

	Hydrochloric acid (HCl) (various concentrations)
Typically used casing material	PP, PE-UHMW, PVDF
Typically used impeller material	PP, PE-UHMW, PVDF
Typically used secondary seals	EPDM, FKM+, FFKM
Options after PFAS-restriction	
Used casing material	PP, PE-UHMW (lower temperatures and concentrations only!), Hastelloy-C and Titanium
Used impeller material	PP, PE-UHMW (lower temperatures and concentrations only!), Hastelloy-C and Titanium
Used secondary seals	EPDM for lower temperatures, but no options for higher temperatures
Consequences without PFAS	Handling of HCl at higher temperatures and concentrations will be much more expensive, complicated and insecure due to missing alternatives, that are chemically evenly resistant. Materials for secondary seals are missing!
Use of Fluid and Application Examples	Pickling and others In steel pickling where the acid is used to remove iron oxide and scale from the metal surface prior further processing such as coating. The extraction of crude oil requires hydrochloric acid for injection into rock and for cleansing of impurities in the well. Hydrochloric acid is also used in the production of many food ingredients such as corn syrup, gelatine, sauces and preservatives. Production of leather products PVC material The production of household cleaning products.

	Producing organic and inorganic compounds in waste water treatment, polymers and battery manufacture.
	Hydrochloric acid can be used to process steel for the building and construction industry. It is used in the chemical industry in the large-scale production of vinyl chloride used to make PVC, and it is one of the chemicals used to produce polyurethane foam and calcium chloride.
	Common end uses for hydrochloric acid include household cleaners, pool maintenance and food manufacturing.

Mixed acids (HNO ₃ /HF/HCl) in various combinations and concentrations
PE-UHMW (only in special cases), PVDF
PE-UHMW (only in special cases), PVDF
FKM+, FFKM
PE-UHMW (only in special cases)
PE-UHMW (only in special cases)
No known options on the market
As per our research there are no known metallic or non-PFAS containing materials, that are resistant at mixed acids (HNO ₃ /HF at different concentrations). Thus, the industry around Stainless steel (sheets, coils, other semi-finished parts) will be impacted by shortages, lower quality products and increased market prices.
Pickling and others
In stainless steel pickling where the acid is used to remove iron oxide and scale from the metal surface prior further processing such as coating.

Concentrated Sulfuric Acid (H ₂ SO ₄) 96-98%	Bromine (Br ₂)
PVDF, PFA, PTFE	PVDF, PFA, PTFE
PVDF, PFA, PTFE	PVDF, PFA, PTFE
FKM+, FFKM	FPM, FKM+, FFKM
Hastelloy C, Titan	No known options on the market
Hastelloy C, Titan	No known options on the market
No known options on the market	No known options on the market
Without the usage of PFAS containing materials the handling of H ₂ SO ₄ will be much more expensive, complicated and insecure due to missing alternatives, that are chemically evenly resistant along the different concentrations	Without the usage of PFAS containing materials the handling of Br ₂ will be much more expensive, if possible at all, complicated and insecure due to missing alternatives, that are chemically evenly resistant along the different concentrations.
Sulfuric acid is also a key substance in the chemical industry. It is most commonly used in fertilizer manufacture but is also important in mineral processing, oil refining, wastewater processing, and chemical synthesis.	Bromine is used in the production of catalysts, such as aluminum bromide.
Production of hydrochloric, nitric and phosphoric acids	The chief commercial source of bromine is ocean water, from which the element is extracted by means of chemical displacement (oxidation) by chlorine in the presence of sulfuric acid through the reaction For Ocean water, H₂SO₄ and Chlorine plastic pumps with PFAS-containing materials are state of the art technologies, without non-PFAS containing options, as shown in this table.
Phosphate fertilizer, where sulphuric is converted into phosphoric acid	
Petroleum production where impurities are removed by the acid	
Paper industries where sulphuric is used as part of chlorine dioxide generation and pH correction	
Sugar bleaching	
Wastewater treatment	

Synthetic textiles production such as cellulose fibres	
Pickling of metals	
Catalyst agent for crude oil and petroleum production	
Agrichemicals for potato crop spraying	
Production of Rayon as a reagent with the pulped wood product	

Concentrated Nitric Acid (HNO ₃) 65% and higher
PVDF, PFA, PTFE
PVDF, PFA, PTFE
FKM+, FFKM
Hastelloy-C and Titanium subject to a degree of corrosion
Hastelloy-C and Titanium subject to a degree of corrosion
No known options on the market
Without the usage of PFAS containing materials the handling of Nitric Acid will be much more expensive, complicated and insecure due to missing alternatives, that are chemically evenly resistant.
Nitric acid is used in the production of ammonium nitrate for fertilizers, making plastics, and in the manufacture of dyes. It is also used for making explosives such as nitroglycerin and TNT. When it is combined with hydrochloric acid, an element called aqua regia is formed.
Used in compounds for explosives and munitions
Processed with ammonia for the production of ammonium nitrate for fertilizer
As an oxidizer in liquid rocket fuel
Treatment of wood for ageing/aesthetics
Nylon/Polyurethane
Pickling of stainless steel

CIP solutions
Processing of spent nuclear fuel
Nitric acid is one of the three most important acids in the chemical industry. It is mainly used for the production of nitrogen fertilizers. It is also used as a starting material for the synthesis of explosives, plastics and man-made fibers, and it is used for pickling metals.

Concentrated Phosphoric Acid (H ₃ PO ₄) 95%	Sodium Hypochlorite (NaOCl) up to 15%
PP, PE-UHMW, PVDF, PFA, PTFE	PE-UHMW (depending on concentration), PVDF, PFA, PTFE
PP, PE-UHMW, PVDF, PFA, PTFE	PE-UHMW (depending on concentration), PVDF, PFA, PTFE
FPM, FKM+, FFKM	FPM, FKM+, FFKM
Lower temperature (40°C): PE-UHMW, PP. Higher temperatures: Hastelloy-C, specifically B-3, G-30 and G-35	PE-UHMW (depending on concentration)
Lower temperature (40°C): PE, PP. Higher temperatures: Hastelloy-C, specifically B-3, G-30 and G-35	PE-UHMW (depending on concentration)
No known safe options especially at higher temperatures	EPDM (more or less chemical attack)
Without the usage of PFAS containing materials the handling of Phosphoric acid will be much more expensive, complicated and insecure due to missing alternatives, that are chemically evenly resistant. Especially for the secondary sealings there are no suitable non PFAS-containing options.	Without the usage of PFAS containing materials the handling of NaOCl will be much more expensive, complicated and insecure due to missing alternatives, that are chemically evenly resistant. Especially for the secondary sealings there are no suitable non PFAS-containing options.
Phosphoric acid is used in the manufacture of superphosphate fertilisers, livestock feeds, phosphate salts, polyphosphates, soaps, waxes, polishes and detergents	Sodium hypochlorite is most often encountered as a pale greenish-yellow dilute solution referred to as liquid bleach, which is a household chemical widely used (since the 18th century) as a disinfectant or a bleaching agent.
The majority of phosphoric acid is used in the production of fertilizer where the acid is reacted with the minerals found in phosphate rock to produce phosphate salts.	Disinfection
For use in rust treatment, phosphoric acid solutions are created as a dipping bath or gel to applied to rusted areas.	Bleach/Whitening
Phosphoric acid also used for the etching of metal and the roughing of tooth enamel during dental treatments such as root canals and tooth whitening.	
For its sharp, tangy taste, phosphoric acid is used as a flavouring in many soft drinks, typically colas.	
Other uses include pharmaceuticals, cleaning products and as a chemical reagent.	

Chromic acid (H ₂ CrO ₄)	Fatty Acid Methyl Ester (FAME)
PE-UHMW, PVDF	PVDF, PFA, PTFE
PE-UHMW, PVDF	PVDF, PFA, PTFE
FPM, FKM+ FFKM	FPM, FKM+, FFKM
PE-UHMW (depending on concentration)	stainless steels, Hastelloy, a lot of other metals
PE-UHMW (depending on concentration)	stainless steels, Hastelloy, a lot of other metals
No known options on the market	No known options on the market
A handling especially at higher temperatures would not be possible any more.	No suitable secondary seals would be available.
Chromic acid or sulfochromic is a strong oxidizing agent that is used to clean laboratory glassware. It has the ability to brighten raw brass and therefore it is used in the instrument repair industry.	Biodiesel
The production of potassium dichromate, ammonium dichromate and chromium dioxide	Production of biodiesel

Toluene	Brine, containing chlorine (from Chlorine-Alkali-Electrolysis)	Sodium Hydroxide (NaOH) 50%, 180 °C (Chlorine-Alkali-Electrolysis)
PVDF, PFA, PTFE	PVDF, PFA, PTFE	PFA, PTFE
PVDF, PFA, PTFE	PVDF, PFA, PTFE	PFA, PTFE
FPM, FKM+ FFKM	FPM, FKM+, FFKM	FFKM
stainless steels, Hastelloy, a lot of other metals	Hastelloy C types	Nickel
stainless steels, Hastelloy, a lot of other metals	Hastelloy C types	Nickel
No known options on the market	No known options on the market	No known options on the market
broadly used solvent for many applications	Most important: Chlorine manufacturing, cooling fluids	Chlor-Alkaline Electrolysis
Important base chemical for the chemical industry	Sea water desalination	Vaporating caustic soda
	Chlor-Alkaline Electrolysis	

