

Steel Industry: Analysis of Acids and Iron in Pickling Baths

Steel is one of the most important raw materials and serves as the starting material for innumerable products. An extremely important part of steel production is the pickling process in which impurities such as mill scale produced during high temperature rolling are removed and the surface prepared for subsequent process steps. At the same time interfering annealing colors are removed while the surface is being passivated by the formation of a protective layer to protect against further corrosion.

The pickling baths used are made up of diluted acids and can vary depending on the grade of steel being treated. Most commonly used are hydrochloric or sulfuric acid or are mixtures of acids such as HNO_3/HF , or $\text{H}_2\text{SO}_4/\text{H}_3\text{PO}_4/\text{HF}$. While pickling removes impurities, the acids used also attack the steel surface and partially dissolve it. This over-pickling of the base steel can result in pitting of metal which leads to an undesirable rough, blistered coating in the following galvanizing steps and also causes excessive consumption of the pickling acid. Dissolved iron in the form of iron oxides present in the metal oxide scale effects the pickling rate of steel as iron concentrations increase. This is why it is important that process-relevant parameters such as bath composition are controlled and maintained as accurately as possible to increase the yield while keeping the quality of the product constant. Continuous on-line monitoring of free and total acid and iron content satisfies this requirement and as a result pickling baths can be used more economically and ecologically and operating and disposal costs are considerably reduced.



Pickling line
(source: ANDRITZ)

Application: Total acid, individual acids and iron: HCl , H_2SO_4 , HNO_3 , HF , H_3PO_4 , Fe^{2+} , Fe^{3+} , analysed using accurate titration methods. Performance monitoring with the use of Metrohm Process Analyzers, ADI2016/ADI2045TI depending on single or multi parameter measurements.

Typical Range: HCl 0 – 60 g/L; Fe 10 - 200 g/L

Remarks: A settler can be used to remove dust and particles from the liquid sample prior to the analysis as a robust preconditioning system.