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Dieselising Europe: Part 2

The devil is in the detail

In an article entitled "Dieselising Europe: Part 1" in the November edition of Hydrocarbon Engineering, T.A. Cook Manager Pedro Custódio discussed the nearly 100% increase in demand for diesel fuel in Europe over the past 23 years. In his article, Mr. Custódio also noted that globally, diesel usage is expected to continue to increase for many years to come and while investments in new hydrocrackers have been economically justified, it's important that they're operated at the highest possible efficiency level. In order to provide the greatest possible impact to a company's bottom line, they must remain online and producing at high levels of output. In this month's article we will be discussing a number of key problems that affect diesel producers, followed by how and why utilizing the correct maintenance and inspection methodology will ensure that high productivity continues, maximizing returns on investment over time.

Attacking the root causes: pumps

When crude feedstock arrives at a refinery, it is typically put into some form of storage tank, each capable of holding thousands of tonnes, before it is processed. As pumps are needed to move the feedstock to the correct area, it is important that these pumps are aligned properly and lubricated to manufacturer specifications: seal and/or bearing failures are common issues that can cause a chain of negative consequences if the equipment is not properly maintained.

Many refineries group pumps and assign their reliability and maintenance to a single person or trade area. Although useful from a theoretical accountability point of view, the failure modes of a pump can be traced to root causes from poor design, ventilation or selection (engineering and/or procurement) an unstable base (civils) through mechanical loading and running (production operations), to improper maintenance which might in turn be the responsibility of mechanical, electrical or instrument trades. It is rare to find a facility where the root cause analysis mechanism regularly and robustly engages all these skill sets to arrive at a complete understanding of how to properly select, run and look after a pump. Too often, time and effort is wasted repeatedly chasing repairs which are fundamentally not attacking the root cause of the problem.

Improper pipe care

One of the biggest issues surrounding piping within a refinery is the potential corrosion and the effects on pipes. Most pipes are made of carbon steel and wrapped in fibreglass insulation and have an aluminium shield. They are visually inspected by people, or by using x-ray technology or ultrasounds. These inspections must occur at regular intervals on all required plant piping. Failure to monitor pipe grade could result in potentially unsafe conditions. Another potential hazard is leakage of material, which could be caused by cracks in the pipes, damaged gaskets between flanges or leaking valves. Any leak should be reported to the appropriate party immediately.

Although facilities usually assign visible and primary product flow piping operation, inspection and upkeep within a unit, there are worrying instances of piping which has lain between units, underground or away from the primary facilities undisturbed and uncared for over many years. Frequently such pipework is not clearly owned by a production unit and there is sometimes no systematic program of care or even inspection. It does not take long to identify if and where such pipes might be and apply at least a high-level risk analysis and inspection program. As inspection and testing techniques become available they must be validated as quickly as possible to determine their usefulness. If other sites are using them already then any localized barriers to entry should be revisited.

Prioritization of work requests

For a refinery to operate efficiently and safely, valves must also be checked to ensure functionality. Valves are located throughout refineries and are important because they regulate the flow of fluids and gases from one area to another. Safety relief valves are also present to isolate equipment when maintenance is being performed. Failures can be caused by wear of seat seals,

Dirk Frame, T.A. Cook Consultants, Germany, discusses the key problems that affect diesel producers and the importance of correct maintenance.

operation in an environment outside of the designed operating parameters (perhaps leading to corrosion) and foreign or abrasive debris passing through. Valves must routinely be checked to ensure pressure and seat leakages are not issues.
It is remarkable how many shutdowns and turnarounds are disrupted in the shut-down or start-up phase by valves which are found to be non-operational by surprised operators. It is the job of Operations personnel not just to send many work requests but to send the right work requests. Consistent prioritization based on a genuine understanding of criticality and common understanding of plant reliability and redundancy is vital if valuable human and material resources are to be managed properly.

A combination of approaches

These examples are a drop in the ocean of refinery parts that need to be monitored closely. In order to assign resources the right areas at the right time, the appropriate maintenance methodology must be used which best suits the equipment concerned. Understanding the benefits of both predictive and preventive maintenance programs and ensuring they are in place where needed, will help to all but eliminate the types of failures listed above.

Preventive or time-based-maintenance allows maintenance activities to be scheduled at set time intervals. Repairs or replacements are made at that time, before equipment fails or capacity is reduced. Some problems with this methodology do exist however, including the possibility that the work is done either too early or too late. If the frequency is too high, production could be lost. On the flip side, just because equipment is maintained at set intervals does not mean that problems are being identified or addressed. It's important that equipment is inspected and an effort is made to understand what the current condition is and why it exists. Root cause analysis should be performed to determine what can be changed in the future so that identified issues are not repeated. Improved reliability and equipment up-time could have a direct impact on production.

Predictive or condition-based-maintenance calls for maintenance to be scheduled only when issues are identified and determined to be unacceptable. For instance, when the vibration level of a pump is shown through incremental readings to be increasing and reaches a dangerous level, then decisive action needs to be taken. This methodology should still allow most fixes to be planned and scheduled; as the unacceptable level will not be the point at which failure would occur. Instead a level that is designated as troublesome, but still safe to operate would be used. This would allow for the proper lead time to procure needed parts. Some up-front costs might occur if equipment is required or training needs to be conducted. But in the long run, with qualified personnel monitoring the equipment on a regular basis, this methodology can lead to improved capacity and equipment uptime.

Ultimately both methodologies work well in theory. But without a top-down approach that instills the maintenance department with the resources and tools needed to successfully implement either one, it will fail. The other factor that will determine success is consistency. Both systems require that certain events occur at specific times, whether it's actual maintenance or monitoring equipment and taking readings. Gaps in data collection or missing a maintenance event altogether can potentially have a negative impact on the organization at some point in the future. Essentially, a combination of both approaches applied in the right manner is likely to have the most positive effect.

Conclusion

Given how many refineries are struggling to cope with smaller margins and a higher workload it is time that sites genuinely integrate risk-based maintenance into their thinking. Systematic area-by-area working is to be lauded – and is a giant leap forward from responding to emergency break-ins because it is so much more efficient – but sometimes it is just not feasible to conduct methodical inspection and maintenance programs which cover one area at a time leaving production losses or, worse, potentially more dangerous situations uncovered for months and even years. There needs to be a combination of the two processes which allocate resources in accordance with efficiency, effectiveness and the scarce resource which is staff and skills availability.