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## Refinery Case History Cooling Water Exchangers

EnvTech Inc. was asked to develop a new method for cleaning cooling water exchangers for a Northern California refinery. Because of the degree of fouling encountered, the refinery had typically relied on mechanical cleaning methods such as hydroblasting. Often this involved extensive mechanical efforts to remove the heads, pull the exchangers and transport them to the bundle pad for cleaning. This resulted in significant costs for manpower, equipment and, most importantly, down time.

EnvTech received scale samples and several analysis reports to assist with the investigation for alternative methods. The analysis reports indicated a wide range of deposit constituents that varied from unit to unit and even from exchanger to exchanger within the same unit. EnvTech evaluated these sample deposits thoroughly in the laboratory to determine the best method for removal.

### **EnvTech and refinery personnel established the following criteria for the evaluation:**

- The chemicals must be effective in a relatively short contact time since down time was a critical factor in meeting the refinery's goal.
- The chemistry must be effective on a wide variety of scale compositions since the analysis indicated variations throughout the refinery.
- The chemistry must be virtually non-corrosive since the equipment might require frequent cleaning applications.
- The chemicals must be safe for all of the different metallurgy that might be encountered.
- The method selected must minimize the amount of mechanical efforts required to support the cleaning process.
- The chemicals must be environmentally friendly since the cleaning solutions would be handled within the refinery's waste water system.

EnvTech developed both chemistry and procedures to meet the criteria and the refinery set up pilot studies on 5 exchangers to test the capability of the new method.

The refinery removed the heads on all 5 exchangers before the cleaning and took close up pictures to document the "before" conditions. After the cleaning process was applied, the heads were again removed and the exchangers were thoroughly inspected.

# Refinery Case History Continued

## Cooling Water Exchangers

### The EnvTech Difference

#### The results were dramatic:

- The first pair of exchangers selected (225 tubes each) were the least fouled, but still contained substantial deposits throughout. Approximately 99% of these deposits were removed with no evidence of corrosion from the cleaning process.
- The third exchanger selected (580 tubes) was 80% plugged at the tube sheet for approximately 6 inches. The actual flow rate at the start of the cleaning was less than 20 gallons per minute at 100 PSI. The cleaning process removed greater than 95% of the deposits and left only 15 tubes with reduced flow rates.
- The fourth and fifth exchangers (690 tubes each) were 15% plugged at the tube sheet for approximately 12 inches. Both exchangers were heavily fouled with a very hard deposit that contained significant levels of silica (greater than 40 %). Chemical cleaning removed 98% of the deposits and renewed the exchangers to near maximum efficiency.

The refinery concluded that EnvTech's chemical cleaning method delivered the desired results at a significantly reduced cost (approximately 25% that of the previously used mechanical methods).

The refinery is currently developing a routine cleaning program for all cooling water exchangers in an effort to perform the cleaning **before** a severe loss of efficiency is observed. This, in turn, would enable the chemical cleaning to provide optimal results. EnvTech further recommends that the entire cooling water system of each unit be cleaned during turnaround outages, thus removing all of the deposits from piping, valves and other components. These deposits typically break loose during unit operation and are trapped in the exchangers.

This innovative cleaning method employs a unique, EnvTech **Nitric Acid Inhibitor** which provides excellent scale removal properties at ambient temperature and is virtually non-corrosive.

#### **Some of the benefits are listed below:**

- Equipment availability is increased by minimizing the out-of-service time associated with mechanical cleaning.
- Cleaning cost is reduced dramatically.
- Equipment service life is prolonged because the "pitting" associated with under-deposit corrosion is decreased or eliminated.
- The water- side deposits are removed on a routine basis rather than waiting until severe loss of efficiency is observed. **This provides significant improvements in throughput, which directly impacts the refinery's productivity and profitability.**

**References available upon request**

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