Reaktiiviset märkäosan lisääineet
Ja tehokasta prosessikemiaa
TrumpJet Flash Mixing Reactor-tekniikalla

Fibertech 2018
Jussi Matula

Superior Cleantech
technology from Wetend
Wetend customers world wide – over 500 installations
Valmet and Wetend Technologies have cooperation in technology

Valmet and Wetend Technologies have a cooperation agreement for project deliveries where Wetend Technologies acts as Valmet’s exclusive technology contract supplier in mixing of chemicals close to headbox.
Wetend Innovations development network

**Injection with stock or solids containing filtrate**

**TrumpJet® mixer for PM & BM chemicals**

- 100% eliminated use of fresh water
- Savings in water heating energy and CO₂

- Two additives at same time
  - TrumpJet Chord
  - TrumpJet Poco
  - TrumpJet Forte
  - TrumpJet Trombone

- Sludge application

- Flash Mixing of gases Microbubbles
- Fast Flash Mixing close to headbox
- A, B, C mixing stations

- Clean process

- TIP Injection pump
- Pump development

- Filler PCC
- Foam forming

- White liquor Oxidation Reactor
- In-Line PCC Reactor & Process
- Tandem Mixing Stations
- TrumpJet Flash Mixing Reactor

- Minerals & Mining

- Sheet Composite structures

- Time span 2001 - 2018
TrumpJet - Mixing technology for different applications

- Flash Mixing of process chemicals and Flash Mixing Reactor
- In-Line PCC™ for filler-fiber composites
- Mixing of extralong fibers, for board, tissue and non-wovens
- Microbubble foam generation for foam forming
- Fluidizing and mixing of nano & micro fibrillated cellulose (NFC/MFC)
Conventional chemical and additive mixing for a paper making process

- Bentonite
- Silica
- Micropolymer

- Strength starch
- ASA or AKD
- Filler
- Microfiber

- Alternative
  - ASA or AKD
  - Filler

- Retention aid polymer
  - CPAM or APAM

- Dye
  - Alternative
  - Filler
  - Strength starch

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TrumpJet Flash Mixing close to the headbox
SC magazine paper production line
SC papermachine, Europe
CD profile improvement with TrumpJet system

TrumpJet
• improved efficiency
• better runnability

Before

CD profile

variation 0.18

CD profile

variation 0.25
TrumpJet® Flash Mixing Reactor
Chemical and additive mixing for paper making process

- Retention aid polymer: CPAM or APAM
- Micro fiber: Synthetic fiber
- Bentonite
- Silica
- Micro polymer
- Strength starch
- Strength polymer
- ASA or AKD
- Filler
Dosing or mixing the wet end chemicals and additives..?

Time: < 1 second
TrumpJet® Flash Mixer

“Injection mixing without a delay” – can use solids containing liquids fast – substantially simultaneous

TrumpJet can use solids containing liquids like:
- Filtrates
- White water
- Thin stock
- Thick stock
- Sludge

Pioneer INNOVATION #1

Substantially simultaneous high shear zone

Process pipe

PATENTED
TrumpJet® Flash Mixing Station
TrumpJet® Injection Pump (TIP)
Wetend – Sulzer – ABB
Additives of group A
• CPAM, APAM
• ASA/AKD
• Bentonite /Silica
• Micropolymer
• Starch
• Filler
• Wet strength agent
• Dry strength agent
• Alum
• Resins
• Dye
• Pigment
• Strength polymer
• Defoaming agent

Additives of group B
THE OPPORTUNITY
• New chemical pairs
• Synthetic fibers
• Micro fiber
• Nano fiber
• Cotton fiber
• Wood ”dust”
• Gas,(O₂, CO₂, Air) micro bubbles
• Calcium Hydroxide
• Plastic
• “Cells”
• Other…
TrumpJet® Flash Mixing Reactor
Pioneering innovation challenges old process rules how to use chemicals

Cationic mixing stations B+C can be merged together for even higher efficiency
TrumpJet® Flash Mixing Reactor
Simultaneous mixing of strength starch and cationic retention aid polymer for higher reactivity and efficiency

Simultaneous flash mixing of cationic chemicals;
- Cationized Starch for strength
- CPAM Retention aid polymer
- ASA/AKD emulsion for sizing -20% saving
Premixing of starch and CPAM
Laboratory results support the innovation

<table>
<thead>
<tr>
<th>Chemicals</th>
<th>Trial point</th>
<th>Starch, g/t</th>
<th>C-PAM, g/t</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Wheat</td>
<td>Potato</td>
<td></td>
</tr>
<tr>
<td>C-PAM</td>
<td></td>
<td></td>
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<tr>
<td>Starch, wheat</td>
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<td></td>
<td>4000</td>
</tr>
<tr>
<td>Starch, potato</td>
<td></td>
<td></td>
<td>4000</td>
</tr>
<tr>
<td>Premixing</td>
<td>Starch + C-PAM</td>
<td></td>
<td>400</td>
</tr>
</tbody>
</table>

Premixed solution gives the best reactivity
TrumpJet® Flash Mixing Reactor for multiple additives
### Earnings and Sustainable results: Coated printing paper, USA

#### Power
- Energy saving: 14,650 MWh/a
- CO₂ emission reduction: 2,750 tons/a

#### Fresh Water
- Water saving: 300,000 m³/a

#### Raw materials and optimized use of additives
- Saving of retention aid silica: 43%
- Saving of retention aid polymer: 33%

#### Process efficiency
- Increased filler content of sheet: 5%
- Increase of reel speed: 8%
- Reduced steam consumption

**ANNUAL SAVINGS: MORE THAN 1 MILLION EUR**
Fine paper production line
TrumpJet Flash Mixing Reactor, mill results

Station C
- Strength Starch
- Starch saving 15…20%
- ASA sizing agent
- ASA saving 15%

Station B
- Retention polymer
- Elimination 100%

Station A
- Bentonite
- Saving 0…5%

To feed manifold of paper or board machine headbox

• Good formation
• Improved retention
• Use of Fresh water or filtrate eliminated
• Energy saving
• Short payback time

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Coated fine paper, North-America
TrumpJet® Flash Mixing Reactor, Results

- Anionic Nanoparticle, Silica +Chemical saving 48%
- Cationic Starch for strength +Chemical saving 25% (min 10% ... max 30%)
- PAC +Chemical saving 25%
- Good sheet strength
- Improved dewatering
- Lower steam consumption
- Use of fresh water eliminated
A large Fine paper production line, Europe
TrumpJet Flash Mixing Reactor, mill results

- Strength Starch together with cationic and anionic retention aid components moved after the screen and just before headbox feed manifold according to the Flash Mixing Reactor process
  - *Strength starch was added earlier into the thick stock line*

- Saving of strength starch >50%
- CPAM 15…20%
- Other results
  - Good sheet quality
  - Positive development of retention and filler presence in the sheet
  - Faster grade changes
  - Fresh water and energy saving
TrumpJet® Flash Mixing Reactor
Sun Paper PM31 and PM32

Wetend has supplied totally 10 TrumpJet mixing stations for production lines of PM31 and PM32, annual capacity of 800,000 metric tons

Repeat orders 2017 for PM36 and PM37

Start ups in summer 2018

Shandong Sun Paper, PM31 and PM32, Zoucheng, China
TrumpJet® Flash Mixing Reactor
Sun Paper PM31 and PM32

Wetend has supplied totally 10 TrumpJet mixing stations for production lines of PM31 and PM32, annual capacity of 800,000 metric tons

Repeat orders 2017 for PM36 and PM37
Start ups in summer 2018
TrumpJet® Flash Mixing Reactor
Smurfit Kappa, Europe
Increased chemical efficiency

Wetend has received two repeat orders based on the performance of the line

Polymer and silica saving is considerable
In–Line PCC™

Revolutionary filler and filler-fiber composite

- Major improvement in end product quality
- Reduced raw material and operational costs
- Capital investment costs smaller than conventional satellite production plant
- Technology in use on running machines
In-Line PCC™ Flash Mixing Reactor

Carbon dioxide + milk of lime + flash mixing

= Calcium carbonate crystals (PCC) into fiber flow

= cost effective filler & fiber composite
In-Line PCC™

Cleaning of process waters with TrumpJet® Flash mixing technology
Printing paper production testrun results

Improved retention

 Trial with In-Line PCC (85% PCC, chalk 15%)
Retention polymer -76%

 Trial with In-Line PCC (100% PCC)
Retention polymer -82%
In-Line PCC™
CASE A. Cleaning of paper machine water circulation

Process water conductivity

Average reduction of dissolved and colloidal material after 60 hours run
24…30 %

- Machine chest
- Clear filtrate
- Before lime TJ
- Cleaner 2nd feed
- Cleaner 4th reject
- Head box
- Wire silo

Date
Ref. 09.06. 09.06. 10.06. 10.06. 10.06. 11.06. 11.06. 11.06.

[mS/cm]
Finnish papermaker produces high quality SC paper 350.000 tons a year with In-Line PCC™ technology

In-Line PCC™ is a new straightforward filler – fiber composite manufacturing process consisting of TrumpJet Flash Mixing Reactor integrated into PM head box approach flow system, lime slaking and grit removal unit, carbon dioxide storage and dosing system.

In-Line PCC™ - calcium carbonate manufacturing process was installed at SC paper production line 1000 tn/d in Finland to produce precipitated calcium carbonate (PCC) loaded directly into papermaking stock generating filler–fiber composite.

Statement: Today the system is running well and the papermaking line is achieving the expected production. Results have exceeded the originally set objectives and profitability target of the total capital investment.
Trend: Replacings plastics by biomaterial

- Plastic bags are outlawed in multiple countries
- Plastics are replaced by fibermaterial in packaging and manufacturing
- TrumpJet Flash Mixing Reactor Technology brings new attractive tools for bio-based product development
Mixing of long bio based or synthetic fibers close to headbox
Water and Energy Annual Saving with TrumpJet® technology

70 million m³ of fresh water and 3.5 million MWh energy corresponding to 1.500.000 barrels of oil

True CLEANTECH: Sustainable, smart and resource efficient new technology
Kiitos!

Good mixing makes the difference

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