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## STAINLESS STEEL TREATMENT OF VERY LARGE HEAT EXCHANGERS

Industrial heat exchangers exist in many forms, with a wide range of applications. The most common heat exchangers are the pipe and plate heat exchangers. There are forms in which the tube is coiled in a spiral enclosed in a casing. Another form is a combination of a straight tube exchanger fitted perpendicularly to a spiral coil tube, the so-called “spiral coil type exchanger”. Another concept is the “heat train” in which several tube heat exchangers are fitted in series in one casing.

The choice of metal for this equipment depends on the process, medium, temperature, pressure, tension and corrosion resistance. Materials such as construction steel, stainless steel, duplex steel, Inconel, Hasteloy, etc. can be used. Depending on the material, the processes such as rolling and welding and the environmental surroundings of the process, the valuable equipment must be protected in an optimum manner against corrosion, in order to achieve the optimum life span.

The Vecom group’s Service Business Units have broad experience in the recovery of corrosion resistance by means of pickling and passivation of the many types of stainless steel processed in both small and large heat exchangers.

### A brief description of pickling and passivation

The most important reason for pickling stainless steel is for removal of welding discolouration. These heat-affected areas have virtually no corrosion resistance. In addition, the pickling dissolves all foreign iron and chloride particles. These particles also have a harmful effect on the corrosion resistant chromium oxide film of the stainless steel. By means of chemical passivation, the chromium oxide film is built up more quickly and the stainless steel achieves an optimum corrosion resistance in the shortest possible time. For further background information about pickling and passivation of various types of stainless steel, please refer to our other Technical Bulletins on [www.vecom-group.com](http://www.vecom-group.com)

### In practice

In November 2008, Vecom Industrial Services received a request from Spain to pickle and passivate five very large stainless steel 304 “heat train” heat exchangers at the beginning of December 2008. The heat exchangers were destined for a bio-ethanol factory under construction in China and weigh 65 to 150 tonnes. The exchangers were transported by ship and temporarily offloaded in Middelburg, where Vecom was given 7 to 10 days to pickle the entire interior and exterior up to the facing of the pipes in the pipe plates. During the initial discussions it was decided that the heat exchangers



needed to be set up indoors due to the environmental temperature, the environment, soil protection and to prevent the pickling agent from being blown away into the surroundings. A large shed was rented, heavy cranes were ordered for loading and unloading and the five heat exchangers were set up on stands on soil protecting sheets.

The Vecom degreasing solution was applied to the material using spray equipment, after which the heat exchangers were rinsed with high-pressure water hoses. Next, Vecom Low NOX spray pickling solution was applied to the entire degreased metal surface. Following a reaction time of several hours, the metal surface was rinsed with water from high-pressure hoses, whilst pH paper was used to ensure that the metal remained pH neutral. The entire heat exchanger was then rinsed once more with demineralised water. This was done to ensure that there were no more chlorides present on the metal

and that the stainless steel can build up its protective chromium oxide film.  
Vecom Industrial Services was able to complete this project to the satisfaction of its Spanish client within the set delivery time, including the removal of waste.



Before and after treatment

### Another example

At the Vecom location in Maassluis, Vecom Industrial Services treated a 60 tonne stainless steel heat exchanger. This heat exchanger is fitted with welded pipes in the pipe plates. In order to achieve optimum corrosion resistance, it is essential for this type of heat exchanger to treat the internal chrome-depleted material on the welding sites with pickling solution. In order to achieve this, a temporary circulation system is fitted to the cooler and according to the protocol degreasing, rinsing, pickling and rinsing fluids are circulated. The exterior was treated with Vecom spray pickling solution. This project again included heavy goods transport, heavy cranes and well-planned logistics.



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