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High Turbulence Pickling

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In steel making, several processing steps are required to produce carbon steels strips. During the hot rolling step, the high temperature and exposure to air and humidity leads to a surface covered by an oxide. The function of the pickling line is to remove this oxide layer to be able to continue processing the steel, such as by cold rolling, welding, coating, painting. Most of the pickling lines remove the scale from the hot rolled strip using a chemical process with strong acids (hydrochloric or eventually sulphuric acid) to chemically remove the oxide. This pickling process has changed little since the year 60's, with some incremental improvements like the incorporation of a mechanical scale breaker (bending the strip before the acid pickling), reduction of the depth of the tanks by using turbulent flows, and the introduction of inhibitors to avoid over-consumption of the steel.

An RFCS funded project named InnoPick was launched in 2023 aiming at a strong modernisation of the pickling process. It focusses on four innovative actuators: pre-heating of the strip, use of organic acids, highly turbulent pickling baths and the utilisation of abrasives particles to reach a sustainable and fast process to remove the scale from carbon steel strips. This paper will focus on highly turbulent pickling, from the design of the modules to their characterisation through laboratory trials. Finally, the paper will illustrate how high turbulence in pickling can decrease the necessary time to fully pickle carbon steel strip. Preliminary laboratory trials performed at CRM have shown a decrease by a factor between 2 and 5 while using turbulent pickling in regards of pickling time.

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