How chemistry can help Brown Stock Washing operations

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Water is the connection

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“Air is our enemy”

Forms of Air in Pulp & Paper Stock

Large bubbles

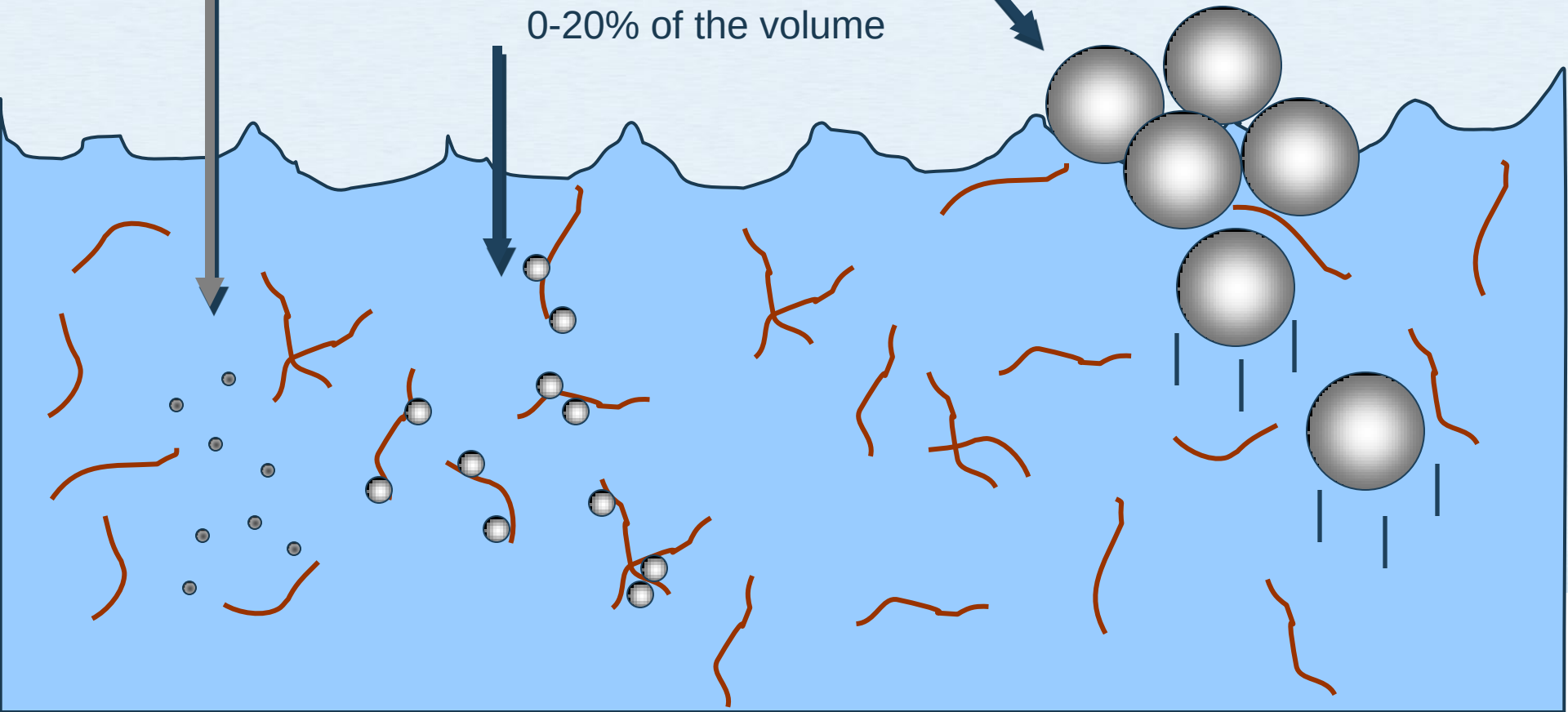
-Causes foam

- Easiest to get rid of

Dissolved air

Entrained air

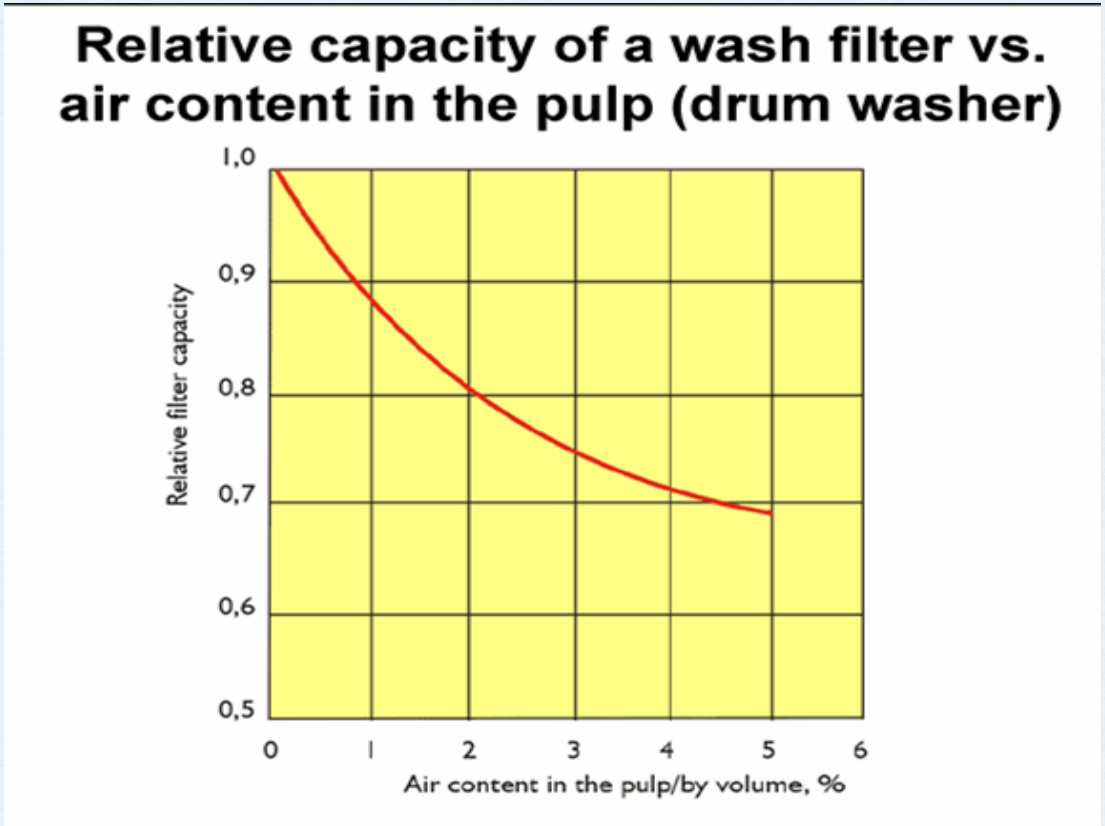
0-20% of the volume



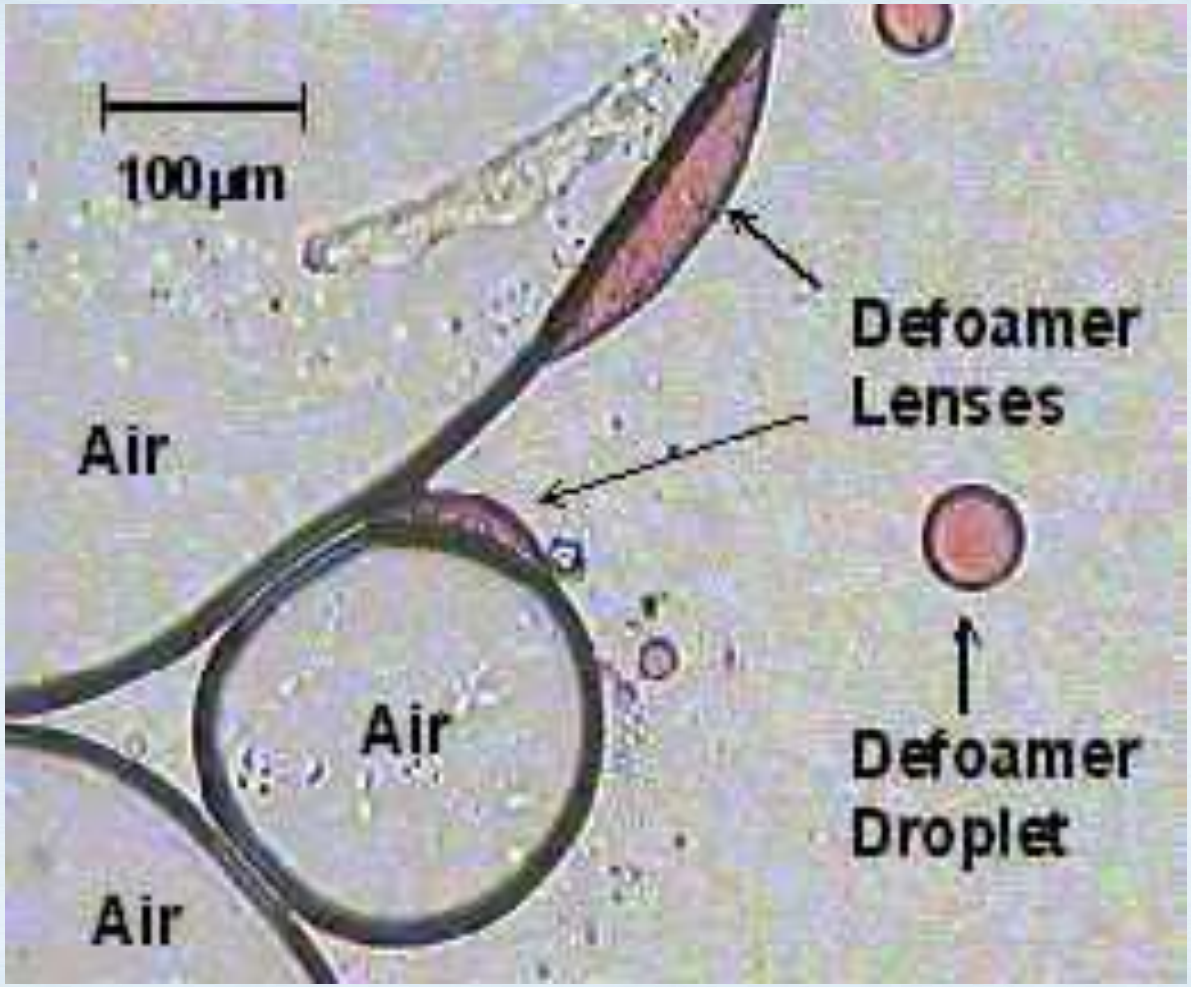
The Effect of Air Content for Washing Capacity

A high air content of pulp and wash water will have negative effect on washing capacity

Already an air content of a few percent in the pulp will significantly decrease the washing capacity of the washer



How Defoamer Works



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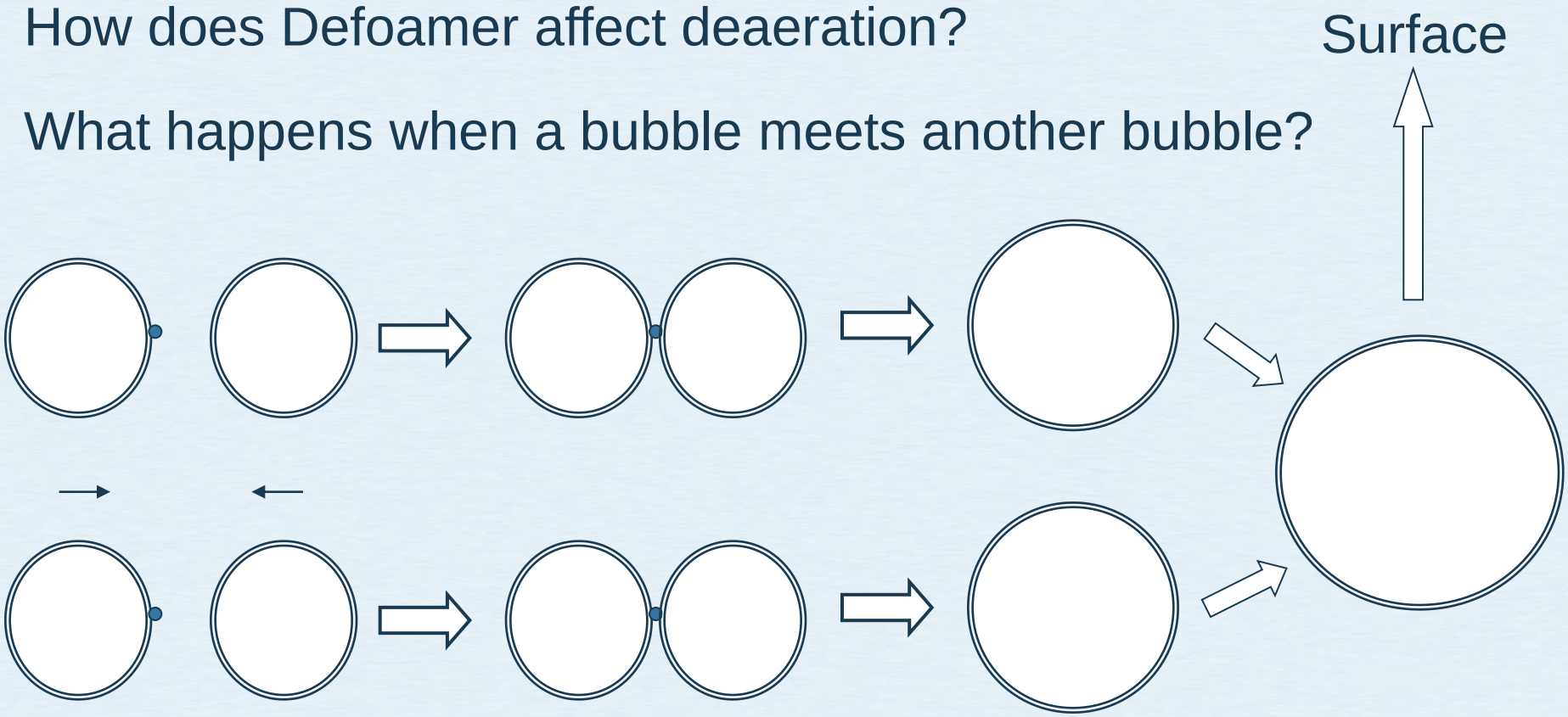
Deaeration

How does Defoamer affect deaeration?

What happens when a bubble meets another bubble?



Where Entrained Air and Foam are coming from?

Softwood	Hardwood
High foaming tendency	Lower foaming tendency
5 – 8 % extractives	2-4 % overall extractives. (Maple and aspen 6 -7 %)
Higher free acid content due to resin acids	More esterified fattyacids.

Mixing of air into stock or liquor!

- Filtration at washers
- Too low vat levels in washing filters
- Too low levels in filtrate tanks.
- Flashing because of too high temperature. (Boyle's law works also in practice)
- Etc…

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What are the Recommended Dosing Points?

- Before process point where air can escape from the liquor at atmospheric pressure.
- Dosing to liquor/filtrate is usually better, because consistency of the pulp can be quite high.
- Better to have more feed in dosage to the first washers than at later stages.
- Dose at least 60% to the first washing stages. Mostly 70 - 80 %.
- If there is a problem with shower displacement, dosing can be done to the shower water.
- Dosing point to O2 blow tube.

What are the defoamers to choose from?

AEROTECH 1000-series **WATER BASED**: Paper applications / WWT

AEROTECH 2000-series **ESTER BASED**: Paper applications / WWT

AEROTECH 3000-series **OIL BASED**: Pulp applications / WWT

AEROTECH 4000-series **WATER EXTENDED OIL BASED**: Pulp / WWT

AEROTECH 5000-series **CONCENTRATES**: Paper applications / WWT

AEROTECH 6000-series **SILICONES**: Pulp applications

FENNODEFO: Different industrial processes / WWT

Finland France Poland USA Canada

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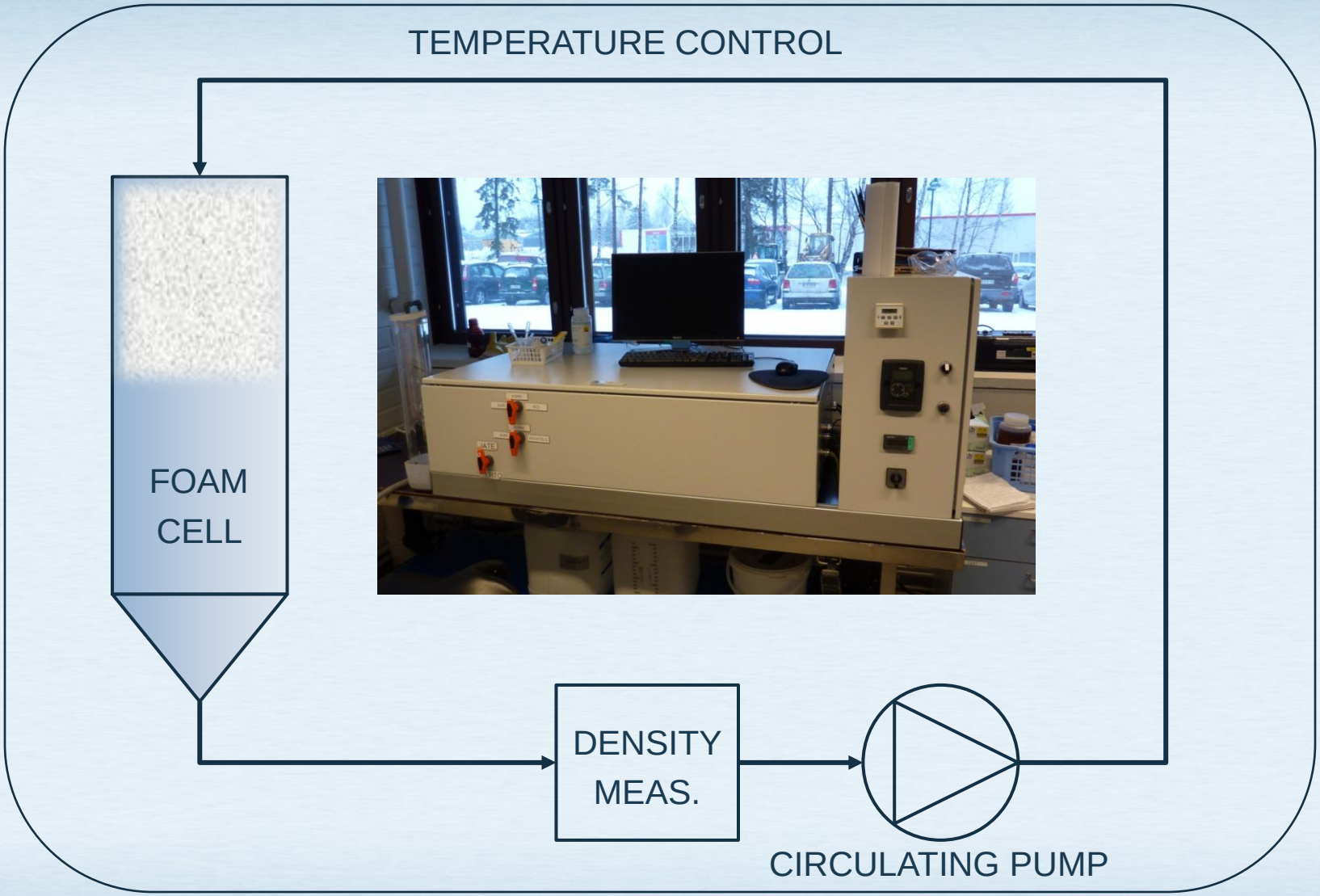
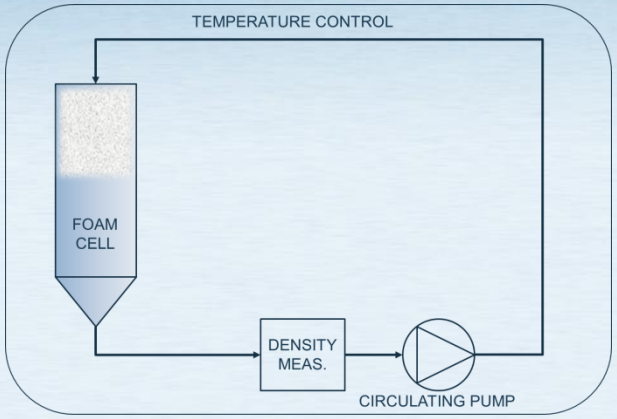
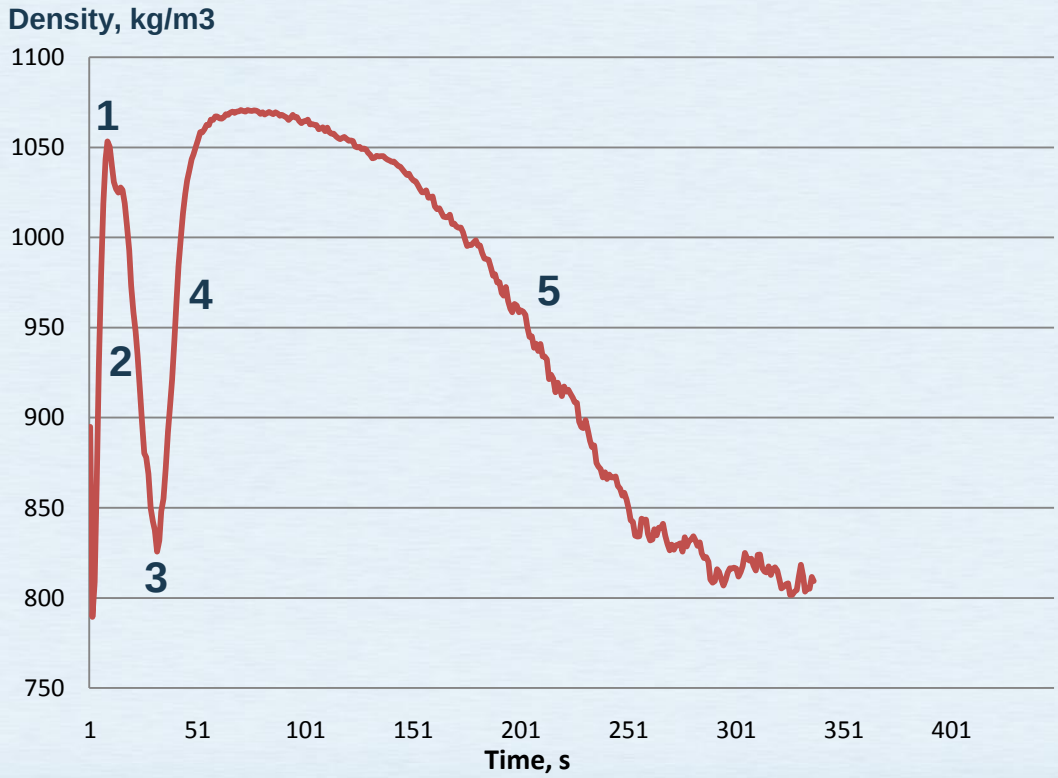
How to choose a defoamer? Kemira's FEAT method



Principle of defoamer testing



1. Pumping started
2. Foam generated
3. Defoamer added
4. Foam disappears
5. Foam re-appears



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Performance of defoamers

Defoamer chemistry

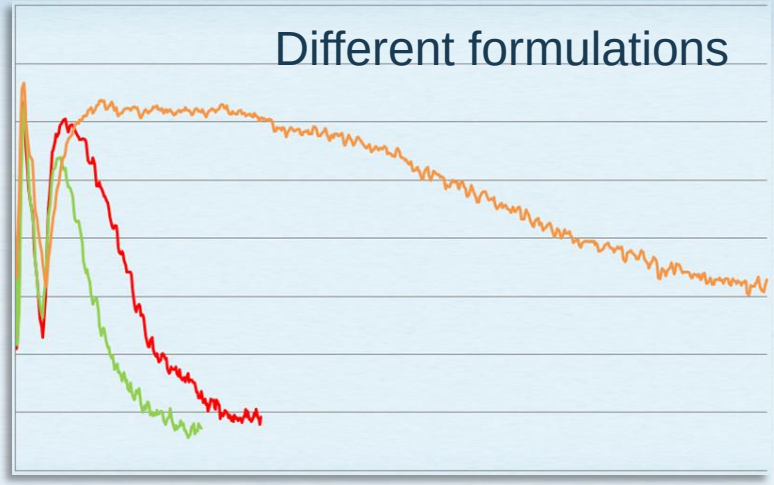
- Type of defoamer; oil, silicone, waterbase…
- Formulation (raw materials composition)
- Colloidal characteristics (e.g. particle size)

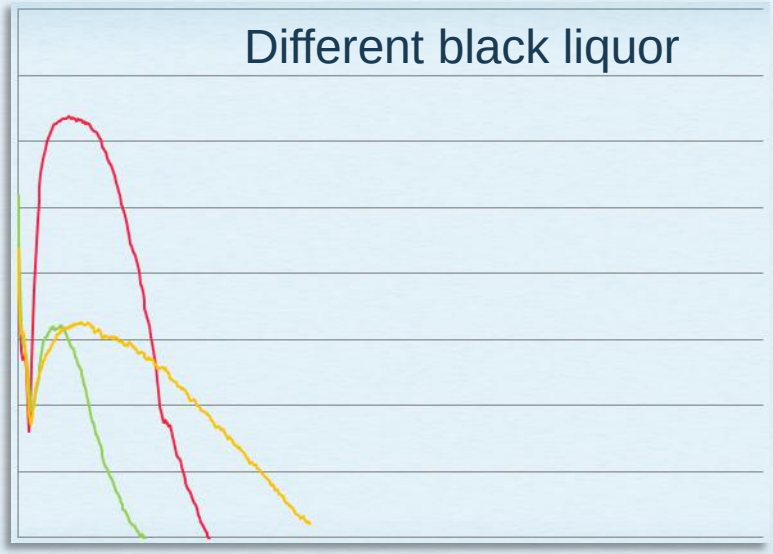
Industrial application

- Pulp mills (black liquor, brownstock)
  - HW / SW liquors – different soaps
  - Temperature and alkali
  - Dissolved solids
- Paper mills
  - Paper grade & furnish type; extractives, dissolved colloids, calcium soaps, dissolved carbonate & microbubbles…

Selection of defoamer:

- always process-specific
- always to be optimized





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Development of FEAT method

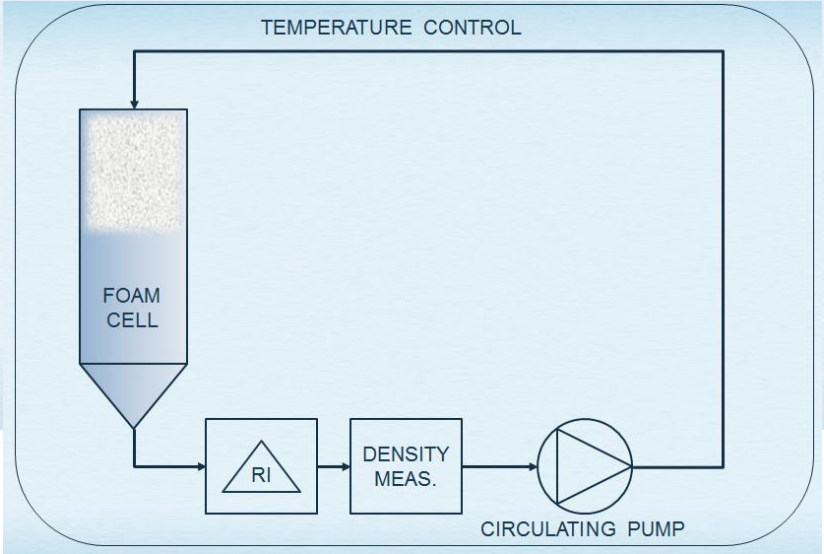
FEAT provides *responses* of defoamers

- Informative from application point of view, i.e. FEAT provides enough data for comparison of products; ”foam killing efficiency”
- The relationship between chemical properties of process liquors and FEAT response curves is incomplete → there is need to measure other properties of liquors

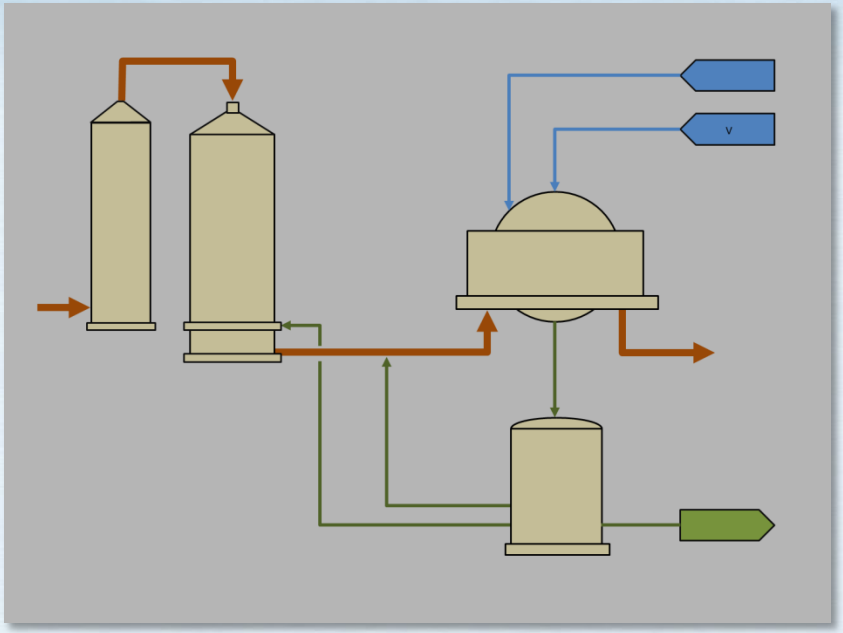
- Dissolved solids
- Conductivity
- Dissolved ions; Na, K, Ca, SO4…
- O2, pH, redox (mainly wastewater applications)
- **Refractive Index**: total concentration of dissolved substances

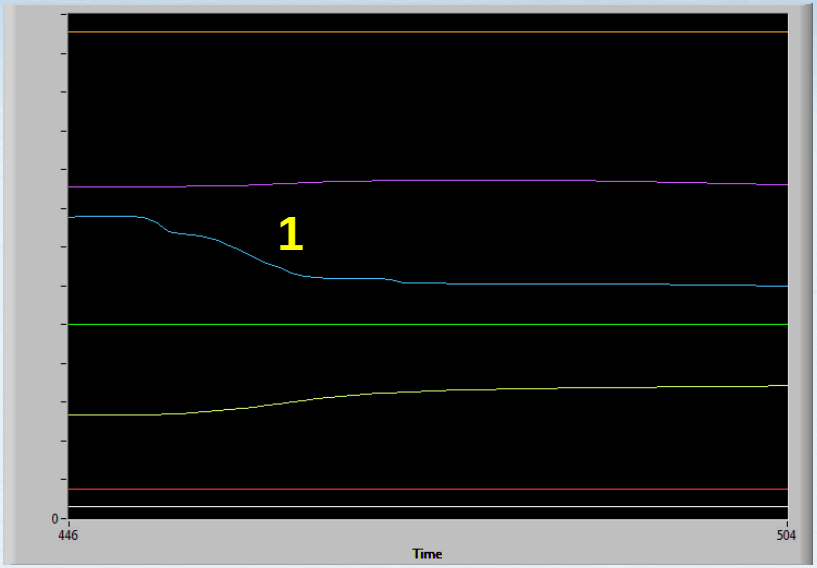
Optimized defoamers:

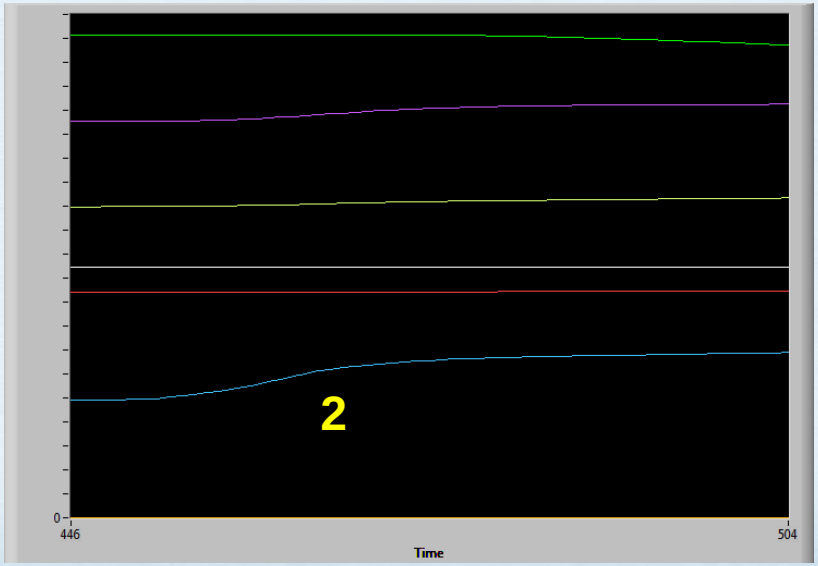
- Chemistry
- Formulation
- Colloidal characteristics



From product testing to online control







Foaming →

1. Decreased washing efficiency
2. Increased carry-over

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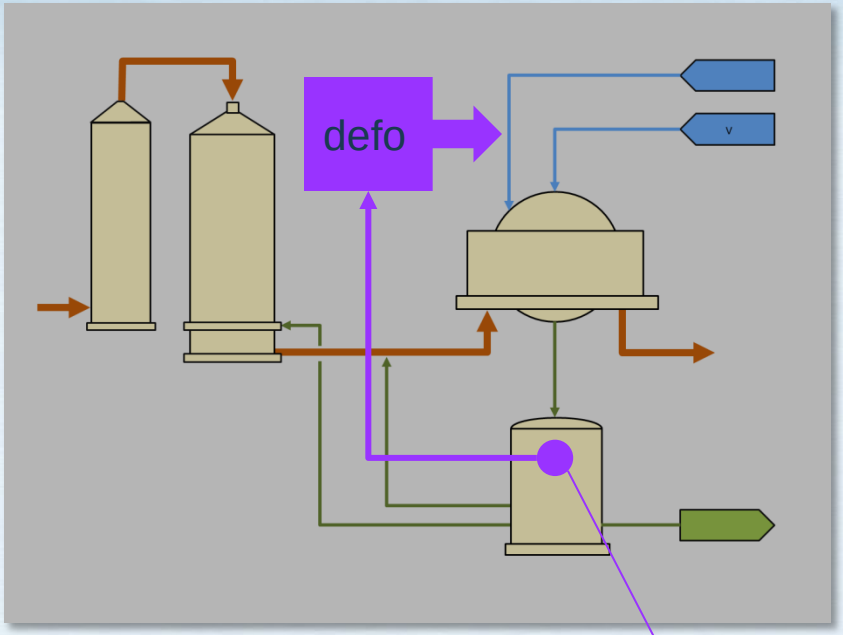
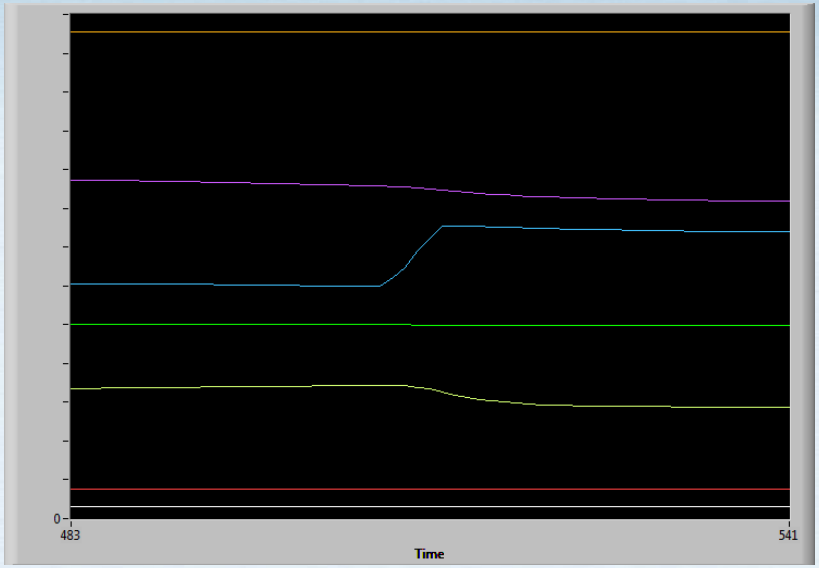
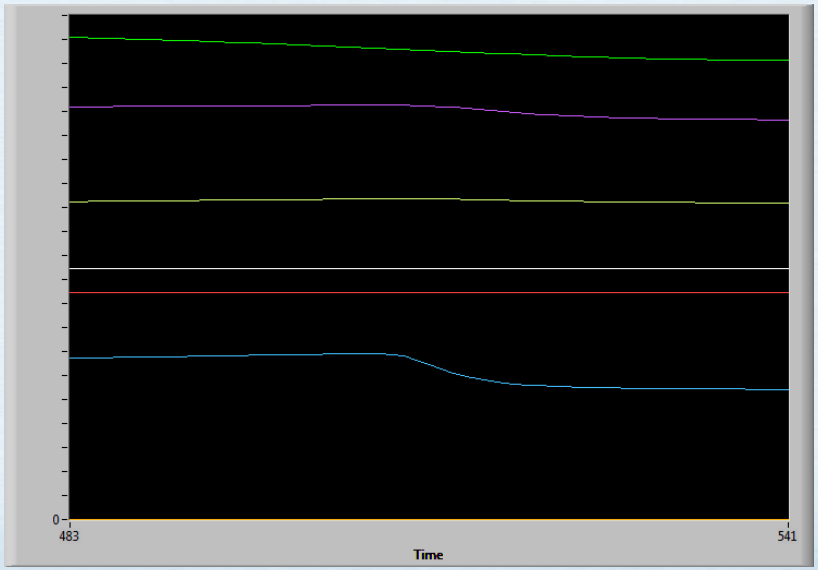
From product testing to online control







Defoaming →

1. Measurement of entrained gas
2. Measurement of dissolved substances
3. Online control of defoamer dosage

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CONCLUSIONS

Brownstock operations are always impaired by

- Air, which is always present
- Overrun capacity

Chemistry can help alleviate these drawbacks

Creating a succesful chemistry solution is a function of:

1. Proper chemistry testing protocol and product proposal
2. Proper system survey with sophisticated control proposal
   - Here proper instruments come into play