifies is the perception of maintenance in relation to other business activities. "[Maintenance] needs to be looked at as an integral part of operating a refinery. Operations and maintenance are both profit-centres and need to work together, but if you look at a typical plant, maintenance is a cost."

Finally, Herrala says that from a manager's perspective, "you have to convince yourself and others that it is possible to keep on schedule. It is possible, so believe in yourself and your organisation. It is not as bad as people think".

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