

23-channel vs. 31-channel ceramic membranes for degreasing bath

Key points of this case study

- A large European company installs an alkaline degreasing bath filtration unit with 31-channel ceramic membranes;
- After three years of constantly blocked membrane channels and increasing downtime, decision is made to trust TAMI Industries and install 23-channel ceramic membranes.

Degreasing bath in metal surface treatment

Metal parts used in multiple industries present impurities on their surfaces and must be cleaned before receiving further treatment, such as painting. Oil is the main contaminant, which can be washed with an alkaline solution containing surfactants; the degreasing bath solution.

The presence of emulsified oil, detergents, solid impurities and the high pH make degreasing bath solutions a challenging effluent to treat. Therefore, the goal is to reuse the same solution for as long as possible and reduce the total volume of effluent generated, without compromising the quality of the bath.



Degreasing bath is a technology used in industries such as car manufacturing

Ceramic TFF is the solution

Ceramic Tangential Flow Filtration (CTFF) is the most appropriate technology to treat alkaline degreasing bath solutions. In ultrafiltration (UF), it can concentrate the oil in emulsion (retentate) and release a clean stream of degreasing bath solution ready for reuse (permeate). In practice, CTFF units can concentrate oil to up to 50% and reduce its concentration in the permeate to less than 20ppm.

Membranes made of polymeric material cannot resist the high pH and temperature, and they lack the robustness required for this use. It is also not possible to clean the polymeric membranes with aggressive cleaning chemicals at high temperatures to fully regenerate their performance after each CIP.

This is the reason why ceramic membranes are the best fit for this application.

The case of a European customer

In 2014, a large European company (Company A) purchased a CTFF unit for the treatment of its alkaline degreasing bath.

Guided by misleading claims and recommendations, Company A accepted to have 31-channel ceramic membranes installed in its CTFF unit, expecting the system to deliver both the flowrate and the steady operation that had been promised. Soon they realized that 31-channel membranes were not

the best choice and started the search for alternatives.

Problems from day 1

The frequent need to stop the unit for cleanings due to blocked membrane channels was noticed from the start-up of the unit with 31-channel membranes.

It is usual for the concentration of suspended solids in the retentate to oscillate due to variations in the process, but the 31-channel membranes in use, with a narrow channel diameter of 2.8mm, were not suitable for this variation, resulting in blocked membrane channels. The solution to this problem is to use membranes with a wider membrane channel diameter, but the initial supplier could only supply membranes with a wider channel diameter by reducing the filtration surface.

The increase in downtime caused by the frequent need to stop the unit for cleaning reduced significantly its availability, which affected the lifetime of the degreasing bath solution due to insufficient oil removal.

This resulted in a higher consumption of new degreasing bath solution, and the frequent need to discharge the entire solution overloaded the wastewater treatment plant.

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Palliative solution

Unable to find a solution for the problem after following multiple recommendations given by the initial supplier, Company A made the decision to operate the CTFF unit at 50% of its design capacity. The alternative found was to continue the frequent changes of the entire degreasing bath solution and hire a third-party company to collect and treat the used solution externally. This situation increased not only the operational cost but also the environmental impact of the operation.

The answer comes from TAMI, 23-channel membranes

Company A approached TAMI Industries while searching for alternatives to reduce the blockage of membrane channels without losing filtration surface. After analyzing the situation and based on previous experience, TAMI Industries was able to propose a solution with minimal disruption to the existing process. This is how, after less than three years of operation, all 31-channel membranes were replaced by TAMI Industries' 23-channel ceramic membranes, finally achieving the desired availability of the unit.



TAMI Industries' 23-channel ceramic membrane, with non-circular channels

Difference between 23-channel and 31-channel

The number of channels is not the only difference.

23-channel membranes with non-circular channels produced by TAMI

Industries are the result of three decades of R&D and innovation that allowed the combination of superior filtration surface and large hydraulic diameter in the same product. It offers 0.35m² of filtration surface per filter element and channels with a hydraulic diameter of 3.5mm. This is a patented product of TAMI Industries that had its advantages and reliability tested extensively in real-life industrial installations.

On the other hand, alternative 31-channel membranes are equipped with circular channels, and despite of the higher number of channels they offer slightly less filtration surface per filter element (23-channel 0.35m² vs. 31-channel 0.34m²). The 31-channel membranes, often offered as the alternative to TAMI Industries' 23-channel membranes, also present the disadvantage of having narrower channels (3.5mm vs. 2.8mm). Narrower channels mean less space for the solution to flow through them, which increases the risk of having the channels blocked by solids.

	23-channel	31-channel
Supplier	TAMI Industries	Alternative
Channel type	Non-circular	Circular
Hydraulic diameter	3.5mm	2.8mm
Filtration area	0.35m ² (per element)	0.34m ² (per element)

TAMI Industries' 23-channel vs. Alternative 31-channel membranes

Due to the relatively low technological requirements and expertise needed to manufacture them, 31-channel membranes are not patented products, and therefore produced by multiple suppliers at varying levels of quality.

Learnings from this case and recommendations

When purchasing industrial equipment and spare parts, it is easy to be lured by bold (and often empty) claims promising superior performance and cost savings. However, the decision to use one or other product in industrial environments must be made based on facts, and above all based on the technical compatibility and specification of the process.

As much as some alternatives seem to be attractive in the first instance, a thorough technical assessment is crucial to avoid costly mistakes.

This is even more true when dealing with CTFF. In CTFF, the recommendation is to always perform extensive pilot testing prior to building the unit, in order to design the most optimized CTFF system for each project based on empirical data. This means that designing or changing the operating parameters and parts of CTFF units without first assessing the consequences will always result in a high risk of losing performance and creating unnecessary additional costs.

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