

# PROJECT SPOTLIGHT

Double containment system for the safe transport of acid.

**For a number of environmental reasons along with reducing costs, Outokumpu Stainless AB, a global leader in the stainless steel industry, decided a new acid regeneration plant was required by the company. With this in mind, they also required a new, improved, pipeline to transport a mixture of hydrofluoric (HF) and nitric acid (HNO<sub>3</sub>) from the pickling line to the acid regeneration unit.**

After research was conducted by Swerea KIMAB Outokumpu, it was decided to they would use PVDF material for the piping system, more specifically, double containment piping with a leak detection.

The piping system was required to meet the following conditions:

Design temperature: 70 °C

Design pressure: 6 bar

HNO<sub>3</sub> <250 g/l

HF <80 g/l

Metal content (dissolved) <35 g/l

The majority of the piping system was installed outdoors on pipe brackets at a height of up to 12 m. The exposure to UV radiation and the outside temperature ranging from -30 °C up to +50 °C had to be considered. In order to prevent the mixed acids from freezing, i.e. crystallisation, the temperature must be kept above +7 °C at all times, preferably around +40 °C. This is especially challenging if the pipeline does not operate during the winter months.



## SOLUTION

After consulting with AGRU, the Swedish companies GPA Flowsystems AB and GT Plast Montage AB developed a solution based on a PVDF/PVDF double containment piping system. The inside pipe with an OD 63 mm SDR 21 according to ISO 10931 is capable of withstanding the required operating conditions. The outside pipe with an OD 110 mm SDR 33 provides additional safety in case the inner pipe is compromised and begins to leak. As the outer pipe is made from PVDF, it is fully resistant to the pickling acid.



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In the space between the two pipes a leakage detection system was installed. This meant that the 600m long pipeline was divided into 16 sections, each equipped with a leakage control sensor. In order to avoid a drop in the media temperature below +7 °C, a heat tracing cable was also used, this was installed on the outside surface of the OD 110 mm pipe. Finally, the whole system was covered with an insulation layer.

One other object to overcome was that the entire piping system was to be constructed as a fixed system, i.e. to inhibit a thermal expansion of the inner as well as the outer pipe. This was achieved by using anchors whenever the piping system changed direction and as a result cost-intensive expansion loops on the pipe bridges were avoided.

### INSTALLATION

For the joining of the PVDF/PVDF double containment piping system, simultaneous welding based on non-contact infrared welding was chosen. The welding parameters were developed especially for this project in order to ensure a high integrity of the welds and a long-lasting quality. To guarantee a smooth installation start, welding training was conducted by an experienced project supervisor from AGRU at the commencement of the project.

It took about 10 weeks to finish the installation with the parameters of each weld were automatically recorded by the SP infrared welding machine. Additionally, each weld was marked with a label immediately after it was finished. At the end of the project, a third-party inspection confirmed the joints were of the highest quality.

### DOUBLE CONTAINMENT PIPING = DOUBLES THE SAFETY

Double containment piping systems from AGRU have been used successfully in a wide range of industrial applications for many years. The inner pipe transports the media, with the outer pipe providing extra safety if leakage of the inner pipe occurs. The material is selected in order to ensure full chemical resistance.

For leak detection different methods are available including; the installation of sensors in the space between inner and outer pipe. The outer pipe in combination with a leak detection system provides protection to workers and buildings and helps to prevent secondary damage such as pollution and ground water contamination.

