



**Innovative development within tight legislative limits –
New pathways of biocidal treatment in manufacturing of
specialty paper with high filler levels**

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Joachim Imhof

Peter Dittmann and Ute Höötman, BK Giulini GmbH

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Biocide application in the stress field of legislation and cost pressure

Cost pressure



Customer demands

Biocidal products directive (BPD)

Safety and environment

Biocide application in the stress field of legislation and cost pressure

The situation how it is

Cost pressure:

Biocide treatment costs per ton
should be as low as possible

Customer demands:

No biocides handling from customer`s side

Biocidal products directive:

Limited biocidal actives are marketable
High costs for registration procedures

Safety and Environment:

Further limitations in respect of S&E



Biocide application in the stress field of legislation and cost pressure

Solutions

Treatment costs:

Evaluation of the most effective combined biocide system by advanced microbiological analysis

Biocides Handling:

Advanced dosing technique, automation to a large extent

BPD:

Use of notified BP`s only, registration of private labels

S&E:

Responsible care, self commitment (no toxic, cancerogenic, mutagenic or terratogenic substances)



Biocide application in the stress field of legislation and cost pressure

Demands for a combined product solution

High efficacy:

Combination of : oxidizer (fast acting)
organic biocide (preserving)
solved in a bromid salt (enhancer, inorganic solvent)

Production and stability:

Easy to produce, water soluble, high storage stability, easy to dose



Development of a combined product solution

The product combination finally developed

Organic/inorganic
biocidal product

- Formulation based on Bronopol
- Formulated in an aqueous Ammoniumbromide Solution

Oxidizing
Biocidal product

- Formulation based on Sodium Hypochlorite

Development of a combined product solution

Advantages

In production/product properties:

- Short production time
- Easy and quickly soluble in water (no additional COD)
- Storage stability in a broad temperature range
- Easy to dose with standard equipment

In antimicrobial action:

- Preservative action by Bronopol
- Immediate action by free chlorine
- Supporting action by formation of Chloramines

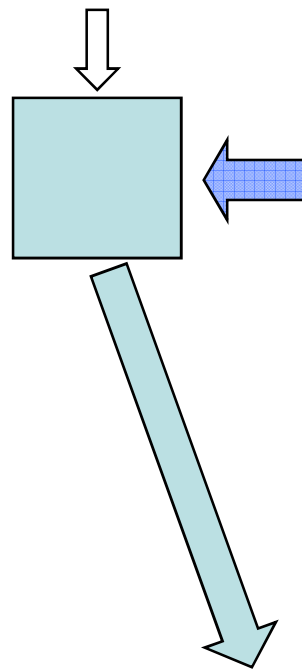


Trial and results

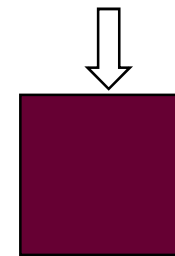
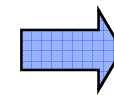
Dosing scheme

Bronopol/AmBr

NaOCl formulation



Optional
dilution with
water



Dosingpoint

Trial and results

Dosing equipment:



Choice of suitable test plants

Characteristics for an appropriate Test plant

Comparability:

Similar biocide systems applied formerly

Size:

Small system to simplify keeping track

Communication:

Existing customer to ensure intensive monitoring and information exchange

Cooperation:

Trust to start new chemical programs



Choice of suitable test plants

Characterization of the agreed plant trial

- Fourdrinier paper machine
- Light weight Specialty paper
- High filler levels
- Formerly treated with DBNPA and DBNPA/NaBr+NaOCl



Development of a combined product solution

Lab Tests

Comparison of several biocidal products

Product	Dosing amounts ppm	CfU/ml WW I
DBNPA 20 % in org. Solution	472	2×10^7 (26)*
DBNPA 20 % NaBr Dispersion + NaOCl	385 + 0,5	$1,5 \times 10^3$ (14)*
Bronopol 20 % AmBr aqueous solution + NaOCl	257 + 0,5	$2,6 \times 10^2$ (7)*

* = number of samples



Trial and results

Dosing regime

Product	kg/d	Intervals/d	Dosing time
Bronopol/AmBr	6,6 (165 g/t)	6	5
NaOCl based formulation	6,3 (16 g/t as Cl ₂)	6	5

Dilution with water for both products



Trial and results

Microbiological effects of dosing

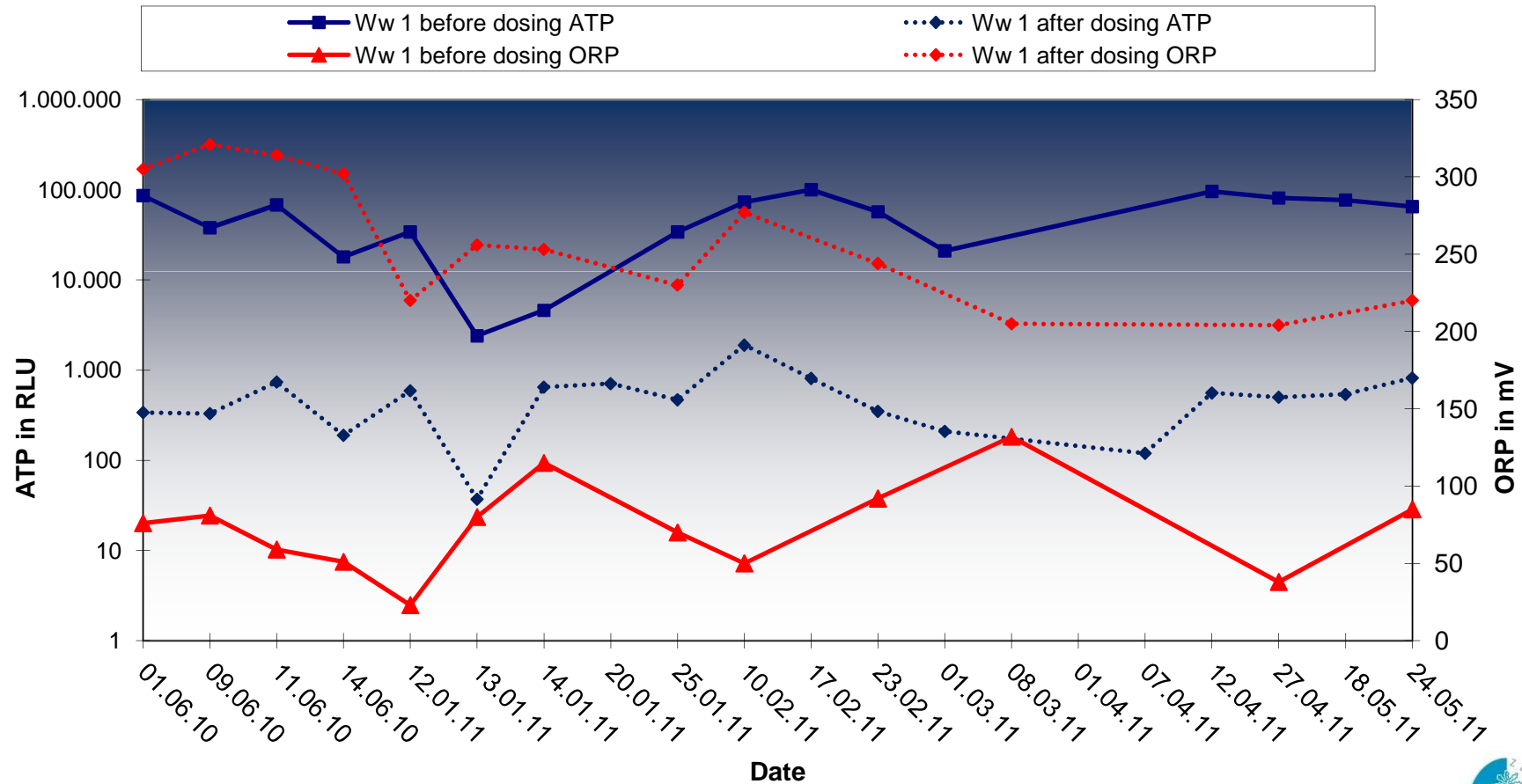
Sample	ATP (RLU)	Total germ counts (CfU/ml)
WW 1 before dosing	96.000	$3,5 \times 10^7$
WW 1 after dosing	560	$2,0 \times 10^3$
Headbox before dosing	85.000	$8,7 \times 10^6$
Headbox after dosing	600	$< 10^3$
WW II before dosing	93.000	$2,3 \times 10^7$
WW II after dosing	6.000	$3,9 \times 10^3$
Clearfiltrate before dosing	46.000	$7,4 \times 10^6$
Clearfiltrate after dosing	12.000	$2,3 \times 10^4$



Trial and results

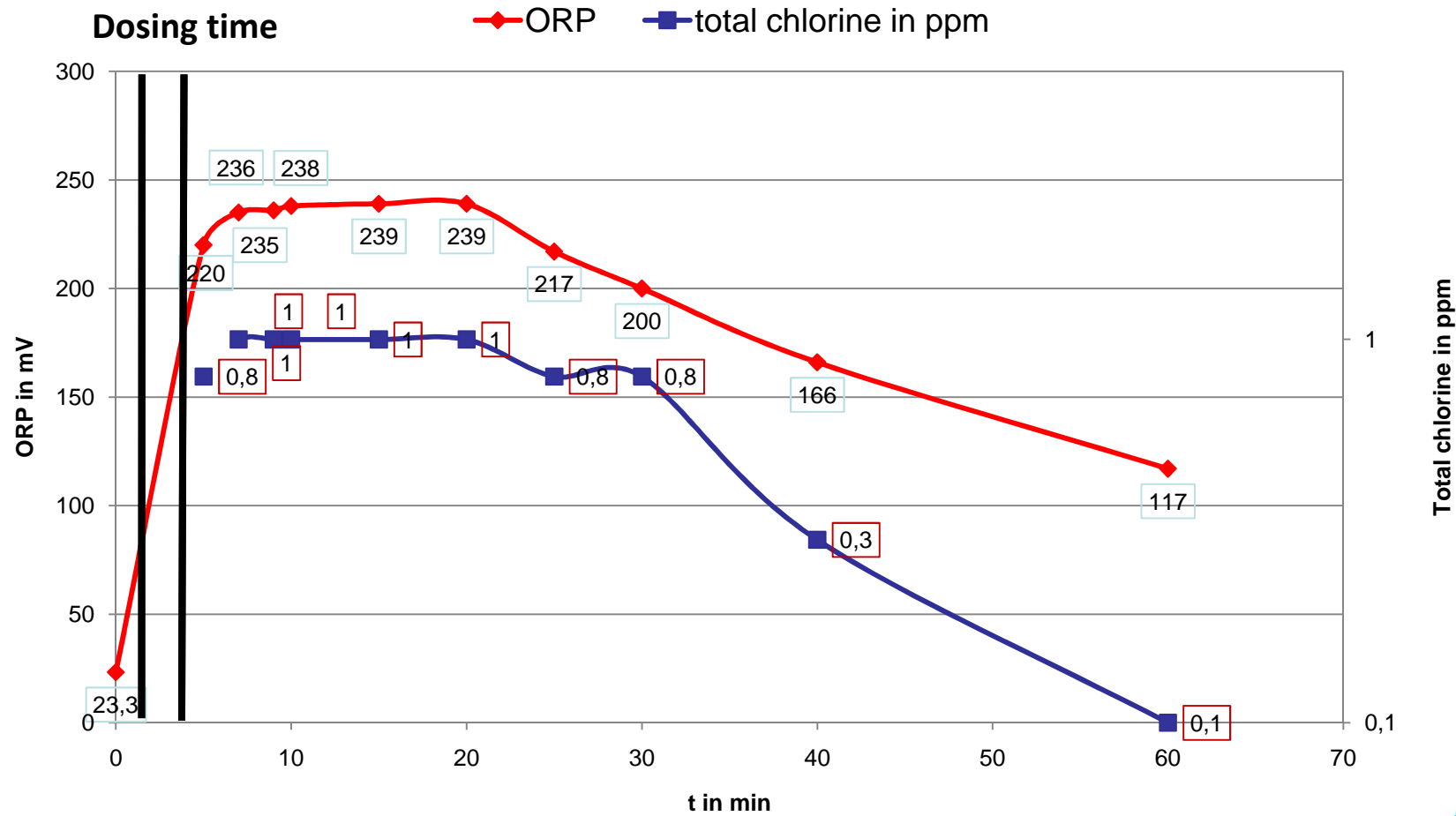
Overview development of the treatment

Messparameter White water 1



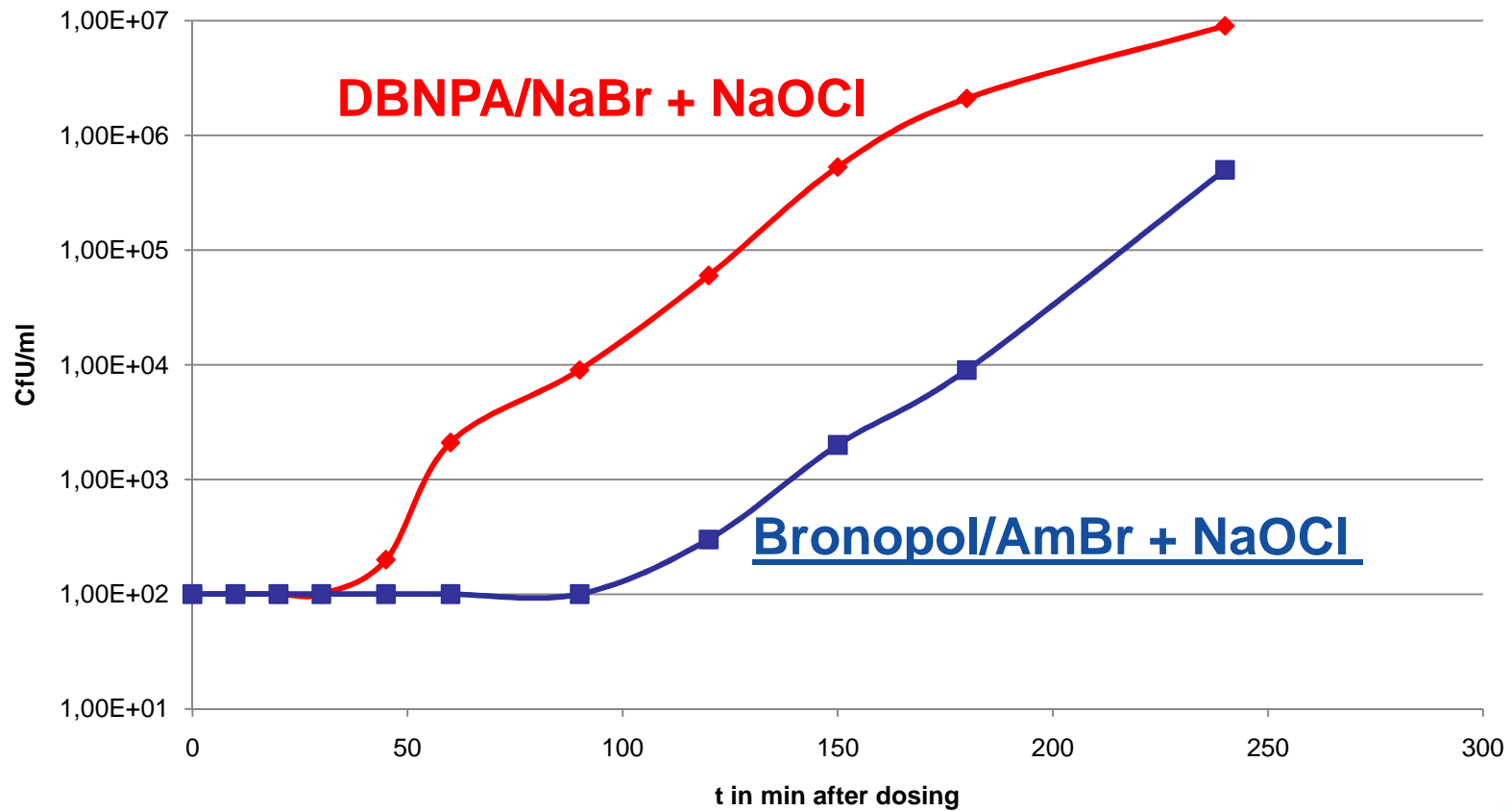
Trial and results

Overview dosing cycle



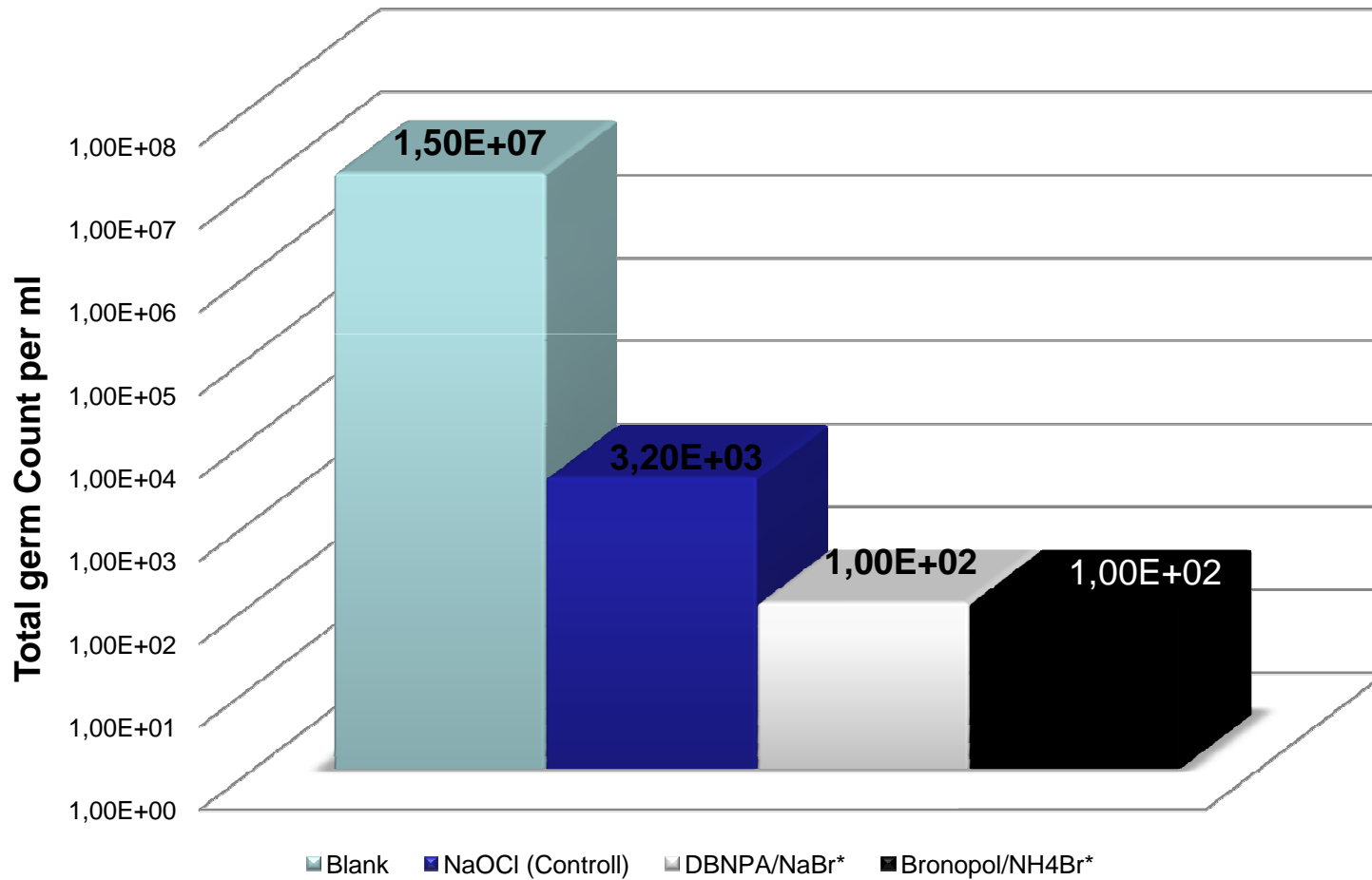
Trial and results

Development of germ counts within one dosing cycle



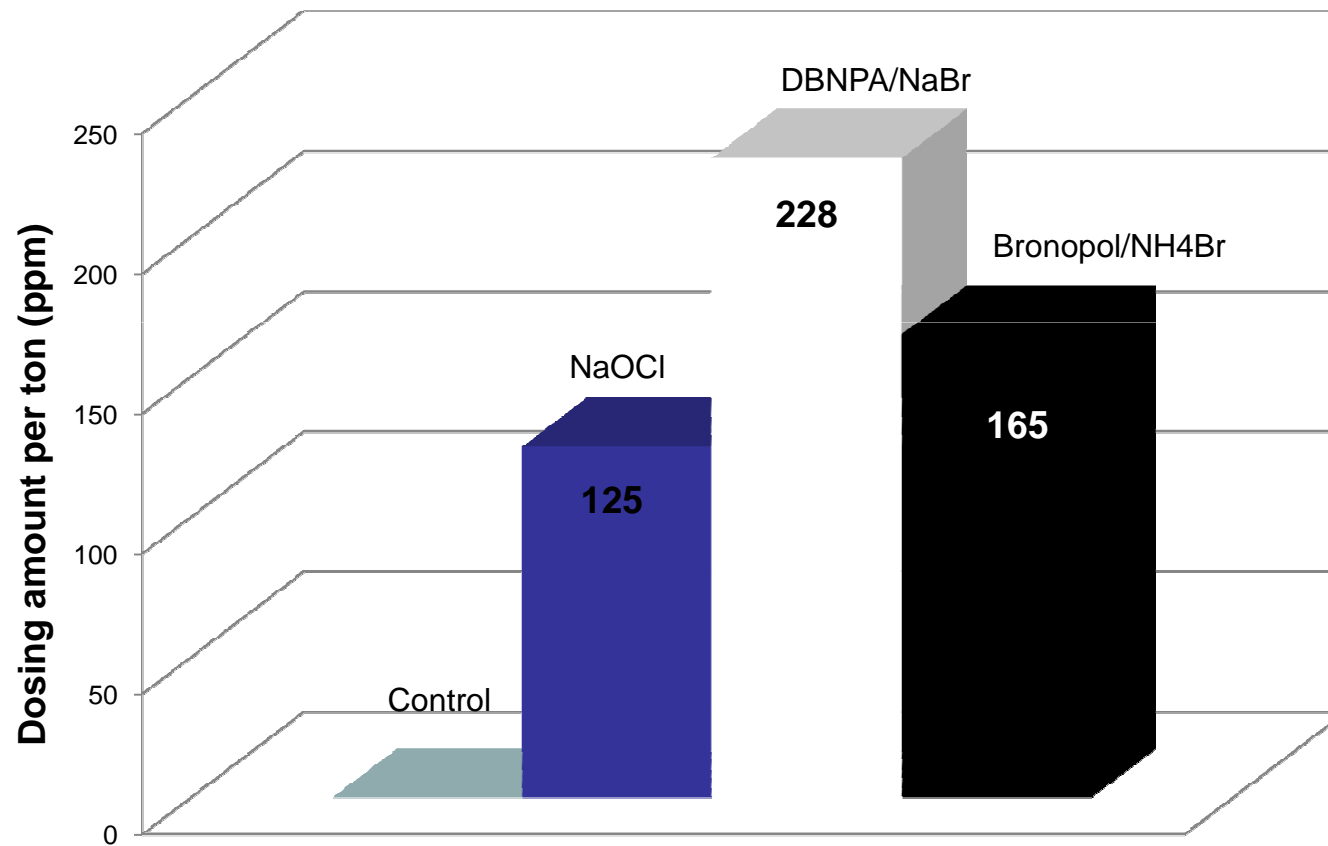
Trial and results

Program Comparison



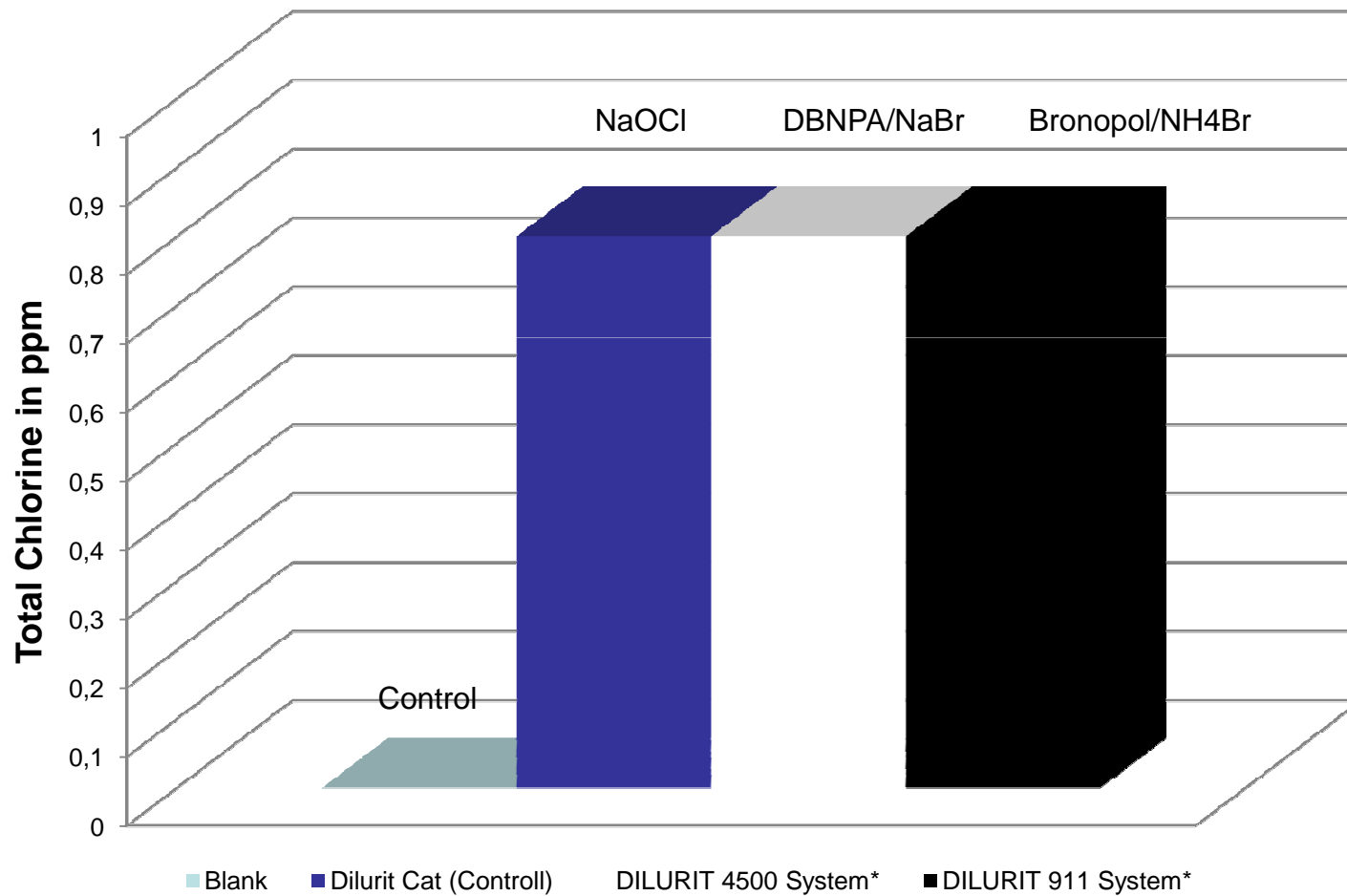
Trial and results

Dosing rates of different programs



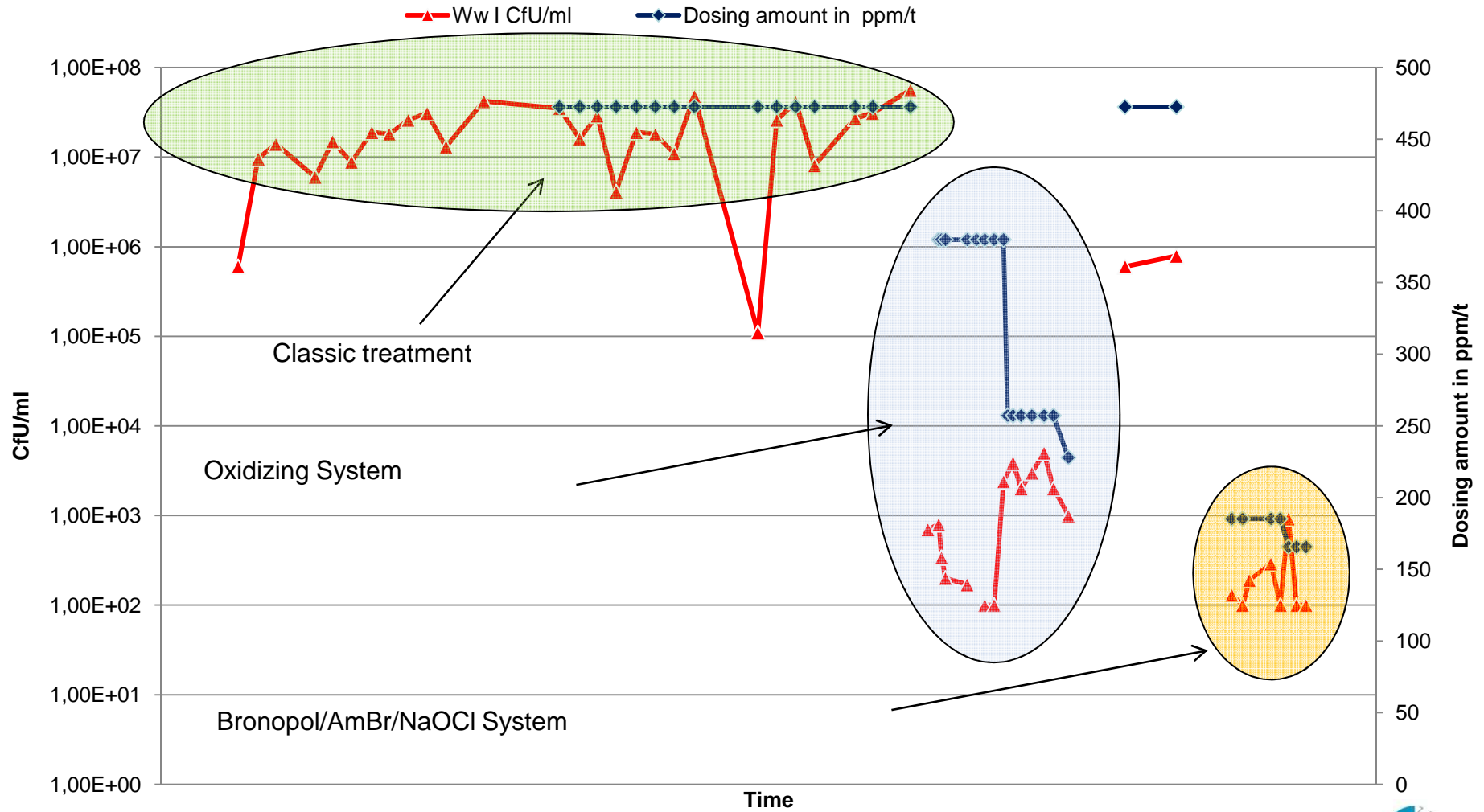
Trial and results

Total chlorine values



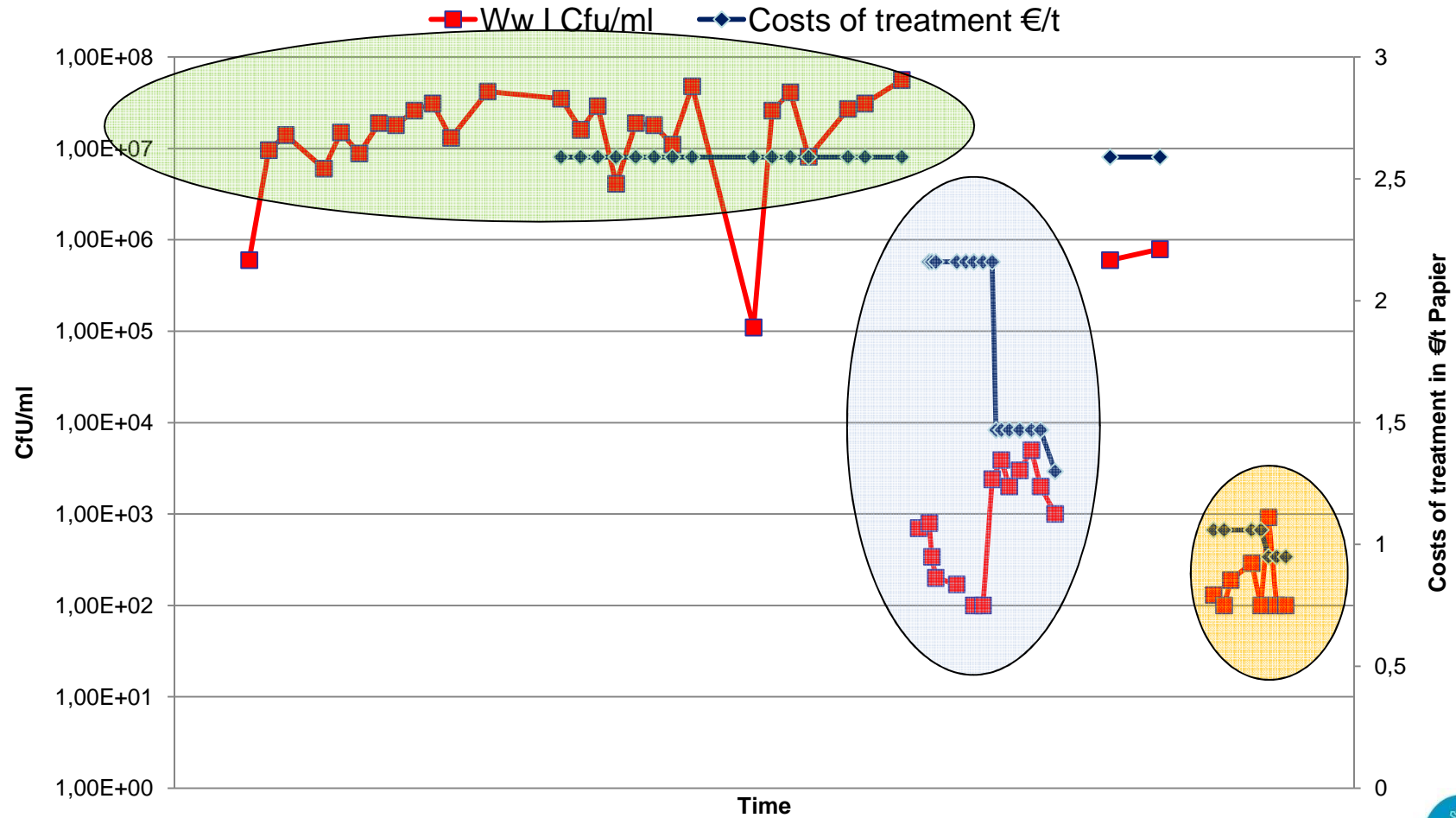
Trial and results

Dosing amount vs. total germ count



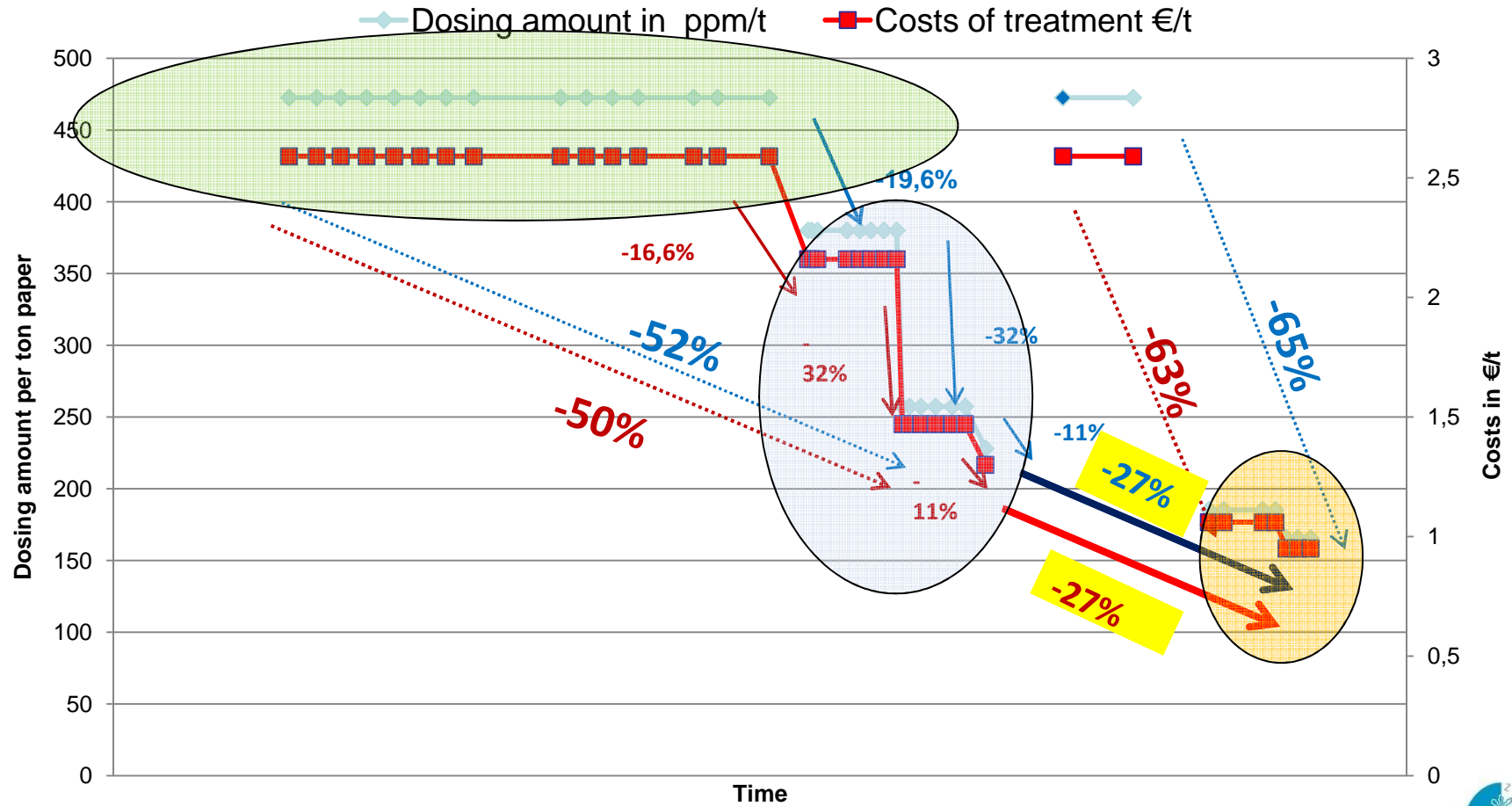
Trial and results

Costs of treatment vs. total germ count



Trial and results

Costs of treatment vs. dosing amount in ppm/t



Trial and results

Benefits of the Bronopol/AmBr/NaOCl System

- Reduction of total germ count to less than 100 CfU/ml
- Reduction of the dosing amount
- Reduction of costs for the treatment
- Less level of total chlorine

Summary

- No new chemicals but new solutions are possible
- The combination of state of the art procedures can lead to progress
- Legislation, S&E and Costs can be brought to a common denominator
- Single solutions will get more and more unusual
- Case to case solutions will get common in future



**Thank you for your
attention,**

we appreciate your
questions

