



RPTA 2021 Virtual Production- Technical Seminar Program & Presentation Slides

Co-Produced with TappiCon 2021 Virtual Conference – TappiCon.org

May 4 - 10:00am-12:00pm	May 4 – 1:00pm-3:00pm	May 5 10:00am-12:00pm
RPTA1: Upgrading and Processing Recycled Fiber Session Chair – Jeff Lyman, Ox Industries	RPTA2: Hot Topics – U.S. Recycling and Multi-Generational Workplaces Session Chair – Dana Pelletier, Greif	RPTA3: Malodors in Finished Paper and Paperboard Products Session Chair – Mark Murphy, Westrock
Upgrading of Poor-Quality Recycled Fiber for Packaging Grades – Ajit Ghosh, AKG Process Consulting A Single Approach for a Multifaceted Result when Processing Recycled Fiber - Niklas Tunell, Cellwood	How the US Paperboard Industry Will Solve the Country's Recycling Crisis – Bill Moore, Moore & Associates Generations in the Workplace – Naomi Garvin, Westrock	Malodors in Finished Paper and Paperboard Products Related to Water System Closure – Linda Robertson, International Microbial Associates

Presentation Slides follow.

Upgrading Of Poor Quality Recycled Fibre For Packaging Grades



Recycled Paperboard Technical Association

Ajit K Ghosh

Principal

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AKGPC

For Process Optimization

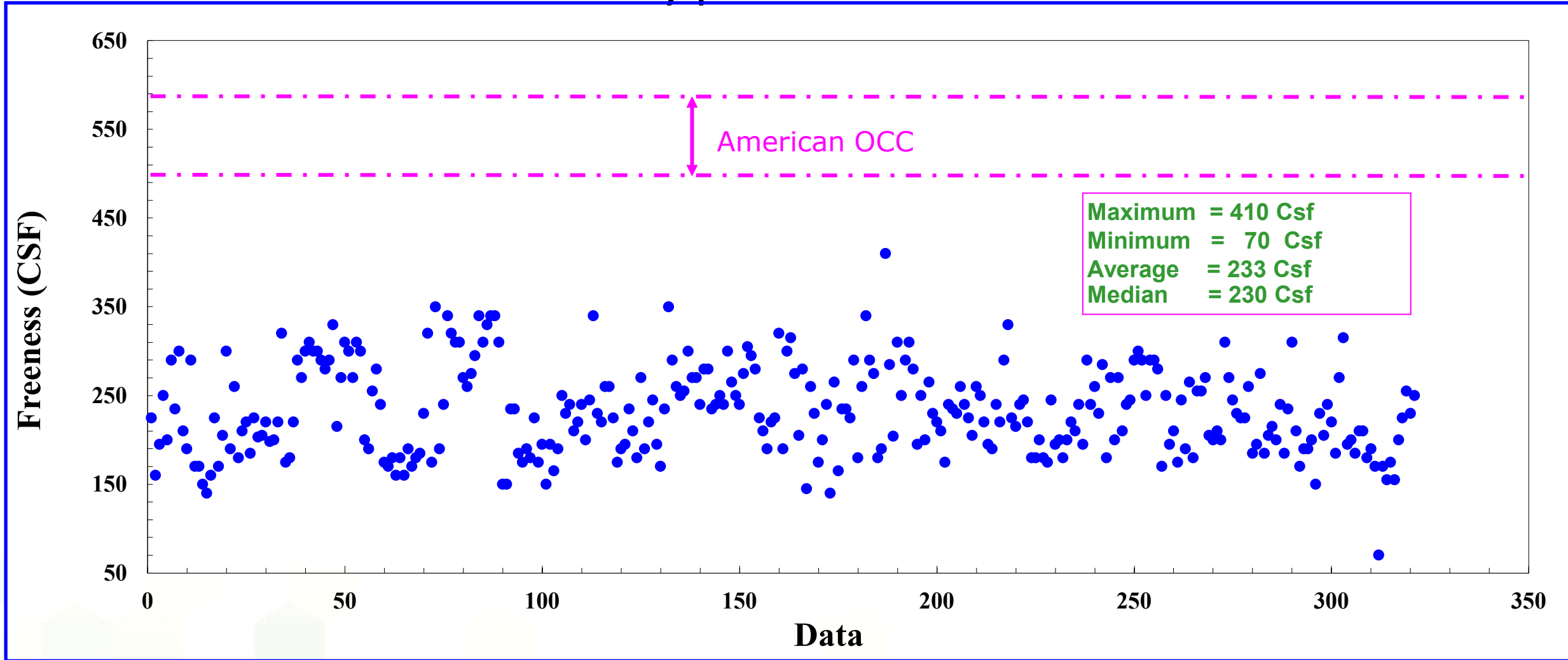
Outline

- Quality and Current Market of Recycled Fibre
- Means of Upgrading RCF
- Main Method Investigated
- Laboratory, Pilot Scale and Mill Trials
- Results
- Cost and Benefits
- Conclusions

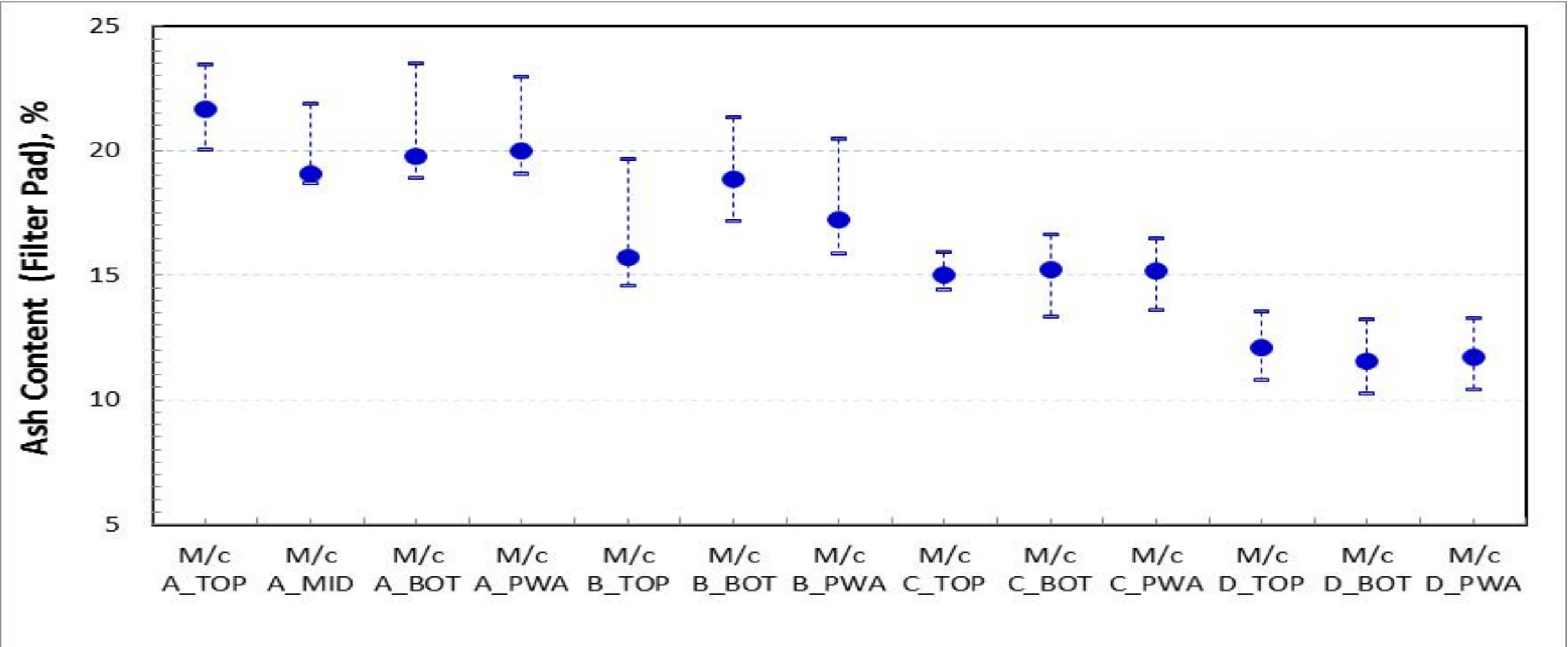
Quality & Current Status of RCF Market

- Decreasing trend in mixed brown waste paper with higher ash content
- Glut in poor quality recycled fibre in market place due to import ban on several countries, China in particular
- Cost of raw material of such fibre is very low and offers the papermakers to upgrade recycled fibre at modest mass loss to make superior grade packaging papers/boards

Freeness Level of Typical Mixed Brown Waste



Ash Content Level of Typical Mixed Brown Waste



Means of Upgrading Recycled Fibre

- Selective collection of Waste Paper
 - high quality recycled fibre (Container Clippings and OCC) is scarce, expensive to collect and sort
- Chemical enhancement
 - addition of starch or other strength enhancing additives at the wet end and/or size press
 - currently done, may not be cost-effective & has limitations

Means of Upgrading Recycled Fibre

➤ Enzymatic treatment

- Can increase freeness, but could be expensive
- Strength improvement difficult to realize

➤ Physical modification

- Fractionation and refining → depends on quality of incoming stock
- **Washing out 'fines' that are mostly filler and degraded fibres followed by refining**

Laboratory-scale Washing Investigation

- Lab Washer
- Pulp Properties
- HS Paper Properties

Laboratory Pulp Washing



Lab Pulp Washer

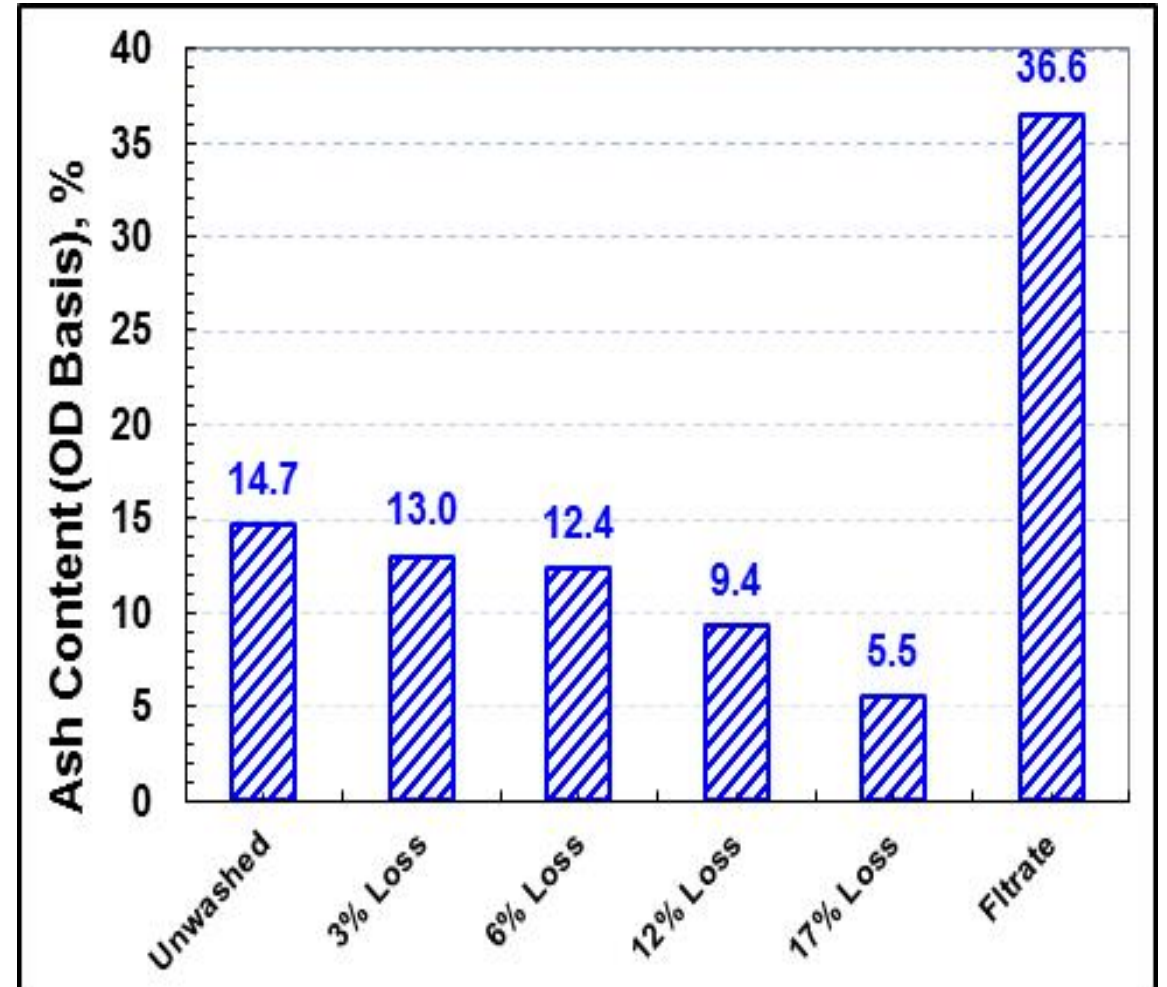
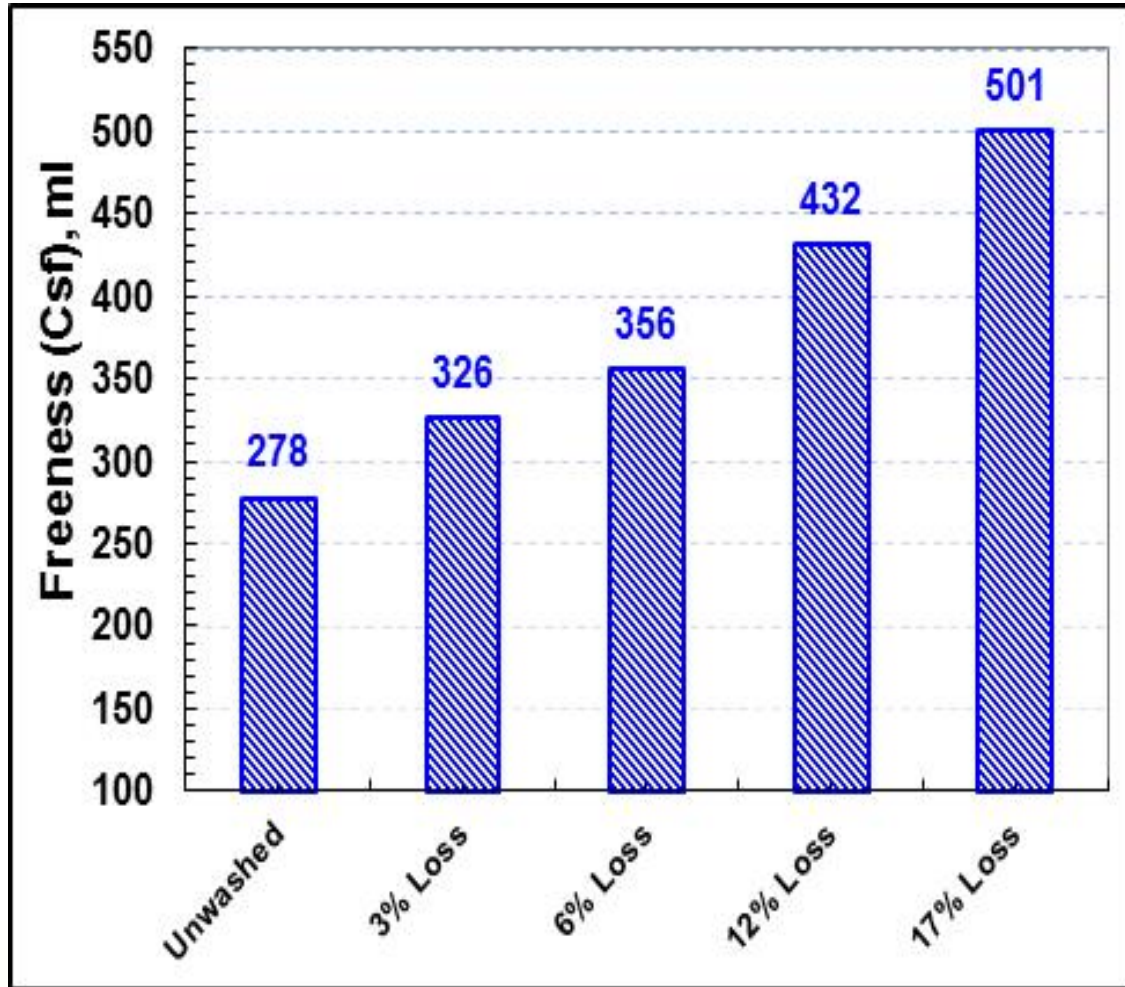


Lab Washing in Progress

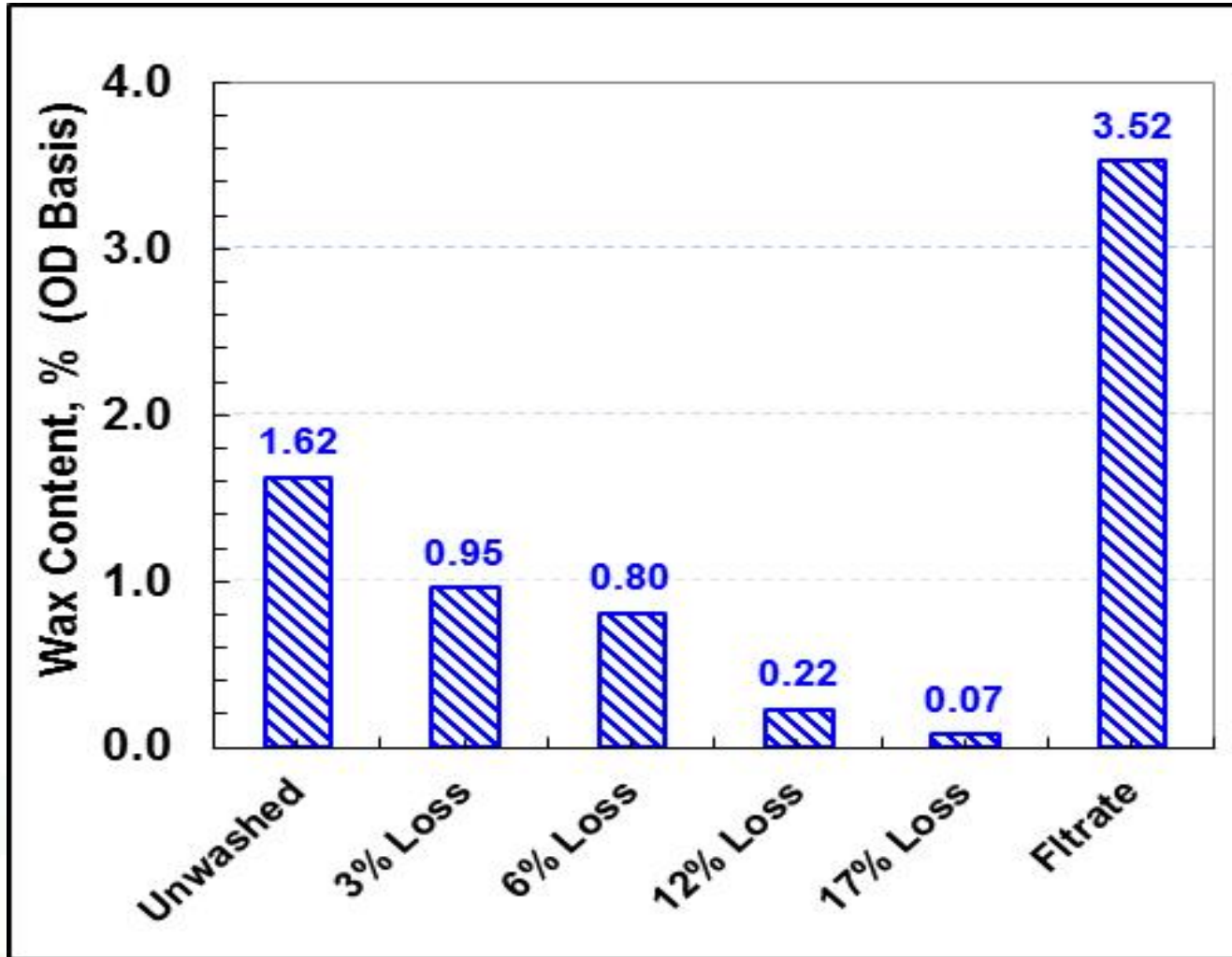


Appearance of 'Fines'

Effect of Washing on Freeness & Ash Content

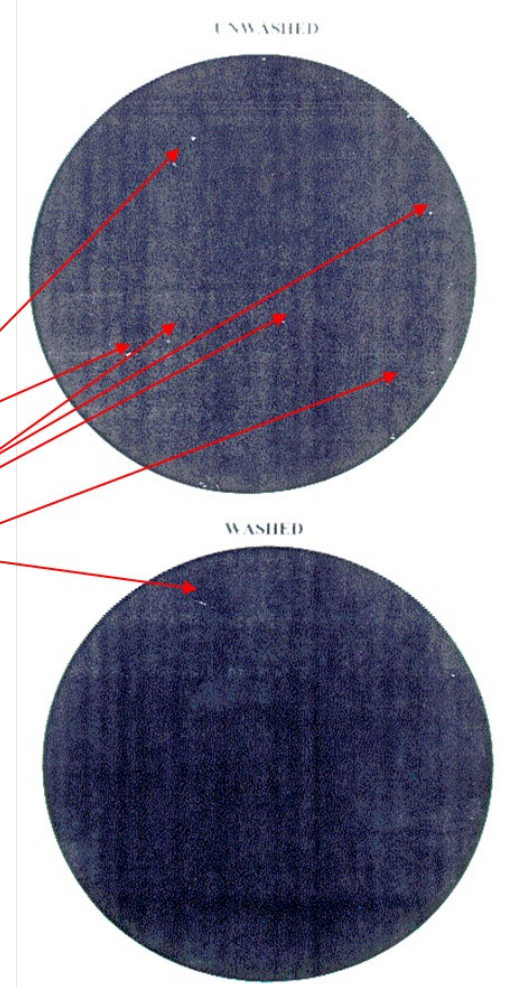


Wax Content & 'Stickies' Levels in Washed & Unwashed Pulps

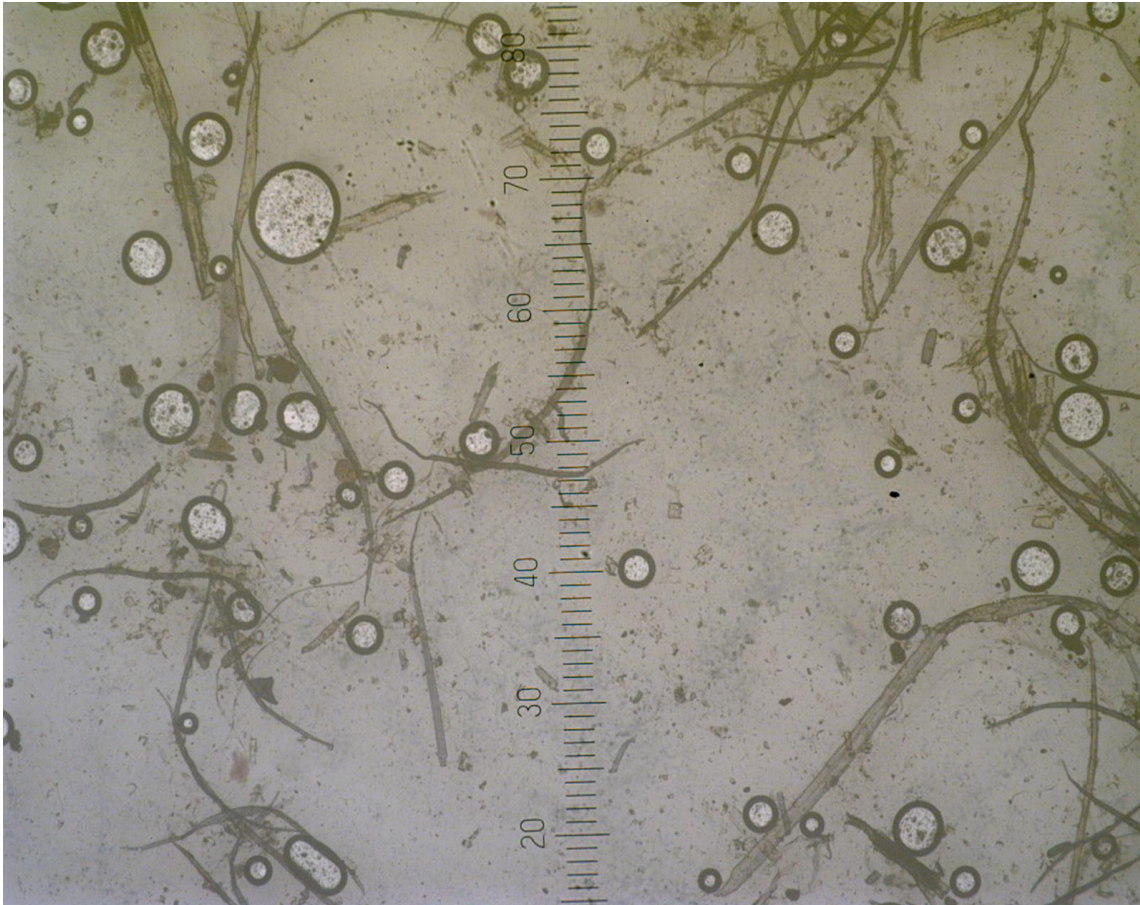


DCM
Extractives

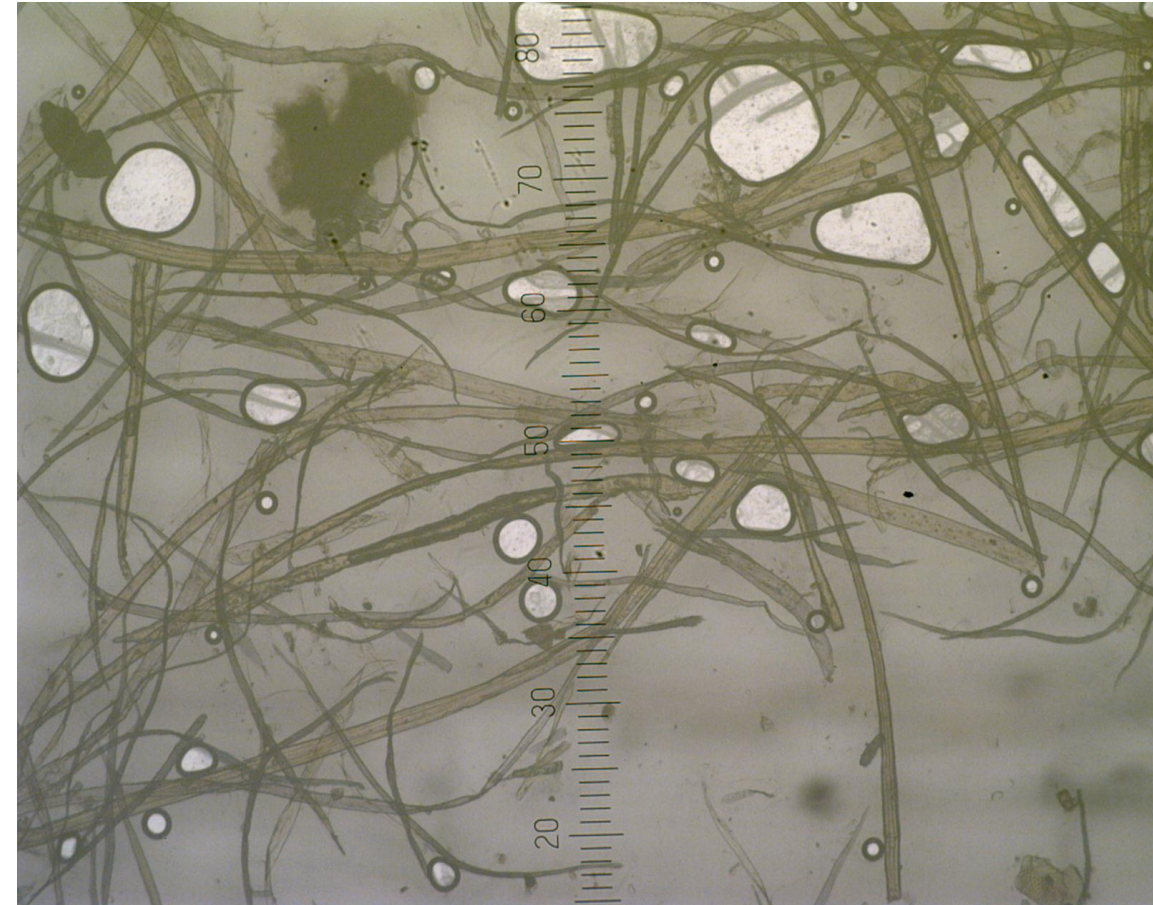
'Stickies'



Micrographs of Unwashed & Washed RCF Pulps

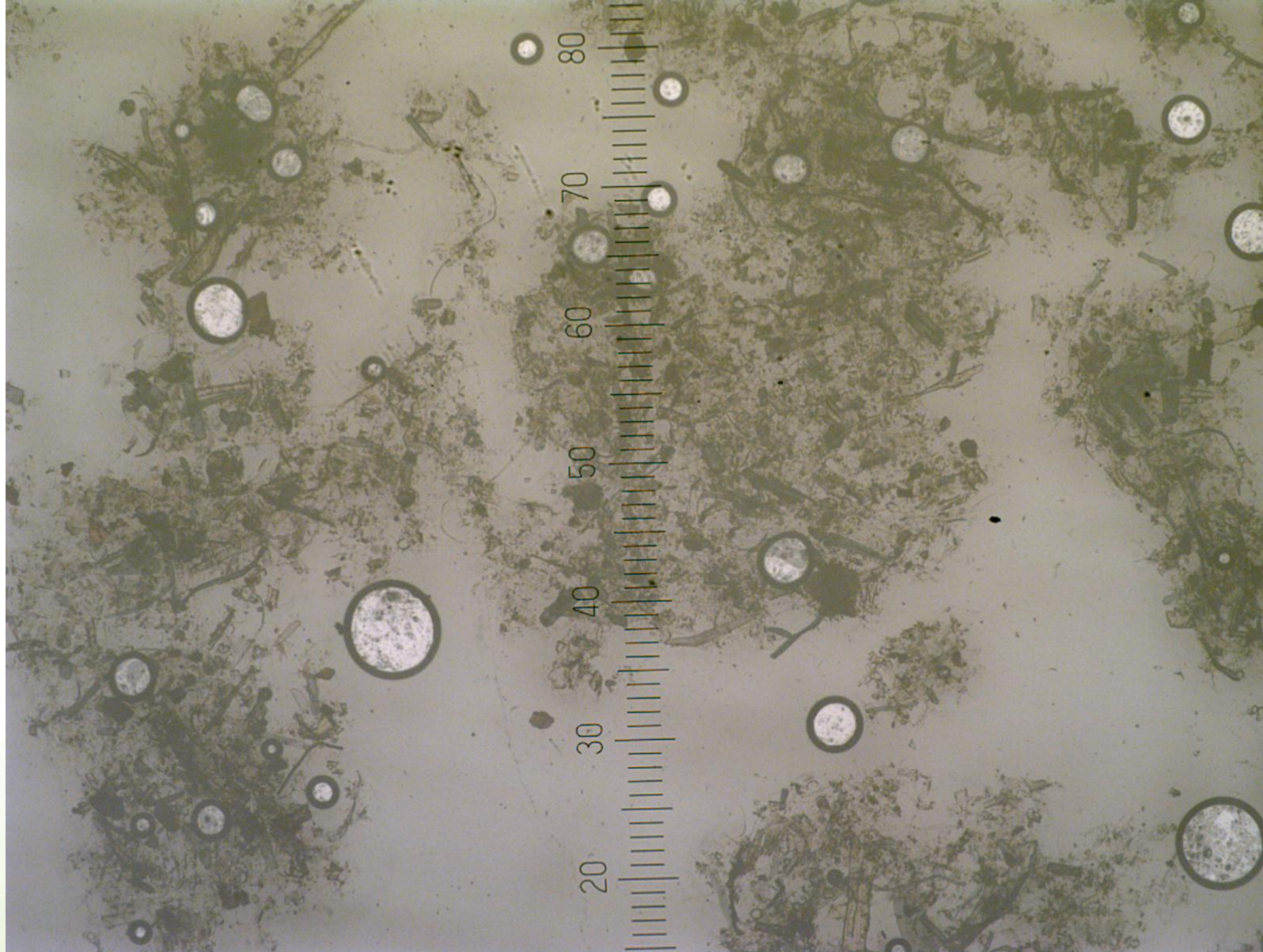


UNWASHED

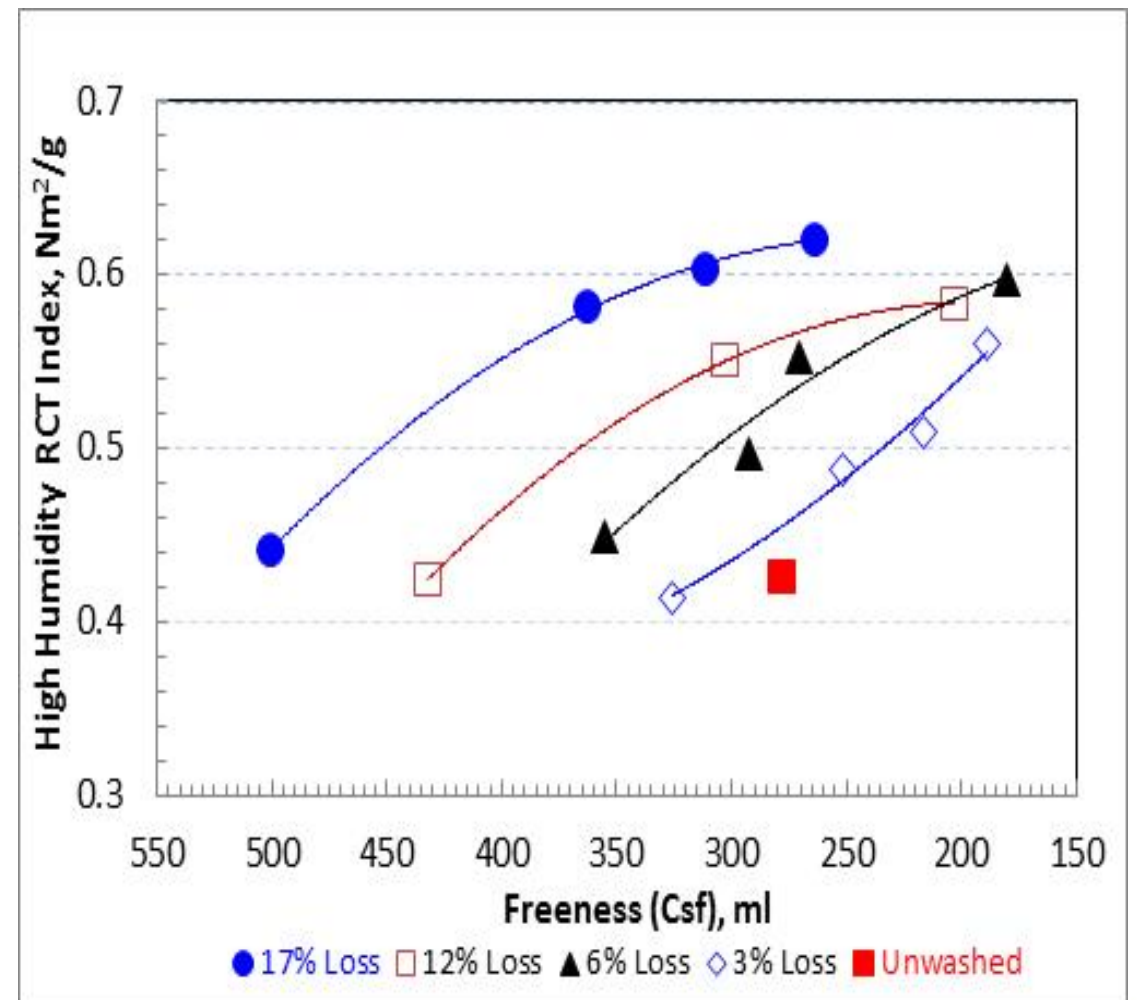
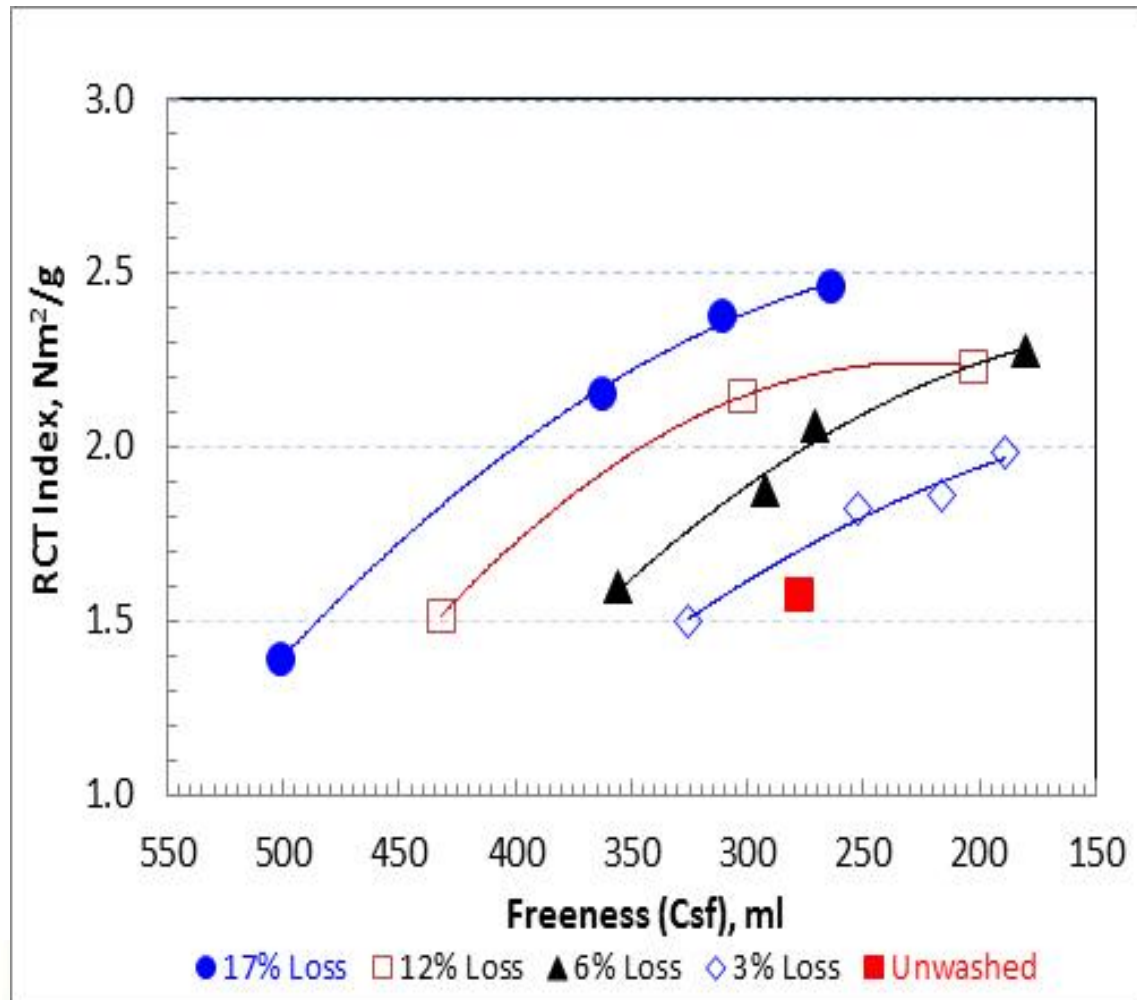


WASHED @17% MASS LOSS

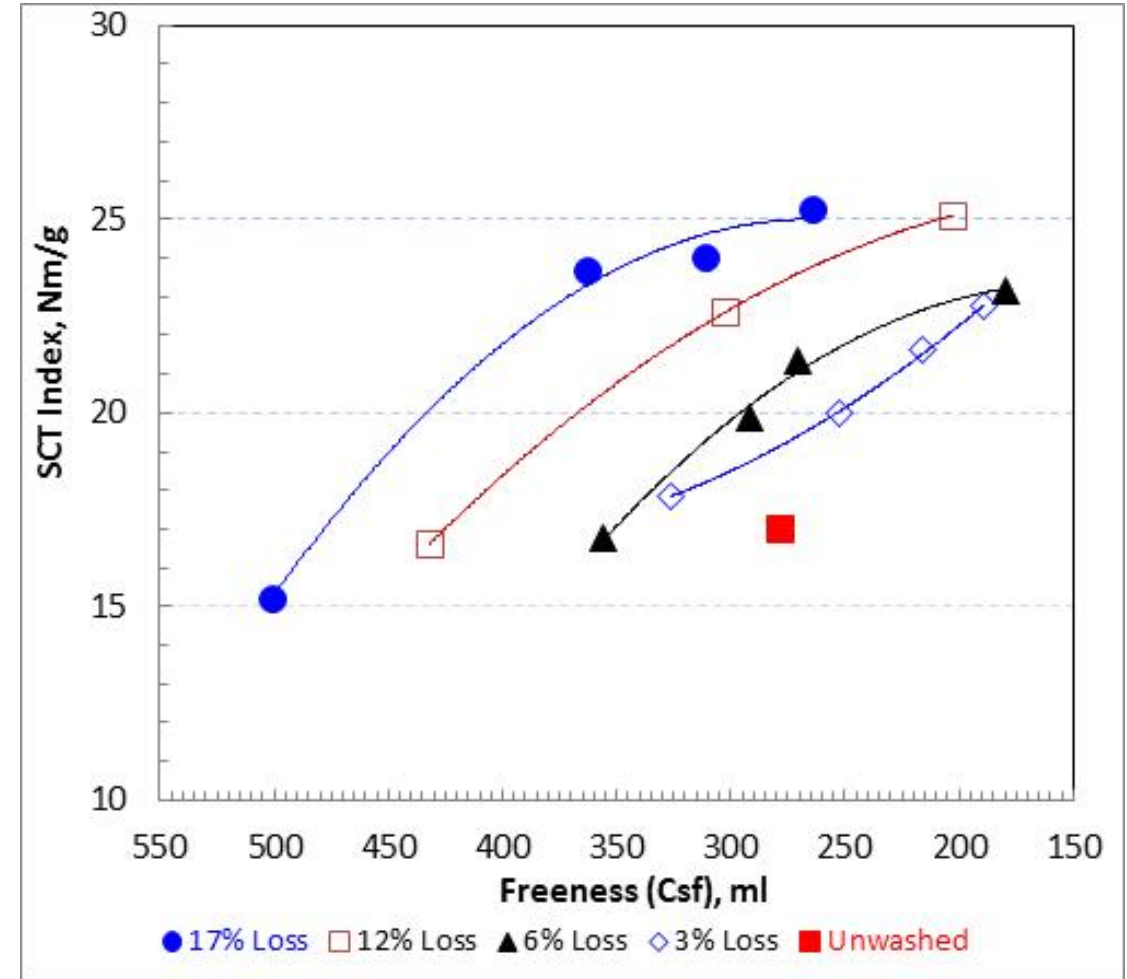
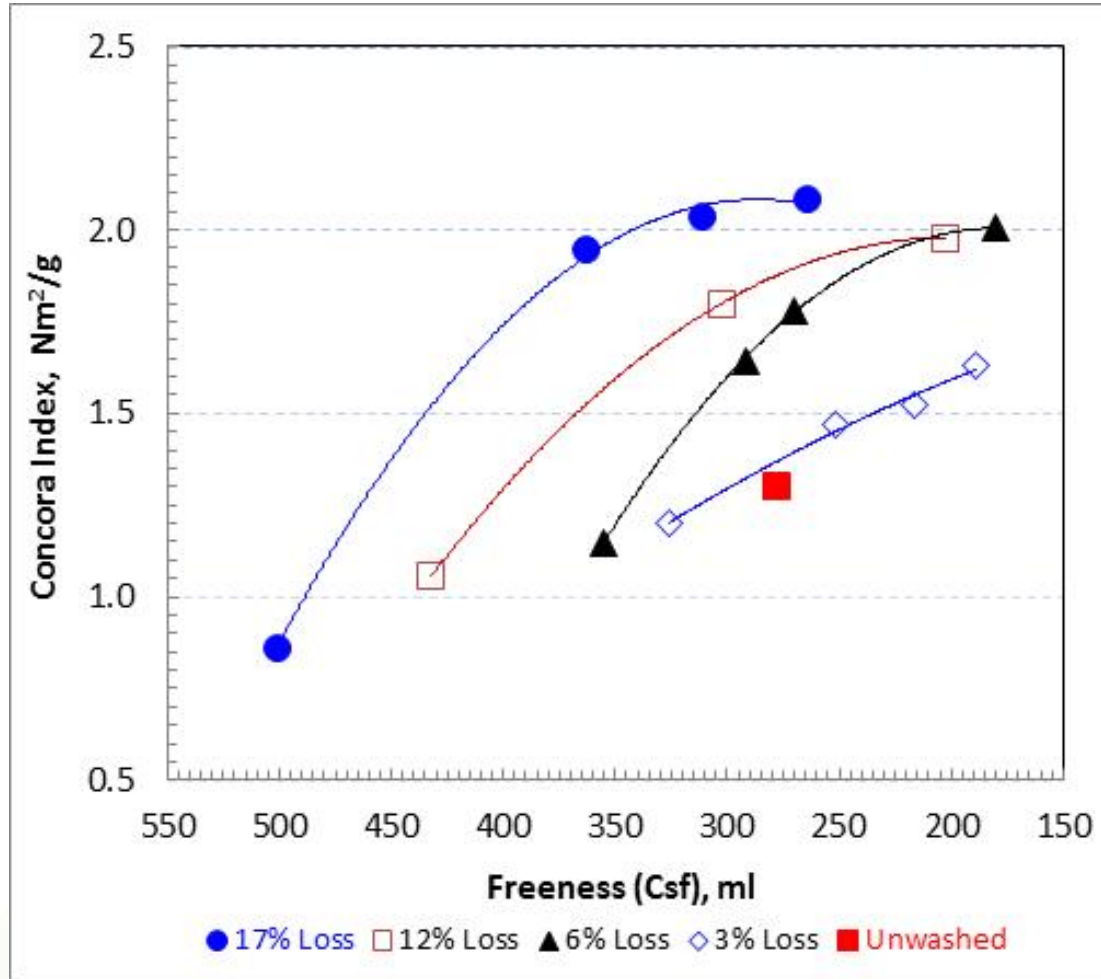
Micrographs of Wash Filtrate



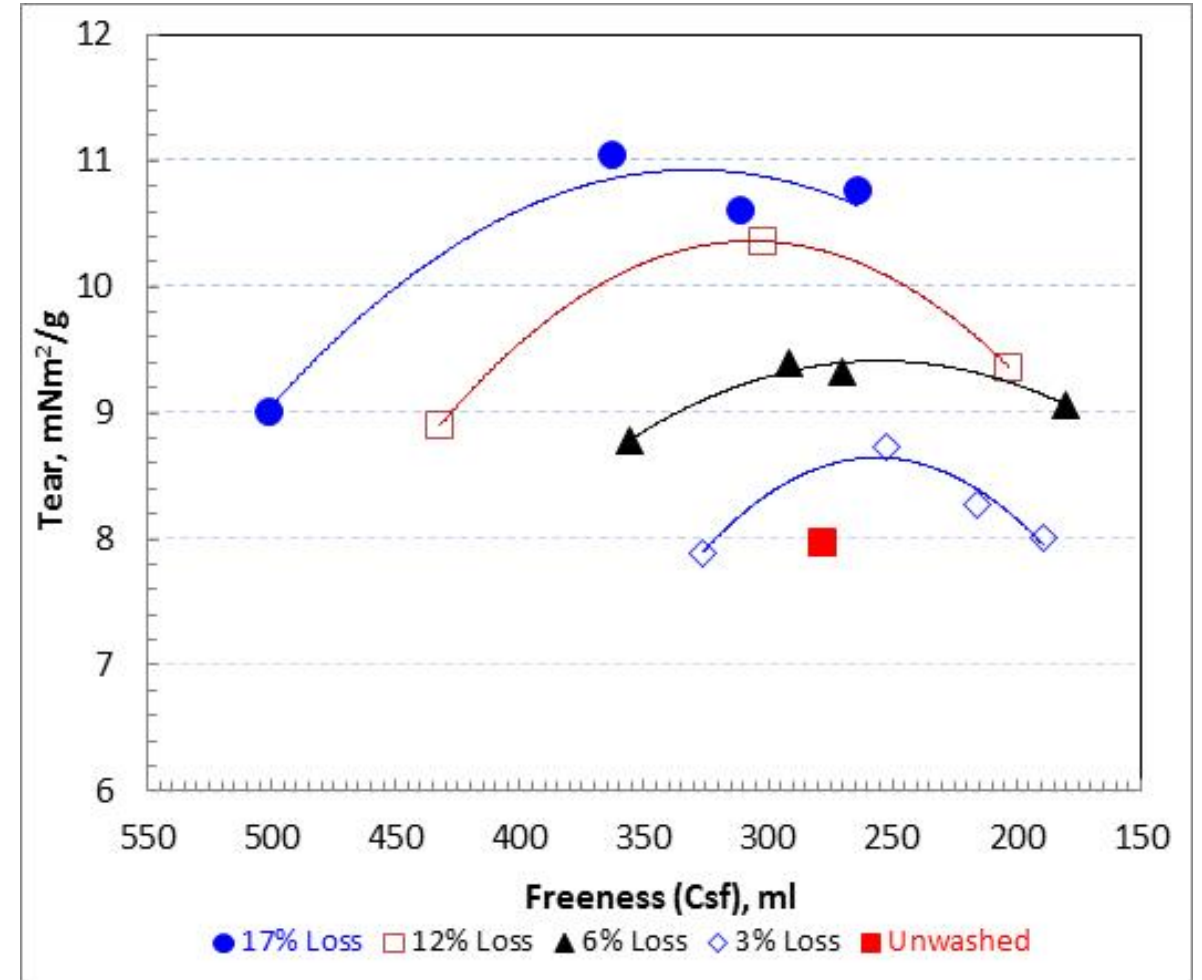
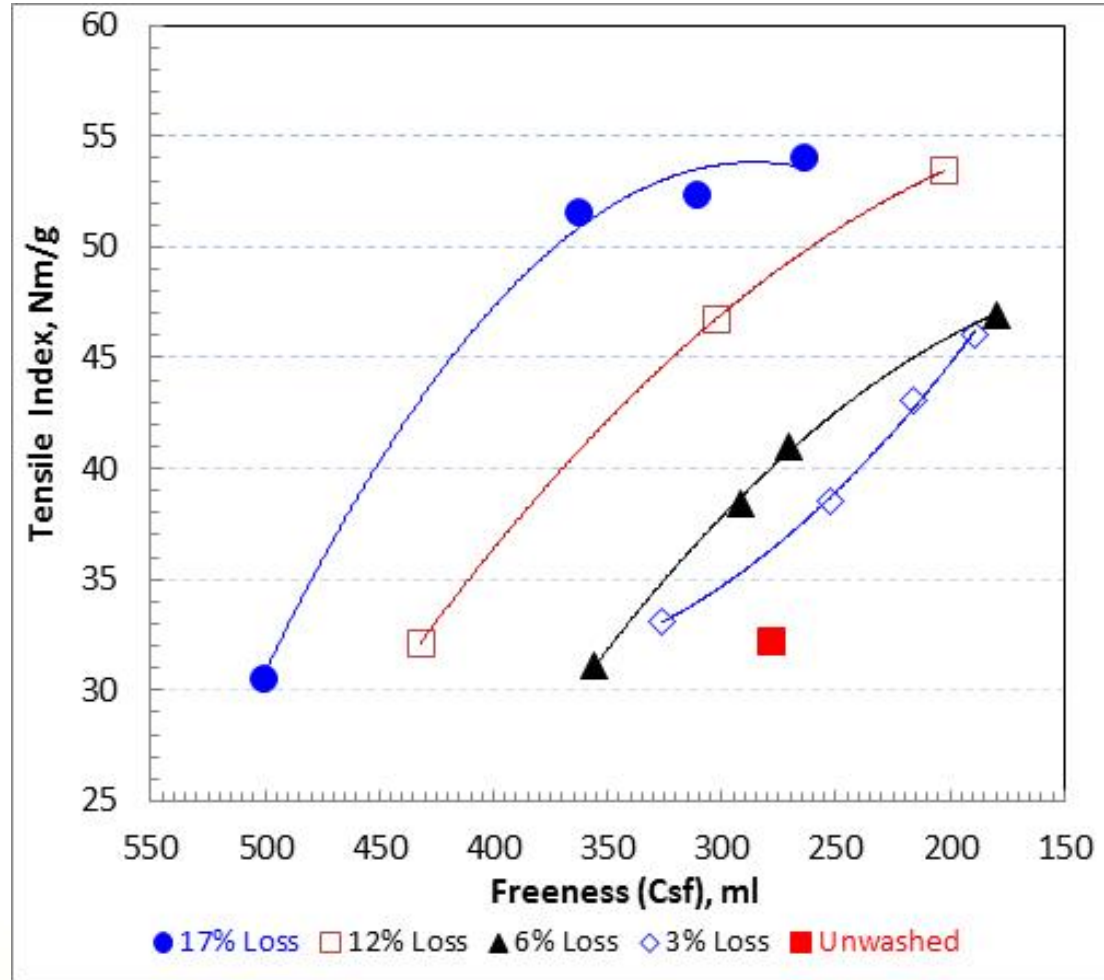
Effect of Washing on Ring Crush Strength



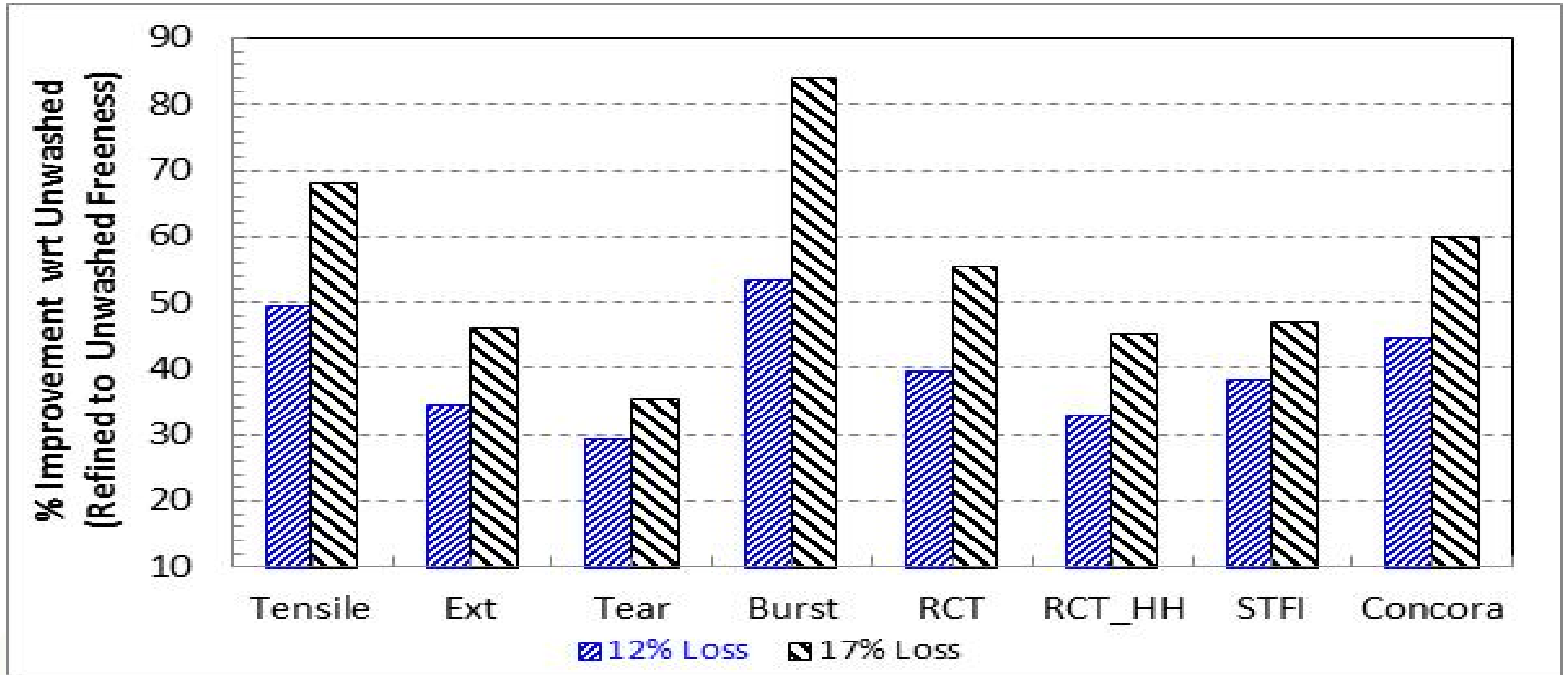
Effect of Washing on Concora Crush & SCT Strength



Effect of Washing on Tensile & Tear Strength



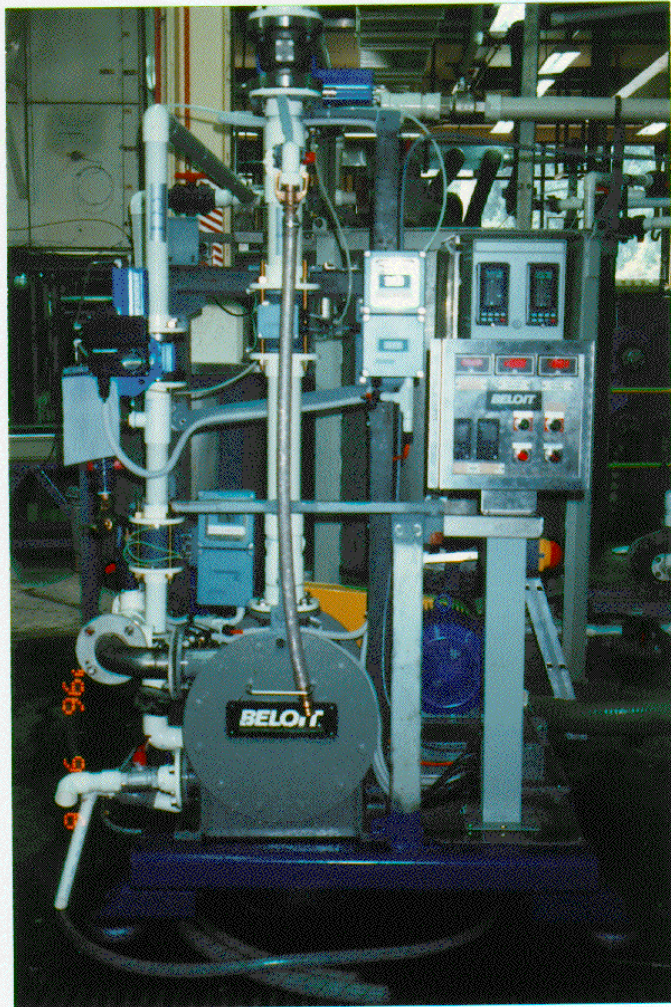
Percentage Improvements Due to Washing



Pilot Scale Washing & Mill Trials

- Pilot Washer
- Properties of Machine Made Papers

Pilot Washer, Basket & Bump Rotor

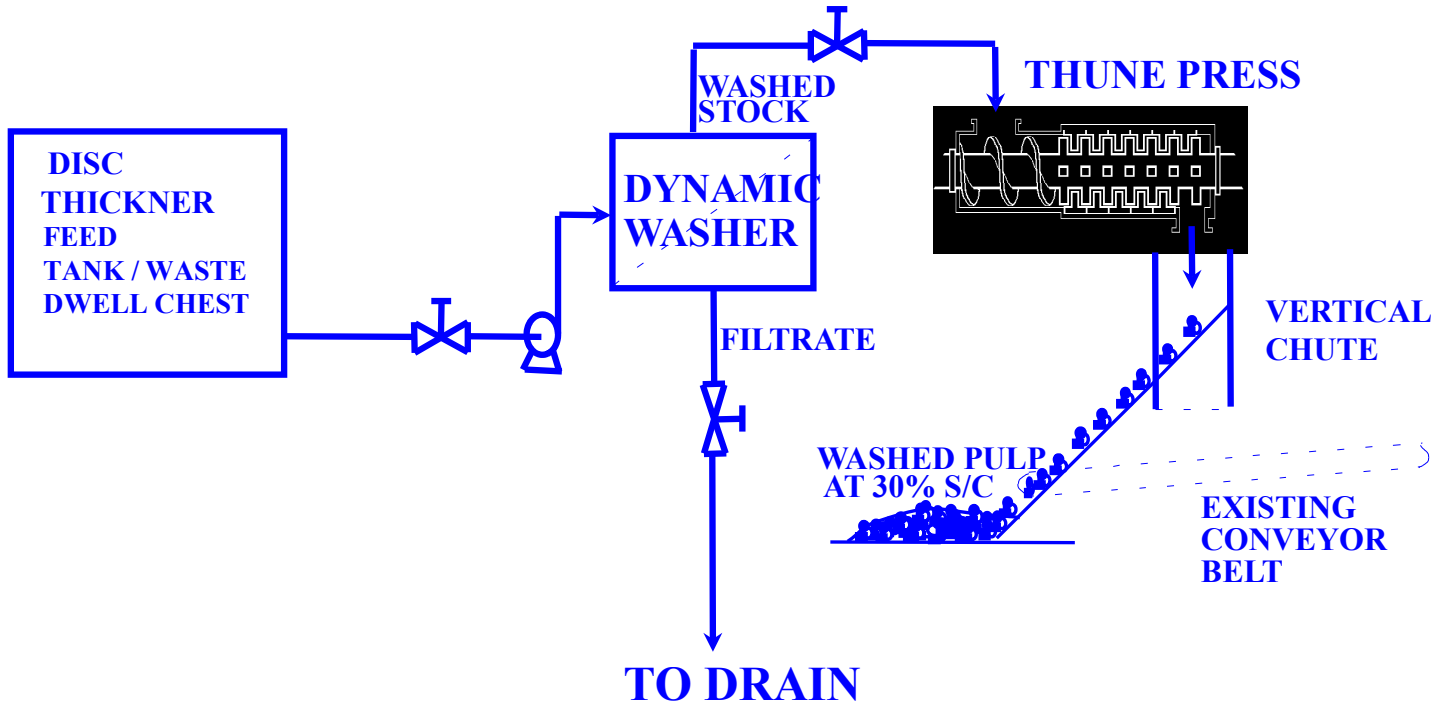
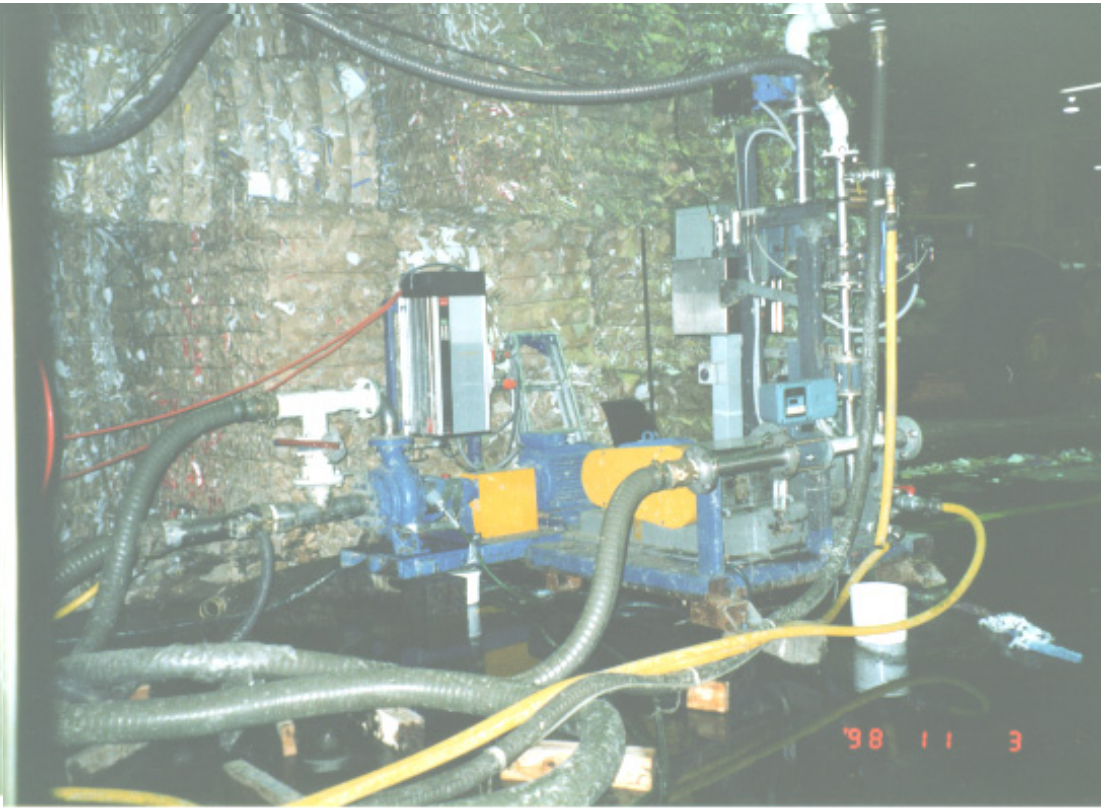


8" PILOT WASHER



BASKET & BUMP ROTOR

Pilot Washer Set up on Mill Site



Washed Pulp generated at mill site dewatered to 30% Consistency using Screw Press and stored on Slab for PM Production Trials

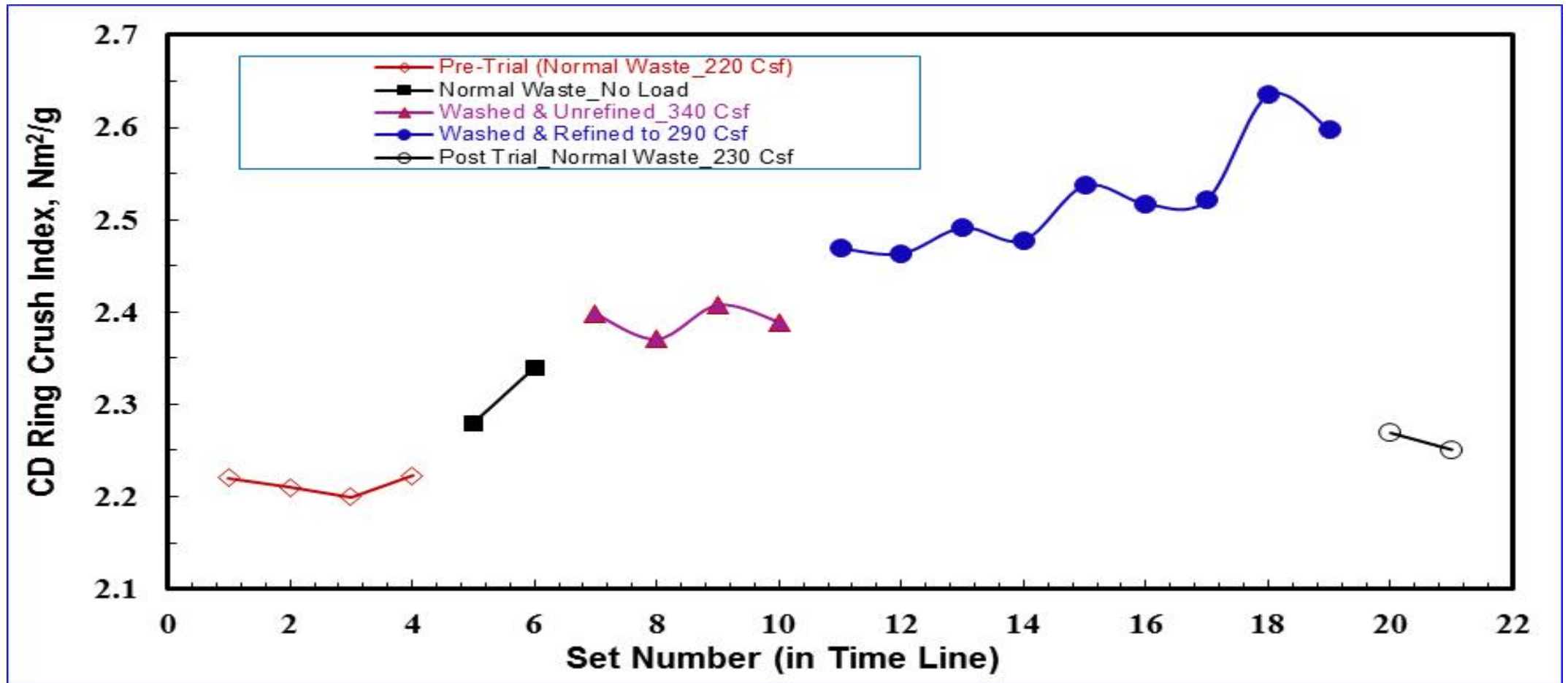
Pilot Washer Connected To Mill's Pulp Chest



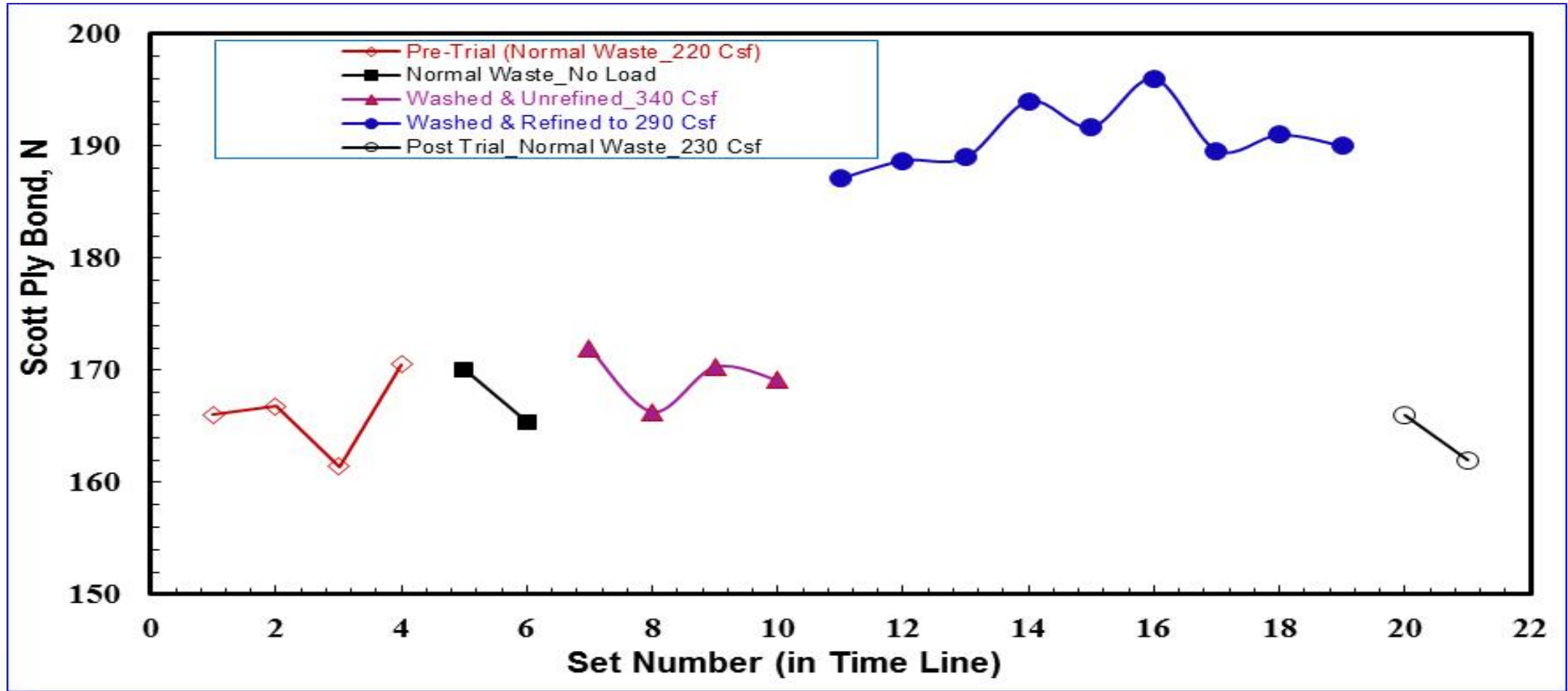
Crumb Washed Pulp on Slab (Mill Site)



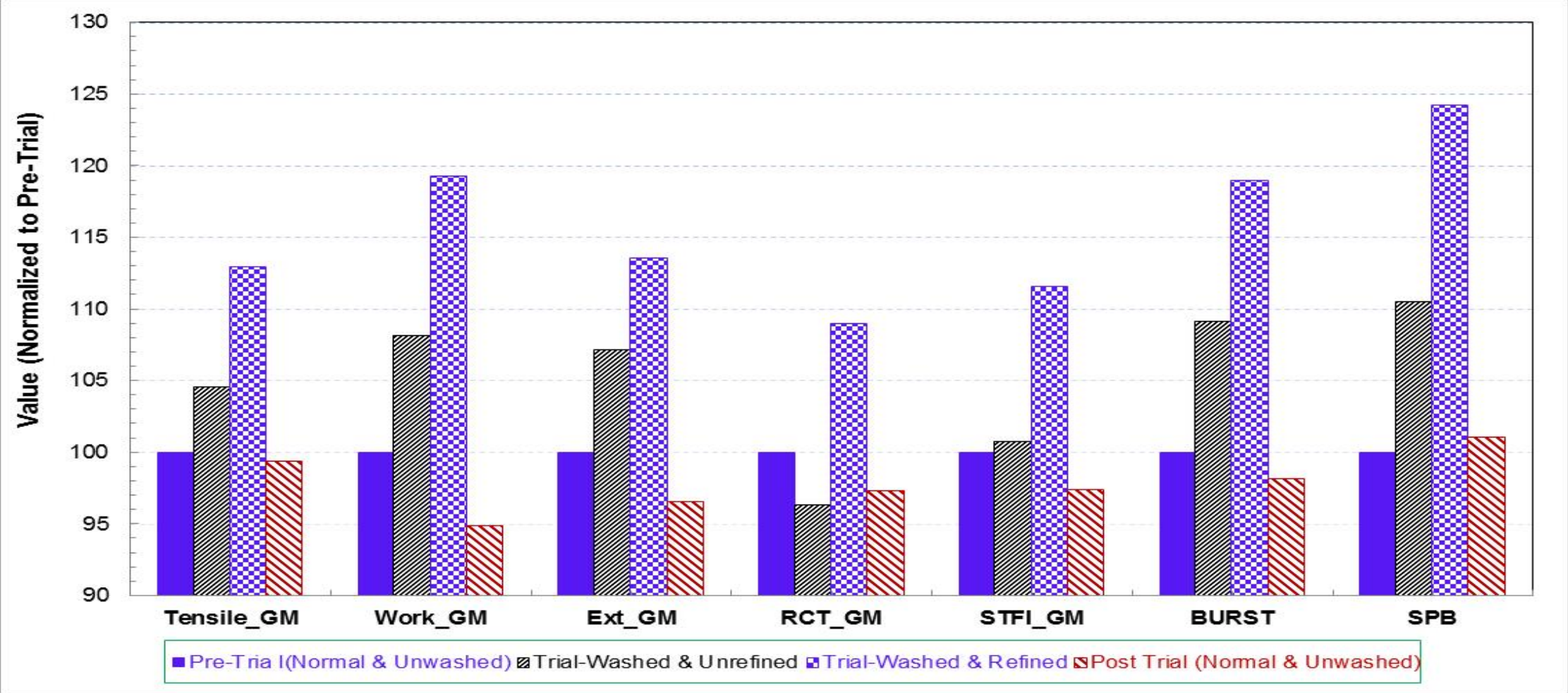
Mill Trial A: CD Ring Crush Index



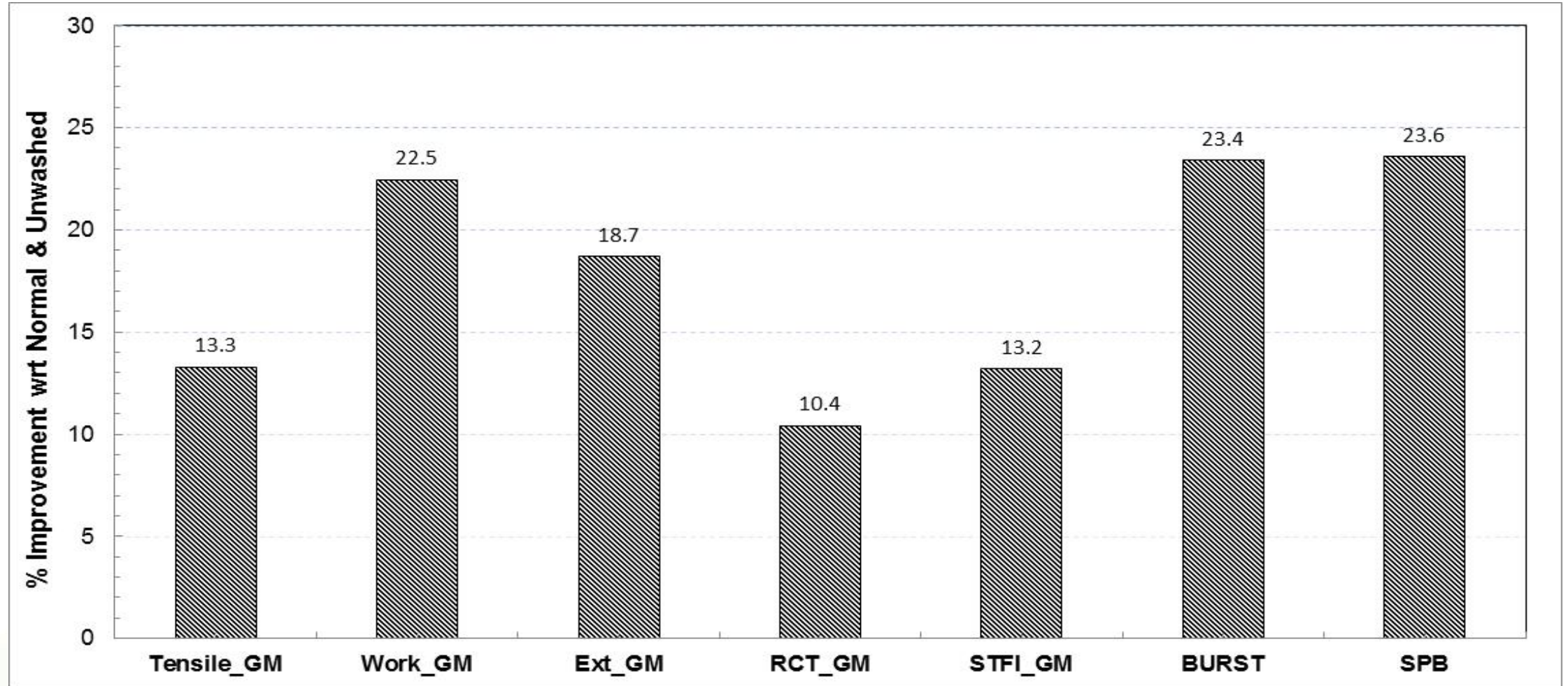
Mill Trial A: Internal Bond Strength



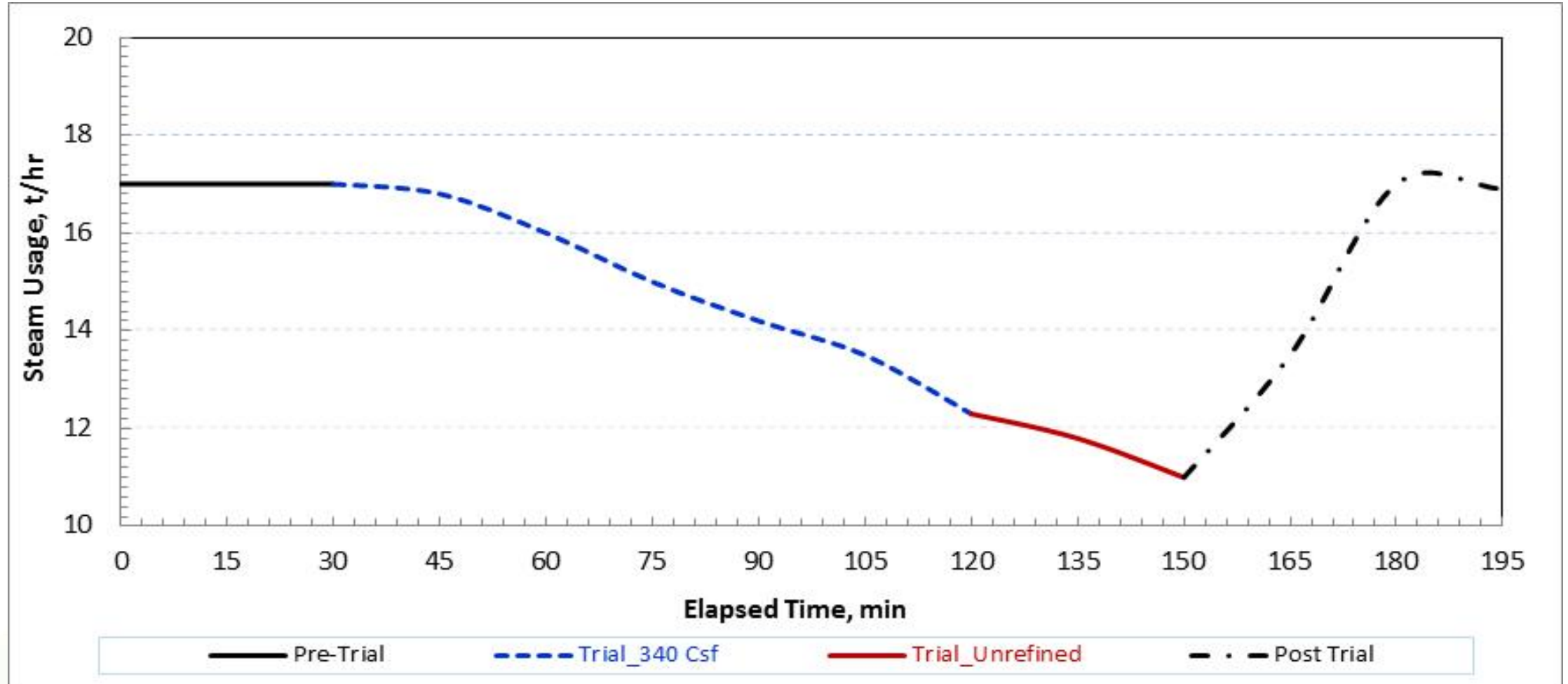
Mill Trial B: Normalized Properties



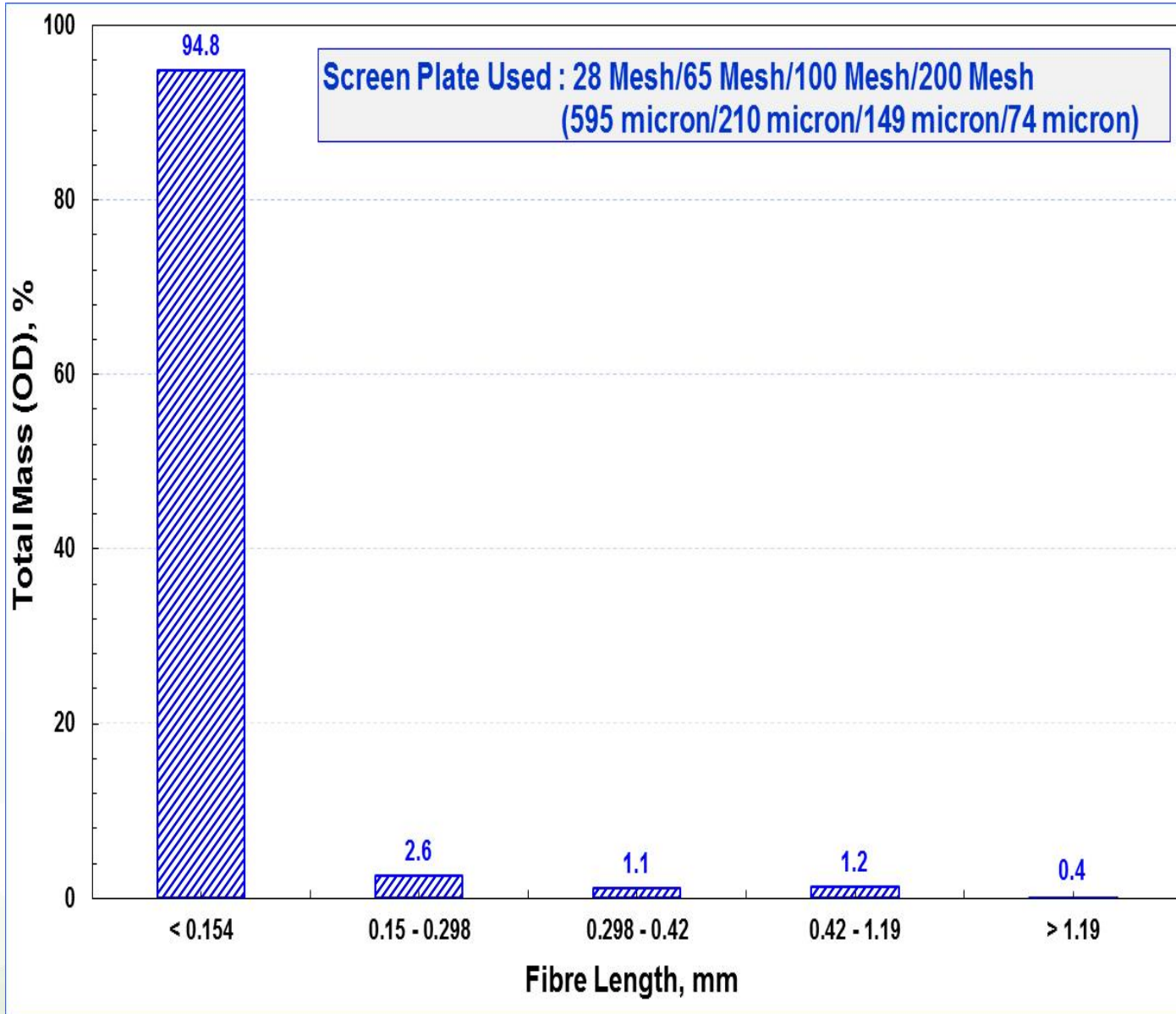
Mill Trial B: Percentage Improvement



Mill Trial B: Trend in Steam Usage during Trial



How Useful Are the solids in Washed Filtrate?



- Laden with Inorganic Filler or Ash (36% of total solids)
- Concentrated with Wax and 'stickies'
- > 95% of solids had Fibre Length less than 0.14mm
- Cellulosic solids 'hornified' (behave like inert) with poor paper making potential

Cost-Benefit : **Costs**

- Cost of extra dry furnish
- Capital costs for washer, refiner and refining power and screw press
- Cost of sludge disposal and coagulating chemicals

Cost-Benefit : **Benefits**

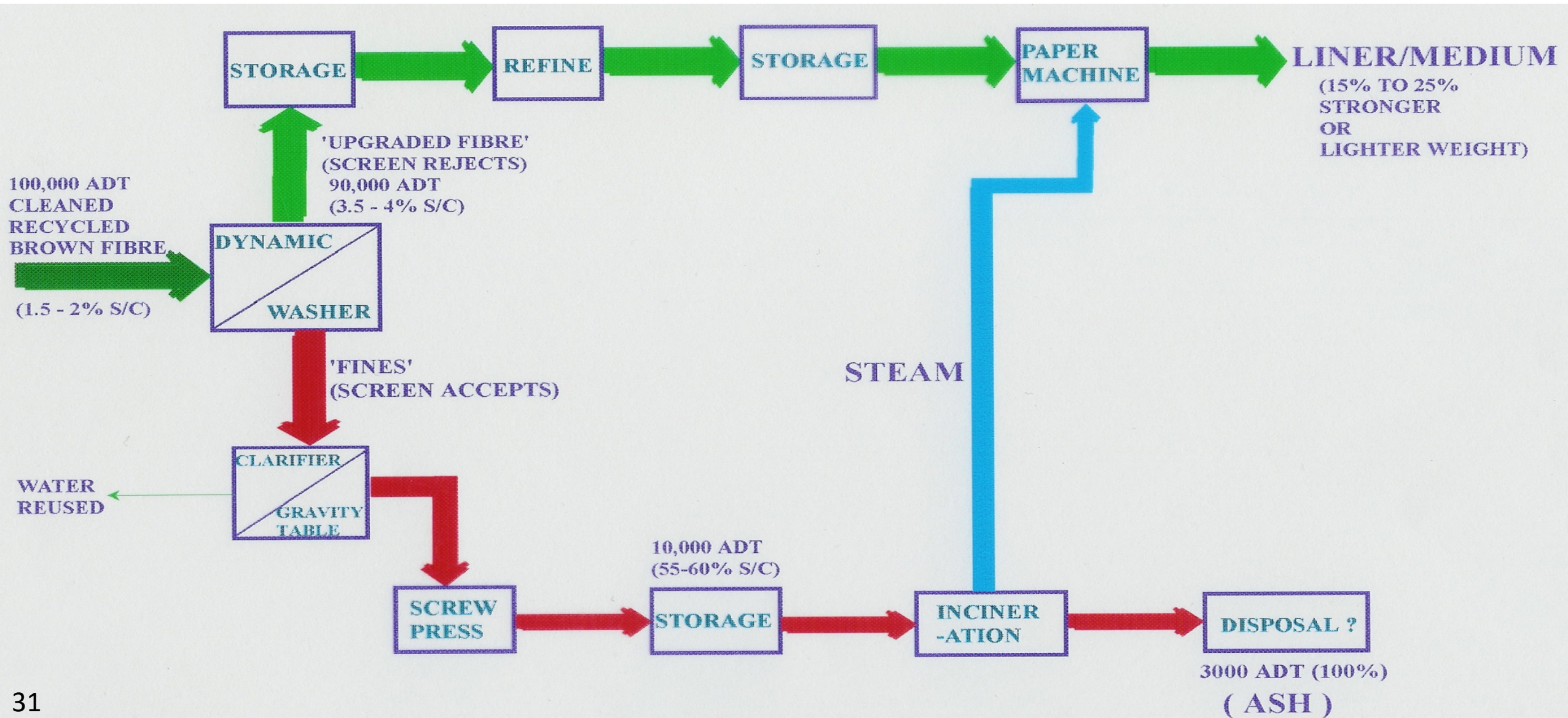
- Availability of superior fibre quality and a cleaner stock preparation system with potentially
 - improved drainage
 - increase machine speed/output
 - reduced steam usage
 - less size press starch usage
 - improved strength and
 - potential light-weighting.

Cost-Benefit Analysis : **Benefits**

➤ Cleaner system with potentially

- less anionic trash
- less biocide
- less stickies and wax content
- potentially less paper breaks and
- higher sizing efficiency/less chemical.

Conceptual Scheme to Upgrade Waste Furnish by Washing Out Fines



Conclusions

- Decreasing quality of recycled fibre is a big challenge to manufacture high performance paperboard;
- Current glut of RCF offers an opportunity for papermakers to utilize the lower cost, in upgrading RCF
- Significant improvements in fibre quality can be achieved by removing inert fines depending upon the starting quality of raw material and level of mass loss.

Conclusions (cont..)

- **Lab & Pilot Investigation** → at 17% total mass loss, 30-80% improvement achieved in all key strength if upgraded RCF fibre is refined back to the freeness level similar to that of the original pulp;
- **1st Mill trial (20% RCF in furnish) producing KLB** → 20% increase in CD ring crush index and 15% increase in SPB, when the 'normal' RCF replaced with upgraded fibre & refined to 290 CSF (220 Csf for 'normal' RCF)

Conclusions (cont..)

- **2nd Mill trial (100% RCF)** → 10 - 25% increases in key strength properties when the 'normal' RCF replaced with upgraded fibre & refined to 340 CSF (220 Csf for 'normal' RCF);
 - Significant reduction in steam usage at constant machine speed along with improvement in key strength properties;

Conclusions (cont..)

- Full potential of upgraded fibres, in terms of strength improvements, can only be realized if the upgraded fibres are optimally refined;
- The finer solid materials present in the washed filtrates comprised of in excess of 36% inorganic ash with 98% of total discarded mass had fibre length less than 0.15 mm.

Thank you for your time.

- **Ajit K Ghosh**
- Principal
- AKG Process Consulting
- Melbourne, AUSTRALIA

Hot Dispersion

A single approach for a multifaceted result when processing recycled fiber



Niklas Tunell
Sales Manager N&S America
Cellwood Machinery



THE NEED FOR HOT DISPERSION

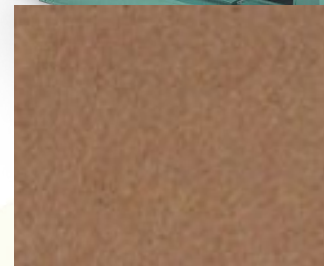
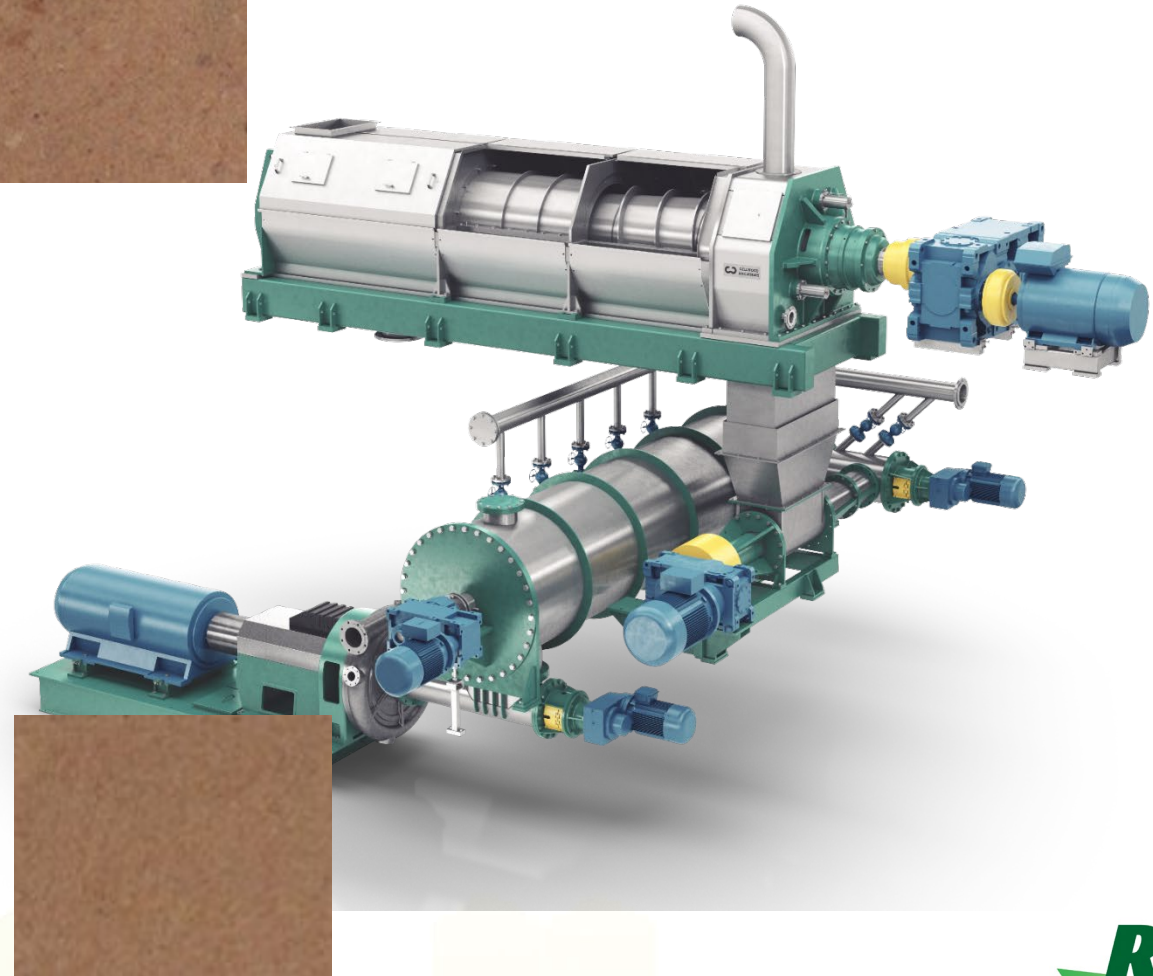
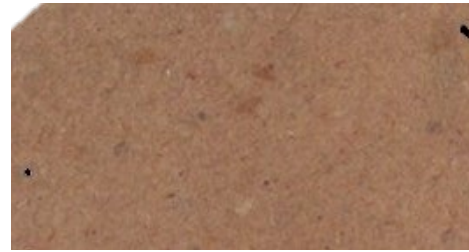


WHAT IS A HOT DISPERSION SYSTEM

A thermo-mechanical high consistency treatment of fiber designed to liquefy, break down and disperse tacky and visible contaminants.

Also designed to gently refine the fiber for significant strength gain.

All in all this produces a clean, strong and uniform sheet.

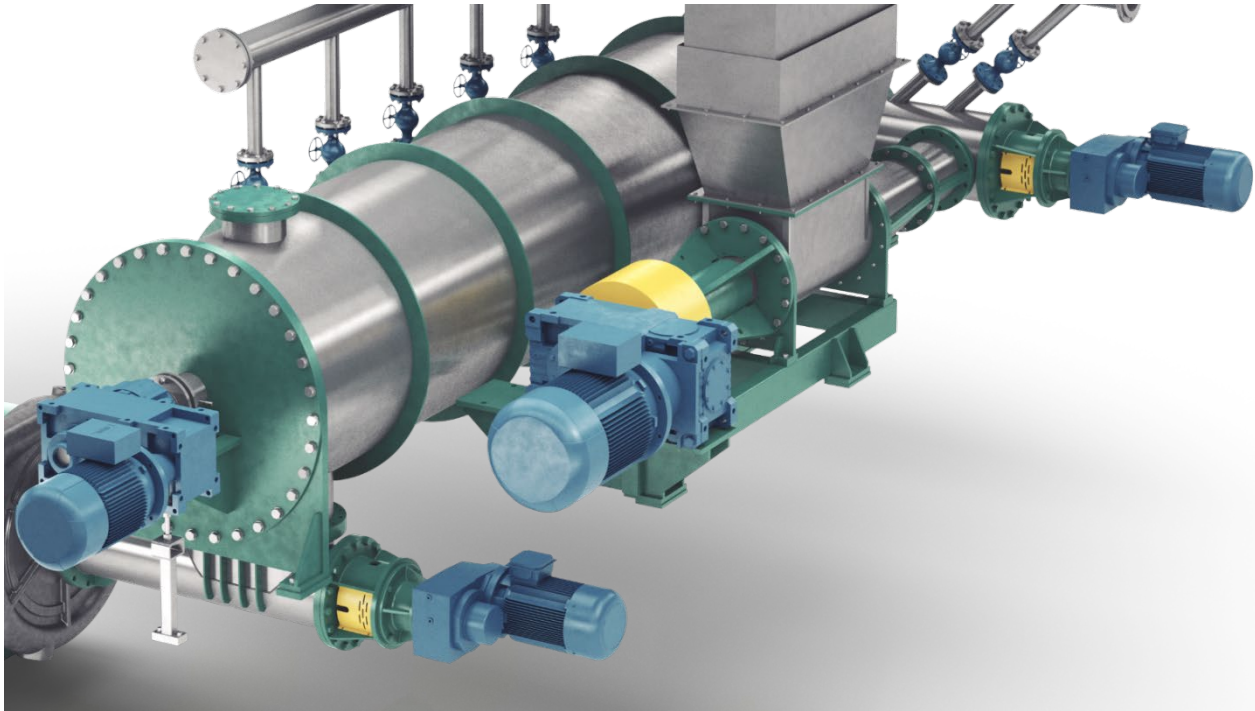


DEWATERING ZONE



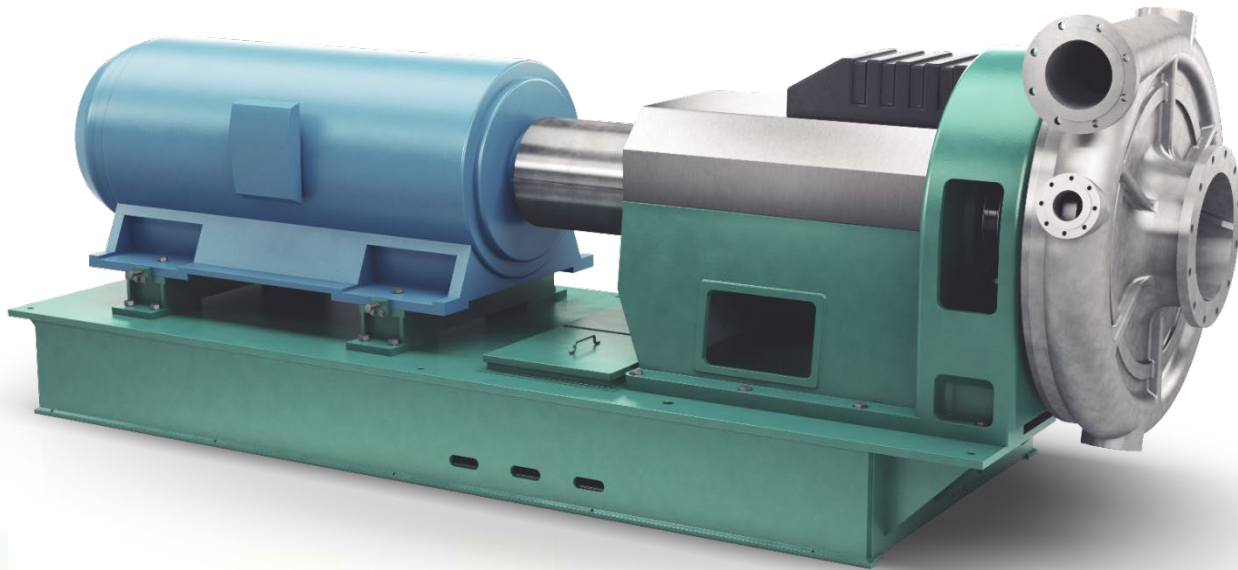
- One stage Screw press dewatering thickens from 3 % to 30 % consistency.
- In this zone the pulp will be thoroughly washed due to the large amount of water pressed out.
- High consistency entering the heating zone will keep the steam consumption low.
- The fiber surface will be dry increasing fiber to fiber friction and thus strength development.

HEATING ZONE



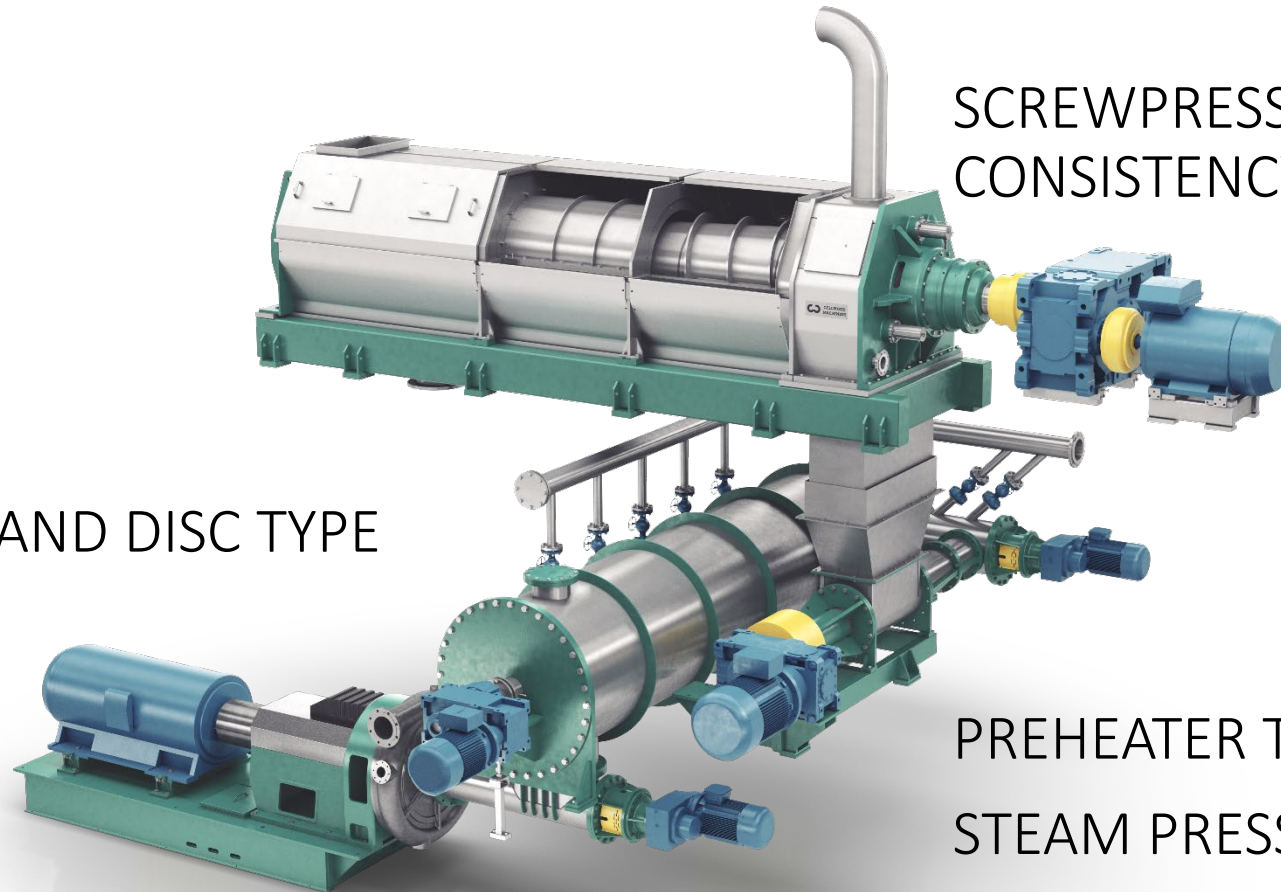
- In the heating zone the pulp will be shredded into small pieces and then evenly heated to a temperature of 90-120°C, depending on raw material.
- The heating of the pulp will improve the dispersing result with reference to wax, hot melts and stickies as it's heated to the melting point and weakens the contaminants strength properties.
- A higher temperature will keep the freeness drop at a minimum level, across the next stage, the disperser.

DISPERSING ZONE



- In breaking down the contaminants the disperser also eliminates any clots or clusters of impurities, which would affect machine operations or contribute to product defects.
- In the dispersing zone the fibres will pass through a narrow disc gap, normally between 0,10-0,50 mm and the contaminants will be reduced to an invisible size.

PARAMETERS AFFECTING RESULT



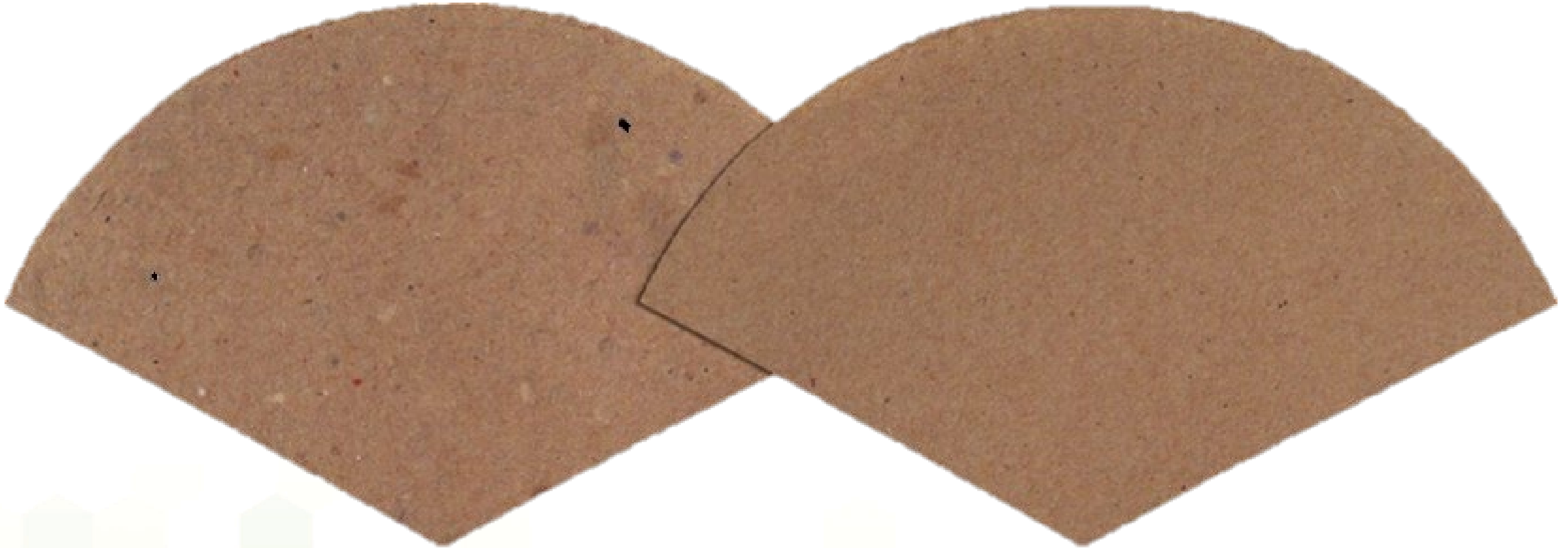
SCREWPRESS DISCHARGE
CONSISTENCY

DISPERSER DISC GAP AND DISC TYPE

PREHEATER TEMPERATURE AND
STEAM PRESSURE

DISCHARGE BACK PRESSURE

Traditional goal for hot dispersion DIRT AND SPECS



BEFORE DISPERSER 105°F

AFTER DISPERSER 220°F

Traditional goal for hot dispersion Tacky contaminants



PULPED SAMPLE
OCC dissolved in pulper with contaminants such as ink, colors, wax, stickies, and hot melts.

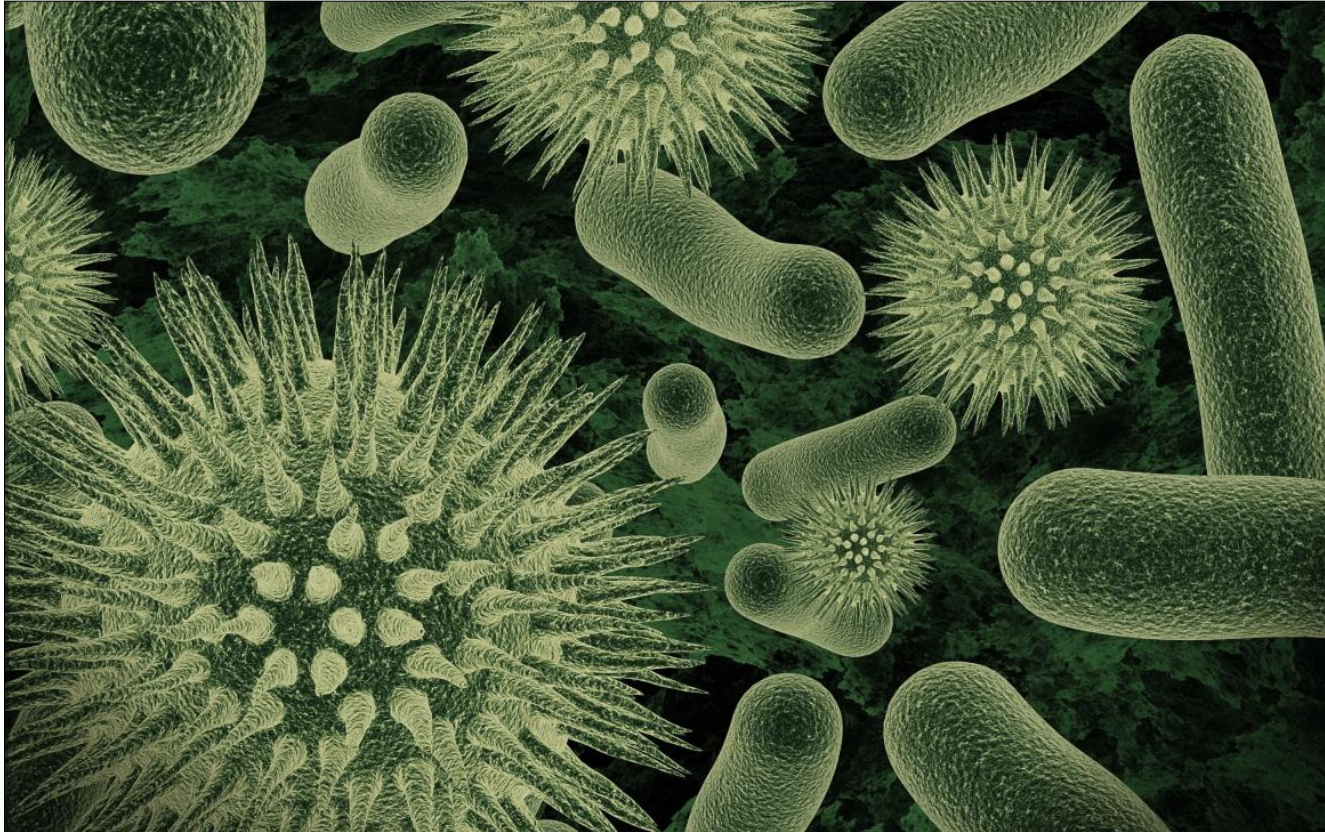


WARM DISPERSED SAMPLE
Only dispersion no screening or cleaning.
OCC dispersed at 90°C (194°F).
Still containing significant sources of wax, hot melts, stickies and fibre bundles.



HOT DISPERSED SAMPLE
Only dispersion no screening or cleaning. OCC dispersed at 105°C (221°F).
Now completely free from wax and hot melts. Very little macro-stickies left.
Completely homogeneous for improved forming.

Reduction of Bacterial Spores



High consistency together with the process temperature and continuous mixing for extended time leads to reduction of Bacterial Spores with some 99%.

More recent goal is Fiber Property Development



Typical OCC development
across a system

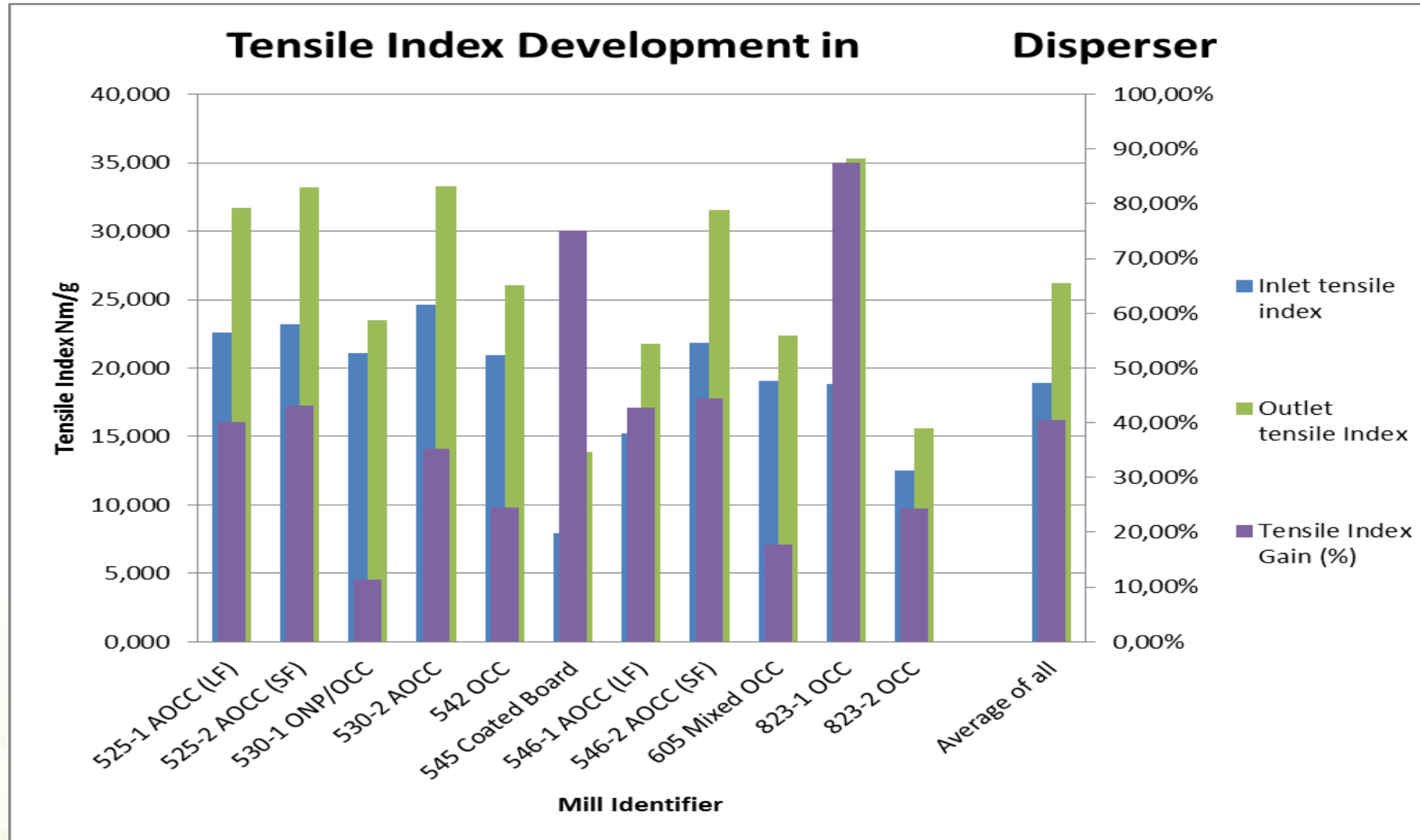
Tensile Index +40%

Elongation +40%

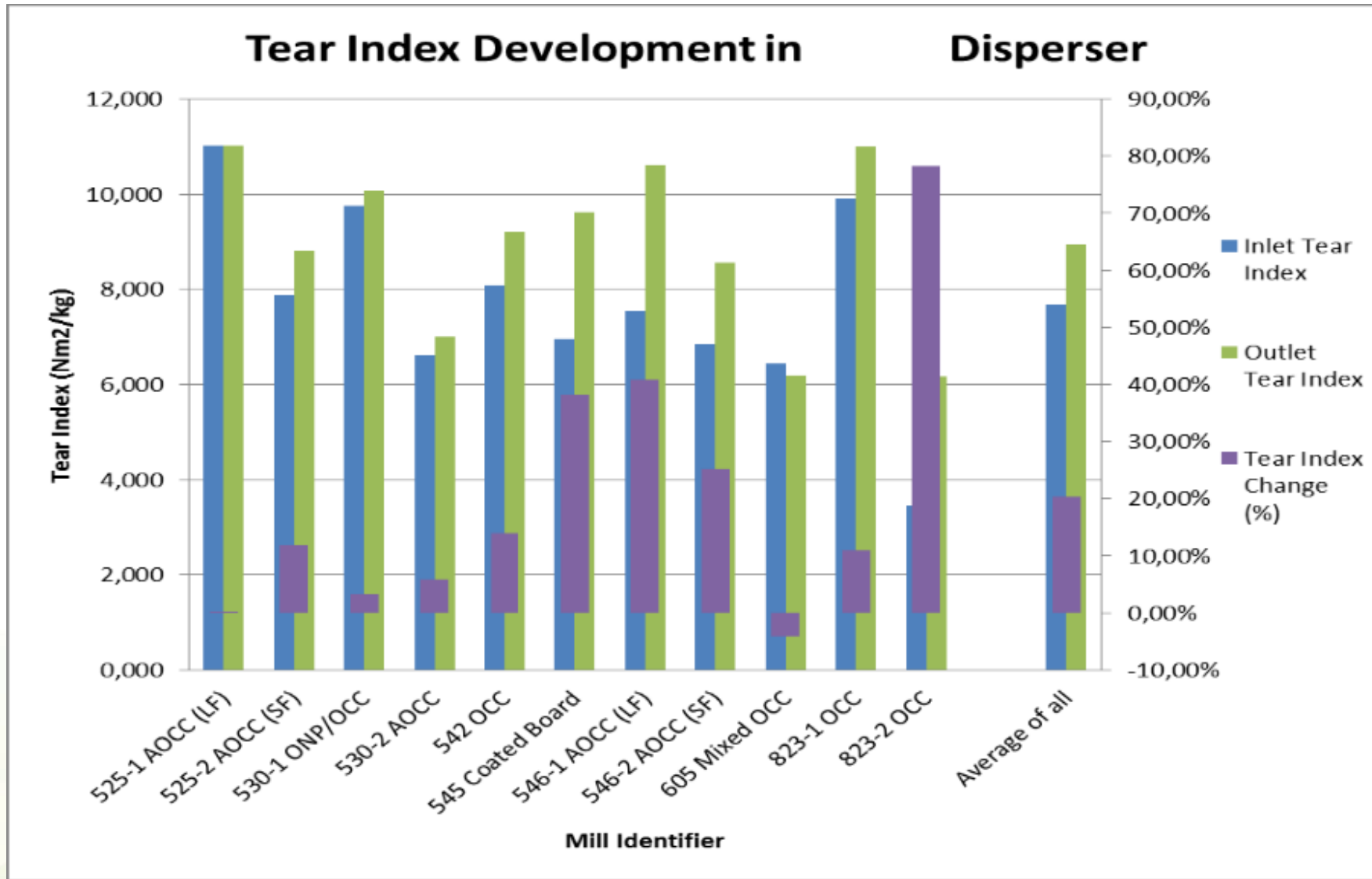
Tear Index +20%

Burst Index +40-60%

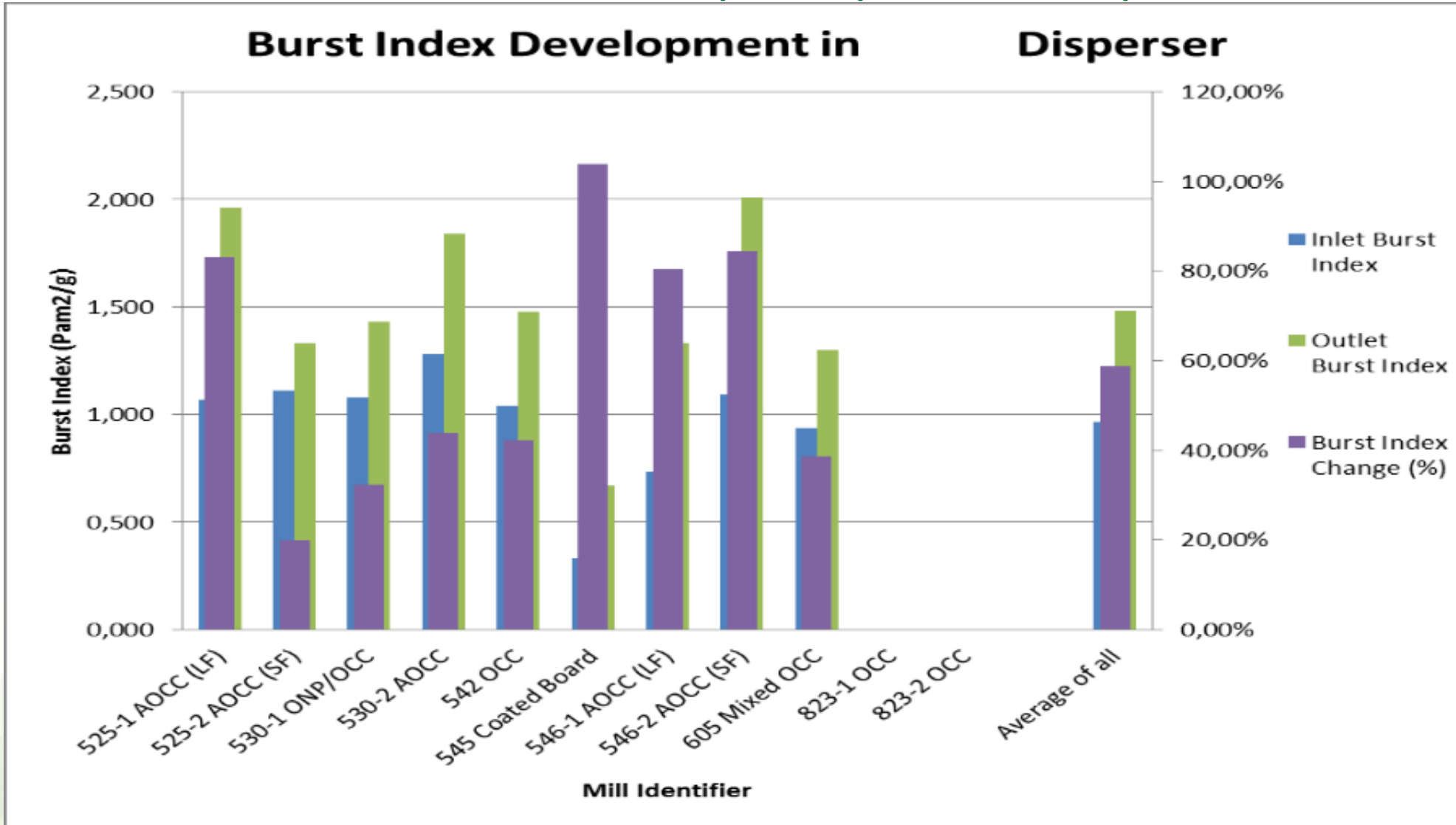
More recent goal is Fiber Property Development



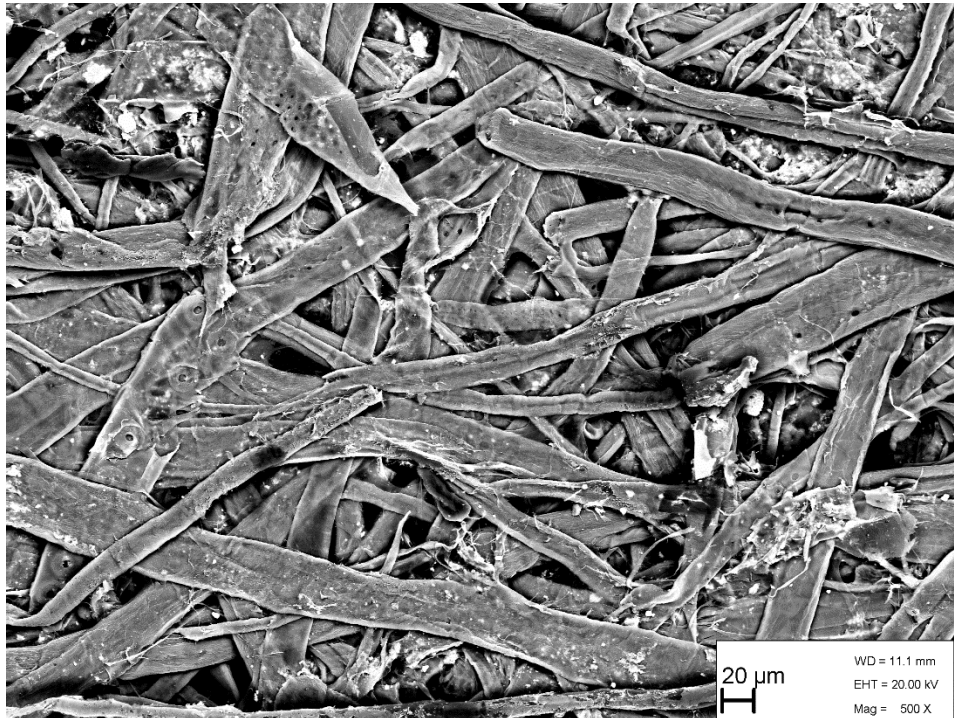
More recent goal is Fiber Property Development



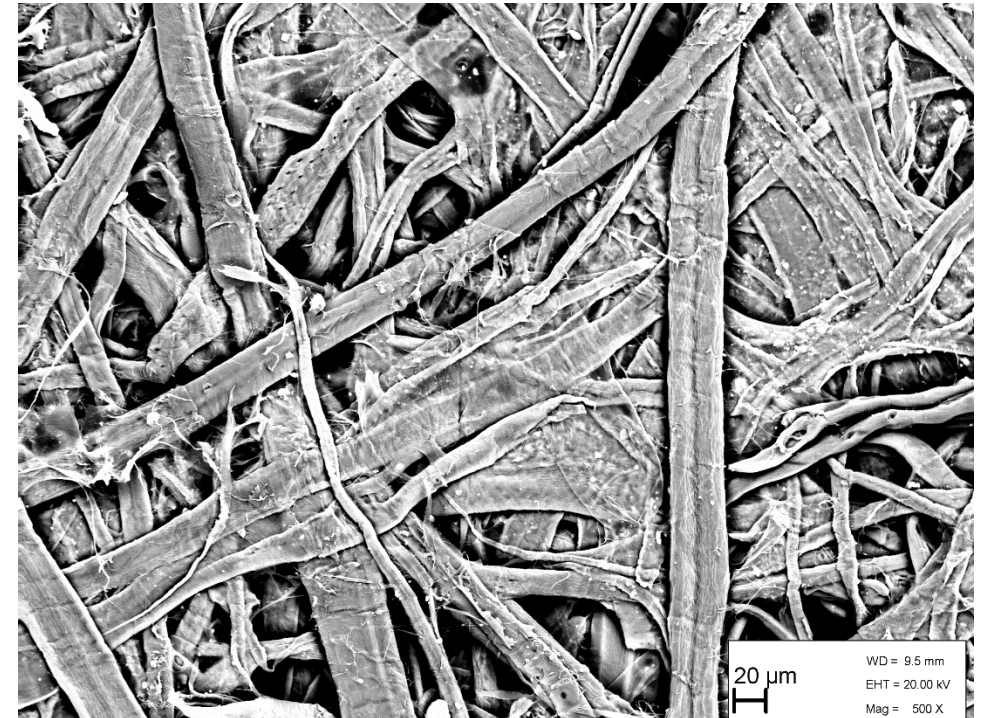
More recent goal is Fiber Property Development



More recent goal is Fiber Property Development



BEFORE DISPERSER



AFTER DISPERSER

Enlargements of OCC hand sheets with no cleaning
or screening only pulping and dispersion

WHAT ABOUT ENERGY?

Energy hog?

With the wrong system and/or old system placed in the wrong position. Then yes/maybe....

But we need to look at the overall mill balance:

A modern efficient system placed in the correct position can become energy neutral.

WHAT ABOUT ENERGY?



ELECTRICAL:

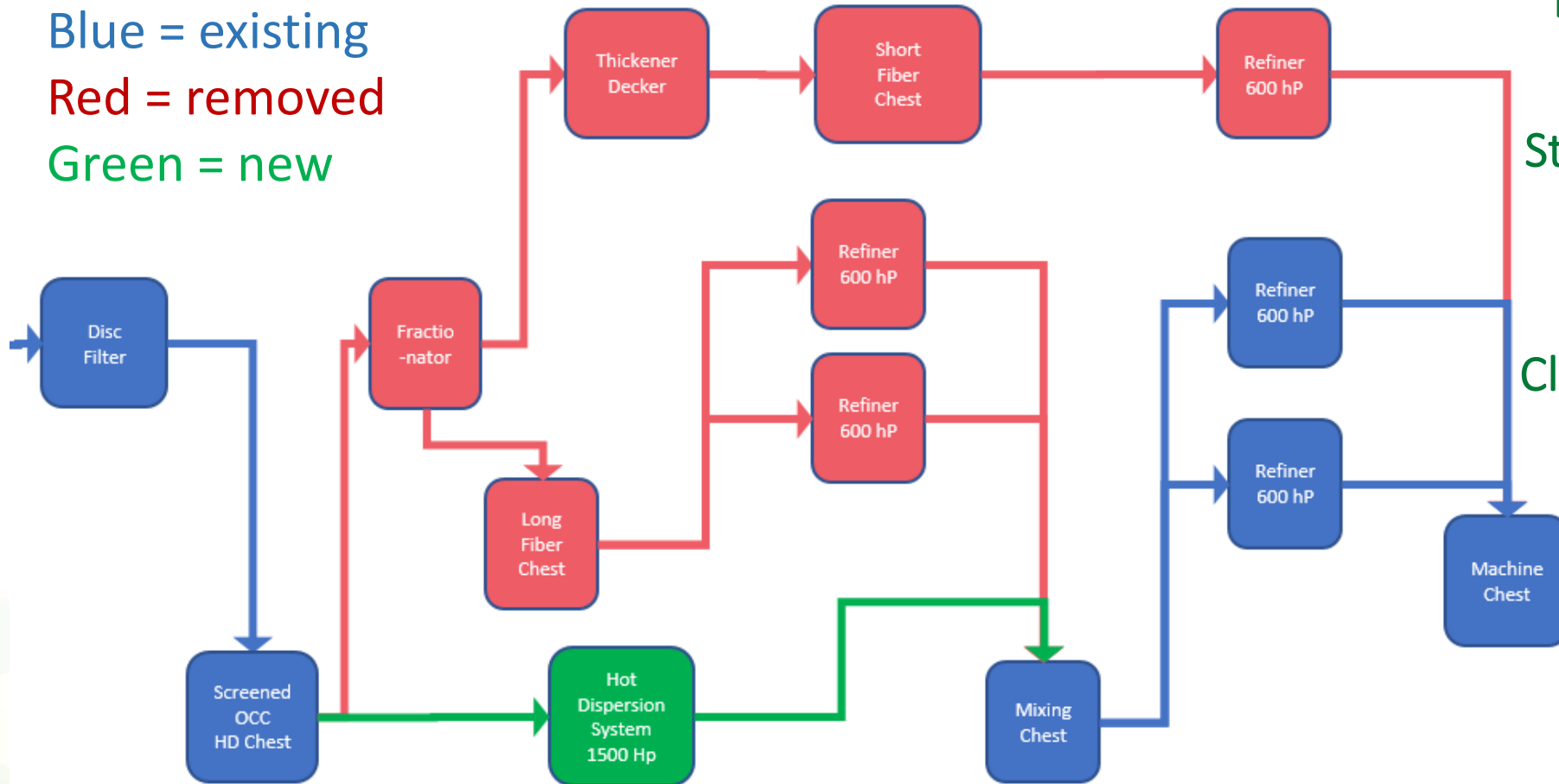
Strength development and deflaking in dispersion means more energy is saved in refiners and deflakers.

STEAM:

Less fines and higher temperature gives better drainage and pressing. Heating in the system is performed at high consistency, in a fully sealed and insulated system making it far more efficient than a chest or hood.

South American liner Mill

Blue = existing
Red = removed
Green = new



Result of project:

Lower cost due to less DKL

Less energy

Stronger paper SCT up 6-10%

Less breaks

More production

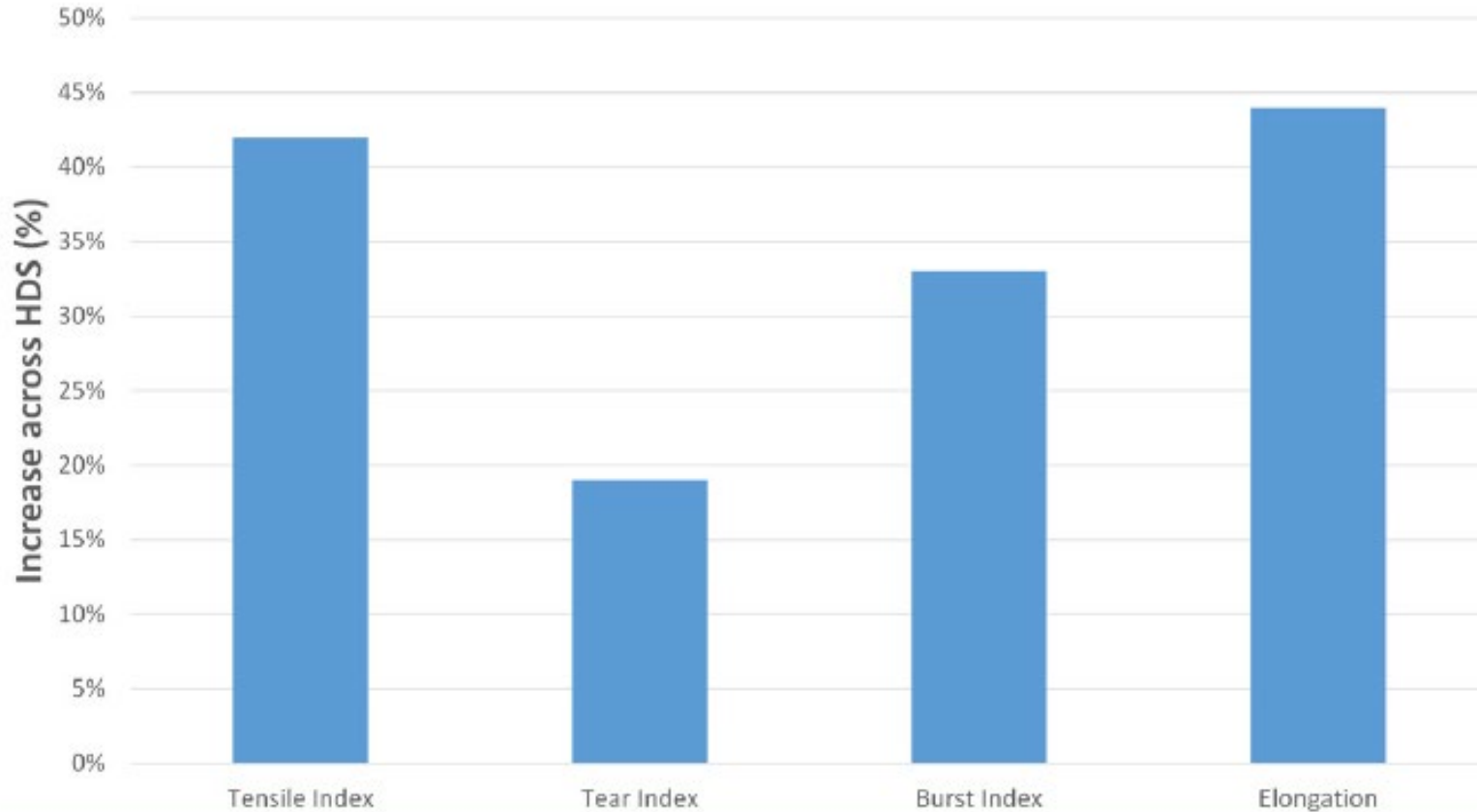
Cleaner paper 85% better dirt reduction

Less maintenance

Paper made stronger and cleaner yet at lower cost

North American Board Mill

Improvement of properties across HDS
Furnish 80%OCC + 20% Mixed Waste



After installation of dispersion

Recipe changed from
80% OCC + 20% DLK
to

70% OCC + 30% Mixed waste.

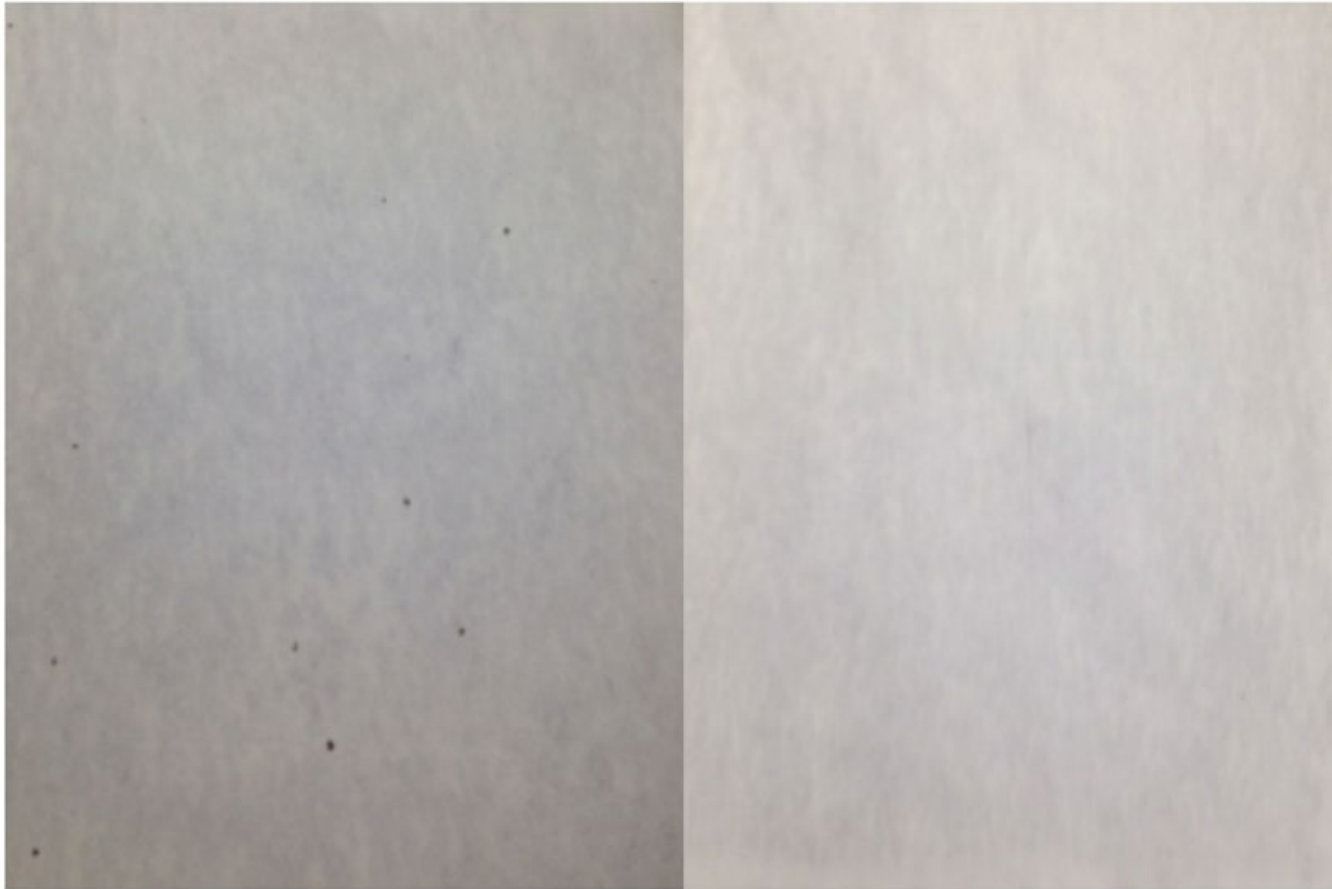
AND

Opened refiners to save more
energy than disperser uses.

AND

Lowered basis weight on paper
and maintained their specs.

North American Lightweight Liner Mill



The dispersion system replaced a planned project of:

- More fine screening
- More low density cleaning
- Adding LC Refiners

“the cleanest sheet on the market”
Mill Manager

SUMMARY FUNCTION – DISPERSION SYSTEM

- **SPECK & DIRT REDUCTION**
 - Primarily reduction of size
 - Secondary detachment from Fibres
- **STICKIE REDUCTION**
 - Primarily stabilization of stickies
 - Secondary detachment from Fibres
- **GENTLE REFINING TREATMENT**
 - Low Freeness drop and minor fibre cutting
 - Good strength development will replace/cut need of Post Refining.
 - Energy efficient
- **EXCELLENT BLEACHING CONDITIONS**
 - Bleaching of brown fibres
 - Bleaching of contaminants
 - Colour stripping
- **ENHANCES EFFICIENCY OF POST FLOTATION**
- **EFFECTIVELY REDUCES BACTERIA AND MOULD SPORES**

KEY EXPERIENCES – DISPERSION SYSTEM

- Ability to use wider selection of raw material
- Develop fibre properties
- Improved end product quality
- Increase of yield (no rejects as well as improved screening)
- In-line bleaching
- Reduction of bacterial spores (less biocide usage)
- Improved run-ability on PM (less cleaning and downtime)
- Reduction (or elimination) of refining energy used, due to excellent strength development across the Disperser.

Thank you for your time.

- Niklas Tunell
- Sales Manager N&S America
- Cellwood Machinery AB

How the US Paperboard Industry Will Solve the Country's Recycling Crisis



Bill Moore

President

Moore & Associates

MOORE

& Associates

Paper's Important Role in Residential Recycling

- Paper and board make up the largest percentage of residential recyclables - about 65%
- The recovered paper (RCP) from residential programs is the biggest revenue component
- Mixed Paper is the single largest commodity produced from the residential stream
- E-commerce corrugated boxes shipped to homes is rising rapidly and the OCC produced from them is of great value to residential programs

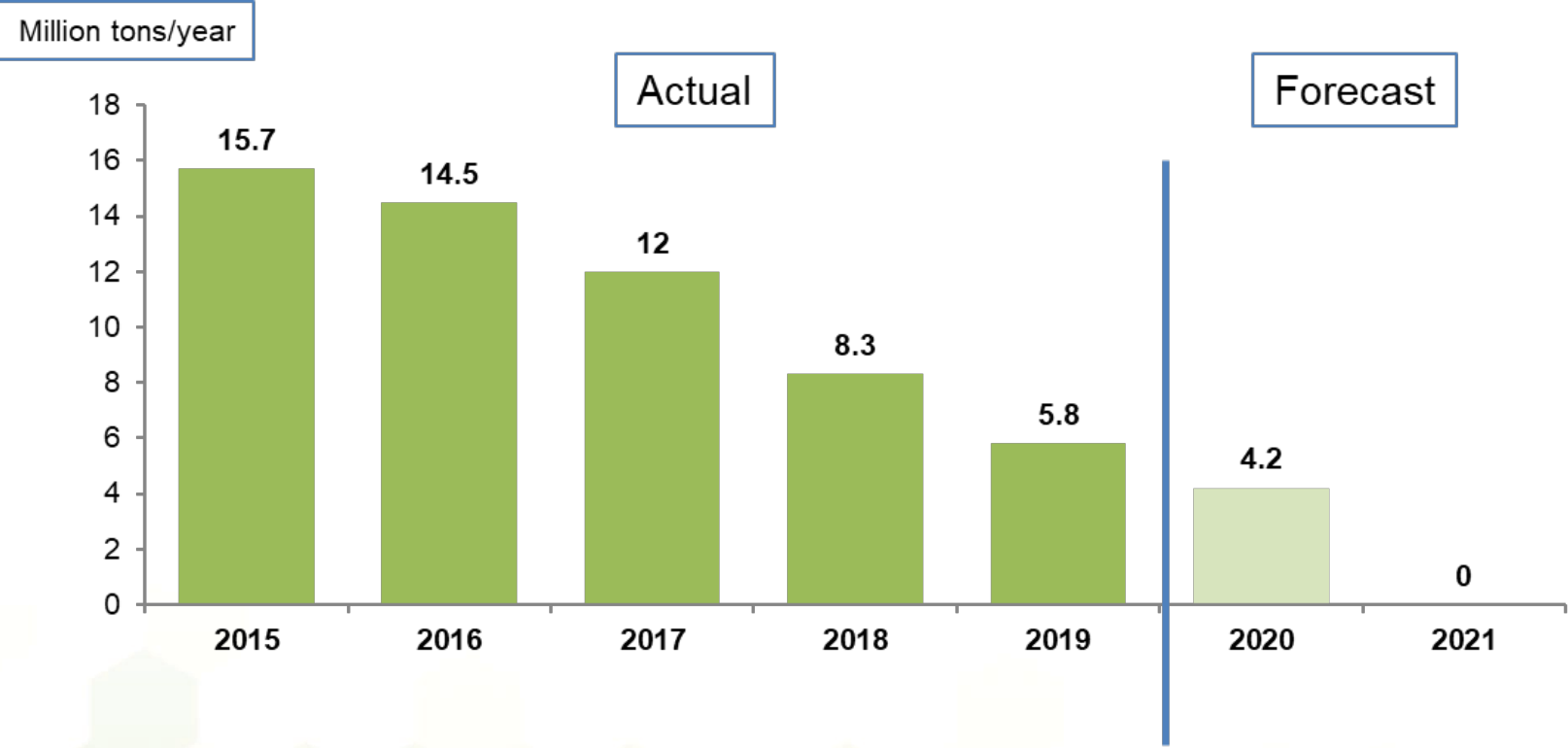
The Crisis

- When China stopped importing Mixed Paper and most OCC beginning in 2018, the recovered markets collapsed. This continued into early 2020.
- The reduced revenue from the paper grades jeopardized the economics of the US residential recycling system
- Contamination levels in the residential paper grades rose to an intolerable level over the last decade, primarily caused by residents wanting to recycle everything they could, but also caused by adding a wider range of marginally recyclable materials

China's Import Restrictions on Recovered Paper

- Began in 2017, fully took hold in 2018/2019
- Reduced governmental RCP import permits
- Limitation of 0.5% prohibitives (non-paper contaminants) on imported RCP
 - Effectively ended imports of US Mixed Paper
 - Standard OCC grade #11 imports stopped (#12 OCC meets the 0.5% limit and still goes to China), but that has now ended also
- Full ban on importing RCP into China went into effect at the end of 2020

US Recovered Paper Exports to China



Other Countries Acceptance of US Mixed Paper

- Vietnam will no longer take imports of Mixed Paper as of the end of 2021
- Indonesia and India have been back and forth on the level of prohibitives they will allow in Mixed Paper imports
- These three countries are now the largest importers of US Mixed Paper

US OCC & Mixed Paper Market Size

(million tons, rounded)

OCC

- 2018
 - Domestic mill demand – 22.6
 - Export demand – 12.5
- 2019
 - Domestic mill demand – 21.9
 - Export demand – 10.6
- 2020
 - Domestic mill demand – 22.8

Mixed Paper

- 2016
 - Domestic mill demand – 3.7
 - Export demand – 4.7
- 2018
 - Domestic mill demand – 3.9
 - Export demand – 2.9
- 2019
 - Domestic mill demand – 4.1
 - Export demand – 2.5
- 2020
 - Domestic mill demand – 4.2

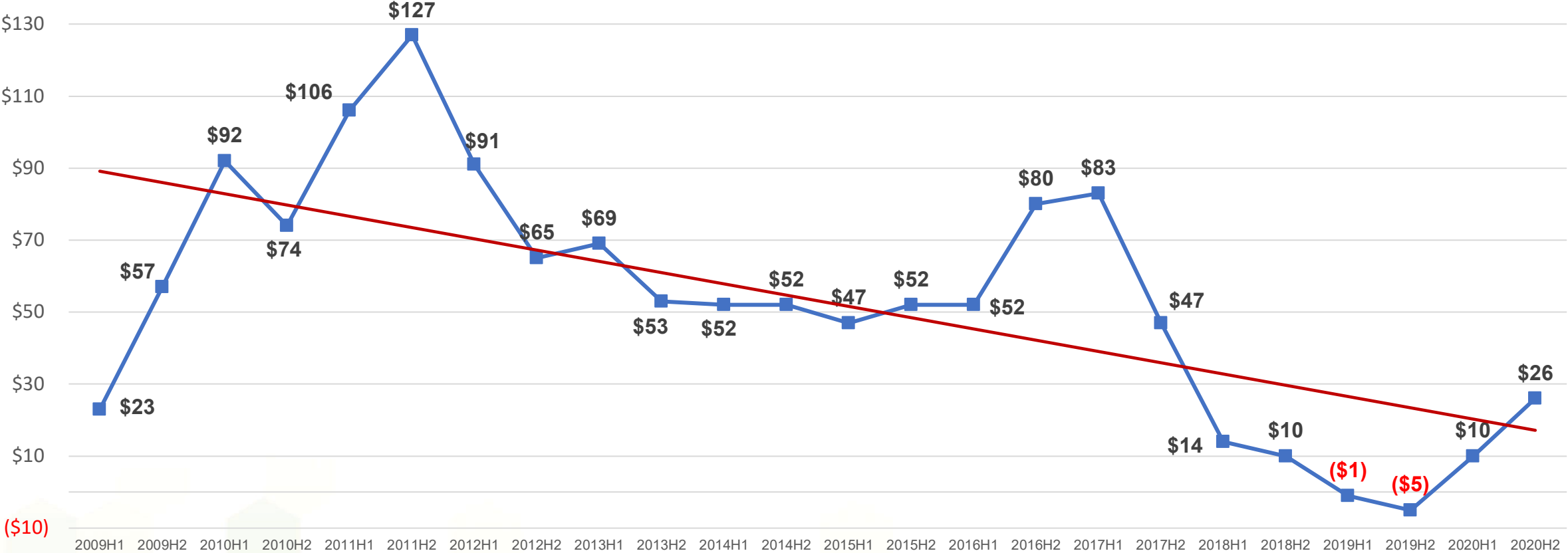
Average Annual North American OCC Price

(US dollar/ton)

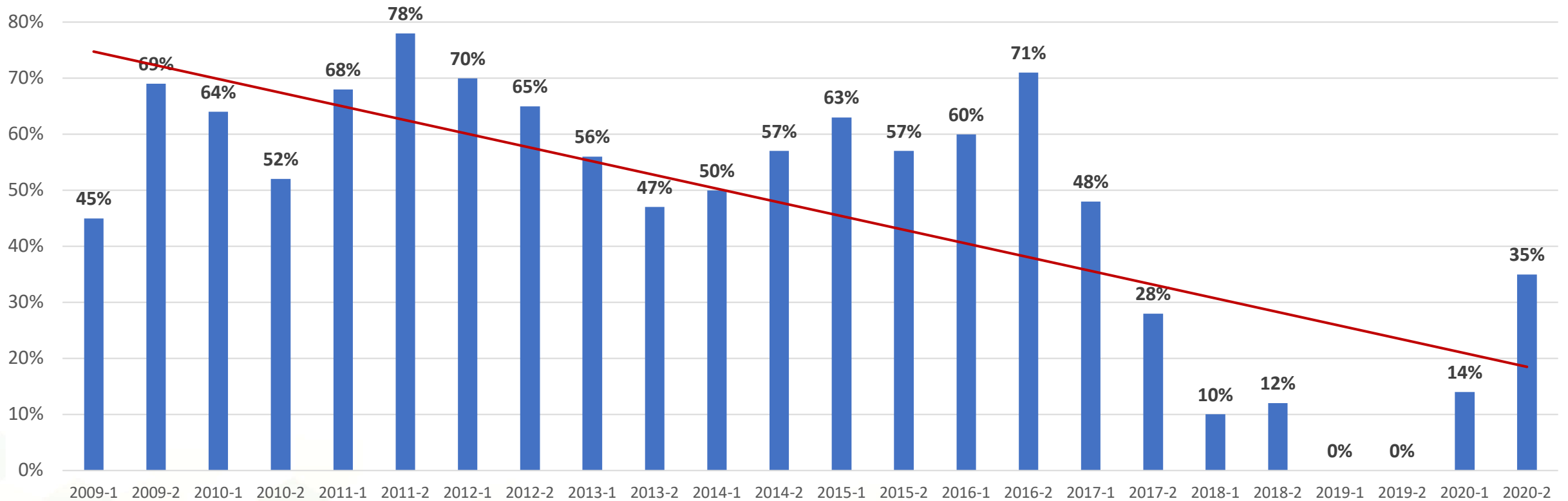


Average North American Mixed Paper Prices

(US dollar/ton)



US Mixed Paper Price/Percentage of OCC



Impact of Low OCC and Mixed Paper Prices in 2019

- Some OCC from commercial sources that was recovered in the past was now being disposed – charging generators of mixed loads vs rebates in the past
- Cost to local governments for residential recycling has gone up two to three fold
- Mixed Paper being dropped from some residential recycling programs
- All these are not good for recycling in the US and for the supply of RCP that US paper mills need

The rebound in 2020

- Primarily due to the impact of the coronavirus shutdown, recovered paper collected from the commercial sector declined dramatically and led to increased OCC prices: Mixed Paper followed.
- Late in 2020 and carrying into 2021, exports of Mixed Paper increased, with India being the leading buyer

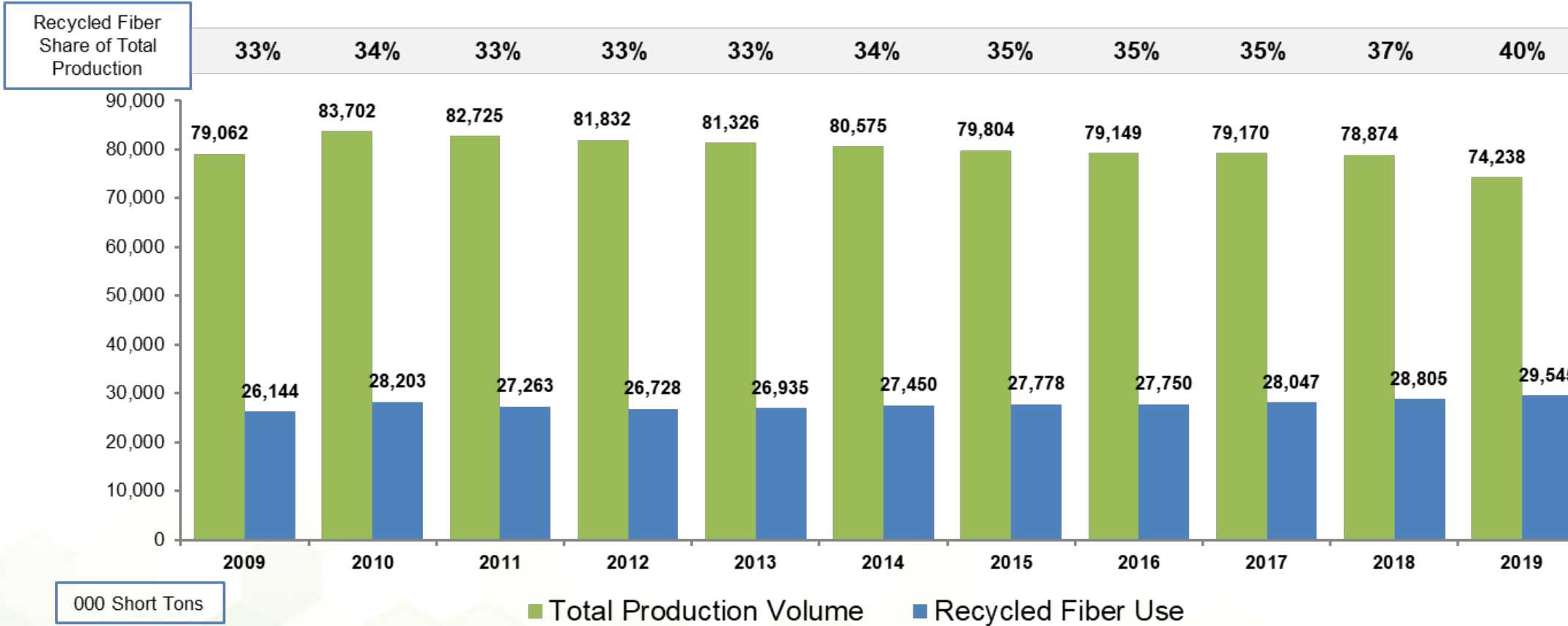
Residential Mixed Paper (RMP) Composition

- 10 - 15% ONP – Declining – probably getting down to 5 - 10% ultimately
- < 5% to 30-40% OCC – Increasing – two types: low OCC version, where star screens or opticals at the MRF pull out as much OCC as possible and high OCC version with little to no OCC removed (can carry a price premium to low OCC content Mixed Paper).
- 10-20% Freesheet – mail, office papers – Declining
- 10-15% coated and uncoated mechanical papers – Declining
- 20% other paperboards/boxboards, coated and uncoated – Steady
- Prohibitives averaging 5+% - Declining, industry is targeting to get to 2%, which is the ISRI specification. Did run as high as 10 to 15%.

What Caused the 2019 Slump in RCP/OCC Prices?

- Some over-supply of recovered OCC: OCC recovery jumped up in 2018 and recovery from small commercial/industrial generators led the way
- Softening global growth/corrugated box demand
- Lower US containerboard mill operating rates caused by:
 - Reduced containerboard exports
 - Lower domestic corrugated box demand growth
- Reduced OCC demand from China and very significantly China's complete pull back on buying Mixed Paper

Recycled Fiber Use in US Paper & Paperboard Production

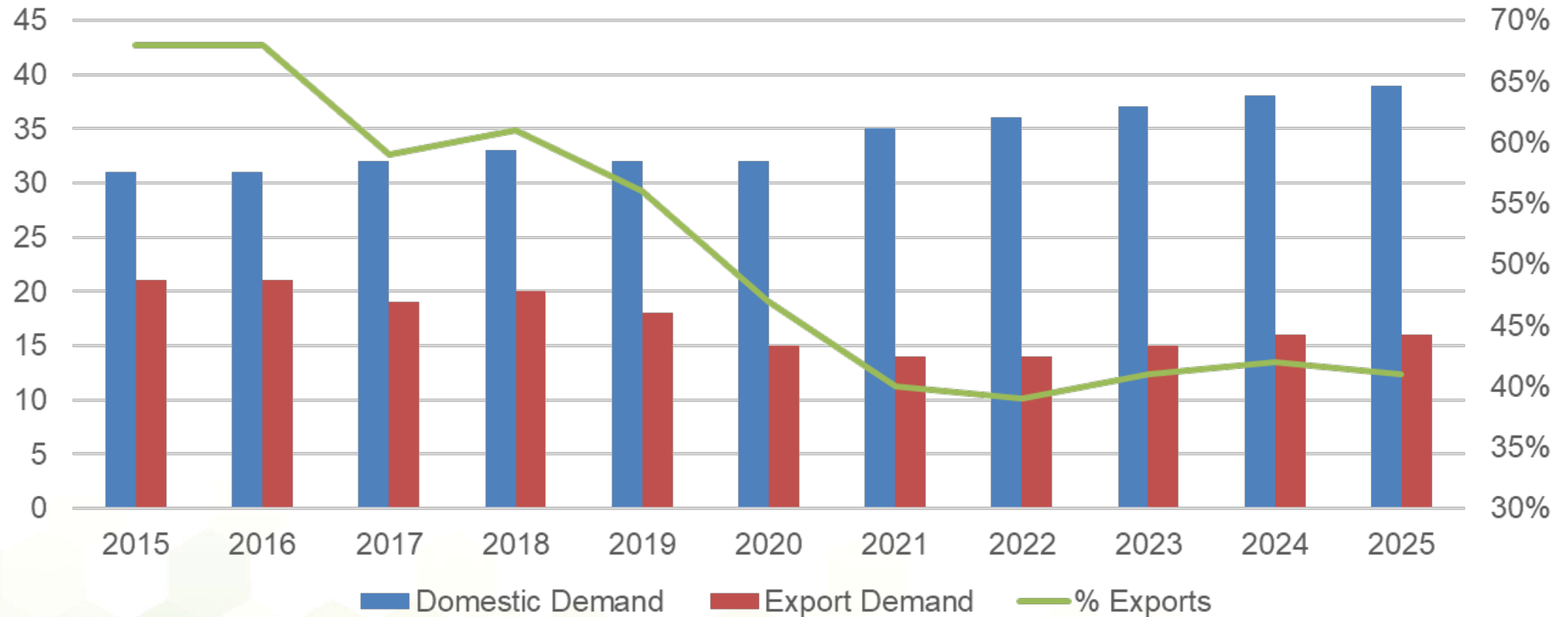


Source: www.paperrecycles.org and Moore & Associates

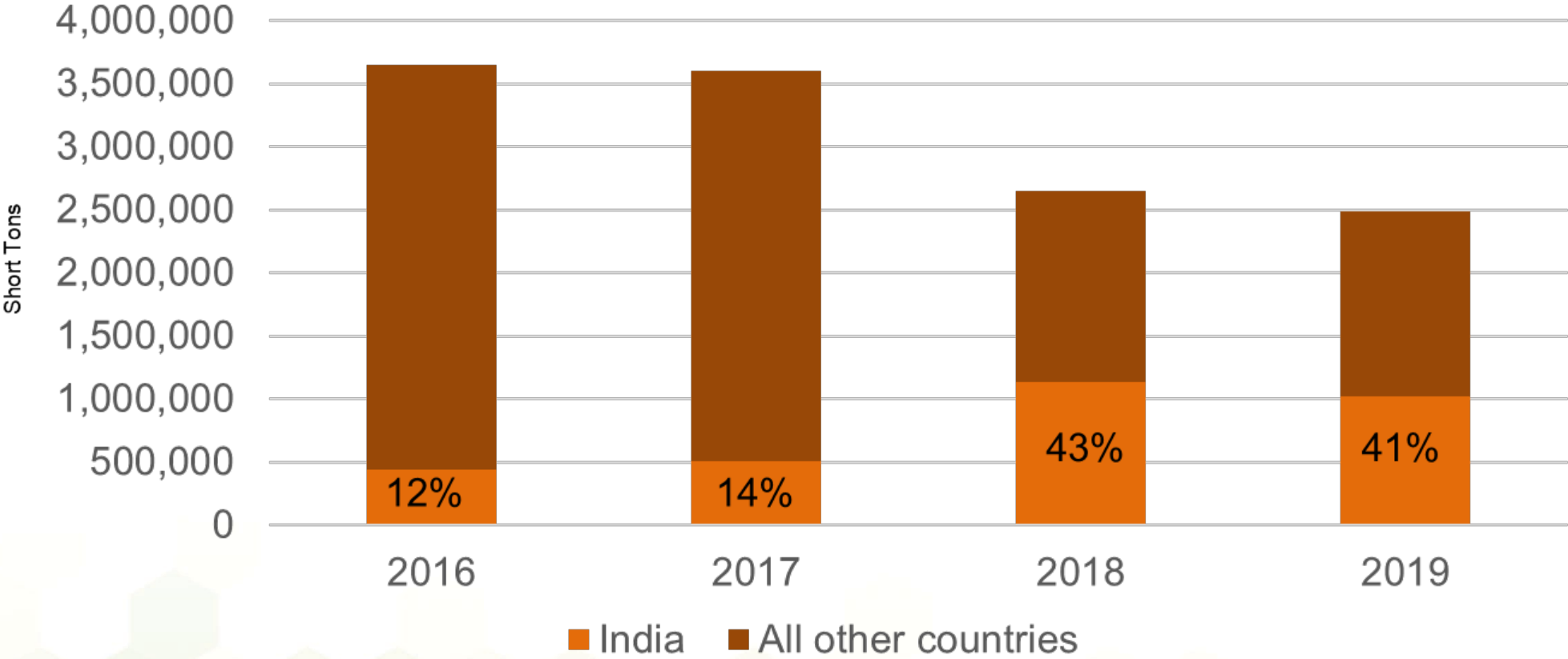


US Domestic and Export RCP Demand

(million tons)



India's Share of US Mixed Paper Exports



Percentage of Exports by Grade - 2019

- Mixed Paper – 39% (at its peak in 2015, exports were 57%)
- ONP – 68% (a large change from a number of years ago, when domestic use was much higher)
- OCC – 33%
- Pulp Substitutes – 57%
- Deinking High Grades – 29%

Macro RCP Supply Trends by Grade Category

- OCC
 - Corrugated box supply grows
 - Ecommerce residential box losses
 - More recovery from residential, with slower growth in supply from commercial/industrial/institutional
- ONP
 - Disappearing
- Mixed Paper
 - Most under-recovered grade
- Pulp Substitutes (PS)
 - Declining – printing and writing papers (major source of PS) consumption declines
- Deinking High Grades
 - Declining for same reason as PS

Macro RCP Demand Trends by Grade Category

OCC

- Significant new demand coming steadily over the next five years

ONP

- Small demand increases: molded fiber and some others

Mixed Paper

- Significant new demand coming steadily over the next five years

Pulp Substitutes (PS)

- Balanced to increased demand by mills that do not have stock prep systems: US and abroad

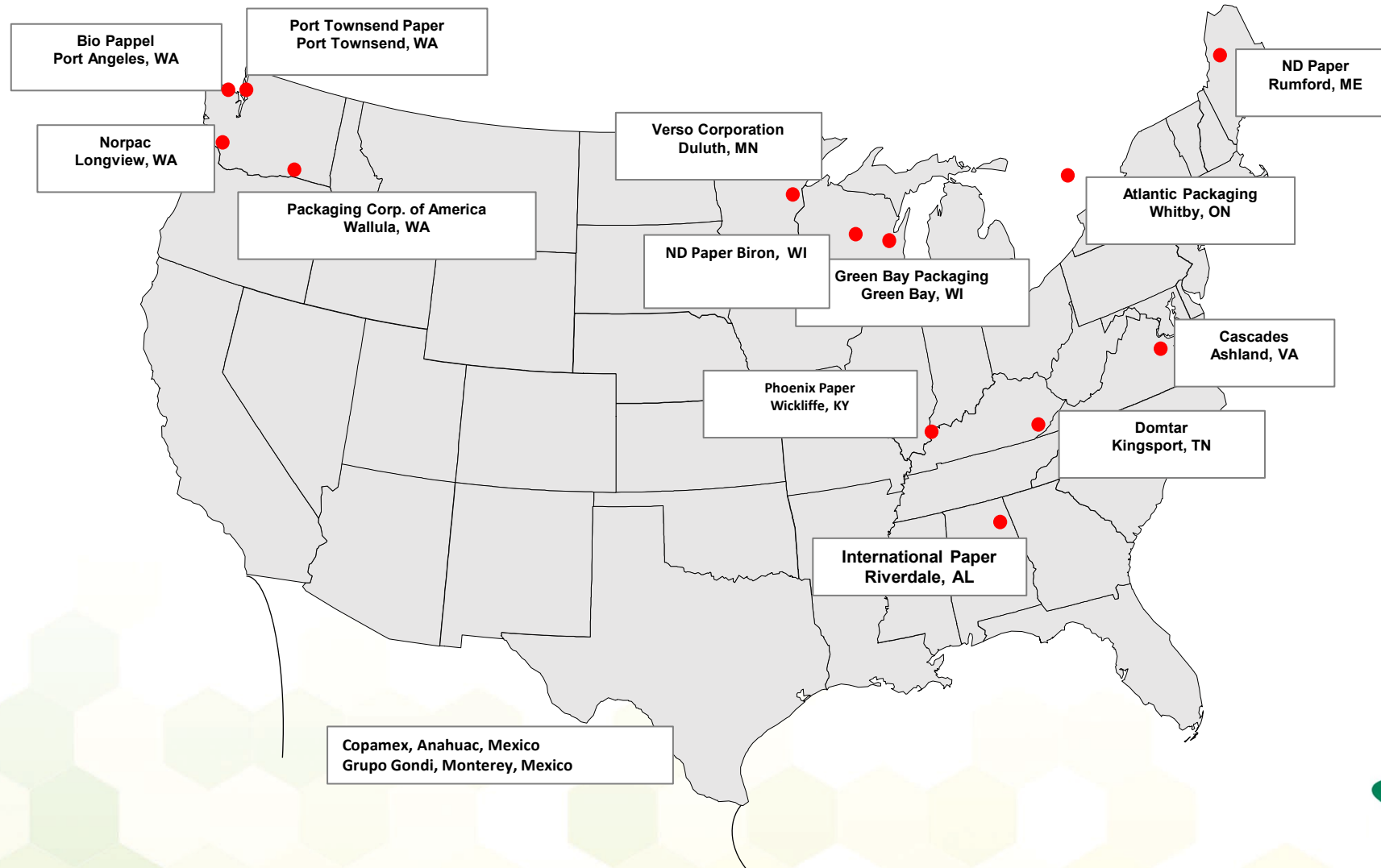
Deinking High Grades

- Slowly declining demand

New US Recycled Fiber Containerboard / Recycled Fiber Pulp Projects

- Committed Projects (tons/year of capacity additions):
 - 2020 – 6 projects: 1.2 million
 - 2021 – 5 projects: 1.9 million
 - 2022 – 1 project: 0.3 million
 - 2023 – 3 project: 1.6 million
- Three of the projects are speculative – 2021/2022: 0.9 million tons
- Other RCF pulp and containerboard projects, not yet announced?
- But there have been some containerboard capacity shuts
- All of these projects will use OCC, most will also use some Mixed Paper

Location of Confirmed New Recycled Fiber-Based Containerboard Mill Projects: All Will OCC, Many Will Use Some Mixed Paper



New N.A. Mill Projects Consuming Mixed Paper

- **Green Bay Packaging** – Replacing Wisconsin mill with one that will consume significant quantities of Mixed Paper, and increasing capacity
- **Cascades** -- Putting in a Mixed Paper system in their plan to convert the Ashland, VA from newsprint mill to containerboard
- **Bio Pappel** -- Installed a Mixed Paper system in their conversion of the Port Angeles former directory paper mill
- **Copamex** – Mixed Paper system went into conversion project (printing & writing machine to board)
- **NORPAC** – Longview, WA mill converting one newsprint machine to produce medium from a heavy OCC/some Mixed Paper blend.
- **Domtar** – Kingsport, TN mill converting from UFS to containerboard – will use OCC and Mixed Paper

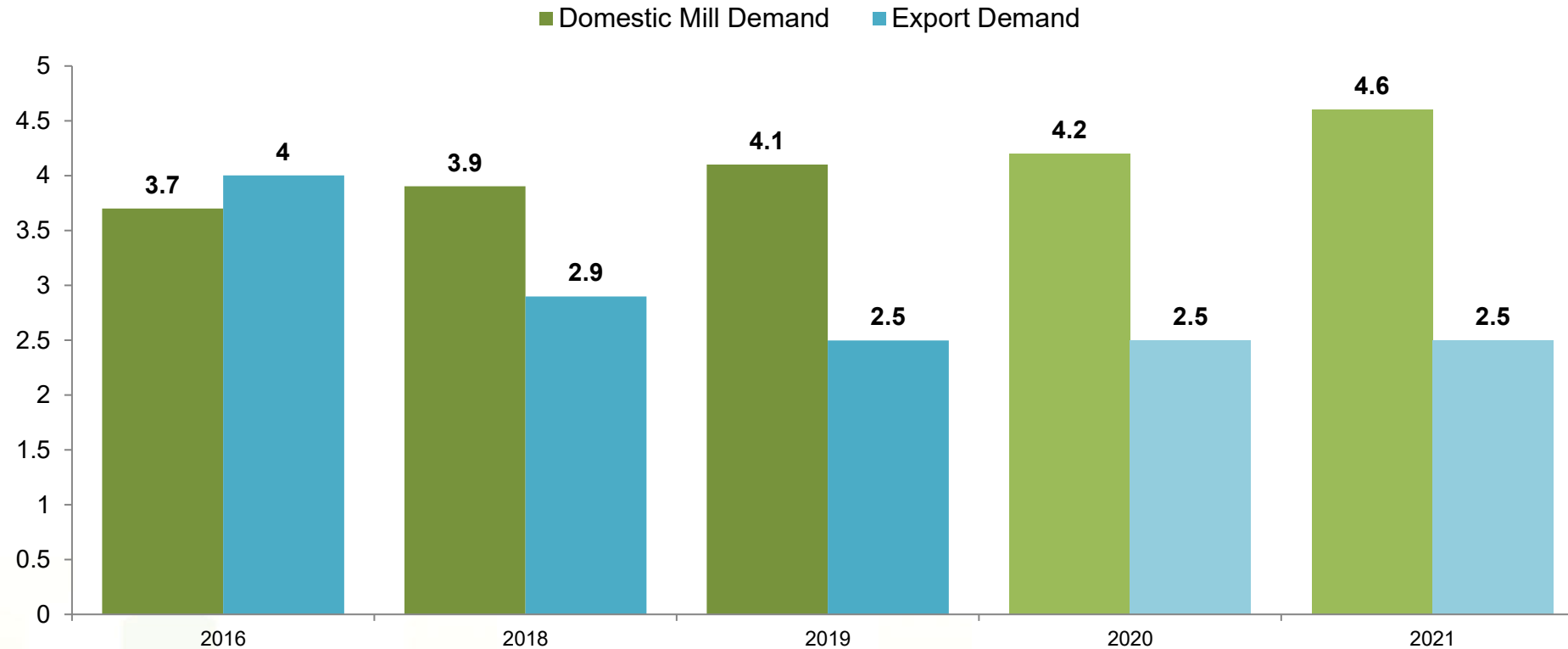
- **In 2020 US mills consumed over 2.4% more Mixed Paper than in 2019**

More Domestic Consumption of Mixed Paper to Come

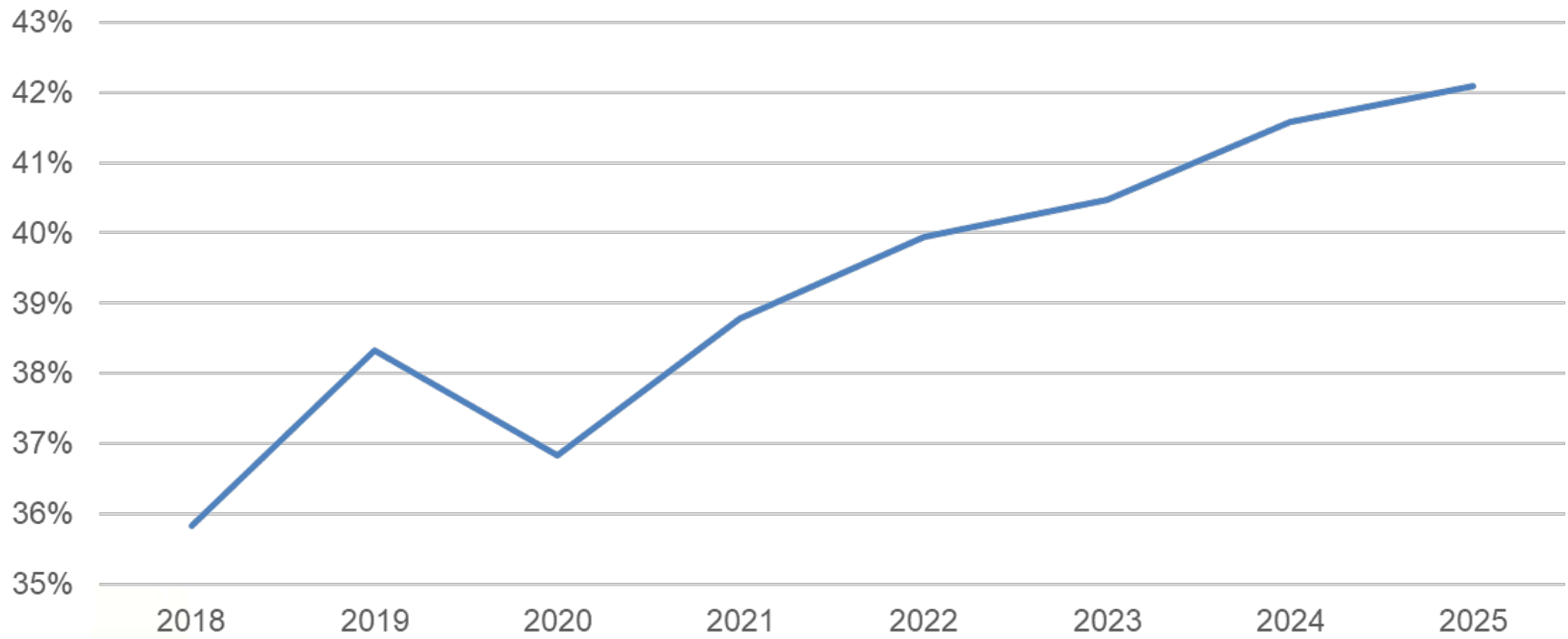
- Many other mills trialing, considering, planning, etc.
 - Major capital expenditures required, but additional detrashing equipment is relatively low cost
 - Stock preparation equipment companies very busy
- **Nine Dragons** has announced a containerboard and RCF pulp conversions at their newly acquired WI, ME, and WV mills
 - All three sites will consume Mixed Paper
- **Shanying Int'l/Phoenix Paper** – KY mill; Converting to recycled fiber containerboard – Mixed Paper use?
- **Verso** considering Mixed Paper for their planned second containerboard conversion project in Duluth
- **Sonoco** has announced installing a Mixed Paper system in their machine conversion in South Carolina

US Mixed Paper Market: History & Forecast

(millions of tons)



US Mixed Paper Recovery Rates



Mixed Paper Use: US vs Europe Mills – Using CRB as an Example

- Most US CRB mills use very little to no Mixed Paper – typically it is viewed that the board tolerances/properties are not very conducive to the use of Mixed Paper
- But there are some mills that do use higher quantities of Mixed Paper and more are currently trialing it
- European CRB mills frequently average a furnish that includes more than 50% Mixed Paper
- European mills have continually upgraded their stock preparation system – US mills have lagged on this
- About to change?
 - No new CRB capacity additions planned
 - Upgrades to existing mills
- More CRB demand (after many years of decline) with the anti-plastic packaging fervor?

OCC Market Drivers – Short and Mid-Term

- **Short term Drivers (next 3 to 6 months):**

- Domestic mill OCC inventories back to average
- Coronavirus impact on commercial business sector that generates a lot of OCC
- Corrugated box business is increasing

- **Mid-term Drivers (6 months to a year):**

- Significant new US and global OCC demand from the many new mill projects, including some in the short term
- OCC supply remains tight, even with collection coming back
 - Residential e-commerce corrugated box losses continue
- Containerboard production continues strong

Mixed Paper Market Outlook - Very Different from OCC

- Mixed Paper market was chronically oversupplied even before China pulled out
- It is the most under-recovered paper grade, so oversupply is always possible
- When OCC prices are up, board mills seek more Mixed Paper
- OCC demand will outpace supply – other fiber will be needed to make paperboard grades
- MRF's are producing a cleaner material
- Mill stock preparation system technology advances all the time
- Higher OCC content in Residential Mixed Paper (from e-commerce) makes it more attractive as a furnish to paperboard mills
- Steady new demand for Mixed Paper at new mill projects will stabilize the market.

US Paperboard Mill – Technology Advances

- Technology advances at recycle mills will be more incremental rather than breakthrough
- There are a lot of very old stock preparation systems in the US that could be upgraded. Europe as compared to the US has more continuously improved their mills
- Still a lot of batch pulpers with old style detrashing that can be upgraded to continuous systems
- Increasing ability to process Mixed Paper: better stock preparation systems:
 - Retrofits (Sonoco Hartsville is a good example)
 - Most new mill projects that in the past may have relied solely on OCC will have stock prep systems that can handle Mixed Paper
- Many opportunities for yield improvement and energy savings
- More sophisticated measurement system for RCP quality – merQbiz approach to automated systematic quality measurement. Slow to gain traction? Europe is more advanced at this than the US.

The Bottom Line

- Supply of OCC is currently contracting as we lose residential e-commerce boxes
- Residential recycling programs cleaning up their recovered paper streams, which will make their OCC and Mixed Paper more useable
- US containerboard mill projects will increase domestic use of OCC and Mixed Paper, strengthening those markets
- URB and CRB mills will use more Mixed Paper
- All the above will strengthen US RCP markets and stabilize the country's recycling programs

Thank you for your attention

Moore & Associates
www.MARecycle.com



GENERATIONS IN THE WORKPLACE

WE'RE NOT SO DIFFERENT...



Recycled Paperboard Technical Association

Naomi Garvin

Manager, Global Diversity,
Inclusion, Equity & Belonging

WestRock



5 GENERATIONS IN THE WORKPLACE

TRADITIONALIST BEFORE 1946

- GREAT DEPRESSION
- WORLD WAR II
- DISCIPLINED
- WORKPLACE LOYALTY
- ROCK N ROLL
- NUCLEAR FAMILIES
- HOME OWNERSHIP
- MOVING TO SUBURBS

BABY BOOMER 1946 - 1964

- CIVIL RIGHTS
- VIETNAM
- MOON LANDING
- WOODSTOCK
- EXPERIMENTAL
- INNOVATION
- HARD WORKING
- PERSONAL COMPUTER IN HOME

GEN X 1965 - 1979

- BERLIN WALL
- GULF WAR
- INDEPENDENT
- INTERNET
- MTV
- HIV/AIDS
- MOBILE PHONES
- JOHN HUGHES MOVIES

MILLENNIAL 1980 - 1994

- 9/11 ATTACKS
- STOCK MARKET COLLAPSE
- IMMEDIACY
- CONFIDENCE
- SOCIAL MEDIA
- EARLY ADOPTERS
- GOOGLE
- FACEBOOK
- CITY DWELLERS

GEN Z AFTER 1994

- ECONOMIC DOWNTURN
- GLOBAL MINDSET
- OPTIMISTIC
- MOBILE DEVICES
- TABLETS
- YOUTUBE
- TIK TOK
- WIKIMEDIA
- MULTITASKING

FLAWS IN THE RESEARCH

- Individuals in the same generation are likely to have just as many differences as individuals from other generations
- Attitudes are typically based on where you are at in life vs. when you were born
- Research has been based on surveying groups at a single point in time
- Places importance on jobs that provide security, high income and opportunities for advancement

WHAT DEFINES A GENERATION



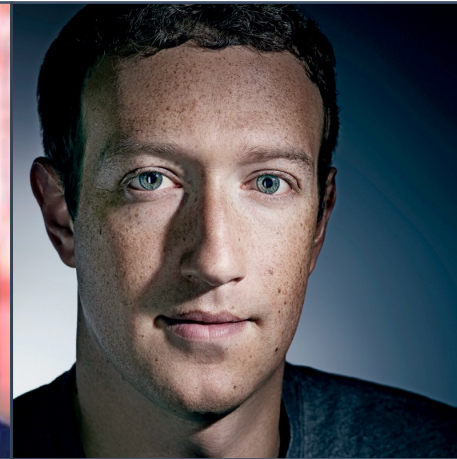
BABY BOOMER

Born 1964
CEO, Amazon
Redefined shopping



GEN X

Born 1972
CEO, Alphabet
(parent company of
Google)
Where did we find
information before?



MILLENNIAL

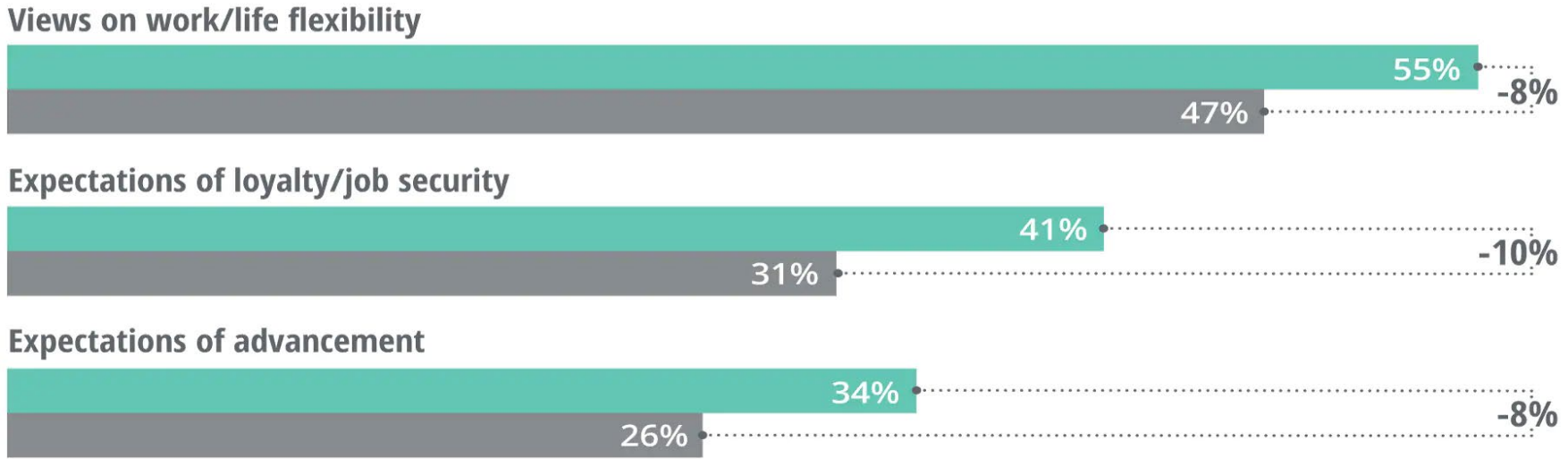
Born 1984
CEO, Facebook
Founding Father of
social media

FIGURE 1

Respondents indicate a shrinking gap in generational differences related to work and careers

What do you see as the biggest differences across generations today?
What do you think will be the biggest differences in three years?

■ Today ■ In three years



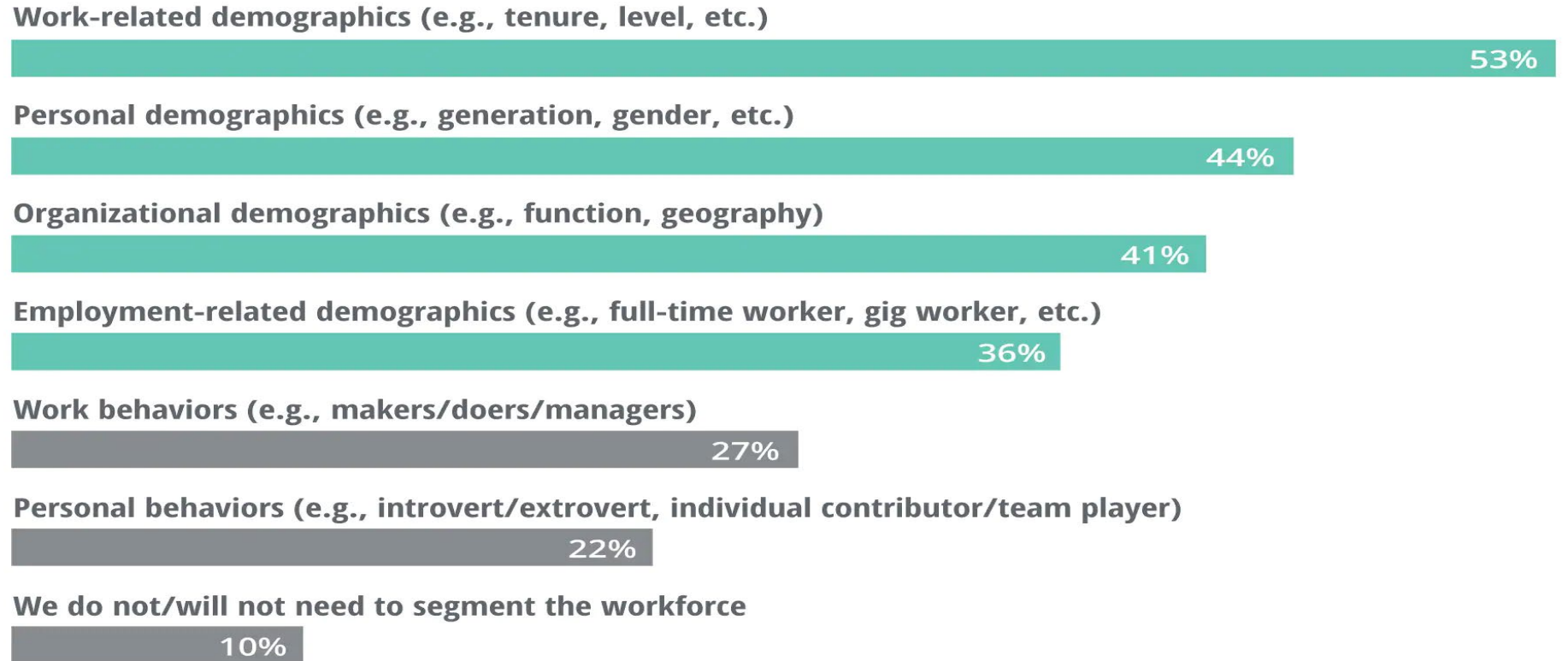
Source: Deloitte Global Human Capital Trends survey, 2020.

Deloitte Insights | deloitte.com/insights

FIGURE 2

Demographic-based segmentation is far more prevalent than segmentation based on personal or work behaviors

Which attributes are being used to segment the workforce today? Select up to three.



Source: Deloitte Global Human Capital Trends survey, 2020.

Deloitte Insights | deloitte.com/insights



LIFE IS A JOURNEY

- Our attitudes are often defined by our experiences
- Consider your needs / desires from 18 and beyond (do this in 10-year increments)
 - How have things changed?
 - What has remained the same?
 - What is important to you now vs then?
- What commonalities can you find with others?



HOW TO AVOID BIAS

DO

- Listen to employees
- Create employee surveys and administer them regularly
- Encourage growth, it will lead to stronger outcomes for your business and employees
- Consider how an employees needs may change over time
 - This will create stronger outcomes across the business: talent management, recruitment, retention, diversity & inclusion and customer satisfaction

DON'T

- Assume behavior based on age/generation
- Limit opportunities to hear from employees
- Be afraid of change and making adjustments
- Stereotype or label

WE'RE BETTER TOGETHER

FOCUS ON MISSION/VALUES



Being clear about expectations, job requirements and behaviors will keep everyone engaged and accountable.

Our integrity is defined by how honest we are with ourselves and each other.

WHAT DO YOUR EMPLOYEES NEED



Make our organization an even better place to work, through words, actions and how we treat one another.

Are we making time to listen to each other? Don't be afraid of change!

HOW TO DELIVER VALUE FOR CUSTOMERS



Our people should reflect the communities around us; therefore, representing the needs of our customers.

How can we deliver a better product by investing in our people?



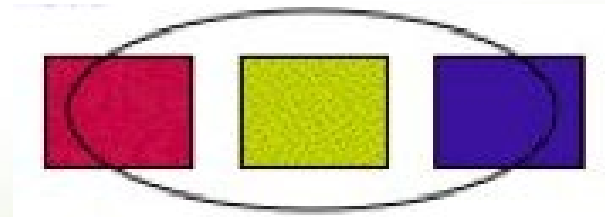
Recycled Paperboard Technical Association

THANK YOU

Water system closure: Malodors in finished paper & board products



Linda R Robertson
Principal Microbiologist
International Microbial Associates



Malodors: *the invisible customer complaint*

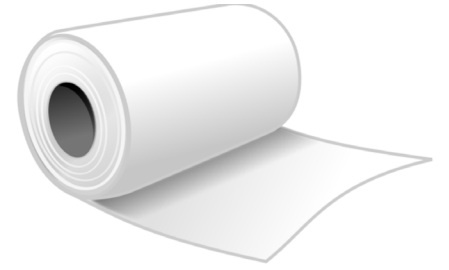
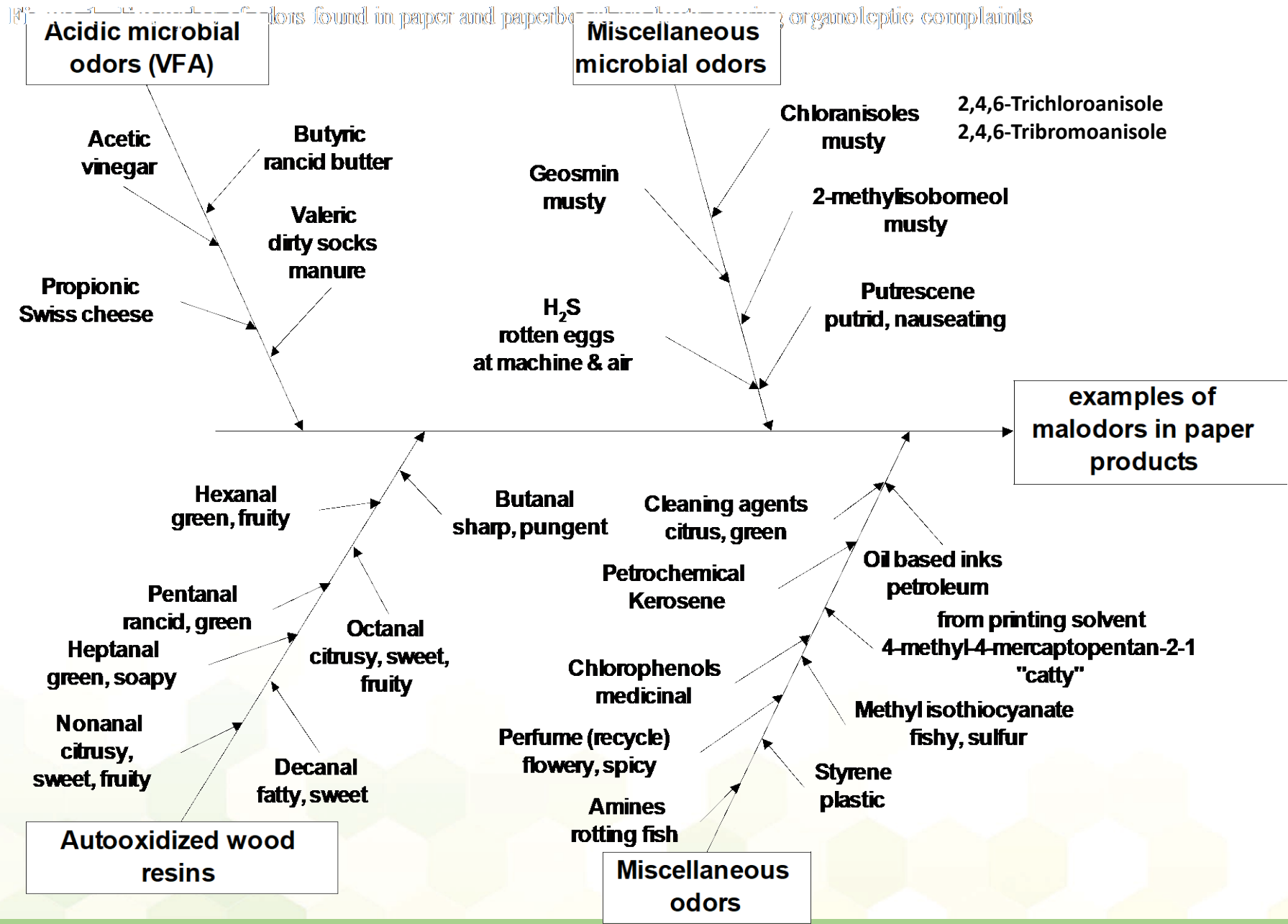
- Increased problems with foul odors in paper and board
- Malodors may not be detected at the time of manufacture
- Odors develop during shipment
- Shipping odiferous product leads to rejects, loss of customers and lost profits

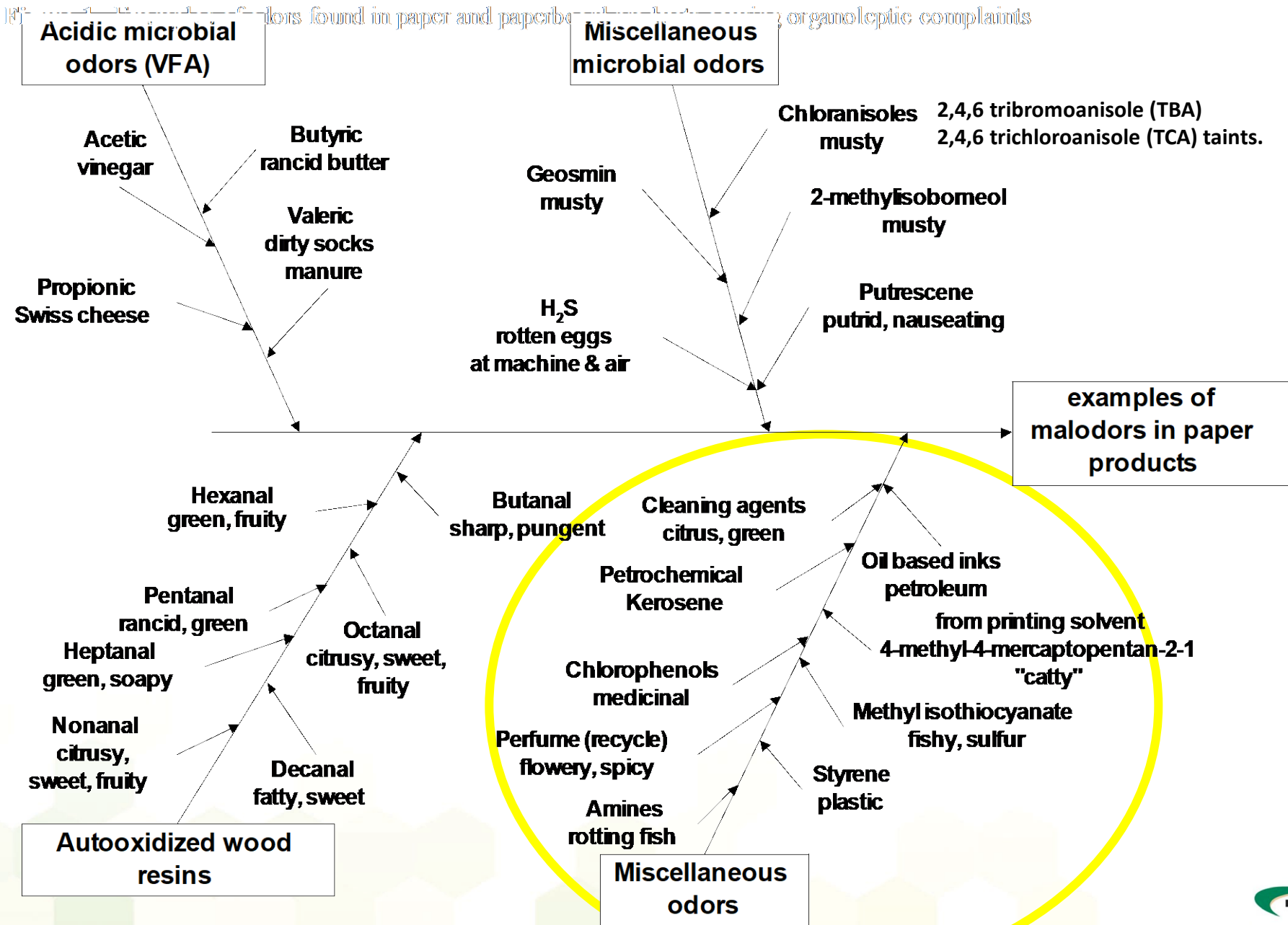


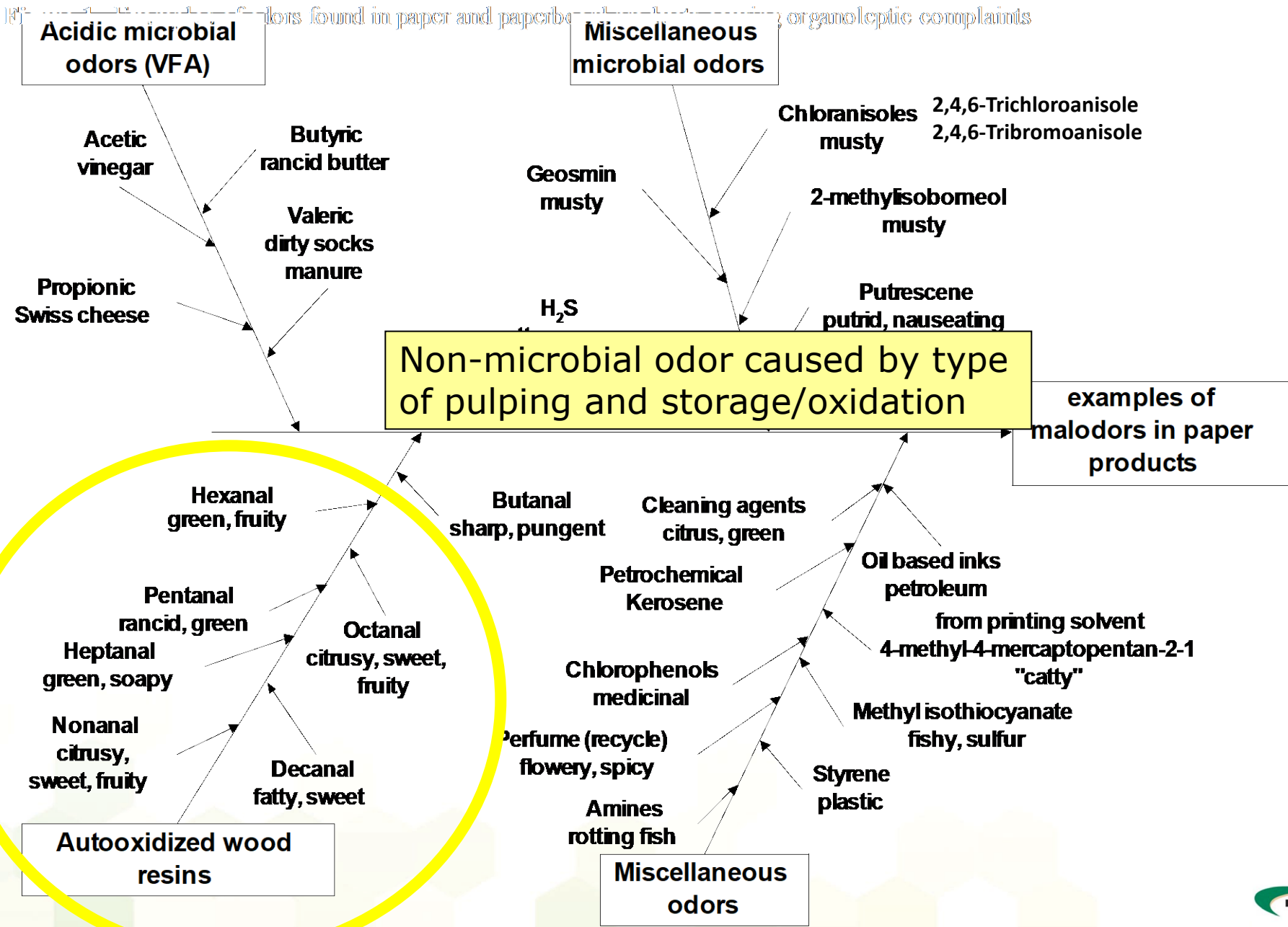
We will discuss:

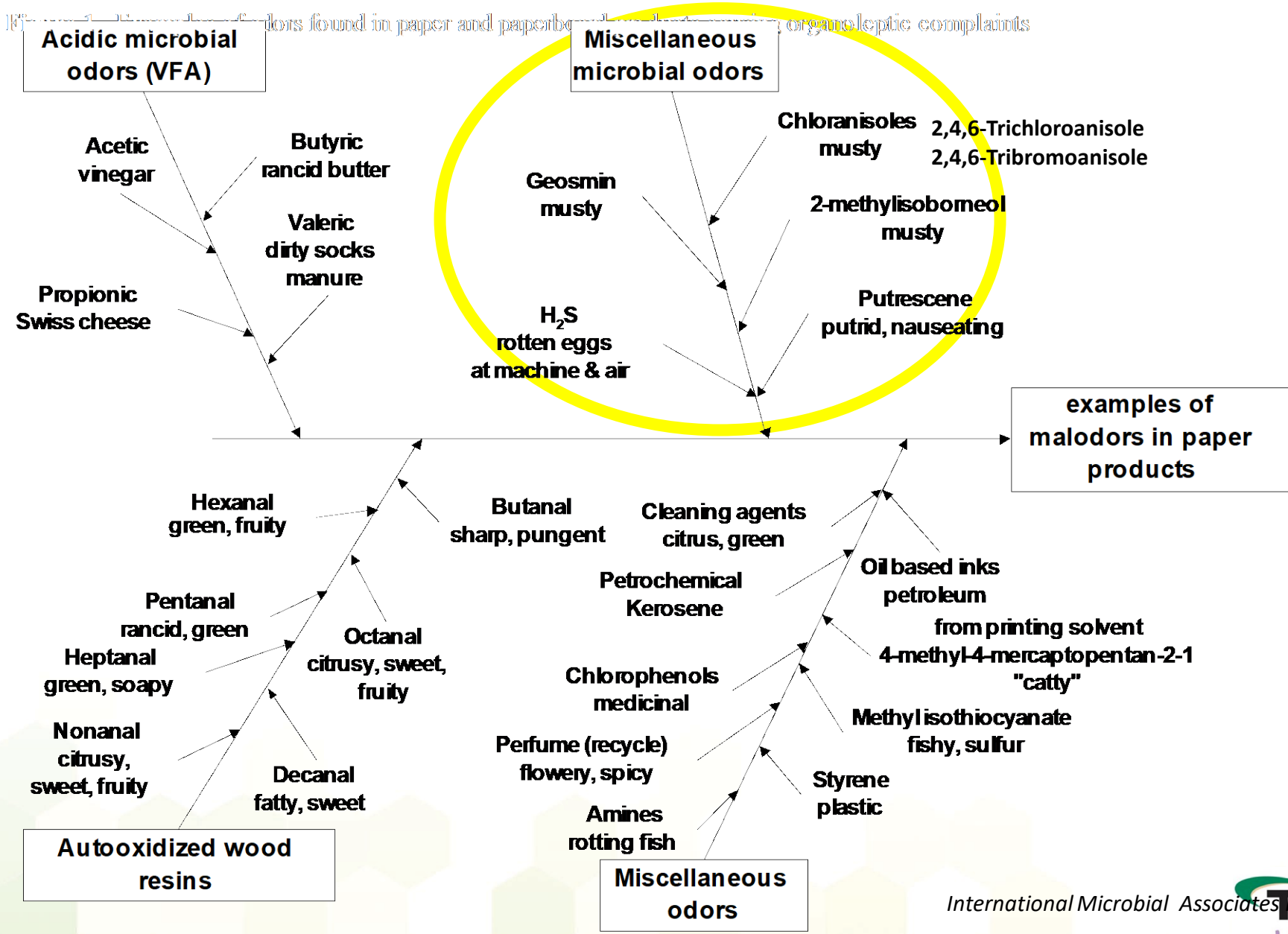
- Manufacturing practices putting products at risk
- Odor compounds
- How to detect them
- Ways to mitigate them





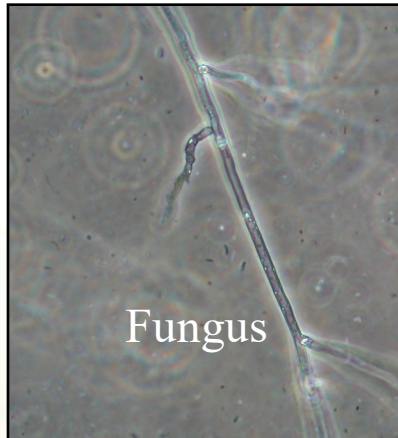
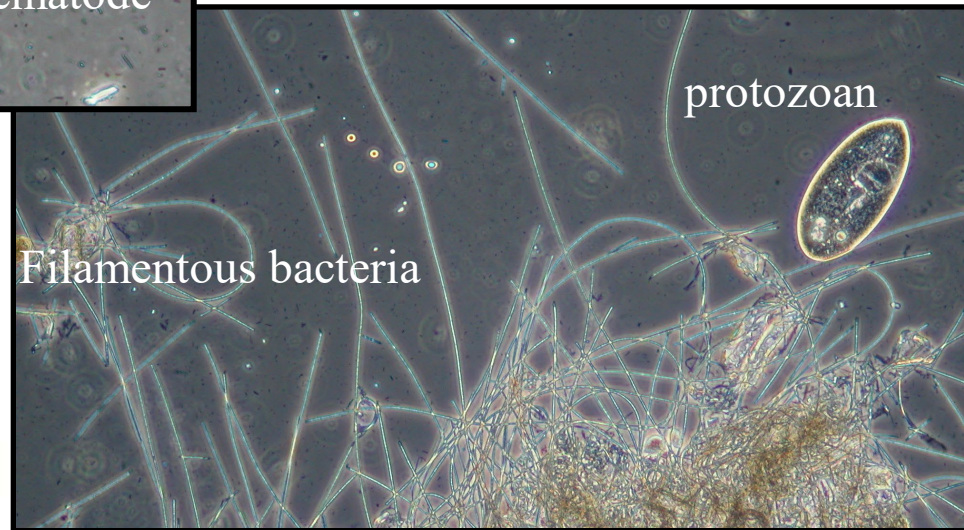
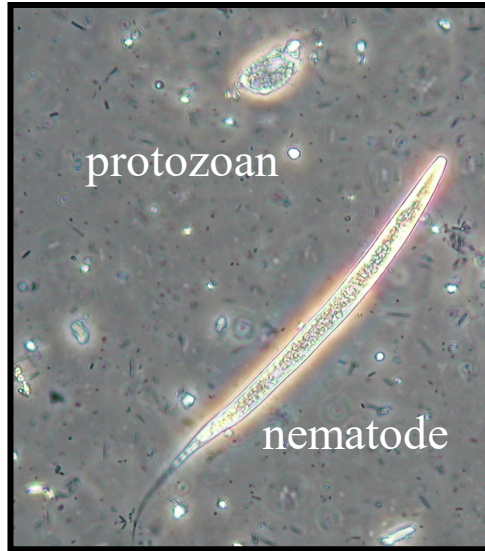




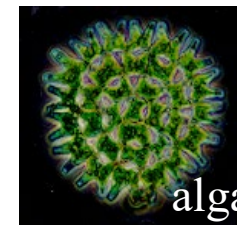




*Although microbes cause malodors,
they are definitely not the cause of all
odor complaints*



- Bacteria
- Fungi
- Protozoa
- Algae
- Worms



Operational Practices Leading to Malodors

- Neutral to alkaline conditions allow anaerobes to thrive
- Increased use of recycle fiber
 - “Extra” nutrients and contaminants
 - “Poorer” quality recycle fiber
 - Reductive bleaching
- Long dwell times
- Reduced biocide programs due to cost constraints
- Inappropriate use of oxidants
- **Water system closure**



Water system closure:

- Cycles up:
 - Noxious chemicals
 - Nutrients
 - Causes changes in bacterial population
- Increases dwell time
 - Stagnant chests
 - Oversized water storage tanks



Detection

- Methods for volatilizing odors
 - Rub paper together-friction
 - Controlled tests in “jars” at elevated temperatures BS, ASTM, DIN, EU
- Gas chromatographic/Mass Spec/Infrared analysis
- GC with specialized sniffing port
- Simple wet lab tests for specific compounds
 - HACH wet lab test for Volatile Acids
- Electronic sensors: e-Noses
- Consultant experienced with odor



Spoilage

- Low strength
 - Problems in startup after shutdowns
- High COD
 - broke towers
- Odor problem issues
 - like walking thorough a GC
 - product complaints
 - pH swings



anaerobic problems

H₂S

Butyric

Odor

Propionic

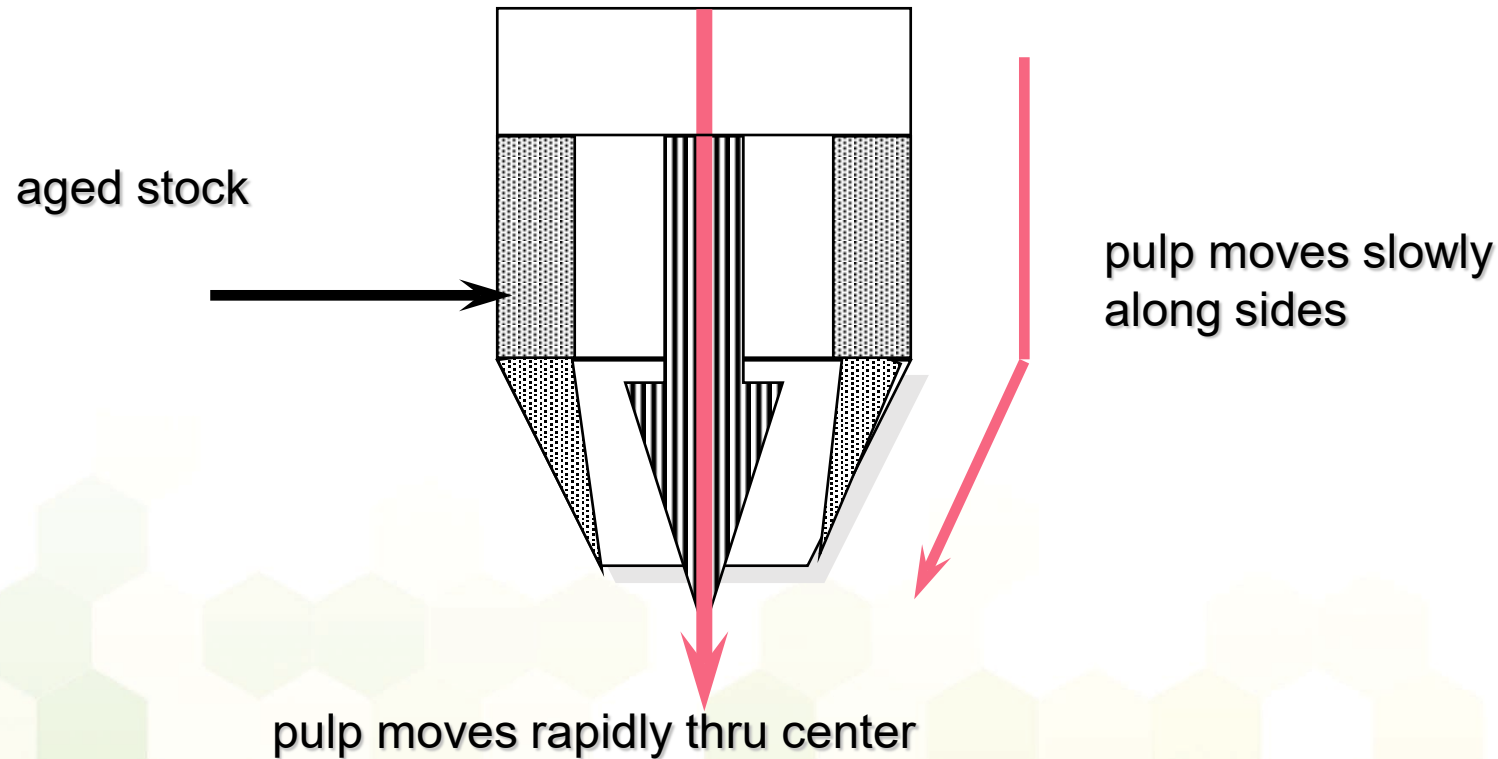
Toxic Gases

Acids

Explosions

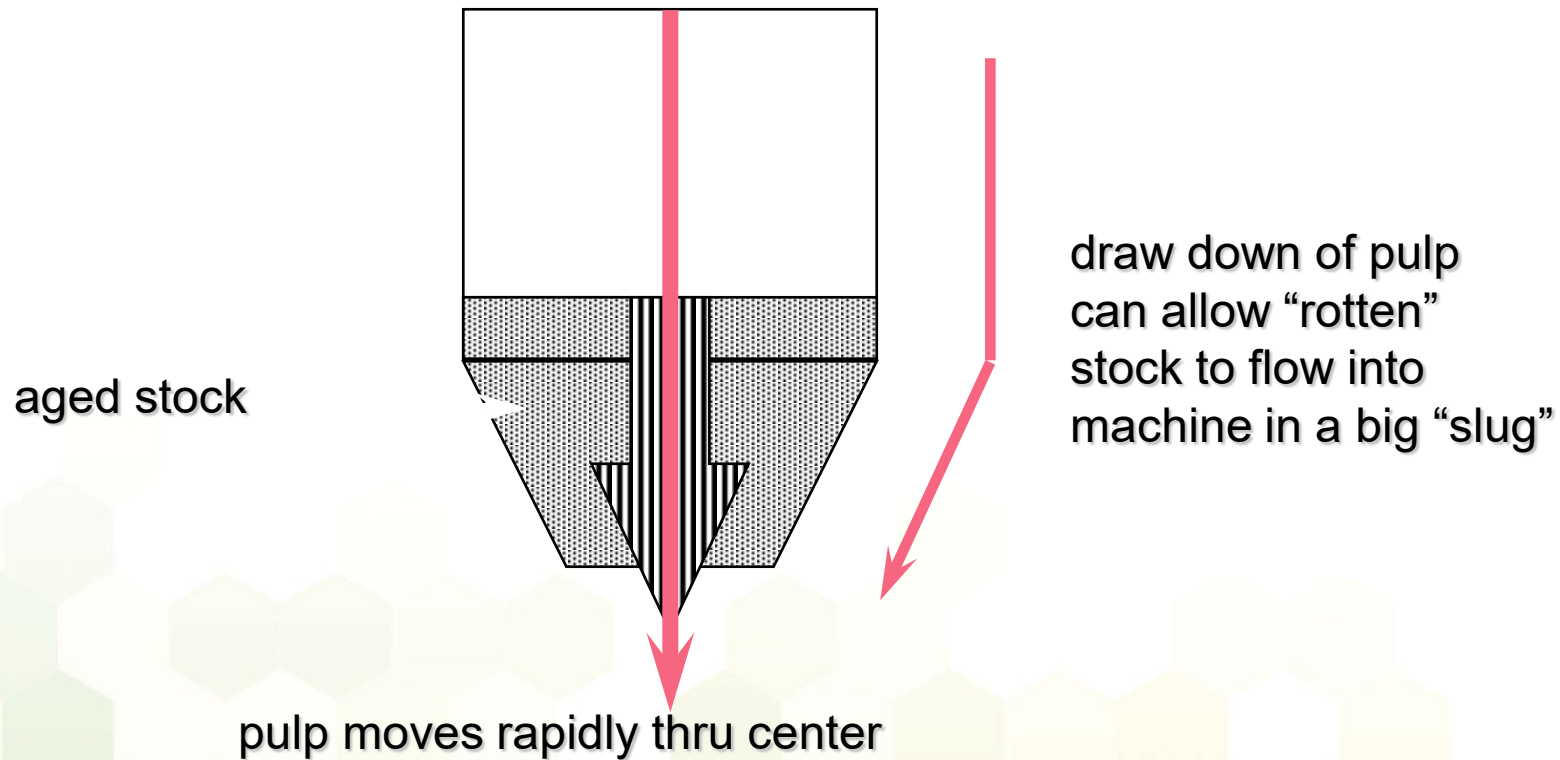
Pulp Preservation

Chest Configuration Problems



Pulp Preservation

Chest Configuration Problems



Two zero effluent mills:

- **Problems**

- Corrosion
- Odor
- Excess Broke*
- Showers plugged*
- Felt Filling*

- **Benefits**

- Improved chemical recovery
- Reduction in fuel for heating water
- Minimal slime deposits**

- **Solutions**

- Improve Retention
- Biocides
- Upgrade to 304/316SS

Chemical & Ionic Indicators of Water Closure

- Mill to Mill Variation in:
 - *fresh water composition*
 - hardness
 - iron levels
 - pH
 - *retention programs*
 - *fiber source*
 - bleaching chemicals
 - *microbial species*

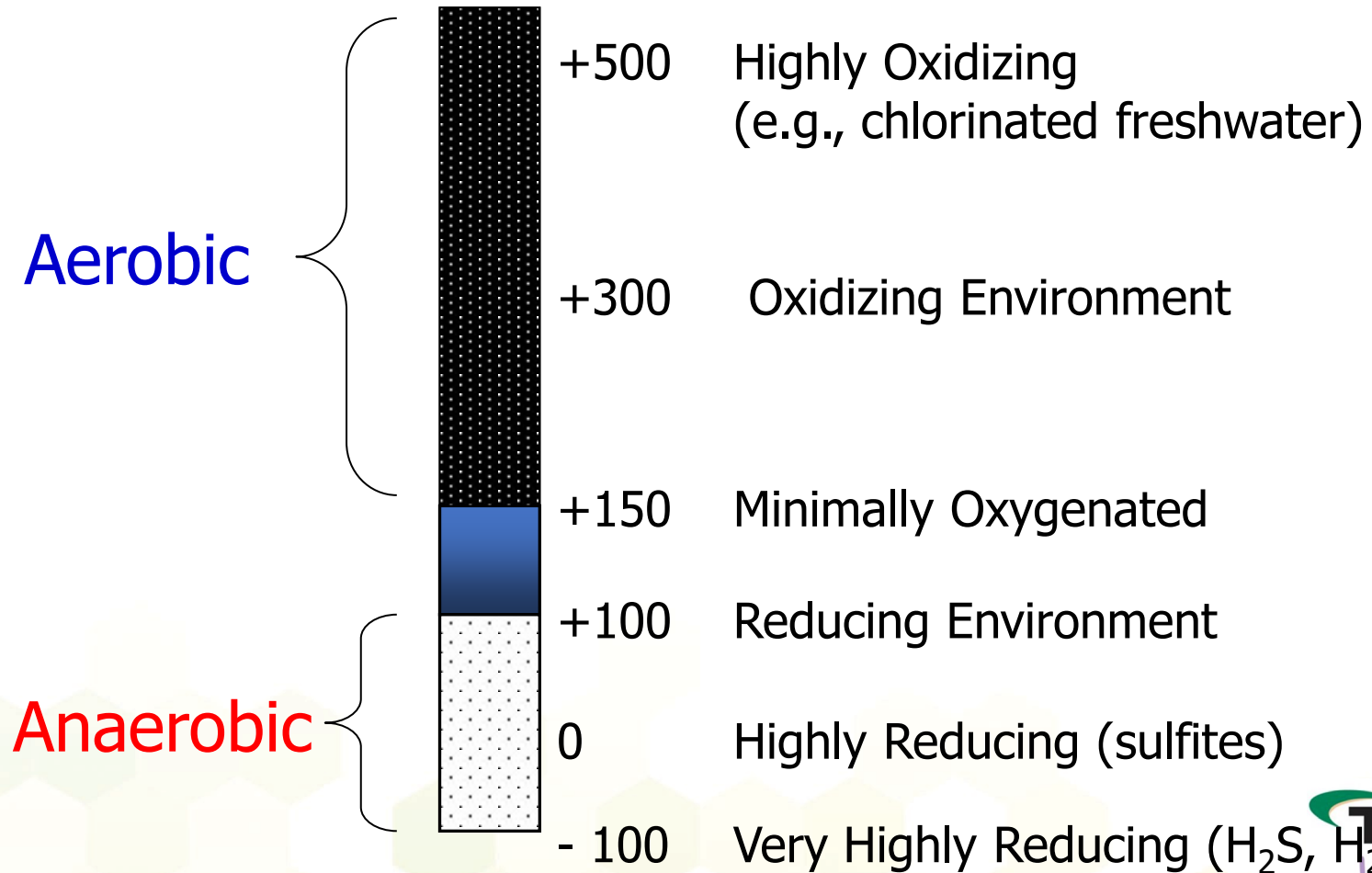
Nutrients

- **Water system closure increases the nutrients in the water systems**
- **Recycle fiber typically has high levels of starch and contaminants that serve as food**
- **Anaerobes thrive when the nutrients in the water system cycle up**

Mill Safety Issues

- H₂S and H₂ have caused several deaths of workers in industry
 - Known problem
 - More serious in recycle systems
- Hydrogen Sulfide
 - Can be detected by the human nose at 0.1 ppm.
 - At 3 ppm the odor becomes objectionable.
 - At 10 ppm health affects are noticeable (headaches)
 - At 100 ppm people loose their ability to smell.
 - By 300 ppm it is life threatening.
 - At 1000 ppm the person goes into irreversible respiratory failure
 - Found at 55 ppm in gypsum mill
 - Linerboard 45-300 ppm over walk space & chests

Oxidation Reduction Potential (ORP)



Conditions Favoring Anaerobic Growth

- Use of Recycled Fiber
- Closed Water Loops
- Higher Temperatures
- Closed, Poorly Vented, or Non-Agitated Chests
- Sulfite Semichemical Pulp

Monitoring of Anaerobes

- Culture Methods
 - Anaerobic Plate Counts
 - SRB Tubes
- Detection of End Products
 - Volatile Fatty Acids
 - H₂S, H₂
- Use of ORP
- LEL testing

Control of Anaerobes

- Mechanical
 - Aeration
- Chemical
 - Redox Changes (oxidants)
 - Biocides

Control issues

- Environmental control
- Stock handling
- Freshwater treatment
- Biocides appropriate for process chemistry
- Recovered water treatment

Steps working with odor complaints:

- Accurate description of malodor
- Dates
- Trace the origin of the roll
- Determine what changed as the board formed
 - Chemical trials
 - Shutdowns
 - Shipment/storage issues
- Solutions depend on proper documentation.

Elements Influencing Program Performance

- Control of System Inoculation
 - Freshwater
 - White water
 - Pulp and Additives
- Mill design & grade profiles
- Stock Management / Housekeeping
- Boilout Strategy
- Biocide Compatibility with Papermaking Operations

Thank you for your time.

Linda Robertson

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International Microbial Associates