

## Chemical cleaning of stainless steel coils of a feed heater

Number: 2011/01

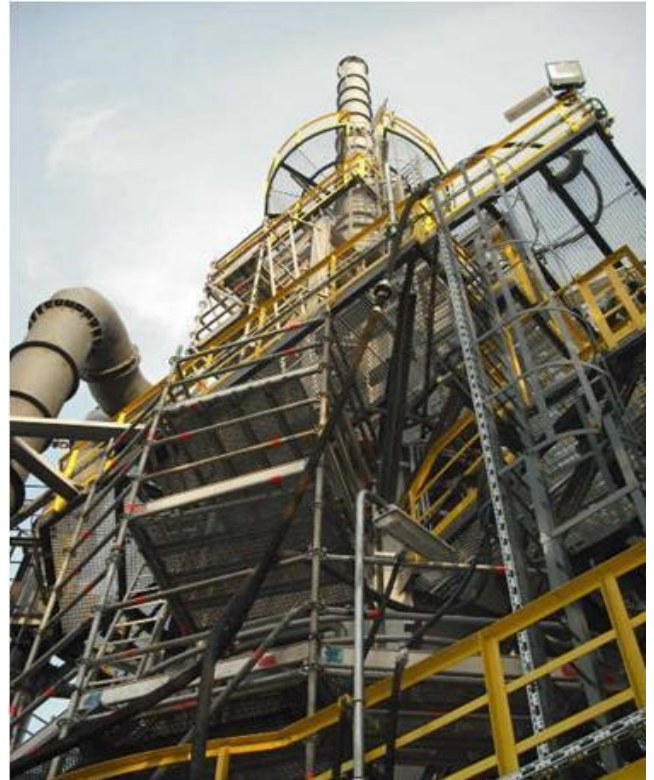
Petrom (now part of the Austrian OMV Group) at Brazi is the largest corporation in Romania and the largest gas and oil producer in eastern Europe. Heurtey has build a Feed Heater (number H-001), which is part of the pre heater installation of a plant for de-sulphuring gasoline. A feed heater consists of stainless steel coils in which the gasoline to be treated is heated, usually by exhaust steam. Subject of the inspection were the weld seams and the adjacent heat affected zone (the "HAZ") inside the stainless steel coil system which, without treatment, can suffer from thermal oxidation, seen as dark oxide bands. At these areas the protective chromium oxide layer cannot adequately form, and the resistance to corrosion, such as galvanic corrosion, will be less than that of the surrounding stainless steel not affected by welding. One source of galvanic corrosion in stainless steel piping is variation in corrosion resistance at adjacent points in the piping.

To prevent corrosion, the stainless steel coils have been pickled and passivated with a mixture of hydrofluoric acid, nitric acid and a wetting agent. This treatment will remove the discoloration from welding and restore the corrosion resistance of the stainless steel surface by the formation of a passive chromium oxide film. Prior to this treatment, the system is degreased by circulating Vecom Multicleaner and completed by rinsing with demineralized water to neutral pH.

After pickling, the acid waste water is collected in collecting tanks and neutralized in situ to pH 7 with caustic soda. Thus meeting the standards of the waste water treatment system of the plant. The job is a quite standard procedure for Vecom, but there's one small problem. The heating coils are formed by four stainless steel pipes, discharging in two headers.



Receiver/launcher of the pigs



Feed heater

These pipes make a U-turn in which a drain is lacking. With the winter approaching and temperatures far below zero, remains of water in the lower part of the pipe system will freeze and cause severe damage. Because of the size of the system, the only effective way to remove all water is to dry it with pigs. To achieve that, large pigs were needed and especially, sufficient pressure in order to drive the pigs and the water left behind all the way down the system. Of course without losing pigs halfway.

### Analysis and Laboratory Results

After preparation of the pickling liquid, the total acidity of the solution was analyzed. During the pickling the iron concentration was measured. Test pieces were immersed in the pickling solution in order to determine the following:

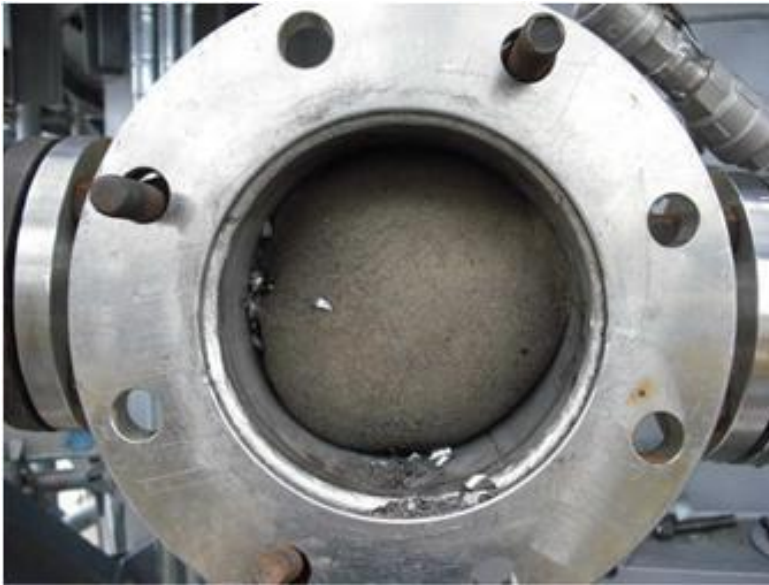
- Removal of blue heat tints from a test piece with a weld before and after pickling (see photo's next page).
- Amount of  $\mu\text{m}$  pickled from the stainless steel surface

The latter items were measured at the laboratory of Vecom, Maassluis in the Netherlands.

### Mission accomplished

The project suffered some delay due to building works around the feed heater. Due to scaffolding and concrete works, parts of the system were not always accessible for the equipment. But nevertheless the complete job was completed within ten days.

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Return of the pig in the receiver



Discoloration before treatment and the result after pickling and passivating