AD Showcase: Additives that will Support the Optimisation of Your Biogas Plant

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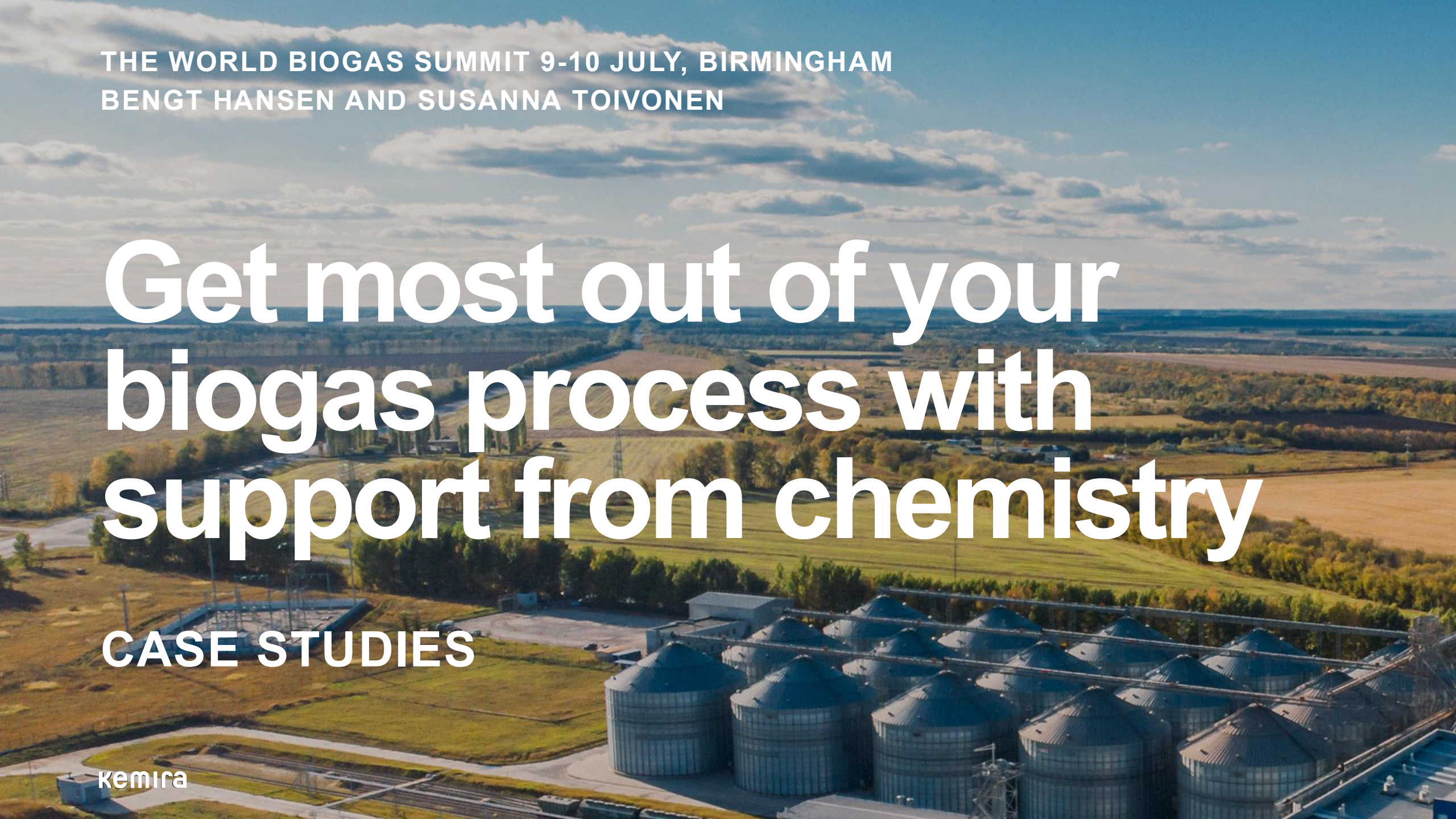
BENGT HANSEN AND SUSANNA TOIVONEN

Get most out of your biogas process with support from chemistry

CASE STUDIES



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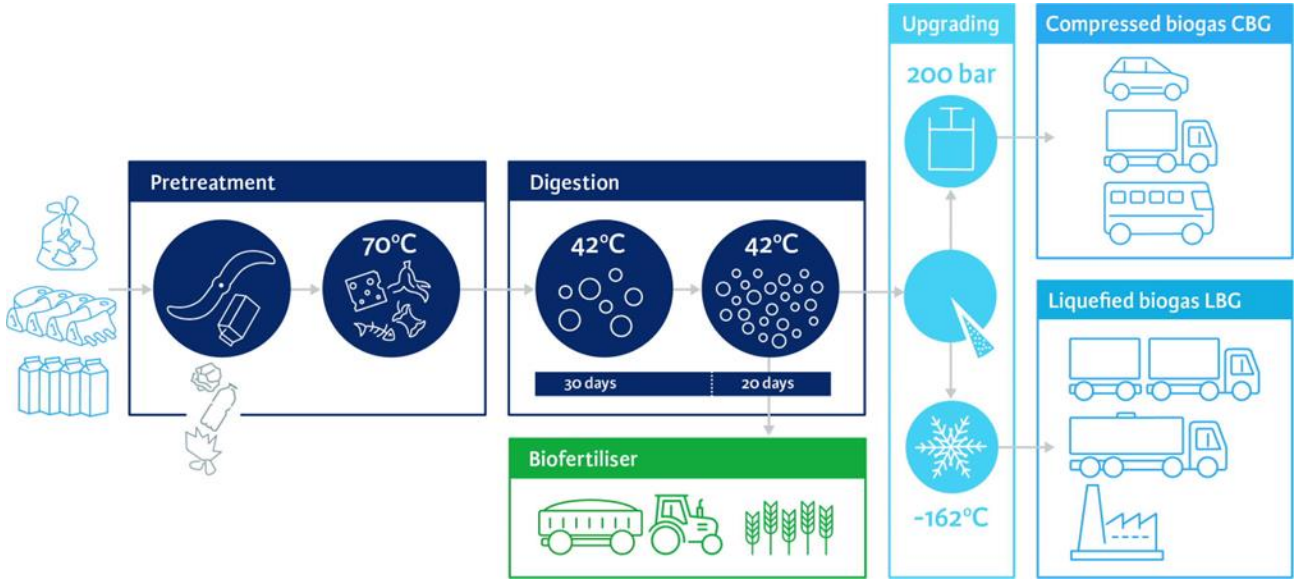
Case 1
Tekniska Verken Biogas Plant, Sweden in operation since 1997

Wet substrate	100 000 tpa
Substrate composition	Household food waste 57%, Food Industry 16%, Slaughterhouse waste 26%,
Biogas reactors	3 parallel reactors with 30-40 days HRT Post digestion 15-25 days
Biogas Production	17 500 000 Nm^3 biogas/year (65% methane)
Energy Production	110 GWh/year
Gas utilization	Bio-LNG for cars, busses, trucks and industry



Tekniska verken

Case 1
Tekniska Verken Biogas Plant, Sweden

Problems during initial years of operation:

- Poor process performance
- Foaming
- High VFA-levels
- Couldn't increase OLR

Identified cause for problems

- High H_2S – levels
- Ammonia inhibition
- Lack of trace elements

Solution

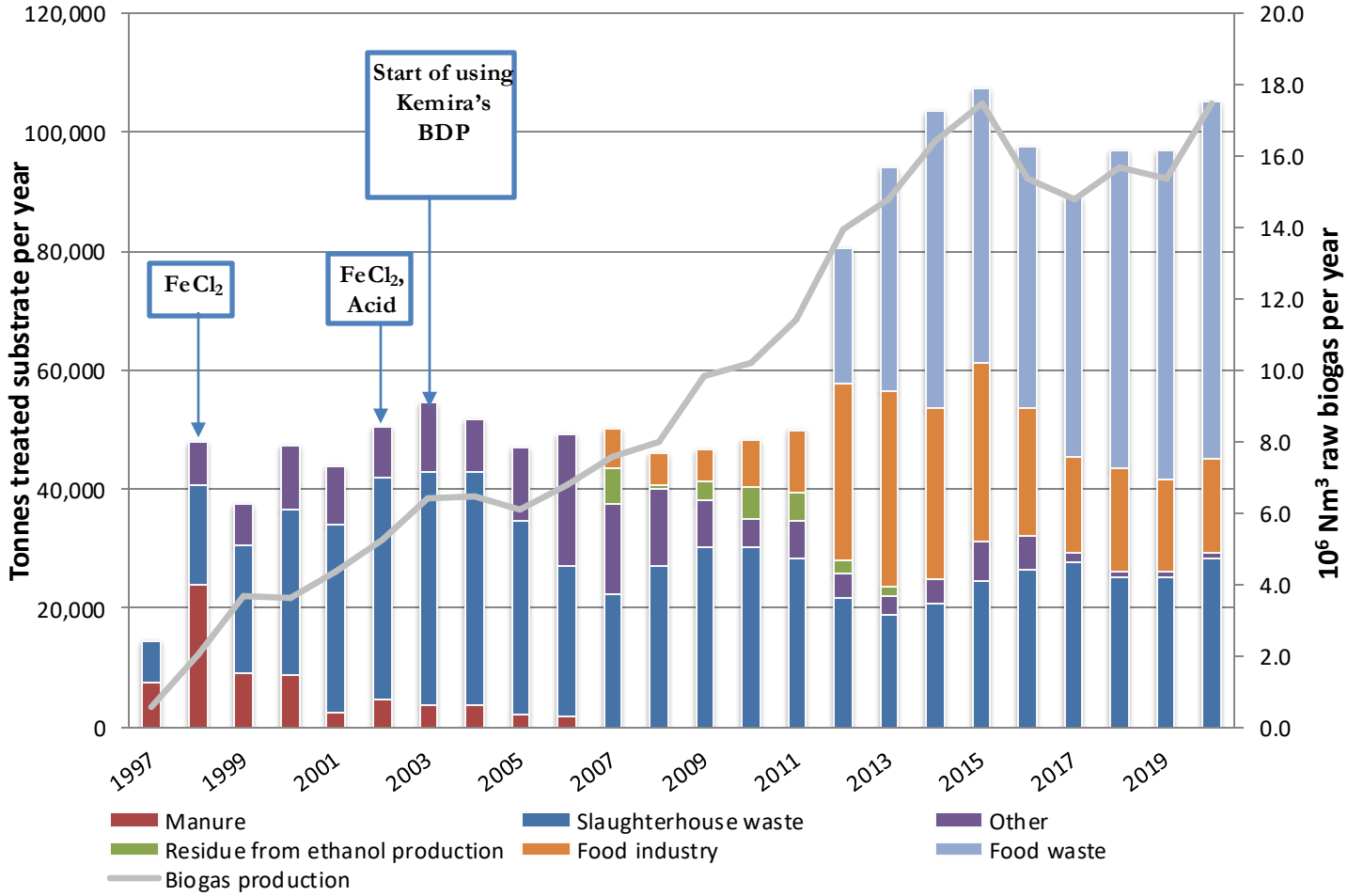
- Co-development of Kemira BDP™ iron product with trace elements and low pH (decreased pH → lower NH_3-inhibition)

Case 1
Tekniska Verken Biogas Plant, Sweden

Results and Outcome

The customer is using **Kemira BDP-868** resulting in:

- High OLR (30% increase)
- Low VFA (<400 mg/l)
- High methane yield (65%)
- Methane slip decreased by using BDP
- Good economy



Case 2

Biogas production and wastewater treatment at a dairy in Finland

Inlet Wastewater	13 200 tpa
Source	Wastewater from dairy production and whey
Biogas Production	550 000 Nm^3 biogas/year (60% methane)
Energy Production	3,2 GWh/year
Gas utilization	For internal usage in the process

OPERATIONAL CHALLENGES:

- Poor process performance
- High VFA- and COD-levels
- Low pH resulting in high NaOH dosage
- Low loading rate and not possible to increase the flow

IDENTIFIED ISSUES:

- High H_2S – levels
- Lack of trace elements

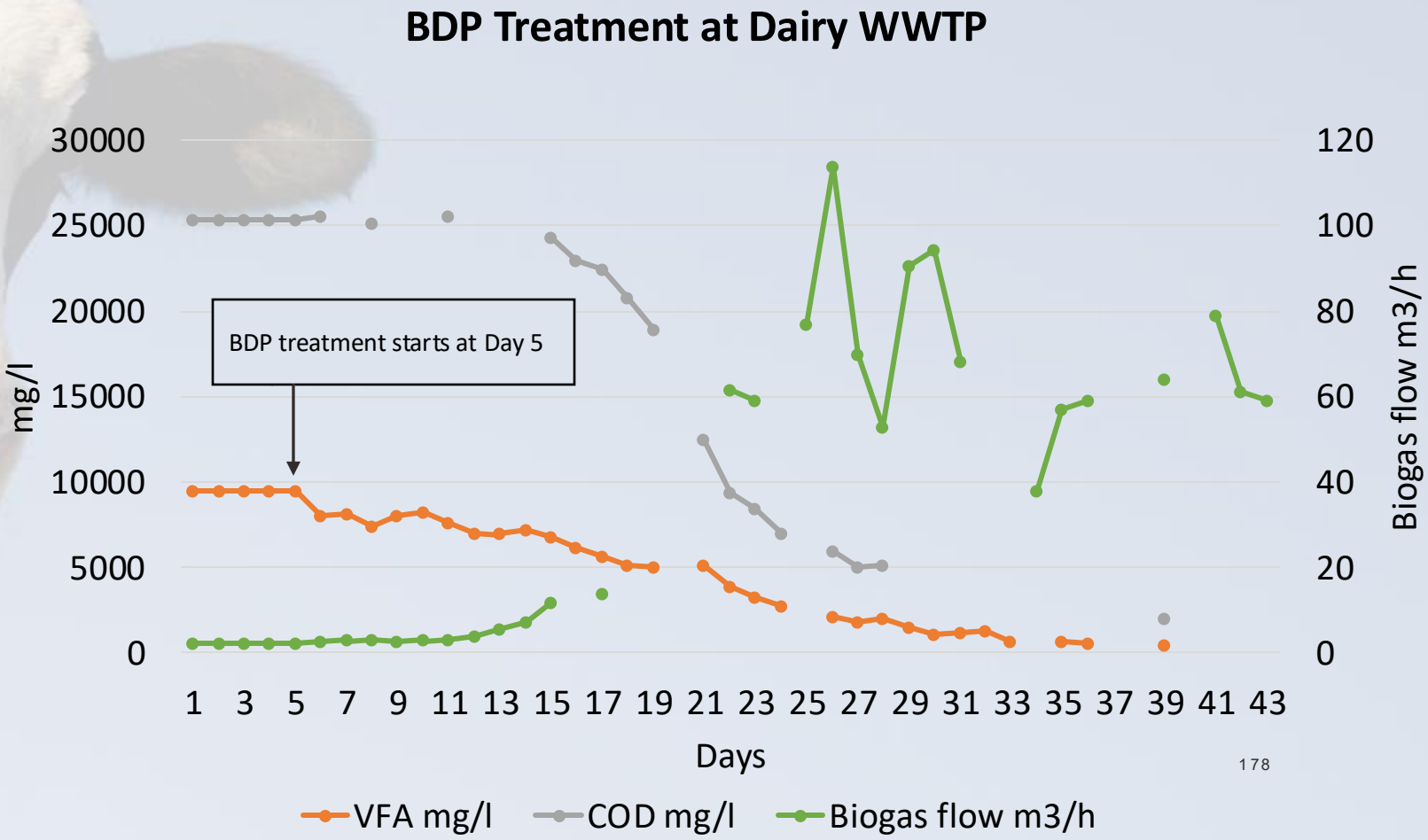
Case 2

Biogas production and wastewater treatment at a dairy in Finland

RESULTS & OUTCOME

Kemira BDP-866 resulting in:

- Heavily increased biogas production from 2,3 to 60 Nm^3/h
- Increased organic loading rates
- Incredible decrease of VFA by 96% and COD by 92%
- After 10 days pH adjustment closed
- Internal reuse of the produced gas and cost savings



Case 1-2
Summary of positive combination effects of BDP, containing Fe and trace elements

BDP influence	What happens?	Digester effect
pH/alkalinity	NH_3 is converted to NH_4^+	Reduces toxicity of NH_3
Sulfides	S^{2-} is precipitated to FeS by Fe^{2+} Release of natural occurring trace elements	Reduces toxicity of sulfides Corrosion control
Sufficient supply of bio-available micronutrients	Optimization of fermentation and methanogenesis	Increased methane formation Reduced VFA levels and increased yield
Ease of use	Accurate dosing	Stabilized operation conditions
Safety	No manual handling	Safer operation, low concentrations of trace elements

Case 3
Digestate dewatering case, Finland

Biogas plant in Finland with 60.000 tons of organic waste treated annually

Feedstock substrate is:

- Sewage sludge ~50%
- Side streams of the food industry

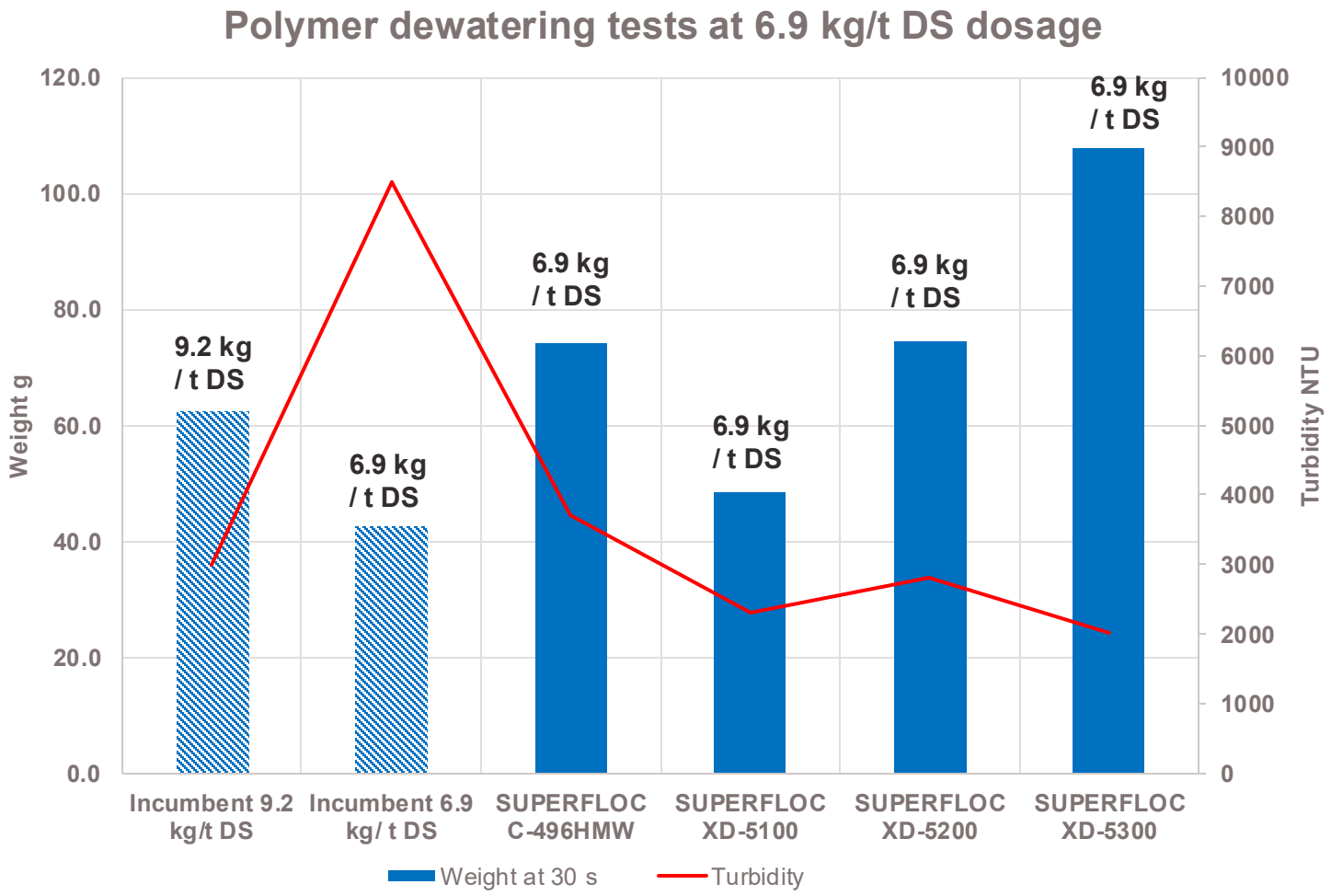
The digestate is used as fertilizer and it should have >30% dry matter content

The reject water is reused in process

Target in this case was to improve dewaterability

- Low turbidity in reject water is preferred

Case 3
Improved performance at lower dosage



Kemira Superfloc® XD-5300

Dry matter content	↑	33%
Turbidity	↓	30%
Dosage	↓	25%

Customer achieved benefits with optimized polymer:

- Improved centrifuge performance
- Increased reject water recycling
- Lower treatment costs

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