Maximizing the Service Life of Process Tanks

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PVDF liners have a proven history with delivering end users longer lasting, lower maintenance plating tanks.

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Electroplating or surface finishing processes are commonly used to provide increased wear and corrosion resistance to finished parts. Many finishers, however, are burdened by corrosion of their own equipment. Process or dip tanks hold aggressive solutions that are frequently at elevated temperatures. It is imperative these tanks withstand aggressive conditions to maximize productivity and limit production downtime. Repair or replacement of failed tanks and linings/liners drastically cuts productivity and can become a costly financial burden.

Steel tanks are known for their high temperature ratings and mechanical strength, but often cannot be used to contain plating solutions. These corrosive solutions attack steel, even stainless steel, and can lead to leaks and premature failure. The common alternatives to steel tanks include using plastics, both as liners and free-standing structures. Plastics protect the steel from corrosion and the solution from contamination. Plastics such as flexible polyvinyl chloride (PVC-P) and propylene (PP) are common alternatives to solid steel

tanks. However, as temperatures climb and chemistries become more complex, these materials face challenges. Polyvinylidene fluoride (PVDF) liners have proven to be a higher temperature, more chemically resistant and robust option.

Materials of Construction

The most common materials used as process tanks include steel with a PVC-P lining or PP tanks. While displaying "good enough" chemical resistance in some applications, there are many instances where aggressive plating mixtures are challenging for PVC-P or PP. Many finishers are no longer satisfied with "good enough," therefore demanding a higher quality, longer lasting and more trouble-free tank. While PVC-P lined steel tanks do not pose a fire risk, PP tanks have a high fire risk associated with elevated temperatures and electric immersion heaters. Polypropylene tanks are quickly combustible and difficult to extinguish. The limited service life, high cost of repair or replacement, desire for minimized unplanned downtime, and risks associated with these commonly used tank materials have led many finishers to evaluate their tank purchase decision-making process. Many have come to the conclusion that spending more upfront can greatly reduce the total cost of ownership over the lifetime of a process tank.

Table 1: Properties of Commonly Used Lining Materials

	Tensile	Impact	Abrasion	Cont. Temp	LOI
	ASTM 638 73°F/23°C	ASTM D256 73°F23°C	(mg/1,000 cycles) CS-17 1,000g:pad		
Polypropylene	3,000 psi	1-3	15-20	80°C	17
Flexible PVC	2,000 psi	No Break	12-20	80°C	30*
Rubber	1,000 psi	No Break	70-90	85°C	20
Flexible PVDF	5,500 psi	4-8	6-9	140°C	42*
					*Denotes self-extinguishing

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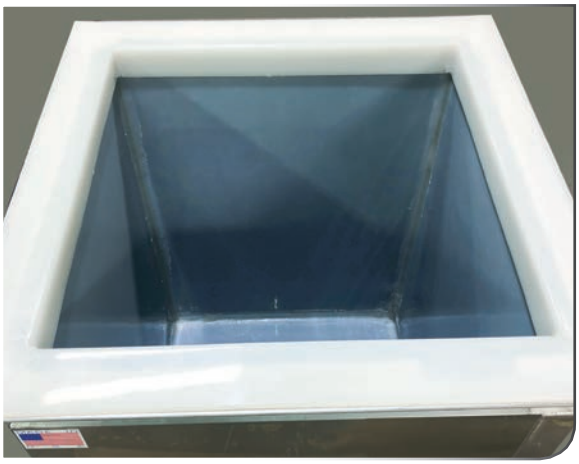

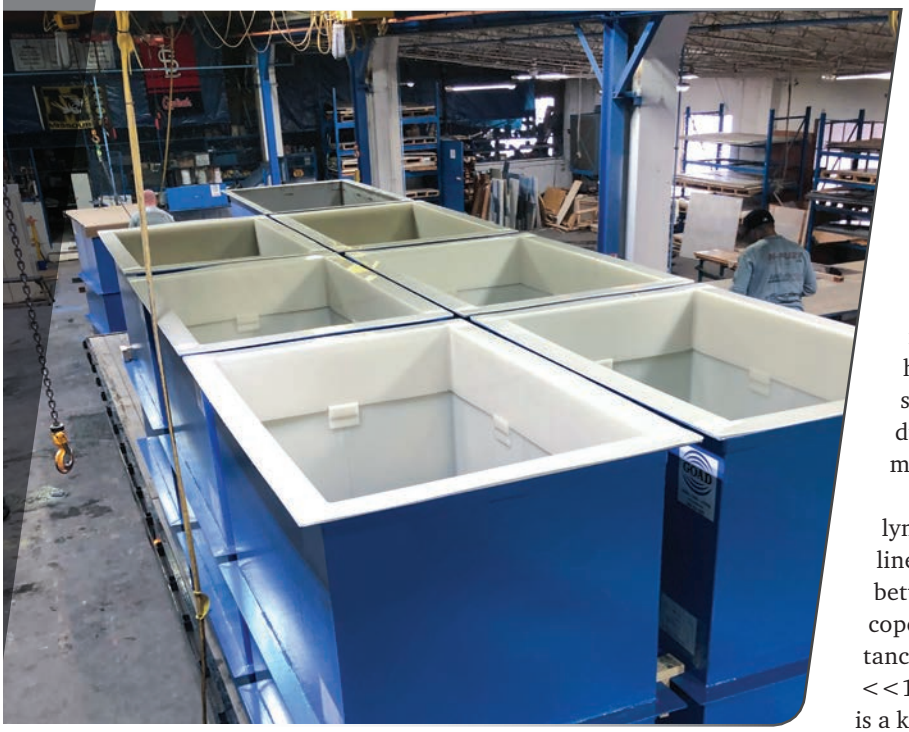

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PVDF Liners Offer Upgraded Solution

For finishers who desire longer tank life, PVDF is increasingly specified as a construction material. PVDF can outperform its competition by providing longer lasting and trouble-free containment for the most aggressive plating solutions, even at elevated temperatures.

PVDF falls into a category of plastics known as fluoropolymers. In general, the fluoropolymer family is known for its robust chemical resistance, high purity, heat and temperature resistance, and good flame and smoke properties. PVDF is selected for plating tanks due to its superior permeation resistance and strong mechanical properties.

Special formulations of PVDF, known as PVDF copolymers, are the main materials used as tank linings or liners. PVDF copolymers have higher flexibility and better ductility than standard grades of PVDF. The PVDF copolymers also exhibit a wider range of chemical resistance, allowing them to be used in applications from pH <<1 to 13.5. PVDF is highly abrasion resistant, which is a key property to ensure integrity of the liner. Table 1 compares the properties of PVDF to other tank liner materials.

PVDF Fabrication

As finishers become aware that there are longer lasting solutions available, PVDF is increasingly in demand. However, it is not only proper material selection that affects the life span of a process tank, but also the experience and qualifications of the fabricator constructing the tank. Qualified fabricators should have fabrication standards and procedures in place, and utilize AWS-certified plastic welding technicians. Newer plastic fabrication equipment and patented welding advancements allow tanks and liners to be constructed with only the highest quality machine welds.

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Here are two case studies of the successful implementation of PVDF copolymer liners:

Solution 1 — Improving Service Life and Eliminating Contaminants: A landing gear processor was told they would have the latest and greatest in material when they elected to have their hard-chrome plating tanks lined with fiberglass overlaid with an exotic resin. In the first year, the fiberglass linings appeared to perform well, but soon thereafter the fiberglass linings began to come under attack from the chromic acid. The customer was left with failing tanks and contamination issues as the fibers from the failed lining were found in the plating bath. In 2015, 12 PVDF copolymer liners were installed in the customer's hard-chrome plating tanks. A significant advantage of the PVDF copolymer liners is that they were installed over the failed fiberglass, eliminating the expense of new steel tanks as well as demolition and disposal of the failed ones. These PVDF liners have been in continuous operation since

installation and show no sign of degradation, outperforming all alternative materials.

Solution 2 — Total Cost of Ownership/ROI: An automotive parts manufacturer had seven large hard-chrome plating tanks. Between the seven tanks, they were stripping and relining the PVC-P lining of at least one tank a year (an approximate annual expense of $55,000). With the customer's willingness to make a larger initial investment, they purchased seven PVDF copolymer liners for their hard-chrome tanks. After installing the seven PVDF liners over flexible PVC-lined steel tanks in May 2001, the customer never required the lining supplier to rework these hard-chrome tanks. The lining supplier was advised that the customer's investment paid off in a couple of years by eliminating downtime and repair expenses. Unfortunately, this facility closed its doors in 2010 after nine years of the PVDF liners continuous service in the chrome tanks.

The materials of construction utilized in plating tanks are often the deciding factor in maximizing tank service life. Chemical resistance and temperature resistance, as well as good anti-flammability properties, are key properties to consider. PVDF liners have a proven history with delivering to end users longer lasting, lower maintenance plating tanks.

Watch The Video

See The Video

Watch RF welded panels for plating tanks take shape in a time-lapsed video. Snap the QR code, or visit **short.pfonline.com/tanks** or scan the QR code above.

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