FRIDAY, MARCH 21, 2014 – MORNING

Technical Session 3: Squeezing More Tons and Quality out of Limited Resources

Understanding and Controlling Press Fabric Filling

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Brandon Mahler is a Paper Chemicals Innovation and Development Specialist at DuBois Chemicals. In this role, he has developed unique methodology for studying soils contamination in and drainage rate through papermaking fabrics as well as fabric surface modification for stickies control. He also studies the effects of cleaning chemistries in dynamic, high speed systems. In his eight years with DuBois, he has previously worked in technical service to quantify and identify contamination in papermaking fabrics and on paper machines. He received his BS from Miami University's School of Paper Science and Engineering. He also spent a semester studying overseas at Helsinki University of Technology.

Tissue press fabrics can be significantly impacted by filling from various contaminants. Common additives used in tissue manufacturing can contribute to a reduction in fabric performance. When recycled fiber is used, stickies and inorganic fillers increasingly become sources of contamination to the press fabrics. This can lead to reduced production efficiency and more frequent shutdowns for fabric changes. Fabric filling can also cause mills to excessively use mechanical cleaning methods like needle showers, which can result in premature wear.

Traditional methods of used press fabric analysis can be inadequate to identify the materials filling felts in the tissue industry. Strength aids, Yankee coatings, and other materials that form gel-like depositions are challenging to identify and can significantly impact void volume filling. While fabric filling problems can be caused by a single contamination source, it is more commonly a matrix of different soils in combination. This presentation will discuss techniques to better identify sources of tissue fabric filling and review the findings from used fabric collected at numerous mills. Suggestions for improving the effectiveness of prevention and cleaning on machines will also be discussed.

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Tissue World Americas 2014

March 21st, 2014

Brandon Mahler – DuBois Chemicals
John Schwamberger- DuBois Chemicals

Impact of Soils Filling Tissue Press Fabrics

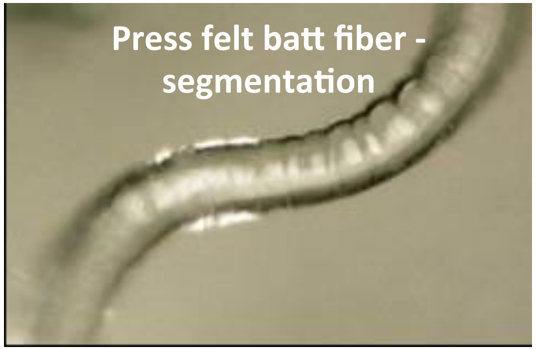
- Productivity losses
  - More frequent breaks or defects
  - Poor dewatering
- Instability
  - Operating condition changes
    - Over felt life
    - Between downtime cleanings
- Downtime
  - Downtime batch cleaning fabrics
  - More frequent outages to change fabrics
- Press Fabric Life
  - Decreased from filling
  - Mechanical wear from excessive HP needling
- Fabric Design Considerations
  - Compromising design parameters to manage filling

Problematic Soils in Tissue Press Fabrics

- Wet strength resins
  - PAE
  - GPAM
- CMC
- Yankee coating/release chemistry
- Fines
- Natural wood pitches
- Recycle fiber contaminants
  - PVA
  - Styrene acrylic
  - SBR latex
- Inorganic fillers
- Starch

Traditional Felt Analysis Methods

- Organic Soils – Solvent extractable
  - Weight percent, identification
- Inorganic Soils (ash, fillers, scales)
  - Weight percent, identification
- Physical Tests
  - Caliper
  - Weight loss
  - Air permeability
- Microscopic Inspection
  - Mechanical, chemical or thermal damage
- Static Wash Studies
  - Effectiveness of cleaning chemistry



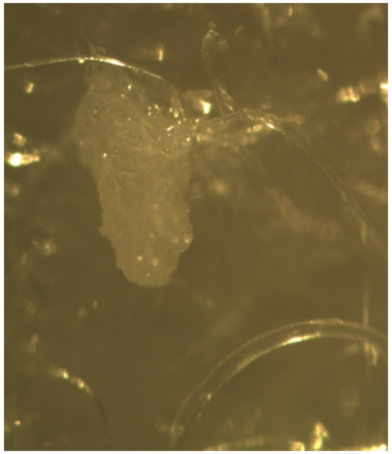
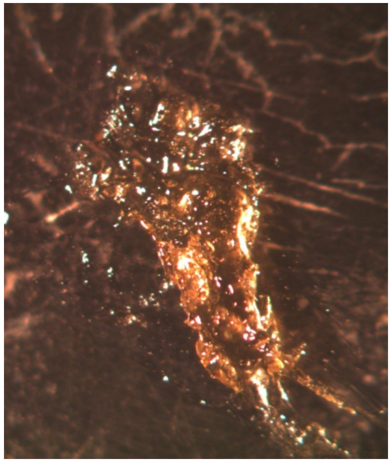
Difficult Soils to Detect and Measure

- Wet Strength Resins
  - Very different physical characteristics when dried compared to wet
  - Chemical structure similar to Yankee adhesives, retention aids and even nylon fabric
  - Chemical and physical characteristics change due to reactions within the system
- Fines
  - Difficult to separate for quantitative analysis
- CMC
  - Difficult to distinguish from fines
  - Nature of the material can change due to reactions within the system

Gel Soils

- What are they?
  - Hydroscopic materials found in press felt
  - Hold large amount of water in proportion to their weight

- Why Important?
  - Ability to fill more void volume in felt compared to other, non-water holding soils
  - Effects machine runnability
    - Less efficient water transfer and drainage
    - Uneven moisture profile
    - Water spots and rewetting in sheet

Examples of gel soils within a press felt

How are gel soils analyzed

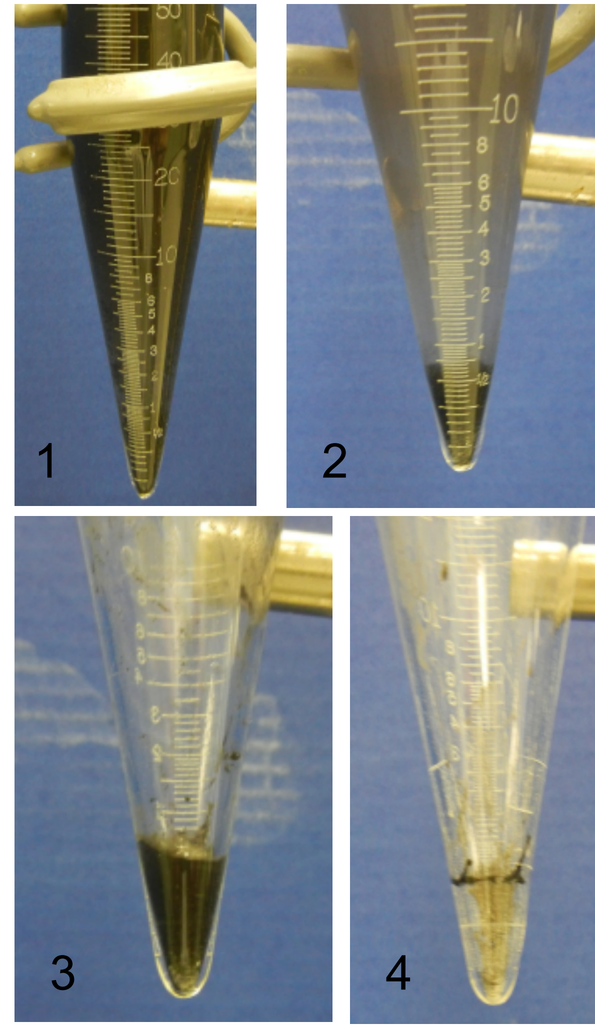
- Wet fractionation test
  - Physical means to separate press felt from contamination
  - Felt kept wet from machine to lab to keep hydroscopic soils hydrated
  - Spin down contaminated solutions in centrifuge to separate wet soils from water
  - Decant water and weight remaining soils in a wet state and a dry state

- Results
  - Wet solids (%): weight of soils and water bound by those soils per weight of tested felt
  - Dry solids (%): weight of soils solids per weight of tested felt
  - Wet:dry ratio: (% wet solids / % dry solids) an indication of the type of soils within the felt
  - Fines (%): non-water or solvent soluble organic soils within the dry solids

Wet Fractionation Test

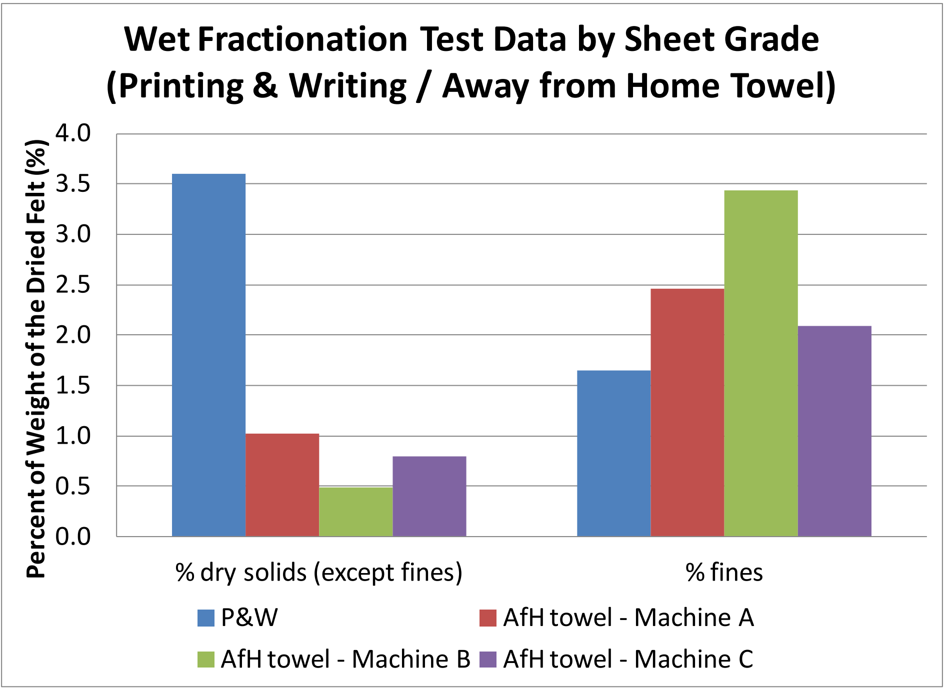
Macerated felt

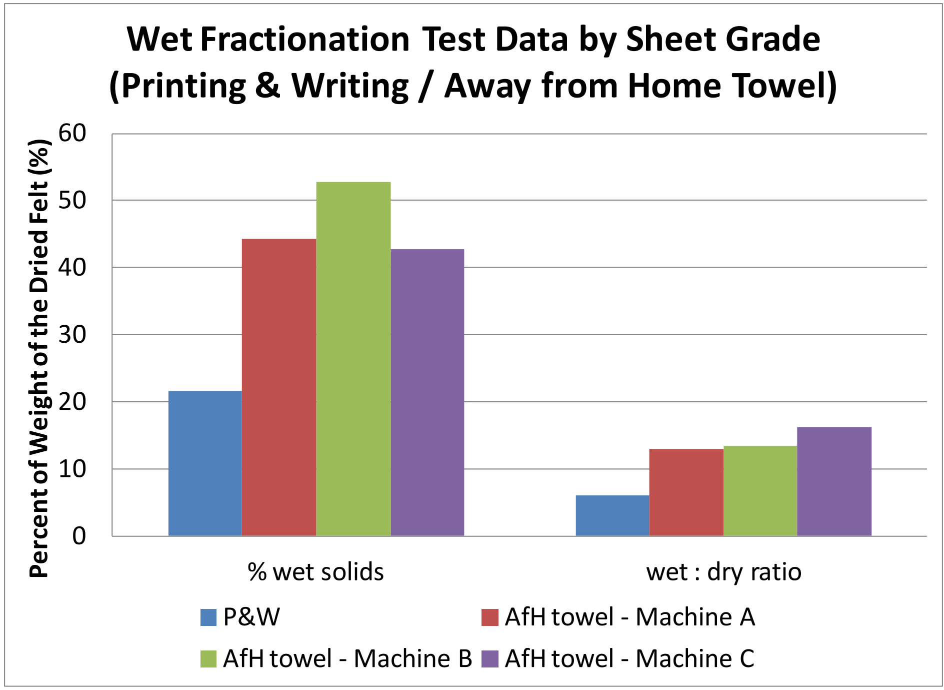
Soils separated from felt in their various forms



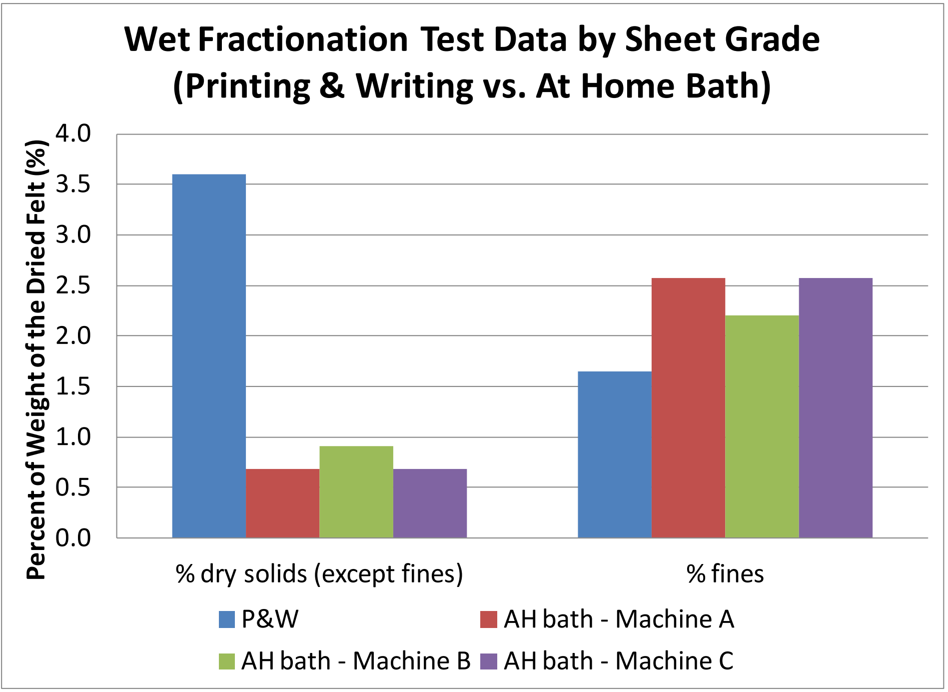
Dried solids content

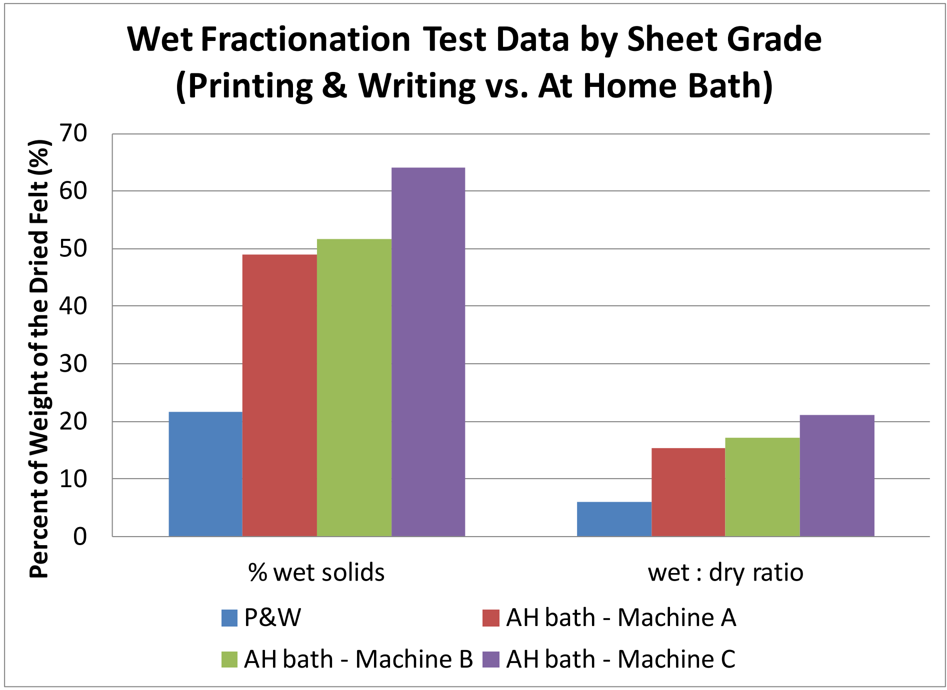
Wet Fractionation Test - Results



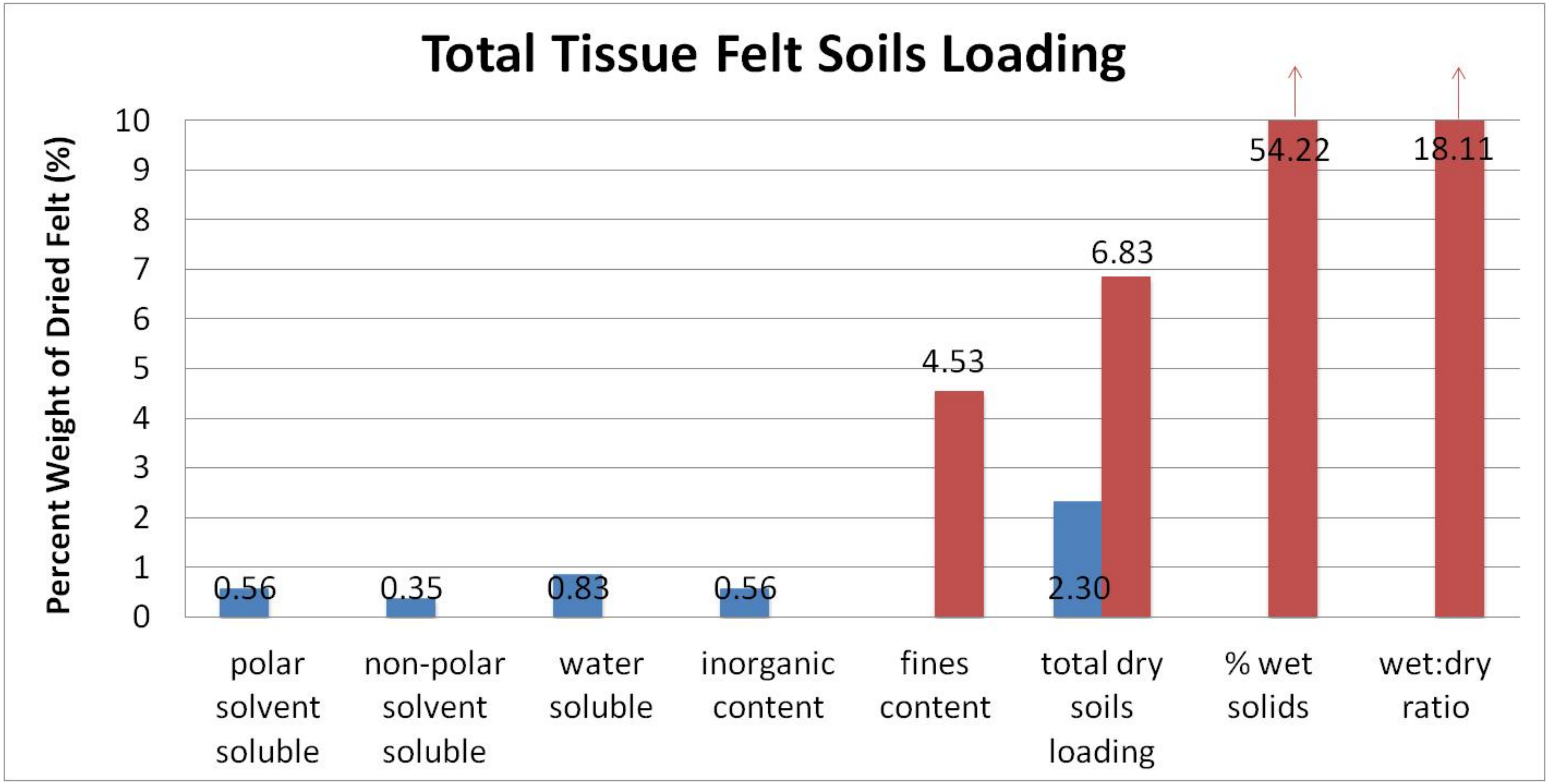


Wet Fractionation Test - Results





Wet Fractionation Test – Typical Results Example



- Grade –
  - at home facial / bath
  - away from home towel
- Furnish –
  - Deinked pulp: printing and writing
  - Kraft: hardwood, softwood, Eucalyptus

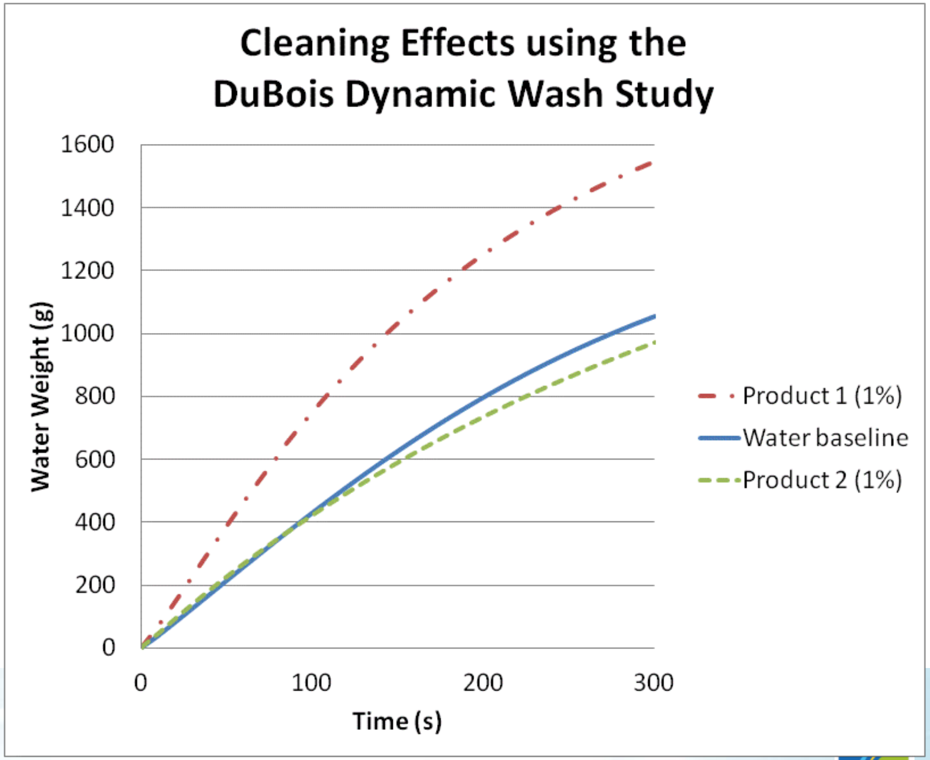
Methods of Selecting Cleaners

Static Wash Study

- Samples placed in beaker with cleaning solution
- Measures weight change and/or permeability change
- Limitations
  - Does not evaluate cleaning in short time periods (during production)
  - Does not always measure the impact of the soil removal on performance

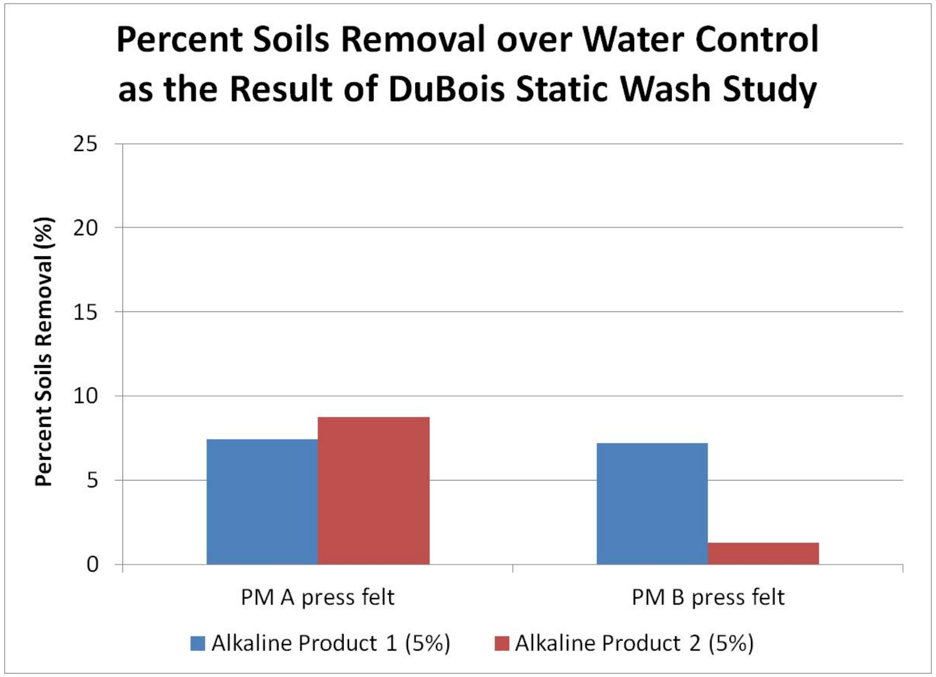
Dynamic Wash Study

- Use flow through a felt as the mechanism of soil removal
- Measures rate of drainage through the felt
- Advantages
  - Better simulates machines conditions
  - Evaluates cleaning in short time periods
  - Demonstrates both soils removal and impact on drainage



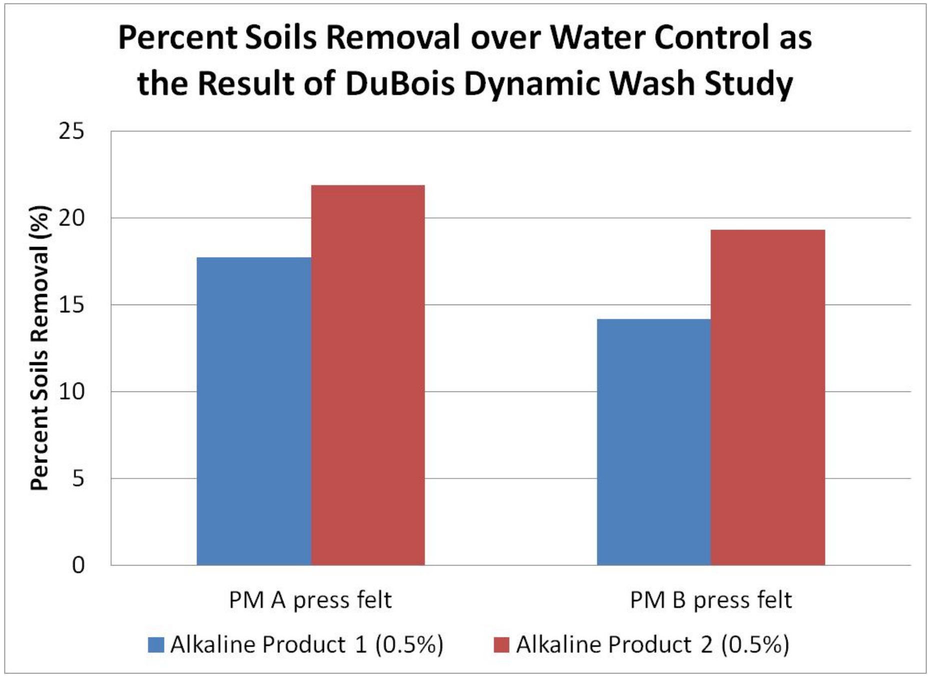
Methods of Selecting Cleaners

Static Wash Study



- PM A – **Product 2** 15.1% improvement over **Product 1**
- PM B – **Product 1** 82.4% improvement over **Product 2**

Dynamic Wash Study



- PM A – **Product 2** 19.0% improvement over **Product 1**
- PM B – **Product 2** 26.6% improvement over **Product 1**

DuBois

Generating Favorable Cleaning Condition on a Machine

- Chemicals Concentration
  - A given chemistry can succeed or fail based on concentration
  - Concentration in the felt matters – not in the shower
- Reaction Time
  - Cleaning during production on high speed machines requires special consideration
  - How fast does a cleaner wet the soils (surface tension reduction)
  - How much dwell time before dewatering elements or dilution
- Showering
  - Set-up and maintenance are critical to uniform cleaning or treatments
- Temperature
  - Higher temperature generally improves cleaning
- Water Quality
  - Minerals, fines and paper additives can affect cleaner performance

Summary

- Newer methods of fabric analysis can aid in solving problems
- Tissue fabric deposition is often not detected by traditional methods
- Understanding the nature of fabric filling can lead to better selection of cleaning and prevention programs
- Better simulation of cleaning and prevention methods in the lab can lead to better performance on the machine
- Success or failure is often determined by both the chemistry and method of application.

THANK YOU

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For Additional Information:

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