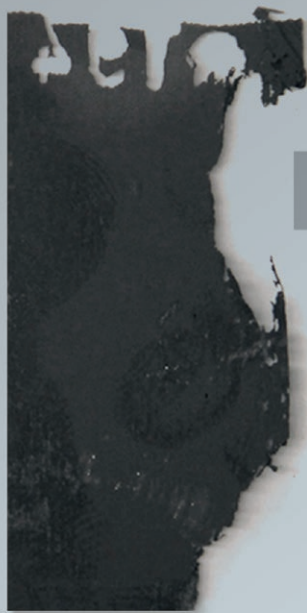


Corrosion inhibitors

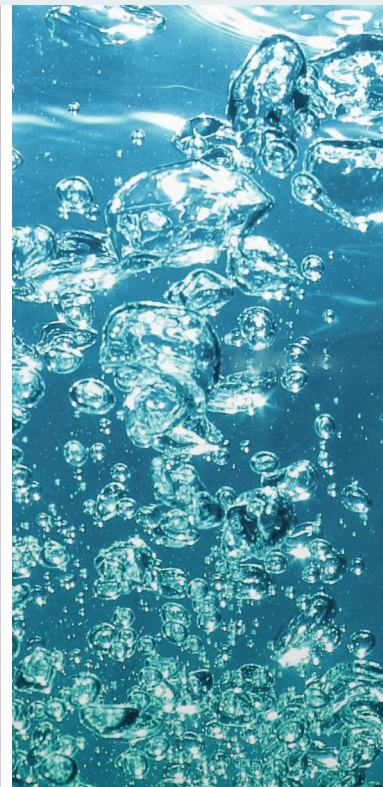
The complete product range for optimum material protection against acid attacks during acid dry cleaning



Without inhibitors



With KEBO inhibitors



Corrosion Inhibitors – the optimum protection against aggressive media

Acids play an important role in many industries

Hydrochloric acid is one of the most important inorganic acids in the chemical industry. It is used in the processing of ores as well as for pickling and etching in metal processing. Sulfuric acid is also an important basic chemical in the industry. It is used to manufacture products such as fertilizers, dyes, and detergents. The food industry also uses various acids, such as malic acid and citric acid in order to preserve products.

Acids are also used for cleaning – to remove mineral scale such as lime or rust. The challenge: On the one hand, to remove the encrustation completely and, on the other hand, to protect the metal surfaces adequately at the same time. Therefore, special inhibitors are added to the acids to protect the material.

Corrosion inhibitors as material protection

The chemical reaction between the acid and the scales often leads to the formation of corrosive substances or aggressive chemicals that attack the material. This in turn causes the gradual degradation of the surface and that can lead to thin material, cracks, or even perforations.

Corrosion inhibitors are used to prevent this corrosion. They work by inhibiting or slowing down the chemical reactions between the acid and the material of the evaporator, thereby reducing corrosion and extending the service life of the material.

KEBO LITHSOLVENT inhibitors when using existing acids

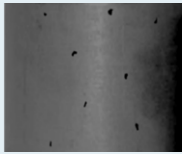
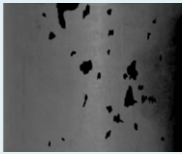
Surfactants contained in KEBO LITHSOLVENT types help the acid to infiltrate the scales. The reaction of the acid with the metals produces hydrogen gas, which blasts the scales from the substrate. Once the metal surface is exposed, the inhibitor will protect it from further attack by the acid. At the same time, detached dirt particles are dispersed.

The most important acids at a glance:

Weak acids	Medium strength acids	Strong acids
➔ Acetic acid (CH_3COOH) ➔ Oxalic acid ($\text{C}_2\text{H}_2\text{O}_4$) ➔ Carbonic acid ($\text{H}_2\text{CO}_3$) ➔ Citric acid ($\text{C}_6\text{H}_8\text{O}_7$)	➔ Hydrofluoric acid (HF) ➔ Formic acid (CH_2O_2) ➔ Phosphoric acid (H_3PO_4)	➔ Hydrochloric acid (HCl) ➔ Sulfuric acid (H_2SO_4) ➔ Nitric acid (HNO_3) ➔ Methanesulfonic acid ($\text{CH}_4\text{O}_3\text{S}$)

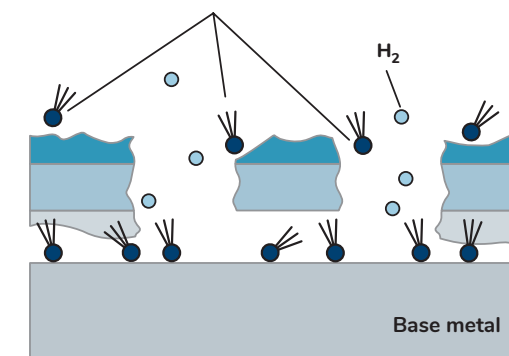
KEBO LITHSOLVENT inhibitors as material protection when using acids

Corrosion inhibitors are special chemical inhibitors that affect a chemical reaction so that it is slowed, inhibited, or prevented altogether. In the case of acid cleaners, this prevents the acid from attacking the material to be cleaned.

Number of acid cleaning actions	After 5 cleaning actions	After 20 cleaning actions	After 27 cleaning actions	After 28 cleaning actions
With protection by KEBO inhibitors				
Without protection				

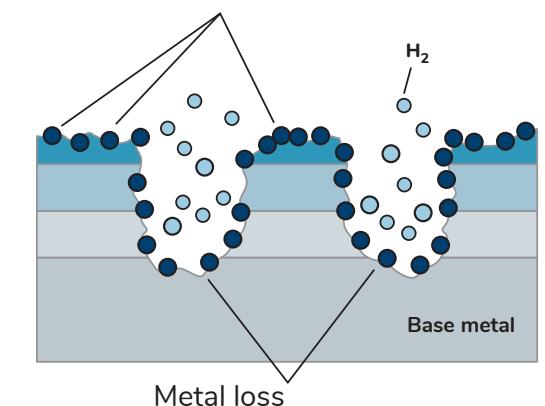
With protection by KEBO inhibitors

Base metal is not attacked



Without protection

Base metal is attacked



A good corrosion inhibitor should have the following properties:

- ➔ High stability against aging, oxidation, or reduction
- ➔ Temperature resistance
- ➔ Immediate effectiveness of the additive
- ➔ No prolonged reaction time for the additive
- ➔ High protective value at a low inhibitor concentration
- ➔ No interfering effects on acid mixture or further processing of treated metal

(By M. H. Akstinat, Waverley-Johannesburg)

LITHSOLVENT Inhibitors for the admixture in acids

Deposits	Acid								Material					Inhibitor	Temperature in °C	Dosage in 5% acid solution ¹ in %	Consistency	Foaming behavior in 5% aqueous solution	VOC in %	Surfactants
	Hydrochloric acid	Hydrochloric and hydrofluoric acid	Phosphoric acid	Formic acid	Citric acid	Amidosulfonic acid (max. 60°C)	Sulfuric acid	Methanesulfonic acid	Steel	Stainless steel	Copper alloy	Aluminum	Zinc							
Inorganic scale such as calcium carbonate, calcium oxalate, silicates, occasionally phosphates, aconates, citrates, and depending on water use also, sulfates or organic coatings	•	•							•		•			→ LITHSOLVENT 620	up to max. 90	0.25	liquid	O	< 1	< 5% cationic and 5 - 10% non-ionic
					•	•			•	•				→ LITHSOLVENT HC MOD	up to max. 100	0.20	powdery	-	none	none
				•	•	•			•		•			→ LITHSOLVENT OT	up to max. 90	0.25	liquid	+	approx. 5	< 20% cationic
				•	•	•			•	•	•			→ LITHSOLVENT 803	up to max. 80	0.20	liquid	O	approx. 70	< 20% non-ionic
	•								•				•	→ LITHSOLVENT HZN	up to max. 40	0.5 - 0.7	liquid	O	none	non-ionic and cationic each 5%
		•		•	•	•			•	•	•			→ LITHSOLVENT 1299	up to max. 80	0.20	liquid	O	approx. 80	< 20% non-ionic
				•	•	•		•	•	•				→ LITHSOLVENT CS	up to max. 60 and 90 ¹	0.25	liquid	+	none	< 25% non-ionic < 10% cationic
			•						•				•	→ LITHSOLVENT PZN	up to max. 50	0.7 - 0.8	liquid	O	approx. 7	2 - 5% cationic und 2 - 5% non-ionic
				•					•				•	→ LITHSOLVENT AZN	up to max. 50	0.7 - 0.8	liquid	O	none	none
	•	•	•	•	•	•	•	•	•	•				→ LITHSOLVENT EB Chloride-free	up to max. 100	0.25	powdery	-	none	0
			•	•	•	•			•	•	•			→ LITHSOLVENT CL 4	up to max. 60 and 90 ²	0.20	liquid	+	< 1	< 1%
			•						•	•	•			→ LITHSOLVENT PF	up to max. 90	0.25	liquid	+	< 1	< 1%
	•		•									•		→ LITHSOLVENT AL	up to max. 40	0.25	liquid	+	< 1	< 1%

Highly concentrated LITHSOLVENT inhibitors for more efficiency and optimum long-term protection of your equipment. Our inhibitors are characterized by their extreme yield. On request, we will determine the mass removal values with and without an inhibitor for you in the laboratory in order to numerically record the subsequent protective effect in your plant.



¹ For formic acid and citric acid up to 90°C, with amidosulfonic acid up to 60°C
² For hydrofluoric acid/phosphoric acid up to 90°C and acid conc. 1 - 2%, with amidosulfonic acid/organic acid up to 60°C and acid conc. 3 - 10%

+ (strong)
O (weak)
- (no)

Your Partner with 100% reliability

Innovative solutions for your industry

We increase the efficiency and quality of your processes

We are KEBO. Our products and services ensure clean processes throughout your production facilities. As specialists for chemical cleaning, water treatment, and corrosion protection, we can always offer you optimum solutions:

- ➔ Customized and individually tailored to your specific needs and challenges
- ➔ With perfect customer service, a high level of commitment, and personalized advice

Our team will be happy to advise you on all matters relating to chemical cleaning, corrosion protection, viscosity reducers, scale preventers, water treatment and conditioning, and much more.

We use state-of-the-art chemical analysis methods and we continuously invest in the latest technologies to provide our customers with innovative and efficient solutions.

Our expertise and years of experience enable us to act as a trusted partner for companies in a wide range of industries. For example, **we specialize in the development and manufacture of high-quality products** that are used in various areas of the food industry, including sugar production, potato processing, starch production, yeast production, and fermentation. Likewise, our customers include companies in the water treatment and steel industries.



KEBO product groups at a glance

Inhibited cleaners

Alkaline cleaners
Neutral cleaners
Acid cleaners
Solvent based cleaners

Corrosion inhibitors

Inhibitors
Standstill preservation
Water treatment (Cooling water)
Water treatment (Boiling water)
Water treatment (Rinsing after pickling)
Pickling inhibitors

Additives

Alkaline cleaning
Acid cleaning

Scale preventers

Food industry
Steam boilers
Cooling water
Industrial water

Defoamers

Sugar production for beet washing
Sugar production for juice extraction
Starch processing
Yeast processing
Fermentation
Technical applications

Biocide

Water treatment

Crystallization

Decolorizers
Viscosity reducers
Crystallization agents



Chemistry is our passion



An effective response for every requirement: not only chemical, but also very personal

We are a globally active company in the specialty chemicals industry. With almost 100 years of tradition, we stand for quality, service orientation, reliability, and innovation.

When it comes to operating your production plants, KEBO products and services ensure clean processes. We meet all of the challenges related to chemical cleaning processes, water treatment, and corrosion protection - whether for the sugar industry, the production of ethanol, starch, and yeast, or for the steel industry. We see ourselves as a partner to our customers and provide our knowledge on an equal footing. Trust, responsibility, and respect are our guiding principles in dealing with colleagues, customers, and nature.

Our services for you:

- Advice from our chemists and engineers in application technology and, of course, also in your planning of the necessary apparatus and operating equipment.
- A worldwide network of competent sales partners who are available to assist you directly on site in analysis, planning, and implementation.

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