
Question 80: What is your Best Practice for removing feed nozzles during turnarounds when only the tips are planned to be replaced? Are there any pros/cons or advantages/disadvantages of removing the nozzles while the system is hot or after it has cooled?

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The answer to this question depends on the installation details of the feed nozzle with the riser sleeve. Three common types of installation are (1) steam-purged annulus, (2) refractory packing installed from inside the riser, and (3) compressible material around the nozzle tip installed externally before the nozzle is placed in the sleeve. The steam-purged annulus utilizes a small flow of steam between the feed nozzle and riser sleeve to keep coke and catalyst from accumulating in the annulus during the run. This system allows the nozzle to be removed from the riser without entering the riser. The system of packing refractory around the nozzle tip from inside the riser does not allow for removal of the feed nozzle without first entering the riser to carefully chip out the refractory. After new or refurbished nozzles are installed, the refractory must be reinstalled from within the riser. The system using compressible material around the nozzle tip allows the nozzle to be extracted from its sleeve without entering the riser. The system relies on the material around the tip compressing and sealing the nozzle against the sleeve when the nozzle flange to riser sleeve flange bolts is tightened. When new or refurbished nozzles are installed, new compressible material must be installed around the nozzle tips.

All of these systems work well most of the time; but at times, there can still be problems extracting the nozzles from the sleeves. A common first line of attack in removing a nozzle from a sleeve is to utilize threaded holes in the nozzle flange that are used with "jacking screws" to break a nozzle loose after it is unbolted from the sleeve. Once the flanges are separated enough to allow it, hydraulic flange spreader "alligator" jacks have been used to further separate the flanges. Twisting forces applied with a suitable leveraging device can also be used effectively to speed the removal processes. Chain hoists and cable pulls are not suggested for pulling stuck nozzles as the lines of force and stiffness of these system are not generally adequate. Preparation by gathering the materials, procedures, and tools required –beforehand –to extract a difficult nozzle is the key. During the process of removing the nozzles, safety considerations require that the nozzles be tied off so they cannot fall from the sleeve. Care should also be taken not to damage the nozzles with direct hammer blows or refractory chipping guns. If the purge steam is wet, which is not normal, and water droplets are allowed to impinge on a stainless-steel feed nozzle during the course of a run, the insert can be destroyed and deform to an extent that removal of the nozzle from the sleeve becomes practically impossible.

We are not aware of advantages in removing the nozzles when the unit is still hot beyond the savings of time spent waiting for the unit to cool. Typically, by the time the catalyst is unloaded from the reactor, regenerator, and riser bottom and manways are opened, the nozzles will be cool enough to handle safely from outside of the riser. And at that time, the probability of hot catalyst escaping from the riser sleeve has been eliminated.

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