

A Prototype for Simultaneous Measurement of Retention, Dewatering and Fiber Flocculation

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Outline

- Introduction
- Laboratory device for Flocculation, Retention and Dewatering Analysis
 - Measurement of Flocculation
 - Prototype for Measurement of Dewatering and Retention
 - Headbox
 - Dewatering Unit
- Conclusions
- Outlook

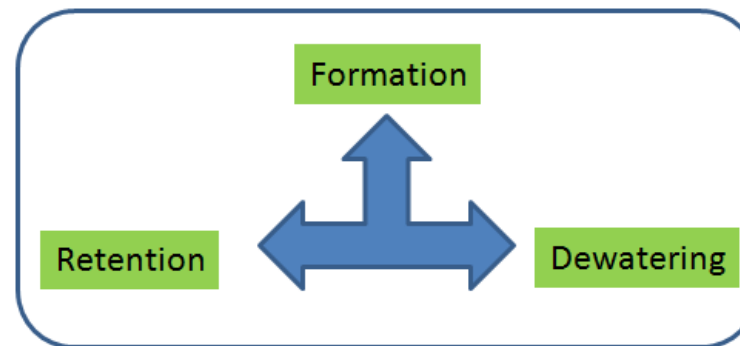
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Introduction

Formation

- mechanical properties
- structural properties
- optical properties



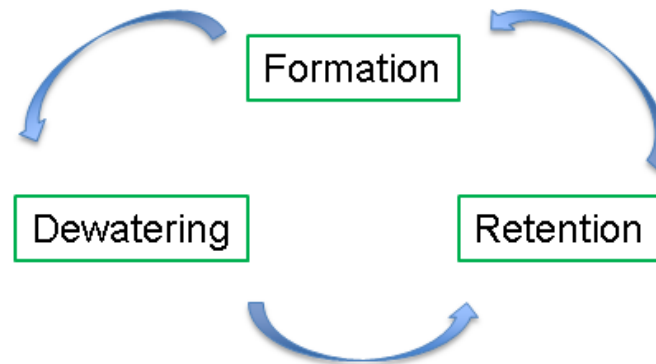
Retention

- higher amount of fillers
- reduction of costs

Dewatering

- reduction of costs
- improves runability

Introduction



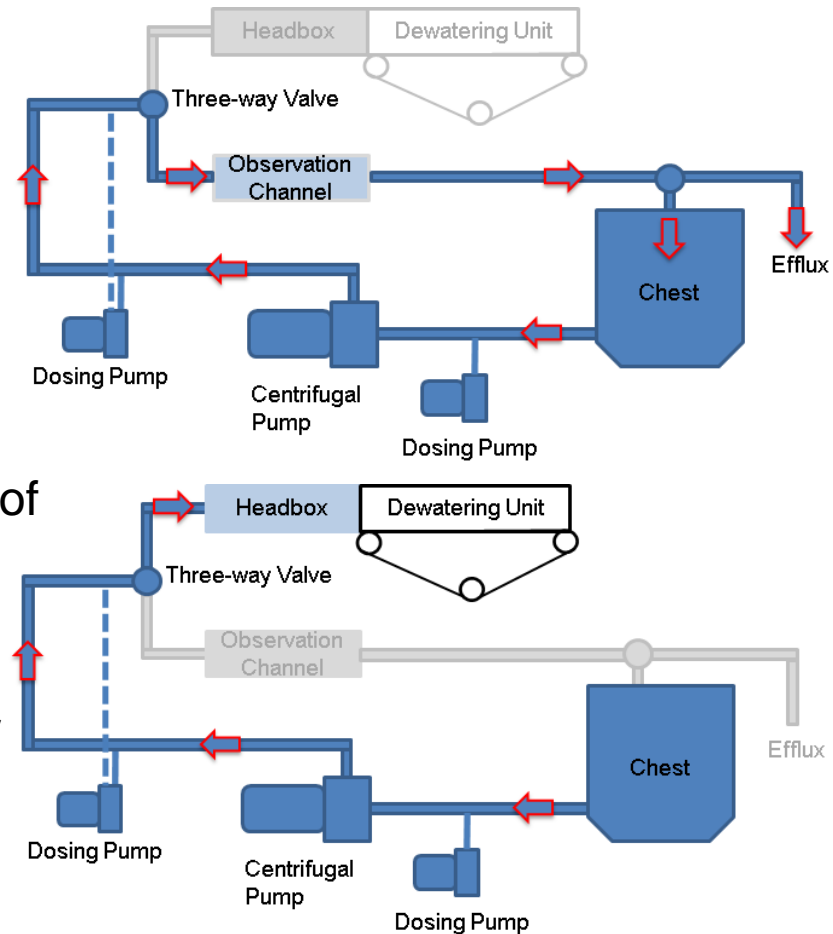
- Retention, dewatering and formation are highly interrelated
- A change of one affects the others

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Laboratory Device for Flocculation, Retention and Dewatering Analysis

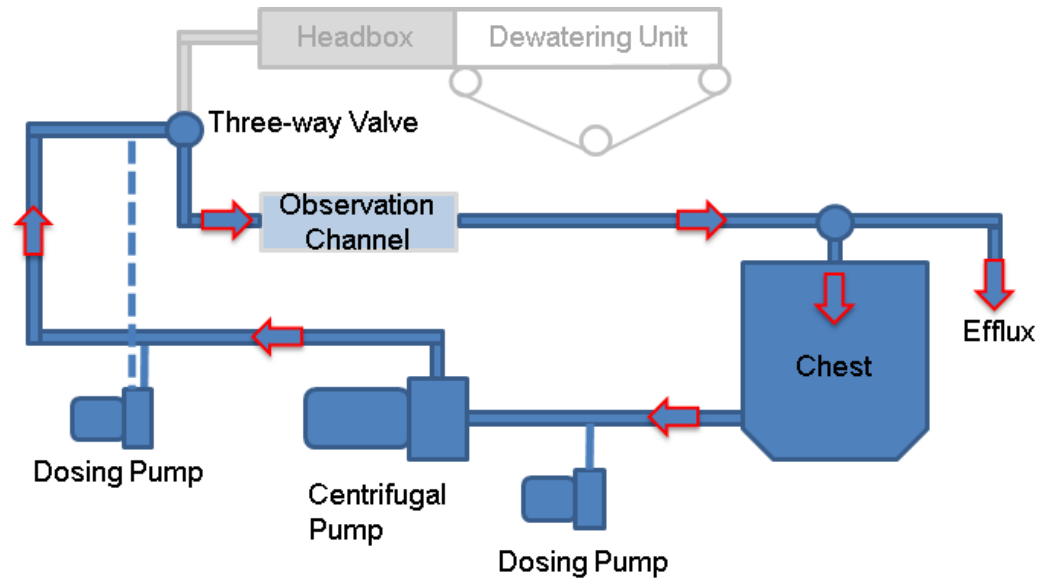
- Flow loop for flocculation analysis
- Three dosage points
- Observation channel and high speed camera
- Dewatering device for the measurement of
 - Retention
 - Dewatering
- Transparent headbox
- Dewatering unit resembling a Fourdrinier former



Outline

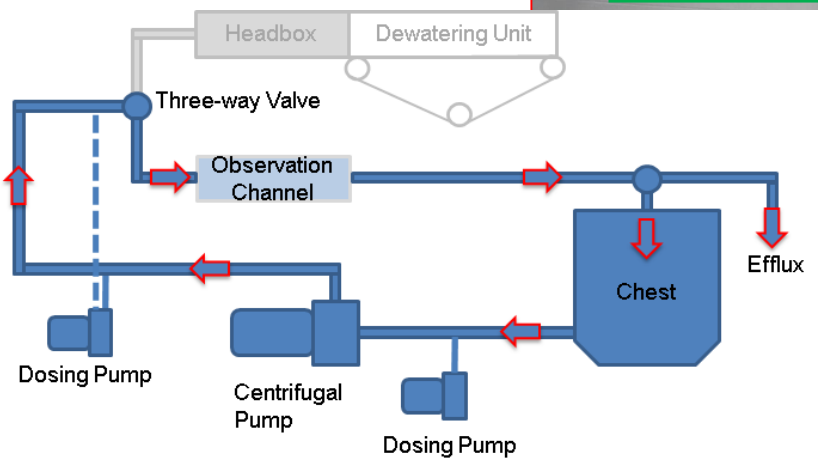
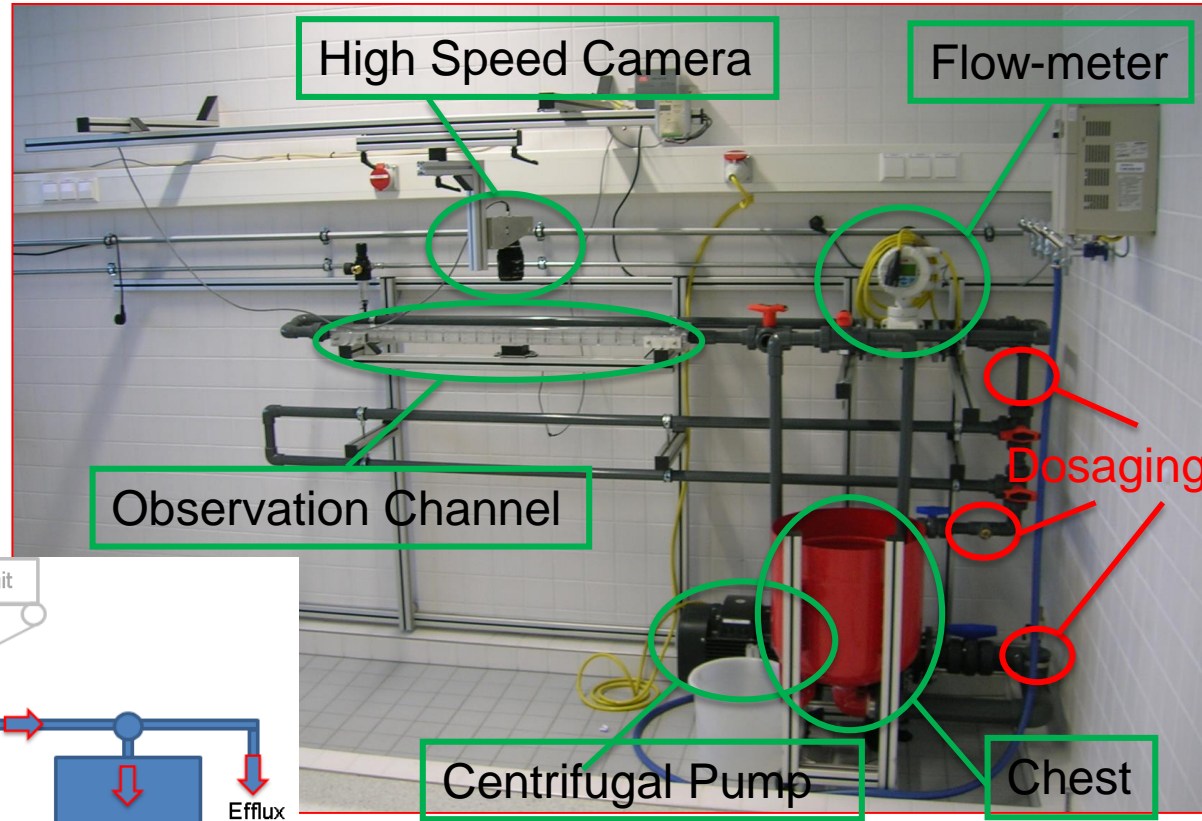
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Measurement of Flocculation



- Volume of the chest: 40 liter
- Measuring at headbox consistency
- Three dosage points
- Transparent observation channel
- High speed camera

Measurement of Flocculation



Measurement of Flocculation

Flow Velocity

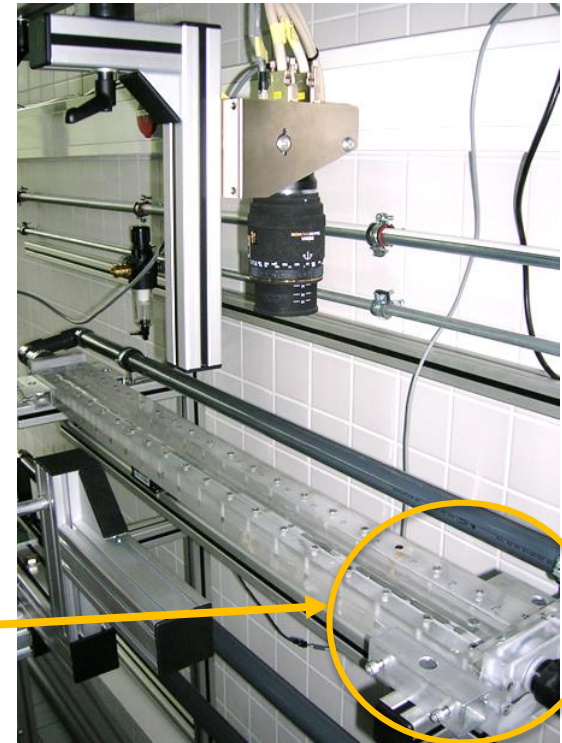
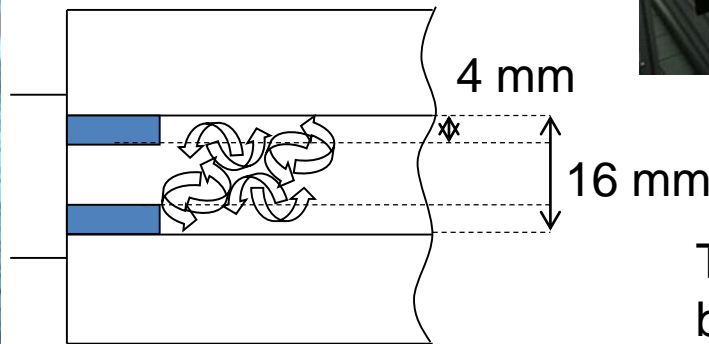
2-3 m/s

Channel-geometry:

length: 100 cm

width: 3.5 cm

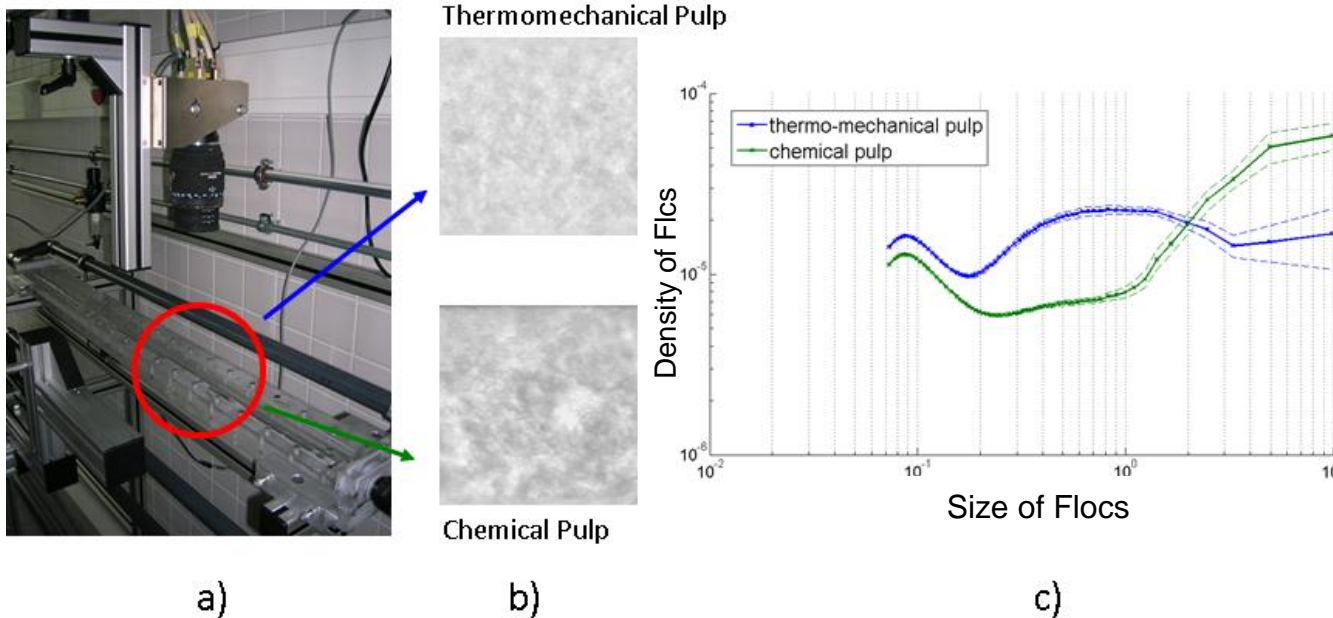
height: 1.6 cm



Turbulences at the beginning of the channel

Measurement of Flocculation

- Acquisition of images of circulating suspension in the region of decayed turbulence => stable structures/flocs

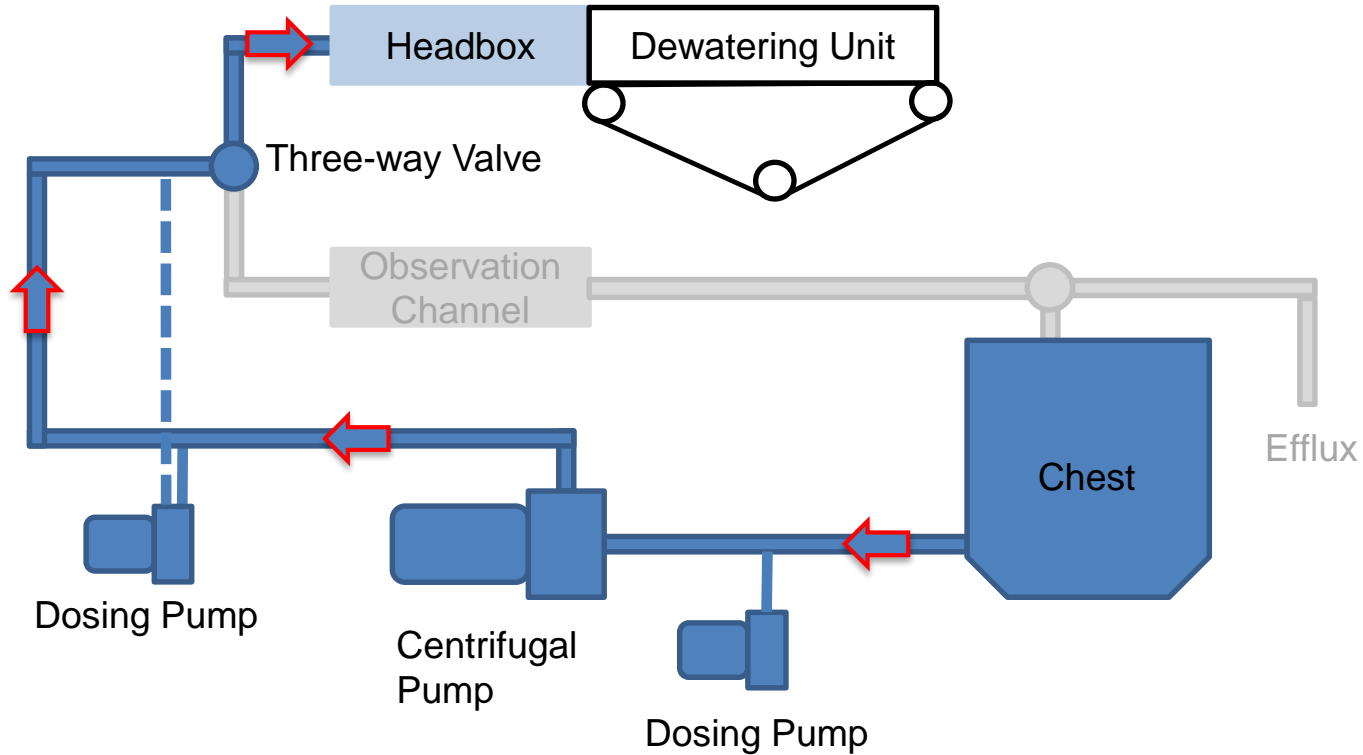


- Evaluation of images by FFT – Structure Analysis

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Measurement of Dewatering and Retention



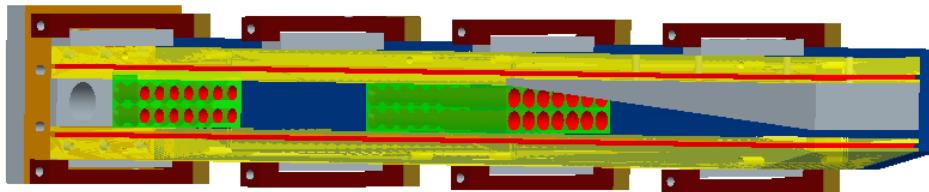
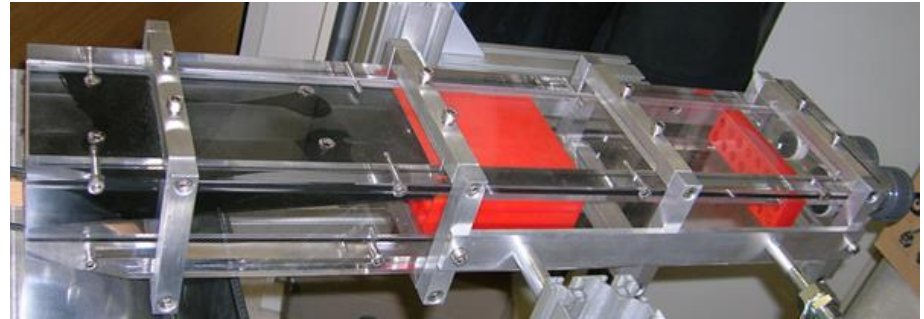
Measurement of Dewatering and Retention



Prototype for Measurement

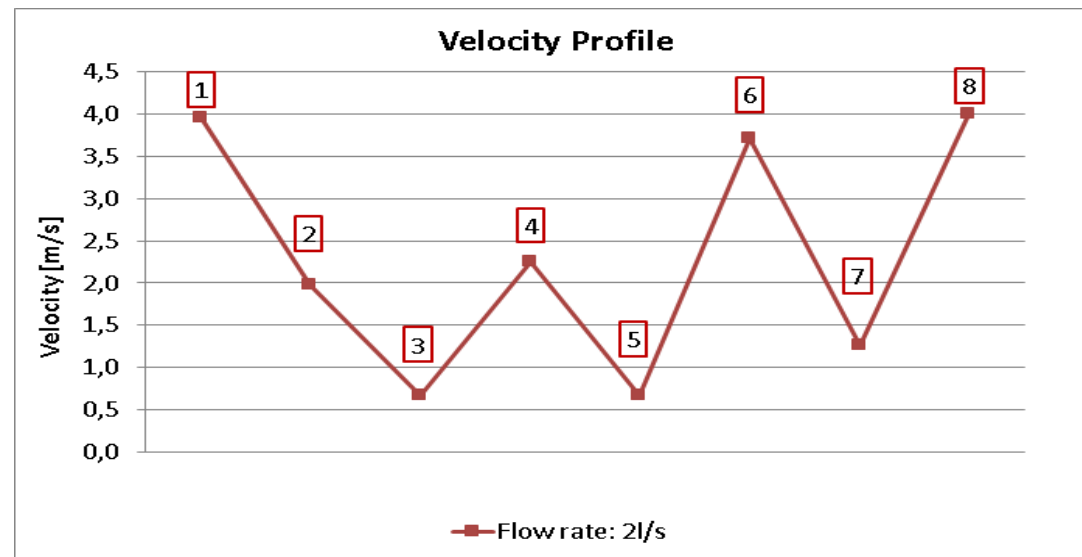
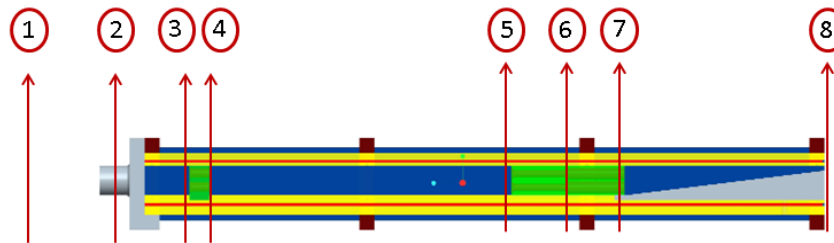
- Headbox

- Pulp consistency: 1%
- Geometry similar to that of a standard headbox
- Different devices included in the headbox for distribution and orientation of pulp fibers
- Headbox construction can be changed easily



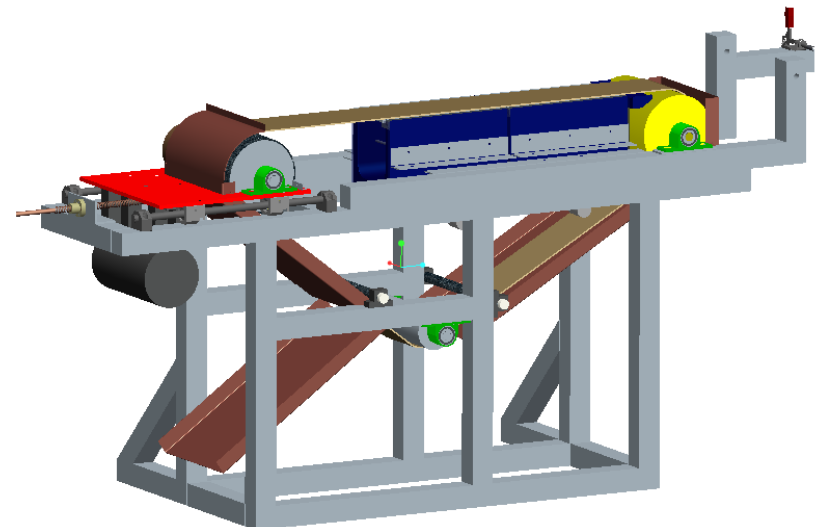
Prototype for Measurement

- Headbox – Velocity Profile



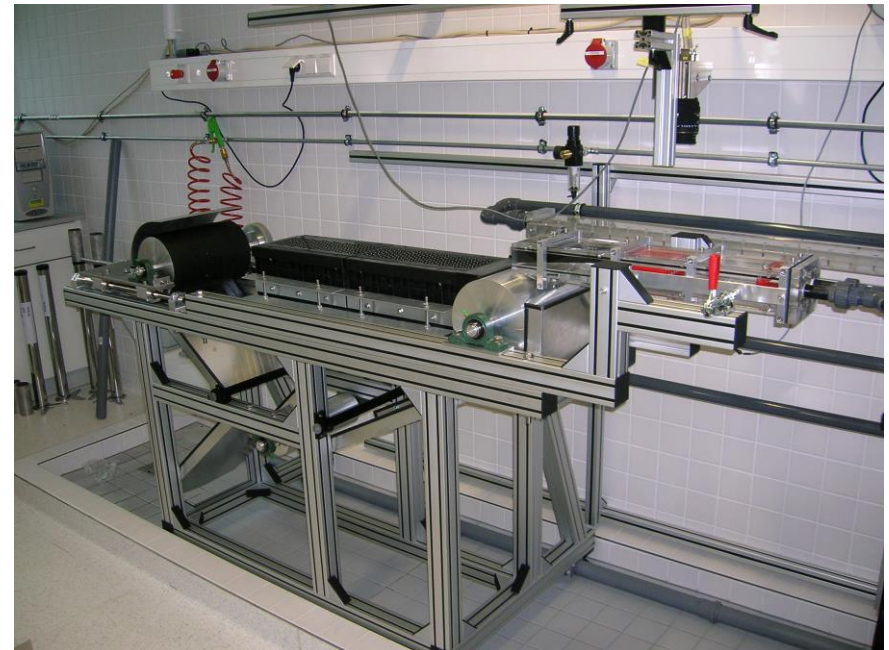
Prototype of Measurement

- Dewatering Unit
- Resembles a Fourdrinier paper machine
 - SC/LWC – wire
 - Maximum wire speed: 120 m/min
- Wire is lead by three rolls
 - Breast roll
 - Arched rubberized driving roll
 - Deflector roll



Prototype of Measurement

- Dewatering Unit
 - Vacuum-supported dewatering
 - Length of the vacuum zone: 700mm
 - Two vacuum levels
- Wire conditioning by air pressure and water nozzles
- White water gathered for measurement of retention and dewatering



Prototype of Measurement

- Dewatering trial



Measurement of Retention and Dewatering

- Measurement of retention
 - Grammage / ash content of the dewatered fiber web
 - White water consistency
 - Outlook: online-measurement by means of a nephelometer
- Measurement of dewatering
 - Moisture of fiber web
 - Water volume in white-water tank

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Conclusion

- Measurement of flocculation is done in an observation channel
- Evaluation of flocculation by structural analysis of the acquired images
- Measurement of retention and dewatering can be done by a dewatering device in laboratory scale
- The geometries of the headbox are similar to a standard headbox
- The dewatering unit resembles a Fourdiner paper machine
- Fast and easy way to measure flocculation, retention and dewatering in the laboratory scale under industry oriented conditions

Outlook

- Enhance the measurement of retention by an online measure
- Experimental series with different pulps and chemical additives
- Compare the results of retention and dewatering acquired by the dewatering unit with standardized techniques

Thank you
for your attention!