HP | Plant Turnarounds and Project Management

Shorten the turnaround window through efficient plant decontamination

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Maintenance turnarounds (TARs) are an unavoidable part of operating a refinery, petrochemical plant or other continuously operating chemical production process. However, the period when the plant is shut down for the TAR represents a valuable lost production opportunity. As a result, the teams operating and maintaining these plants are always looking for ways to keep that shutdown period as short as possible.

Focus on shutdown efficiency. Very often, the site organization will focus on methods to improve efficiency during the execution window (i.e., the period when the plant is already shut down and the field contractors are carrying out inspection, cleaning and maintenance activities). However, what is frequently

overlooked is that significant gains can be made by ensuring the plant shutdown happens as quickly as possible, and in as predictable a time as possible. A fast shutdown helps shorten the overall TAR period of lost production, while a predictable shutdown helps avoid having a field contractor waiting around, unable to start because the shutdown period has overrun.

Using chemical decontamination methods. In recent years, sites have reduced their plant shutdown time by using chemical decontamination methods to rapidly clean and decontaminate the plant and allow maintenance work to start. The use of chemical methods has helped plant operators avoid lengthy steam-out cycles and reduce the time needed to prepare the plant for handover to the TAR team.

However, not all sites fully understand the benefits of chemical decontamination and what it means for shutdown procedures, nor do they understand how best to take full advantage of these benefits.

Chemical wash or vapor phase? In broad terms, there are two approaches: chemical washing and vapor phase decontamination.

- **Vapor-phase decontamination:** In this process, the chemical cleaning product is injected via a steam system. It offers very fast cleaning compared to the old “steaming out” methods. However, it does not work well if there are sludge fouling deposits in a vessel.
- **Chemical wash:** This process involves liquid containing the cleaning chemicals being “washed” or “circulated” through the equipment. This is slower but provides improved removal of fouling sludge and solids.

The process units and the various unit systems or circuits must be carefully examined to assess which process is best for each.

The chemical recipe. Each chemical decontamination contractor has its own “recipes” for chemical cleaning fluids and implementation. Not all these recipes work for every plant. The contractors themselves can advise on which is best for cleaning and decontaminating units under various operating conditions. If in doubt, it may be possible to pre-test samples of contractors’ products in a facility under laboratory conditions and following their guidelines.

Modifying procedures to align with chemical decontamination. Using chemical decontamination, especially the use of vapor-phase decontamination, can result in much faster cleaning and removal of contaminants such as benzene or hydrogen sulfide.

It is important that the operator’s procedures for plant shutdown consider this faster cleaning and allow for recirculation until the desired contaminant parts per million (ppm) limit is reached, rather than simply continuing to circulate for a given number of hours because “we know that works.”

Failing to modify procedures to take advantage of faster cleaning is a common issue witnessed among clients using chemical decontamination for the first time. The following are examples of issues to watch for:

1. **Pyrophoric materials:** As a direct result of the increase in sour crude processing, oil refineries face significant problems with pyrophoric iron sulfide, which can be extremely hazardous and introduce major safety issues that will delay the TAR and put lives at risk. Pyrophoric iron sulfide can remain in a vessel or column even after an apparently successful decontamination procedure that has achieved sufficiently low ppm conditions. If an appropriate chemical stage is not implemented during the decontamination procedure, the hidden deposits of iron sulfide will dry out and can spontaneously catch fire!
2. **Hydrofluoric acid (HF) alkylation units:** Chemical cleaning of HF alkylation units can seem daunting to many people; however, safe, successful and proven procedures are available to remove the iron fluoride scale and potential small pockets of HF from key columns and vessels. These procedures can also remove malodorous acid soluble oil (ASO), where necessary. A successful approach will always include neutralization and passivation of vessel and column internals, providing completely clean and safe conditions for maintenance and inspection personnel to enter.
3. **Draining down of spent chemical washing solutions:** Delays can be incurred if the client has restrictions on draining the chemical solution to effluent drains. In particular, columns can be left partially full of chemical solutions while effluent checks are made. Temporary storage tanks can facilitate rapid drain-down to free up the vessel or column and allow maintenance work to proceed. Stored effluent can be handled later.
4. **Incorrect alignment of circulation patterns and/or incorrect tie-in locations:** Unless washing circulation routes or vapor phase steaming routes are fit-for-purpose, contaminated sections of the plant can cause unexpected delays when opened. A key step can be to identify and agree on the most effective circuits as early in the planning process as possible, then to get out on the plant and identify critical temporary tie-in points that may require minor mechanical work and/or scaffold support to access. In some cases, temporary adaptors can even be installed ahead of the shutdown and save time on the event.

Systemization. Planning for shutdowns should incorporate chemical decontamination circuits into the overall discussion of operations' systems. By focusing on systems for shutting down the plant, a greater level of integration between operations shutdown and the start of field execution can often be achieved, saving precious hours in the TAR.

For example, identifying suitable laydown areas for the chemical contractor's equipment early on—and, where possible, pre-fabricating and installing hard-piping systems before shutdown—can smooth the transition from operation to early release of decontaminated systems.

Start early and plan ahead. As illustrated by the examples above, it is important to begin planning early how the plant will be cleaned and decontaminated. Early decisions on liquid or vapor on systems and circulation patterns will pay dividends in ensuring a fast shutdown.

Spending two years planning a TAR but then waiting to select a chemical decontamination contractor until the last three or four months before shutdown means you may miss out on time savings that could have been integrated months earlier. **HP**

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