# MFC massan ja kemikaalien tehokas käyttö kartongin ja paperin valmistuksessa

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**Wetend Technologies Oy**

# MFC Käyttökohteita:

- Lujuuslisäaine pakkauskartongissa ja paperissa
- Estokerros; vesi, rasva, happi ym
- Pehmeys – tissue
- Erityisapplikaatiot
- Päällystys
- Additives

# Valmistus:

- Mekaanisesti tai kemiallisesti

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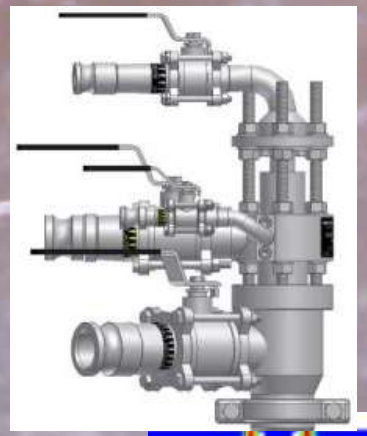

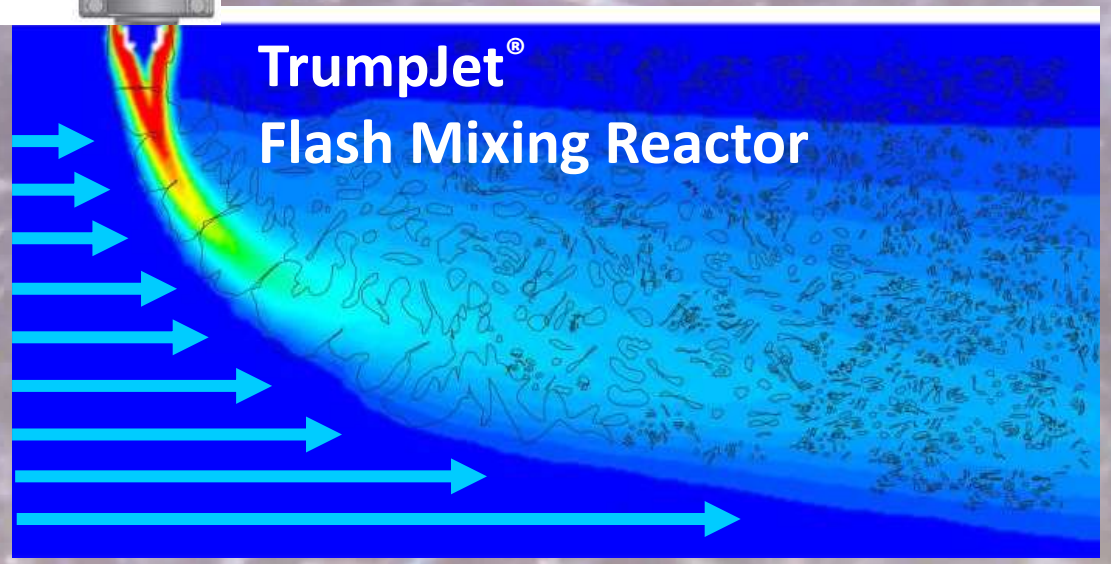


# Good Mixing makes the difference

# Importance of fines

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**The fines contained in a paper or board making stock have an important, even dominant influence on the quality and characteristics of paper or board products**

**Role of fines:**
**-The amount of inorganic filler may vary from 0 to 35%, while fiber-based fines can make up as much as 35 % of the total amount of solids in the stock flow**

**-Dominating role for sheet quality: formation, strength, opacity, density, air permeability, pore size distribution, drainage, profiles CD / MD**

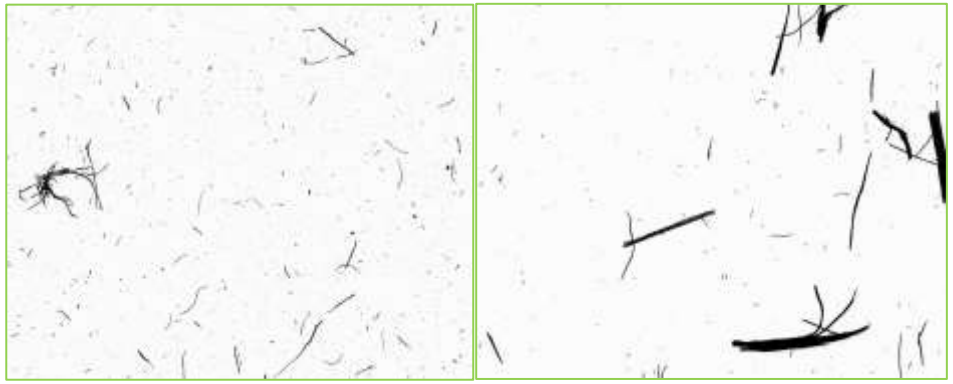
**-Use of optimized chemicals: efficient novel flash mixing,  location with short delay time, avoid shear forces of the process equipment**

**-Retention and measurement/control/automation, speed of control, fast response time**

# Analyzers & UHD -Technology

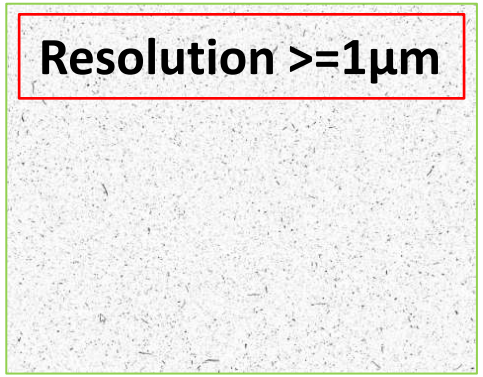
- Furnish elements like fibre fractions of the furnish can be detected by UHD imaging analysis.

- Large and small particles like flocs, shives, dirt, fibres and fines are measured separately.

Flocks, Shives and Long Fibers

Fibers




Fines and Fillers

# Image analysis of stock, new visual means to improve fines management – no chemicals

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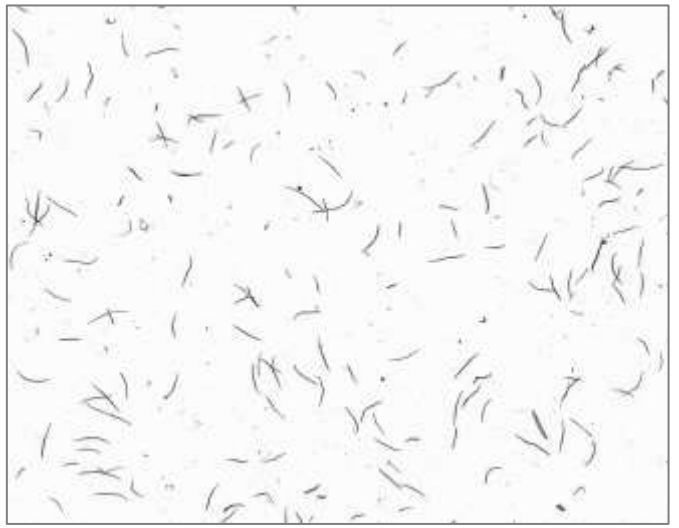
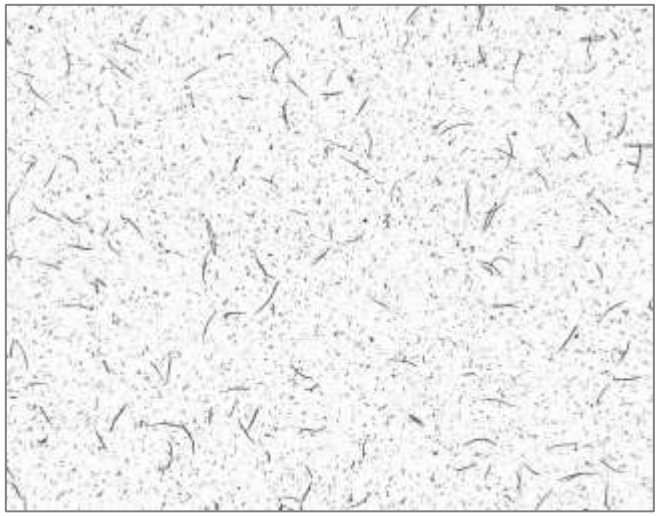
Long Fibers



Short Fibers

Short Fibers,
Cellulosic Fines
&
Filler Particles



Cellulosic Fines
&
Filler Particles

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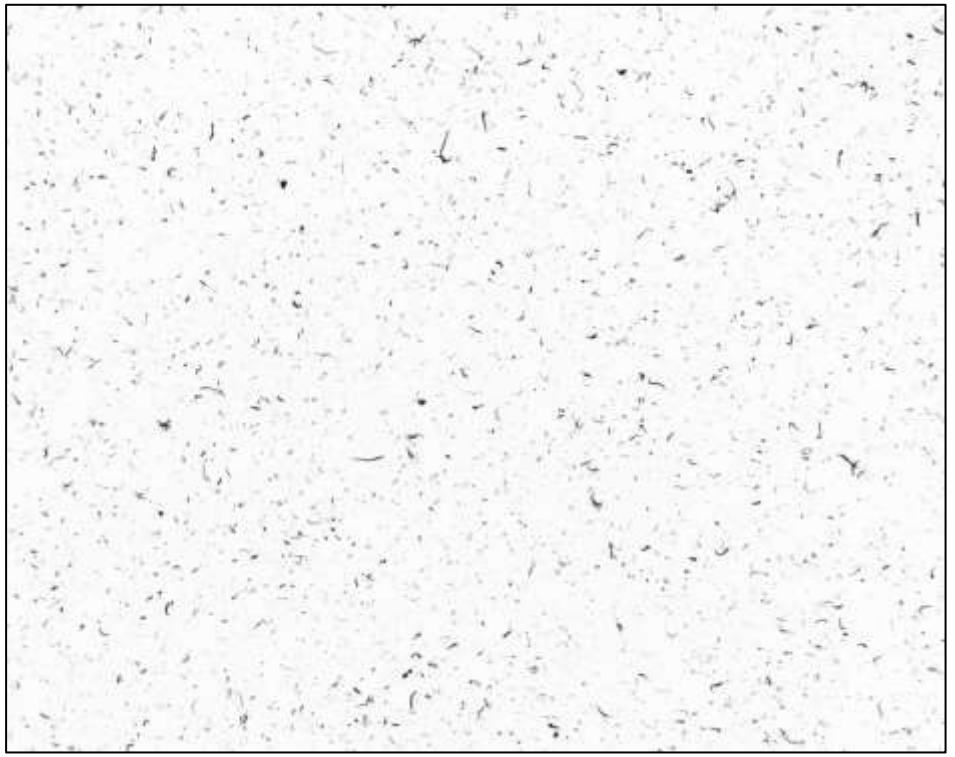
# Fines of Stock and Micro Fibrillated Cellulose Pulp
# Scale of behavior follows the same pattern in the retention process…..??

Fines and Filler



Micro Fibrillated Cellulose

# Images of the interaction of fibers, fines and fillers with chemicals to form agglomerates

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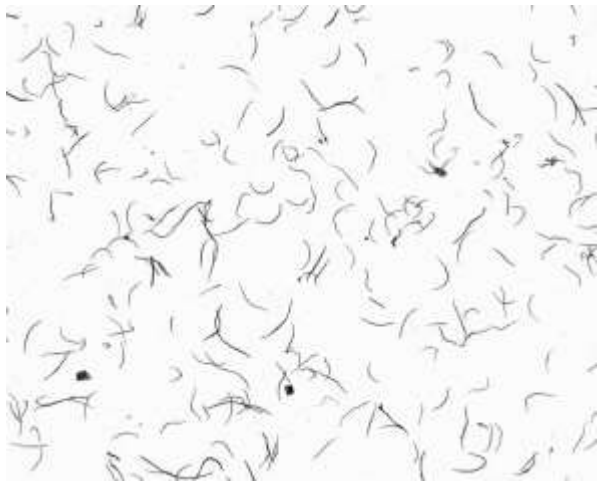
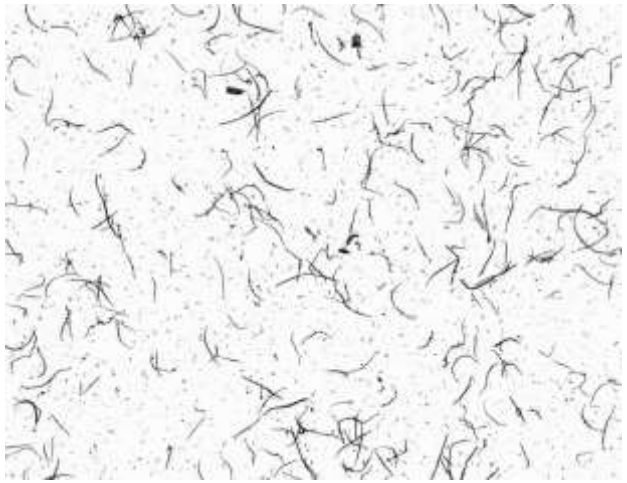
Reference pulp
no chemical

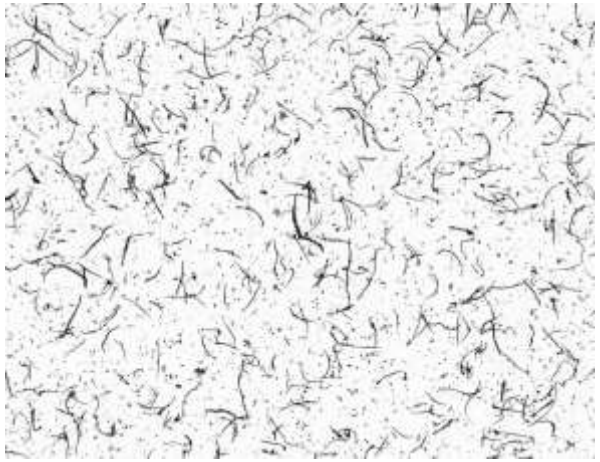
Reference Pulp



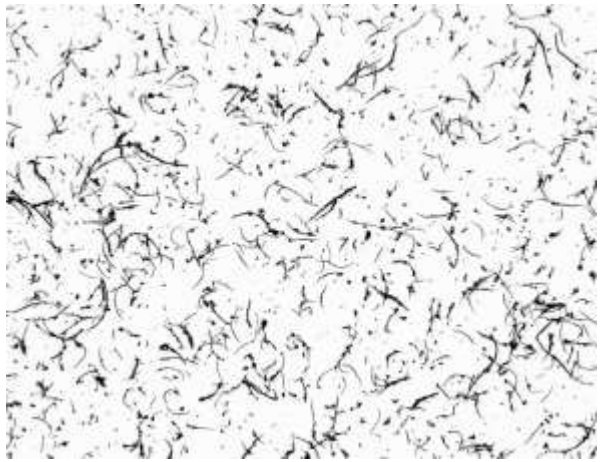
C-PAM

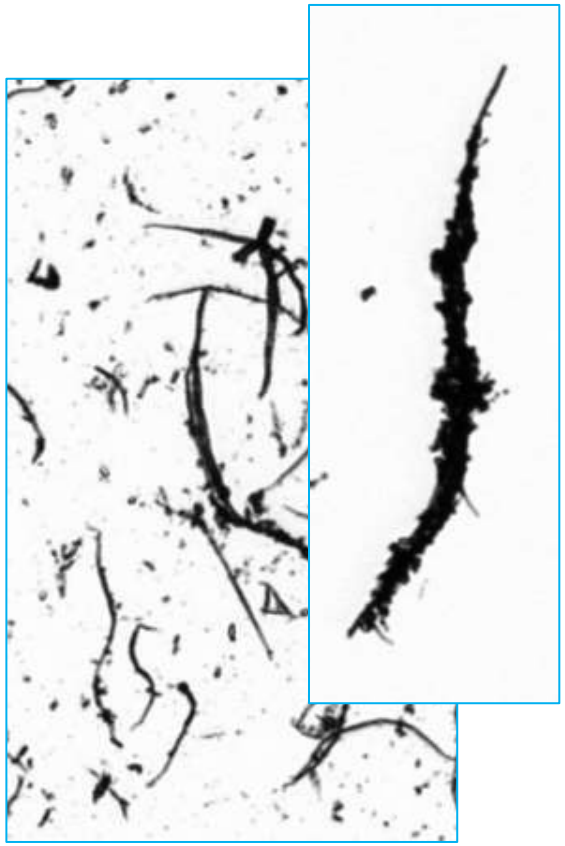


C-PAM + Silica



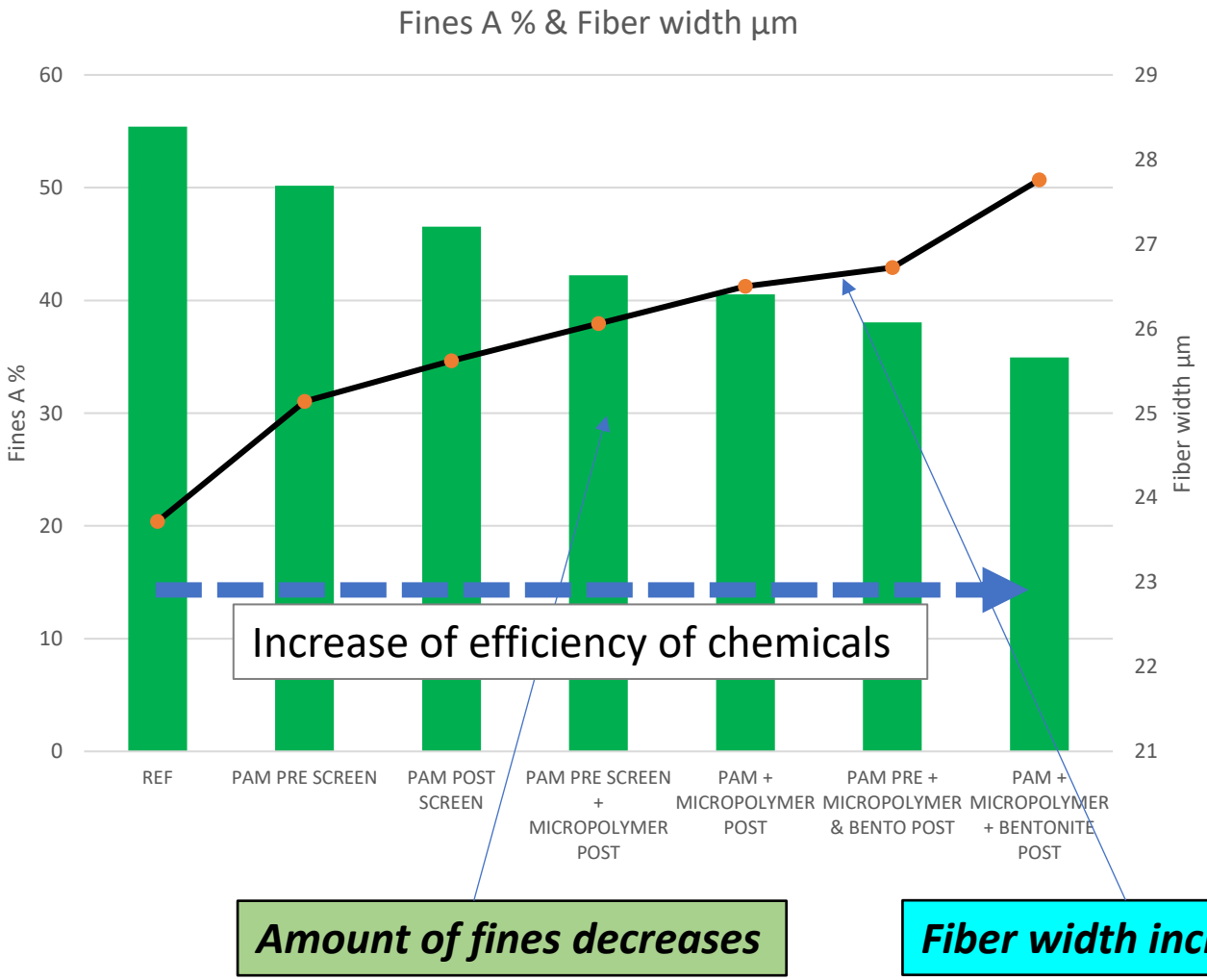
C-PAM +Micropolymer

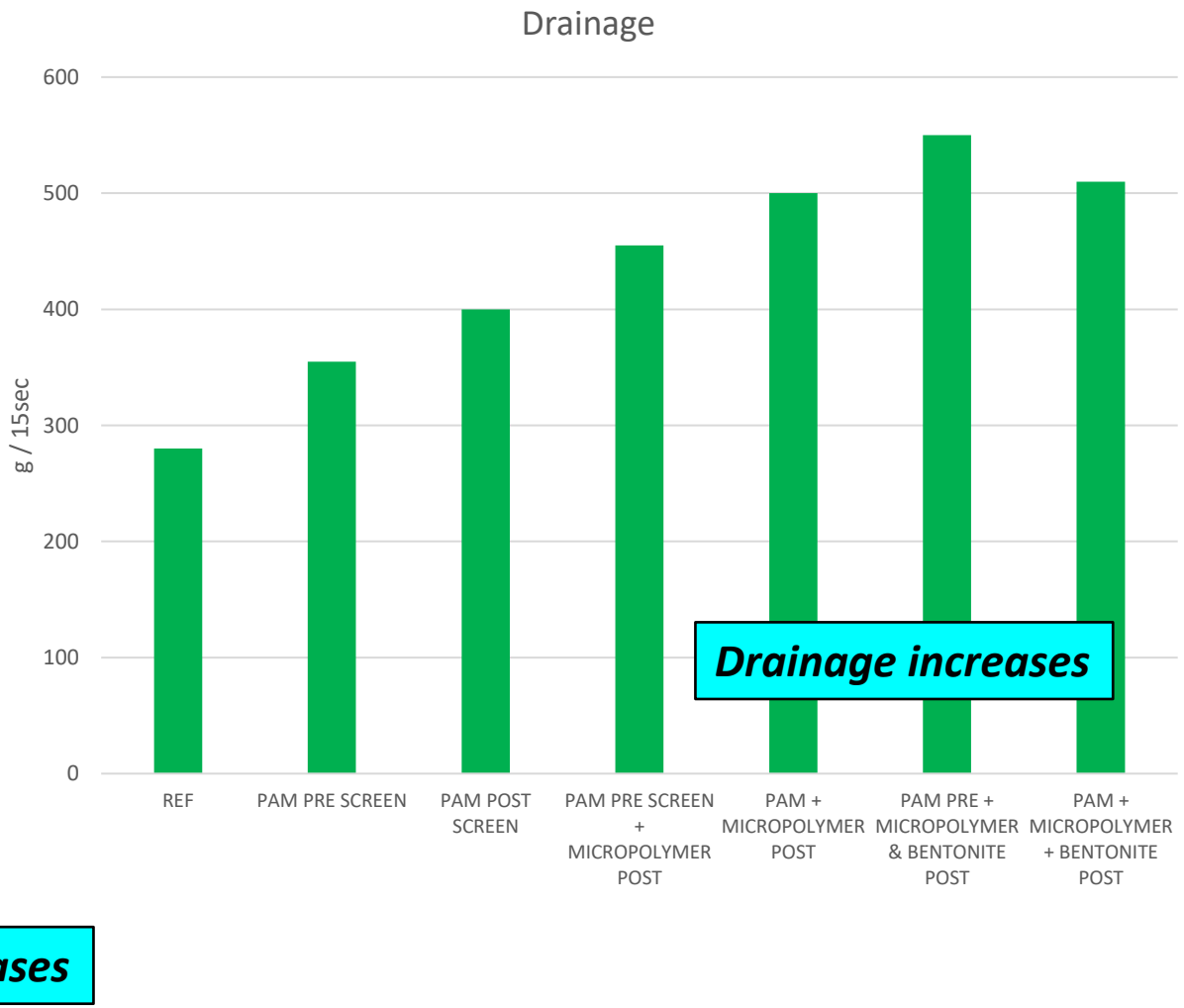




Reference pulp
with chemical

# With chemical retention fines and filler are attached to fiber surfaces and visible fines decrease and fiber width increases



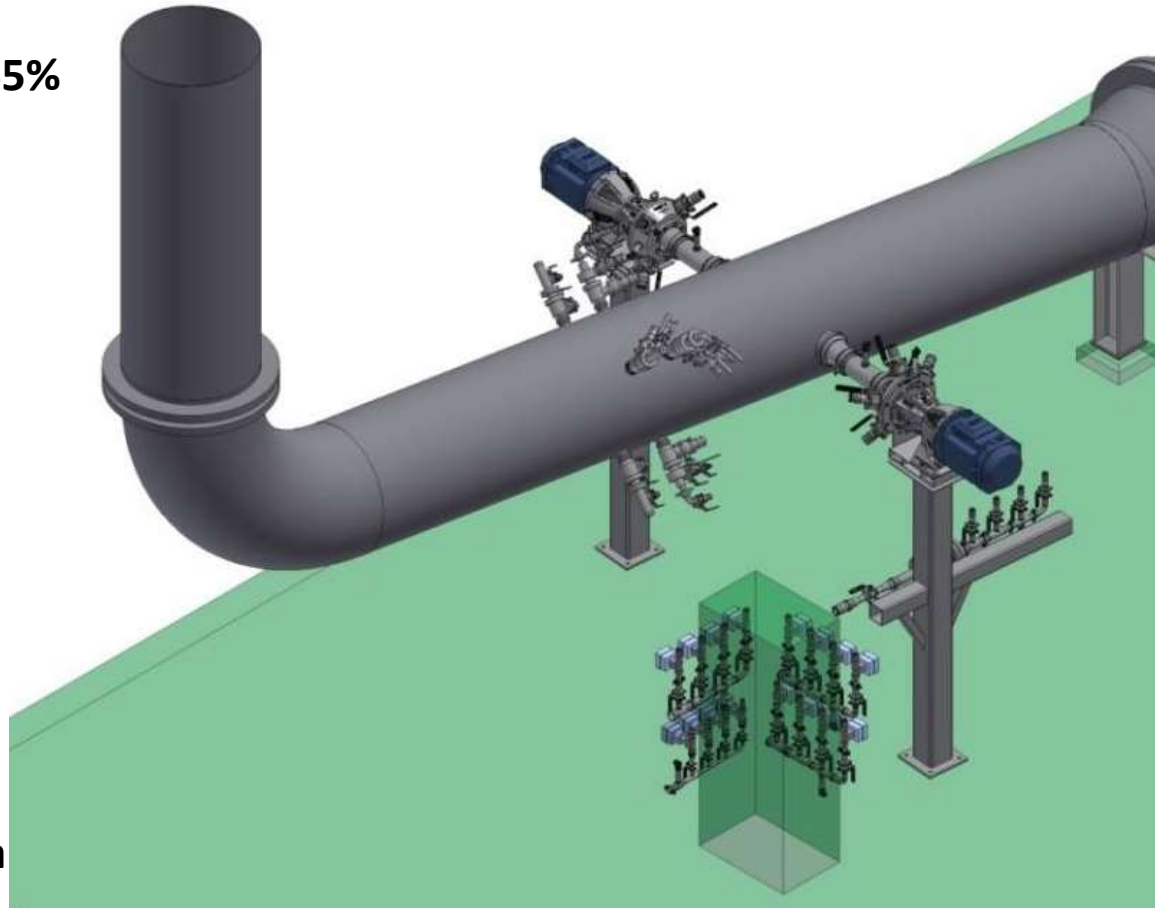



# Fine paper line - Sappi Stockstadt PM1, Germany

**TrumpJet Flash mixing reactor for CPAM, ASA, Starch, Microparticle located close to headbox**

**Mill results:**

- **Less sheet breaks, reduction of time loss due to breaks 65%**
- **Net efficiency increase 2…3%**
- **Improved formation**
- **Less dirt agglomerates**
- **Strength starch saving 50%**
- **ASA saving 10%**
- **Bentonite saving 5…10%**
- **Optimized use of CPAM, saving 20…25%**
- **Defoaming agent saving  50%**
- **Water saving 1,35 m3/ton, energy saving 13.000 MWh/a**

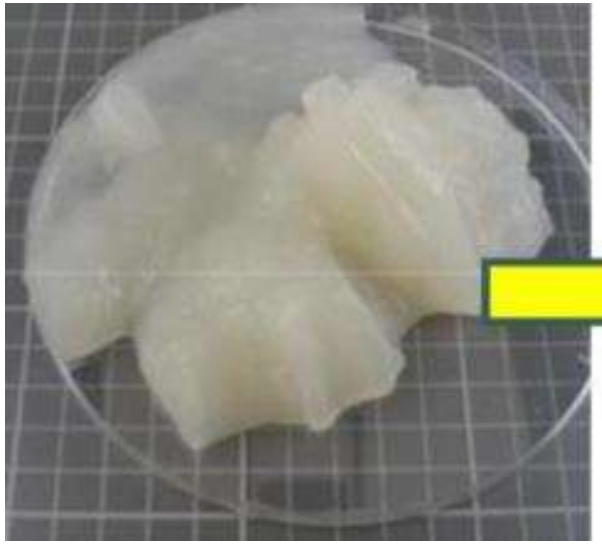


# MFC / Replacing plastics by biomaterial

**Board, paper and tissue industry has to invest and renew its production and product offerings and generate new bio-based innovations and solutions to its clients & consumers**

Innovative technologies and products of Wetend Technologies Ltd make it possible for the customers to develop and produce new competitive industrial processes and products that meet the new expectations and challenge.

**FLUIDIZING → MIXING → FORMING → END PRODUCT**



**Nano and micro fibers for board and paper packages**

# *Vähemmällä enemmän*

- **Tavoite:** Sekoitusteknologiaa hyödyntäen maksimoidaan MFC massan hyödyt ja minimoidaan tarvittava MFC jakeen määrä sekä kustannukset ja kemikaalien ja veden käyttö.

- **Visio:** Fluidisoidaan ja sekoitetaan Flash Mixing teknologialla tehokkaasti MFC massa yhdessä märkäosan kemikaalien kanssa paperi ja kartonkimassaan välittömästi ennen perälaatikkoa. Tuloksena saadaan MFC massan hyvä dispergaatio ja sekoittuminen perusmassaan. Märkäosan kemikaalien esisekoituksen ja/tai yhteisannostelun kautta saavutetaan merkittävä MFC kuitujakeen retentio viiraosalla, jolloin valtaosa MFC jakeesta jää rainaan. Tehokas ja tasainen päämassaan sekoittumien lisää syntyvän rainan lujuutta per MFC-annos, sekä ylläpitää hyvää vedenpoistoa ja profiileja. Nollavedessä kiertävä MFC-jae pienenee lisäten prosessin puhtautta ja häiriöttömyyttä. Kokonaisuutena lopputulos kasvattaa MFC:llä saavutettuja prosessi- ja laatu hyötyjä, vähentäen raaka-aine ja kemikaalien tarvetta ja lisäten laatu- ja kustannustehokkuutta.

# TrumpJet® Flash Mixing Reactor

## Mixing for MFC stock into headbox feed flow for a composite structure

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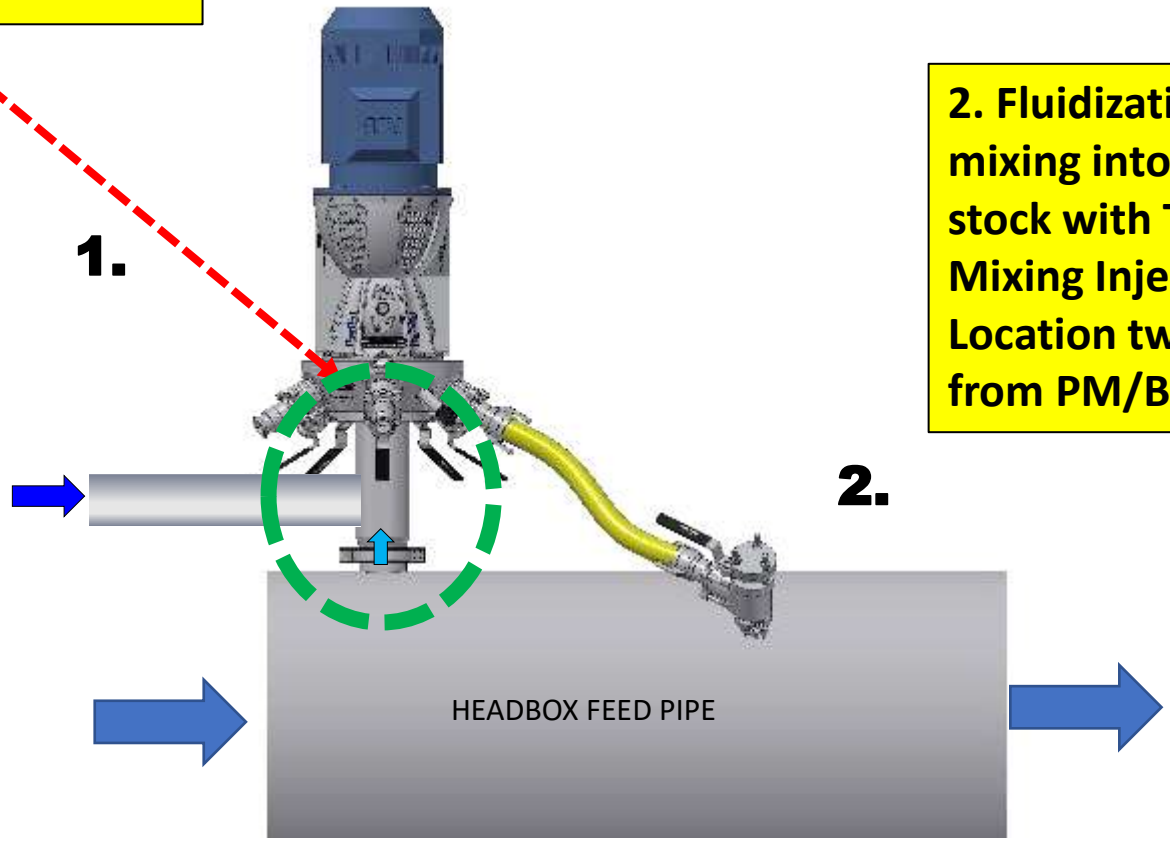
**1. Pre-fluidization in TIP Injection pump 4000 rpm**

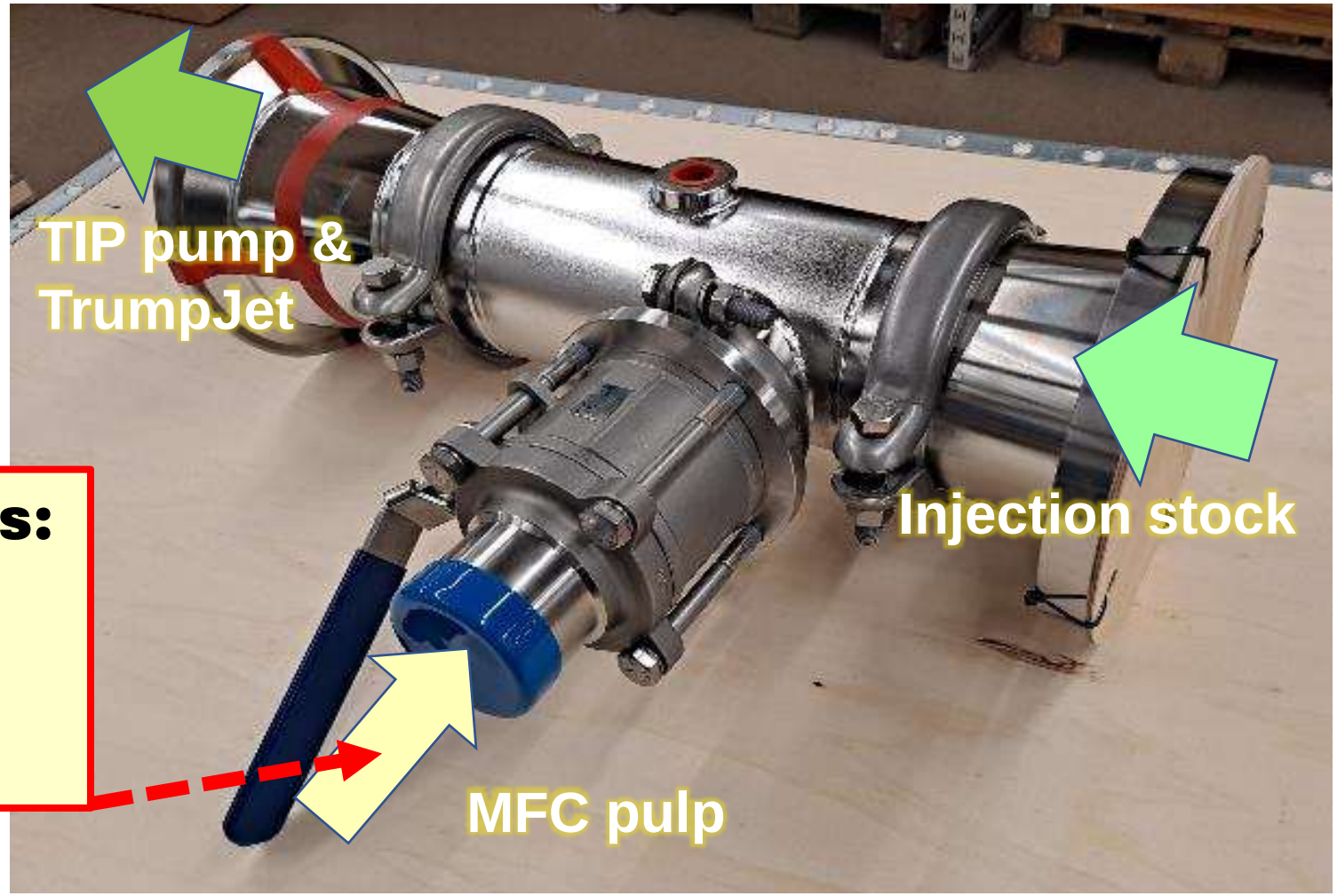



**2. Fluidization by shear and mixing into headbox feed stock with TrumpJet Flash Mixing Injection Technology; Location two (2) seconds from PM/BM headbox**

**…to headbox – distance to manifold approx. two (2) seconds**

# MFC: Clean Transfer and Mixing components

## TrumpJet TIP Injection pump – suction pipe with MFC feed valve

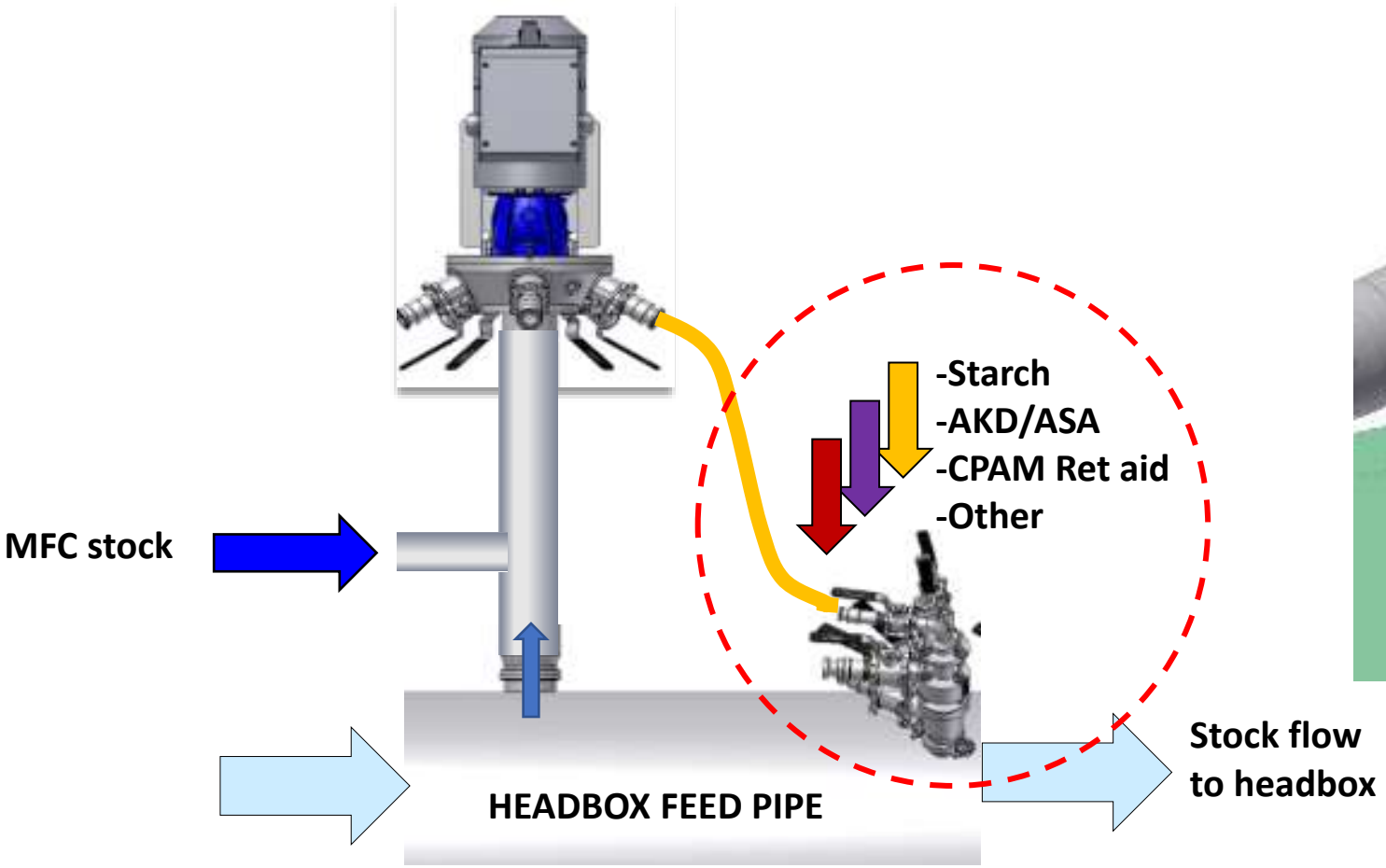


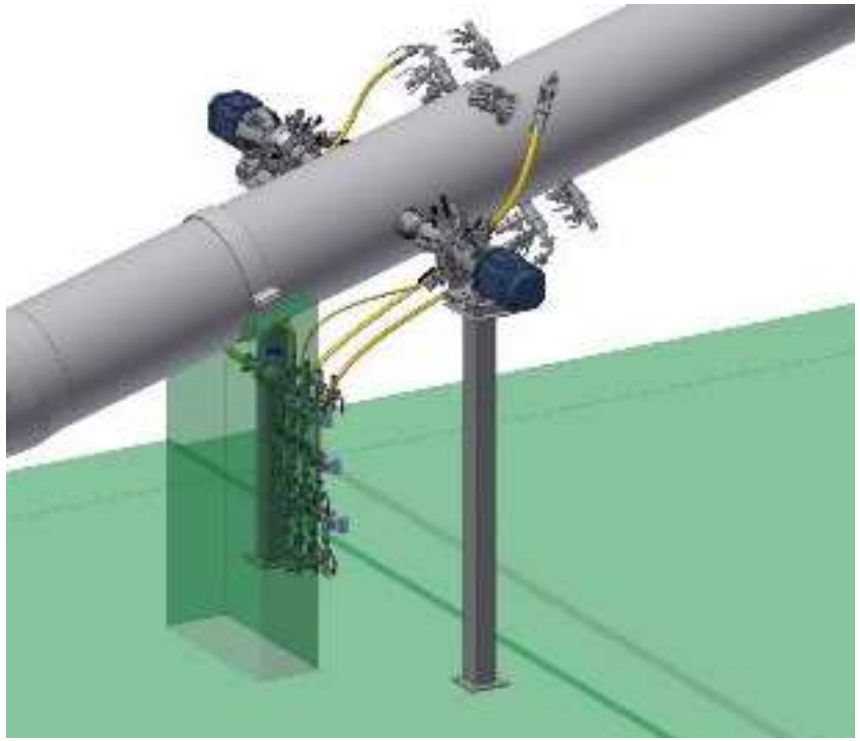

**Surfaces and edges:**

- ❑ **Smooth**
- ❑ **Clean**
- ❑ **Fit**

# TrumpJet® Flash Mixing Reactor

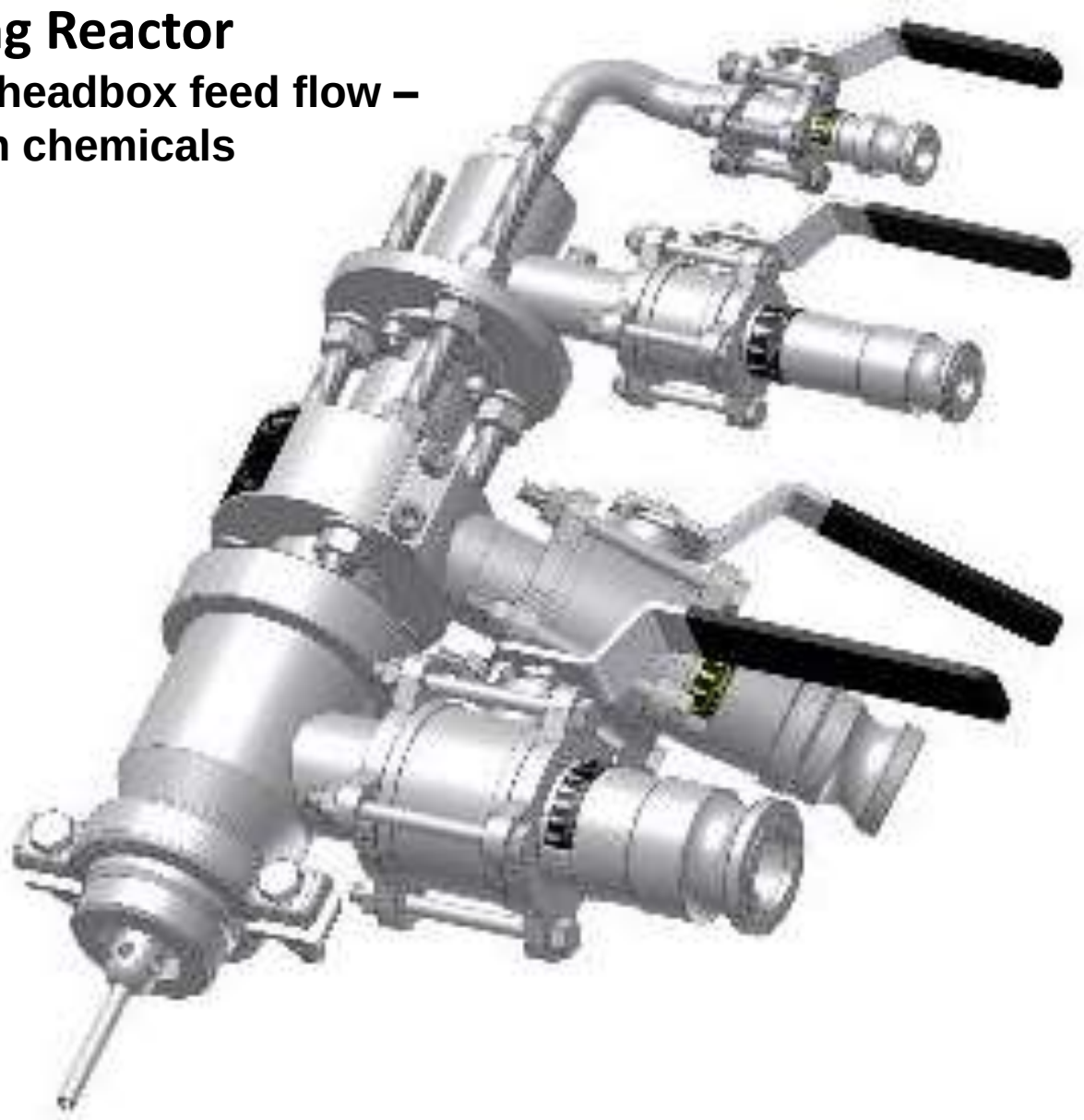
**Mixing for MFC stock into headbox feed flow simultaneously with wet end chemicals** (pat.pend)



# TrumpJet® Flash Mixing Reactor

**Mixing for MFC pulp into headbox feed flow – stand alone or jointly with chemicals**



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# Flash mixing of papermaking additives

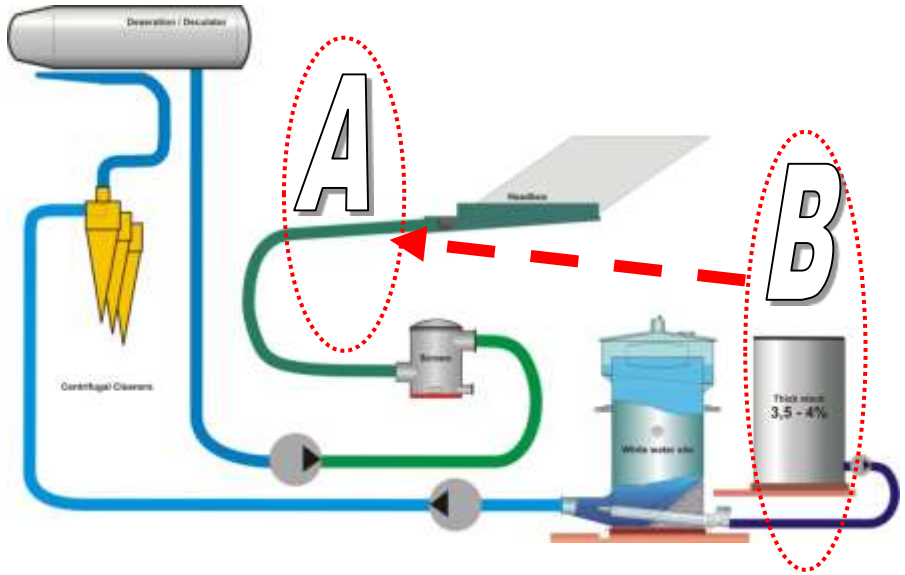
## Age distribution of MFC when mixed

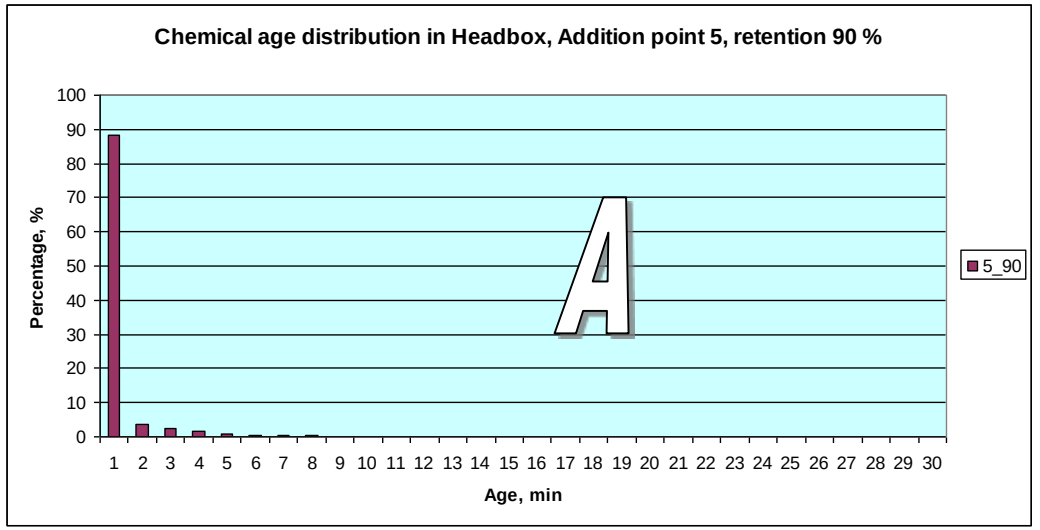
**A: Two (2) seconds from headbox:**

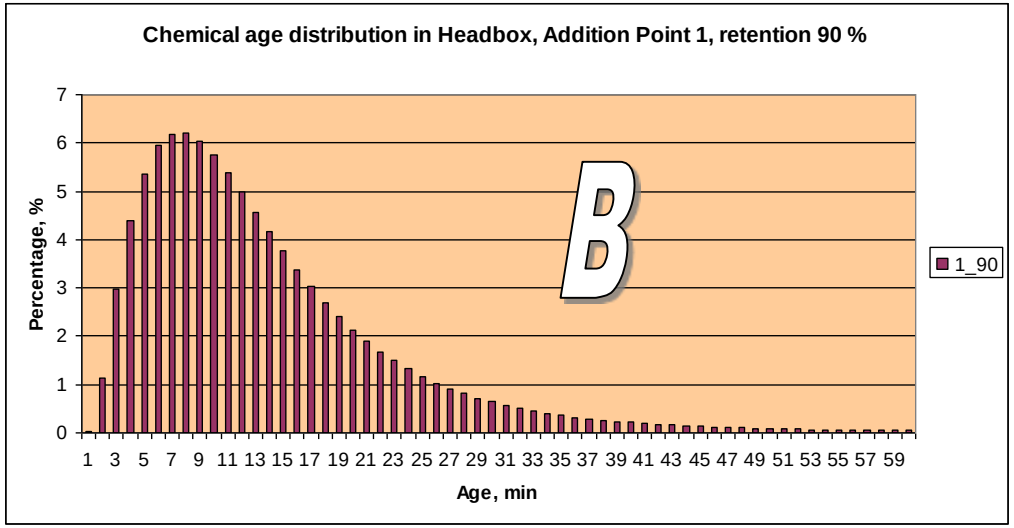
**- 90% < 5 sec - 1 min, tale 8 min**

**B: Into machine chest:**

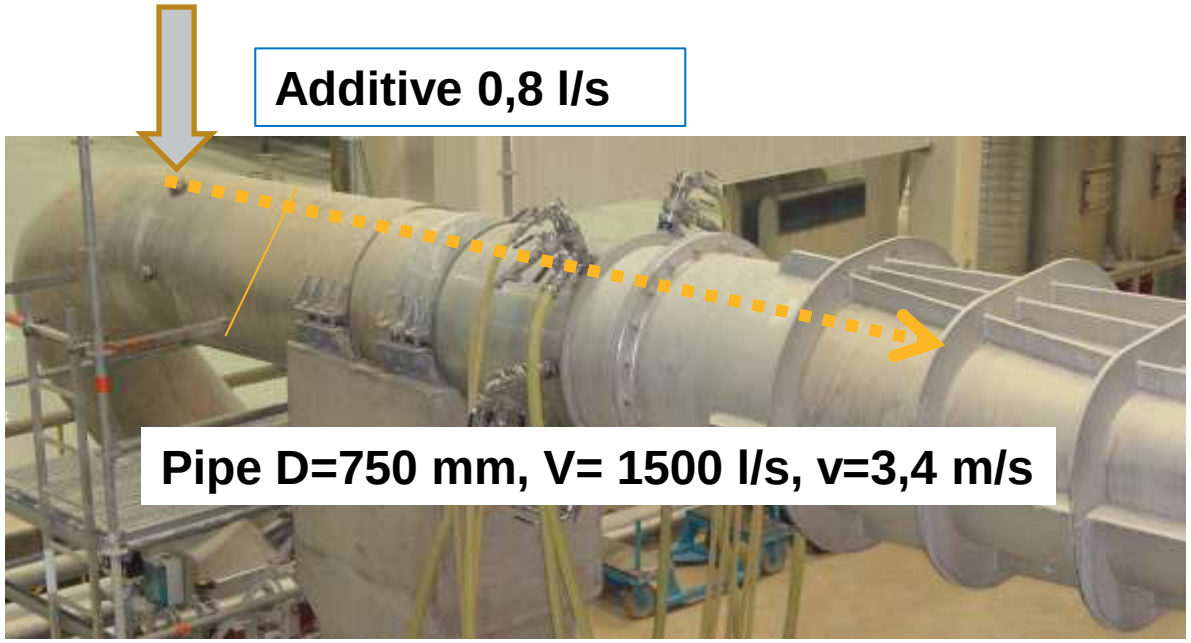
**- 6% peak 9 min, tale 1 hour**



# Dispersion and precipitation of Additives into stock

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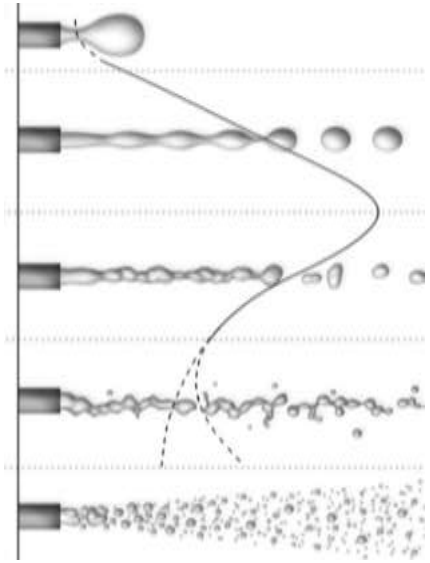
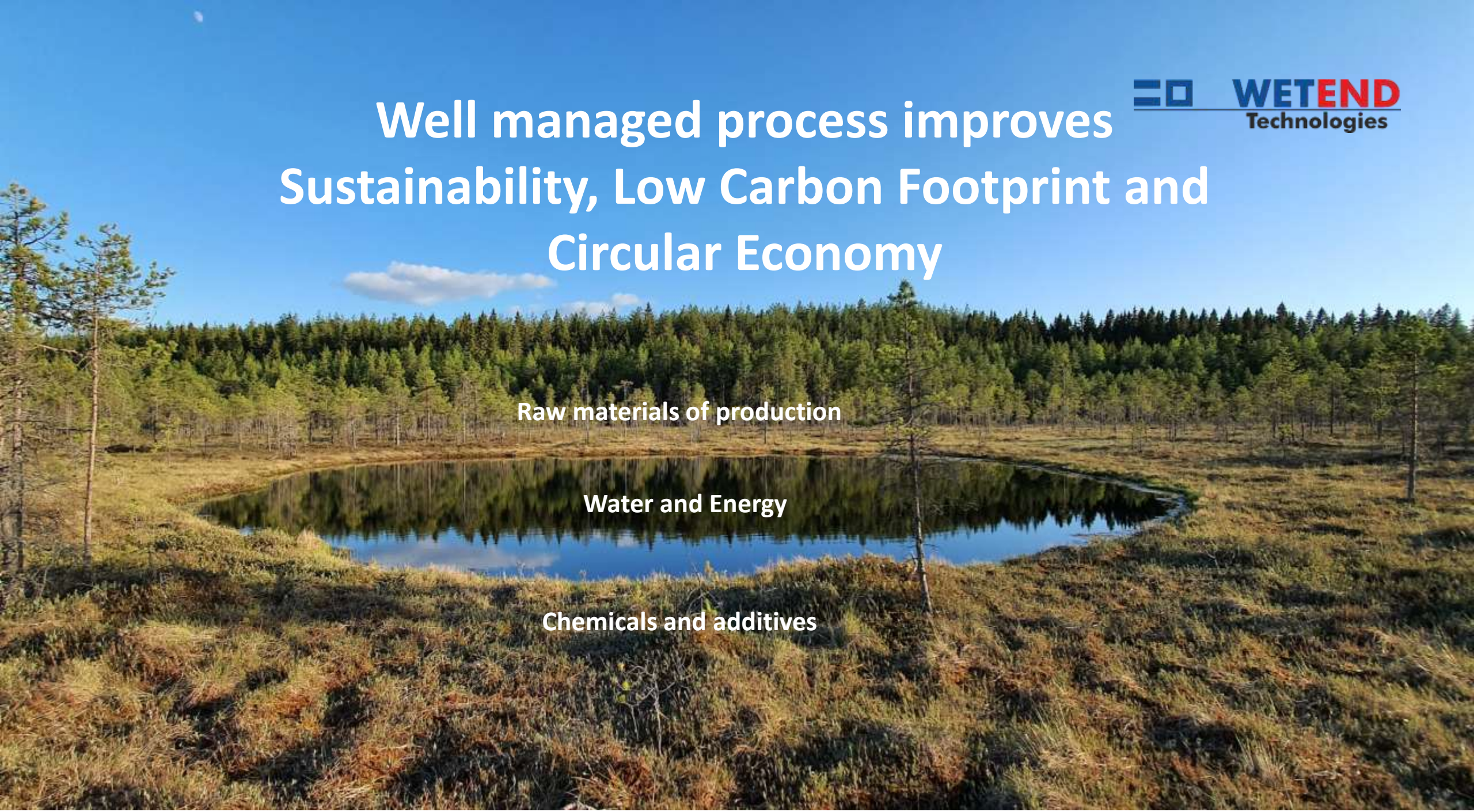


| Droplet dia mm | Droplets per second | Surface area per second | Droplest in one litre of stock |
|---|---|---|---|
| D= 10 mm | 1.528 | 0,48 $m^2/s$ | 1 $pcs/dm^3$ |
| D= 5 mm | 12.230 | 0,96 $m^2/s$ | 8 $pcs/dm^3$ |
| D= 1 mm | 1.528.700 | 4,80 $m^2/s$ | 1.000 $pcs/dm^3$ |
| D= 0,5 mm | 12.229.300 | 9,6 $m^2/s$ | 8.000 $pcs/dm^3$ |
| D= 0,1 mm | 1.53 billion | 48 $m^2/s$ | 1.000.000 $pcs/dm^3$ |

# Yhteenveto

- MFC jakeen annostelu ja sekoitus massaan välittömästi ennen perälaatikkoa antaa hyvän vasteen ja valtaosa MFC:stä päätyy suoraan rainaan
- MFC:n kierrätys lyhyessäkierrossa ja nollavedessä minimoidaan
- Yhtäaikaisannostelua ja sekoitus märkäosan retentioaineiden ja lujuustärkin kanssa parantaa retentiota
- Hieno- ja täyteaineiden käsittelyn kehitystulokset ja oppi pätee pääosin myös perän massaan sekoitettuun MFC jakeeseen
- PUHTAUS: Lyhyenkierron pyörrepuhdistuksen ja sihtauksen jälkeen annostellun MFC jakeen tulee olla vapaa  kaikista ajettavuuteen ja laatuun vaikuttavista epäpuhtauksista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Technologies
Well managed process improves Sustainability, Low Carbon Footprint and Circular Economy
Raw materials of production
Water and Energy
Chemicals and additives


# Kiitos – Thank you