VTA Nanofloc®

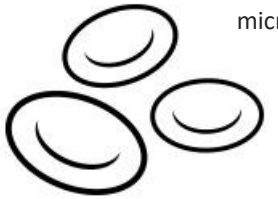
RESULTS & PROSPECTS

10^{-9} m = 1 ηm

The prefix nano, ancient greek [νᾶνος - nános], means dwarf and is related to a dimension, which is not visible for the human eye even with an optical microscope.



Thickness of a fingernail: **0.7 mm**
milli = thousendth



Red blood Cell: **7 µm**
micro = millionth



Virus: **70 ηm**
nano = billionth



Atom of carbon: **70 pm**
pico = trillionth

Nano particles show new physical and chemical properties. The smaller the particles get, the more the physical and molecular parameters can be different from „macroscopic“ properties. This is related to the **ratio** of surface area to volume.

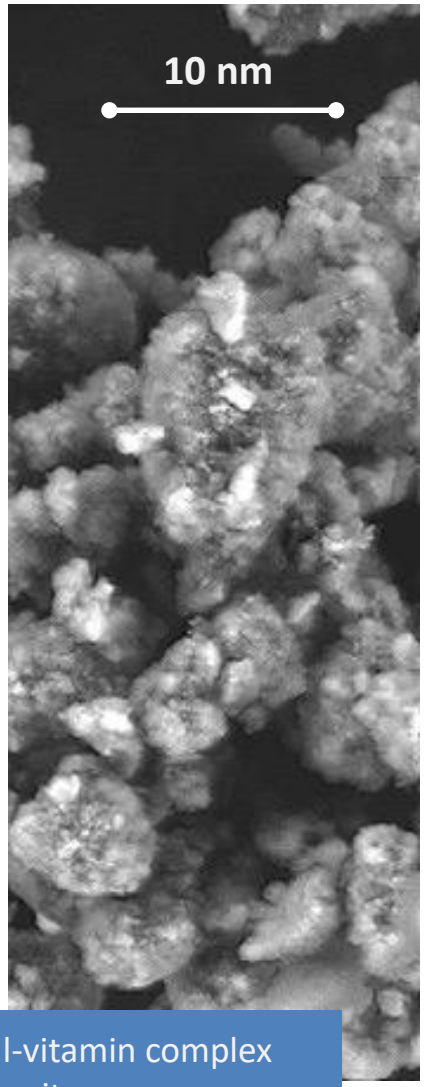
APPLICATIONS

- paint (stain resistance, UV protection)
- computer technology (Intel produces chips below 10 nm of size)
- textiles (water and stain repellants)
- crop protection (nanotechnology instead of pesticides)
- medicines (controlled release)
- cosmetics (TiO_2 as UV protection, tooth paste etc.)
- food (colour, texture, taste, etc.)

- **Wastewater technology: VTA**

VTA Nanofloc®

- Iron oxide nanoparticles are bound into a matrix of organic charge carriers
- The small size allows rapid insertion into the sludge flocs
- The surface of the nanofloc complex increases the attraction forces inside the sludge floc already
- Flocs are very compact and high in density
- Settling rate and hydraulic load capacity improves significantly



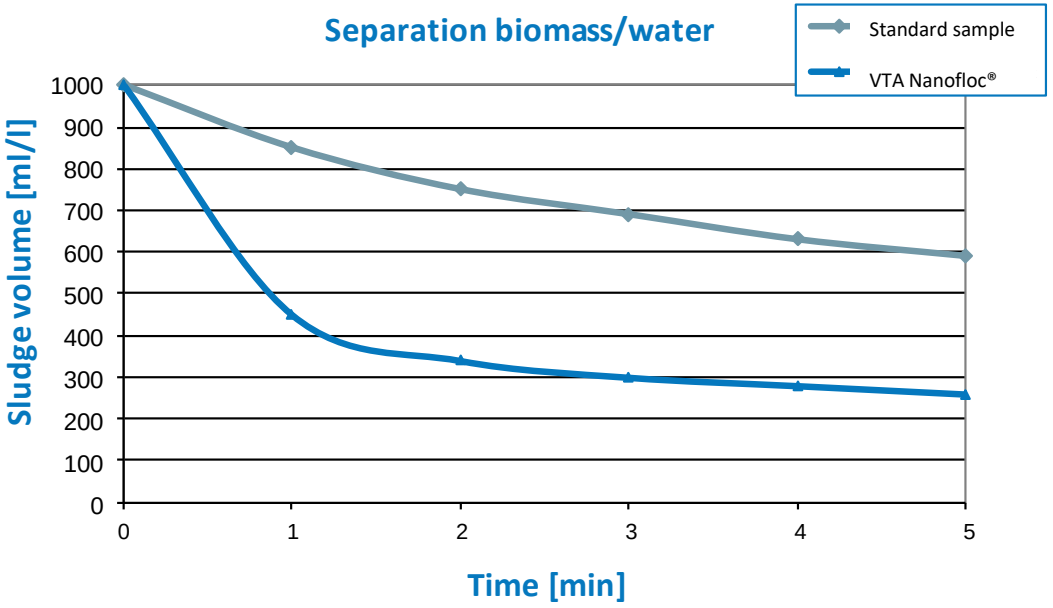
highly amorphous, nanostructured metal-vitamin complex with high cationic charge density



VTA Nanofloc®

The application of VTA Nanofloc® in the standard activated sludge process optimises the most critical step – **the separation of biomass from its surrounding water**.

Positive effects can be observed along the whole wastewater treatment process.



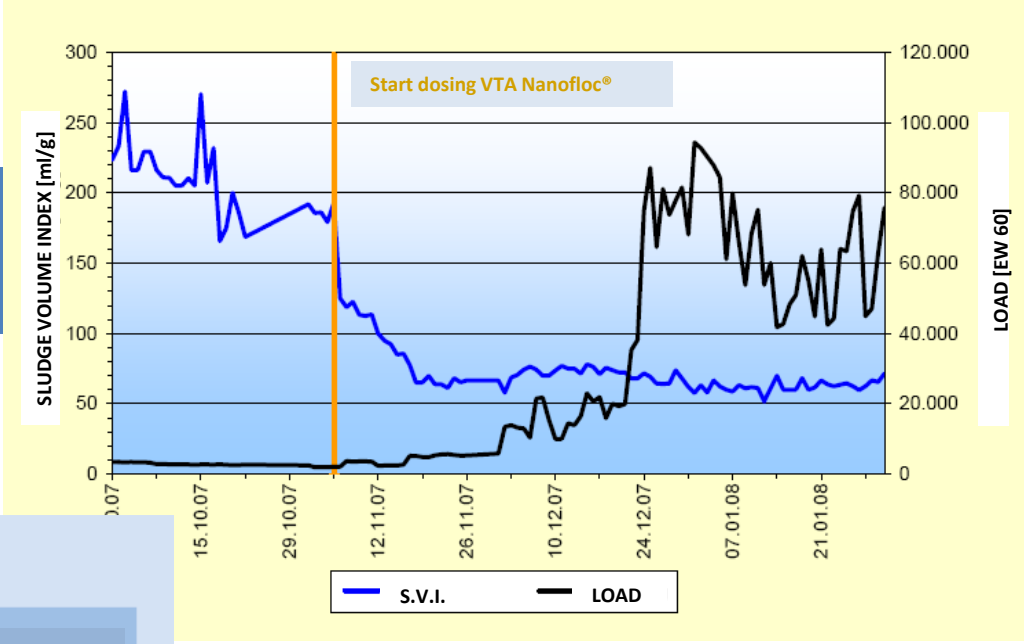


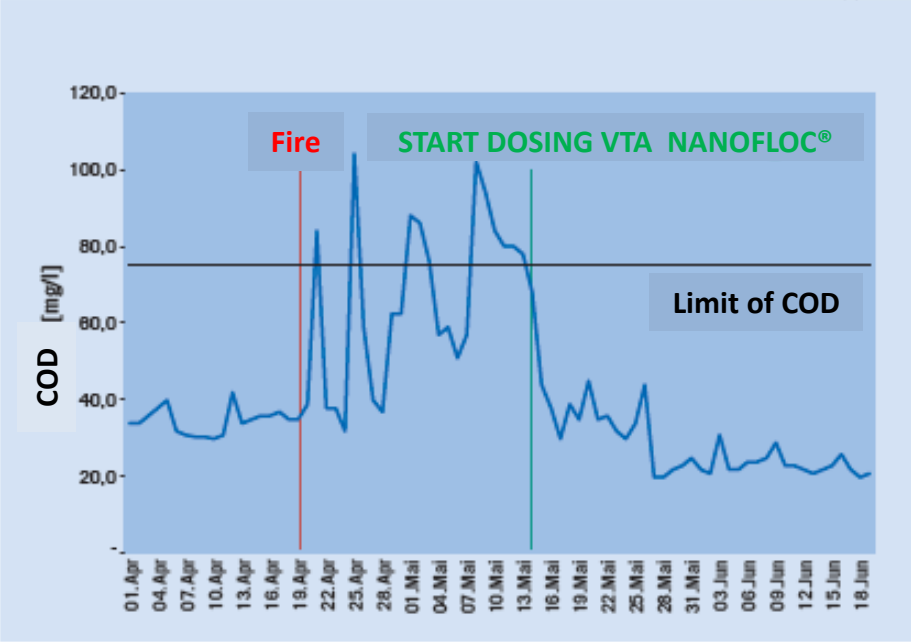
VTA Nanofloc®

One drop of VTA Nanofloc®
has a huge impact!

- Greatly improved flocculation
- Increased plant stability
- Sludge thickening and enhanced dewatering
  - increased dry solids
  - reduced polymer consumption
  - decreased filtrate solids
- Clear effluent

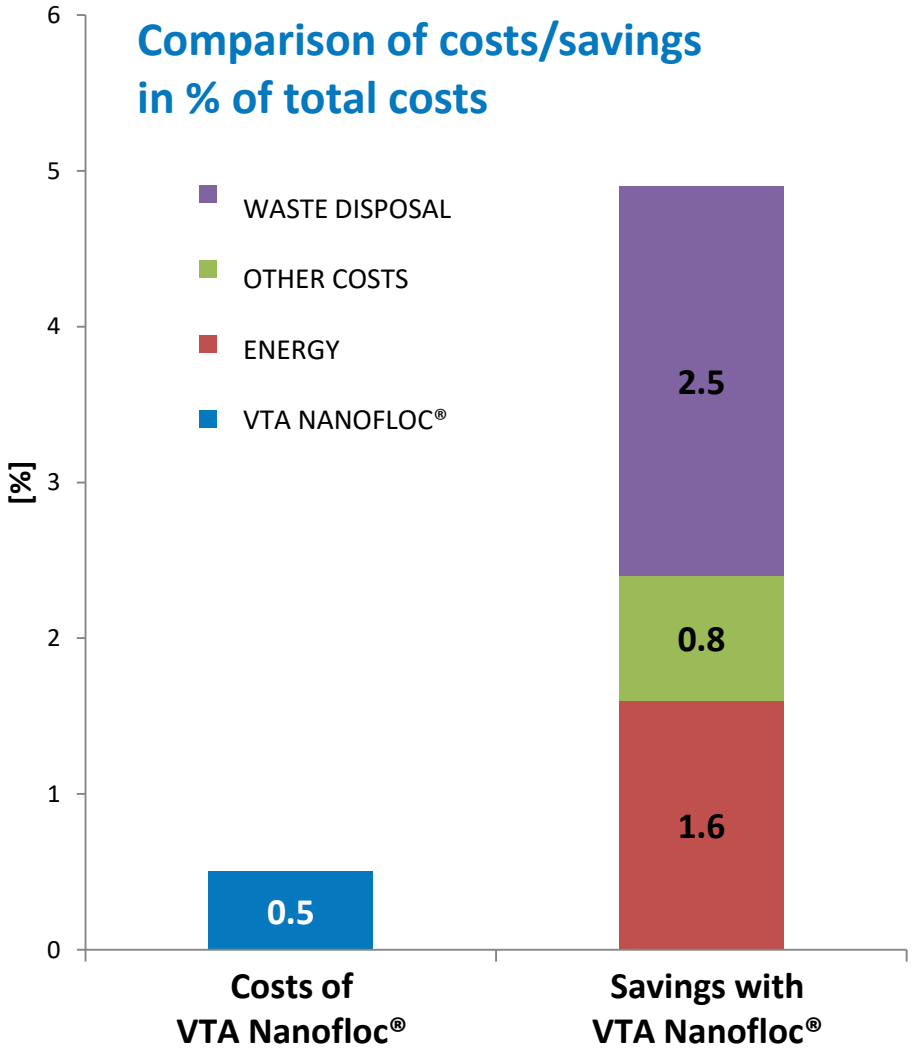
Effluent quality can be preserved …





… even at overloaded conditions

Comparison of costs/savings in % of total costs



Fields of application for VTA Nanofloc®

- **precipitation** and solids capture in the **primary settlement tank**
- **improved sludge settlement** and removal of **fine flocs** in the secondary settlement tank
- **surplus sludge t**reatment before **thickening & dewatering**
- **sulphur binding**
- **Optimizing the organic substrate of digester sludge**
- **prevention** of digester foaming
- supports the **degradation of fats, oils and greases**

8.000 PE Plant in AT

	Without VTA Nanofloc®	**With VTA Nanofloc® (5ppm)**
PRECIPITATION AID	40 l/d	25l/d
AERATION	460 kWh/d	380 kWh/d
POLYMER	150 kg/m	110 kg/m
RESIDUE DISPOSAL	60 m³/m	53 m³/m

Calculated on an annual basis*

	Without VTA Nanofloc®	**With VTA Nanofloc® (5ppm)**	**Saving**
VTA Nanofloc®	0	6622	-6622
PRECIPITATION AID	10306	6441	3865
AERATION	15111	12483	2628
POLYMER	4482	3551	1291
RESIDUE DISPOSAL	21600	19080	2250
SAVINGS:			**3412.-**

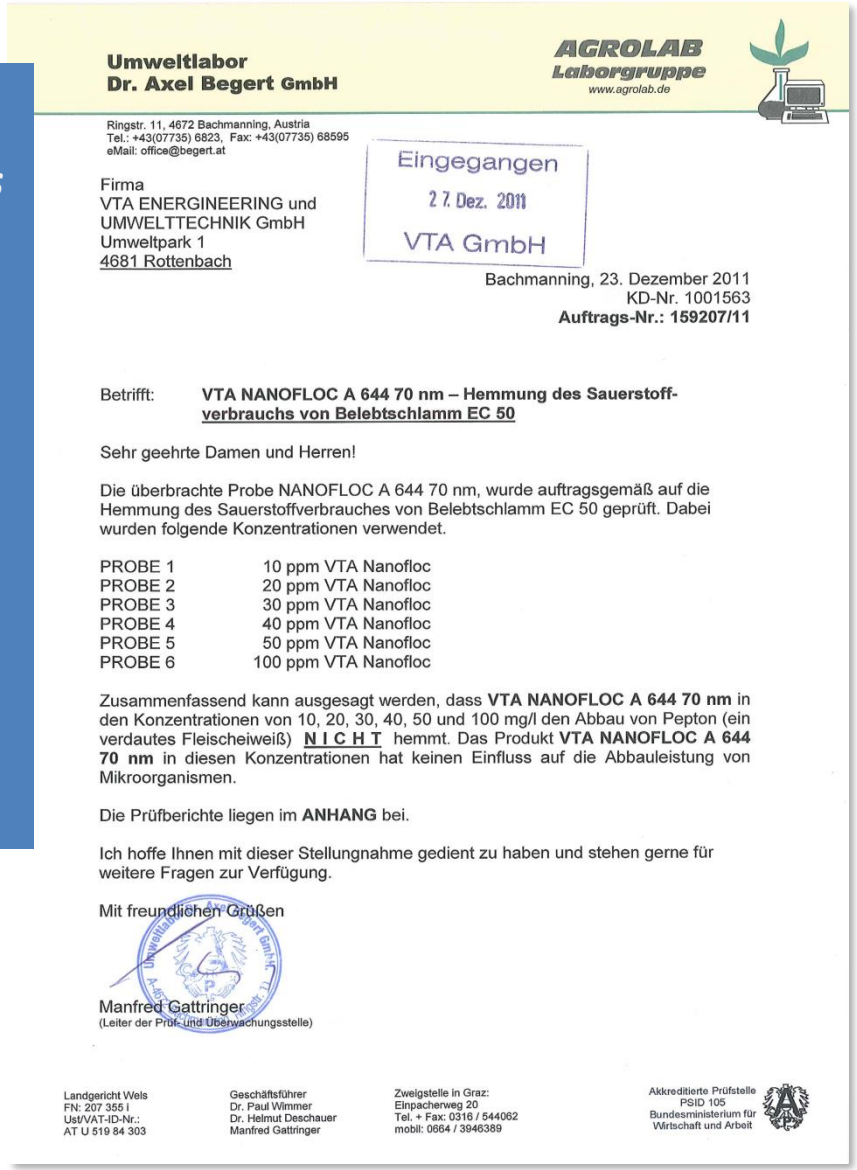
*Coagulant: 0.543 €/kg; energy: 0.09 €/kWh; polymer: 2.69 €/kg; disposal: 30 €/t, all values are in €

„The use of VTA Nanofloc A644 70 nm has no impact on the degredation performance of the activated sludge“

…since it is an inorganic, iron-based material, which is common in occurance …

…the nanoparticles are incorporated into the sludge“

Umweltlabor Dr. Axel Begert GmbH



Umweltlabor
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Eingegangen
27. Dez. 2011
VTA GmbH

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UMWELTTECHNIK GmbH
Umweltpark 1
4681 Rottenbach

Bachmanning, 23. Dezember 2011
KD-Nr. 1001563
Auftrags-Nr.: 159207/11

Betrifft: **VTA NANOFLOC A 644 70 nm – Hemmung des Sauerstoff-verbrauchs von Belebtschlamm EC 50**

Sehr geehrte Damen und Herren!

Die überbrachte Probe NANOFLOC A 644 70 nm, wurde auftragsgemäß auf die Hemmung des Sauerstoffverbrauches von Belebtschlamm EC 50 geprüft. Dabei wurden folgende Konzentrationen verwendet.

PROBE 1	10 ppm VTA Nanofloc
PROBE 2	20 ppm VTA Nanofloc
PROBE 3	30 ppm VTA Nanofloc
PROBE 4	40 ppm VTA Nanofloc
PROBE 5	50 ppm VTA Nanofloc
PROBE 6	100 ppm VTA Nanofloc

Zusammenfassend kann ausgesagt werden, dass **VTA NANOFLOC A 644 70 nm** in den Konzentrationen von 10, 20, 30, 40, 50 und 100 mg/l den Abbau von Pepton (ein verdautes Fleischeiweiß) **N I C H T** hemmt. Das Produkt **VTA NANOFLOC A 644 70 nm** in diesen Konzentrationen hat keinen Einfluss auf die Abbauleistung von Mikroorganismen.

Die Prüfberichte liegen im **ANHANG** bei.

Ich hoffe Ihnen mit dieser Stellungnahme gedient zu haben und stehen gerne für weitere Fragen zur Verfügung.

Mit freundlichen Grüßen

Manfred Gattringer
(Leiter der Prüf- und Überwachungsstelle)

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Akkreditierte Prüfstelle
PSID 105
Bundesministerium für
Wirtschaft und Arbeit

VTA Nanofloc®

IN OPERATION



ADO Goldkante GmbH
textile industry

task definition:

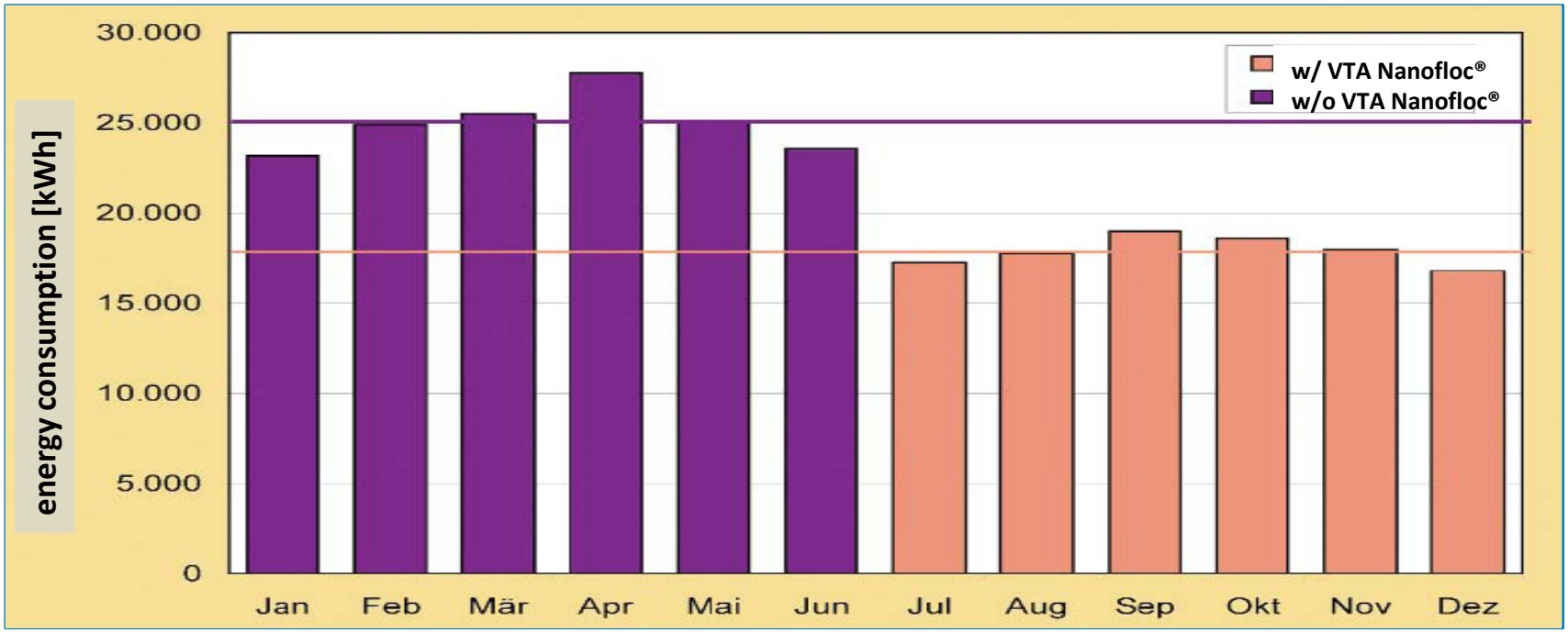
- visibility depth in 2^{ry} sedimentation unit is very low (~40 cm)
- separate chemical P-precipitation requested to attain the outlet limits

Solution: VTA Nanofloc®:

- visibility depth from 40 → 180 cm increased
- better sludge settling
- lower COD-values
- separate P-precipitation was done by VTA Nanofloc at the outlet of aeration basin



ADO Goldkante GmbH
textile industry





ADO Goldkante GmbH
textile industry

dosing of **VTA Nanofloc®** for improving the operation at KA Papenburg

	w/o VTA Nanofloc®	**with VTA Nanofloc® (5ppm)**	**effective improvement**
VISIBILITY DEPTH	40 cm	180 cm	+ 140 cm
CHEMICAL COSTS	100 %	70 %	- 30 %
ENERGY COSTS	100 %	57 %	- 43 %
SLUDGE	100 %	72 %	- 28 %

absolut savings of ~ € 100,000.– per anno



Agrana Stärke GmbH
225.000 PE

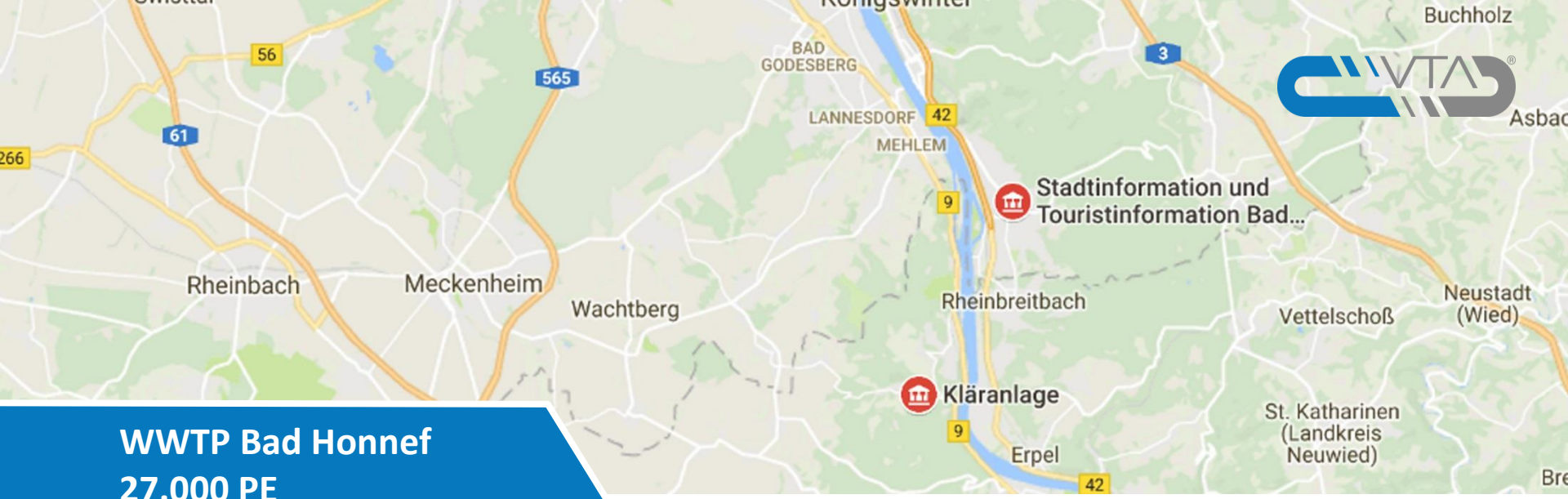
task definition:

- Phosphorus precipitation with $FeCl_3$: during high hydraulic load sludge flocs were too leight weighted → post sedimentation unit is overloaded (sludge is carried out)→ increased COD values at outlet

Solution: VTA Nanofloc®:

- sludge flocs got higher in density and thus have a faster sedimentation
- side effect → lower consumption of precipitation aid

guarantee of a reliable operation state, even at high hydraulic load



WWTP Bad Honnef
27.000 PE

task definition:

- pH-value > 12 at inlet, because of incoming NaOH → biology was destroyed
- high turbidity in all post sedimentation units
- German cities obtain their fresh water from river Rhein

Solution: VTA Nanofloc®:

- visibility depth after ONE day at 60 cm in post sedimentation units
- After TWO days visibility depth at 110 cm and all limits could be reached (except nitrogen values – nitrification bacteria)



WWTP Prenzlau
80.000 PE

task definition:

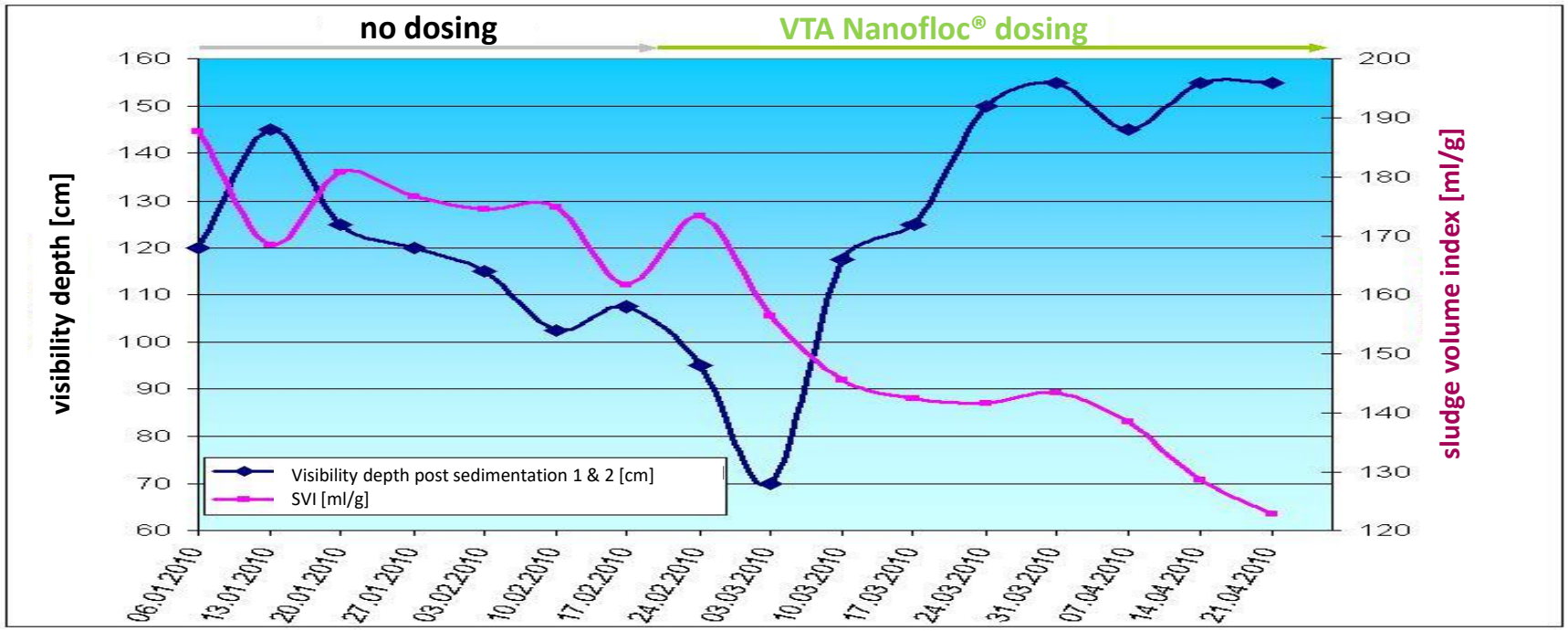
- increased grease amount at the inlet → dairy and ice factory connected indirectly
- issues at the aeration system caused inhomogenuous oxygen distribution →that resulted in a high amount of **filamentos bacteria - *Microthrix parvicella***
- SVI > 180 ml/g → sludge carry out

Solution: VTA Nanofloc®:

- hydraulic capacity issues solved



WWTP Prenzlau
80.000 PE





WWTP Grünau
65.800 PE

task definition:

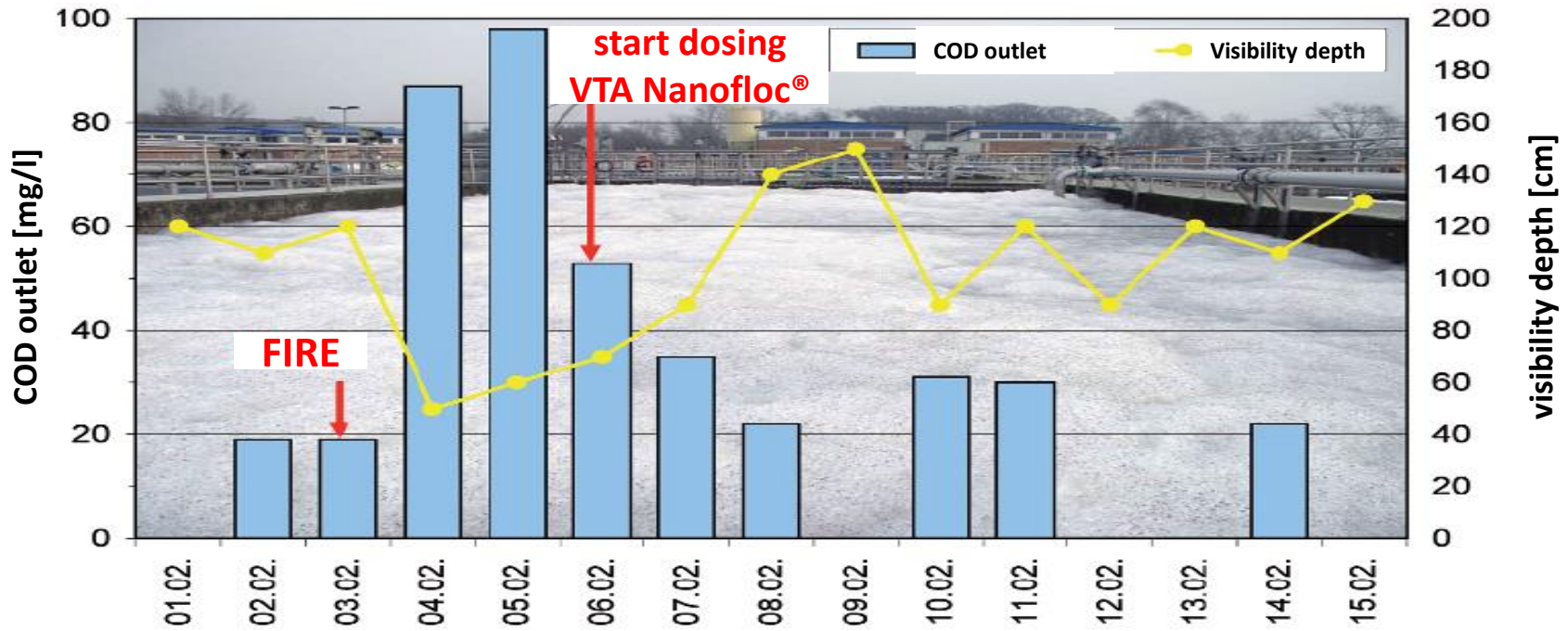
- serious fire at a storage house nearby
  → **20.000 liters fire extinguishing foam**
- very low visibility depth in post sedimentation, sludge carried out, floc destabilization and significant increase of COD

stabilization of operation with dosing VTA Nanofloc ®:

- COD outlet → O.K.
- visibility depth returned to normal level



WWTP Grünau
65.800 PE



VTA Nanofloc®

SUMMARY

VTA Nanofloc®

costs in continuous operation

- **~ 0.01 €/m³ (0.5 % of total costs)**

SAVINGS

- **aeration costs:** reduction >20 %
- **polymer costs:** reduced polymer consumption at dewatering stage of up to 4 kg/t dried sludge
- **disposal costs:** increased solids content of up to 4 %-points
- **coagulation costs:** reduction of coagulation aid of up to 30 %

On top: a very high reliability of operation can be reached

VTA Nanofloc®
SUMMARY

- advantages of Nanotechnology arrived at water treatment sector
  - **temporarely as a solution for current issues to get back to reliable operating conditions**
  - **in continuous operation to surpress rising bad conditions or to optimize the whole cleaning process**

- effective at low dosing ranges

- Works even where conventional methods fail and can be used to optimize existing processes
  (cost savings, capacity increase, increase operation reliability)



Thank you for your attention!

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