

PAPTAC BLEACHING COMMITTEE
FALL 2015 MEETING MINUTES - NANAIMO, BC
September 21-23, 2015

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*PAPTAC Bleaching Committee, Fall 2015 Meeting
Hosted by Harmac Pacific, Nanaimo, BC (Sept. 21-23, 2015)*

PAPTAC Bleaching Committee
Section 2 - ATTENDANCE LIST
Nanaimo, BC – September 21-23, 2015

	Name	Mill / Company	Job Title
	Aamirah Allykhan	Howe Sound	Process Engineer
	Rohan Bandekar	NORAM	Process Engineer
	Norman Brisson	Unipex Solution Canada	Business Unit Manager
	Daniel Brouillette	GL&V	Global Business Mgr, Screening
5	Sabrina Burkhardt	Econotech	Mgr Pulping & Bleaching
	Mark Cameron	Skookumchuck Pulp Inc.	Process Specialist
	Greta Caron	DMI Peace River	Operator
	Dominic Cote	LaTuque	Asst. Superintendent Pulp Mill
	Dan Davies	Evonik	Application Manager
10	Nariné Demirchian	Unipex Solution Canada	Reg & QC Manager
	Stephen Desrochers	Howe Sound	Bleach Superintendent
	Danielle Dotson	Clearwater Paper	Process Engineer
	Brennan Dubord	Cariboo Pulp and Paper	Process Engineer
	Paul Earl	Paul Earl Consulting	
15	Almer Fetahovic	DMI Peace River	Process Specialist
	Dave Flater	Kraft Solutions Ltd. / Poyry	Sr. Process Specialist
	Heather Friesen	West Fraser Hinton	Jr. Process Engineer
	Dennis Froats	ERCO	Technical Service
	Brittany Gagas	Verso Wisconsin Rapids	Pulp Area Manager
20	Robert Gallant	TAC West	President
	James Goldman	Valmet	Product Manager
	Mona Henderson	Valmet	Business Manager
	Howard Herbert	Verso Luke	Pulp Mill Manager
	Tim Jarvis	ERCO	Business Manager
25	Meredith Kaknevicus	Canfor Intercon	Process Engineer

PAPTAC Bleaching Committee

Section 2 - ATTENDANCE LIST

Quesnel, BC – October 21-23, 2013

	Name	Mill / Company	Job Title
26	Michael Kjerulf	Nalco	Industrial Technical Consultant
	Brian LaBrash	Verso Quinnesec	Process Engineer
	Chung-Li Lee	FPInnovations	Research Scientist
	Jackie Lorette	Solenis	Pulp Applications
30	Rashiv Lubana	Cariboo Pulp and Paper	Process Engineer
	Stephane Messier	Canexus	Technical Service Manager
	Dominic Michaud	Weyerhaeuser Grande Prairie	Bleach OP Leader
	Shree Prakash Mishra	FP Innovations	Research Scientist
	Laurier Morissette	TEXO Controls	Process Control Engineer
35	Tom Mullen	Process Innovations	Principal
	Honey Nampak	Harmac Pacific	Process Engineer
	Raymond Paquet	Kemira	Application Specialist
	Doug Pryke	DCP Consulting	President
	Doug Reid	AkzoNobel	Sr. Process Engineer
40	Travis Reinheimer	Canfor Intercon	
	Chris Roberts	Spartan Controls	Sr. Controls Engineer
	Sean Roberts	Harmac	Operator
	Alison Rowat	Weyerhaeuser	Manufacturing Services Mgr.
	Phil Sekerak	Verso Androscoggin	Technical Leader
45	Jerry Seveck	Harmac	Bleach Area Supervisor
	Craig Simon	DMI Peace River	Fibreline Day Lead
	Curtis Spencer	Harmac Pacific	Bleach Operator
	Coby Stone	BTG	Sales Manager
	Kenny Tam	Canfor - PG Pulp	Process Engineer
50	Roger Tembreull	Verso Escanaba	Process Engineer

PAPTAC Bleaching Committee
Section 2 - ATTENDANCE LIST
Quesnel, BC – October 21-23, 2013

	Name	Mill / Company	Job Title
51	Anne Toderean	Harmac Pacific	Bleach Assistant
	David Trzil	Clearwater Paper	Process Engineer
	Rick Van Fleet	BTG	Mgr. Fibreline Bus. Dev.
	Murray Walters	AllNorth Consultants	Project Manager
55	Rick Wasson	Irving	Bleach Plant Superintendent
	Dave Willis	Peroxychem	Technical Account Manager
60			
65			
70			
75			

PAPTAC Bleaching Committee

Section 2 - ATTENDANCE LIST

Nanaimo, BC – Sept 21-23, 2015

	Name	Mill / Company	Job Title
	Doug Reid	Akzo Nobel	Sr. Process Engineer
	Honey Nampak	Harmac Pacific	Process Engineer
	Alison Rowat	Weyerhaeuser	Manufacturing Services Mgr.
	DOMINIC COTE	WESTROCK	ASS. SUPERINTENDENT PULPMILK.
5	DOUG PRYKE	DCP CONSULTING	PRESIDENT
	Paul Earl	Paul Earl Consulting	
	DANIEL BROUILLETTE	GL&V	Global Business Mgr, Screening
	David Treil	Clearwater Paper	Process Eng
	Danielle Dotson	Clearwater Paper	Process Engineer
10	Kenny Tam	Canfor - P&P Pulp	Process Engineer
	MEREDITH KAKNEVICIUS	CANFOR - INTERCON	PROCESS ENGINEER
	DAVID FLATER	POYRY (MONTREAL)	SR. PROCESS SPECIALIST
	Sabine Burkhardt	Econotech	Mgr Pulping & Bleaching
	JACKIE LORETTE	SOLENIS	PULP APPLICATIONS
15	MICHAEL KSERULF	NALCO	INDUSTRIAL TECHNICAL CONSULTANT
	RAYMOND PAQUET	KEMIRA	APPLICATION SPECIALIST
	Mona Henderson	Valmet	Business Manager
	SEAN ROBERTS	HARMAC	OPERATOR
	Jerry Seveck	Harmac	Bleach area Supervisor
20	CHRIS ROBERTS.	SPARTAN CONTROLS.	SENIOR CONTROLS ENGINEER.
	Stephane Messier	CANEXUS CORPORATION	Technical Service Manager.
	Greta Caron	DMI - Peace River	operator
	Almer Fetahovic	DMI Peace River	Process Specialist
	SHREE PRAKASH MISHRA	FPI Innovations	Research Scientist
25	CHUEN-LEI LEE	FPI Innovations	Research Scientist

PAPTAC Bleaching Committee

Section 2 - ATTENDANCE LIST

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26	Craig Simon	DMI Peace River	Fiberline Day Lead
	Brittany Gagas	Wis Rapids / Verso	Pulp Area Manager
	Brennan Dubard	Canbo Pulp & Paper	Process Engineer
	Rashiv Lubana	Cariboo Pulp & Paper	Process Engineer
30	Howard Herbert	LUKE MD / Verso	Pulp Mill MANAGER
	Roger Tremblay	ESCANABA / Verso	Process Engineer
	Brian LaBrash	Verso Corp - Quinnesec	Process Engineer
	Tom Mullen	Process Innovations	Principal
	Mark Cameron	Skookumchuck Pulp Inc	Process Specialist
35	MURRAY WATERS	ALLNORTH CONSULTANTS	PROJECT MANAGER
	CURTIS SPENCER	HARMAC PACIFIC	BLEACH OP.
	ANNE TORREAN	HARMAC PACIFIC	BLEACH ASST
	DAVE WILLI	PEROXICITEM CANADA	TECHNICAL ACCOUNT MGR
	LARIER MORISSETTE	TEXO CONTROLS	PROCESS CONTROL ENG.
40	ROHAN BANDEKAR	NORAM	Process Engineer
	Dominic Michaud	Weyerhaeuser - Grande Prairie	Bleach OP Leader.
	Rick Van Fleet	BTG Americas	MGR Fiberline Bus Dev.
	COBY STONE	BTH Americas	Sales Manager
	Tim Jarvis	ERCO	Business Manager
45	DENNIS FROATS	ERCO	TECHNICAL SERVICE
	Aamirah Allykhan	HSPP	Process Eng.
	Stephen Desrochers	HSPP	bleach Superintendent
	JAMES GOLDMAN	VALMET	PRODUCT MANAGER
	Rick Wasson	Irving Pulp & Paper	Bleach Plant Superintendents
50	Trauis Reinheimer	Canfor Intercon	

PAPTAC Bleaching Committee
Section 2 - ATTENDANCE LIST
 Nanaimo, BC – Sept 21-23, 2015

	Name	Mill / Company	Job Title
51	Heather Friezen	West Fraser - Hinton	Jr. Process Eng.
	Don Davies	Evonik Canada	Application Manager
	Robert Gallant	TAC / TAC West	President
	Phil Sakerak	Verso Co.	Technical Leader
55	Normand Brisson	Unipex	Business Unit Manager
	Narine Demirchian	Unipex	Reg & QC Manager
60			
65			
70			
75			

PAPTAC Bleaching Committee
Section 3 – BUSINESS MEETING MINUTES
Nanaimo, BC; September 21-23, 2015

1) NEWS FROM PAPTAC

- Had some issues with PAPTAC adding members without our knowledge; appears to have been clarified with Sylvie and Thomas

2) MEMBERSHIP REVIEW

- Many new members have joined recently. Membership spreadsheet is up to date as of this meeting.
- Guests – 20 at this meeting (8 from suppliers, 12 from mills)
- Resignations
 - Harold Petke has transferred the Solenis membership to Jackie Lorette
 - Ted Tam (Cariboo) has retired
- Supplier membership – OK

3) SUB-COMMITTEE REPORTS

- Meetings & Conferences – Dan Davies
 - See presentation in minutes
 - Paul Earl won this year’s Rapson Award for “Bleaching Practices For Oxygen-Delignified Softwood Pulp: Analysis of the 2013 PAPTAC Bleaching Committee Survey”
- Projects – James Goldman
 - Running low on potential projects, will continue to look for more.
- Technical – Alison Rowat
 - Theme for Spring 2016 is “Cooking and Effects Downstream”
 - Theme for Fall 2016 is “Brownstock, Bleach Plant Measurements and Testing Fundamentals”
- Internet – Paul Earl
 - Sabrina Burkhardt to become new Internet sub-committee chair.
 - Presentations spreadsheet (from R. Paquet) – decision to remove hyperlinks prior to posting on website. Sabrina will keep the spreadsheet updated.

4) FUTURE MEETINGS

- Spring 2016 – LaTuque
 - Exact date TBD - will have to be mid-June to avoid mill outage, Memorial Day, and PacWest Conference
 - Technical session = Cooking and Effects Downstream
- Fall 2016 – Location TBD

5) FINANCIAL – Doug Reid

- Balance in supplier fund = \$3980 before paying for Tuesday night’s dinner
- Will need to go out for another round of supplier contributions in Spring 2016

Fall 2015 Bleaching Committee – Business Meeting

6) NEW BUSINESS

- Brian La Brash taking over as chairman after this meeting
 - Candidates identified for Vice Chair roles
- James Goldman unanimously voted to Full Member status

7) CUNNINGTON AWARD

- Meredith Kaknevicius of Canfor Intercon won the Cunnington award for the meeting attendee who most added to the value of the meeting with their participation and contributions



Honey Nampak (Harmac Pacific) presents Meredith Kaknevicius (Canfor Intercon) with the Cunnington Award.

PAPTAC Bleaching Committee
Section 4 – SUBCOMMITTEE MEETINGS
Nanaimo, BC; September 21-23, 2015

See following presentations.

MEETINGS - 2015

PacWest – June 10 to 13

Rapson Award

Dan Davies, Evonik Canada Inc.

PacWest 2015

- Attendance higher this year
 - At 349, up 50% over last year
 - Influence of venue? Whistler?
- 24 Mills represented
 - Mill personnel were 25% of attendees
- Conference forum was "Leveraging Our Competitive Advantages".
 - Excellent forum, mostly up to this conference's norm.

PacWest 2015

Highlights:

- Dedicated student presentation session
- 20 displays in Trade Fair
- Strong line up of papers
- Great mill participation

Rapson Award

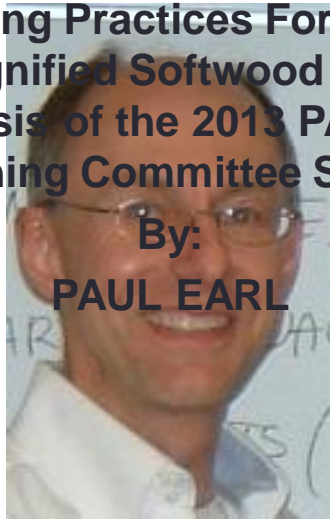
- Bleaching presentations from PaperWeek
- Strong field of presentations
 - All good
 - Some excellent
- One particularly stood out...

Rapson Award

“Bleaching Practices For Oxygen-Delignified Softwood Pulp: Analysis of the 2013 PAPTAC Bleaching Committee Survey”

By:

PAUL EARL



PAPTAC Bleaching Committee

Internet Sub-Committee: Website and e-mail

Group e-mail

- ◆ Group e-mail system – use “bleach@paptac.ca” to send message to group
 - ◆ Meeting information, questions and problems from members
 - ◆ Recent problems have been due to corporate IT filters
- ◆ e-mail system is for registered Bleaching Committee members only
 - ▣ Your current e-mail address must be on the server
 - ▣ e-mail list administered by PAPTAC
 - ▣ Only currently active PAPTAC members will be added to the mailing list
- ◆ Please summarize the responses that you receive and send them back to the group in a timely manner (1-2 weeks)

PAPTAC Bleaching Committee - Fall 2015 Meeting

Members' Website

- ◆ Transitioned to new website last year
 - All material has been transferred
 - Website now part of PAPTAC site, <http://www.paptac.ca>
 - Technical Communities / Bleaching / Members Corner
 - <http://www.paptac.ca/bleaching/index.php/en/members-corner.html>
 - Need to log in with your *personal* PAPTAC login information
 - Username = first initial + last name, e.g. "pearl"
 - Some original usernames may be email address
 - Password = PAPTAC number, Txxxxx ("T" + 6 digits)
 - If you don't log out, you shouldn't have to log in again
- Need help? Contact:
 - Sylvie Veilleux, 514-392-6954, sveilleux@paptac.ca
 - Thomas Perichaud, 514-392-6956, tperichaud@paptac.ca

PAPTAC Bleaching Committee - Fall 2015 Meeting

Presentations on Members' Website

- ◆ Spreadsheet cataloguing past presentations
 - Created by R. Paquet
 - Will be added to website *without hyperlinks*
- ◆ Please remember that presentations & information from these meetings and on the website are not in the public domain
 - Please use only within your own mill or company
 - Please contact the author if you wish to use any of the information in your own presentations, etc.

PAPTAC Bleaching Committee - Fall 2015 Meeting

PAPTAC Bleaching Committee
Section 5 – TECHNICAL SESSION PRESENTATIONS
Nanaimo, BC; September 21-23, 2015

See following presentations.

Oxygen Delignification How to get pH Right

Alison Rowat
Weyerhaeuser

Oxygen

CHARACTERISTICS

- Clear colorless gas, pale blue liquid
- Powerful oxidant

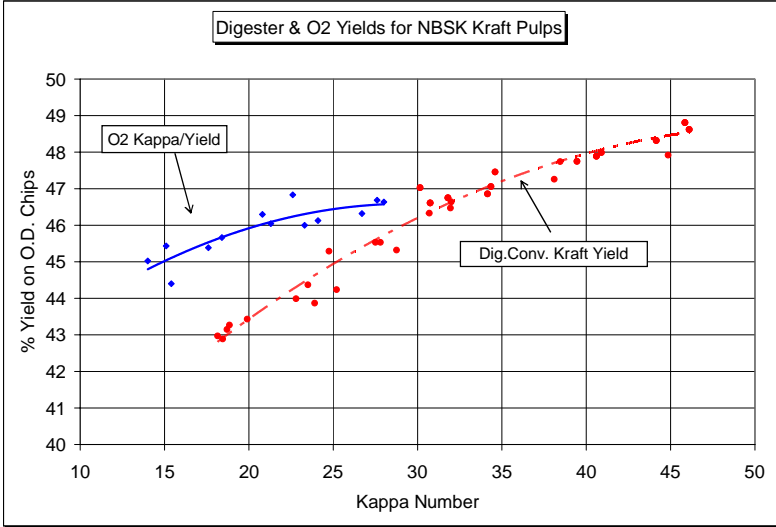
EFFECTS

- Contact with liquid will result in frostbite/burns
- Can be highly flammable in concentrated vapor form

Oxygen Reactions

In the presence of alkali and temperatures around 200 F, Oxygen reacts with both lignin and cellulose

Yield Benefits



Two-Stage Oxygen Chemical Addition

- The alkali and oxygen are added based on the incoming and target kappa (delta kappa), and applied using a fixed caustic and O2 factor. These factors do not have equal values and are tied together or ratioed together.
- The caustic is added for delignification and to hit a target end pH of 10.5 and the O2 is added strictly to hit a delignification target.

5

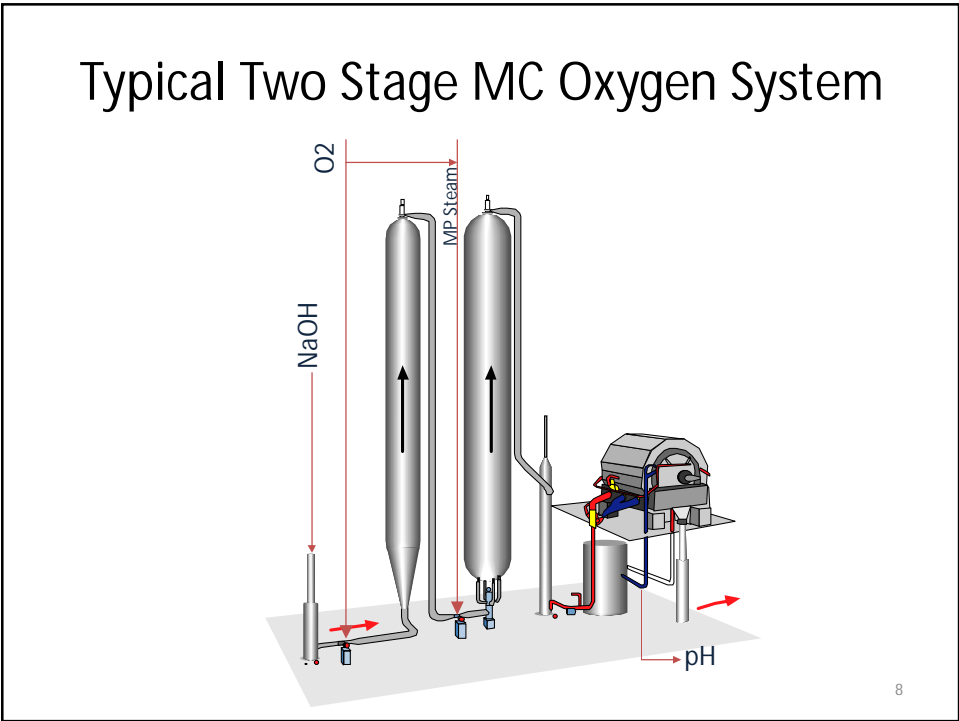
Two-Stage Oxygen Chemical Addition

- The internal recycle streams in the BS washing system can build up excess alkali in the system fairly quickly if fast changes are made to the chemical application rates.
- Before making changes evaluate the trend of:
 - the digester , O2 feed and exit kappa
 - The O2 exit pH
- Over control will lead to greater O2 kappa variability

6

Two-Stage Oxygen Delignification: Operator Decision Matrix

	Increase NaOH Factor	Increase O2 Factor	Decrease NaOH Factor	Decrease O2 Factor	Increase Temp	Decrease Temp
Kappa is on target pH is on target						
Kappa is on target pH is high			X			
Kappa is on target pH is low	X					
Kappa is high pH is on target	X	X			watch	
Kappa is high pH is high		X			X	
Kappa is high pH is low	X	X			watch	
Kappa is low & pH on Target			watch			X
Kappa is low & pH is high			X			X
Kappa is low & pH is low				X		X



Is Measuring the pH of the post O2 press pressate a true terminal pH?

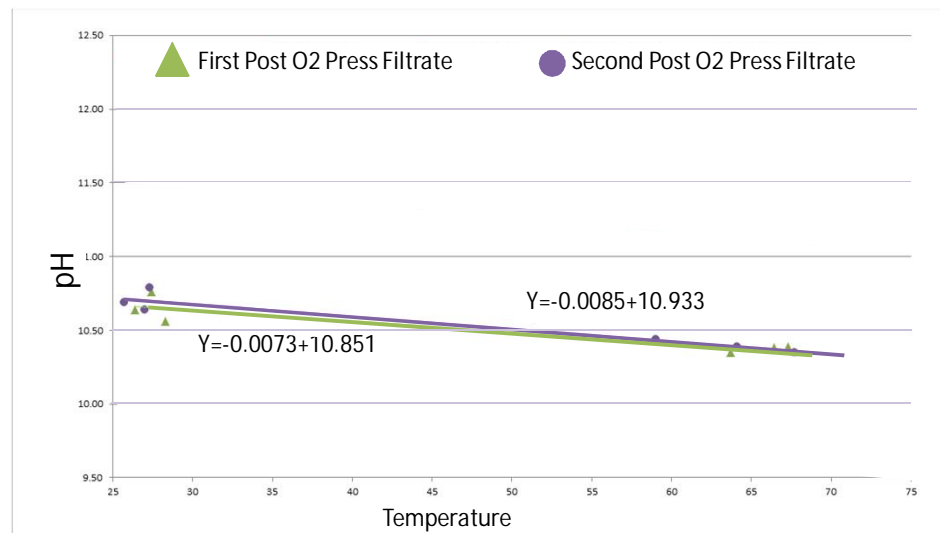
Difficult to say, as hardly anybody measures the post O2 pH before any dilution done

Next slide shows some filtrate pH testing. The second post O2 pH pressate was essentially the same as the first post O2 stage pressate

- Carbonates creating a buffer?

9

Is Measuring the pH of the post O2 press pressate a true terminal pH?

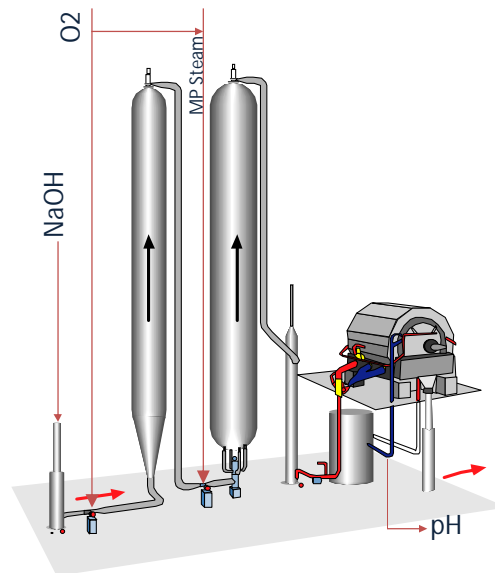


Is Measuring the pH of the post O2 press pressate a true terminal pH?

We believe the first press pressate is a good indication of post O2 terminal pH

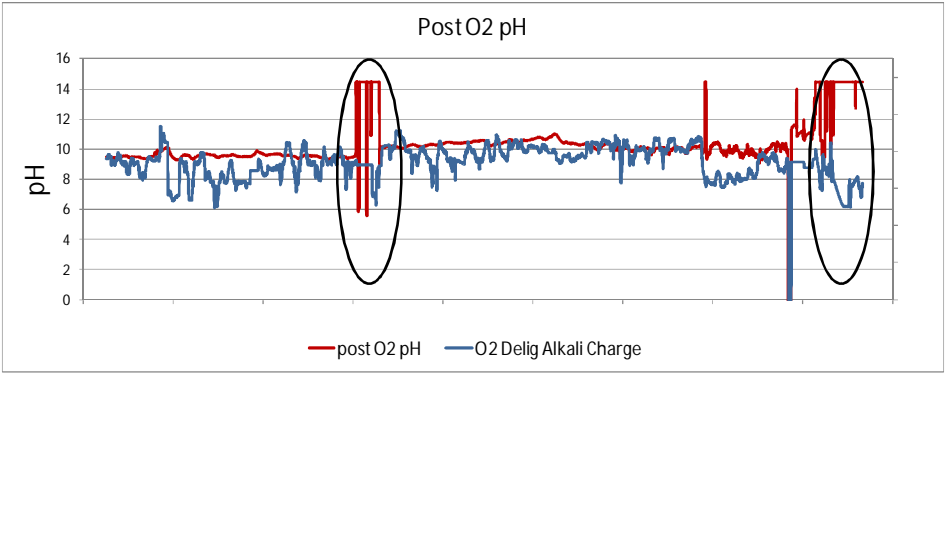
11

Typical Two Stage MC Oxygen System



12

Typical trend of post O2 pH - BEFORE



Filtrate Cooling

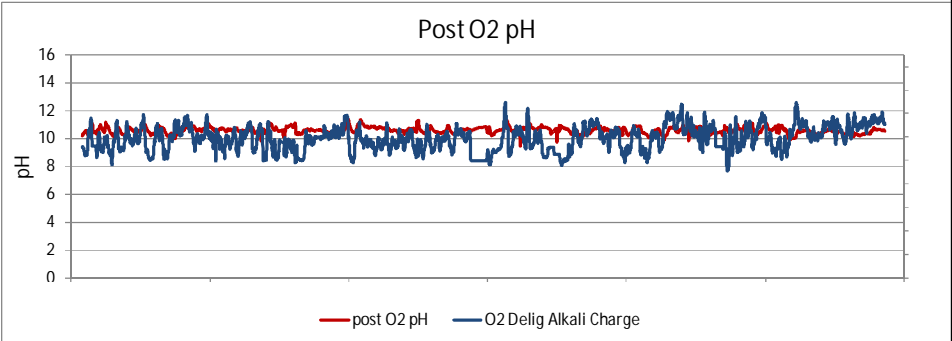


- Cooling Water
- Filtrate Path

Bath and Coil, Front and Rear View



Typical trend of post O2 pH - AFTER



Conclusions

- Cooling the sample gives a much more reliable pH – the probe signal does not decay, become unresponsive, or jump to a falsely high value and its life expectancy is much, much longer.
- High pressure or putting the probe in medium consistency environments was thought to be the reason for poor probe performances, but perhaps it is the hot temperature that is more to blame.

Delignification in the First Stage of the Bleach Plant

Principles and Practice

Douglas C. Pryke, P. Eng.
Consultant
Toronto, Ontario

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The Bleach Plant



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Outline

- Definitions and Fundamentals
- Delignification with Chlorine Dioxide ClO_2
 - Elemental Chlorine Free (ECF) Bleaching

First Stage of Bleaching

- Purpose
 - to remove residual lignin from unbleached pulp
 - to assist bleaching of shives
- How
 - through substitution and oxidation reactions with lignin
 - which in part allows the lignin to dissolve in water; and
 - makes the lignin soluble in the subsequent extraction stage

Definitions

- Elemental Chlorine Free “ECF” is the term used when chlorine dioxide (ClO_2) has fully replaced chlorine gas (Cl_2) in the first stage of bleaching
 - 1 kg of ClO_2 is equivalent to 2.63 kg of Cl_2 on an oxidizing equivalent basis
 - 1 kg of ClO_2 transfers the same amount of electrons as 2.63 kg of Cl_2
- In bleaching stage designations the following terms may be used for the first stage:
 - D, D₀, D₁₀₀

Definitions

- Kappa Factor is defined as:
 - Weight percent equivalent chlorine applied to the unbleached pulp divided by the unbleached pulp kappa number
 - i.e., 6 % equivalent chlorine applied to 30 kappa no. unbleached pulp
Kappa Factor = $6/30 = 0.20$
- Kappa Factor is the same as:
 - Active chlorine multiple
 - Equivalent chlorine multiple

Chlorine Dioxide Delignification (Elemental Chlorine-Free, ECF)

- Driving forces
- Chemistry
- Delignification
- Process conditions
 - pH
 - Consistency
 - Temperature
- Industry practice

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Driving Forces for ECF

- Environmental
 - Elimination of dioxins, furans, polychlorinated phenols
 - Decrease chloroform, AOX and color discharges
- Market
 - Meet demand for Elemental Chlorine Free pulp
- Regulatory
 - Compliance with the Canadian Environmental Protection Act
 - Compliance with US EPA “Cluster Rules”

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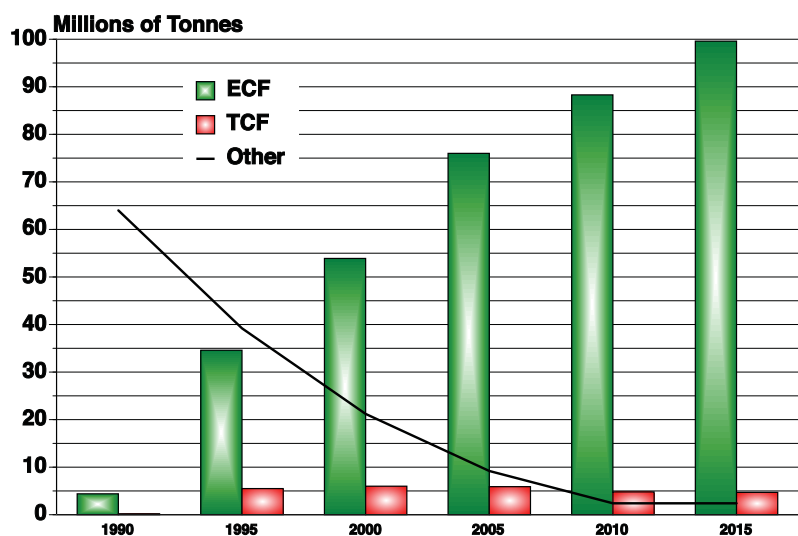
Impact of ECF on Bleaching Effluent

- Dioxins and furans non-detectable
- Tri-, tetra-, penta- chlorinated phenols non-detectable
- AOX decreased
- EOX decreased
- Chloroform decreased
- Color decreased
- Acidity decreased

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Growth of ECF

- The production of bleached chemical pulp using Elemental Chlorine Free (ECF) technology based on ClO_2 has grown steadily
- In 2015 ECF represents ~ 95% of production
- TCF is declining and represents < 5% of production



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Chemistry of ClO₂ Delignification

- ClO₂ + Lignin $\xrightarrow{\text{Acid}}$ oxidized lignin + Cl⁻
- Lignin is
 - Fragmented
 - Oxidized
 - Ionized
 - Solubilized partially in the first stage and more so in the subsequent extraction stage

ClO₂ Reaction with Carbohydrates

- Aldehyde groups \longrightarrow Carboxyl groups
- No carbohydrate degradation
- Minimum viscosity loss
- High selectivity to lignin

ClO₂ Decomposition

- Decomposition in the gas phase:
 - $\text{ClO}_2 \longrightarrow \frac{1}{2} \text{Cl}_2 + \text{O}_2$
- Decomposition in solution:
 - $\text{ClO}_2^- + \text{HClO} \longrightarrow \text{ClO}_3^- + \text{Cl}^- + \text{H}^+$

ClO₂ Reaction Products

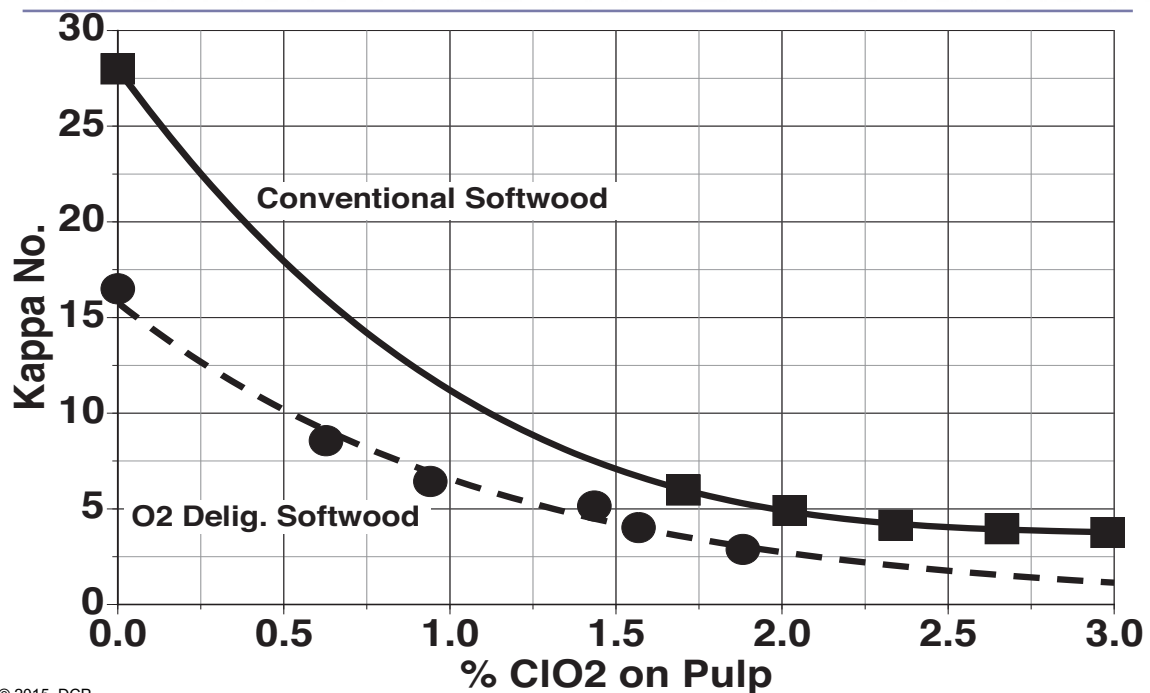
- ClO₃⁻ chlorate ion unreactive
- ClO₂⁻ chlorite ion unreactive at pH > 5
- HClO, hypochlorous acid, forms organochlorine
Cl₂ chlorine
- Cl⁻ chloride ion HCl formation

ClO₂ Delignification Variables

- Hardwood or Softwood
- Incoming Kappa Number
 - Conventionally Delignified
 - Oxygen Delignified
- ClO₂ Chemical Charge (Kappa Factor)
- Reaction Temperature & Time
- Reaction pH
- Consistency
- Carryover of Dissolved Organic Material

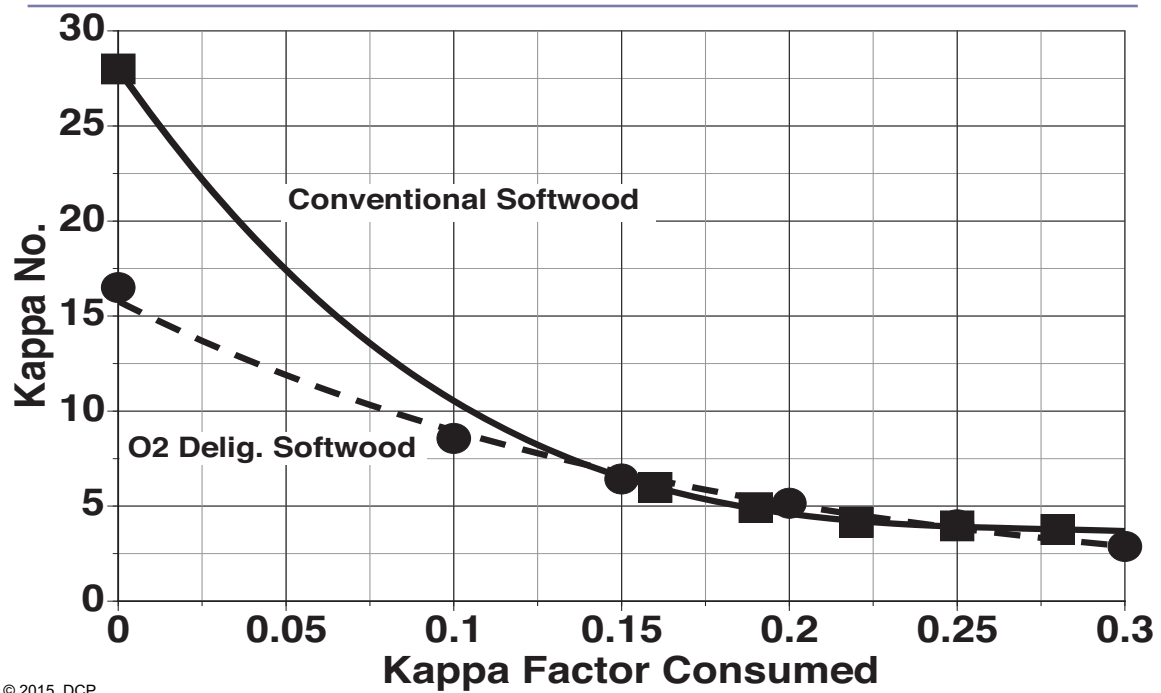
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Delignification with ClO₂



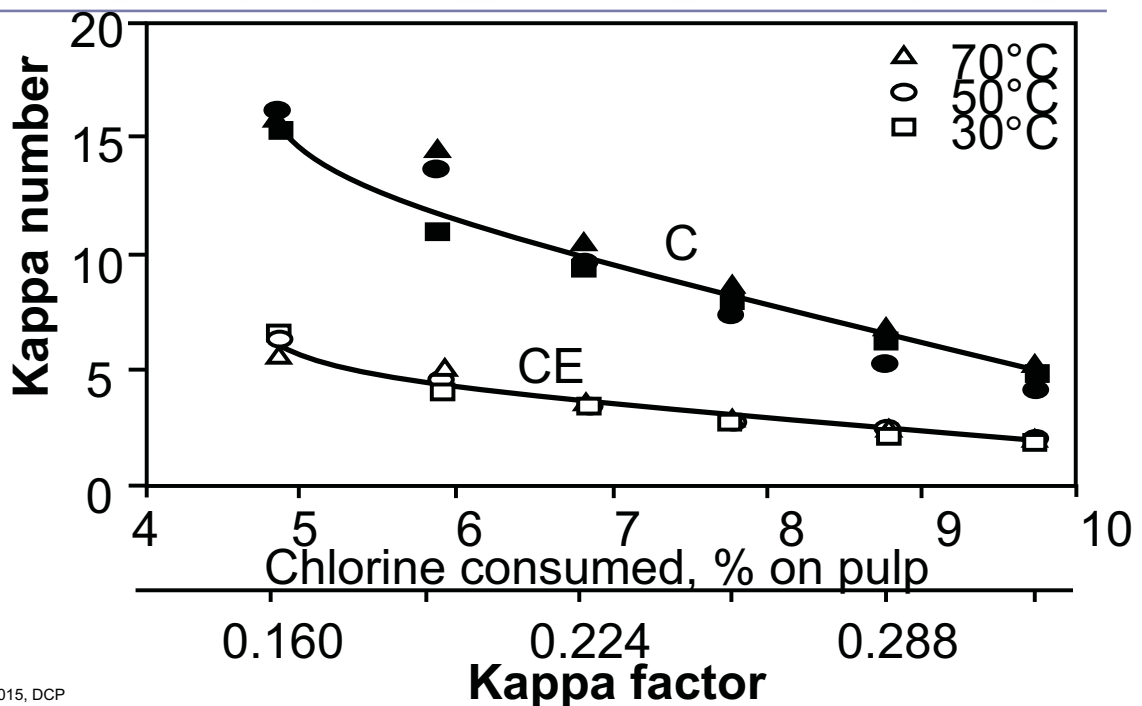
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Delignification with ClO_2



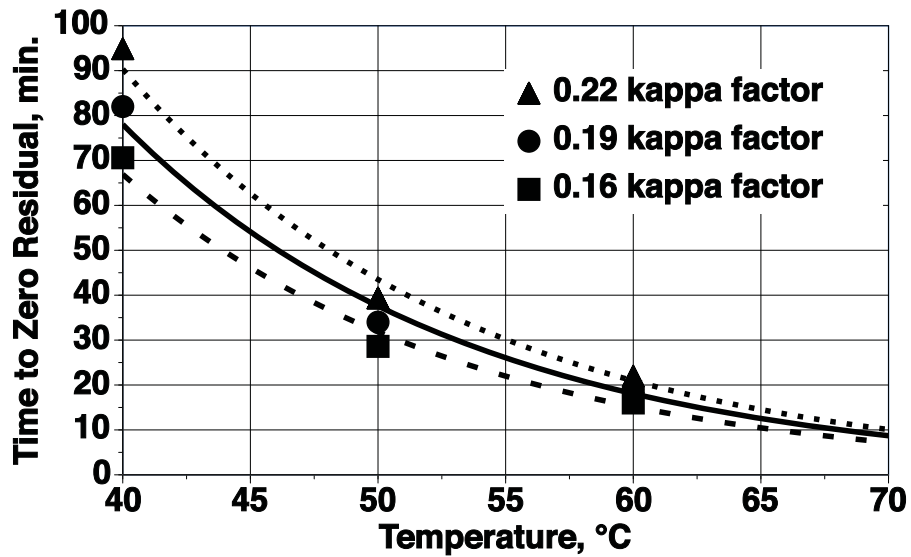
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Delignification with Cl_2 : Effect of Temperature



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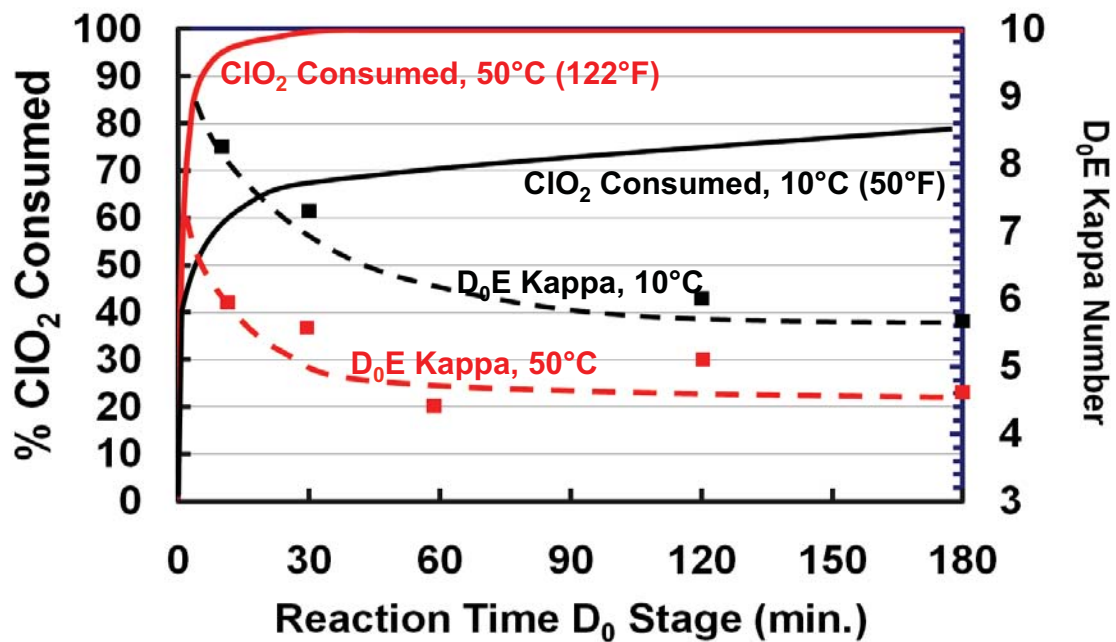
Delignification and Temperature



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Delignification and Temperature

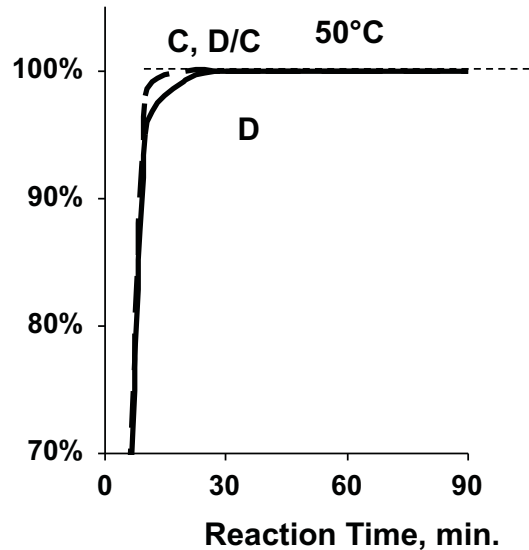
30 Kappa No. Softwood Kraft: 0.18 Kappa Factor



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Reaction Rate

- At 50°C (122°F) the rates of chlorine dioxide consumption and delignification are indistinguishable from those of chlorine
- Two-thirds of the lignin in a kraft pulp can be solubilized in 4 seconds and 85% in 30 seconds.

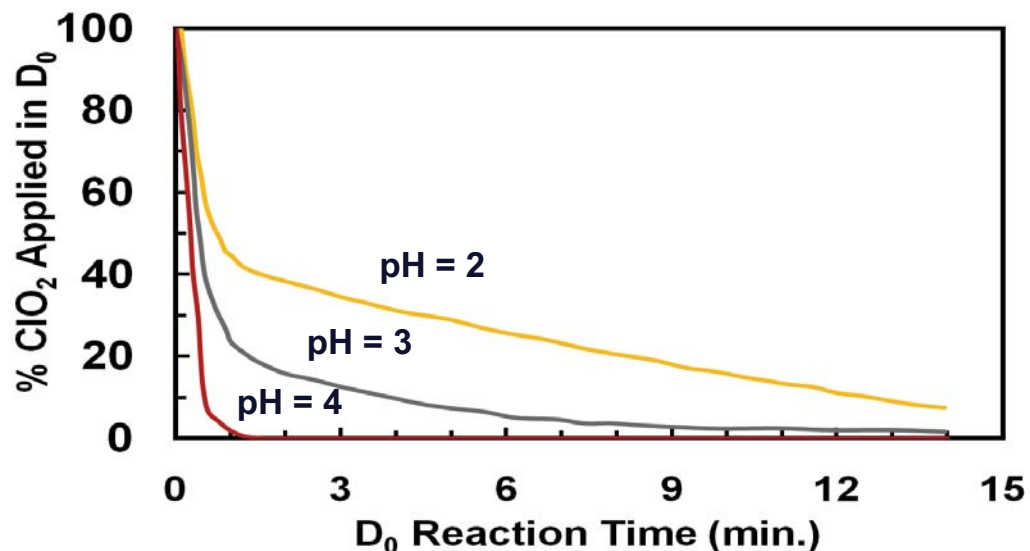


– Ref. *Pulp Bleaching: Principles and Practice*. Pages 247, 264

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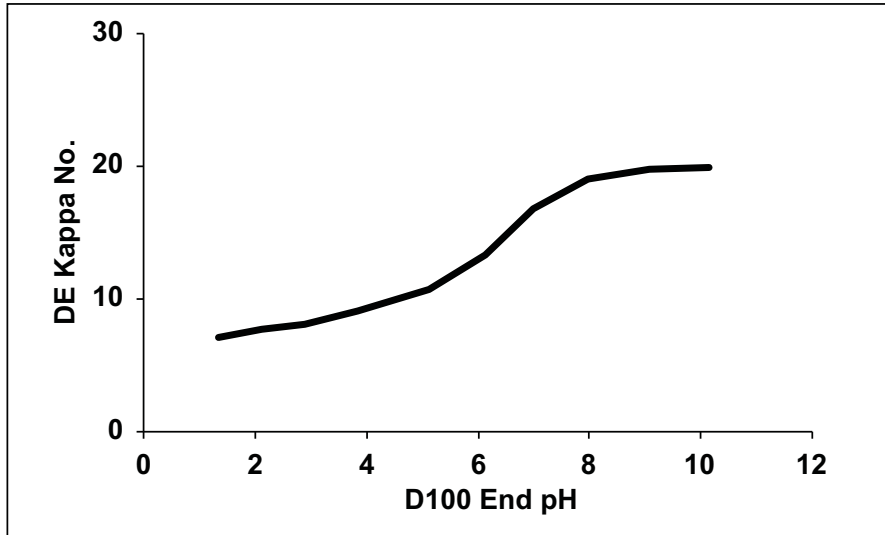
Impact of pH on Reaction Rate

15 Kappa No. Softwood Kraft, 45°C D₀ Stage



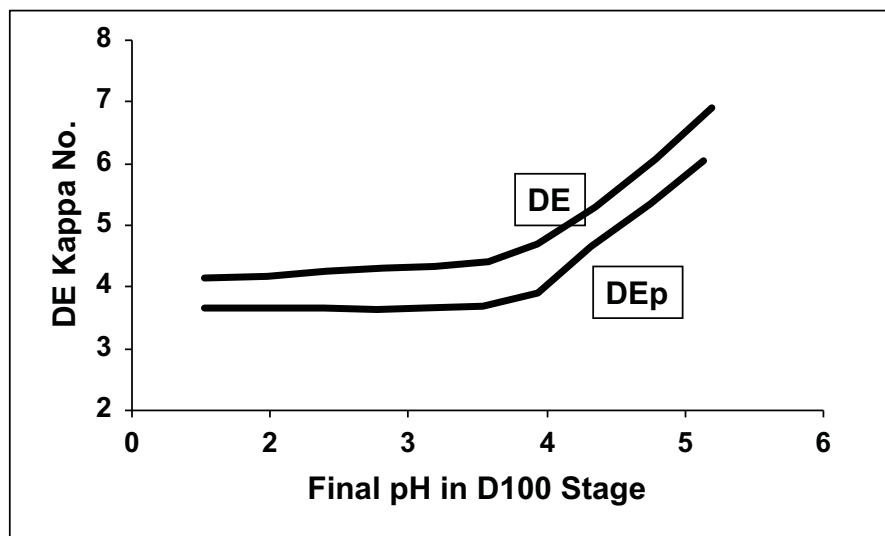
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Impact of pH on Softwood Delignification



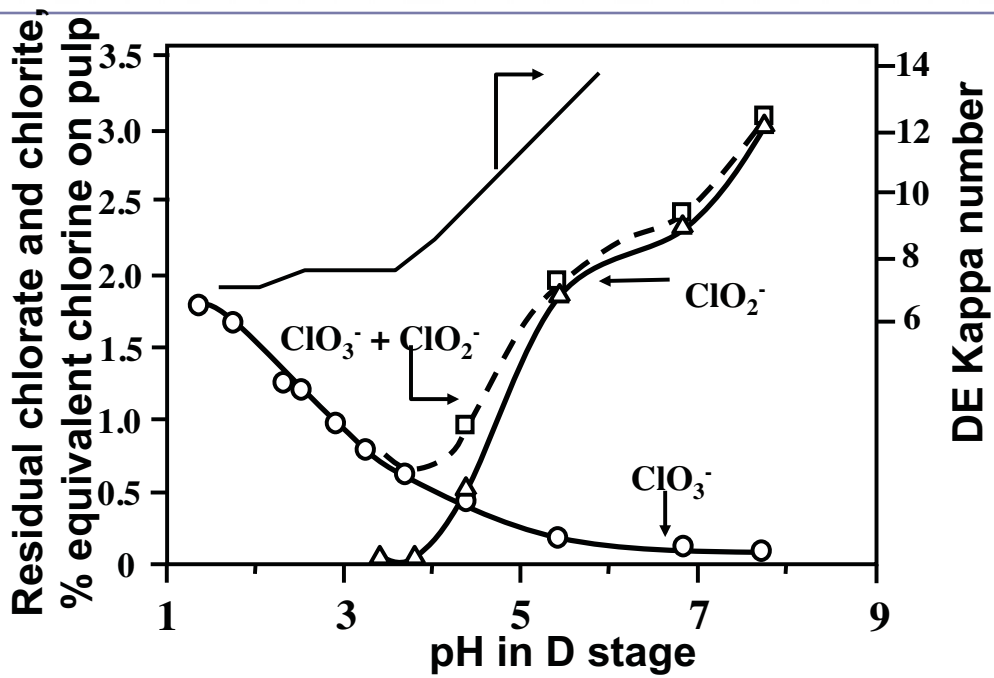
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Effect of pH on ECF Hardwood Delignification



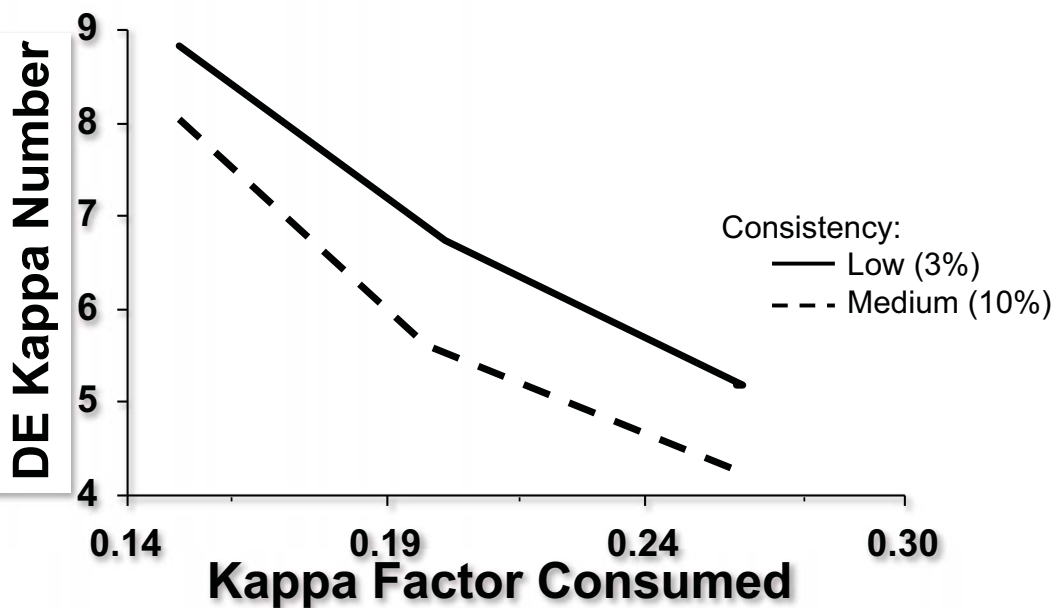
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Impact of pH on Delignification



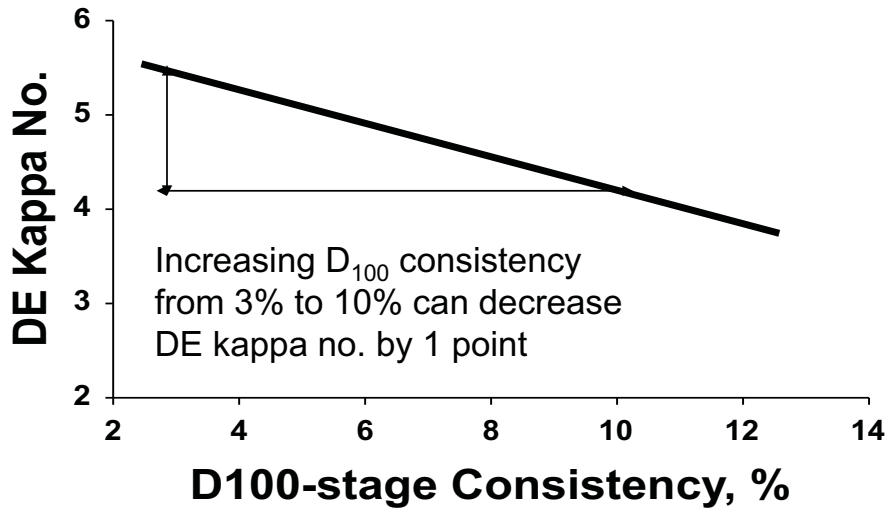
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Impact of Consistency



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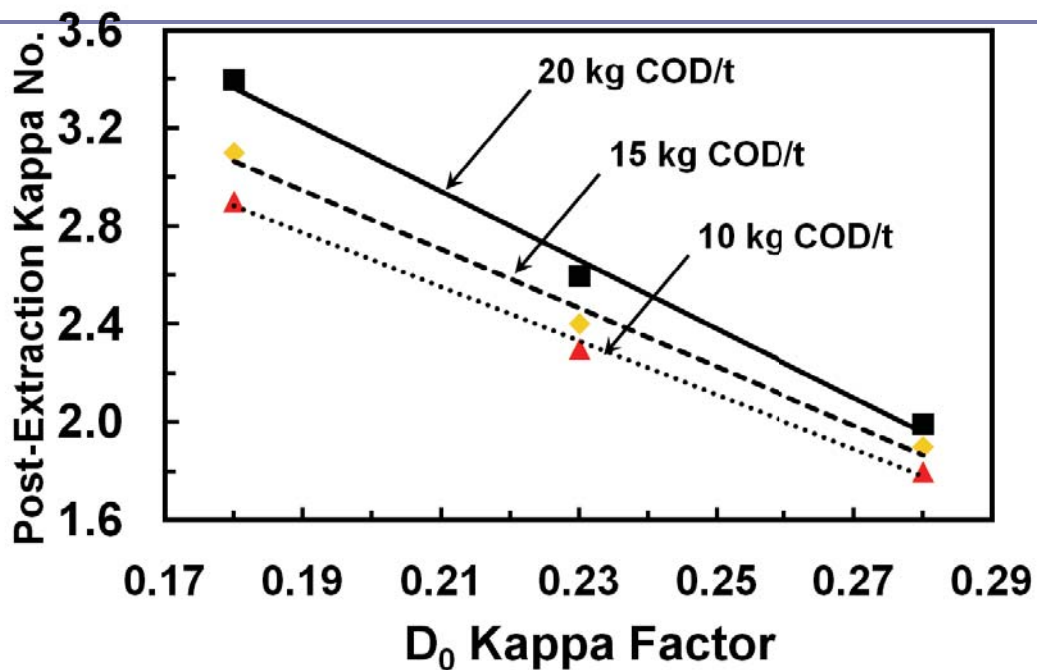
Impact of Consistency



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ClO_2 Delignification – COD Carryover

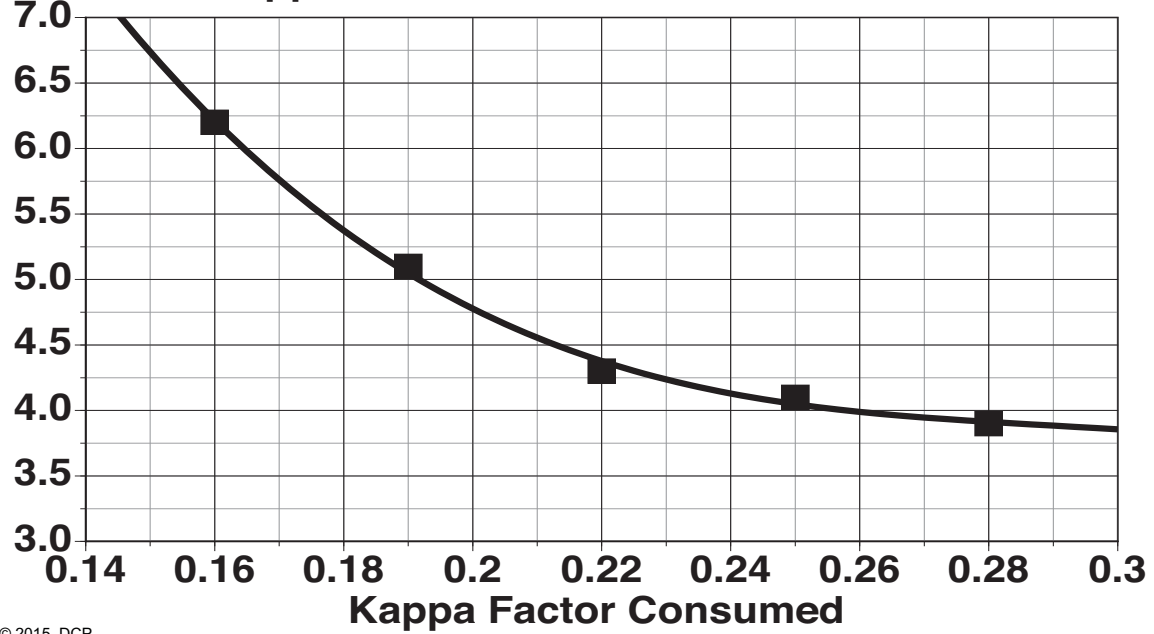
O_2 Delignified Softwood Kraft Pulp



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Softwood Delignification

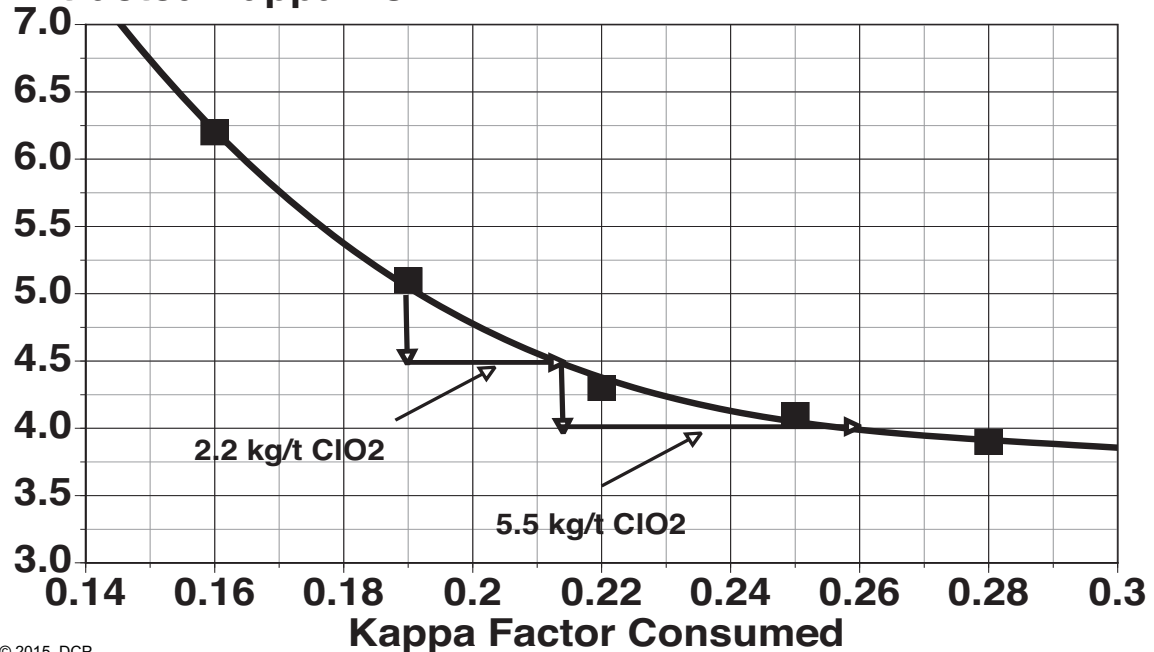
Extracted Kappa No.



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Softwood Delignification with ClO₂ 29 kappa no.

Extracted Kappa No.

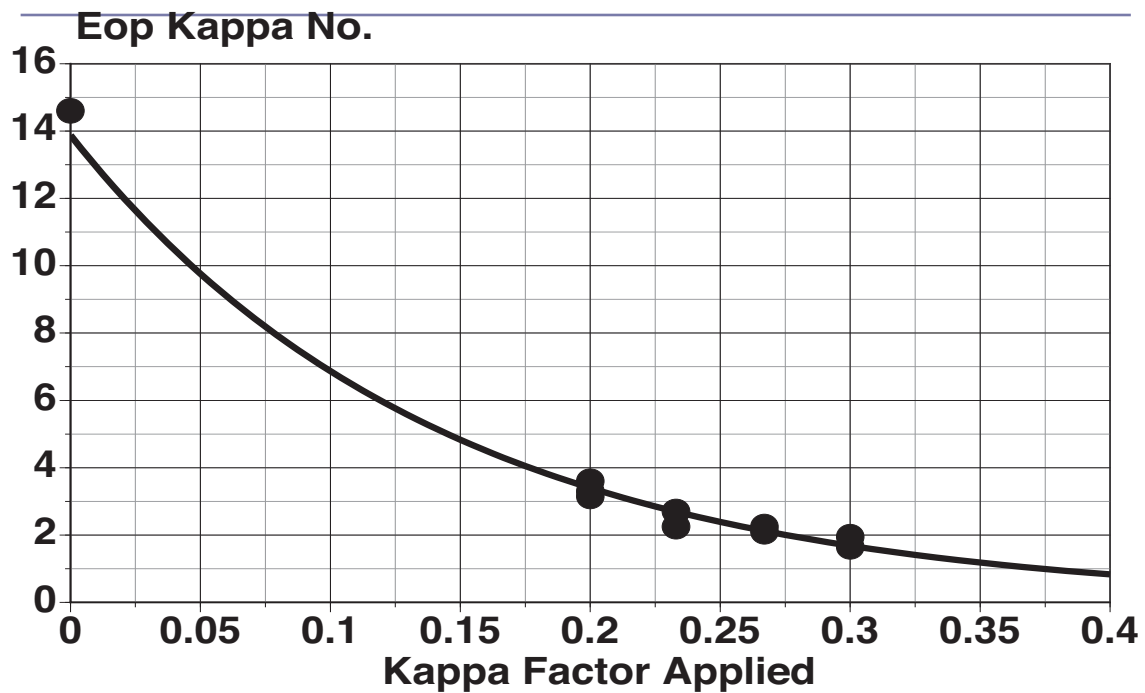


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Delignification with ClO₂

Oxygen Delignified Softwood

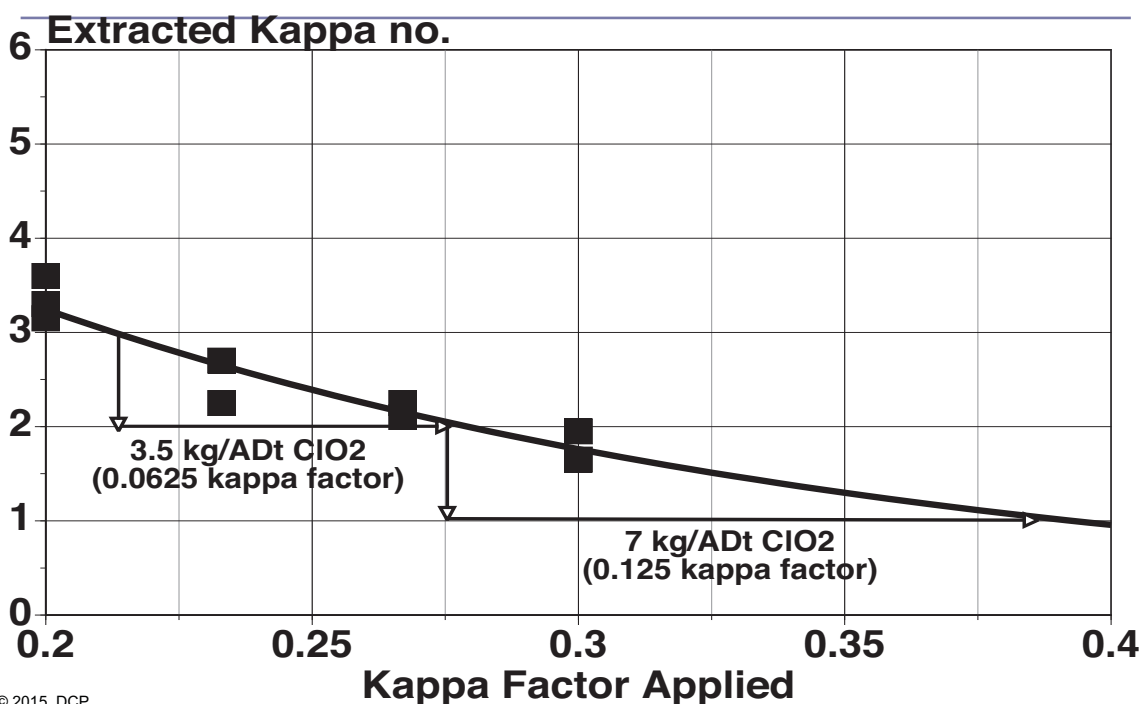
14.5 Kappa No.



Delignification with ClO₂

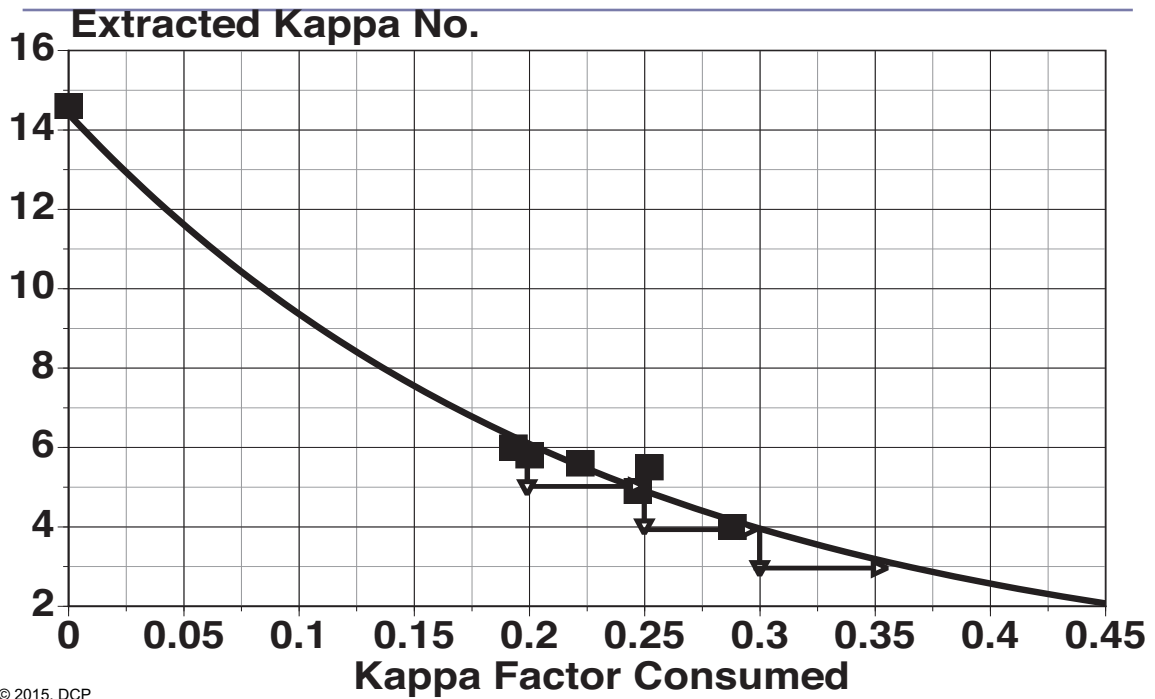
Oxygen Delignified Softwood

14.5 Kappa No.

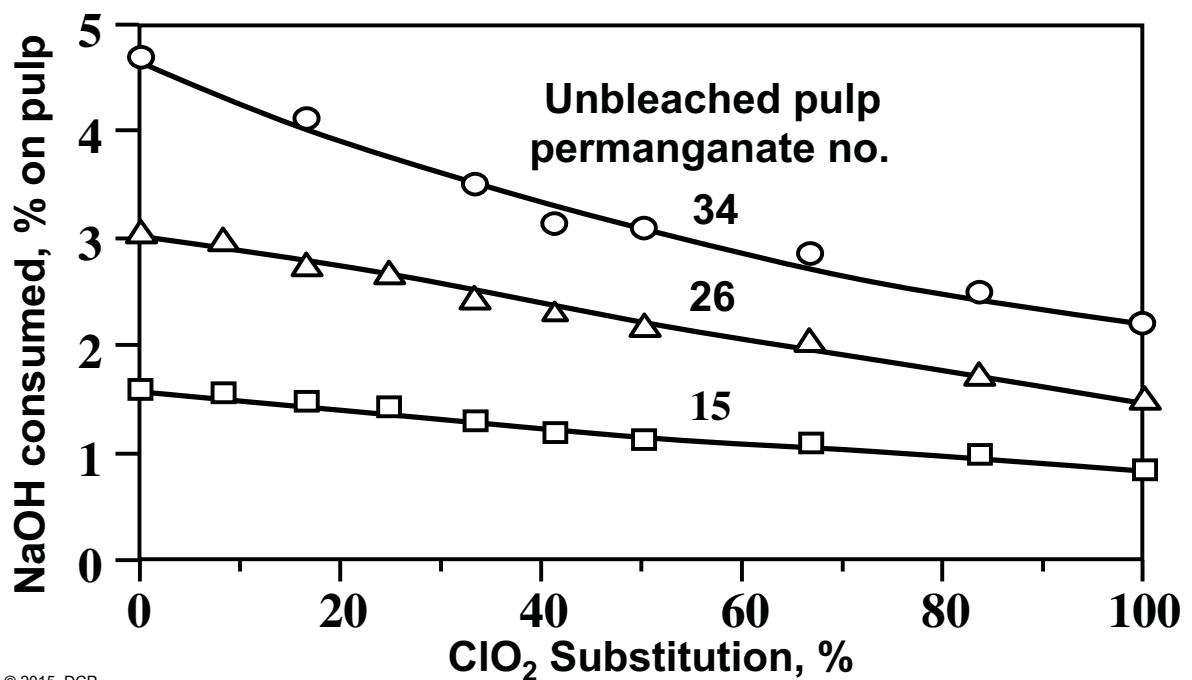


Hardwood Delignification with ClO_2

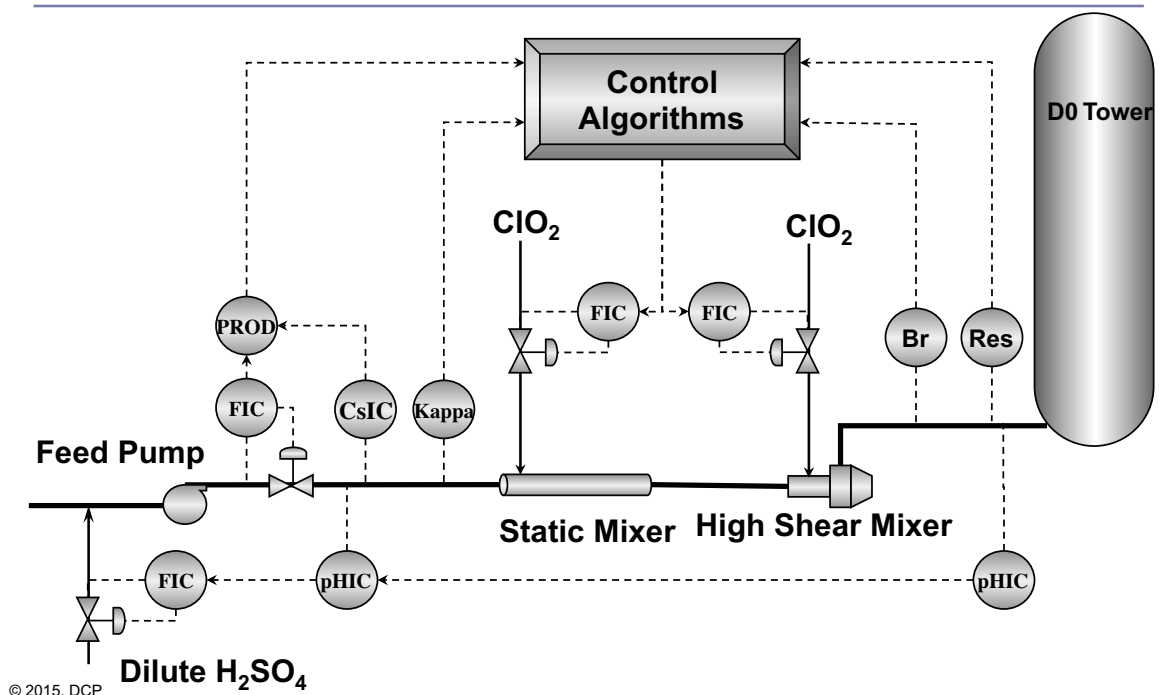
14.5 Kappa No.



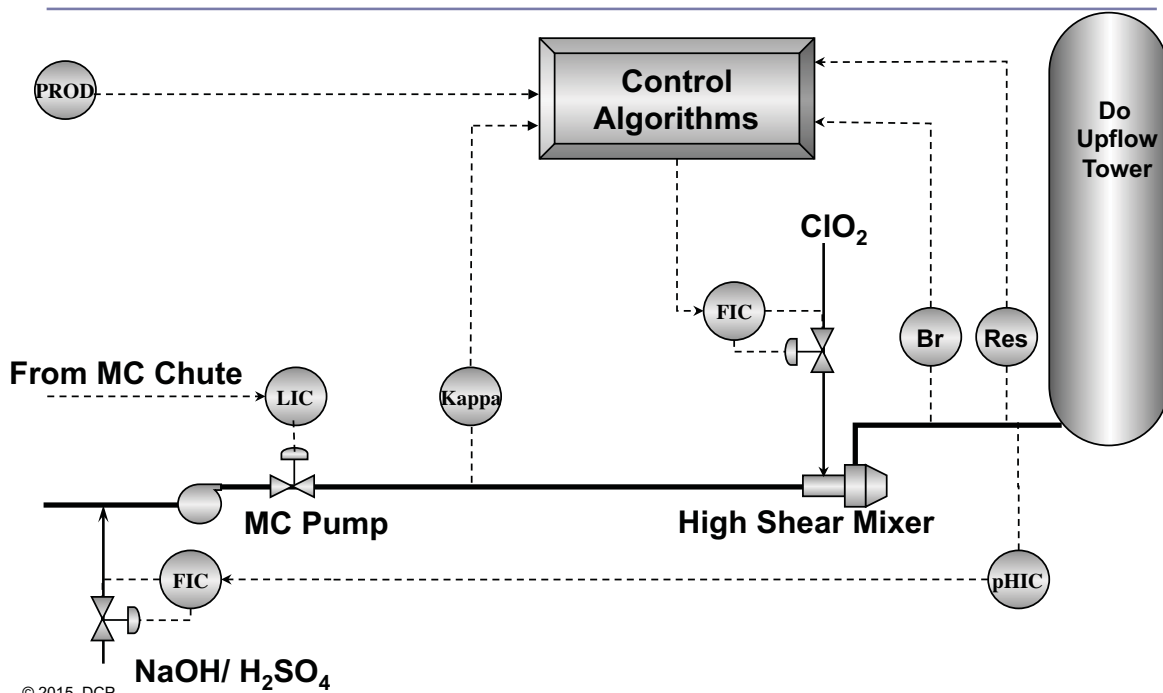
NaOH Consumption



Low Consistency ECF



Medium Consistency ECF



ECF Bleaching Practice

- Based on 2012/13 Pulp and Paper Technical Association of Canada (Paptac) Bleaching Committee Survey
- Responses from 23 mills with 37 ECF bleach lines or grades

Do Stage

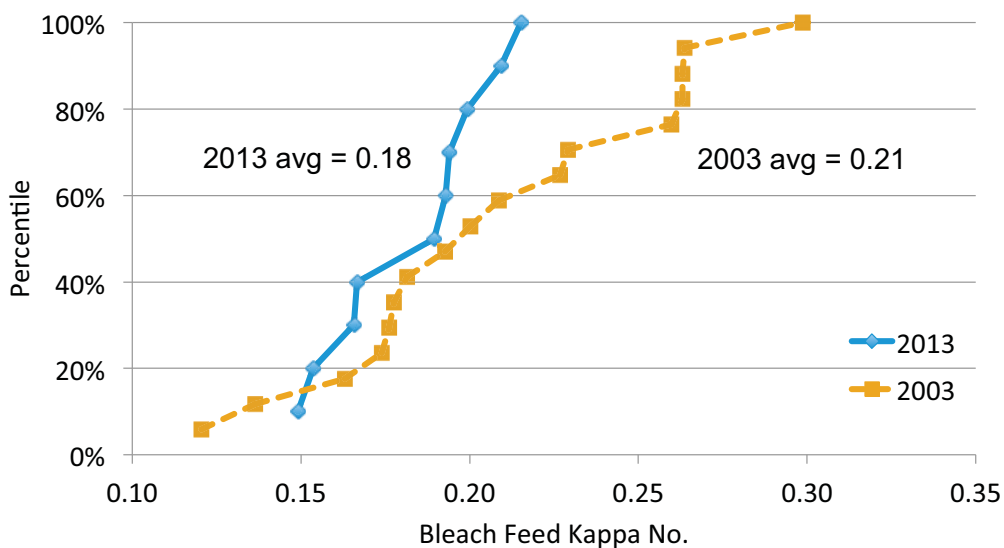
- Operating Conditions
 - 65% low cons. (LC) 35% medium cons. (MC)
 - 33 minutes retention time (25 to 75 min. range)
 - 50°C to 60°C
 - Operate to “zero” residual
 - End pH 1.5 – 3.0
 - Kappa Factor
 - Conventional Softwood 0.18 (0.15 – 0.22)
 - O₂-Softwood 0.27 (0.17 – 0.43)

Do Stage Control

- All bleach plants have installed on-line Kappa Analyzers
- Most bleach plants use some form of Kappa Factor and compensated Kappa Factor control in D_0
- The majority of mills use the E_1 -stage kappa no. for D_0 /Eop control
- Few use post Eop brightness

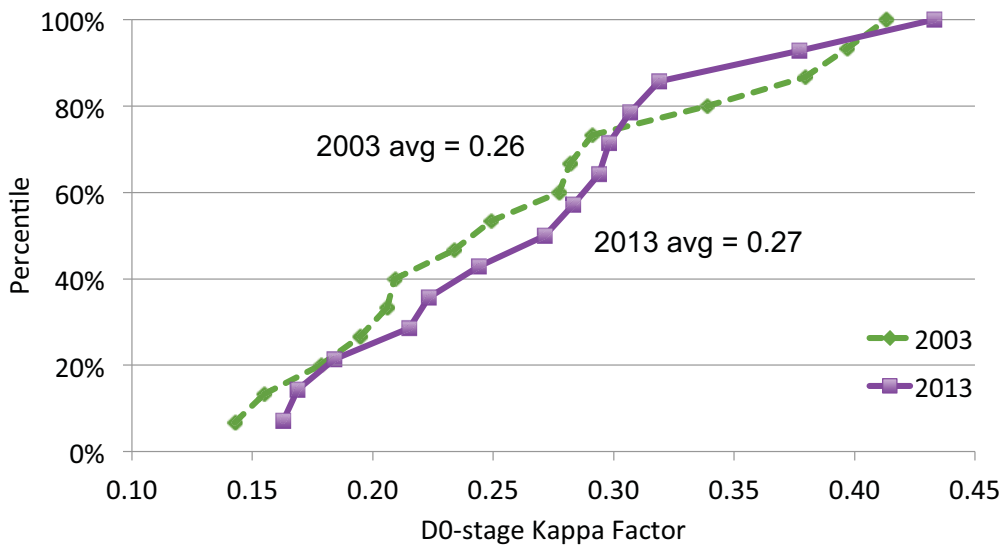
© 2015, DCP

Conventional Softwood Do Kappa Factor



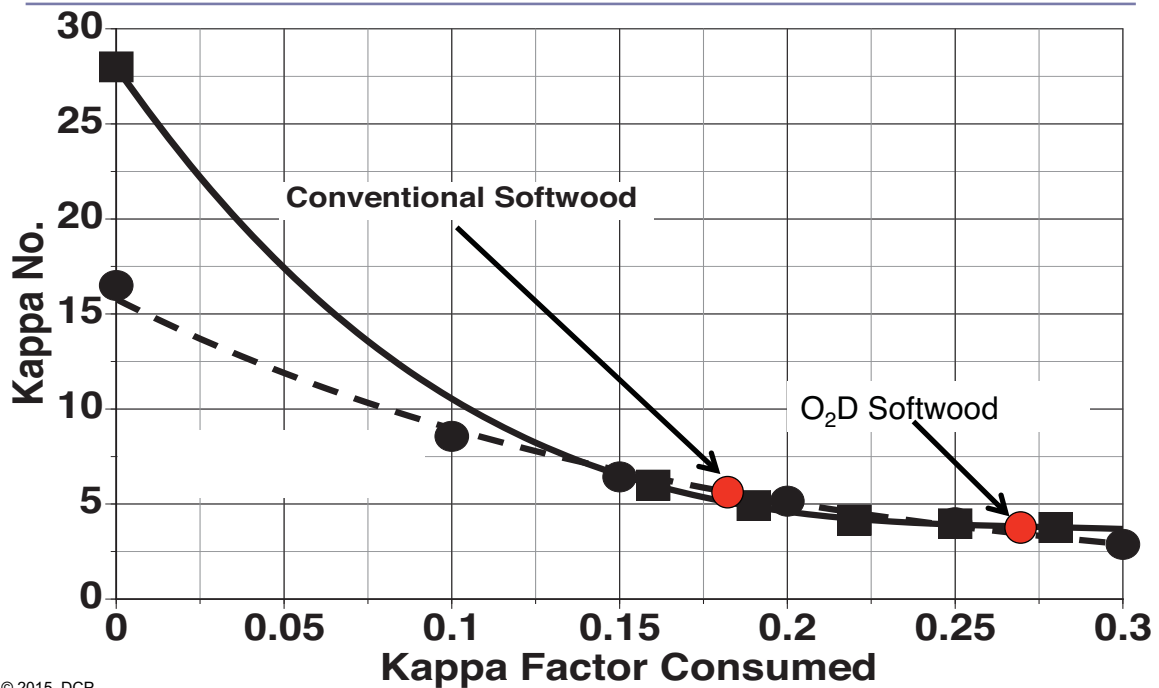
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Oxygen Delignified Softwood Do Kappa Factor



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Delignification with ClO₂



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Thanks!

E Stage Experiences

Harmac Pacific, Nanaimo

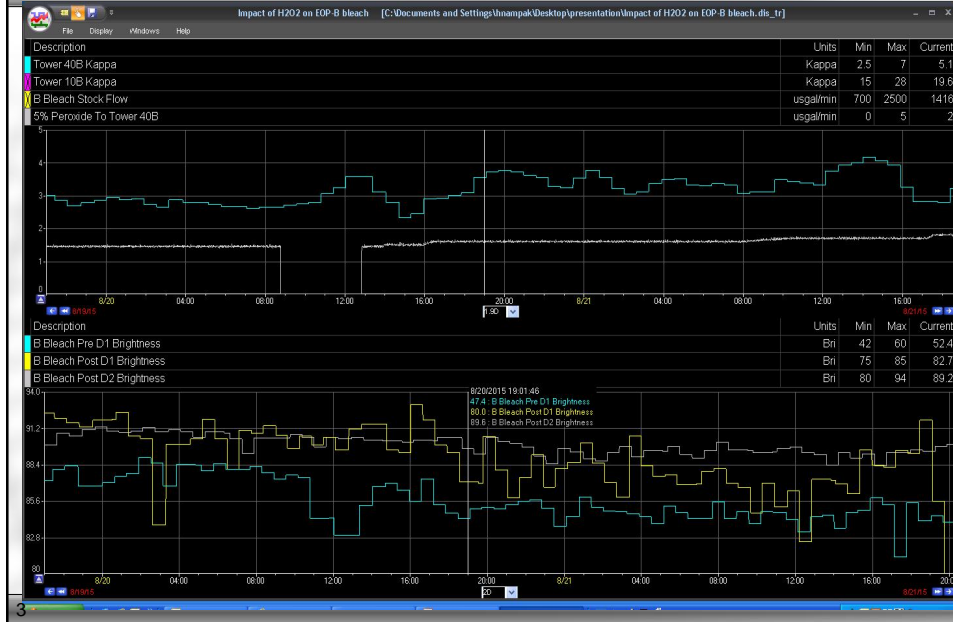


1

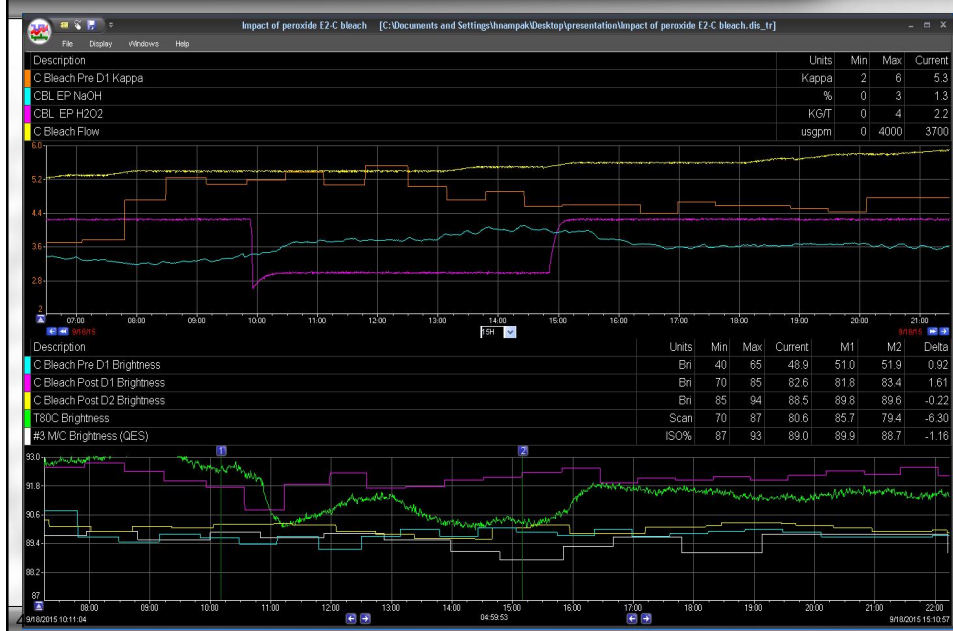
Impact of O2 on E1 stage (C bleach)



Impact of H2O2 on E1 stage (B bleach)



Impact of H2O2 in E2 stage



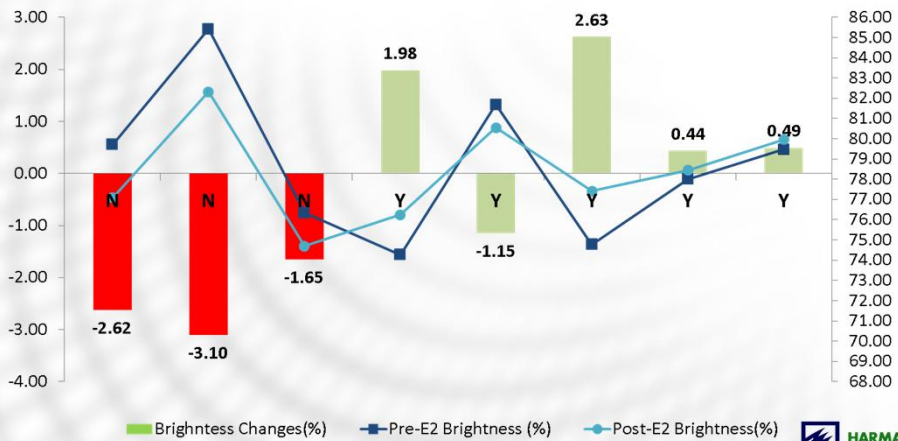
Impact of H2O2 in LC E2

H2O2 addition:	Y	N	N	Y	Y	Y	N	Y
W65B Vat pH	5.93	5.97	5.75	5.88	5.84	5.90	5.86	5.89
W65B Temp (°C)	71	71	71	71	71	71	71	71
W75B Vat pH	9.84	9.96	10.05	10.10	9.98	9.98	10.05	10.11
W75B Temp(°C)	59	59	60	59	61	59	59	59
Pre-E2 Brightness (%)	74.26	79.71	85.42	81.69	74.78	78.00	76.34	79.47
Post-E2 Brightness(%)	76.24	77.09	82.32	80.54	77.41	78.44	74.69	79.96
Brightness Changes(%)	1.98	-2.62	-3.10	-1.15	2.63	0.44	-1.65	0.49



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Impact of H2O2 addition in LC E2 stage



6

Extraction Stage Optimization for Lowest D0/Eop Combined Stages Costs

PAPTAC Bleaching Committee

2015 fall meeting
Nanaimo BC

by: Raymond Paquet

kemira

Content

- Objectives
- Assumptions
- Strategy

kemira

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Objectives

- Achieve lowest bleaching cost
- Get the most bleaching and delignification from peroxide in extraction stage
 - Use as much peroxide as possible
 - Peroxide about half the cost of chlorine dioxide
- Preserve as much as possible peroxide for the duration of extraction stage
- Target ending with few ppm of residual peroxide concentration in extraction stage washer vat
- No residual peroxide to be left in pulp leaving extraction stage washer to D1 stage

Assumptions

- Chlorine dioxide charge in D0 stage is proportioned to incoming pulp Kappa number
- No change in production rate, brown stock, D0 and extraction stages washing
- Target same CEK on pulp at extraction stage washer outlet
- Target same or higher brightness on pulp at extraction stage washer outlet
- The maximum effective amount of peroxide in extraction stage is in the order of but not limited to:
 - 0.6% on SWD
 - 0.3% on HWD

Strategy with no residual peroxide in Eop washer vat

- Step 1:
Increase peroxide charge by steps to get residual in washer vat
 - Limit peroxide charge to a maximum depending on wood species:
 - 0.6% on SWD
 - 0.3% on HWD
- Step 2:
Once peroxide charge giving residual peroxide in washer vat is reached, start cutting chlorine dioxide in D0 stage up until no residual peroxide is detected in extraction stage washer vat
- Step 3:
Go back to step 1 until maximum peroxide charge is reached

Strategy with no residual peroxide in Eop washer vat (cont'd)

- Step 4:
If no residual peroxide is detected after completion of steps above, start cutting caustic charge at extraction stage inlet
- Step 5:
Cut caustic until residual peroxide is detected in extraction stage washer vat
- Step 6:
Stop caustic reduction if CEK exceed target or if pulp brightness entering D1 stage starts dropping

Strategy with residual peroxide in Eop washer vat

- Step 1:
Start cutting chlorine dioxide charge in D0 stage up until no residual peroxide is detected in extraction stage washer vat
- Step 2:
Increase peroxide charge by steps to get residual in washer vat
 - Limit peroxide charge to a maximum depending on wood species:
 - 0.6% on SWD
 - 0.3% on HWD
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Go back to step 1 until maximum peroxide charge is reached

Strategy with residual peroxide in Eop washer vat (cont'd)

- Step 4:
If no residual peroxide is detected after completion of steps above, start cutting caustic charge at extraction stage inlet
- Step 5:
Cut caustic until residual peroxide is detected in extraction stage washer vat
- Step 6:
Stop caustic reduction if CEK exceed target or if pulp brightness entering D1 stage starts dropping

E_{OP} Stage control

Laurier Morissette, M.Sc.A., ing.



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E_{OP} stage pH control: why do it?

- Significant savings in NaOH if end pH can be lowered without affecting brightness
 - Target reduction from 10.8 to 10.3 results in ~2.0-2.5kg/ton NaOH saving
 - At ~0.50\$/kg NaOH, this represents ~330,000-410,000\$/yr for a 1000 bdmt/d.

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E_{OP} stage pH control: other incentives?

- Temperature affects how pH of E_{OP} filtrate behave
 - This is not temperature correction for the pH probe electronics
 - This is temperature compensation of solution
- Safety issue
 - Insertion/retraction of pH probe
 - Hot process media
 - High pH

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E_{OP} stage pH control: other incentives?

- Simplify and speed up preventive maintenance
 - Typically a long process for calibration
 - Insertion pH probe tends to have short life span (due to high temp, high pH, scaling)
 - Become insensitive with time (due to high temp, high pH, scaling)
 - Calibration accuracy
 - Measure in medium consistency pulp, calibrate in liquid

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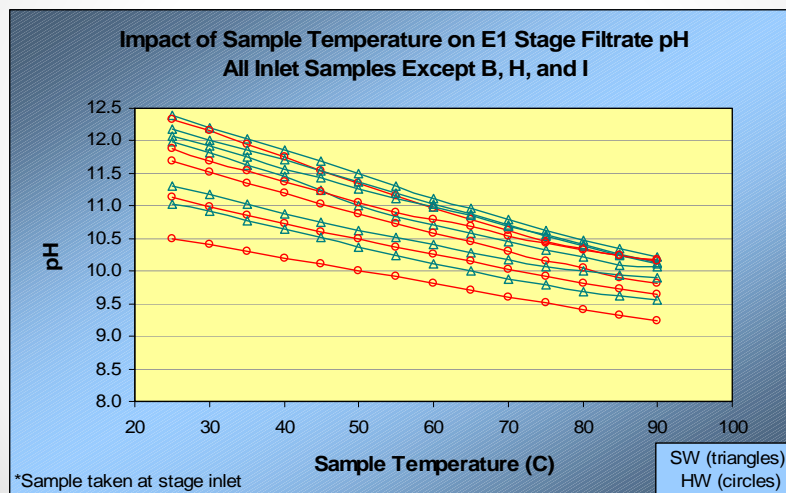
E_{OP} stage pH control: correction at 25°C

- Standardization at 25°C:
 - Report pH meter at 25°C at operator level
 - Report lab test at 25°C to the operator
 - Recommended to enter test results for pH & temperature in DCS for computation using same DCS compensation
 - Recommended 25°C because this is how pH are reported in technical papers by research facilities such as FPIinnovations
 - Allow comparisons from mill to mill
 - *However, any fixed temperature standardization would work...*
- Works for O₂ stages & E_{OP} stages of hardwood and softwood

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E_{OP} stage pH control: correction at 25°C



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E_{OP} stage pH control: How to do it?

- Safety issue
 - Recommend the use of filtrate extractor
 - Static type with filter screen
 - Piston type with squeeze mat
- Simplify and speed up preventive maintenance
 - Scarcier E&I resources
 - Calibration liquid-liquid

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E_{OP} stage pH control: How to do it?

- Filtrate extractor
 - Allow the use of cheaper pH probe
 - Safe handling of hot filtrate media
 - Faster calibration check
 - Use temperature measurement at pH probe location
 - Beware of built-in temperature measurement, here is it located on the probe
 - Use RTD on filtrate pot
 - Minimize deadtime with location close to pump/mixer
 - Also minimize piping diameter and pipe length to pH pot
 - Look for minimum 200-250ml/min filtrate flow
 - Flush back with combination of steam/hot water/air to avoid scaling deposit of filter screen and temperature shock of pH probe

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E_{OP} stage pH control: How to do it?

- pH probe preventive maintenance
 - Weekly
 - Use pH buffer 7 and 10, higher if available
 - Replace probe at fixed date
 - Have a historical tracking of pH probe
 - You may loose your accumulated savings by trying to extend probe life to failure.
 - When replacing a pH probe, always double check the next day. Somehow it needs to “cure in process media”

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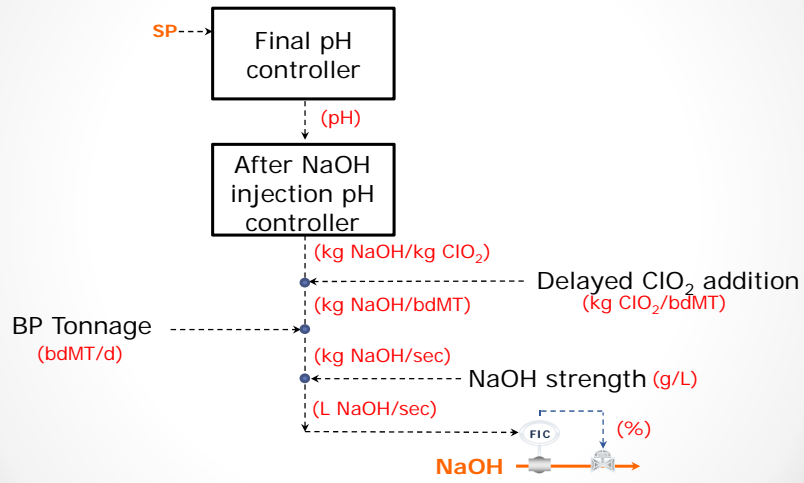
E_{OP} stage pH control:

- NaOH dosage is added as kg/ton, lb/ton or % applied
- Monitor/use NaOH/ClO₂ ratio – back up control
 - Indication of potential issues
 - Also used as limiter
- PID controller to be Lambda tune
 - with possible gain schedule on tonnage
- Multiple cascades loop possible
 - End pH is what we're after
 - Achieved by better control of pH early on
 - End pH
 - ph at top of upflow pipe or tube
 - before pressure control valve if present
 - at the botton of downflow tower some 5 ft above dilution ring
 - in the vat...(because this is where testing is done)

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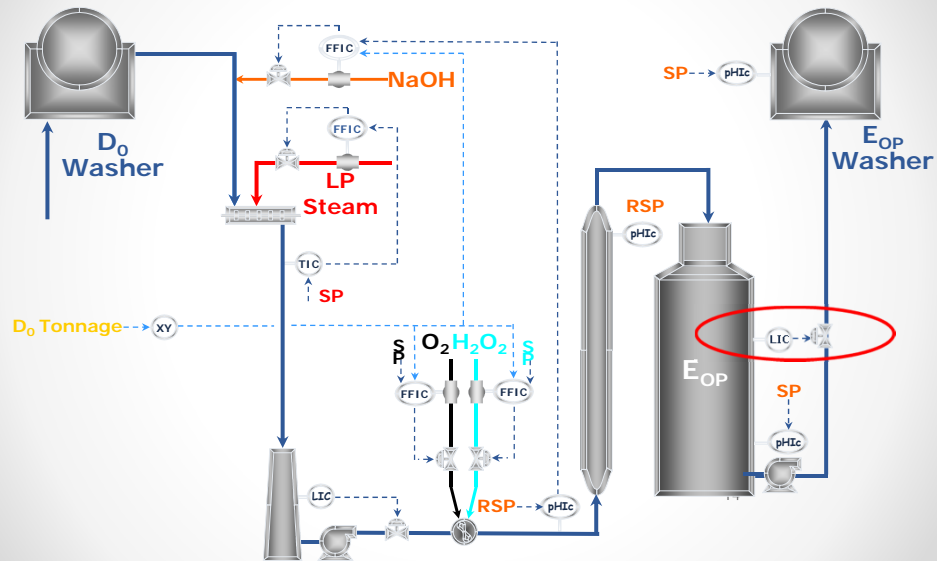
E_{OP} stage pH control:



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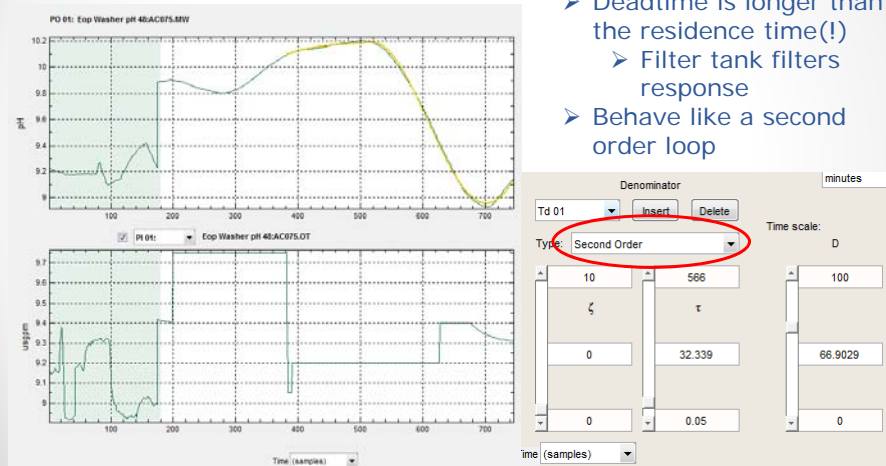
E_{OP} stage pH control:



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•

E_{OP} stage pH control: in the vat...



- Deadtime is longer than the residence time(!)
- Filter tank filters response
- Behave like a second order loop

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E_{OP} stage pH control:

- Multiple cascades loop possible
 - Permissive: time delay for PID on top of upflow tube
 - Permissive: time delay for PID at end of tower
 - Lambda tuned with gain schedule based upon tonnage
- Troubleshooting: when pH loop starts cycling, this is a strong indication pH probe has become insensitive
 - Don't retune the loop!!!
 - Change pH probe.
 - log life times and schedule PM for probe replacement
 - pH probe cost not worth running to failure

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Acknowledgment:

- Doug Reid & AKZO team for all testing on E_{Op} filtrate, and main author of technical paper: " THE IMPACT OF SAMPLE TEMPERATURE ON pH OF EXTRACTION STAGE FILTRATES "
- Brian LaBrash & team for sharing process data.
- Feedback from the BC participants to make me realize once again that process control engineers need to do a better job at explaining and simplifying control concepts. Too often, process control engineers take basic process control concept for granted.



Brightening with Chlorine Dioxide: The D1 and D2 stages

Paul F. Earl
Paul Earl Consulting Inc.

PAPTAC Bleaching Committee, Fall 2015 Meeting
Nanaimo, BC – September 21, 2015

ClO₂ Brightening Stages (D1 & D2)

▶ Purpose

- ▶ To brighten pulp to desired target
- ▶ To eliminate shives
- ▶ To decolourize bleachable dirt

▶ Options

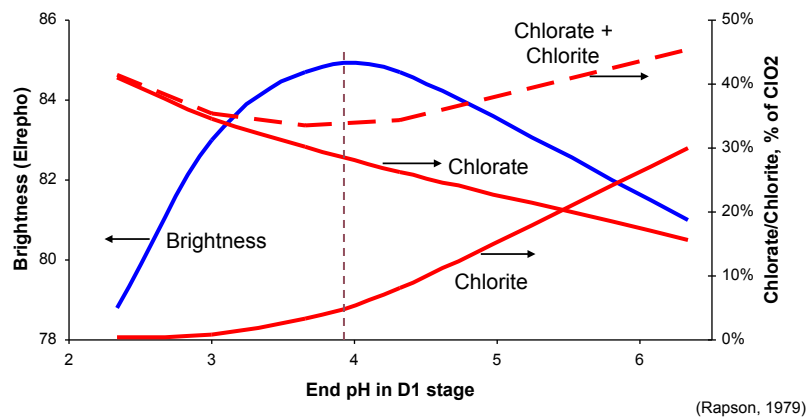
- ▶ D₁ – single ClO₂ stage
- ▶ D₁E₂D₂ or D₁EpD₂ – two ClO₂ stages with full alkaline extraction in-between (with or without peroxide reinforcement)
- ▶ (D₁E₂)D₂ – two ClO₂ stages with simple neutralization in between, without washing (also known as “DnD”)
- ▶ D₁D₂ – two ClO₂ stages with only washing in between

ClO₂ Brightening Stages (D₁ & D₂)

- 1) Impact of pH
- 2) Time & Temperature
- 3) Impact of Eop Washing
- 4) D₁-stage Brightness Development
- 5) Brightness Reversion or Brightness Loss?

Effect of D₁-stage pH on Brightness

Rapson's pH-Brightness curve; optimum end pH for brightening is 3.8-4.0.
Lab bleaching using 5-kappa SWD and 1% ClO₂ (10 kg/odmt)

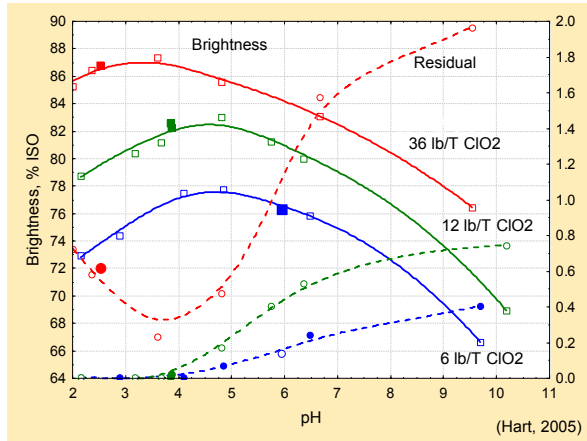


Effect of pH on Brightness (SWD)

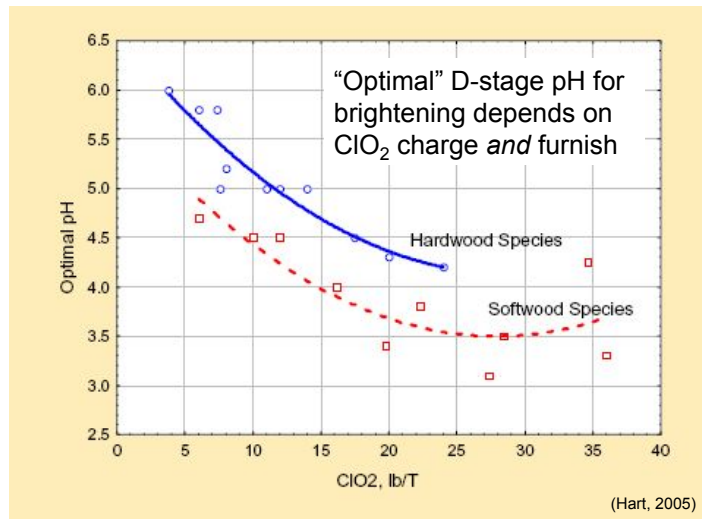
- New studies carried out to vary Rapson's conditions:
- For softwood pulp with high ClO₂ charges, the optimum D1-stage end pH was close to 3.8
- However at lower ClO₂ charges, the optimum end pH increased
- Results even more pronounced for HWD

Note: (20 lb/T = 10 kg/mt = 1% on pulp)

Softwood: D₁ stage: 4.1 kappa, 71°C for 180 min.

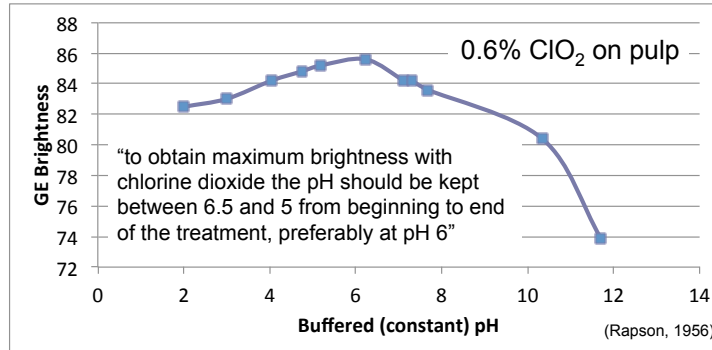


Impact of D1-stage pH (II)

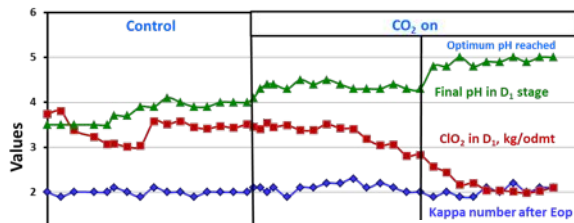


D1 Bleaching at *Constant* pH

Earlier studies by Rapson used laboratory buffer solutions (phosphates) to maintain a *constant* pH.

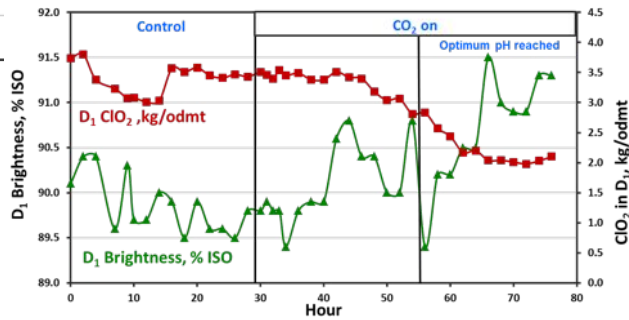


“Near Neutral” Brightening



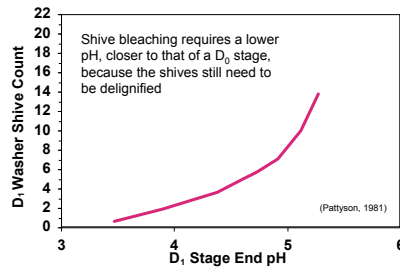
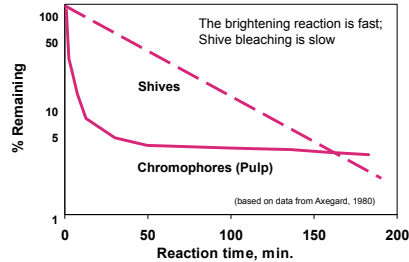
Buffering the final D stage with NaHCO₃ allows for higher pH and more efficient use of ClO₂

(Audet, 2014)



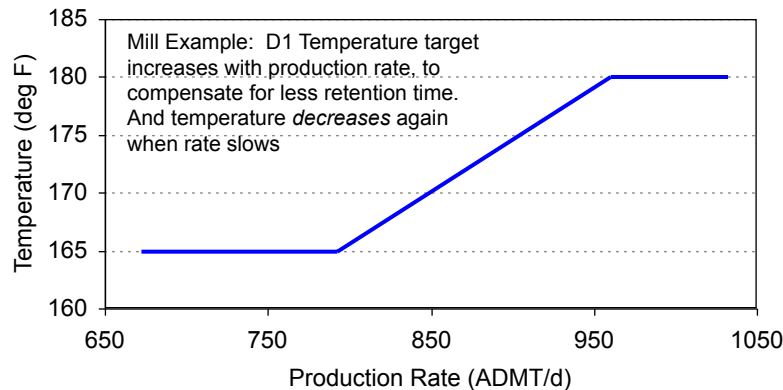
Bleaching Shives

- ▶ Shive bleaching is favoured by:
 - ▶ Long reaction time (time needed for penetration)
 - ▶ Lower temperature (shives bleach slower than fibres)
 - ▶ Lower pH (delignification vs. brightening)
- ▶ Because of long retention time, D1 stage is the preferred bleaching stage to remove shives
- ▶ Lower pH in D1 means a trade-off between brightness development and shive removal
 - ▶ Must keep end pH <3.5



D₁-stage Temperature & Time

Higher temperatures make ClO₂ react **faster**, not better.
 Rule-of-thumb: an increase of 10°C (18°F) doubles the rate of reaction



Eop Washer Carryover

Eop washer carryover consumes ClO_2 in the D1 stage

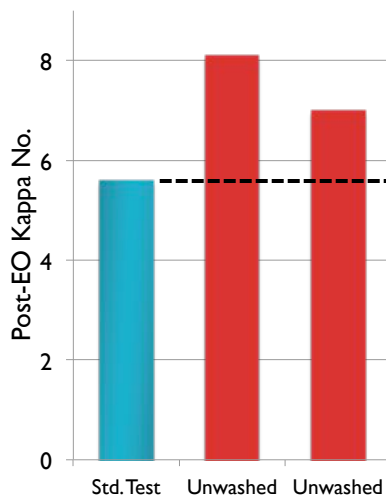


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"Wet" Kappa No. Testing



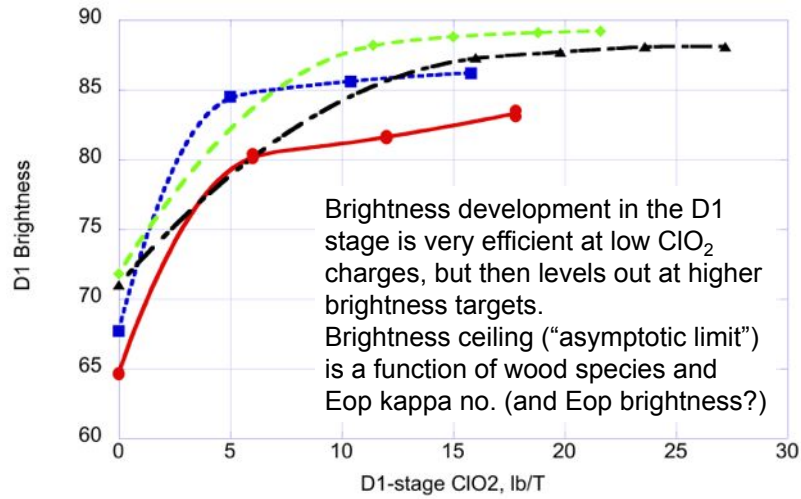
- ▶ "Wet" or "unwashed" kappa no. test includes the filtrate surrounding the pulp sample
- ▶ Measures contribution of carryover
- ▶ Example on left indicates that on average, 25% of the ClO_2 added to the D1 stage is being consumed by EO carryover

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D1 Brightening - Hardwood

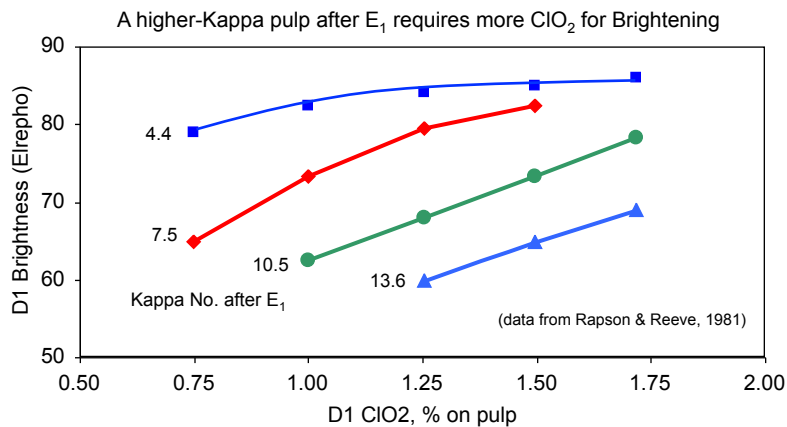


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D₁-stage Brightening

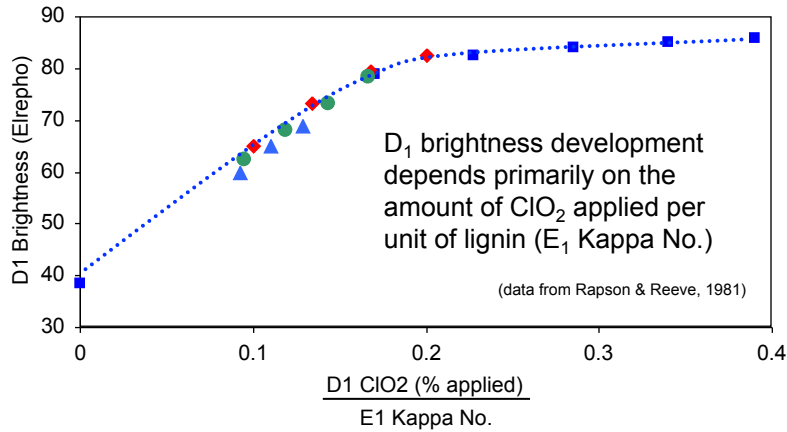


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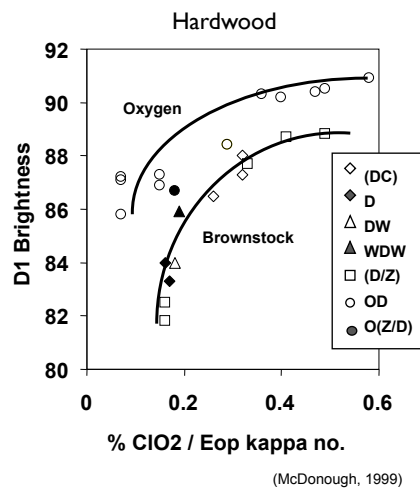
14

D₁-stage Brightness Development



Chlorine Dioxide Brightening

- ▶ D₁-stage brightening efficiency depends on the ClO₂ charge and the Eop Kappa No.
- ▶ For HWD, D₁-stage brightening efficiency decreases when ClO₂ use exceeds ~0.25% ClO₂ per Eop kappa no. (~2.5 kg/mt or ~5 lb/T per kappa)



Brightness Reversion

- ▶ Light, heat, certain chemicals, and aging can all form (or re-form) chromophores in the pulp
 - ▶ Fibres will absorb more light and brightness is decreased
 - ▶ “yellowing”
- ▶ Possible causes:
 - ▶ Zero residual & high temperature in tower, before dilution/neutralization and washing
 - ▶ Residual lignin
 - ▶ Poor Eop extraction stage
 - ▶ Oxidized cellulose
 - ▶ Hypochlorite, Ozone, even ClO_2 under wrong conditions
 - ▶ Drying or baling at high temperature
- ▶ Reversion cannot be reversed without adding more bleaching chemicals

Brightness Loss

- ▶ A decrease in brightness that takes place when light-absorbing chemicals are deposited onto the fibres
- ▶ Possible causes:
 - ▶ Caustic
 - ▶ Dyes
 - ▶ Poor-quality white water
 - ▶ Metal ions
 - ▶ esp. Manganese (forms MnO_2)
- ▶ Brightness loss can be reversed if the material can be washed out of the pulp

Reversion or Loss?

- ▶ Check brightness measurement
 - ▶ Different brightness meters in different departments?
 - ▶ Different procedures for testing or handsheet-making?
- ▶ Check effects of wash water & white water; compare handsheets made with:
 - ▶ Deionized water
 - ▶ Acidified DI water (loss)
 - ▶ White water (loss)
 - ▶ Filtered white water (loss)

ClO₂ Brightening Stages: D1 & D2

- ▶ Thank you
- ▶ Questions?

How to Final P

Dan Davies
Greg Melenkevitz
Gerhard Arnold



What is Final P?

- Application of H_2O_2 at end of sequence
 - Formal bleaching stage
 - Defined retention time
 - Conventional tower
 - Bleached Hi-D
 - Surge tower
 - Variable retention time

Why Final P

- Brighten pulp, reduce reversion
- Shortage of ClO_2
 - Undersized generator
 - Increase in production
- Excessive brightness reversion
- Replace some or all ClO_2
 - Only at end of sequence
 - Not D0

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Why Final P

- Advantages
 - Higher brightness
 - Less brightness reversion
 - Lower dosage
 - Most effective location to apply H_2O_2

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Chemistry

- Two stages are better than one!
 - D1 and D2, versus single final D
 - pH swing helps even more
 - DED versus DD
 - Same benefits to DP
 - Two separate stages
 - pH swing

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Chemistry

- ClO_2 is an electrophile
- H_2O_2 is a nucleophile
- React with different species
- Nucleophiles prevent reversion
- Alkali: NaOH & $\text{Mg}(\text{OH})_2$

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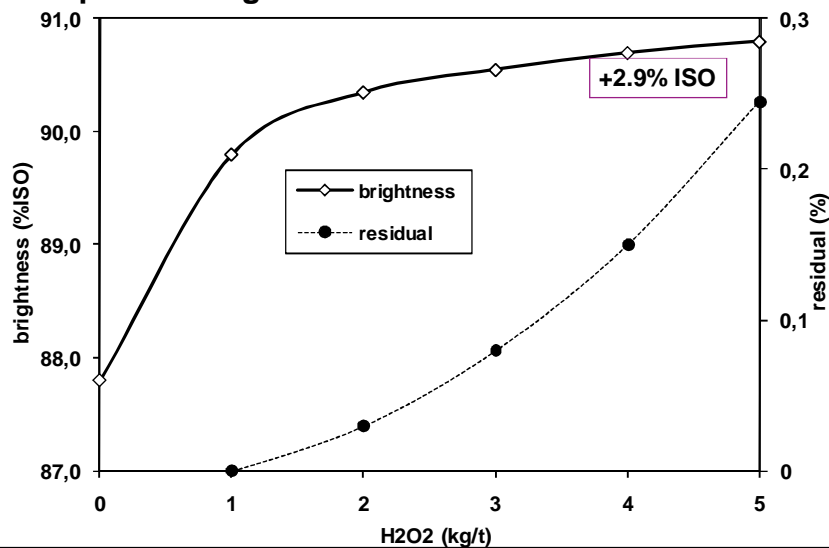
Benefits

- Brightness Gain
 - Depends upon style: Formal vs. Hi-D
 - Formal stage gives up to 5 or 6% ISO
 - Up to 5kg/t H₂O₂
 - Hi-D gives up to 3 or 4% ISO
 - Up to 2kg/t H₂O₂

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Brightness Gain

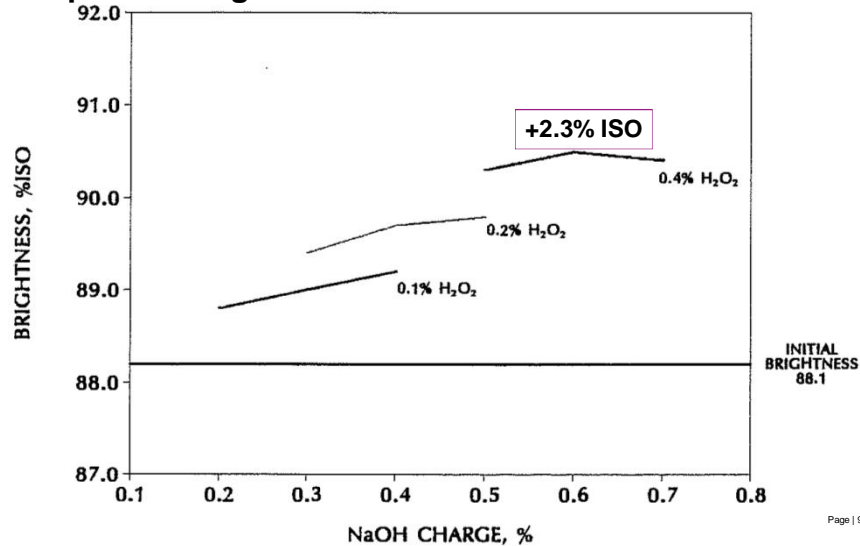
DEopDP – using a conventional tower



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Brightness Gain

DEopDP – using a bleached Hi-D

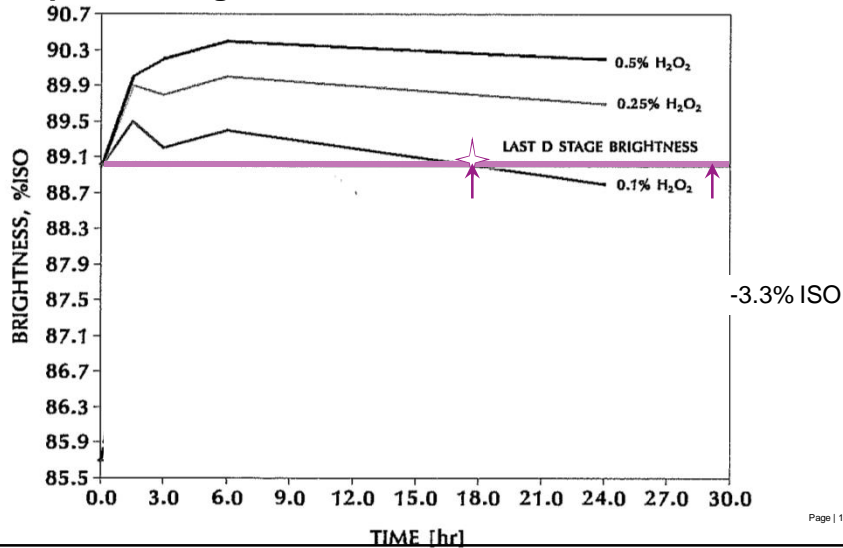


Benefits

- Brightness Reversion
 - Difference in chemistry means less reversion
 - Even small dosage helps
 - 0.1% H₂O₂ gives 0.5% ISO gain
 - Advantage in reversion is 1.5% ISO

Brightness Reversion

DEopDP – using a bleached Hi-D

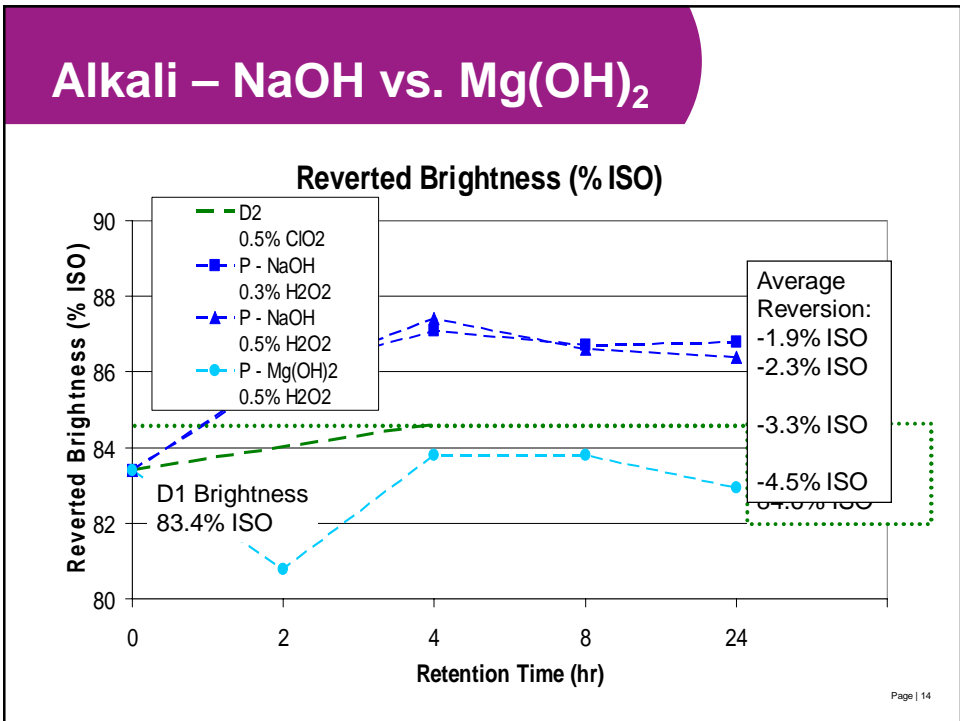
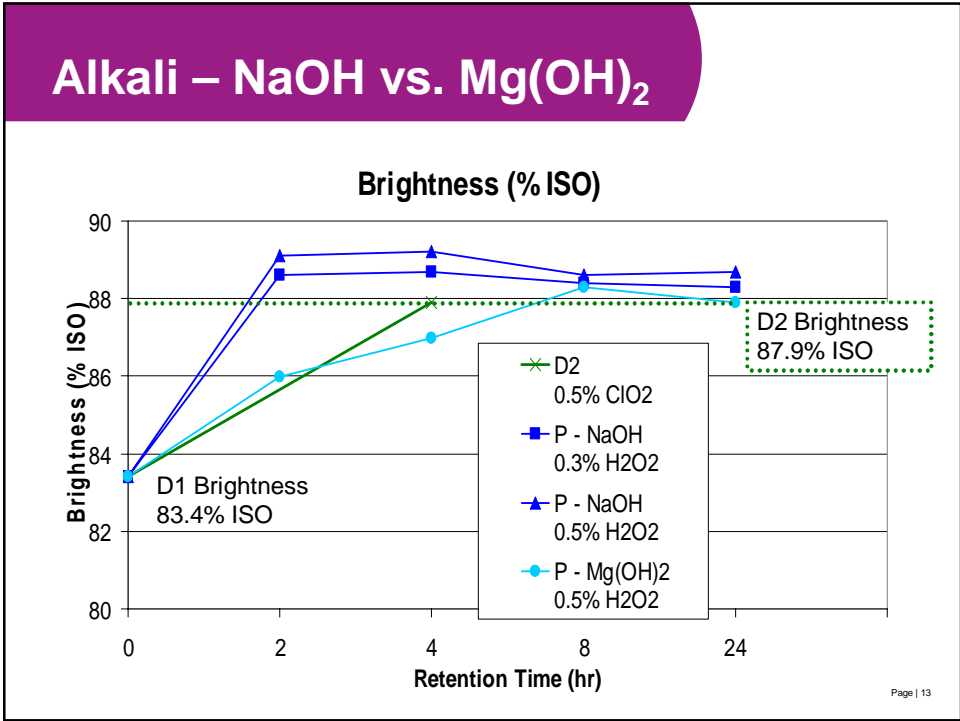


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Alkali – NaOH or Mg(OH)₂

- Advantages of Mg(OH)₂ over NaOH:
 - Cost
 - Slow reacting
 - Low pH
- Disadvantages:
 - Similar to use in conventional stages
 - Does not activate H₂O₂ as strongly
 - Other...

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Alkali – NaOH vs. Mg(OH)₂

- Significant disadvantages!
- Handling, solubility, reactivity
 - Low pH requires longer retention time
- Slow brightness gain
 - Reduces flexibility
- Poor reverted brightness

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Conditions

- Formal Stage
 - Defined retention in conventional tower
- Conditions set by:
 - Goals – brightness gain, reversion, ClO₂ savings
 - Available equipment – tower size, washers, etc.
 - Previous treatment – temperature, brightness

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Conditions – Formal Stage

- Retention time, 2 to 5hr
 - Can adjust to other times
- Temperature 60 to 85°C
 - Too low slows reaction
 - Too high consumes too much H_2O_2
 - H_2O_2 dosage depends upon goals
 - NaOH dosage depends upon conditions

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Conditions – Formal Stage

- Residual chemical
 - Need residual to prevent reversion
- May need to eliminate
 - SO_2 consumes H_2O_2 and lowers pH
 - Catalase only reacts with H_2O_2

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Conditions – Bleached Hi-D

- Accomplish goals similar to formal stage
 - Some significant differences
- Primary purpose is surge tower
 - Variable retention time
 - Must accommodate primary purpose
- Still achieve some brightness gain
- And prevent reversion

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Conditions – Bleached Hi-D

- Must accommodate existing conditions:
 - Retention time range 1 – 20+hr
 - Temperature?
 - Incoming pH?
- Must achieve brightness gain quickly ~1hr
- Must not revert over long periods ~20+hr
- Possible, but lose some brightening efficiency

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Conditions – Bleached Hi-D

- Special case – no alkali
- Conventionally, need alkali to activate H_2O_2
- Low H_2O_2 dosage with no alkali
 - Low brightness gain
 - Prevent reversion
- Must at least be close to neutral pH
 - Prevent viscosity loss

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Formal or Hi-D?

- Depends on targets and available equipment
- Suitable tower → Formal
- No 'spare' tower → Hi-D

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Thank You!

Questions?



PAPTAC Bleaching Committee
Section 6 – PROJECTS SESSION PRESENTATIONS
Nanaimo, BC; September 21-23, 2015

See following presentations.

Methanol

Safe Handling, Loading / Unloading,
Transportation / Storage

WHAT IS METHANOL?

- o Methanol is a colorless alcohol, hygroscopic and completely miscible with water, but much lighter.
- o Methanol, also known as methyl or wood alcohol, is a colorless organic liquid at normal temperature and pressure.
- o The particular hazards of methanol that matter most to your facility depend in large part on how methanol is received and stored, how it is used, where it is used, and how much is stored and used at any given time.

FIVE OVERRIDING CONSIDERATIONS ARE IMPORTANT WHEN HANDLING METHANOL:

- Methanol is a flammable, easily ignited liquid that burns and sometimes explodes in air.
- The molecular weight of methanol vapor is marginally greater (denser) than that of air (32 versus 28 grams per mole).
- In certain specific circumstances, methanol vapor may explode rather than burn on ignition.
- Methanol is a toxin;
- Methanol is totally miscible in water and retains its flammability even at very high concentrations of water.

TRANSPORTATION AND STORAGE OF METHANOL

Ocean-Going Transport

- Methanol is pumped from dockside storage tanks into sealed cargo holds of tanker ships. Delivery to dockside storage may be by pipeline, barge, rail, or truck.
- Double-hulled vessels are commonly used by shippers.
- Accidental releases into open ocean are to be avoided, but are considered to pose less of a threat to the environment than crude oil, bunker fuel, gasoline, or diesel fuels. Solubilisation of pure (100%) methanol in water is rapid and complete.

TRANSPORTATION AND STORAGE OF METHANOL, Cont.

Rail Transport

- Precautions for rail transport are much the same as those for ethanol, gasoline, MTBE, jet fuel (kerosene), and distillate. This includes grounding for protection against static discharge.
- Specially designed tanker cars are equipped with provisions for pressure relief in order to accommodate thermal expansion during transit and short-term (less than 30 days) side-lining during switching and temporary holding. Rail transport is considered to be safe, as long as methanol is contained within an upright tanker car.
- In the event of derailment, first responders should treat methanol as highly flammable and highly toxic.

TRANSPORTATION AND STORAGE OF METHANOL, Cont.

Tanker Truck Transport

- Comments relating to rail tank cars apply equally for tankers attached to tractor haul trucks and for tank trailers towed by tractor haul trucks. Methanol transport by truck haulage is subject to substantially the same precautions as are routinely exercised for gasoline transport.

METHANOL STORAGE

- Storage of methanol is subject to substantially the same provisions as those used for gasoline storage.
- Because methanol is commonly stored with other solvents and feed stocks, all piping and valves subject to carrying methanol should be consistently labeled, and direction of flow should be indicated.
- Methanol burns with a non-luminescent flame, which may be invisible in bright sunlight.

METHANOL STORAGE, Cont.

Docks and Marine Terminals

- Storage facilities at docks and marine terminals are typically floating roof tanks, dedicated to methanol handling. Internal floating roofs are preferred to avoid contamination.

Tank Farms

- Tank farms at facilities such as refineries and chemical plants likely have dedicated methanol storage and handling systems.

METHANOL HANDLING

Certain aspects of methanol handling require special provisions and protective measures. These include the following:

- o As much as possible, methanol should be stored and used in a dedicated area that is specifically marked off and appropriately labeled.
- o The area designated for methanol handling should be equipped with an effective audible alarm, which will summon assistance in a timely manner.
- o Use positive materials identification for gaskets, filters, hose material, and similar supplies.
- o Replace gaskets, hoses, and “O” rings periodically, *before* they are expected to degrade or fail.
- o Ensure that procedures are in place to:
 - o ground, and periodically verify grounding.
 - o protect from water uptake and accumulation.
- o Ensure that provisions and procedures are in place to/for:
 - o prevent spilled methanol from entering drains, manholes, and confined spaces.
 - o preventing methanol entry into the water table or aquifers.
 - o personnel protection and exposure mitigation. This should include eye wash and shower stations.
- o Ensure that procedures and equipment are in place for:
 - o leak detection and alarm.
 - o onsite emergency response.
- o Ensure that procedures and possibly specialized equipment are in place for offsite emergency responders.

PRECAUTIONS FOR LOADING, UNLOADING, TRANSPORT AND STORAGE OF METHANOL

- o Methanol requires that handlers pay particular attention to two specific hazards in order to avoid accidental release and ignition of methanol and methanol mixtures:
 - 1.) accidental combustion hazard, *and*
 - 2.) accelerated corrosion of common containment alloys.
- o Hazards associated with loading, unloading, rail and road transport, and tank storage of methanol are essentially the same regardless of intended use.

BEST PRACTICE

- o In order to prevent fire, practices for loading, unloading, transporting, and storing methanol should consider taking the following precautions:

1) Avoid accumulation and subsequent discharge of static electricity within low methanol concentration blends which may result from turbulence:

a) Control flow rate into and out of containers to minimize turbulence and avoid accumulation of static electricity within the flowing liquid;

b) Discharge through a liquid seal dip leg pipe rather by free-falling through air to prevent air entrainment, absorption of moisture, and accumulation of static electricity in the falling liquid; Bond and ground tanks, vessels, containers, and associated piping,

c) Avoid switch loading with gasoline, diesel, and other petroleum products that have bulk electrical conductivities less than 50 picosiemens per meter.

2) Isolate liquid and vapors from recognizable ignition sources to a radial distance of 50 feet.

BEST PRACTICE, Cont.

OR

3) Prevent contact with air (oxygen) by padding free board in vessels tanks and containers with inert gas (e.g., nitrogen). Consider using a combination of gravity and pressure transfer using nitrogen rather than pump transfer.

4) Cordon the area surrounding transfer to a radial distance of 50 feet and use caution tape and signage indicating presence of a flammable hazard.

5) Seal drains and sewers to a distance of 50 feet or more as appropriate. Methanol spills may create flammable mixtures of vapor in air as they run down hill and pool.

6) Use appropriate personal protection equipment.

BEST PRACTICE, Cont.

Electrical Classification

- o Electrical equipment within the proximity of methanol storage and handling must be explosion proof to meet National Electrical Code requirements.

Grounding and Bonding

- o Grounding is especially important in protecting methanol from accidental ignition resulting from static discharge
- o Grounding is required for lighting systems, pipe racks, pumps, vessel, filters, and all other equipment near and potentially within range of methanol vapor.
- o Hoses must be grounded.
- o Methanol transfer operations should be bonded and grounded.
- o Metal containers (drums or totes) and the associated fill equipment pump should be bonded together and grounded during methanol transfer operations. Fill pipes or hoses should be conductive and should be bonded to the filling system

HEALTH AND SAFETY

- o Methanol should always be kept within closed systems and not left open to the atmosphere.
- o The building ventilation system should provide fresh air for normal operation and should take into consideration the possibility of a leak.

HEALTH AND SAFETY, Cont.

Personal Protective Equipment

- Exposure to methanol can occur via inhalation, skin absorption, contact with the eyes, or ingestion, whenever methanol is used or handled.

Respiratory Protection

- Respiratory protection should be selected based on hazards present and the likelihood of potential exposure.

HEALTH AND SAFETY, Cont.

- The following table is a guide for whether respiratory protection is required or not, when the air concentration of methanol is known.

Respiratory Protection Guide

Air Concentration of Methanol	Respiratory Protection
<200 ppm	No protection required. Skin and eye protection may still be needed.
200 ppm or greater	Protection required if the daily time-weighted-average (TWA) exposure is exceeded or if there are additional routes of exposure (skin, eyes, ingestion). A supplied air system must be used if protection is needed.
>200 ppm sustained	A supplied air breathing apparatus (SCBA) system must be used (i.e., positive-pressure SCBA).

HEALTH AND SAFETY, Cont.

Chemical-Resistant Clothing/Materials

- Chemical-resistant clothing/materials should be worn if repeated or prolonged skin contact with methanol is expected. These may include rubber boots, resistant gloves, and other impervious and resistant clothing. Chemical-resistant materials include butyl rubber and nitrile rubber. Use chemical goggles when there is a potential for eye contact with methanol, including vapor. A full face-shield may be worn over goggles for additional protection, but not as a substitute for goggles.

Personal Protective Equipment Selection

Low risk of vapor/low risk of volume splash	High risk of vapor/low risk of volume splash	High risk of vapor/high risk of volume splash
Fire retardant clothing	Full chemical resistant suit	Full chemical resistant, impermeable suit
Gloves (Silvershield or disposable nitrile)	Chemical-resistant rubber gloves	Chemical-resistant rubber gloves
Safety glasses with side shields	Full face supplied air respirator	SCBA or compressed air breathing apparatus (CABA)
Full boot cover	Chemical-resistant rubber boots	Chemical-resistant rubber boots

FIRST AID MEASURES

A Safety Data Sheet (SDS) for methanol or materials containing methanol should be carefully reviewed for information on first aid measures.

Inhalation

- In case of inhalation of methanol vapors, first remove the individual to fresh air if it is safe for you to do so, and keep him or her warm and at rest. Monitor for respiratory distress. If difficulty in breathing develops or if breathing has stopped, administer artificial respiration or cardiopulmonary resuscitation (CPR) immediately and seek medical attention. If trained to do so, administer supplemental oxygen with assisted ventilation, as required.

Skin Contact

- In case of contact with skin, immediately use an emergency eyewash or safety shower, and flush the exposed area with copious amounts of tepid water for at least 15 minutes. Contaminated clothing and shoes should be removed under the shower. Wash the area thoroughly with soap and water. Seek medical attention if irritation or pain persists or if symptoms of toxicity develop. Wash contaminated clothing and shoes before reuse.

Eye Contact

- In case of contact with eyes, immediately irrigate the eyes with copious amounts of tepid water for at least 15 minutes. The eyelid should be held apart during the flushing to ensure all accessible tissue of the eyes and the lids are in contact with water. Obtain medical attention.

Accidental Ingestion

- Ingestion of methanol may be life threatening. Onset of symptoms may be delayed for 18 to 24 hours after ingestion. Do not induce vomiting. Get medical attention immediately. The individual should remain under close medical care and observation for several days.

SPILL RESPONSE

Steps if a Spill Occurs

The first steps to take if a spill occurs are:

- o Stop or reduce methanol release rate at the point of release, if it can be done safely.
- o If there are noxious vapors, evacuate, sound a vapor release alarm, and notify supervisor or emergency coordinator.
- o Eliminate all sources of ignition to a safe standoff distance from the point of release and nearby methanol pooling.
- o Evacuate all persons not wearing protective equipment from the area of the spill or leak until cleanup is complete (this requires that cleanup levels be pre-determined).
- o Do not walk through spilled product. Avoid skin contact and inhalation.
- o Stay upwind and keep out of low-lying areas that might accumulate vapor.
- o For large spills and fires, immediately call the fire department.

SPILL NOTIFICATION AND REPORTING

- o Federal, State and Local government agencies may have notification and reporting requirements following a hazardous materials spill.
 - o Methanol's Reportable Quantity in the United States is 5000 pounds (2.2 tonnes), which is equivalent to 755 gallons (2858 liters).
 - o In Canada, reporting requirements are triggered for spilled amounts as low as 53 U.S. gallons (200 liters).
 - o In the European Union (EU), the public will be able to access an electronic database on pollutant releases through Regulation Number 166/2006 (European Pollutant Release and Transfer Register).
- o Spill notification may trigger requirements to remediate the spill area and restore any damage to the environment, in addition to penalties and fines.

WASTE MANAGEMENT

- o Methanol is a commonly used solvent in many organic reactions, and the resulting spent methanol is considered a hazardous waste.
- o Waste methanol, or water contaminated with methanol, is considered a hazardous waste and must never be discharged directly into sewers or surface waters. It may only be disposed of at a licensed facility permitted to handle Hazardous Waste.



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APPENDIX(s)

COMPATIBILITY OF GASKET AND O-RING MATERIALS IN METHANOL-FUELED TRUCK SERVICE

Compatibility of Gasket and O-Ring Materials with Methanol ⁷		
Gasket/O-Ring Material	Rating ⁸ (Compatibility with Methanol Fuel in Truck Service)	Recommended ^{9, 10}
Natural Rubber	Good	No Recommendation Given
EPDM (ethylene-propylene)	Good	Yes, Recommended
Neoprene	Good	Yes, Recommended
Silicone	Good	Yes, Recommended
Kalrez	Good	Yes, Recommended
Teflon	Good	No Recommendation Given
Fluorosilicone	Good	No Recommendation Given
Buna-N	Fair	Not Recommended
Nitrile	Fair	Not Recommended
Polyurethane	Sometimes OK	No Recommendation Given
Butyl Rubber	Poor	No Recommendation Given
Butadiene	No Data	No Recommendation Given
Fluorocarbon	No Data	No Recommendation Given
VITON (most types)	No Ranking Given	Not Recommended


GENERAL INFORMATION	
Property/Information	
DOT Number	UN 1230
DOT Hazard Class or Division	3.6.1 flammable liquid
DOT Guide Number	28
CAS Number	65-56-1
STCC Number	4909230
ICC, OSHA, NFPA Liquid Flammability Class	IB flammable liquid
DOT Packing Group	PG II
DOT Packaging (non-bulk/bulk)	202/242
Types of Shipping Containers	NON-BULK: 1-119 gal DOT PG-II performance oriented containers BULK: tank cars, tank trucks
Shipping Container Hazards	rupture, BLEVE: containers may fragment & rocket in fire
Special Fire Hazards	blue flame invisible in daylight; flame flashes back from ignition source to leak point; accumulated vapor may explode if ignited in confined area or deflagrate as a near-neutral-buoyancy radiant fire ball in unconfined poorly ventilated area
Other Information	liquid floats & mixes with water; near neutral vapor buoyancy
Molecular Weight	32.04
Chemical Composition	
Carbon (w/w %)	37.5
Hydrogen (w/w %)	12.6
Oxygen (w/w %)	49.9
LIQUID PROPERTIES	
Freezing Point Temp. (°F)	-143.5
Specific Gravity (@ 60 °F/60 °F)	0.796
Density (lb/gal @ 60 °F)	6.63
Viscosity	
@ -4 °F (centipoises / mm ² /s)	1.15 1.345
@ 68 °F (centipoises / mm ² /s)	0.59 0.74
@ 104 °F (centipoises / mm ² /s)	- -
Specific Heat (Cp, Btu/lb-°F)	0.60
Thermal Conductivity (Btu/hr-ft-°F)	0.12
Coefficient of Thermal Volume Expansion (@ 60 °F & 1 atm)	0.00067
Electrical Conductivity	
Neat or without additives	4.4 x 10 ⁷ pS/m
Industrial use	30 μS/m
Fuel specification	< 1000 μS/m
Latent Heat of Vaporization	
(Btu/gal @ 60 °F)	3,340
(Btu/lb @ 60 °F)	506

Heating Value	
Lower [liquid fuel combusted to water as vapor] (Btu/gal @ 60 °F)	56800
Lower [liquid fuel combusted to water as vapor] (Btu/lb)	57250 8570 8637
Higher [liquid fuel combusted to liquid water] (Btu/gal)	65200
Higher [liquid fuel combusted to liquid water] (Btu/lb)	9750 9837
Heat of Combustion [ΔH_c^0] [liquid fuel combusted to liquid water] (Btu/lb)	9900 9378
Equilibrium Vapor Pressure	
Reid [RVP] (psi @ 100 °F)	4.6
True Vapor Pressure [TVP] (mm Hg @ 68 °F)	92 104
Boiling Pt. Temperature (°F)	149
Water Solubility @ 70 °F	
Fuel in Water (v/v %)	100
Water in Fuel (v/v %)	100
Vapor Specific Heat (Btu/lb/ °F)	0.38
Equilibrium Vapor Pressure	
Reid (psi @ 100 °F)	4.6
True Vapor Pressure (mm Hg @ 68 °F)	92 104
Vapor Density (air=1)	1.1
Vapor Heat of Combustion	
Lower [gaseous fuel combusted to water as vapor] (Btu/lb @ 60 °F)	9080
FLAMMABILITY PROPERTIES	
Flash Point Temperature	
Closed Cup (°F)	52
Open Cup (°F)	-
Autoignition Temperature (°F)	867
Flammability Limits	
Lower (v/v %)	7.3
Upper (v/v %)	36.0
Flammability Range (v/v %)	28.7
Stoichiometric air/fuel ratio (w/w)	6.45
Fuel in Vaporized Stoichiometric Mixture (v/v %)	12.3
Stoichiometric Flame Speed (ft/s)	1.41
Minimum Ignition Energy (mJ)	0.14
Adiabatic Flame Temperature (°F)	3470
Flame Temperature (°F)	3,398
Mass Burning Rate (lb/ft ²)	0.083

Bleach Load Trial on D0 Stage

Wisconsin Rapids

Philip Sekerak & Brittany Gagas



About Us

Brittany Gagas

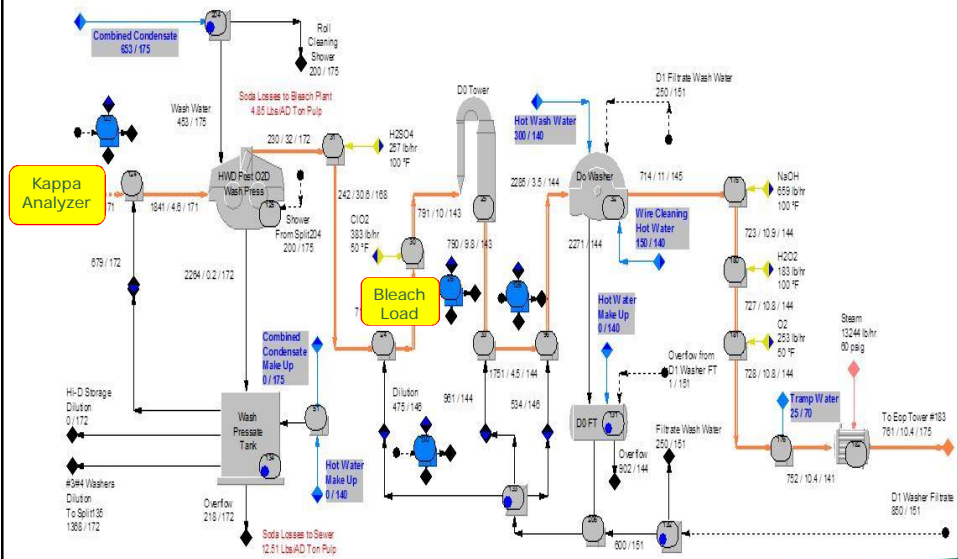
- ❖ Pulp Mill Area Manager at the Wisconsin Rapids Mill
- ❖ BS Chemical Engineering (University of Wisconsin)
- ❖ Born and raised in Stevens Point, WI
- ❖ In pulping industry for a little over two years
- ❖ Hobbies: Ski boat, dog, wedding planning, baking



Trial Milestones

- A bleach load transmitter (fiber and filtrate kappa) was installed on January 14, 2014 on the D0 stage of the #2 Fiberline at the Wisconsin Rapids Pulp Mill
- Trial was started and ran through numerous digester cooking modifications (from modified to conventional to downflow)
- New analyzer indication was substituted into the current control logic in place of the existing kappa measurement.
- Initially, it was thought that one calibration curve would serve for both hardwood and softwood species. Through testing, this was found to not be the case.
- Further testing showed that analyzer will work for both species – just need separate calibration curves
- Currently in the process of moving our current analyzer to the DEK position on the #1 Fiberline and purchasing a second to go on the inlet of the D0 stage on that line

Wisconsin Rapids Softwood Kraft Pulping Fiber Line 2 (Page 5 of 6: Wash Press and D0 Tower)



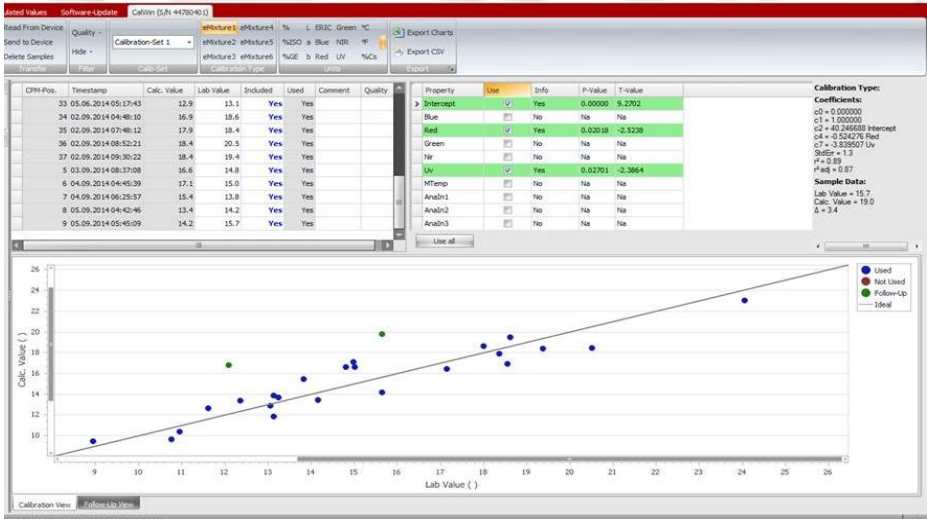
Calibration Testing Procedure

- 4 tests completed on each sample
 - Consistency
 - Fiber kappa analysis
 - Filtrate kappa analysis
 - Brightness

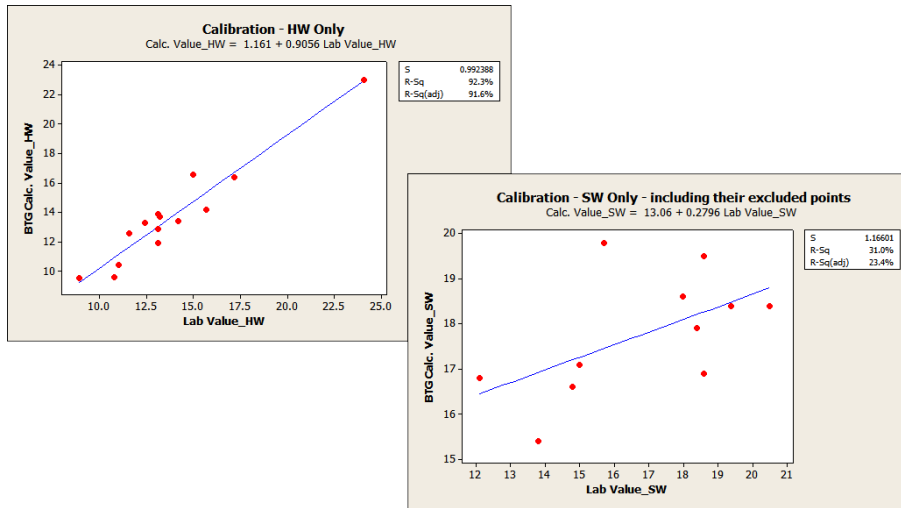
$$\text{Bleach Load} = \text{Fiber Kappa (per g)} + \text{Filtrate Kappa (per g)}$$

$$\text{Filtrate Kappa (per g)} = \text{Filtrate Kappa (per mL)} \times \frac{1 - \text{Consistency}}{\text{Consistency}}$$

Calibration (Both HWK & SWK)



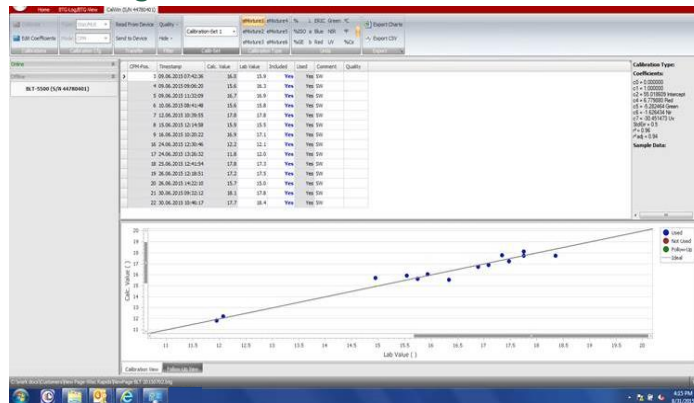
Separating Out Species



7

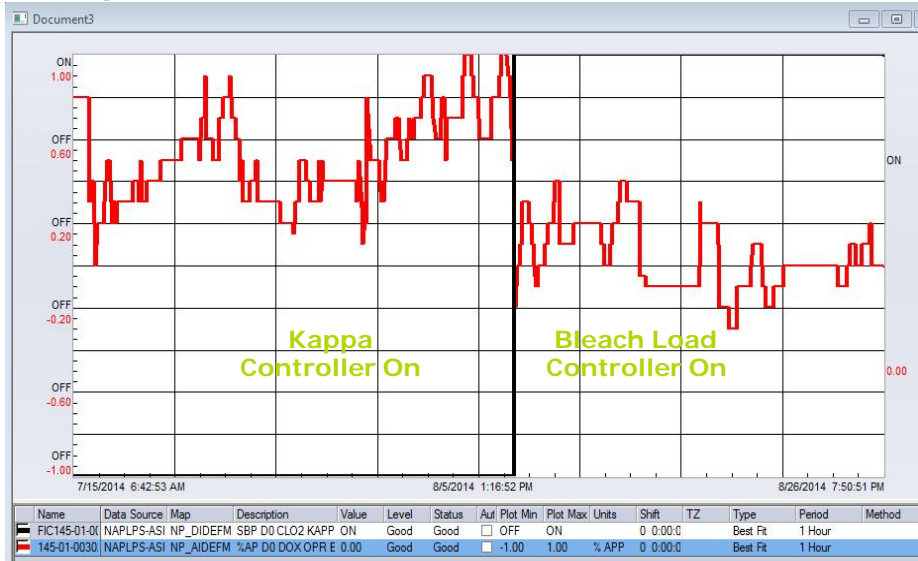
Separating Out Species

- Continued testing of softwood on one digester cooking method proved that a calibration curve could be generated



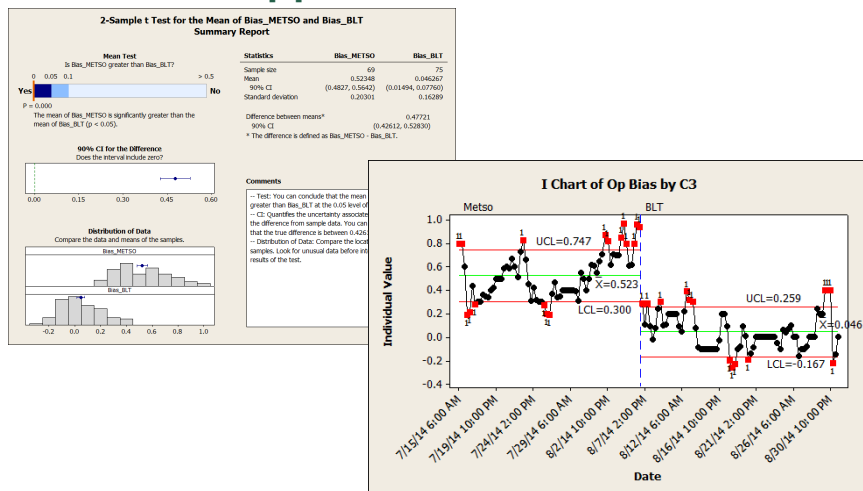
8

Operator Bias



9

Operator Bias is compensating for Filtrate Kappa



10

Moving Forward - #1 Bleach Plant

- Currently no kappa measurement on bleach plant
- Runs all HWK
- Prior to ozone elimination, was a four stage (ZEDD) bleach plant
- Ozone elimination converted bleach plant to a three stage (DED) bleach plant
- One additional analyzer was purchased for control of ClO₂ application of both D stages
- Currently collecting data to develop controls

11

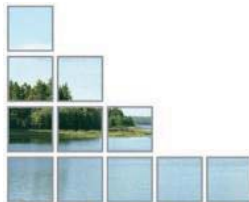
Conclusions

- Successfully measures fiber kappa and filtrate kappa – responds to changes in washing
- Acceptable for both HWK and SWK
 - Two calibration curves will be needed
- Continuous measurement with less need for operator bias adjustments
- More to come

12



***Bleach Plant Effluent Fibre Filters
PAPTAC Bleaching Committee
2015 Summer Meeting
Nanaimo, BC***



by Daniel BROUILLETTE
GL&V

Reduce your operating cost with GL&V's cost saving solutions...

Environment Friendly Presentation

- This presentation is certified to contain at least 30% recycled content



AGENDA

1. The Hardware
2. Process Matters
3. Solving Common Issues

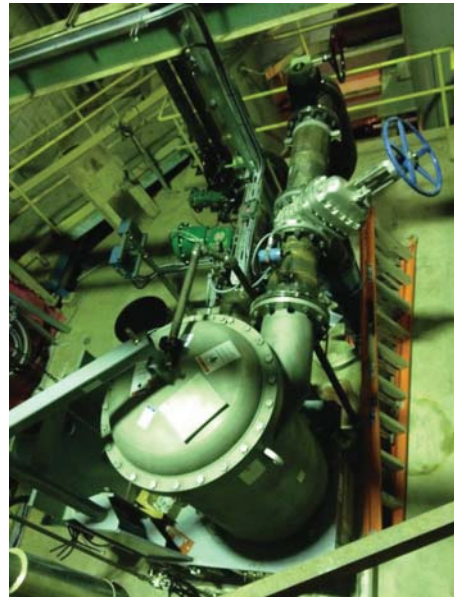


SECTION 1 – THE HARDWARE

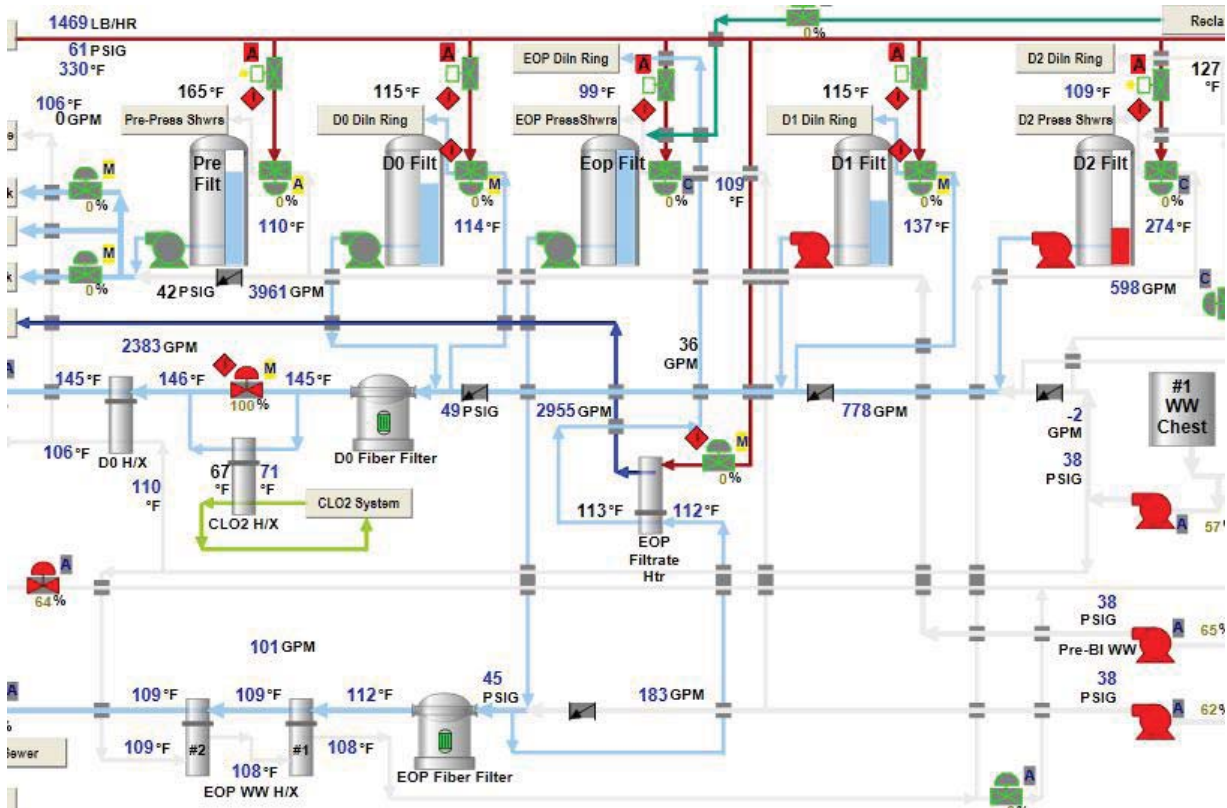


Fibre Filters: Where will I find them?

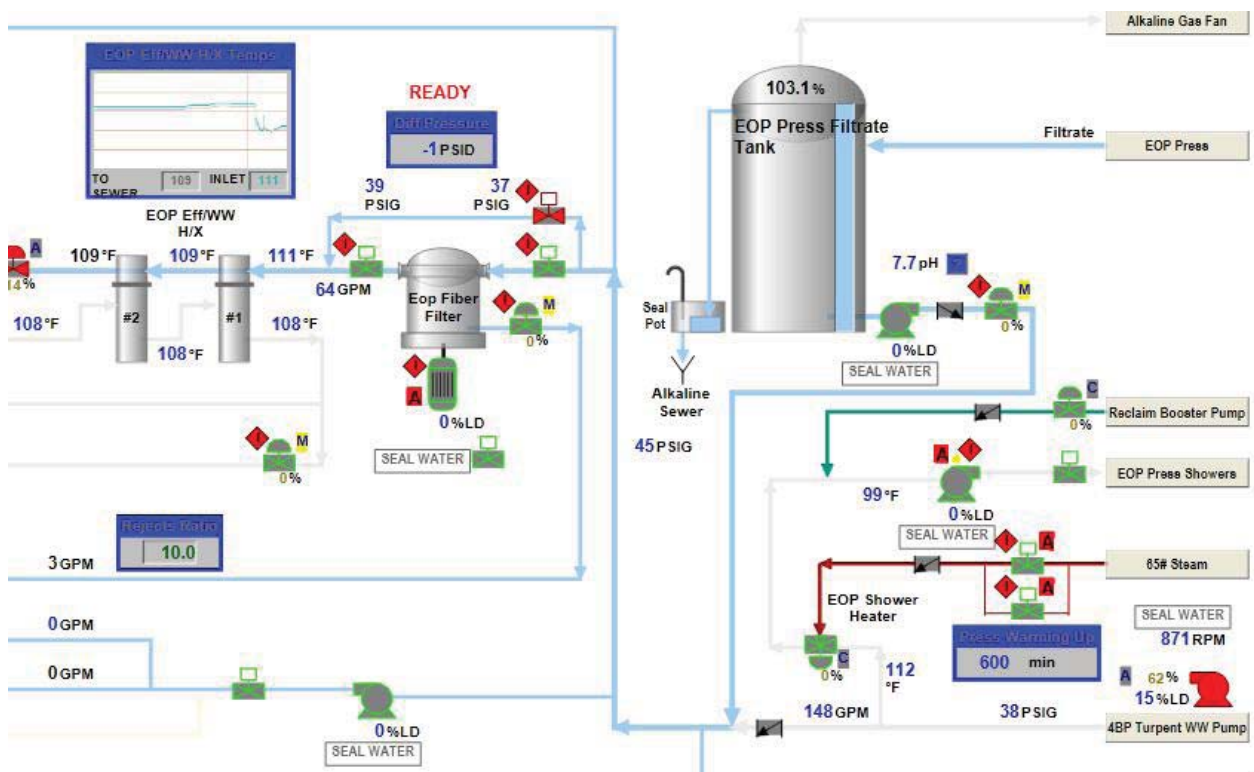
- 1- Black Liquor Filters
- 2- White Water Filtration
- 3- Fines Removal
- 4- Thickening
- 5- Bleach Plant Effluent Filters



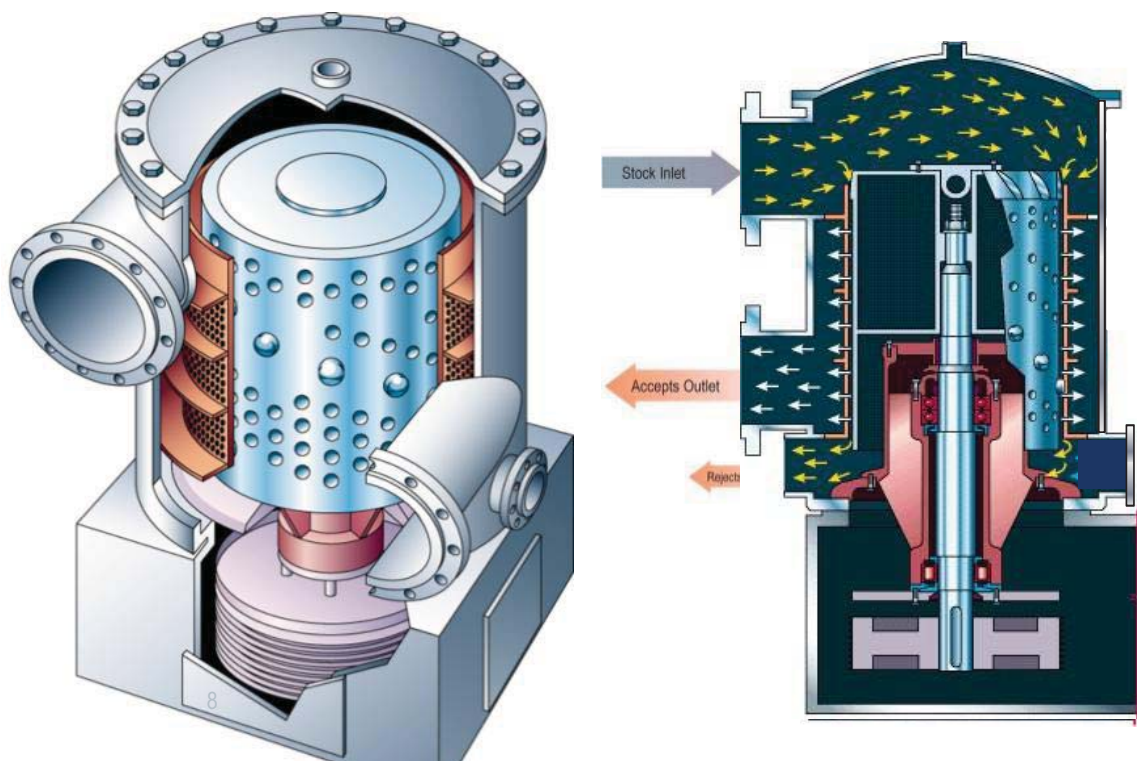
Fibre Filters: Where will I find them?



Fibre Filters: Where will I find them?



Fibre Filters: How do they work?



SMALL FIBRE FILTER



INTERMEDIATE SIZE FIBRE FILTER



HI-Q® FIBRESAVER™ FILTER



BLEACH PLANT ALKALINE AND ACID FILTERS BEING INSTALLED

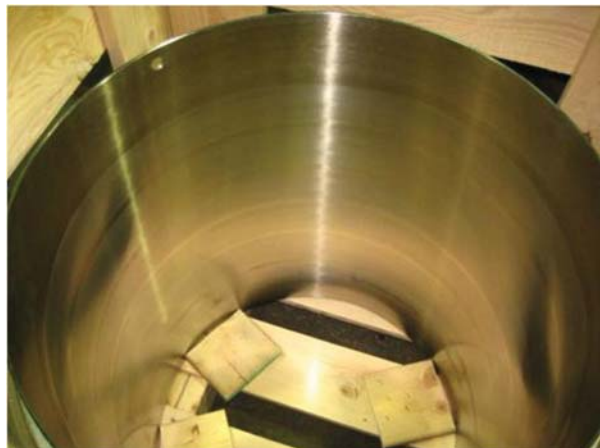


Typical Fibre Filter Rotor

- Uses both bumps and depressions to maximize efficiency



Fibre Filters use Electron Beam Drilled Screen Cylinders



PERFORATION SIZE

Previously: 0,30mm, 0,25mm, 0.20mm diameter

Today: **0.15mm** or 0.10mm diameter



What is Electron Beam Drilling (EBD)?

- EBD is a thermal drilling process
- EBD is performed inside of a vacuum chamber
- A focused beam of electrons is accelerated up to $2/3$ the speed of light.

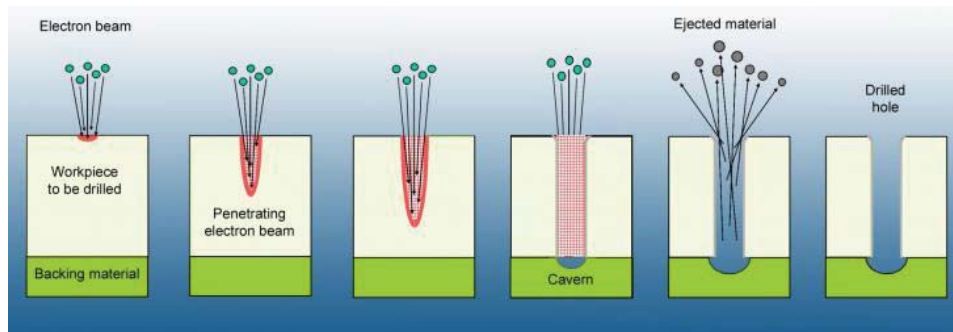


Image source: <http://www.steigerwald-eb.de/en/application-areas/drilling.html>

What is Electron Beam Drilling (EBD)?

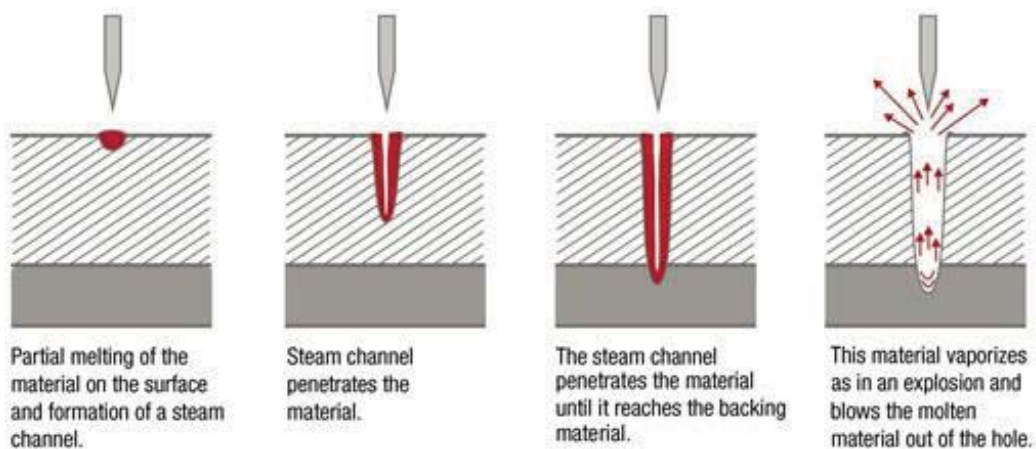


Image source: http://www.micromanufacturing.com/sites/default/files/stories/import/1308-Micromachining-web-resources/image/EB-Perforation%20engL_ha_opt.jpeg

EB Drilled cylinder



Although the screen surface appears to be blind, this screen cylinder has just under **4.5 million holes.**



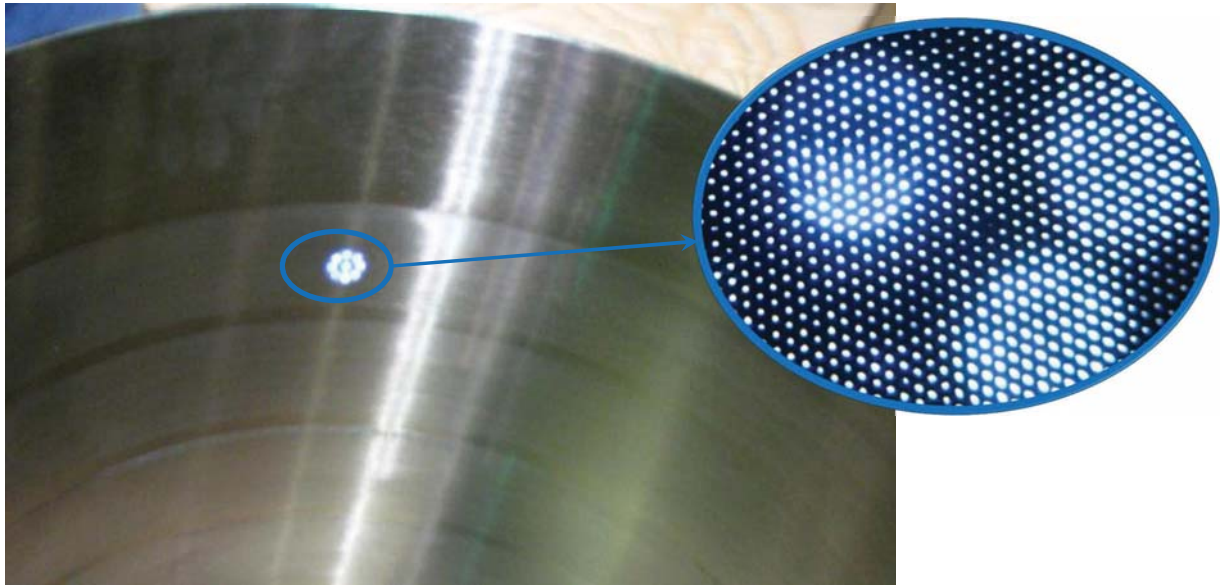
EB Drilled cylinder



Same picture angle as on previous slide, this time with flashlight on opposite side of screen surface



EB Drilled cylinder



Electron Beam Drilled Screen Cylinder
Close-up on illuminated area



EXAMPLE FOR FIBRE FILTER EBD CYLINDER

Cylinder Surface	1.25	sq. m
Cylinder Surface	13.5	sq.ft
Open Area	10%	
Effective Area	1.35	sq.ft
Hole Diameter	0.006	inch (0.15mm)
Surface/hole	0.00002827	sq. in.
Number of holes	6 875 494	



HI-Q FIBRESAVER FILTER Being prepared for shipment



Fibre Filter Installation



Oups !



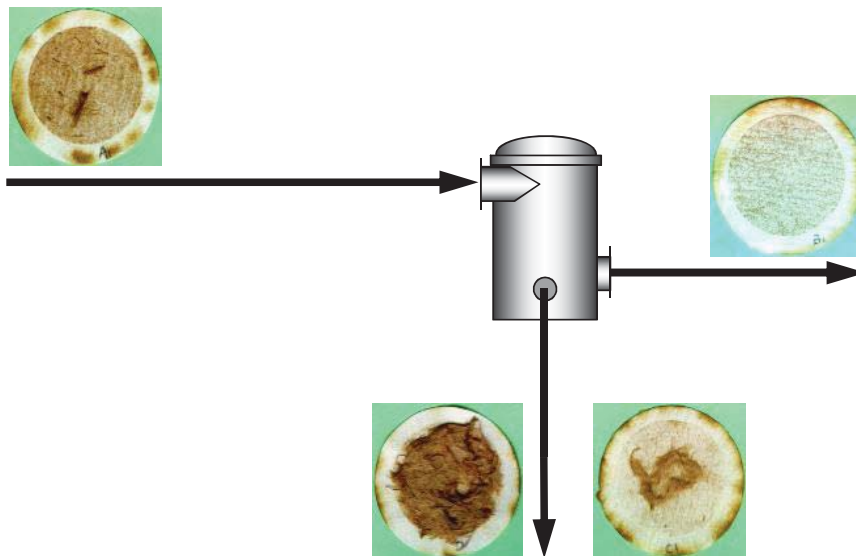
SECTION 2 – PROCESS MATTERS

Example of Capacities

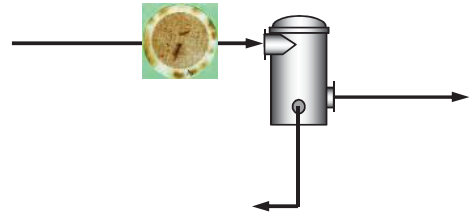
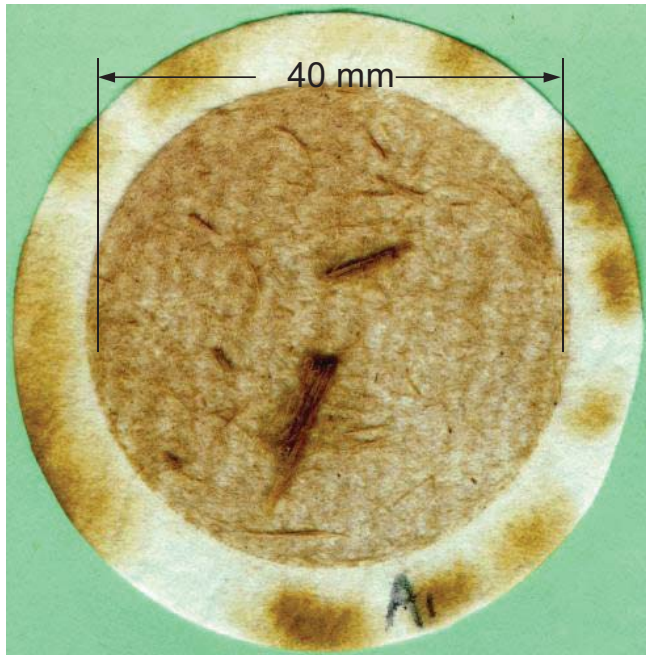
Installed Power	Approximate Maximum Accept Capacity	
	USgpm	m ³ /h
30 / 22	550	125
60 / 45	1,500	340
100 / 75	2,400	550
150 / 110	3,500	800
250 / 200	5,500	1,250



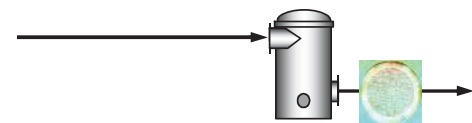
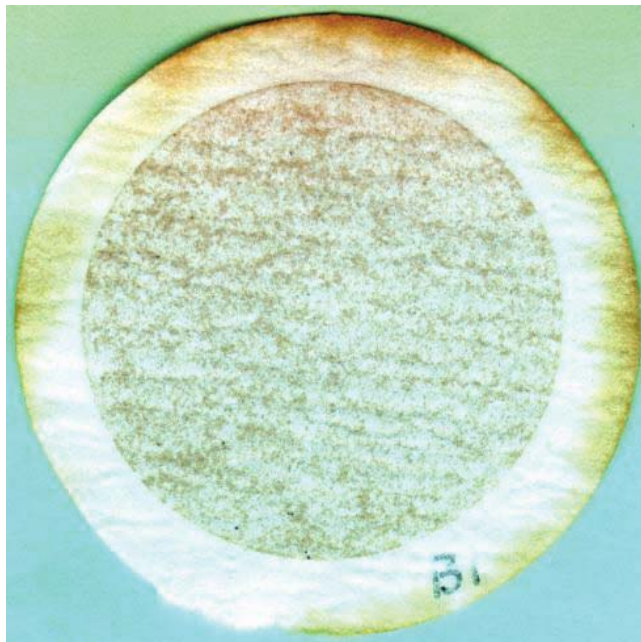
Fibre Filter Results



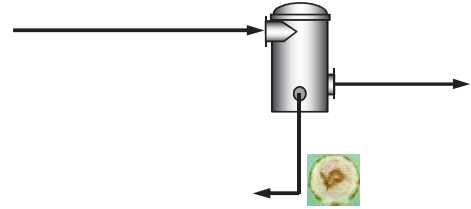
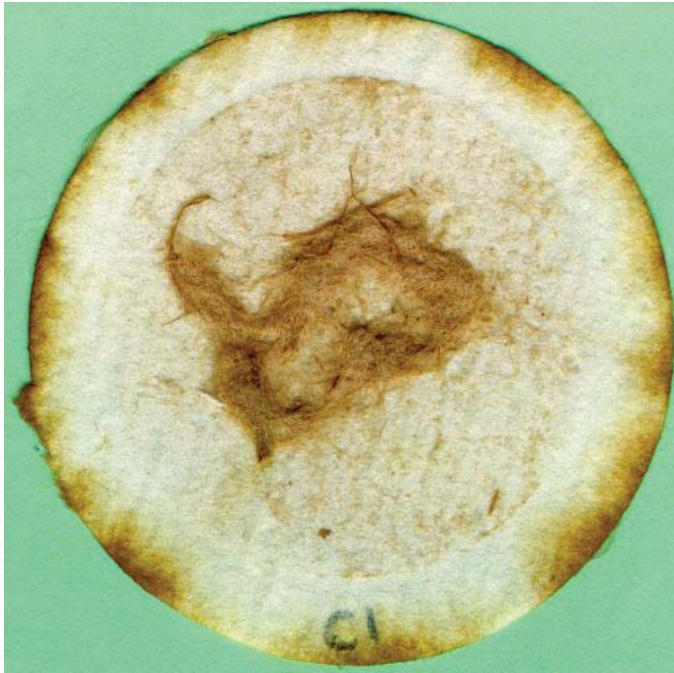
Filter Inlet



Filtered Stream (Accepts)



Recovered Fibres (“Rejects”)



Fibre Filters Cylinder Hole Size Selection

PERFORATION SIZE

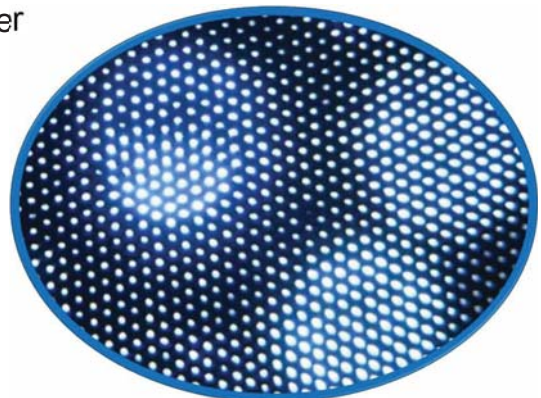
- Previously: 0,30mm, 0,25mm, 0.20mm diameter
- Today: **0.15 or 0.10 mm** diameter

CAPACITY

- Is a function of Open Area
- (EB Drilling Limitations)

EFFICIENCY vs OPERABILITY

- Unlike pulp screens,
smaller holes does not mean more plugging

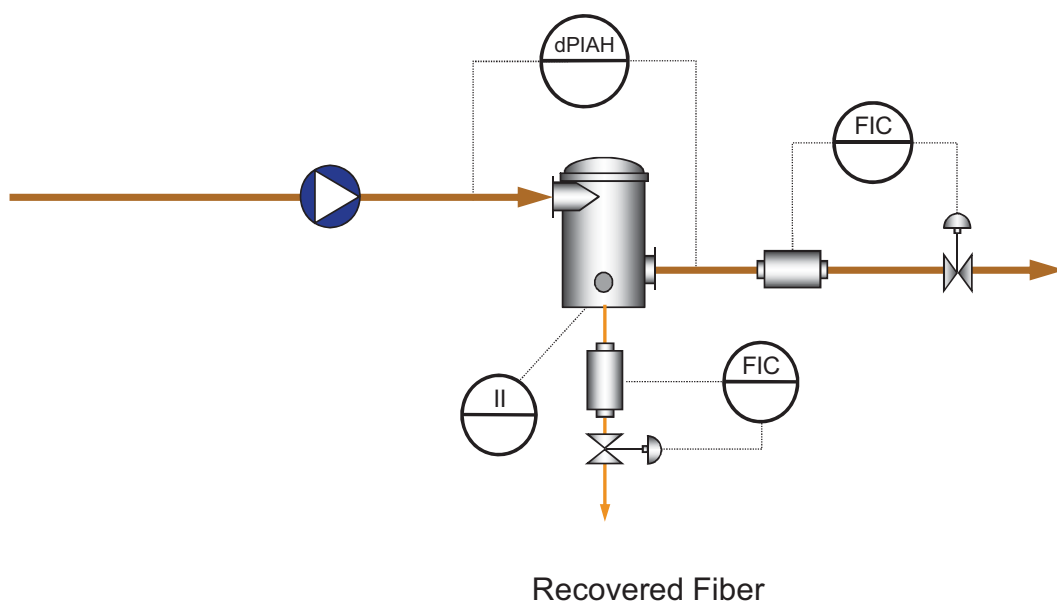




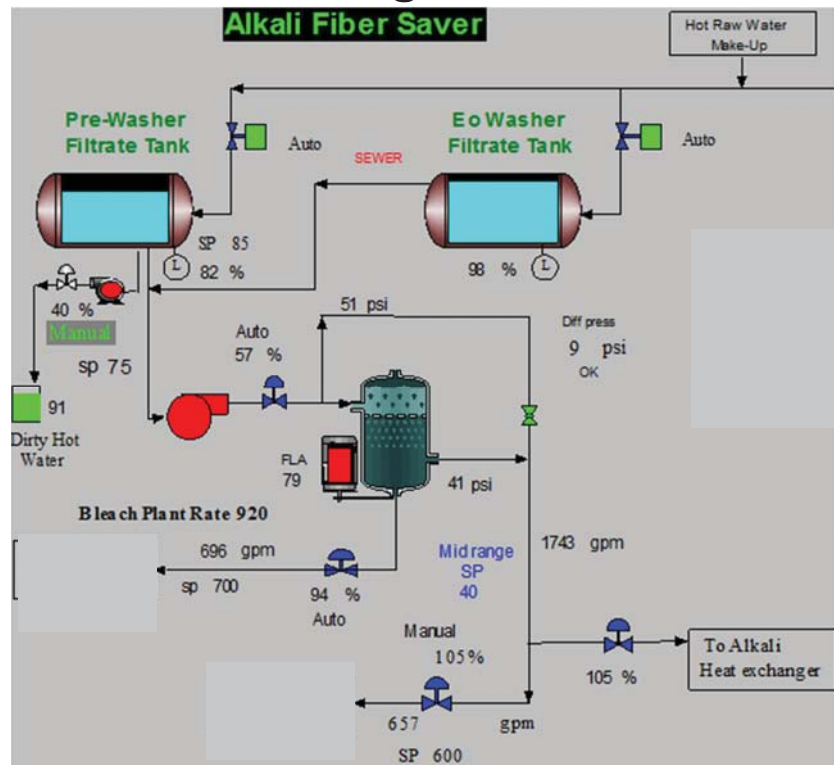
SECTION 3 – SOLVING COMMON ISSUES



Fibre Filter - Typical Instrumentation

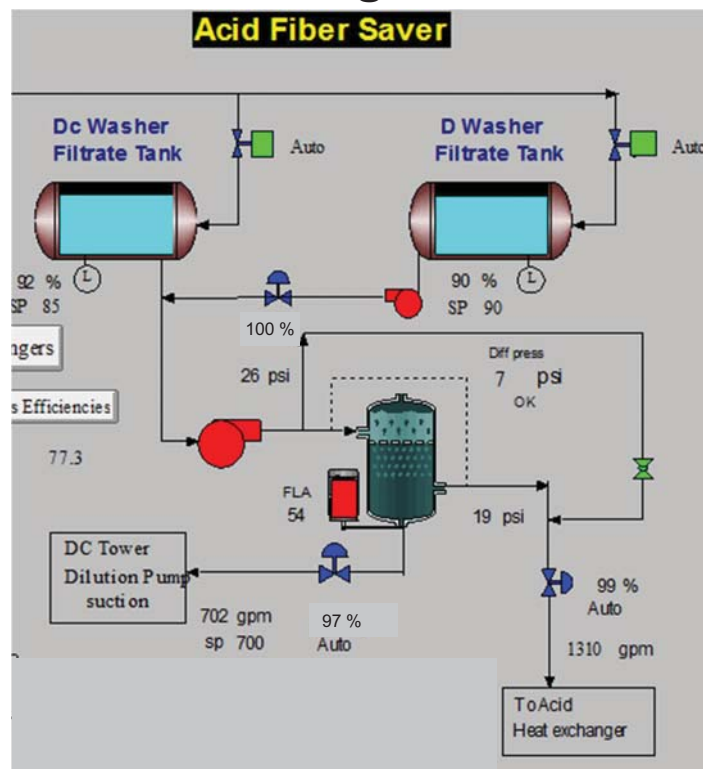


Fibre Filter Troubleshooting 1



33

Fibre Filter Troubleshooting 2



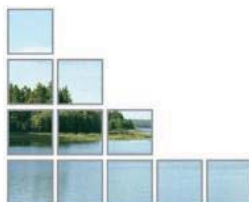
34

SCALING ON FIBRE FILTER CYLINDERS option 2 – the easy button

1. Put it in a box and send to your favorite screening solution provider 😊



QUESTIONS and DISCUSSION

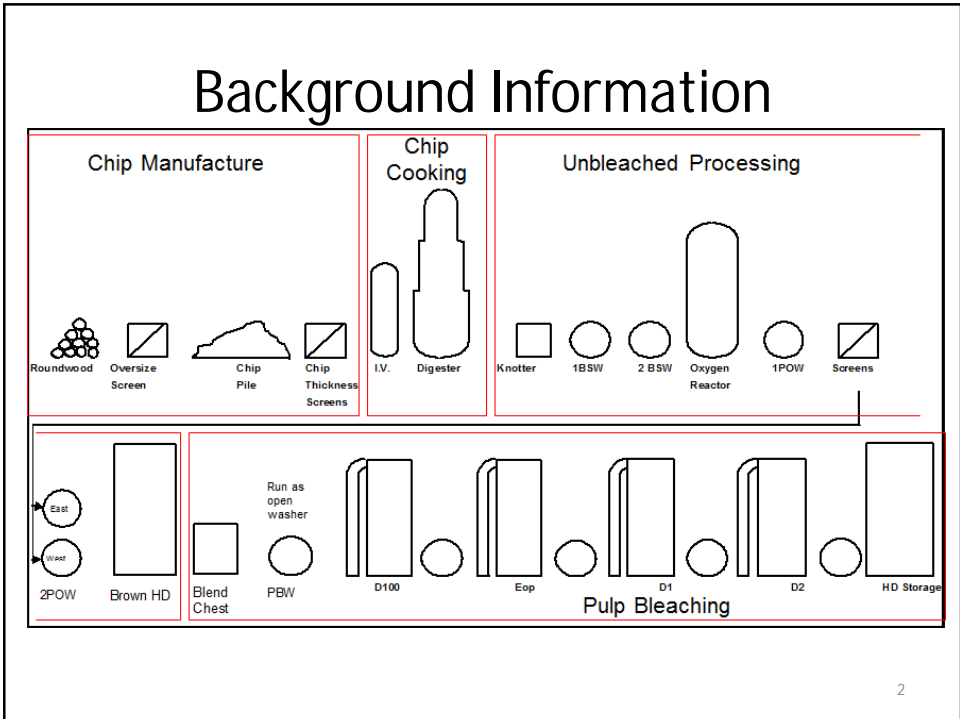


Reduce your operating cost with GL&V's cost saving solutions...

COD Reduction in Fiberline

Brian La Brash
Verso Corporation – Quinnesec Mill
Fall 2015 PAPTAC Bleaching Committee
Nanaimo, BC Sept 21-23

1



Additional Information

- Since start-up in 1985 production through fiberline has doubled from the original 750 ADSTPD
- O2D added in 1990. No wash presses installed.
- Current specific loading on vacuum drum washers is 1.07 vs. good design of 0.65-0.70 for hardwood. Original loading was 0.56.
- Digester has a wash zone, but was not built for EMCC so has no additional zone between the main extractions and wash zone at the bottom

3

Open Pre-Bleach Washer 2006

- To address very high carryover into the Bleach Plant from the Brown Stock system, the Pre-Bleach Washer (PBW) was put into an open filtrate mode.
- Shower water for the washer had been a combination of evaporator combined condensate (CC), stripped condensate, and hot water
- Showers were changed to 90-100% hot water and stripped condensate and CC were moved to the #2 POW showers.

4

Impact of Open PBW

Process Measurement	Units	Open Mode
Dissolved Solids	Pct Change	-50%
COD	Pct Change	-50%
Do Acid Use	Kg/ADMT	-2.5
Do ClO2 Use	Kg/ADMT	-2.25
Eop NaOH	Kg/ADMT	-0.50

5

Impact of Open Washing

Property	Open Washing
Flow to Sewer	1000 – 1500 gpm
Soda Loss	+10 lbs/ADT
Fiber Loss	+1 TPD
Acid to D100 Stage	-5 lbs/ADT
ClO2 to D100 Stage	-4 lbs/ADT
NaOH to Eop Stage	-1 lbs/ADT
COD to D100 Stage	-50%
PBW Shower Flow	Does not need to change over Closed Washing
Total Solids to Sewer	+35 Lbs/ADT
Increased Slush Pulp	15 ADTPD

6

Opportunity / Issues

- Washer audits in 2013/2014 identified potential opportunities for low cost improvements
 - Automating level control on washers
 - Minimizing by-pass flows between filtrate tanks by improving washer drainage
 - Evaluating post Oxygen Delignification pH target as this pH correlated to pre-bleach washer conductivity and Do acid use
 - Improving shower performance by adjusting showers and keeping clean/unplugged
 - Challenging solids limit from the Evaporators, i.e. send lower solids
- Solids/T to O2D and Bleach Plant were very high

7

Results Prior to Washing Improvements

Measurement Location	Results in Lbs/ADST	Results in Kg/ADMT
Digester Blowline COD	1750	800
Into O2D system COD	225	110
Into Bleach Plant COD	18	8

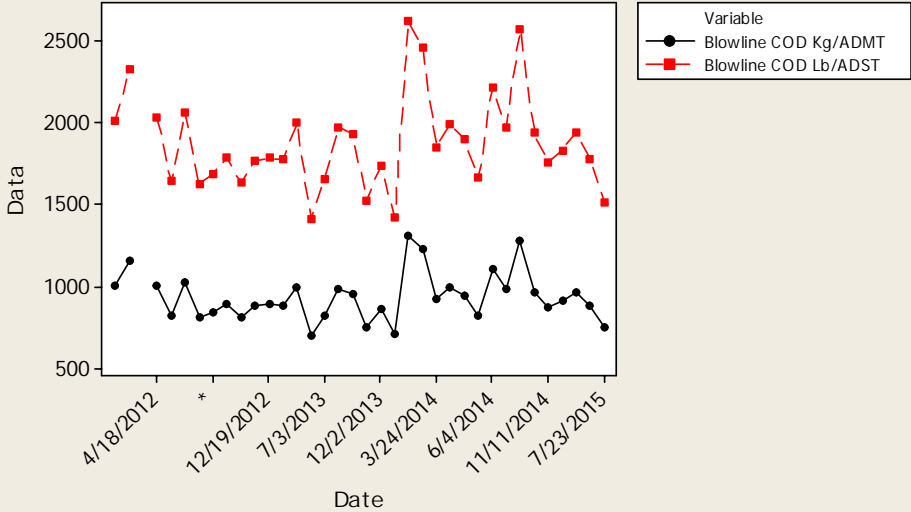
8

Areas Addressed to Improve Washing

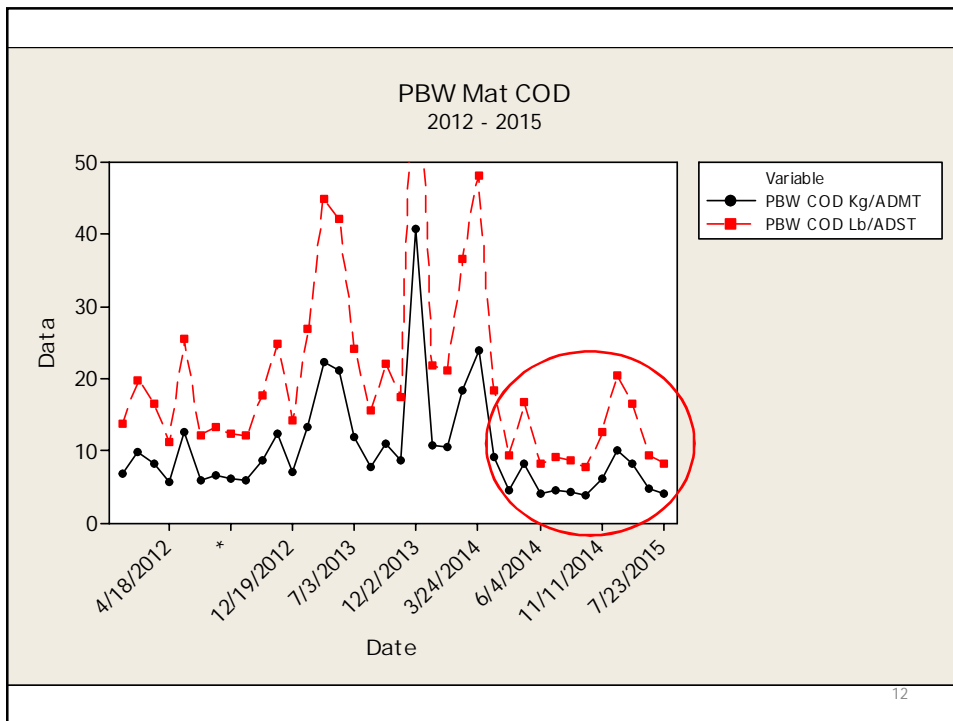
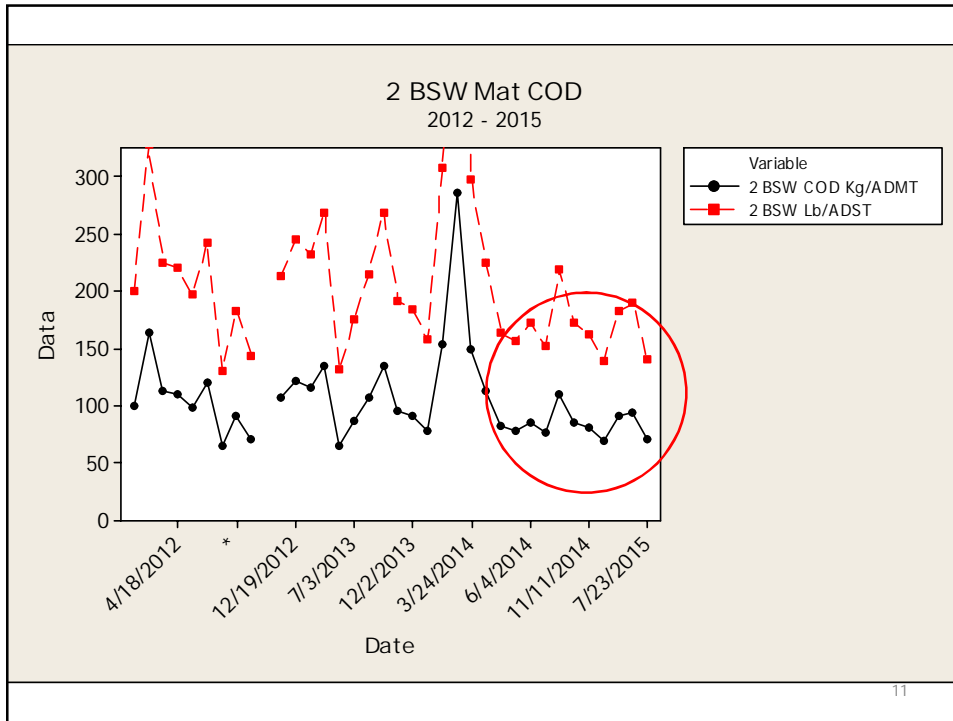
Area	Items Addressed / Investigated
Digester	Blow consistency, full Downflow Cooking, wash zone dilution factor, counterwash use, small changes to bottom of digester, controls for bottom, SOP's
Pre-O2D BSW	Defoamer type and application, Washer controls, washer mechanical issues, solids control strategy, solids target to R&U
Post Washing	New defoamer program, washer level controls, dilution factor control
O2D	Lowered pH target

9

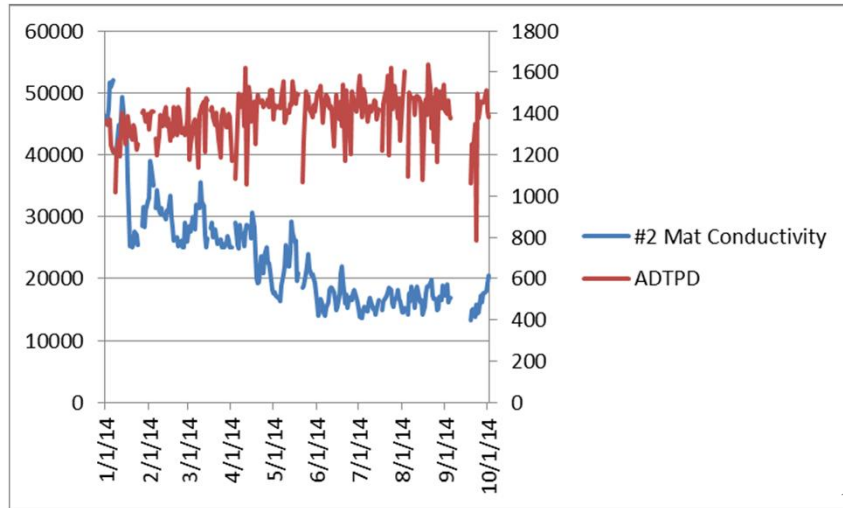
Digester Blowline COD
2012 - 2015



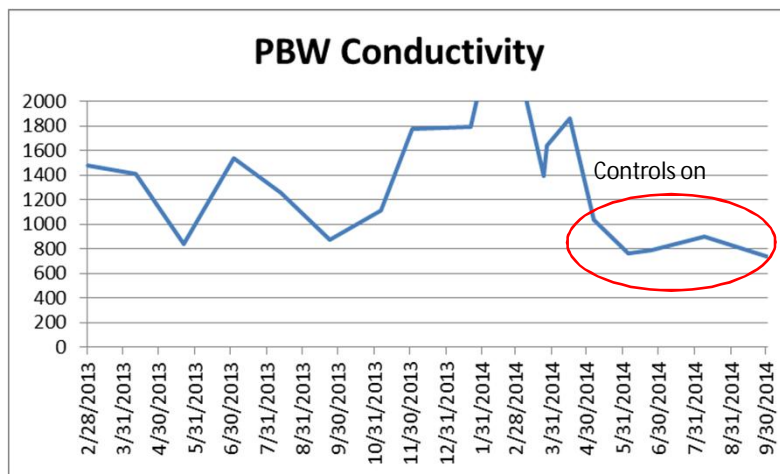
10



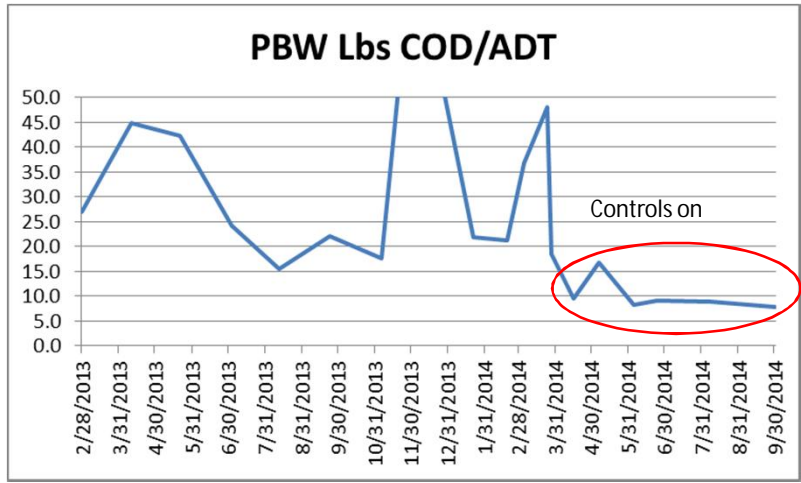
Impact on Pre-O2D Carryover



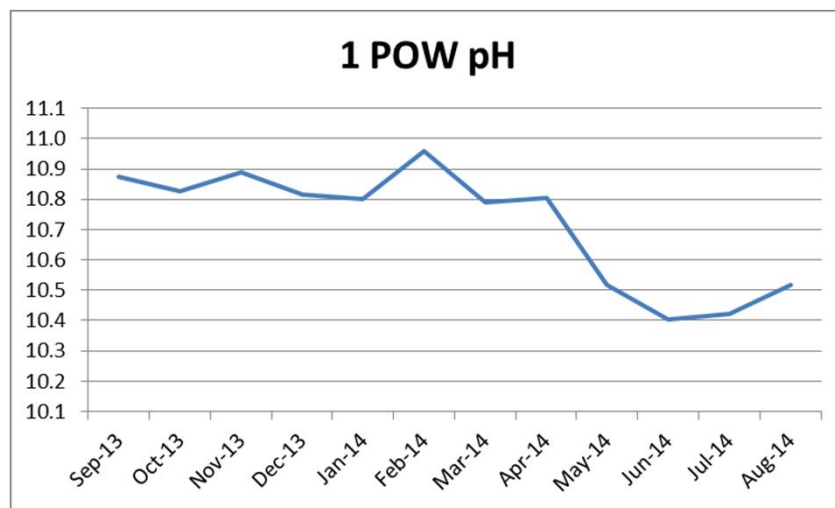
Pre-Bleach Washer Conductivity



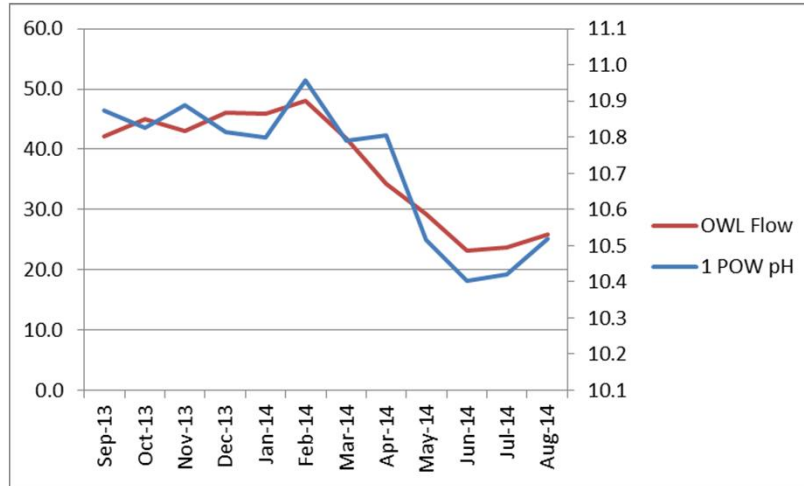
Impact on Pre-Bleach Carryover



Reduction in Post O2D pH



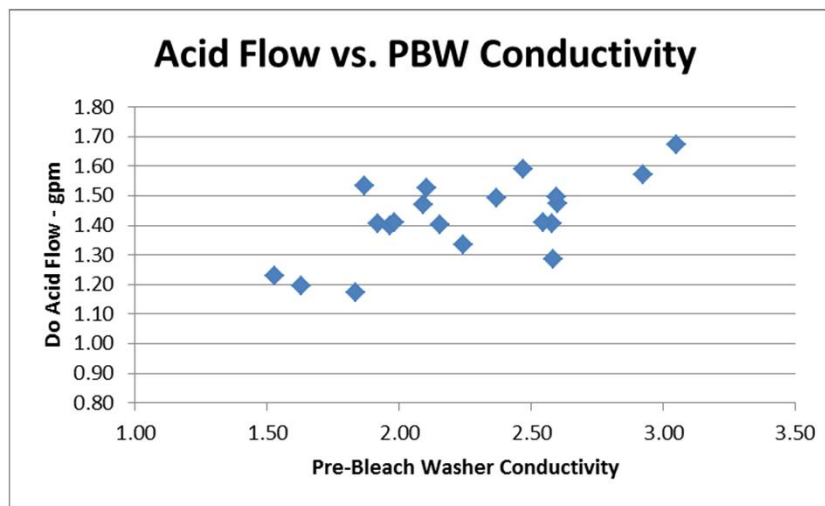
Reduction in OWL Flow



Note: using 1 gpm caustic to help maintain 0 sulfidity from WL Oxidizer. The flow reduction is a combination of the 1 gpm of caustic and the pH target reduction.

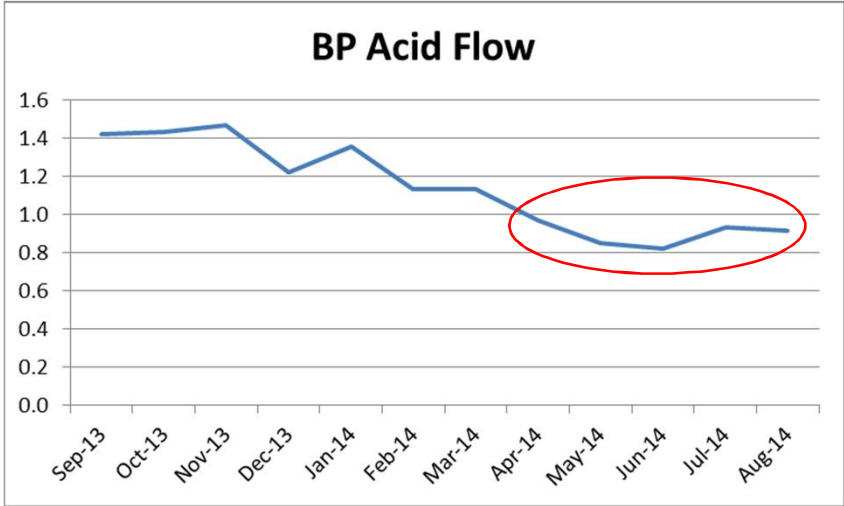
17

Impact of PBW Conductivity on Do Acid Use



18

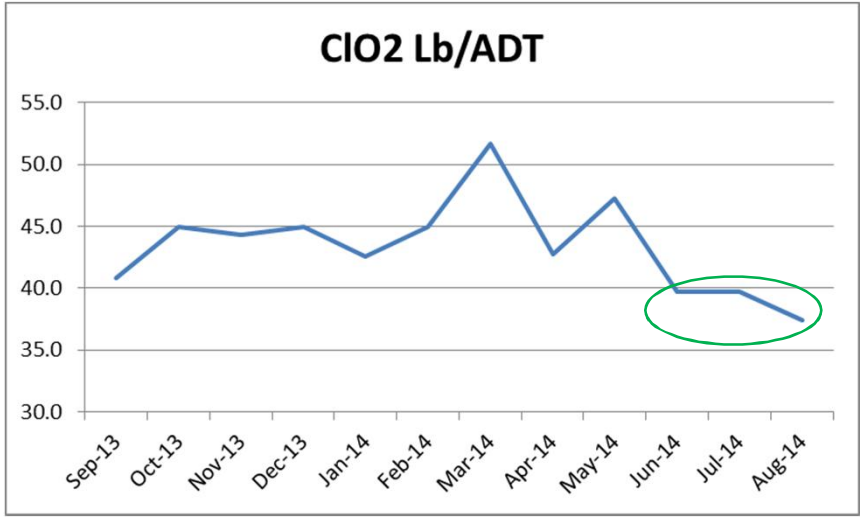
Impact on Do Acid Consumption



Acid use is down even though Do ClO2 use has also decreased

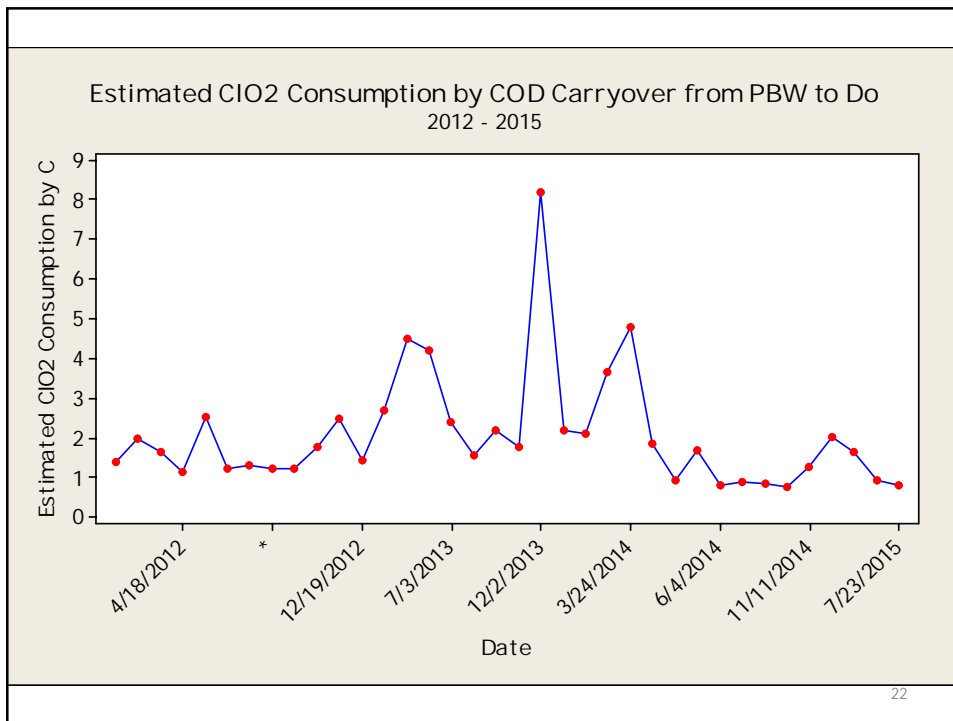
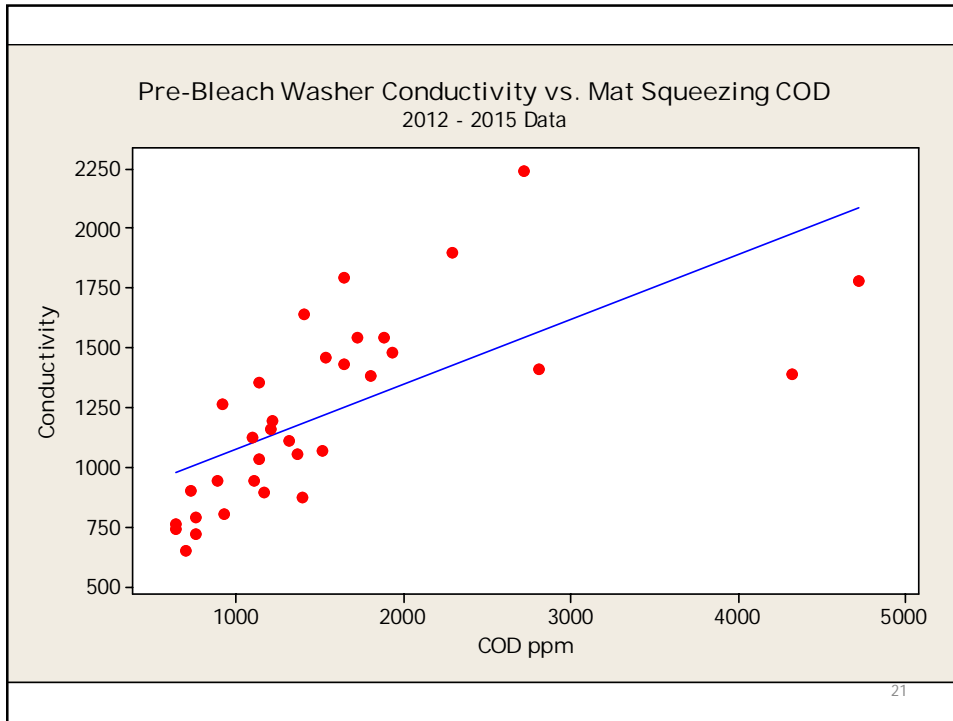
19

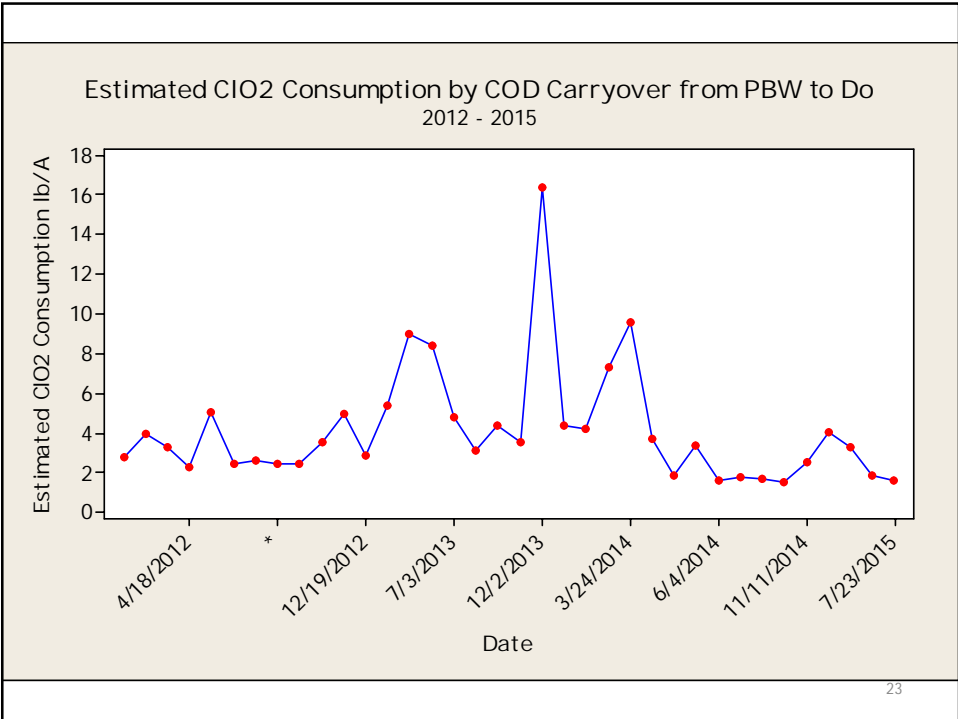
Impact on ClO2 Use



ClO2 use to the same final brightness has been reduced at record production rates

20





Bleach Plant COD Work

Current & Future Plans

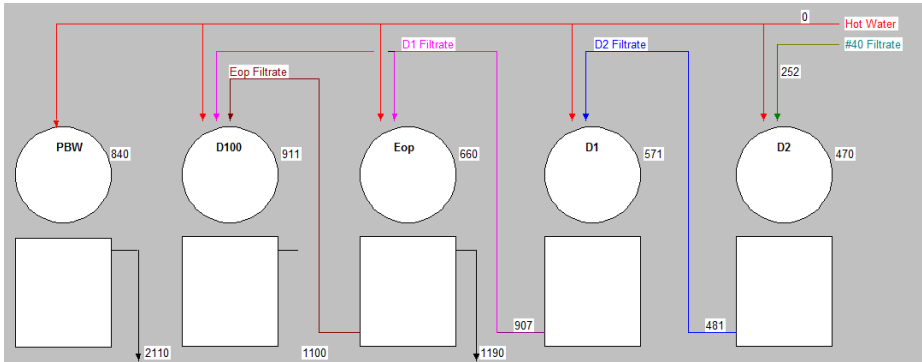
24

Variability Across Eop Washer Drum

Location	Far South	South	Middle	North	Far North
Consisten	12.84	12.96	10.95	15.07	14.06
COD ppm	720	850	800	1000	950
Kg/ADMT	4.40	5.14	5.86	5.07	5.23
Lbs/ADT	8.80	10.28	11.71	10.14	10.45

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Bleach Plant COD Profile



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Further Work

- Additional Bleach Plant COD profile data for a baseline
 - Trials with differing shower and recycle configurations to evaluate COD impact
 - Develop the COD vs ClO₂ consumption relationship for the washers
 - Regular washed/unwashed K# testing to be instituted
- Use of the above data to justify shower bar changes and to keep track of Bleach Plant washing performance

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NORAM

encl

engineering + constructors

Precipitator Dust Purification (PDP)

Chloride and Potassium Removal System

NORAM Engineering and Contractors, Ltd.

PAPTAC Fall 2015

1

Background

Make up Chemicals and NPE's

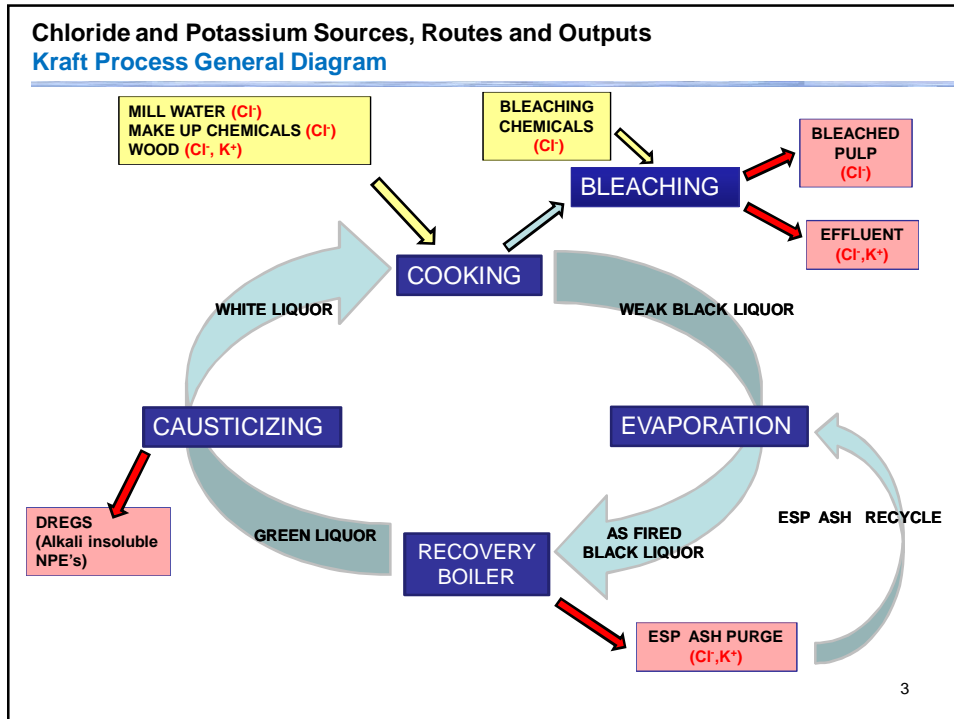
- **Make up Chemicals:** Na, S and Ca
- **NPE:** Si, Al, Fe, **K, Cl**, Mg, Mn, P, Ni, Cr.
- **Organics:** C, H and O

NPE's CLASSIFICATION

- **Highly soluble** in alkali and can build up without limit (**K and Cl**)
- **Partially Soluble** in alkali and are naturally purged by precipitation (Si, Al, P)
- **Highly insoluble** in alkali and are removed with GL dregs (Other NPE's)

As Fired BL Elemental Composition (72% Solids)	Wt % in DS
C	30 - 40
H	3.2 - 4
O	34 - 38
Na	17 - 22
S	3.6 - 5.6
<i>K</i>	<i>1 - 3</i>
<i>Cl</i>	<i>0.1 - 4</i>

2



Background

Chloride and Potassium Sources

Chloride

- Wood Furnish
 - Example: 2000 t/d @ 200 ppm = 0.4 t/d Cl
- Chemical make-up (NaOH, NaSH, sesqui, salt cake, etc.)
 - Example: 40 t/d Na_2SO_4 @ 0.5% = 0.2 t/d Cl
- Mill water
 - Example: 500 gpm at 100 ppm = 0.3 t/d Cl

Potassium

- Wood Furnish
 - Example: 2000 t/d @ 700 ppm = 1.4 t/d K

Effect of Chloride and Potassium

ESP Ash Composition

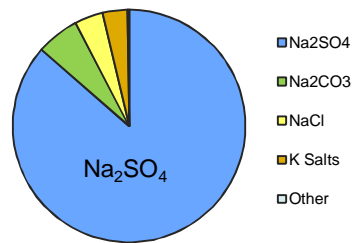
High chloride and potassium concentrations in the recovery boiler cycle can cause:

- Plugging: Reduced sticky temperature increases presence of molten phase which causes material in the flue gas to stick on metal surface
- Corrosion: Sticky deposits increase the rate of diffusion of both metal ions and corrosive gases setting up a galvanic cell
- Production loss: Frequent water washes
- Lower steam production
- Increase in soot blowing

ESP Ash Composition:

- Chloride and potassium are enriched in ash due to higher vapor pressure compared to other sodium and sulphur compounds
- If ESP catch is purged to remove chloride and potassium – costly makeup of sodium and sulfur chemicals is needed.

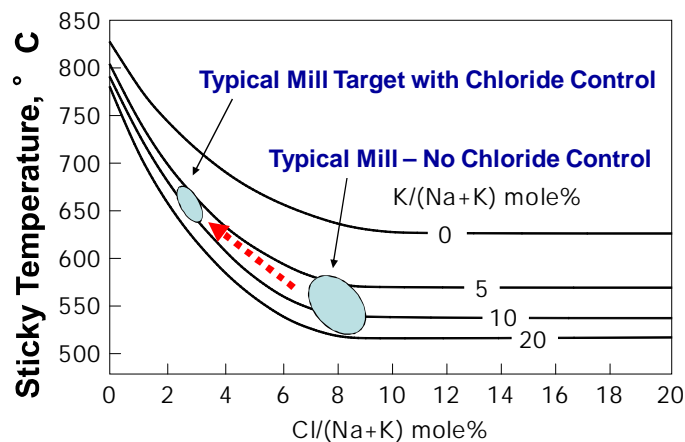
Typical ESP Ash Composition Wt %



5

Sticky Temperature

Effect of Chloride and Potassium



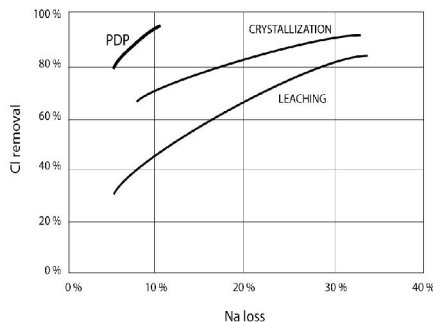
❖ It is important to note that when the deposit Chloride levels are low, potassium has very little effect on sticky temperature

6

Chloride and Potassium Removal Processes in Kraft Mills

Comparison of Available Technologies

Process	% Removal		% Recovery		Temp, C
	Cl-	K-	Na-	SO4	
Valmet Ash leach	69	69	80	85	90
HPD CRP	70-85	50-85	80-82	80	75
Andritz ARC	90	90	80	NR	60-80
Andritz Leaching	70-85	NR	60-80	NR	60
Eka PDR	90	90	NR	80	75
Mitsubishi, MPR	90	75	70	75	40/15
Ecp-Tec NORAM PDP	97	5	94	99	40-60



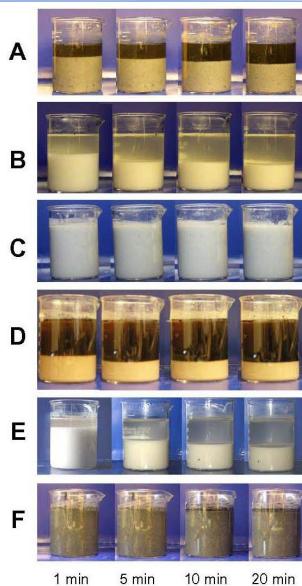
Can also be used to treat leach and crystallizer effluent to recover sulfate and carbonate while rejecting chloride and potassium

Different methods for the purge of Chlorides and Potassium from ESP dust in Kraft mill, Ulrica Johansson, Lund Institute of Technology, February 2005.

7

Effect of Carbonate

Reduced Effectiveness in Competitor Systems



1.2% CO₃

Competing chloride removal systems based on crystallization or leaching have poor performance on ESP dust with > 5% CO₃

0.3% CO₃

12.4% CO₃
(Poor settling)

At <5% CO₃ all carbonate is typically lost in effluent and must be made up with NaOH

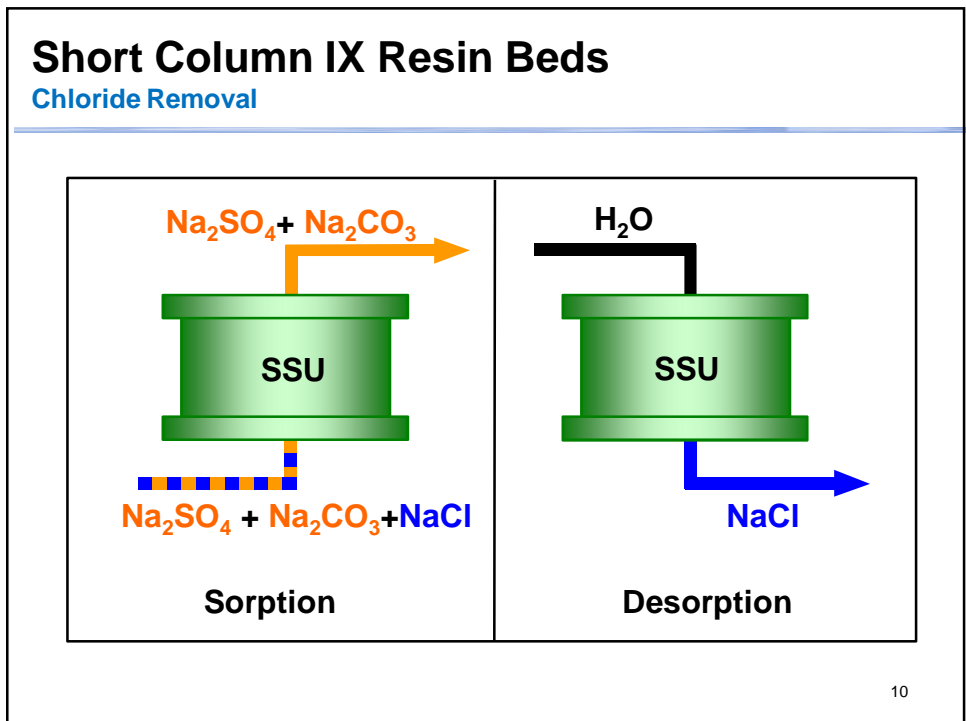
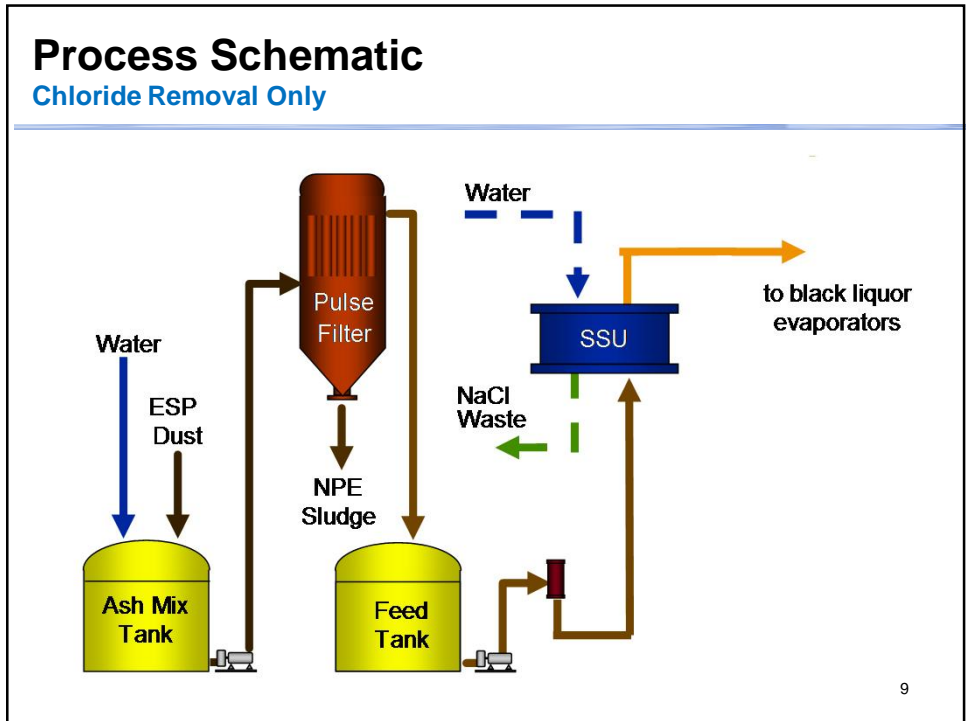
2.7% CO₃

PDP handles any CO₃ content with the same recovery as SO₄

0.1% CO₃

6.4% CO₃
(Poor settling)

8



Short Column IX Resin Beds

Recoflo® Separation Unit



- Reciprocating flow
- Short column
- Fine-size resin beads
- Efficient separation
- Low/no dilution
- 100s of installations in a wide variety of industries

11

PDP Installation

Arauco 30 TPD System (Pulse Filter and Break Tank)

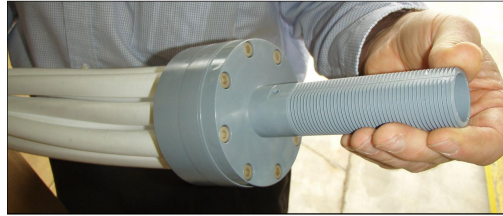


12

Pulse Filter Socks

High Surface Area Filter Elements

- Replaces sock over core-tube design
- Easy replacement
- High area/unit filter
- Solids removed via periodic reverse flow
- Break Tank controls reverse flow pressure



13

PDP Installation

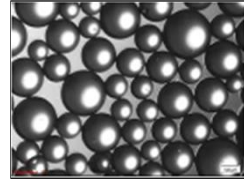
Arauco 30 TPD System (SSU Resin Bed and Feed Tanks)



14

Resin Beads

Ion Exchange Bed and Feed Tanks for Cl/K Removal



15

PDP Installation

Rocktenn 75 TPD System (Alabama, USA)



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PDP Reference List

Eight Installations

Company	Location	Start-up Date	Size
Mill A	Southeast USA	2008	50 t/d
Rocktenn	Alabama, USA	2010	75 t/d
Mill B	Southeast USA	2011	25 t/d
Mill C	Brazil	2013	58 t/d
Mill D	Brazil	2014	60 t/d
Arauco	Chile	2014	30 t/d
Mill E	Southeast USA	2014	25 t/d
Mill F	Northwest USA	Expected 2015	40 t/d

17

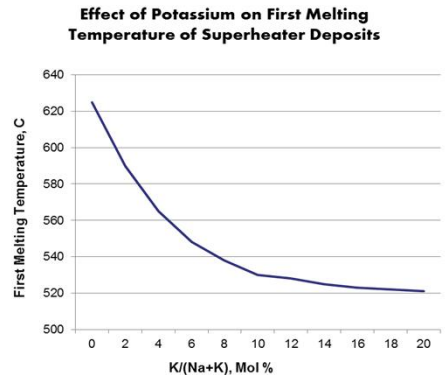
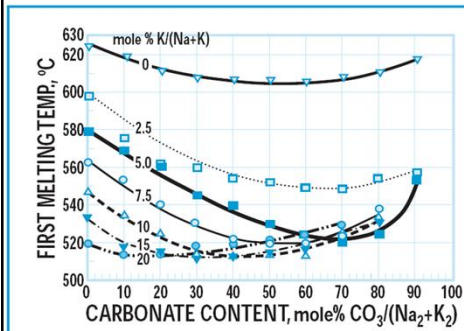
Why K Removal for Mill's with Low Cl Content

Effect of Potassium and Carbonate on FMT

- Mills with high temperature boilers (steam temperature >450 C) can undergo rapid superheater corrosion if the tube temperature exceeds first melting temperature of the deposit
- Potassium has the greatest effect on FMT followed by carbonate and sulfide
- Although chloride has no additional effect on the deposit FMT, high chloride levels can make the deposit more corrosive by increasing the molten phase and thereby increasing the fluxing effect
- High pressure boilers typically target K levels of <4 wt% in ash to minimize superheater corrosion

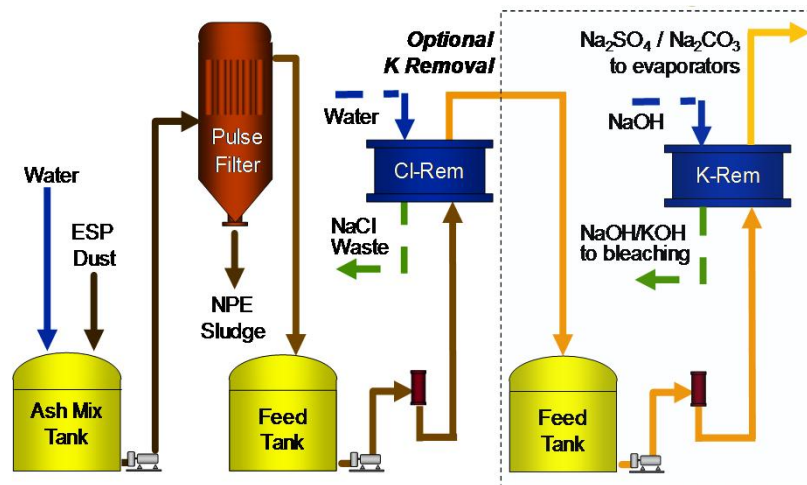
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Why K Removal for Mill's with Low Cl Content Effect of Potassium and Carbonate on FMT



19

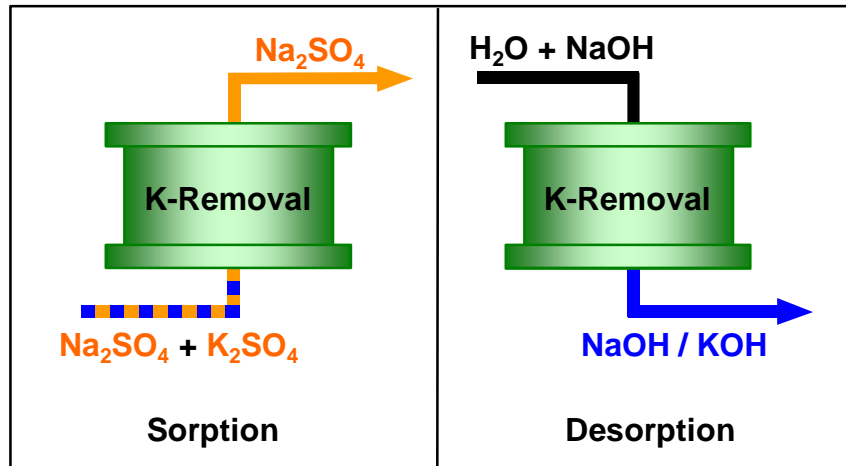
Process Schematic Optional Potassium Removal



20

Short Column IX Resin Beds

Potassium Removal



21

PDP-K System Efficiency

High Chloride/ Potassium Removal and Chemical Recovery

Chloride Removal	80-97%
Potassium Removal	80%*
Carbonate Recovery	90-96%
Sulfate Recovery	90-96%
Pulping Sodium Recovery	90-96%

- These performances can be tuned to either maximize SO_4 and CO_3 recovery or maximize Cl and K removal
- Recent PDP start-ups have achieved >95% Cl removal with >95% chemical recovery

* If potassium removal ion exchange bed is part of installation removal efficiency depends on available caustic for regeneration

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PDP Advantages

Construction

- Small footprint,
 - Flexible layout
 - No new building required
- Low Installation cost
 - Simple small piping connections to process
 - No large vapor ducts or solids conveyors
 - Pre-piped & instrumented modular units

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PDP Advantages

In Operation

- Highest chloride removal
- Optional potassium removal
- Lowest chemical losses (<10% SO_4 and CO_3)
 - Lowest make-up chemical cost
 - Less chloride input in make-up chemicals
 - Less sulfate to sewer (CaSO_4 dredging)
- Simple automated operation
- Little operator attention
- Operates independently of all other equipment
- But! Requires attention to filter maintenance

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PDP Advantages

Maintenance

- Equipment proven in diverse installations
- Low maintenance requirement
- Easily stopped and isolated
- Maintenance can be performed outside of annual mill shut-down

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PDP System Requirements

For a 75 TPD System (Typical)

With Chloride Removal Only

Soft Water (Dissolving Ash and Regenerating Resin)	65 gpm
Additional Evaporator Steam	40 TPD
Power Consumption	50 kW

With Chloride and Potassium Removal

Soft Water (Dissolving Ash and Regenerating Resin)	95 gpm
Additional Evaporator Steam	45 TPD
Power Consumption	85 kW

26

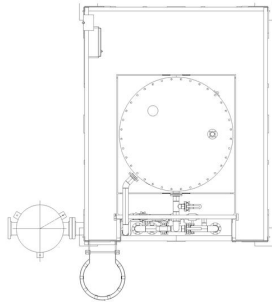
PDP System Footprint

Small and Flexible Layout

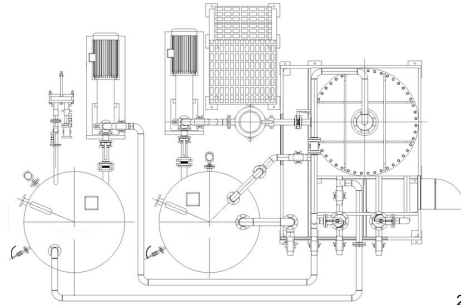
75 TPD Dimensions

	Length	Width	Height
Pulse Filter	20 ft	20 ft	30 ft
Ion Exchange (Cl or K removal)	20 ft	15 ft	10 ft

Pulse Filter



Ion Exchange System



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Thank You

Questions?

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The Impact of Dissolved
Lignin on O2 and D0 Stages
2015 PAPTAC Fall Bleaching Committee
Meeting
Nanaimo, B.C

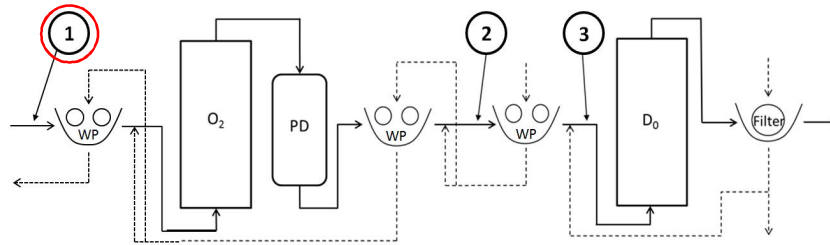
Presented by:
Rick Van Fleet
Fiber Line Business Manager
BTG Americas, Inc.

Introduction

- It is well known that the fiber kappa number is very important in determining bleach demand, it has been shown that the filtrate or carryover contribution must also be considered
- Previous work has focused on the total lignin content or the Bleach Load (fiber plus filtrate kappa)
- It was noticed that the filtrate kappa levels varied significantly and rather quickly
- A study was commissioned to determine if the impact of each was similar

Oxygen Delignification

- Sampling position for laboratory trials
 - Fiber + filtrate



3

Research background

- Cooking – SW Kappa 30:
 - 1000 kg Wood = ~270 kg Lignin
 - ~500 kg Pulp
- Mass balance
 - ~25 kg Lignin in Pulp
 - ~245 kg Dissolved Lignin
- Pulp washing never perfect
 - How does the Dissolved Lignin impact O₂ and D₀ stages?

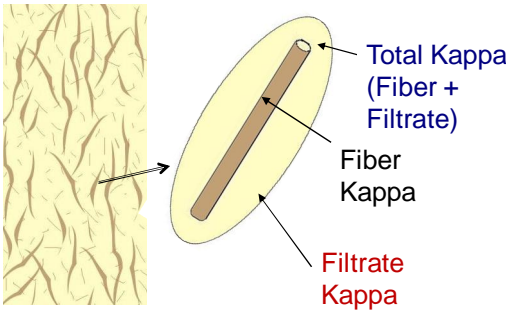


4

Impact on Chlorine Dioxide stages

- Total Bleach Load = Total Kappa number

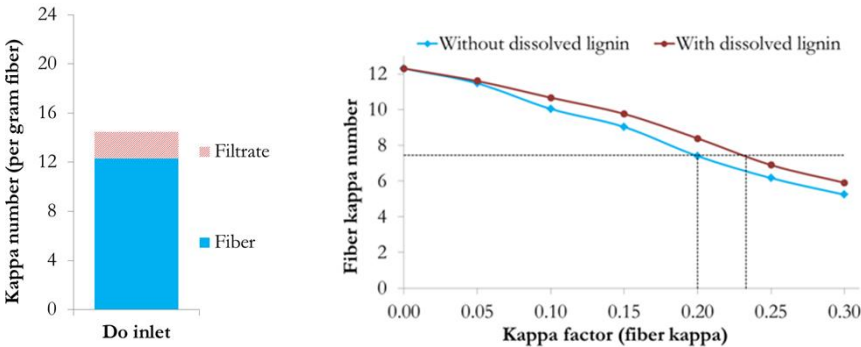
Filtrate Kappa [per mL filtrate] \Leftrightarrow Filtrate Kappa [per g fiber]
– Compare COD



5

Impact on Chlorine Dioxide stages

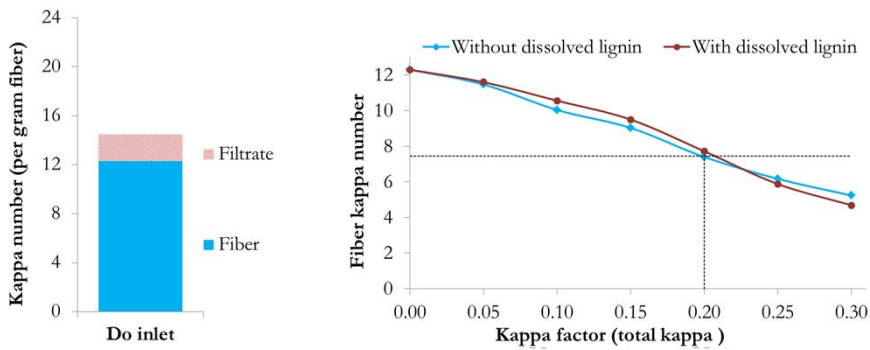
- Laboratory Bleaching Experiments (O₂-del SW Pulp)
 - Conventional Kappa factor



6

Impact on Chlorine Dioxide stages

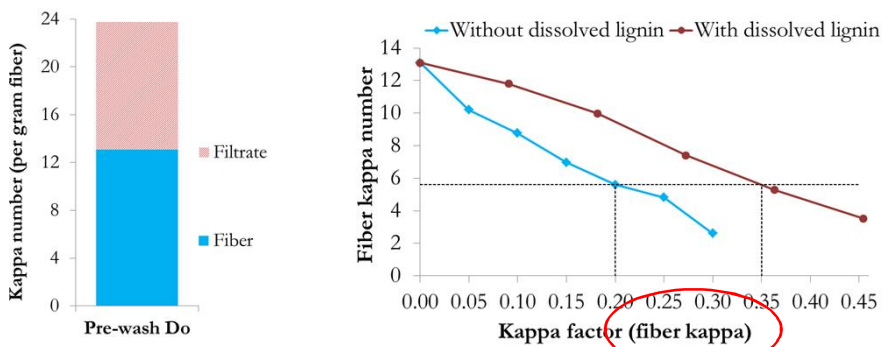
- Laboratory Bleaching Experiments (O₂-del SW Pulp)
 - 'Total Kappa factor'



7

Impact on Chlorine Dioxide stages

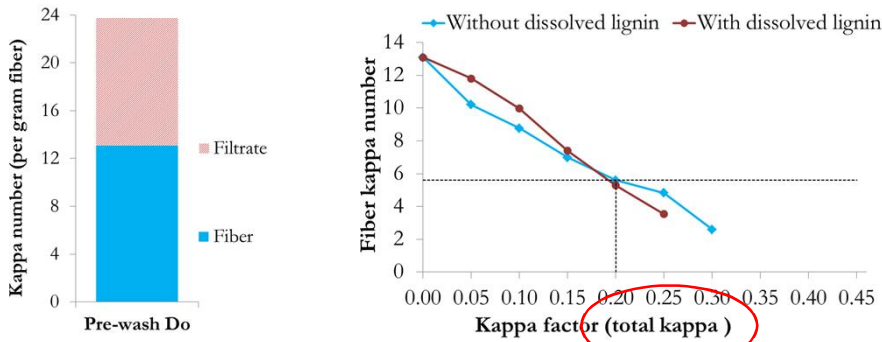
- Verify Filtrate Kappa vs. additional ClO₂ demand
 - Pre-wash pulp D₀ inlet



8

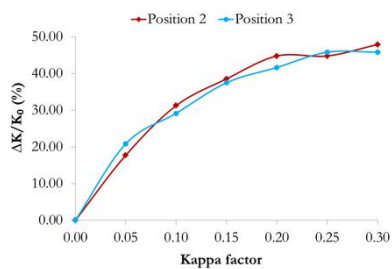
Impact on Chlorine Dioxide stages

- Verify Filtrate Kappa vs. additional ClO_2 demand
 - Pre-wash pulp D_0 inlet

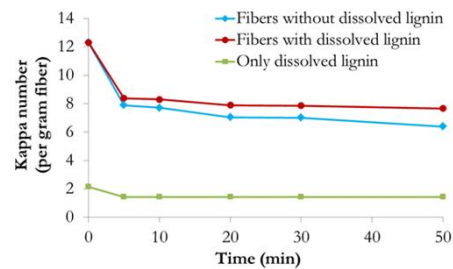


9

Impact on Chlorine Dioxide stages

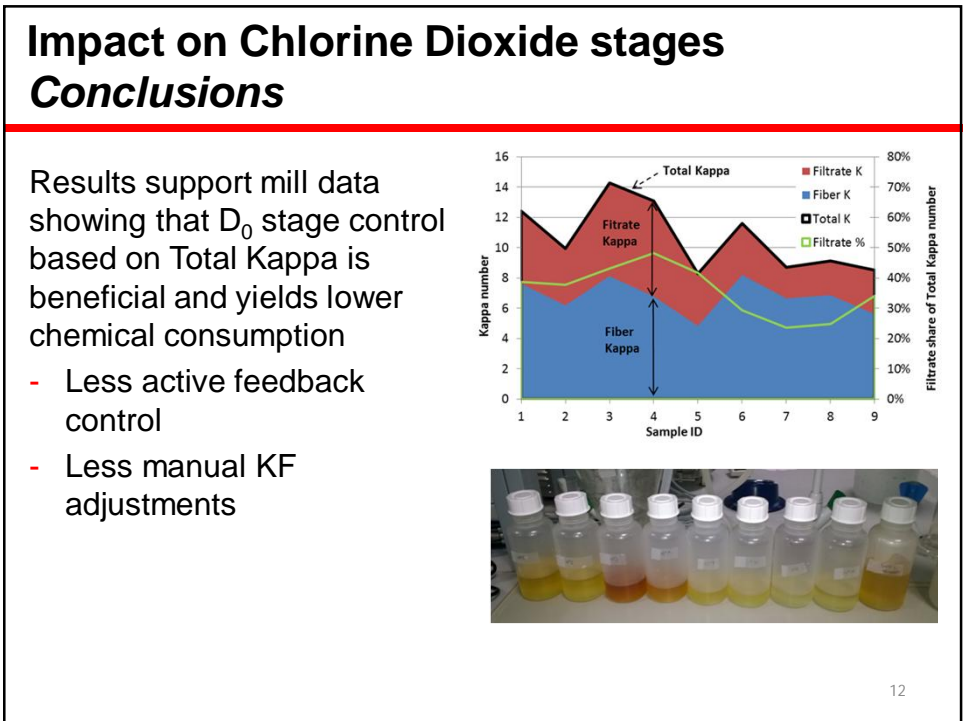
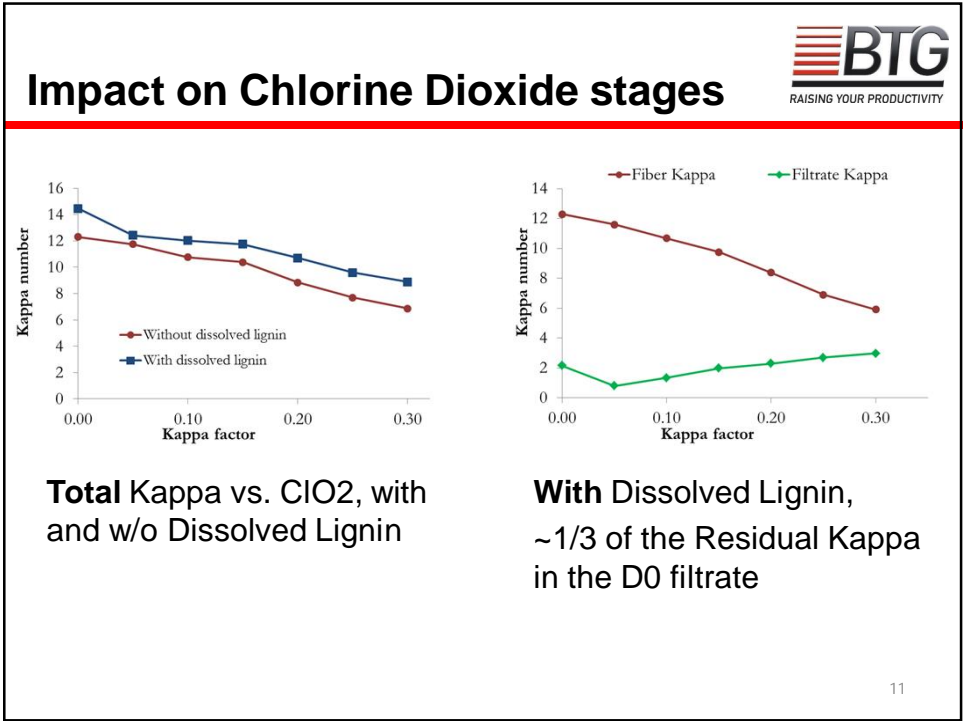


Pre-wash filtrate and D_0 feed filtrate react similarly vs. ClO_2 charge

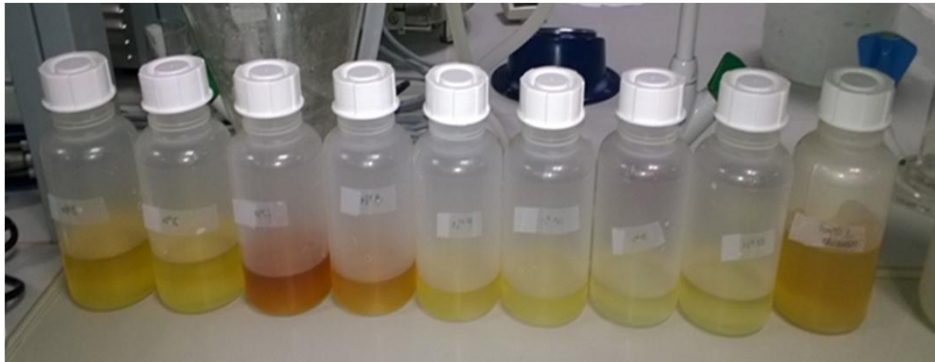


Filtrate and fiber behave similarly vs. time

10



Total Bleach Load = Fiber Kappa + Filtrate Kappa

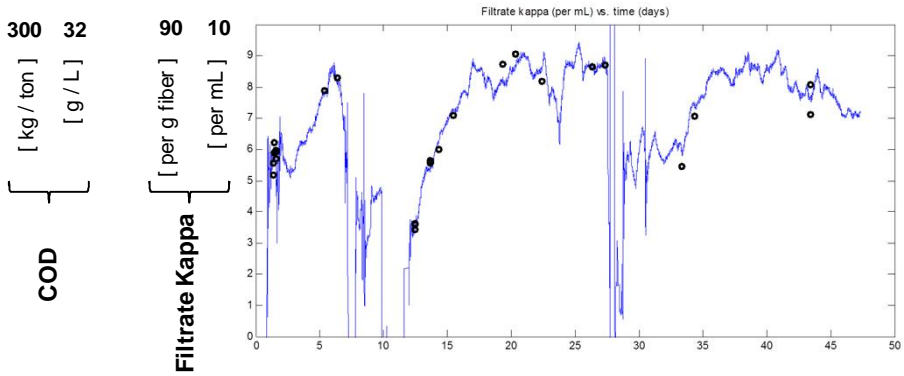


Fiber Kappa	7.61	6.19	8.12	6.78	4.83	8.20	6.65	6.86	5.61
Filtrate Kappa	4.80	3.75	6.15	6.30	3.45	3.40	2.05	2.26	2.90
Total Kappa	12.41	9.94	14.27	13.08	8.28	11.60	8.70	9.12	8.51
Filtrate Kappa Percentage (%)	39%	38%	43%	48%	42%	29%	24%	25%	34%

13

Oxygen Delignification

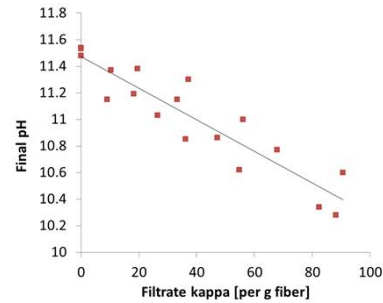
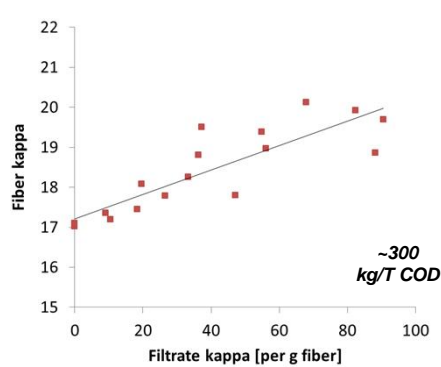
- Variability is significant (47 days, SW kraft O₂ feed)



14

Oxygen Delignification

- Varying COD Load (controlled); partly 'Virgin COD'
 - *Impact 2-3 Kappa units over the studied range*



- *Significantly lower final pH at high COD Load*

15

Oxygen Delignification Conclusions

- Significant variability in dissolved lignin carryover is typical
- Results indicate (at least) 'Virgin COD' carryover should be measured/controlled
 - Brownstock washing control/optimization
 - Feedforward O₂ delig control – alkali and O₂ charges
- Further trials planned to resolve
 - 'Virgin' vs. Recirculated COD
 - Dissolved lignin vs. alkali

16

Acknowledgements

- Based on research by Niclas Andersson, BTG, Caroline Wilke, BTG and Karlstad University, Akhlesh Mathur, BTG and Ulf Germgard, Karlstad University
- The Swedish Knowledge Foundation
- VIPP Industrial Graduate School
 - Values created In fibre-based Processes and Products
 - Karlstad University, Sweden

KK-stiftelsen 



17



IMPACT OF OWL & OWL(T) ON OXYGEN DELIGNIFICATION

Presented by: T. Mullen
Process Innovations

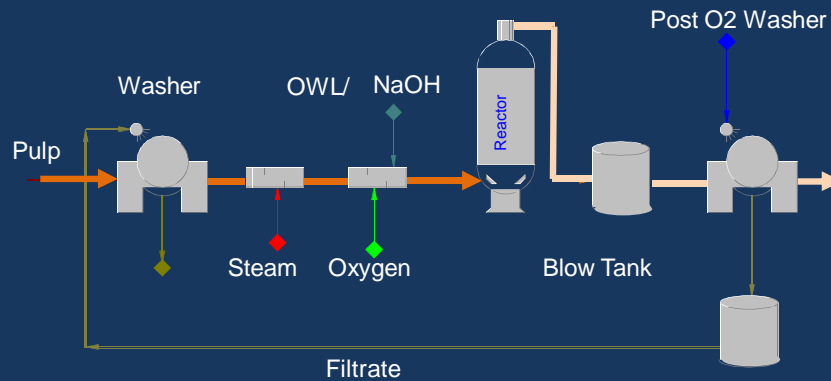


Presentation Format

- Oxygen delignification
- White liquor as the alkali source
- O₂ stage oxygen requirement
- Oxygen mixing
- Oxygen stage model



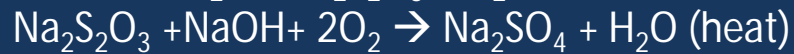
Oxygen Delignification



Operating Parameters (SWD)

- Consistency: 10-14%
- Pressure: 100-200 psig
- Temperature: 90-105°C
- Inlet Kappa: 24-32
- Oxygen charge: 1.8kg/ Δ kappa
- Caustic charge: 1.7-2.0 kg/ Δ kappa
- % Delignification: 30-60%

White Liquor Oxidation



White Liquor Composition (g/l as Na₂O)

Parameter	WL	OWL(T)	OWL(S)
NaOH	85	107.5	85
Na ₂ S	45	0	0
Na ₂ CO ₃	20	20	20
Na ₂ SO ₄	2	2	2
AA	130	107.5	85
EA	107.5	107.5	85

Sulphidity (on AA): 35%

O₂ Delignification Oxygen Consumption

- White liquor
- Lignin/Carbohydrate
- Raw black liquor carryover



White Liquor

- Na₂S/NaOH ratio (molar): 45/85=0.53
- O₂/Na₂S ratio (molar): 2.0 WL to OWL(S)
- O₂/Na₂S ratio (molar): 1.0 OWL(T) to OWL(S)
- O₂, WL to OWL(S): 0.42kg O₂/kg NaOH
- O₂, OWL(T) to OWL(S): 0.21kg O₂/kg NaOH



White Liquor

WL and OWL(T) is converted to OWL(S) in the oxygen reactor.

Value used 2.0 kg NaOH/ Δ kappa:

- WL to OWL(S): 0.85kgO₂/ Δ kappa
- OWL(T) to OWL(S): 0.42kgO₂/ Δ kappa



Lignin/Carbohydrate

- Commercial system¹: 0.7kgO₂/ Δ kappa
- Laboratory¹¹: 1.4kgO₂/ Δ kappa
- Other: 0.6-1.0 kgO₂/ Δ kappa

- Value used: 0.9kgO₂/ Δ kappa



Raw Black Liquor

- Literature values: 0.08-0.09kgO₂/kg RBL
- Reference 3: 0.14kgO₂/kg RBL (calculated)
- Reference 11: 0.11kgO₂/kg RBL

- Value used: 0.11kgO₂/Kg RBL
- 25kg RBL/BDMT (conservative)

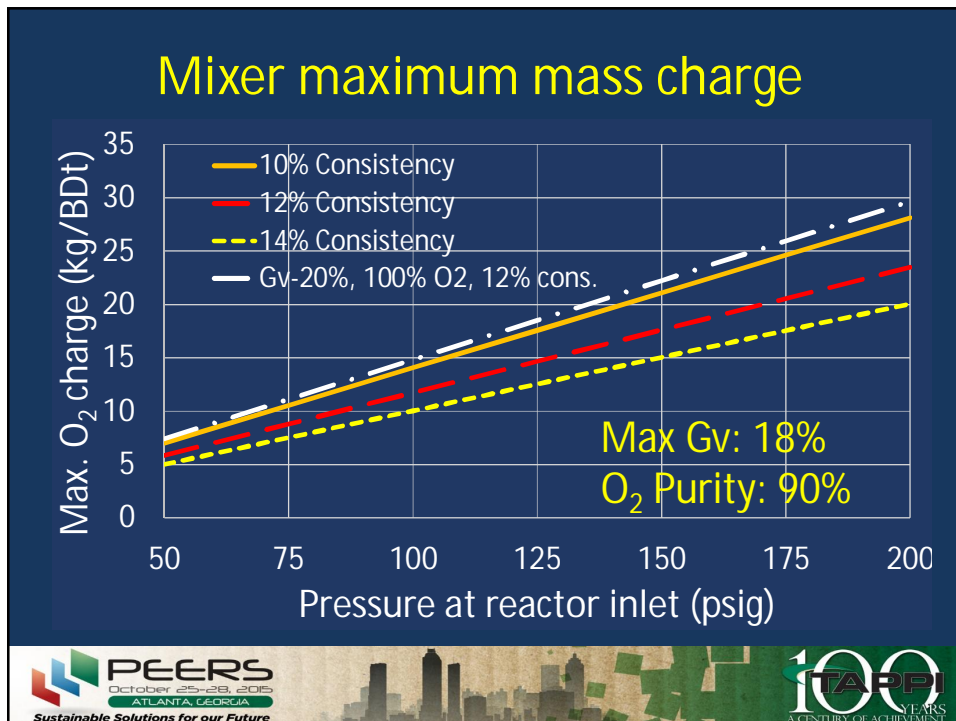
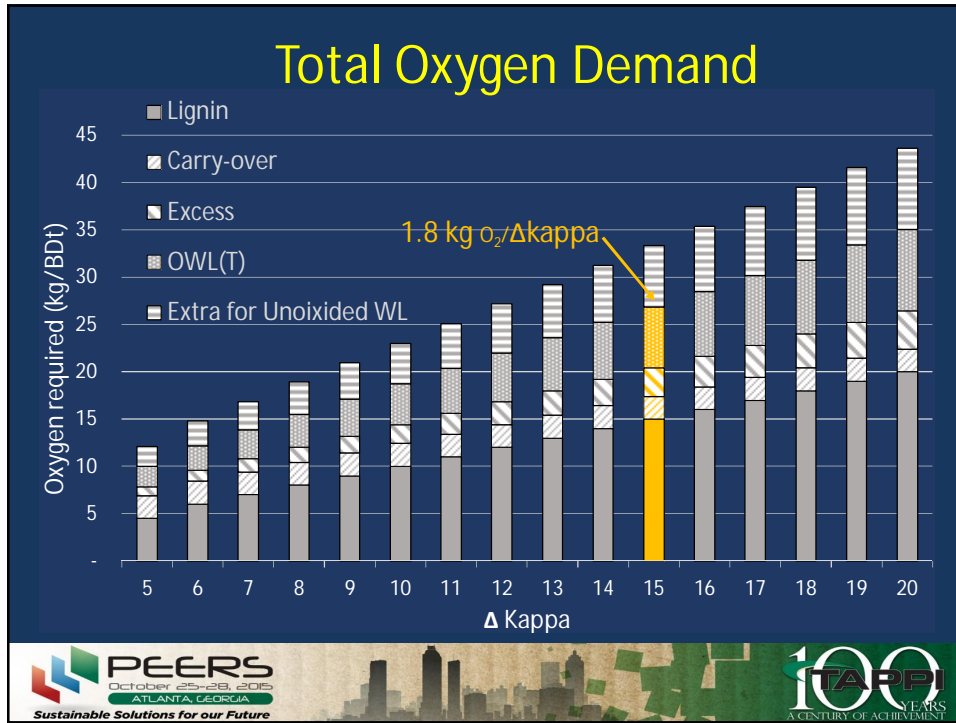


Excess

- Reference 1, Run 1, oxygen mass transfer limited at 33% excess

- Value used: 20% based on oxygen for delignification only (no WL or RBL)





Oxygen Stage Kinetic Model

$$-\frac{dLc}{dt} = 0.175 \frac{[OH]}{0.111 + [OH]} * \frac{P_{O_2}}{1 + 3.39P_{O_2}} * Lc$$

Lc = mg lignin/g
pulp (HexA free)

[OH]= mol/l

P_{O2}= MPa

Adjusted from temperature: 100 vs 90°C



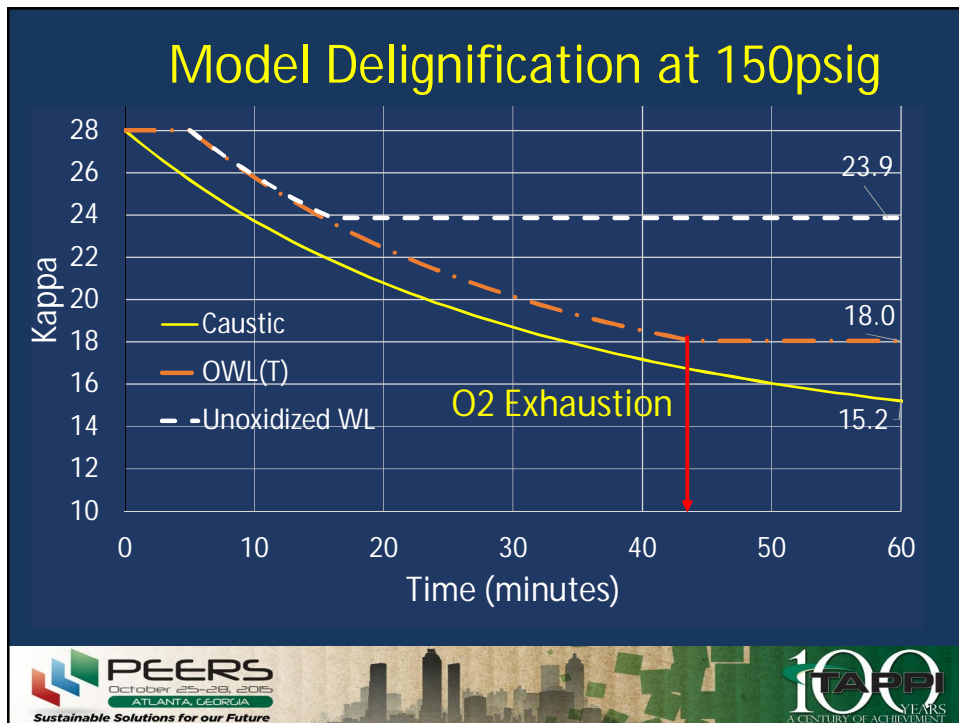
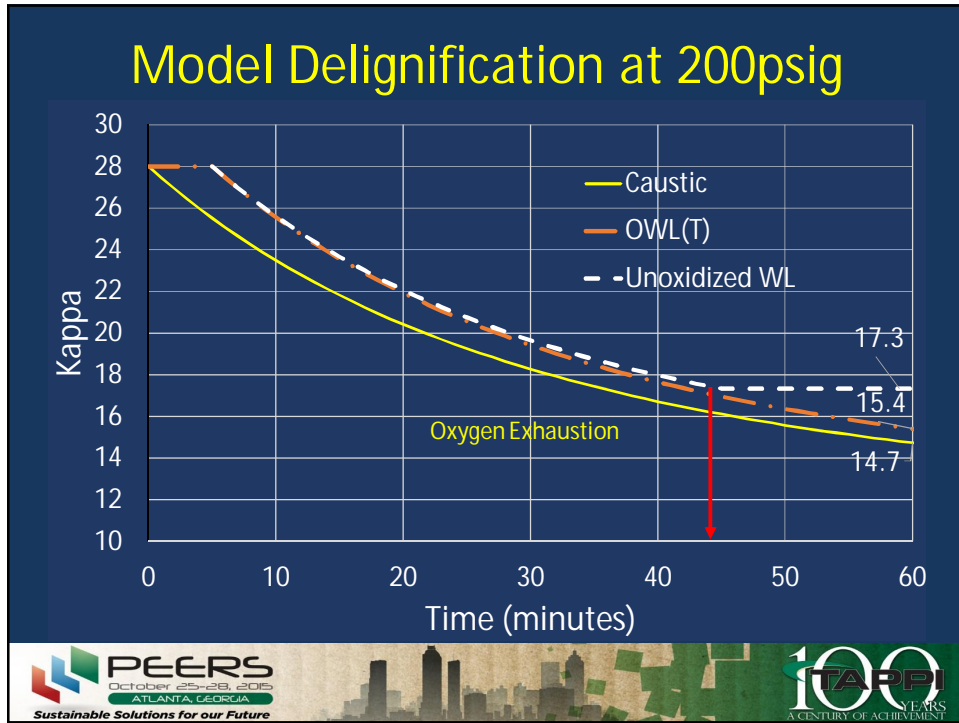
Model Parameters

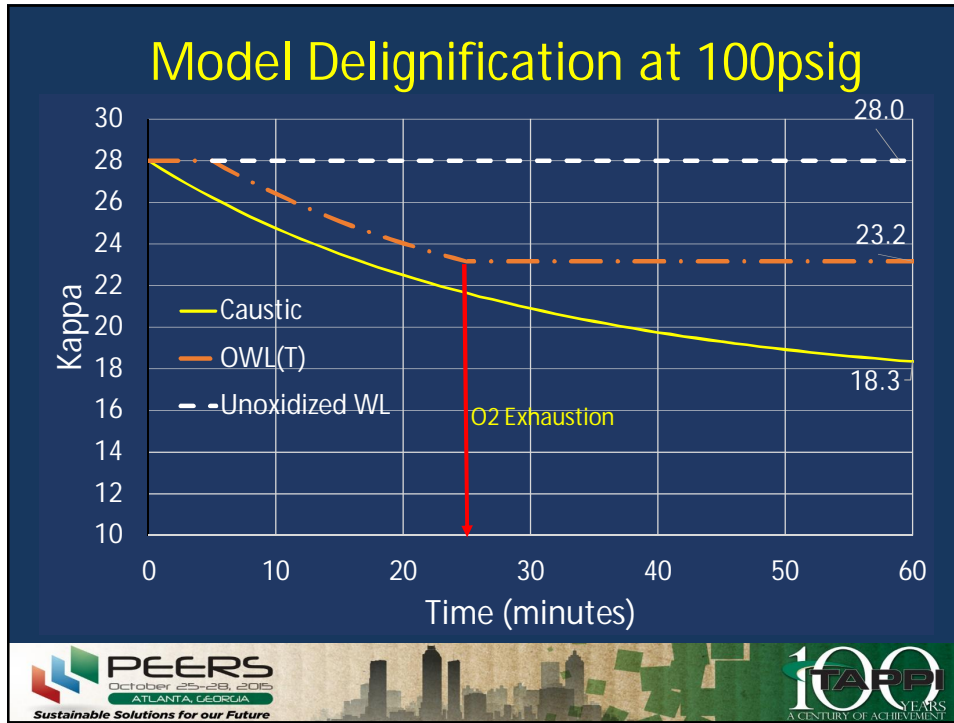
- Inlet kappa: 30
- Caustic charge: 1.8kg/Δkappa
- Oxygen charge: 18% void fraction
- Oxygen purity: 90-100%

Reactor

- Pressure: 0.7-1.38 Mpa
- Static head: 0.4Mpa
- Residence time: 60minutes at 12% cons and
O₂ not considered







Conclusions and Comments



- Minimize the use of WL or OWL(T)
- Using OWL(S) is the same as NaOH
- Increasing the WL, OWL(T) charge will decrease delignification if insufficient O₂
- Increasing consistency may limit the O₂ charge due to maximum void fraction
- O₂ charge: RBL + WL/OWL + Delignification



Questions




Parameter	Units	NaOH	OWL(T) ¹
Δkappa		15	15
Alkali	kg/Δkappa	1.7	1.7
Caustic	kg/BDt	25.5	25.5
RBL carryover	Kg/BDt	15	15
Post O2 Washer Filtrate			
Total Organic	Kg/BDt	124	124
Inorganic			
Na	kg/BDt	51	97
CO ₃	kg/BDt	30	43
SO ₄	kg/BDt	3	51
S ₂ O ₃	kg/BDt		
Total Inorganic	kg/BDt	84	191
Total solids	kg/BDt	208	315
Inorganic/Organic ratio		0.68	1.54
1 White liquor composition as per table 1.			

PAPTAC Bleaching Committee
Section 7 - MILL UPDATES AND PROBLEMS SESSION
Nanaimo, BC. – September 20-22, 2015

Paul Earl Consulting

Question: Do folks filter the Cormec or Polarox readings?

- James Goldman – depends on mixing
- Laurier Morissette – Controller sometimes acts as filter

Paper Excellence - Skookumchuck

- Will be installing a Noss Secondary Knotter
- Installing FITNIR for EKA Generator and digester
- Have installed 4 wells to supply water to the Mill. 4-5K gpm for 28 days under testing .
- Installing a new drive system for a Pulp Machine

Question: Anyone recycling Bleach Cleaner rejects back to brownstock?

- Brian La Brash – Yes on hardwood pulp
- Many possibilities – Should first focus on improving cleaners, like adding an additional stage.
- Should test rejects for ash, some grit can be from tile grout
- Recovering might be a seasonal opportunity due to things like sclereids
- Some have seen dirt build-up in their systems. Suppliers don't recommend

Clearwater Paper – Lewiston

- The proposed Polysulfide Continuous Digester project has been fully approved
- Purchased a FITNIR in 2015 for Kiln
- New 1000 ADT bleached HD in 2016
- Installing pressurizing Eop and a Precipitator Dust Purification™(PDP) for chloride removal
- 2 new gas burners for kilns

Question: Does anyone use spray / nozzles to reduce foam on level tanks?

- Irving uses on paper machines
- Castlegar uses a spray knockdown on a seal tank

Question: Any ideas on handling charred wood from forest fires?

- Skookumchuck – Don't use if possible, will see dirt. Double debarking helps

Question: Has anyone tried HCL instead of H2SO4 in the Bleach Plant?

- Alison – Flint River Mill tried it and didn't see a difference

Question: Has anyone looked at fiber charge off final bleach washer?

- Use as clean a wash water as possible, not much you can do if this is the case
- Question has come up at mechanical pulp mills
- Irving – Use Bi-Sulfite continuously to control ClO2 residual instead of SO2

Irving Pulp

- New Valmet digester to start-up at end of 1stQ 2016
- New demineralizer plant
- New bleached stock recovery system
- Pulp Dryer engineering ongoing
- New advanced controls in Bleach Plant ongoing
- New hog and bark delivery system for Power Boiler

Working on upgrade project for replacing 3 old pulp machines with 1

Question: How can we increase Bleach Plant capacity with CanRon washers?

- Daniel Brouillette – Talk to AV Nackawic, and GP Alabama River Pulp
- Paul Earl – See Fall 2005 presentation from Elk Falls on vacuum assist

Question: Where is the best place in the Bleach Plant to upgrade washing?

- Do stage to improve Eop performance
- Running a simulation can help determine the best location

West Fraser - Hinton

- Mill has been running better since Sept Outage
- Best month ever since 2008 machine upgrade
- Some management changes, have filled most of staff positions
- Put in APC bleaching controls from Spartan Controls

Question: Best practice for bleaching tower level measurement?

- Radar as primary measurement
- DP cell as back-up to radar for most mills

Question: What types of instruments are people using for washer vat levels?

- David Trzil – DP cell and two vibrating prongs, will email info on this
- Rick Wasson –Continuously purged DP cells

Question: What could be causing lower brightness from bleach washers than final pulp dryer brightness?

- Look at ClO₂ residual
- ClO₂ will absorb into pulp causing color
- Take bi-sulfite and do a side by-side test with and without to see if there is a significant difference
- Should neutralize to 5-5.5 pH to run brightness

DMI – Peace River

- Corrosion projects and FRP replacement after 25 years of operation (Digester Flash Tank and bottom of Digester overlay)
- Replacement of #5 Wash Press rolls – positive impact on conductivity
- Training focus to address employee turnover and succession planning for knowledge retainment
- Replaced 10 ft of kiln shell due to corrosion concerns around one of the support points
- Lost 6 days due to HPF bearing issue
- Looking at MC Pumps
- Solved evaporator problems
- Broke TC Pump/line
- Have lowered blowline temperature

Question: How many mills are still using Lithium Bromide chillers? Group survey

- No mills responded yes

Question: How do mills shrink wires?

- Steam hoses to vat
- Steam spargers in vat

Question: How do folks measure evaporator condensate quality?

-

WestRock – LaTuque

- New DCS
- Batch digester replacement

Question: What are mills using for scrubbing medium in Bleach Plant Scrubbers? Group survey

- ~80% use white liquor

- ~20% use weak wash or NaOH
- 3 mills use Eop filtrate - these have Turbotek scrubbers

NORAM Engineering

- Have a chloride and potassium removal system for treating Recovery Boiler saltcake?
Question: Have developed a resin based technology which captures Potassium in the ESP catch as KOH. The resin is regenerated using 20% caustic. Can this caustic be re-used in the Bleach Plant?
- Group response was it could be used and is similar to most caustic to bleach plant strengths

Harmac Pacific

- Partnering with city for WWTP
- Adding O2 plant
- Installing mixer in bleach plant
- Going to medium consistency on E2
- Adding DCS for digester
- Changing outlet device cone in digester
- Changing bleach washer shower nozzles
- Raising evaporator solids

Question: Who is using a BTG BLT or DLT device?

- Verso Wisconsin Rapids, Howe Sound installing one, Castlegar?

Question: Washer speeds limit production, what can be done / causing this?

- Control washer inlet consistency?
- Does the washer need defoamer?
- Look at wires, check for vacuum leaks

Question: What is backpressure on a pressurized Eop Tube?

- Mona Henderson – 40-80 psig
- Hinton – 20 psig?
- Grand Prairie – 50-60 psig 165 oF

Question: White water used on pre-bleach washer has changed and not sure if conductivity measurement is still useful?

- Develop a relationship between the conductivity and ClO2 consumption

Verso Corporation – Luke Mill

- Converted pine line from 4 stage to 3 stage, by-passing a P stage

Verso Corporation – Phil Sekerak -Corporate

Question: D1 pH Extractor readings not representative of the process?

- Could be channeling – check consistency, repulper dilution
- Poor mixing is likely the cause

Question: Having reliability issues with direct steam heating of Chlorate, what are folks doing?

- Heat hot water as high as possible, Steam coils
- Murray Walters – Some use spargers in the railcars
- Cariboo and Skookumchuck have steam coils in the tank – Skook controls to 200 oF
- Howe Sound controls to 60-70 oC and trims with direct steam

Question: Peroxide residual testing options?

- Peroxidase strips, remove D1 shower water before testing to remove ClO2 residual, there is a titration that can be done to negate the influence of ClO2

Verso Corporation - Quinnesec Mill

- Installed new de-barking drums in Woodyard, largest chip pile in many years
- Lots of new hires throughout the mill
- Wireless alarm system installed on safety showers/eye washes in Chemical Preparation & R10

Question: Are folks controlling dilution water to MC pumps?

- Some are doing ratioing to production
- Texo has configured major/minor flows to repulper / standpipes

Question: Has anyone re-packed S-10 vent scrubbers and seen a marked improvement in efficiency?

Question: How many folks are running to DEK vs. %Delig for their Do controls?

- No one is running to %Delig. Most are running to DEK, some with Eop brightness feedback
- Skookumchuck – Running just feed forward KF
- Many using residual measurement as part of the control

Akzo Nobel

- Paper chemicals division sold to Kemira. Retaining bleaching chemicals and chlorate business

Kemira

- Bought SOTO

Question: Do mills have emergency systems to treat NCG's sent to the stack when they cannot be handled normally?

- Sent to power boiler, lime kiln
- Scrubbed in packed tower using white liquor
- Sometimes they cannot be treated and are vented to atmosphere

Texo

Question: How do mills handle dry chips?

- Verso Quinnesec, Add cold blow to FV-4
- Honey – Harmac adds water to the chip belt
- Many responded it depends upon digester runnability. Some screen out and meter a portion back in to the digester feed

Verso Corporation - Wisconsin Rapids Mill

- Ozone stage has been removed. #1 Fiberline converted from ZEpD1D2 to DED
- Converted hardwood and softwood 2 digesters to Downflow Cooking
- No longer white liquor limited so working to get White Liquor Oxidizer back on-line
- Broke safety record for days between recordable injuries

Question: Are having significant scale issues with feeding caustic to D stage repulper – clove rotor pump feeding the Eo tower is full of scale. Have tried anti-scale. Working to get acid press running to be able to add acid?

- DMI – use anti-scale and acid clean with Urea HCL
- Could be poor washing in previous stage

Verso Corporation - Escanaba Mill

- Changed batch digester cooking strategy and have improved yield and number of cooks
- Converted from 5 stage to 4 stage bleach plant. Removed E2 stage.

Question: Anyone using a direct steam injection device for heating?

- GL&V has a medium pressure mixer
- Solaris by Hydrothermal sells a device

Fall 2015 Bleaching Committee – Mill Updates and Problems

- No one in attendance is using one
- Question: Are seeing the ClO₂ flow from storage to the Bleach Plant diverging?
- ERCO has seen this when flowmeters start to die
 - Hinton has experienced this
-

Valmet Automation

- Metso is out of Pulp and Paper; all P&P under the name Valmet
-

Valmet

- Moved office from Norcross to Duluth Georgia
-

Canfor – Intercon Mill

- New Turbo Generator
- Looking to convert 2 steam turbines to VFD in bleaching and Pulp Dryer
- Adding a quaternary screen to the brownstock system
- 2-stage O₂ in 2016
- #1 washer trowled on lining installed last year was inspected and is doing well

Question: Seeing flow restriction in a dilute acid line?

- Kynar lines have melted/collapsed
 - Barium Sulfate
 - Irving – Iron Sulfate from dirty acid
-

Canfor – Northwood Mill

- New chiller before summer of 2016 – compression style instead of absorption
- Looking at lots of energy savings projects – steam trap maintenance, heat exchangers

Question: Who has absorption style ClO₂ vent scrubbers and what is the scrubbing medium used?

- Irving – use chilled water
- Skookumchuck – Used to use NaOH, now use chilled water, 39 ppm
- Cariboo – Well water, gas fed to Bleach Plant scrubber which uses NaOH

Question: Who has Upflow Towers?

- Irving – Do only
- Skookumchuck – Do upflow
- Crofton – D stages are upflow

Question: What kind of washer wire do you use, do you have issues with tears?

- Irving – Shrink on, don't have tears
- Verso Luke – Shrink on Kynar
- Harmac – have dilution line on top of tower for start-ups
- Skookumchuck – Can get pulp wedged under doctor board, added a water doctor, use a chime ruing instead of bands

Question: How do you control washer rpm / dilution?

- Irving – Control vat dilution flows
-

West Fraser – Cariboo Mill

- Bought first kappa analyzer and are installing
- Lots of new young workers
- Capital investment in upgrading Kiln, Recaust, and ash handling
- Steam conservation projects, looking at Bleach Plant temperatures

Fall 2015 Bleaching Committee – Mill Updates and Problems

- Working on ClO₂ alarms – 12 zones with monitors

Question: Who is using Metso and FTNIR measurements for digester liquor residuals?

- No responses for Metso
 - FTNIR - Canfor Northwood and PG pulp, Crofton, Resolute Thunder Bay
-

Weyerhaeuser

- Lots of cross-training between mills
- Lots of new bleaching Process Engineers
- Flint River up and running after shutdown, delayed almost 30 days
 - New Do tower – 30 min
 - New Do and Eop Valmet wash presses
 - New DCS in Bleach Plant
- New Bern – Goes down for annual outage in October – new headbox

Question: Is anyone regulated on the feed to a Bleach Plant Scrubber?

No one has really heard of this, but David Trzil stated that it can be used to potentially infer scrubber emissions

Paper Excellence - Howe Sound

- New MC Do stage
- New 600 ADT storage tank
- New O2D system
- New digester wash screens
- New CRP for ash purging
- New evaporators

Question: Has anyone removed SO₂ from the final stage?

- Many are using bi-sulfite
 - Adding H₂SO₄ to pulp dryer takes care of it
 - Control residual better
 - Can use H₂O₂ to kill ClO₂ residual
-

Nalco

- Mike Kjerulf has joined Nalco
-

Econotech

- They are releasing a new reburnt lime analyzer
-

Doug Pryke Consulting

- Optimizing the bleach Plant at Covington
-

Murray Walter – AllNorth

- Lots of work
-

Tom Mullen

- Oxygen plant to be installed for primary clarification
-

Catalyst – Crofton Mill

- New Page acquisition
 - Working to improve reliability
 - Lining Do tower with FRP
 - Changed washer wires
-

Fall 2015 Bleaching Committee – Mill Updates and Problems

FP Innovations

- Near neutral bleaching trials
 - Working with BTG on brown stock washing
-

Question: Who is using acidic bleach filtrates as a heat source?

- Paul Earl – A few mills are using Do filtrate for ClO₂ HX's since they have to be built from titanium anyway
-

Canfor – Prince George Mill

- Water treatment system
 - Splitting warm and hot water systems
 - Pulp Eye installation
-

Verso Corporation - Androscoggin Mill

- Re-structuring. Going to 1 fiberline and 3 paper machines
-

Poyry Canada

- 110 Kappa southern pine line
 - Drum washer replacement
-

ERCO

- New president Ed Bechberger