MAGNETIC PERMEABILITY OF OUTLET PIGTAILS

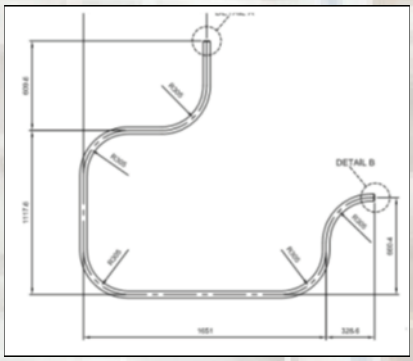
The outlet pigtails in Steam Methane Reformers (SMR) are used to transfer the reformed gas from the centrifugally cast tube to the outlet manifold system. The outlet pigtail is generally made from a wrought alloy of Incolloy 800, 800H or 800HT material. Some designs have an outlet pigtail while some do not. In some cases, the pigtail is embedded within the tube and in some cases, it is visibly connected from the reformer tube outlet to the outlet header.

Over time, these outlet pigtails can undergo carburization due to the interstitial diffusion of the carbon atom through the microstructure. In normal conditions, this process of diffusion is very slow and can withstand the life of the reformer tubes. However, in abnormal conditions involving higher than normal outlet temperatures, and improper steam/carbon ratios, this diffusion process can be accelerated.

The reliability and integrity of the outlet pigtail plays a vital role in the Steam Methane Reformer System. The failure of a single pigtail can cause a plant shutdown. Therefore, the outside diameter measurements of the outlet pigtails and the Magnetic Permeability are required to be checked from turnaround to turnaround to ensure the integrity of the system.

Foerster Magnetoscop

Outlet Pigtail System



Schematic: Outlet Pigtail System

In some designs, the outlet pigtail can be used to isolate a leaking reformer tube in service without having to shut the plant down. In such situations, the inlet and outlet pigtail are required to be hydraulically nipped, or pinched, and this is where the magnetic permeability plays a significant role. Depending on the value of the permeability, the condition of the pigtail can be identified to be either brittle or ductile. Nipping a brittle pigtail can be catastrophic, whereas nipping a ductile pigtail can save you a plant shutdown.

The MAGNETOSCOP 1.070 facilitates the portable and fast measurement of the relative permeability within the scope of the quality control of stainless steel. The relative permeability of a new Incolloy 800 HT pigtail is approximately 1.003.

Permeability values of a sizable number of samples together with destructive tests to determine extent of ductility, have helped determine the maximum allowable magnetic permeability for outlet pigtails for safe operation in service.