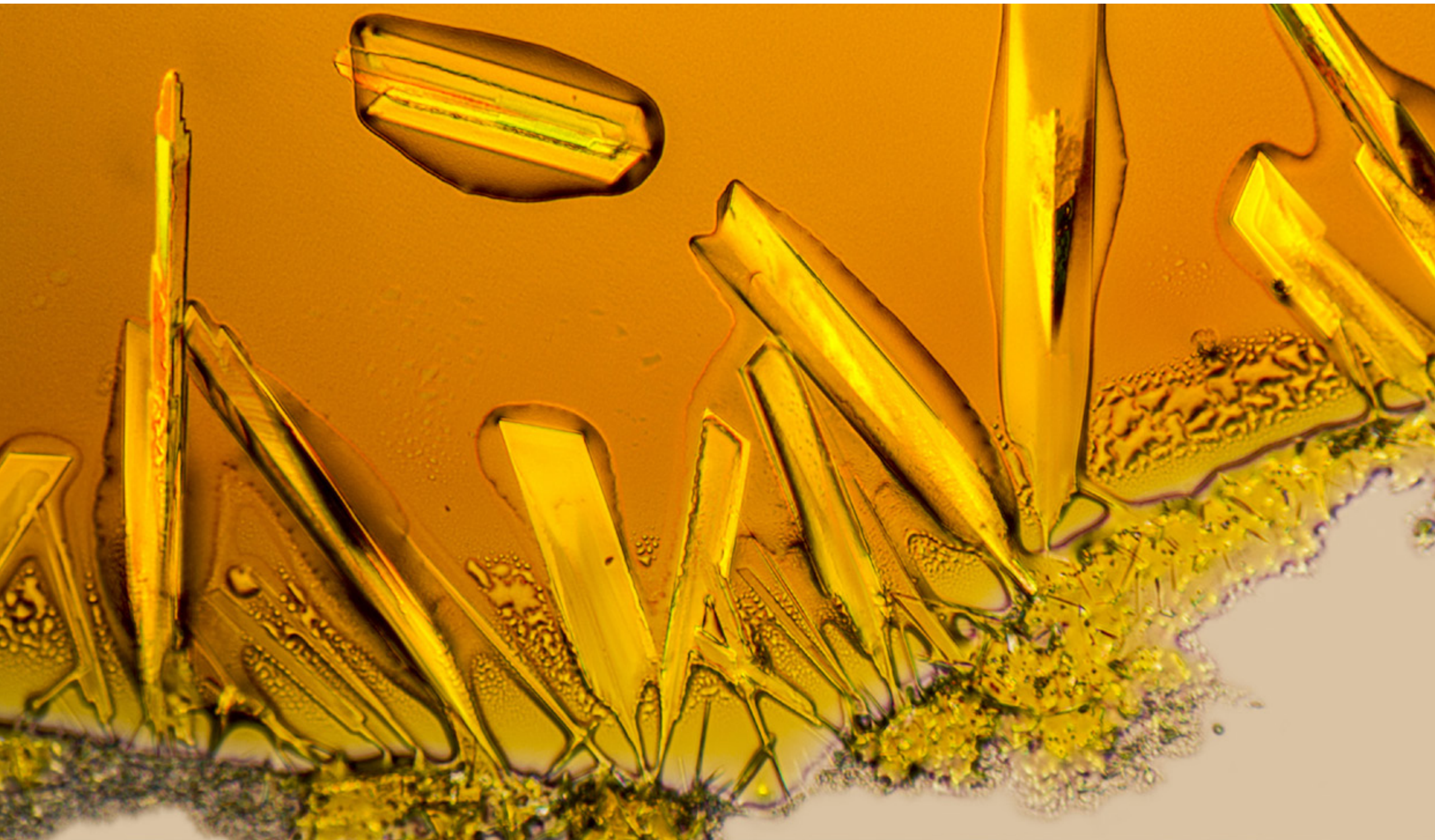
SULZER

CASE STUDY

Sulzer agitator delivers unmatched reliability for ferric chloride production

For chemical producers facing highly corrosive and demanding agitation applications, reliability is paramount. With a broad portfolio and material selection, a comprehensive set of product features, and strong expertise in chemical processing applications, Sulzer experts replaced a client's agitators resulting in a measurable positive impact.



A leading Spanish chemical manufacturer used to experience persistent agitator failures in their critical ferric chloride production. Thanks to a tailored solution from Sulzer, leveraging our deep expertise, the customer has been able to maintain continuous, trouble-free operations over an extended period. Compared to the frequent breakdowns in the past, Sulzer's solution has driven sustained improvements in productivity and safety.

The process: mastering ferric chloride production

The plant produces ferric chloride by reacting ferric oxide with hydrochloric acid. The exothermic main reaction occurs in a large reactor with the approximate dimensions of 4 meters in diameter and 12 meters in height. The product flows by gravity to a lower-level tank, where a vertical agitator keeps around 1% residual solids in suspension and ensures consistent feeding to downstream filtration.

Membrane pumps transfer the ferric chloride solution from this lower tank to filters for purification. The process operates at a challenging temperature of 70°-80°C, conditions that significantly intensify the corrosive nature of the fluid. As a batch process, partial recirculation of the filtered fluid to the lower tank is required to maintain a minimum level for the agitator, ensuring stable agitator operation and preventing mechanical stress.

Ferric chloride is widely used in water treatment as a coagulant, both for drinking water production and wastewater treatment. It can also be used for other purposes, for example as an etching agent for metals.

The problem: a cycle of agitator failures

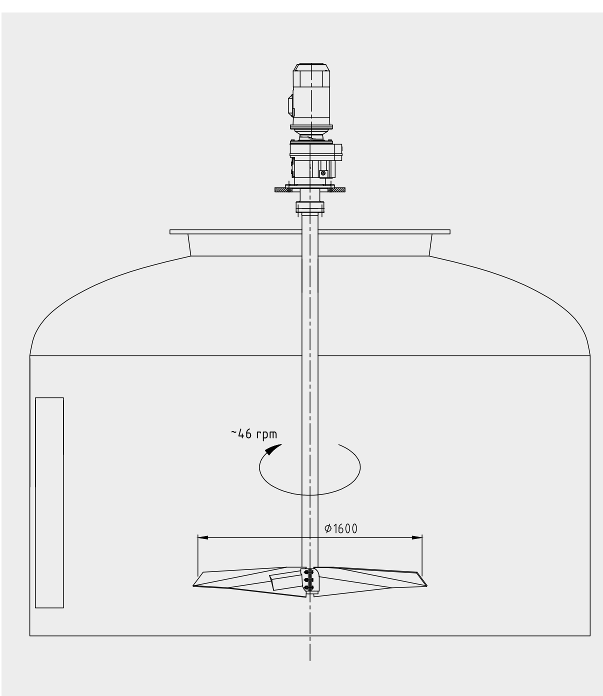
The customer used to face recurring agitator shaft breakages near the blade level in the lower-level tank. Despite trying three different agitator configurations with various protective linings, failures continued to occur, leading to unplanned downtime and costly maintenance.

Design 1: Carbon steel shaft with a 5.5 mm ebonite lining. The lining appeared to be intact, but severe, hidden internal corrosion of the carbon steel led to premature fatigue failure.

Design 2: Carbon steel shaft with a 0.71 mm ethylene chlorotrifluoroethylene (Halar) lining. This thin lining was highly prone to scratches and abrasion, after which rapid corrosion of the carbon steel occurred, leading to shaft breakage.

Design 3: Carbon steel shaft with a 5.1 mm butyl lining. Initially resistant, but ultimately heavy internal corrosion developed beneath the lining, causing failure.

None of these linings provided a fully reliable barrier against hot, corrosive ferric chloride. Once the solution penetrated, catastrophic shaft failures followed, often without visible external warning.



SALOMIX LV agitator

The solution: Sulzer's titanium agitator for unrivaled performance

Sulzer engineered a robust solution for the customer, a SALOMIX™ vertical agitator with all wetted parts meticulously crafted from grade 2 titanium, a material renowned for its exceptional corrosion resistance in aggressive environments like hot ferric chloride.

The agitator shaft is strategically longer than in the previous designs, ensuring constant impeller submersion. This prevents dynamic stress and fatigue on the upper shaft and bearings caused by the pendulum effect and inadequate liquid dampening, both of which were critical contributors to the past failures.

Key specifications of the engineered Sulzer agitator were as follows:

Agitator: SALOMIX™ LV-5,5/32,05.

Motor and gearbox: Robust units selected for efficiency and reliability (ABB M3BP IE3 IP55, SEW RF97 gear, ratio 1:32), with enhanced protective coatings.

Coupling: Titanium grade 2, ensuring consistent corrosion resistance.

Impeller: Efficient 2-bladed AF paddle (1600 mm diameter), operating at ~46 rpm for effective solids suspension.

Agitator shaft: Hollow, single-piece titanium grade 2 unit (114.3 mm diameter, 6 mm wall thickness, ~2.87 m length).

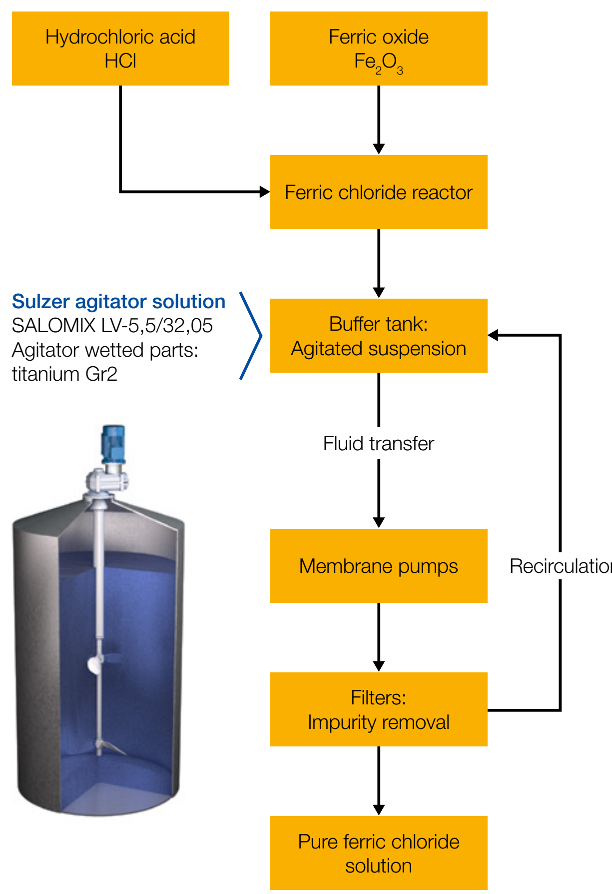
Wetted parts material: Titanium grade 2 for the entire shaft and impeller, providing unparalleled, inherent resistance to the aggressive hot ferric chloride without reliance on external linings.

The results: proven reliability in operation

Since installation, the Sulzer agitator has been operating continuously under demanding conditions showing no signs of wear or corrosion. In addition, with no lining present, any potential surface changes on the titanium parts would be immediately visible, simplifying inspection and maintenance.

This success story demonstrates Sulzer's ability to deliver reliable, engineered solutions for the most challenging industrial processes. Beyond agitators, Sulzer's comprehensive portfolio of process equipment ensures long-term performance, enhanced operational safety, and peace of mind for customers worldwide.

Process flow diagram: ferric chloride production



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