



NICASAL[®] FLOCCULANT

A new era of water treatment –
supported by microbes



INDUSTRY



feralco

ALLES GEKLÄRT.

Feralco: Made in Germany – at home in Europe

The Feralco Group is one of Europe's largest providers of aluminium and iron-based coagulants for water treatment, with bases in many European countries. As a specialist in aluminium salts, Feralco Deutschland manufactures primary polyaluminium chloride and aluminium sulphate coagulants.

In addition to this, we also produce aluminium, iron and polymer combination products. Aluminium nitrate sulphates are our special innovation for water cycles, while flocculant aids round off our portfolio of chemical products for water treatment.

Our name and logo

The company name, Feralco, is derived from:

fer | al | co

Ferrum *Alumi-* *Com-*
(iron) *nium* *pany*

Our logo combines the alchemical symbols for iron and aluminium:



WATER



SEWAGE



PAPER



INDUSTRY



EXPORT

Locations

- Headquarters
- Production sites
- Offices



- SWEDEN:**
- › Helsingborg
 - › Kungälv
 - › Sölvesborg
 - › Vetlanda

- UK:**
- › Grangemouth
 - › Widnes

- GERMANY:**
- › Nienburg
 - › Duisburg
 - › Ibbenbüren
 - › Schwarzeide

- THE NETHERLANDS:**
- › Sas van Gent

- FRANCE:**
- › Colombes
 - › Basse Indre
 - › Saint-Clair-du-Rhône
 - › Le-Pont-de-Claix

- SWITZERLAND:**
- › Uster

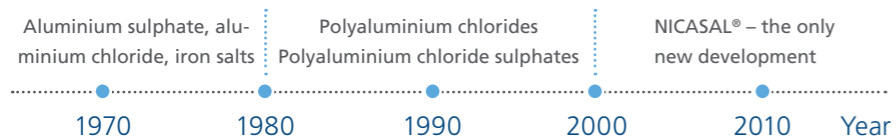
- ITALY:**
- › Millesimo
 - › Livorno

- SPAIN:**
- › Leaburu
 - › Alegia
 - › Valdemoro

A flocculant with no chloride or sulphate – is that possible?

Water recycling is increasingly important, leading to water being reused more often. The resulting cycles of water can be managed in such a way that they are fully closed. However as numerous substances and impurities accumulate in the water during this process, a cleaning stage needs to be incorporated into the water cycle so it is able to function long-term.

Flocculation additives are the best option here:



▶ Unfortunately, both chloride and sulphate products cause issues when used excessively within the water cycle. The solution: NICASAL®



Flocculants

For water cycles:

- ▶ Aluminium sulphate
- ▶ Aluminium chloride
- ▶ Aluminium hydroxychloride (SACHTOKLAR® 39)
- ▶ Aluminium hydroxychloride sulphate (PAPER-PAC™ N / SACHTOKLAR®)

Our top recommendation:

- ▶ Aluminium nitrate sulphate (NICASAL®)



NICASAL® – water cycle purification without the side-effects

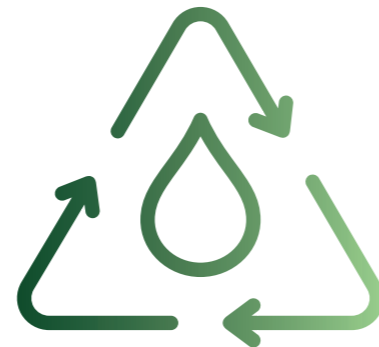
NICASAL® is suitable for a wide range of applications in closed and semi-closed water cycles. NICASAL® achieved equivalent or even improved results compared to comparable polyaluminium chloride products with regard to the following:

- ▶ Reaction speed
- ▶ Floc size
- ▶ Floc stability
- ▶ Residual turbidity of treated water
- ▶ Dosage amounts

NICASAL® is a nitrate-based product. So it doesn't suffer from the disadvantages affecting sulphate or chloride products. And nitrate can be metabolized by bacteria (see box). This means the water cycle can be cleaned without increasing the concentration of unwanted components of the flocculant.

NICASAL®: ALUMINIUM HYDROXIDE NITRATE SULPHATE – $Al(OH)_x(NO_3)_y(SO_4)_z$

Density	1,27
pH value	2,5
Al [%]	5,4
NO ₃ [%]	17,0
SO ₄ [%]	3,0
Basicity [%]	45



Nitrate degradation in practice

Nitrate metabolized into nitrogen

NITRATE ▶ NITRITE ▶ NITROGEN

Every time NICASAL® was added, there was a measurable reduction in the nitrate levels after a few hours or days.

After an adjustment period, the levels of nitrate remained very low, regardless of how much NICASAL® was added. The water cycle had a residual nitrate concentration of 5 to 45 mg/l nitrate.

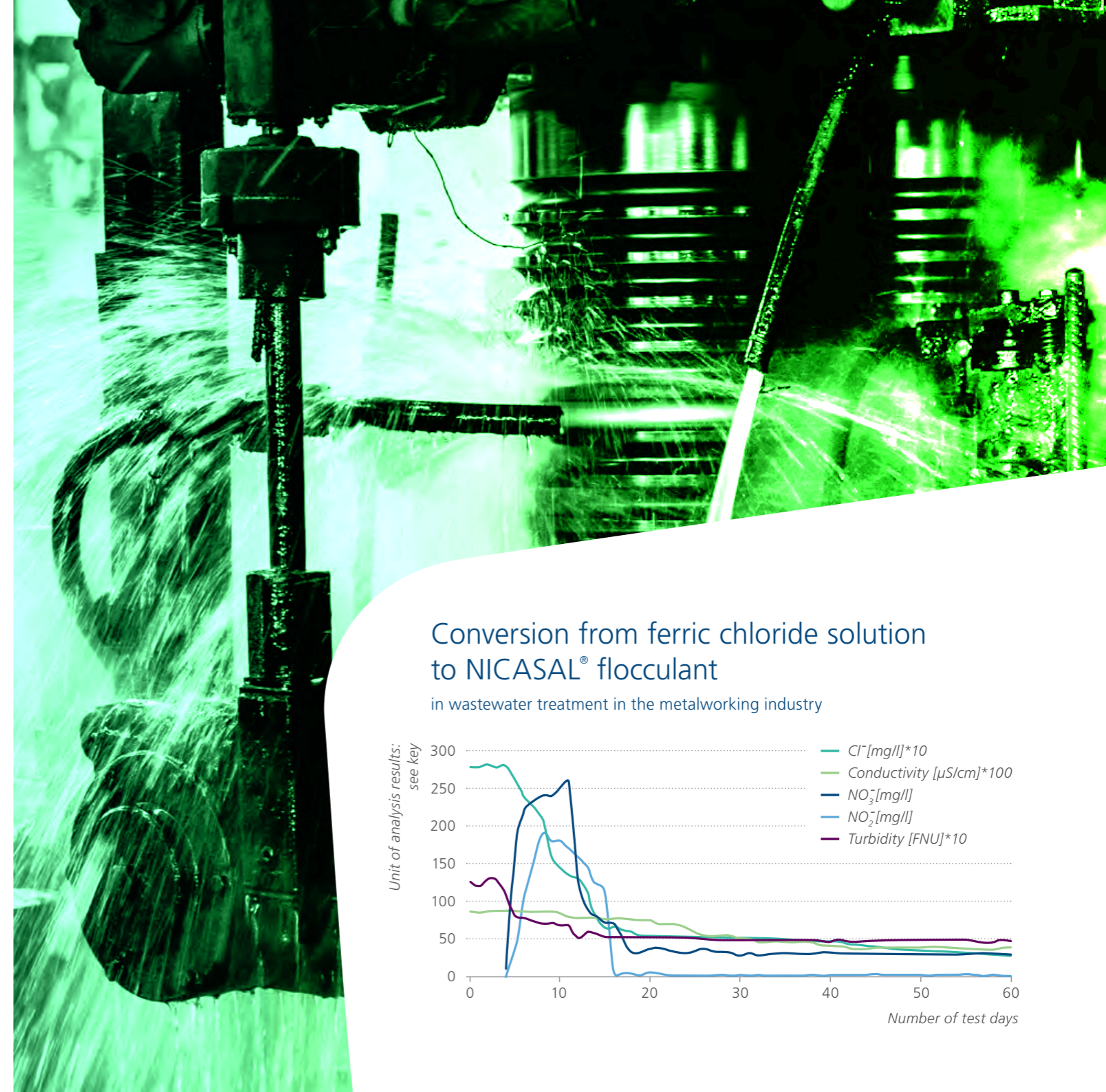
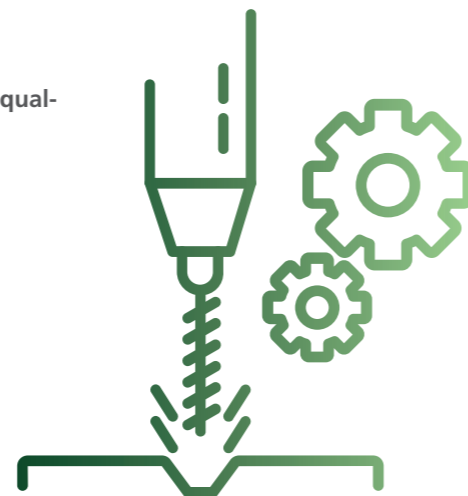
Case study 1: Wastewater treatment in the metal industry

Prior to the introduction of NICASAL®, wastewater had been treated with iron chloride. This process led to issues with corrosion due to the high accumulation of chloride in the system.

Measurable improvements after switching to NICASAL®:

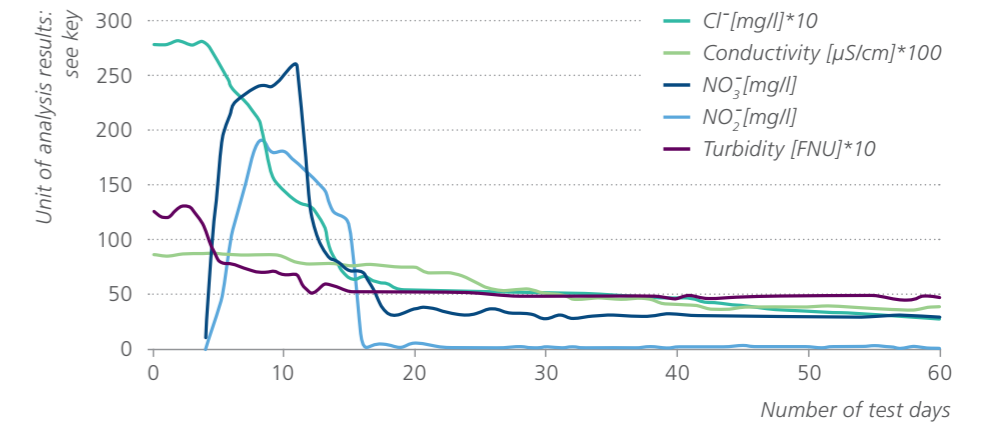
- ▶ Nitrate degradation started after a few days
- ▶ Readings fell after about a week
- ▶ Stable nitrate levels of approx. 40 mg/l after around three weeks
- ▶ Nitrite levels only traceable at the start of testing in the adaptation phase
- ▶ The water system became significantly cleaner
- ▶ Turbidity readings more than halved
- ▶ Significant reduction in salt and chloride levels
- ▶ Conductivity halved to just 4 mS/cm

Summary: In this example, all of the issues relating to corrosion, salinity and the quality of the treated water permanently disappeared.



Conversion from ferric chloride solution to NICASAL® flocculant

in wastewater treatment in the metalworking industry



Case study 2: Wastewater treatment Paint coagulation in the automotive industry

The diagram on the right shows the switch from aluminium sulphate to NICASAL®. The main issue was the high sulphate content in the water cycle.



Measurable changes after switching to NICASAL®:

- ▶ Nitrate degradation started after a few days
- ▶ Readings fell after about a week
- ▶ Nitrate levels stabilised at 50 mg/l
- ▶ Nitrite content less than 1 mg/l
- ▶ Sulphate concentration reduced by > 80 %
- ▶ Conductivity could be reduced by approx. 30 %
- ▶ The water system became significantly cleaner
- ▶ Turbidity readings more than halved
- ▶ Prevention of unpleasant odours caused by hydrogen sulphide

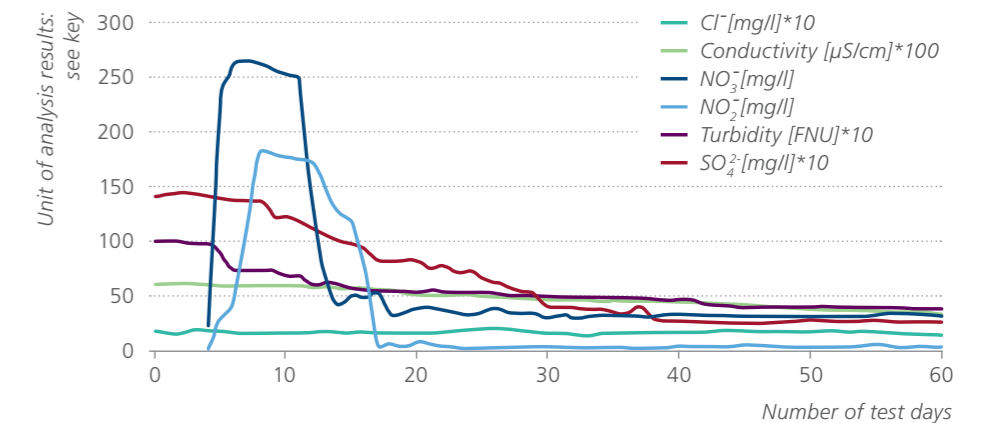
NICASAL® can also be used to prevent the formation of hydrogen sulphide (H₂S). In this case, it is important that NICASAL® is dosed into the system on a continuous basis – as long as the system contains nitrate, the sulphate reduction is limited resulting in significantly fewer unpleasant odours.

Additional benefits of NICASAL®:

- ▶ No need for disinfectant
- ▶ No longer necessary to replace the water after 20 to 30 days
- ▶ No additional downtime of the system
- ▶ Cycle interval tripled
- ▶ Significant reduction in issues relating to sulphate corrosion and gypsum deposits

Switching from aluminium sulphate to NICASAL®

in a paint coagulation of a wastewater treatment plant in the automotive industry

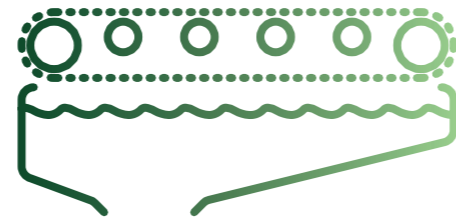


Case study 3: Water cycles in paper production

NICASAL® is ideal for use in the production of paper and cardboard. The product is well-suited for use in fresh water, thick stock, thin stock, white water and wastewater. In this specific case, the dosing for flotation took place in the white water cycle. The denitrification began after just five days, with residual nitrate levels stabilising at 30 mg/l. Nitrite was only detected for a brief period, as in the two case studies outlined above.

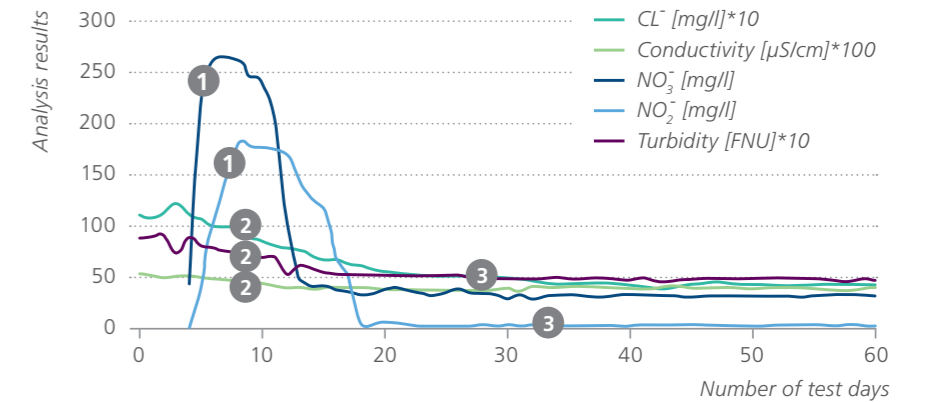
The benefits for paper production:

- ▶ Significant improvement in flotation cleaning performance
- ▶ Turbidity almost halved
- ▶ Significant reduction in salinity, lower conductivity (-20 %)
- ▶ Reduction in chemical oxygen demand (COD) > 30 %
- ▶ 50 % reduction in the concentration of chloride



Paper mill case study:

Replacing polyaluminium chloride (PAC) with NICASAL® – purifying at a dissolved air flotation plant



- 1 Adaptation of microorganisms
- 2 Conductivity, turbidity and chloride concentration fall significantly
- 3 Nitrate degradation by microorganisms

Summary – NICASAL® flocculant in practice

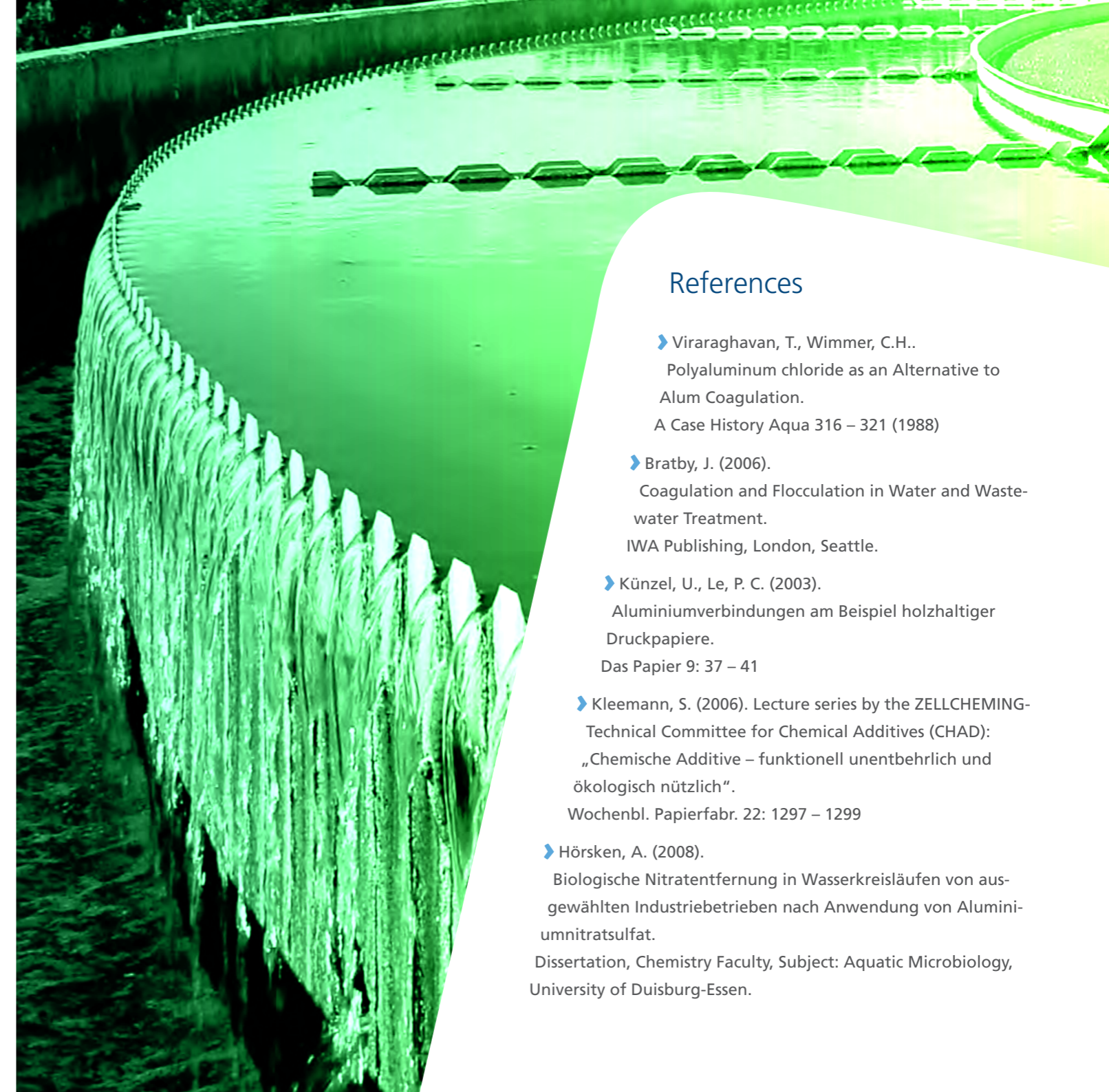
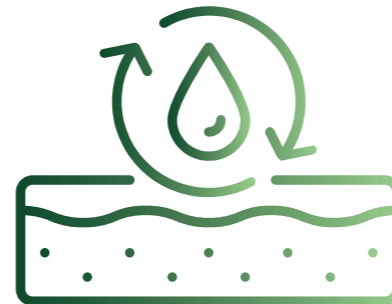
Using NICASAL® in suitable systems is an innovative step with clear benefits for your company.

All of the case studies above demonstrated:

- ▶ Ongoing nitrate reduction after 5 to 20-day adjustment period
- ▶ Stabilisation of nitrate concentration to < 50 mg/l nitrate
- ▶ NICASAL® dosed at a quantity of 25 to 4000 ppm
- ▶ Lower conductivity in the water cycle
- ▶ No corrosion

NICASAL® offers solutions for closed and semi-closed water cycles, in particular for water cycles in paper production. It also offers the following advantages:

- ▶ Improved coagulation compared to other aluminium salts such as aluminium sulphate or polyaluminium chloride
- ▶ Good cleaning performance with regard to turbidity, TSS and COD
- ▶ No chloride, resulting in lower conductivity
- ▶ Prevention of hydrogen sulphide formation



References

- ▶ Viraraghavan, T., Wimmer, C.H..
Polyaluminum chloride as an Alternative to Alum Coagulation.
A Case History Aqua 316 – 321 (1988)
- ▶ Bratby, J. (2006).
Coagulation and Flocculation in Water and Wastewater Treatment.
IWA Publishing, London, Seattle.
- ▶ Künzel, U., Le, P. C. (2003).
Aluminiumverbindungen am Beispiel holzhaltiger Druckpapiere.
Das Papier 9: 37 – 41
- ▶ Kleemann, S. (2006). Lecture series by the ZELLCHEMING-
Technical Committee for Chemical Additives (CHAD):
„Chemische Additive – funktionell unentbehrlich und ökologisch nützlich“.
Wochenbl. Papierfabr. 22: 1297 – 1299
- ▶ Hörsken, A. (2008).
Biologische Nitratentfernung in Wasserkreisläufen von ausgewählten Industriebetrieben nach Anwendung von Aluminiumnitratsulfat.
Dissertation, Chemistry Faculty, Subject: Aquatic Microbiology,
University of Duisburg-Essen.



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Feralco Deutschland GmbH is a subsidiary of Feralco AB, which is based in Helsingborg in Sweden. The group is one of the leading producers of aluminium and iron-based chemicals in Europe. Its products are used in the drinking and wastewater sectors, in paper and in other industries.

Feralco AB is active across Europe, with sites in Germany, France, Great Britain, Italy, the Netherlands, Sweden, Switzerland and Spain. This guarantees fast delivery times, a personal service and excellent flexibility.