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Paper

CLEANING OF HEAT TRANSFER TUBES WITH AUTOMATED WATER JETS

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ABSTRACT

The paper documents the removal of ash and scale build-up on large heat transfer tubes inside of power plants. This has always been a big problem for power plants and utility companies, as the build-up must be removed at least twice a year to keep it from restricting heat transfer. Now automated, high horsepower water jetting systems can easily removes this build-up without damaging the tubes.

The key elements of these new systems are high horsepower water jetting pumps, which delivers unusually high water flows, and new cleaning systems with automated indexing capabilities. These systems clean in stages, sliding along cable between two heat transfer tubes while their rotating arms direct water jets at both tubes simultaneously. After each stage the cleaning assembly is taken to the next level to repeat the process.

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1. WATER JETS AS USED FOR POWER PLANT CLEANING - A BRIEF HISTORY

Water jets have proven to have great potential for the cleaning of transfer tubes inside of power plants and have been used for such for over 30 years. Older systems required multiple high pressure pumps to generate the flow and pressure required for the cleaning process, and manual manipulation of the cleaning assembly to effectively remove the build-up. These two issues caused inefficiencies in the cleaning process.

Reliable higher horsepower pumps, coupled with automated cleaning systems can now remove build-up in less time and with much less operator involvement. This combination of high horsepower and automation makes the removal of the ash and scale much easier.

2. MANUAL METHODS FOR REMOVING ASH AND SCALE

2.1 Traditional Methods

One of the most common methods for removing power plant build-up is manual water blasting. There are a number of variations on this, but all generally require an operator to manually index a cleaning nozzle over the surface to be cleaned. In some instances a winch and guide cable are used to manually move either a rotating or non-rotating cleaning assembly along the face of the surface to be cleaned.

Another manual process includes operators actually manually blasting the tube face with high pressure lances.

2.2 Problems Associated with Traditional Methods

One of the biggest problems with manual cleaning is the production rates. The cleaning process is slow enough that it causes the facility to have its power generation systems down for an extended period of time. Manual cleaning also inserts a number of variable into the cleaning process, making it more difficult to get a surface that is cleaned the same way every time.

The manual cleaning processes also require operators to directly interface with the high pressure water leading to operator fatigue.

3. USING AUTOMATED SYSTEMS

Automated systems are an excellent method for removing ash and scale from heat transfer tubes. Not only do they lessen the amount of time that alternate methods require; they more importantly eliminate the variables an operator brings to the process.

3.1 System Components

The new automated systems typically consist of the 2D nozzles with a cable pass through bore through the center. The passage allows the nozzle to track along a guide cable that is erected near the surface of the face to be cleaned. A tracking system is then attached to the nozzle and the guide cable is fed through it in a way that allows the tracking system to grip the cable and use it to push or pull the assembly. A computerized control panel controls the system and manipulates the assembly via a loaded program. Air motors are used to provide the motion. The speed of the cleaning assembly is varied depending on the build-up to be removed.

The high pressure water for the cleaning can now be supplied from a single high horsepower water blasting unit. Using a single pump unit eliminates the complexity of linking multiple pumps together and provides improved efficiencies.

3.2 Advantages of Automation

The automated systems allow the operators to set the system up, and then allow it to run on its own. Many of these new automated system also allow the operator to vary the speed of the cleaning system, dependent on the build-up present, making the cleaning of especially hard deposits much easier. The automated systems also have the advantage of storing programs from multiple facilities, allowing the operator to call up a program from a previous cleaning session.

4. OTHER APPLICATIONS

While Power Plants have proven to be the largest application for systems of this type to date, there are a number of other potential applications. The same systems can be used for cleaning the I.D. and O.D. of many structures.

5. CONCLUSION

Advancements in technology, including increased pump horsepower and automated traversing devices have made the cleaning of heat transfer tubes in power plants easier and safer.