

In-house pickling: keeping your pickling bath in tip-top condition

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Introduction

Stainless steel can be used in a wide range of applications and in various industries: food processing industry, chemical and petrochemical industry, oil and gas extraction etc. Stainless steel is mainly used due to its specific corrosion resistance properties. This corrosion resistance is due to the natural property of stainless steel to form a protective chromium-oxide layer. However, this oxide layer is very thin and therefore very vulnerable as well. The various treatments that the stainless steel is subjected to during the construction stage and sometimes also during the transportation stage, may cause damage to the oxide layer. This means that, depending on the field of application, the stainless steel may lose its resistance to corrosion and (corrosion) damage can occur. Pickling after the construction stage removes the chromium-depleted zones and free iron, restores the corrosion resistance and restores the base material completely to its original form. The pickling process can be outsourced to one of Vecom's metal laundries. In this case the customer does not have to worry about complex procedures, environmental and safety regulations.

However, often due to logistical reasons, some companies prefer to carry out a portion of the pickling work in-house. In this case, however, there are several aspects that one has to take into account, such as licensing, the use of pickling products, monitoring the bath and the disposal of the rinse water and the pickling liquid.

The products

Various types of pickling products are available, especially tailored to the various applications.

Pickling paste: is applied with an acid-resistant brush. Low NO_x variants are also available, which help to reduce toxic emissions from nitrous fumes.

Pickling spray: the spray is used to treat large stainless steel objects that, for example, due to their size cannot be immersed. Low NO_x variants are also available.

Pickling liquid: in which stainless steel is submerged. The higher the content of alloy in the stainless steel, the longer the pickling time will be. For overnight pickling, a diluted pickling liquid can be used in a different composition.

To reduce transportation, a concentrated version is used as the basis for larger quantities for larger pickling baths. The concentration of nitric acid and hydrofluoric acid is twice as high as that of normal pickling liquid. Therefore, after it has been diluted with the same amount of water, PL detergent (a product with surfactants specifically for stainless steel pickling baths) should be added, because it is immiscible in the undiluted concentration. In all pickling methods it is very important that the stainless steel is rinsed with water very well, it is also preferred that a final rinse be carried out using demineralised water to prevent lime precipitation and negative effects caused by the chlorides in the tap water. After that, the stainless steel can be passivated by the surrounding air.



Manage your own pickling bath

This process takes 24 hours. The passivation process can be accelerated through chemical passivation using a liquid.

Monitoring a pickling bath

The composition of the pickling agent will change when using a pickling bath. During the pickling process, some substances such as iron may be released, iron forms a complex with the fluoride of the hydrofluoric acid. This results in a decrease of the free hydrofluoric acid. If the percentage of free hydrofluoric acid is lower, the pickling time will be longer. In order to achieve a constant pickling, the bath should be analysed regularly. This is done by taking samples which must be analysed at a laboratory. After the analysis the customer receives a complete report, which contains a recommendation to either increase the strength of or to possibly replace the pickling liquid, depending on the degree of saturation. It also specifies the percentage of nitric acid and free hydrofluoric acid and the concentration of iron, chromium and nickel. Based on this data, the customer will be advised on what is required or should be added in order to optimise the pickling bath.

Removal and disposal of the rinse water

After pickling the stainless steel, the treated surface should be rinsed with water. The water contains a small amount of pickling acid and dissolved alloying elements, such as iron, chromium and nickel. The rinse water should not be drained in a municipal sewer system, because:

- the pH of the waste water is too low (acidic)
- the waste water contains fluoride, originating from hydrofluoric acid
- in addition to iron, the waste water also contains heavy metals like chrome, nickel and molybdenum.

If the detoxification of the collected rinse water is not done in-house, a certified licence holder must drain and dispose of the waste water. The rinse water is collected at the customer in, for example, 1,000 litre multi-boxes or by using a tanker to collect very large quantities. All legal obligations pertaining to transport and administration are then taken off your hands.



If this aspect has to be carried out in-house as well, there are suppliers of detoxification facilities for rinse water originating from pickling stainless steel. The rinse water is collected and if required, automatically neutralised in batches. After neutralisation, the treated rinse water is filtered and, after analysing, drained by means of a sewer.

The installation is designed and tailored to the customer's specific needs.

Removal and disposal of pickling liquid

If the pickling bath is saturated, the pickling liquid should be disposed of and replaced. A licence holder can take care of the removal and disposal of the used pickling liquid. Usually, the removal of the saturated pickling liquid and the delivery of new pickling liquid takes place at the same time. In doing so, transportation can be reduced and all chemicals-handling is taken off your hands. Finally, the legally required administration pertaining to the waste is taken care of.

The most common and suited method to neutralise waste water before disposing of it on the sewer is called D.N.D.:

Detoxification, **N**eutralisation and **D**rainage.

This results in water-insoluble sludge, through precipitated heavy metals. This process can be disturbed by aqueous degreasers, which may include so-called hard complex binders (EDTA and NTA). The use of these products should therefore be avoided.

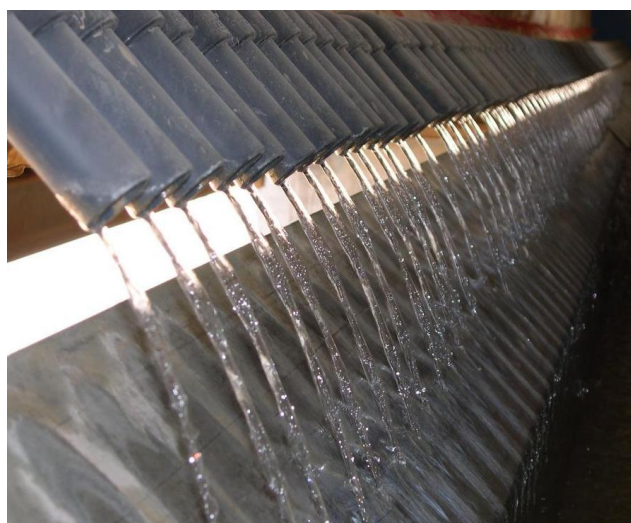
Advice on setting up a pickling location and applying for a licence

Several aspects are involved in managing your own stainless steel pickling. There are the necessary licences, emission standards, safety and practical design of a pickling location and the other aspects as described above.

Our organisation has extensive experience in collecting rinse water, rinse water detoxification, acid-resistant floor coatings, use of acid-resistant materials, logistical aspects pertaining to pickling, use of safety equipment, etc.

In addition, Vecom can assist you with all the aspects as described in this bulletin.

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