



WASTEWATER APPLICATIONS

Next-FOGStop

Made up of proteins released from heat Stressed Fermentation plus surfactants that are synthetic and bio-derived a combination of anionic, cationic, non-ionic and amphoteric used in:

- Oil clean ups at sea
- Equipment clean ups
- External and Internal tank clean
- Oil drilling and Oil fracking
- Beach and Soil oil contamination clean ups

WHAT IT IS:

- A complex of low molecular weight metabolites with surfactants
- Affects only existing bacteria by bio-augmentation
- A liquid with pH of 7 and requires only eye protection and gloves it is non-volatile, non-toxic to animal and marine life minimally irritant, and environmentally benign and biodegradable

WHAT IT'S NOT:

- Bacteria
- Enzymes
- Toxic chemicals



Next-FOGStop - Protein Surfactant Complexes (PSCs)

- Stable and functional from pH 1 to 13
- Retain surface activity after heating at 90 deg C for 96 hours
- Compatible with strong oxidants such as H_2O_2 , Cl_2

ACTIONS OF THE PSCs

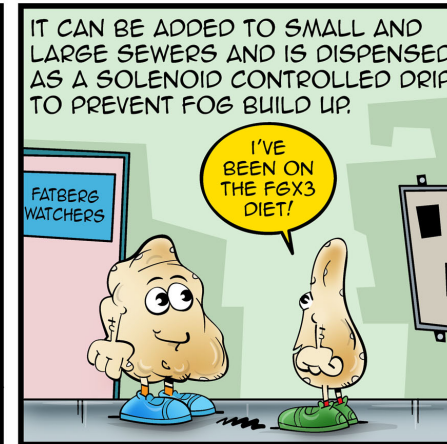
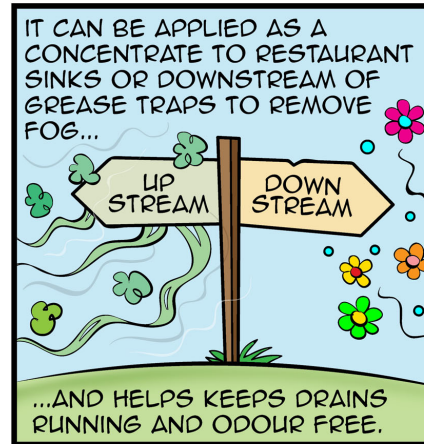
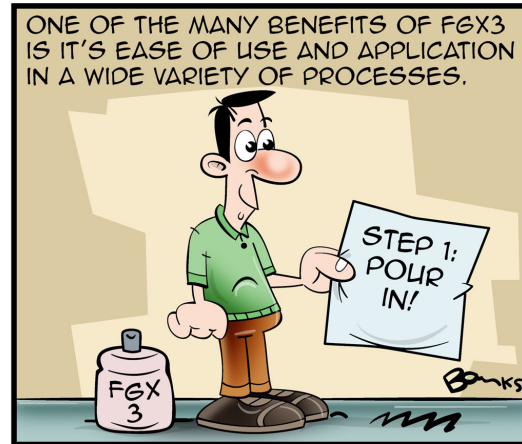
- Enhancement of surfactants to reduce Surface Tension ST, Interfacial Tension IFT and Critical Miscelle Concentration CMC
- The above properties promote and facilitate wetting, spreading, penetration and solubilization and therefore more efficient cleaning as an immediate short-term effect
- Longer term effects are achieved by activation of bio-processing by the existing aerobic microflora

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NEXT TREATMENT WORKS – FGX3 APPLICATIONS

next™ filtration technologies inc.



ACTIVATED SLUDGE APPLICATIONS

- Improved Process Control
- DO set points Achieved with 25% saving in energy
- 25% Increase in NH3 removal
- 25% increase in P removal
- 75% saving in post coagulation to achieve p consents
- 15% increase bod removal
- 11% decrease in SAS
- Compliance improvements

SEWAGE SYSTEM APPLICATIONS

- 11% decrease in ps energy use
- 10% operational costs savings
- Fog mitigation in sewer
- Fog mitigation in PS wet wells
- H2s and odour reduction
- Reduced flooding incidents
- Reduced eco-regulator ODI refunding (UK)
- Reduced septicity in sewers

Bench Methods Results of Measuring IFT, ST & Contact Angle

Oil-water IFT &
drop volume

Pendant Drop: Capillary

CCD Camera

5 μ L oil
droplet

Pendant
drop IFT
& drop
volume
analysis

Contact angle & drop volume:

Wetting & uptake

CCD Camera

Green leaf or skin

Spread only, no uptake: volume
constant

Drop volume &
contact angle
analysis

Spread & uptake:
volume reduced

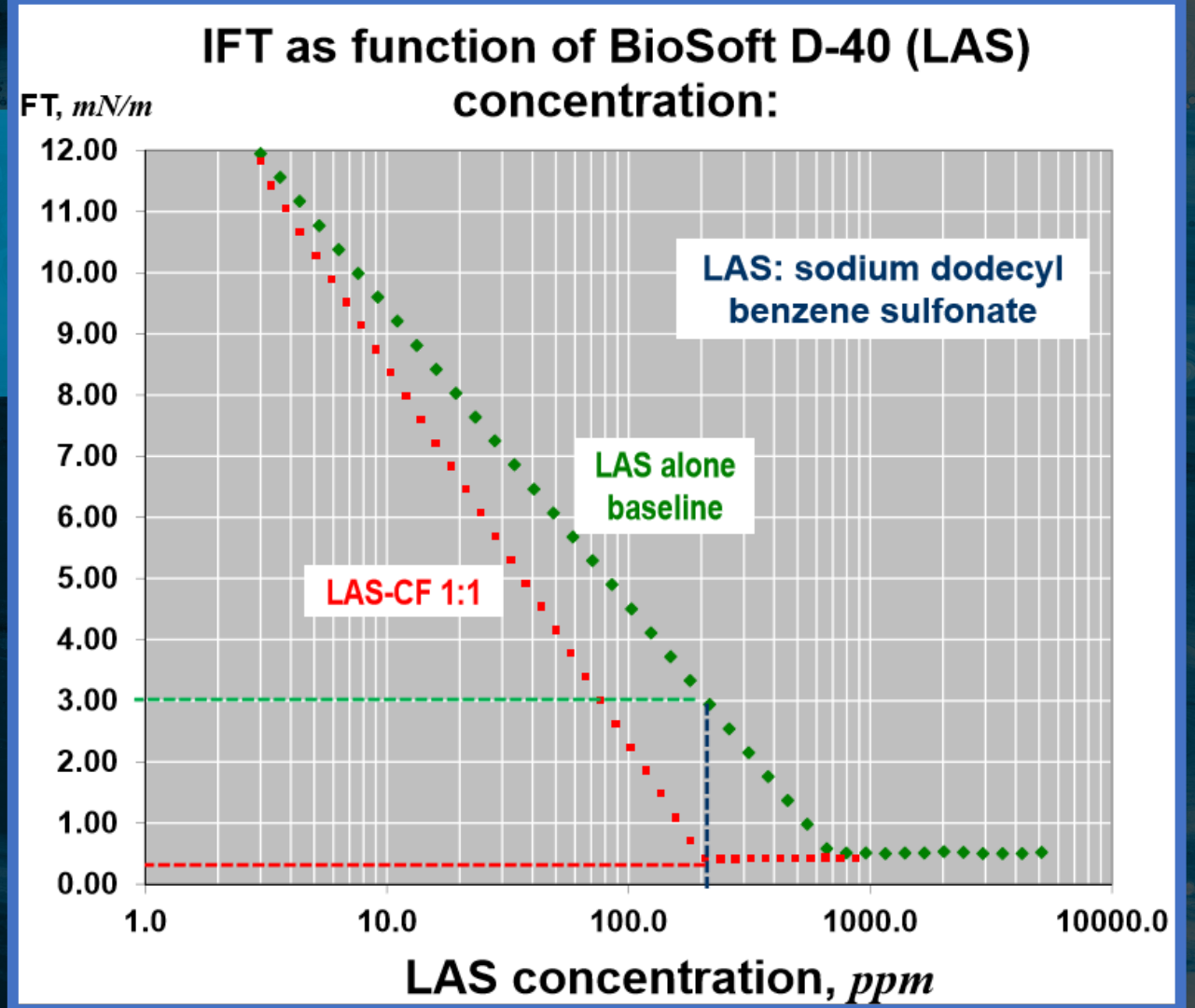
The pendant drop method consists of inferring the interfacial tension from the shape profile of a pendant drop of one liquid in another at mechanical equilibrium.

Contact angle change is a measure of wetting capacity of the resultant liquid

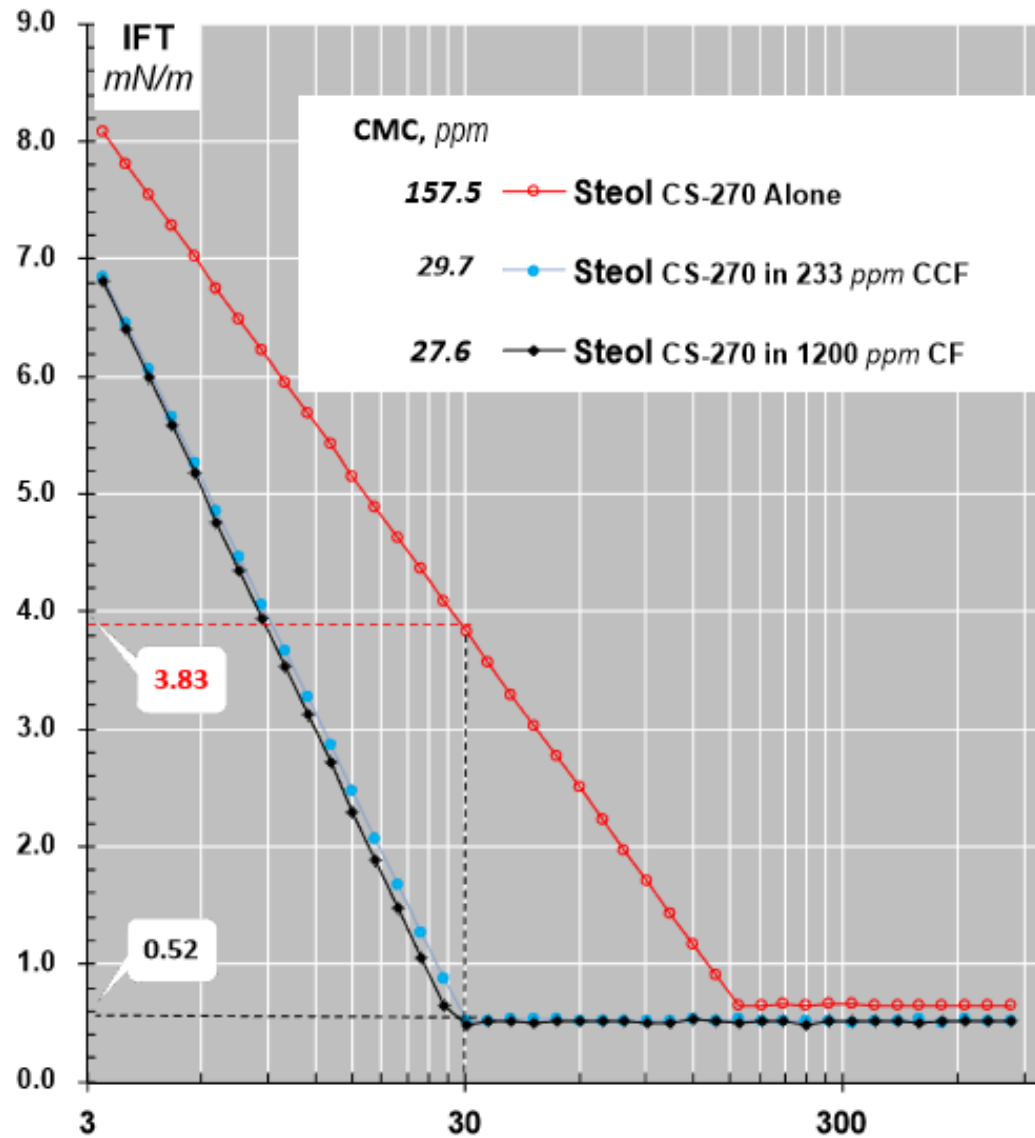
IFT Compared to Standard Surfactant

CF – Clear Ferment: another, more antiquated, term for Protein Surfactant Complexes.

As you can see, with the added PSCs the angle is smaller, which indicates greater wetting of the resultant liquid



Aqueous Steol CS-270 against Canola Oil
Interfacial Tension vs. Concentration Data



IFT Compared to Anionic Surfactant

Protein:
CF – Clear Ferment

**CCF – 5.15x
membrane-
concentrated CF**

Concentration of CCF=233 ppm
taken 1/5.15 of the concentration
of CF = 1200 ppm

Here you can see that the blue and black line which both have PSCs (one being a higher concentration of them) experience less interfacial tension than the red control

CMC Reduction

Surfactant	CMC, <i>ppm</i>	
	<i>no protein</i>	<i>+protein</i>
Ammonyx LO (lauramine oxide)	99.78	13.03
Steol cs-230 (Na laurethsulfate)	1240	333
1:2 LO - CS230	146.1	7.72

With some surfactants,

CMC is reduced by 1-2 logs, & lower pre-CMC IFT

The lower the CMC the more powerful the surfactant

Decrease in Blower Demand & Decrease in DO Readings

One week DO readings at Jax Heights Wastewater treatment plant.
Unit #1 Blue received 45% less air.

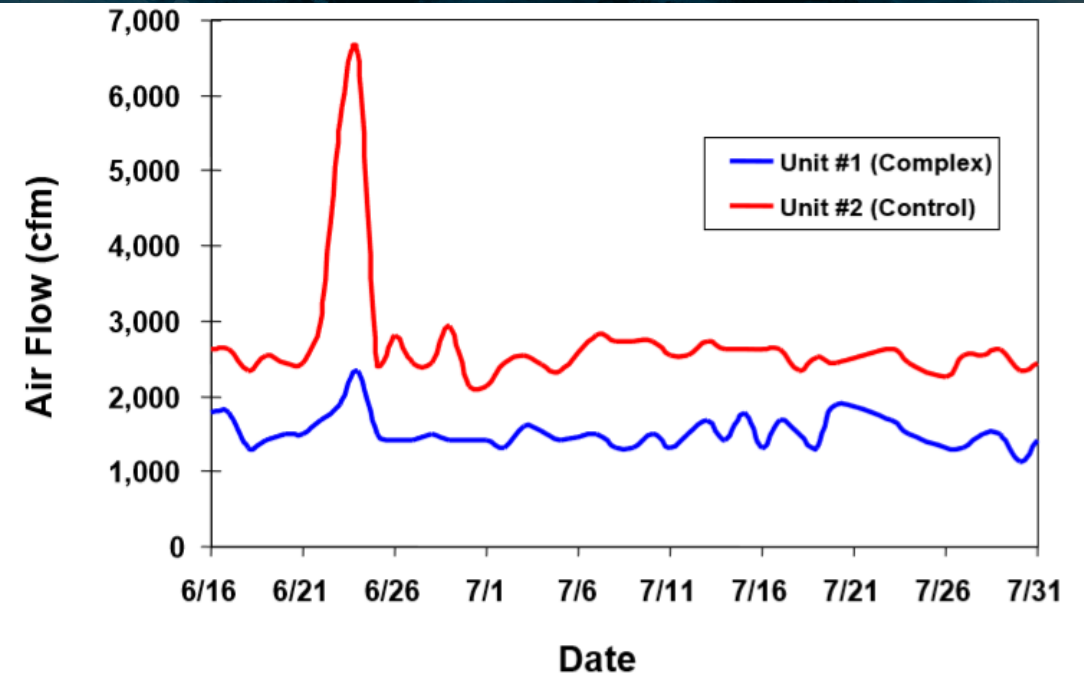
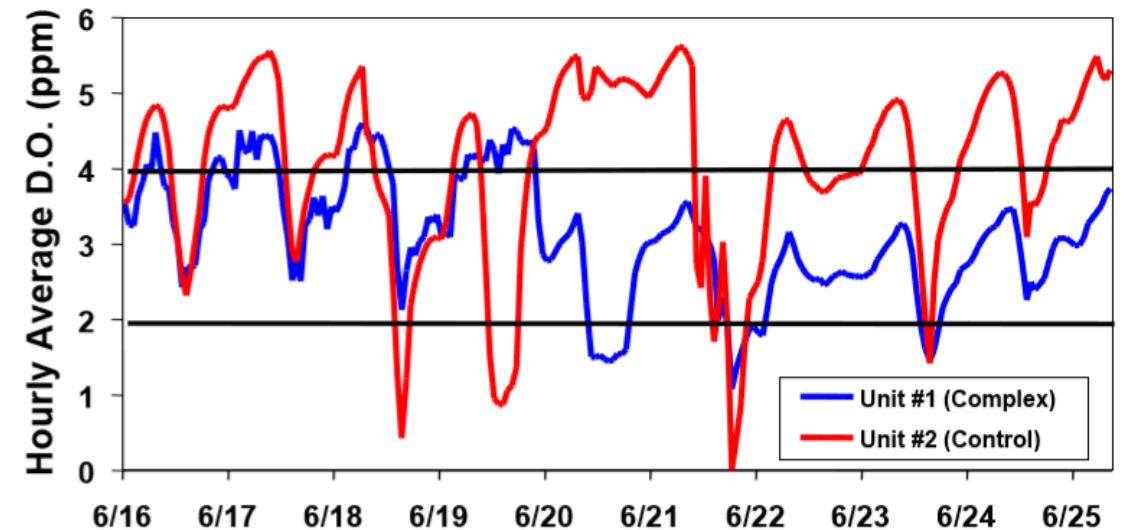
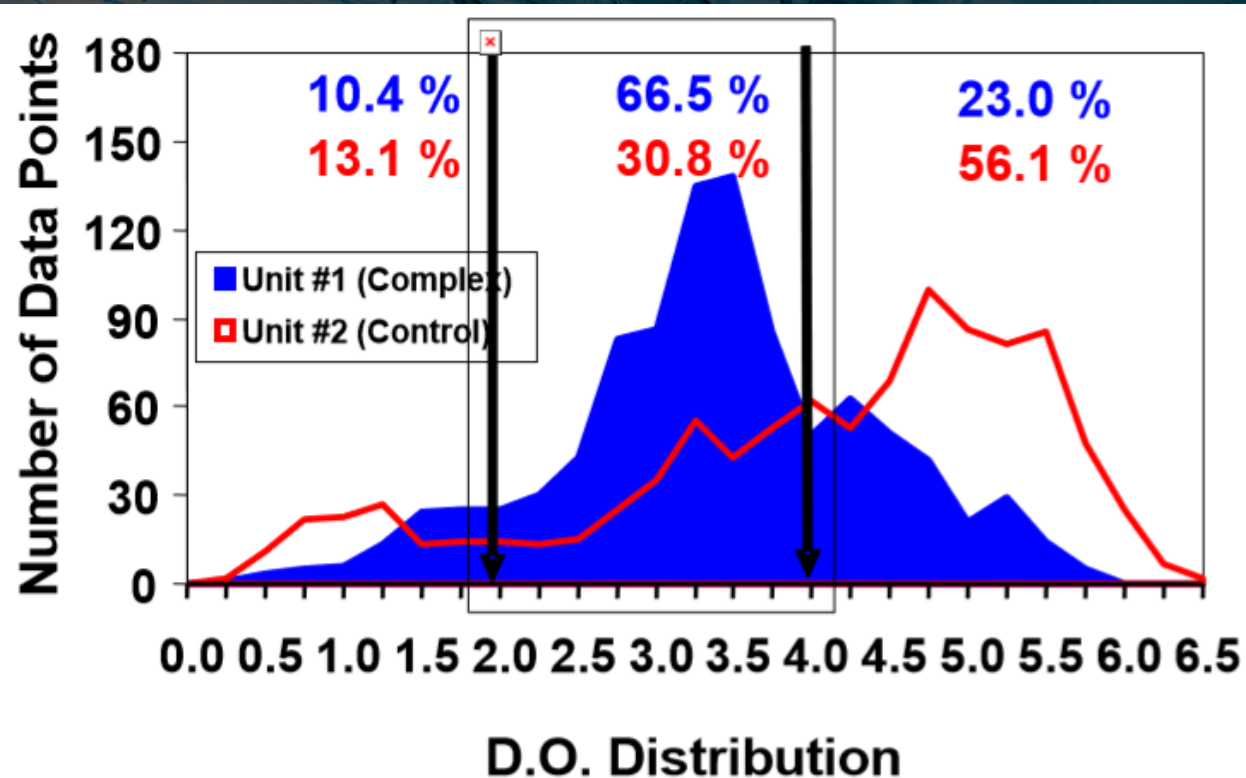


Figure 1: Air flow applied to Unit #1 and Unit #2 of Jax Heights Wastewater Treatment Plant during Phase 1 of the *Complex* treatment study. Unit #1 (*Complex* treated) received approximately 45% less air than Unit #2 (control).



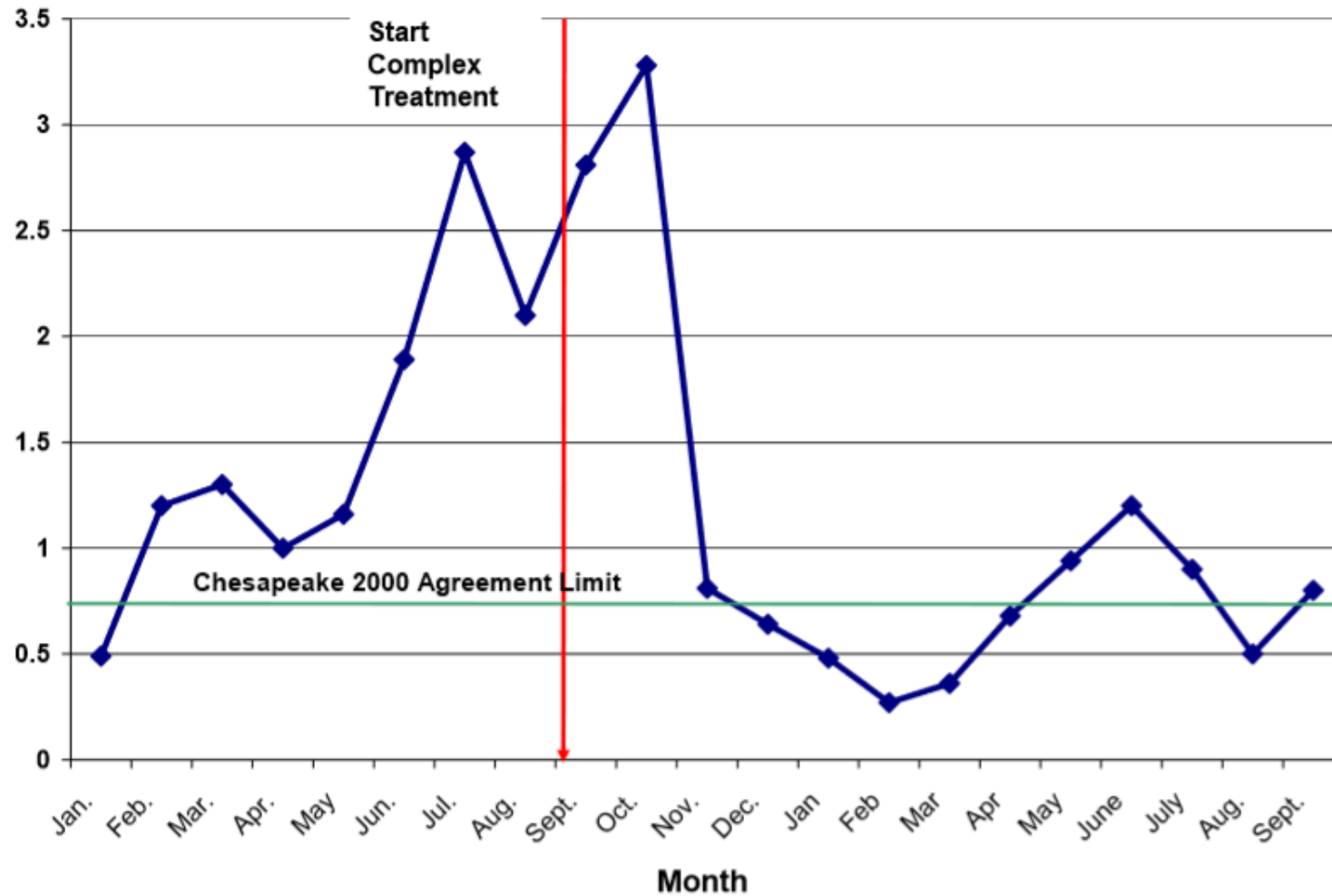
DO Readings Along Sequencing Batch Reactor



Two thirds of #Unit 1 were in the set range 2-4ppm DO, as opposed to the untreated tank two thirds were under the operating range.

Unit #1 Blue received 45% less air

Pine Grove Monthly Effluent Phosphorus Average





**Ammonia levels reduce
because FGX3 increased
the metabolism rate of the
carbon bacteria, leaving
available oxygen earlier in
the process for
nitrification**

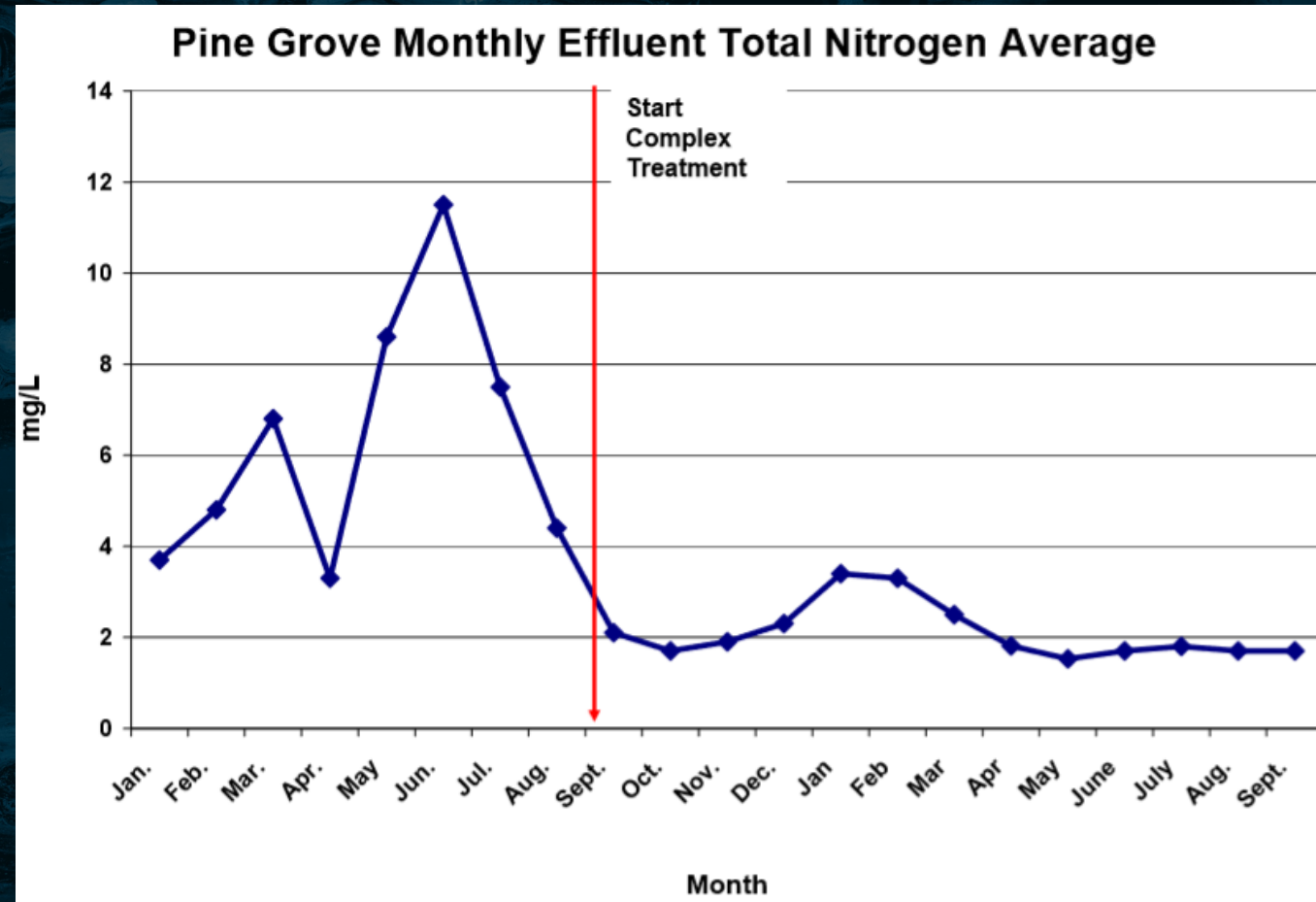


Table 1: Total industry cost base

First four years of AMP5 £m	Water	Waste-water	Total	Water	Waste-water	Total
Opex	6,876	5,832	12,708	45%	32%	38%
Maintenance capex	6,158	7,149	13,307	41%	39%	40%
Botex	13,034	12,981	26,015	86%	71%	78%
Enhancement capex	2,146	5,218	7,364	14%	29%	22%
Totex	15,180	18,199	33,379	100%	100%	100%

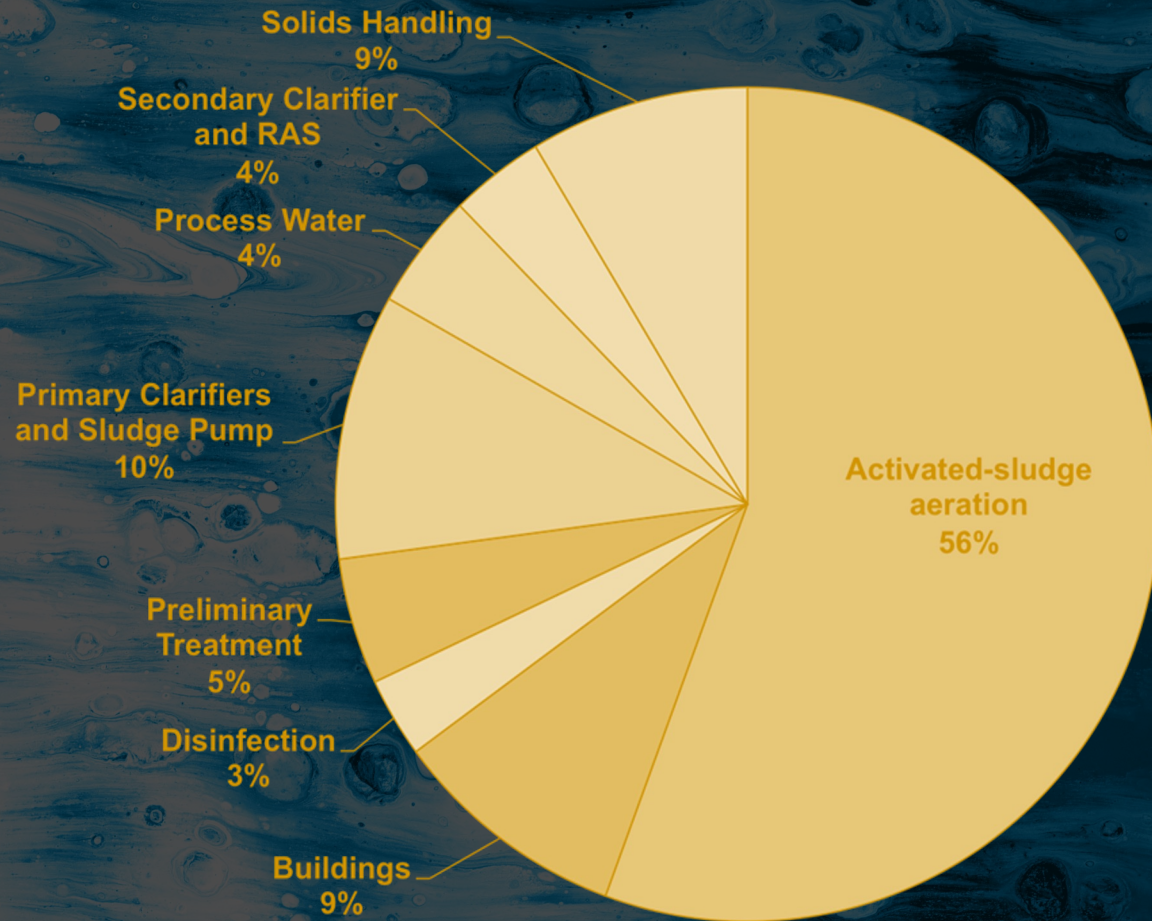
Source: Anglian Water analysis of Industry data-share

Enhancement capex, as the name suggests, represents a material extension of the existing base of capital equipment to address new requirements, such as new quality standards, higher service levels or material increases in population.

This relates to Asset management plans of UK water companies; in general, it's showing 70% on the industries spending over 4 years (the UK regulators work in 5-year cycles) was on operations and maintenance of operational assets

Financial Considerations

Real Cases:

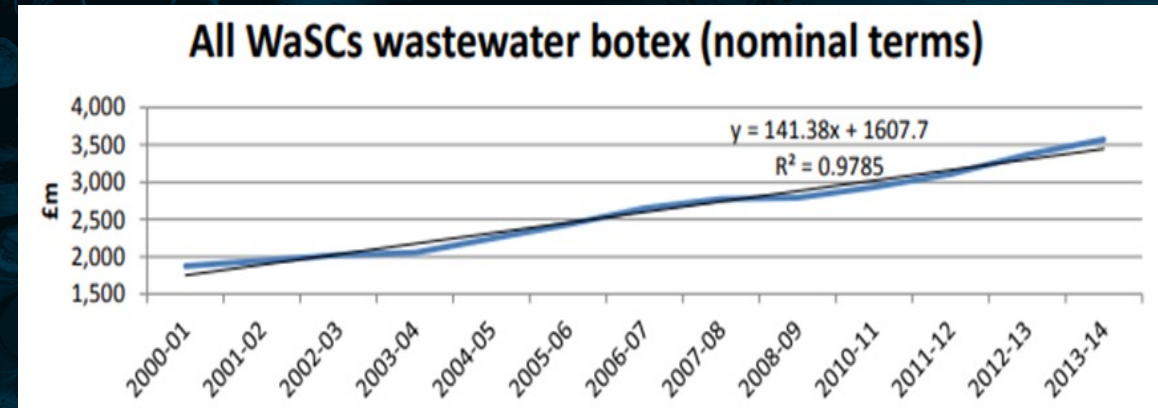


- A Wastewater plant for a 80,000 pop uses £120k per annum in Electricity Costs
- this power use will be for Blower energy equating to 55% of Total energy used
- 25-50% energy saving normally achieved and in this example 38%
- Model demonstrates this will be realized at 1 ppm dosage
- This example 19% opex saved Euro 19,000 allowing for the costs of dosing

Financial Considerations:

- Approximately 50% of the water companies are more efficient than the case studies given
- Approximately 50% are less efficient
- Ferric for phosphate removal is suffering a world wide shortage and therefore chemical cost of treatment will be competitively increasing and therefore BOTEX will Increase

BOTEX is already increasing on an upward trend:



FOG Removal Networks Using Next-FOGStop:



- The mitigation effect of using NextFOGStop on FOG accumulation in the sewer network downstream of FSEs sites delays the build-up of FOG.
- This was observed by lower overall grade values for service conditions during the trial due to build-up of FOG up to 15% which did not exceed this value during the duration of the trial.
- The effect of NextFOGStop in a pumping station receiving wastewater from FSEs MITIGATED the formation of hard build ups in the wet well.
- NextFOGStop in fact keeps the FOG in a PUMPABLE FORM
- Maintaining EMULSIFIED FOG AT WORST: led to 10% lower energy consumption and easier cleaning procedures for the pumping station.

Since these operational figures were analysed, we have reduced the cost of FGX3 by 30% so Operational expenditure will show a saving of >25% on standard operational costs



BREADSHALL & SEWER FINANCIALS	
PRE-DOSING	
Rising Main Cleansing x2 pa (Min)	£5000
NRV Cleansing x 2 pa (Min)	£5000
Wet Well Cleansing every 2 months	£7000
Weekly Visits	£10,000
TOTAL	£27,000
POST -DOSING	
Rising Main Cleansing x 1	£2,500
NRV Cleanse	£2,500
Wet Well Cleanse x2 pa	£2,333
Monthly Visits	£769
TOTAL	£8102
Cost of Dosing NFS	£15,497
COST BENEFIT	£3,401 13% £5,725 21% Discounted



BREADSHALL & SEWER FINANCIALS	The Potential (changes to Dosing)
PRE-DOSING	
Rising Main Cleansing x2 pa (Min)	£5000
NRV Cleansing x 2 pa (Min)	£5000
Wet Well Cleansing every 2 months	£7000
Weekly Visits	£10,000
TOTAL	£27,000
POST -DOSING	
Rising Main Cleansing x 1	£0
NRV Cleanse	£0
Wet Well Cleanse x2 pa	£0
Monthly Visits	£769
TOTAL	£769
Cost of Dosing NFS	£18,829
COST BENEFIT	£7402 27.5% £10,226 38% Discounted
	Euro 8,300

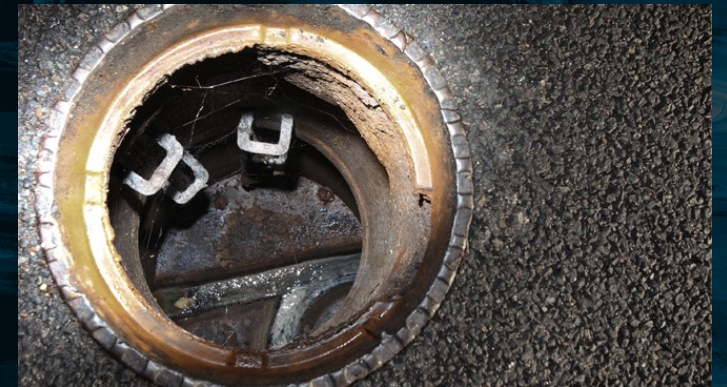
FOGStop Dosing Apparatus

**Pumped Dosing for
Greater Accuracy**



Balance Head Drip Doser in Manhole

ST Solution



OPERATIONAL CONSIDERATIONS



- Stirred concentrate to avoid settlement
- Dilute dosing to give greater volume input and potentially improve mixing
- The longer term effect on sidewall accumulations that are preventing assessment decreasing below grade 3
- Dosing calculations based on 1.5 times average flow to keep concentration at 95%ile flows
- Security CABINET STORAGE and COSTS
- DOSING INSIDE FSE's
- POWER available from FSE's
- Cleansing Floors with NFS at FSE's
- A successful deployment has the potential to save ST between £1.25K and £2.1k pa



THANK YOU