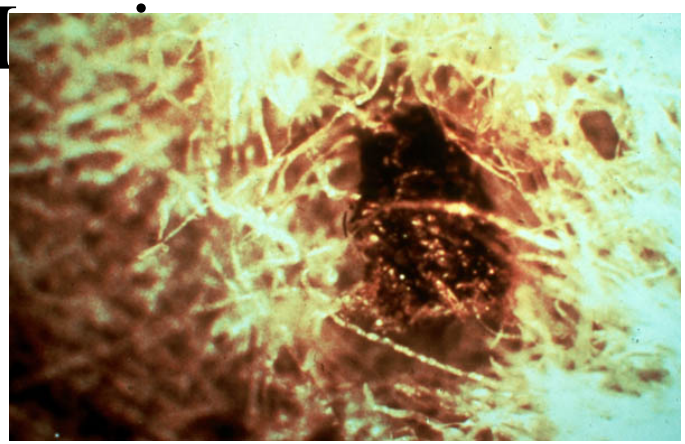
Paptac Bleaching M

Quinnesec Mill



Dirt (Extractives)
Causes & Solutions

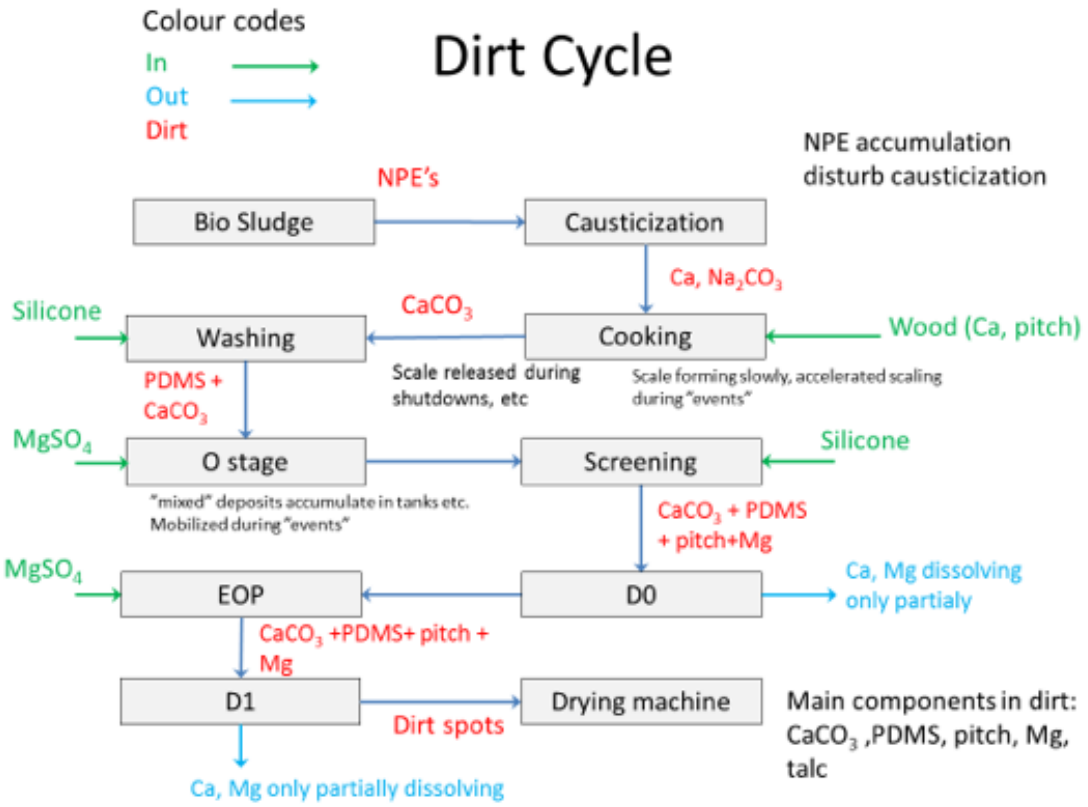
M
Global Industry Technical Consultant

May 15 2019

Agenda

- Pulp Mill Dirt Cycle
- Dirt Deposit Analysis
- Pitch Composition
- Typical Solutions

Pulp Mill Dirt Cycle

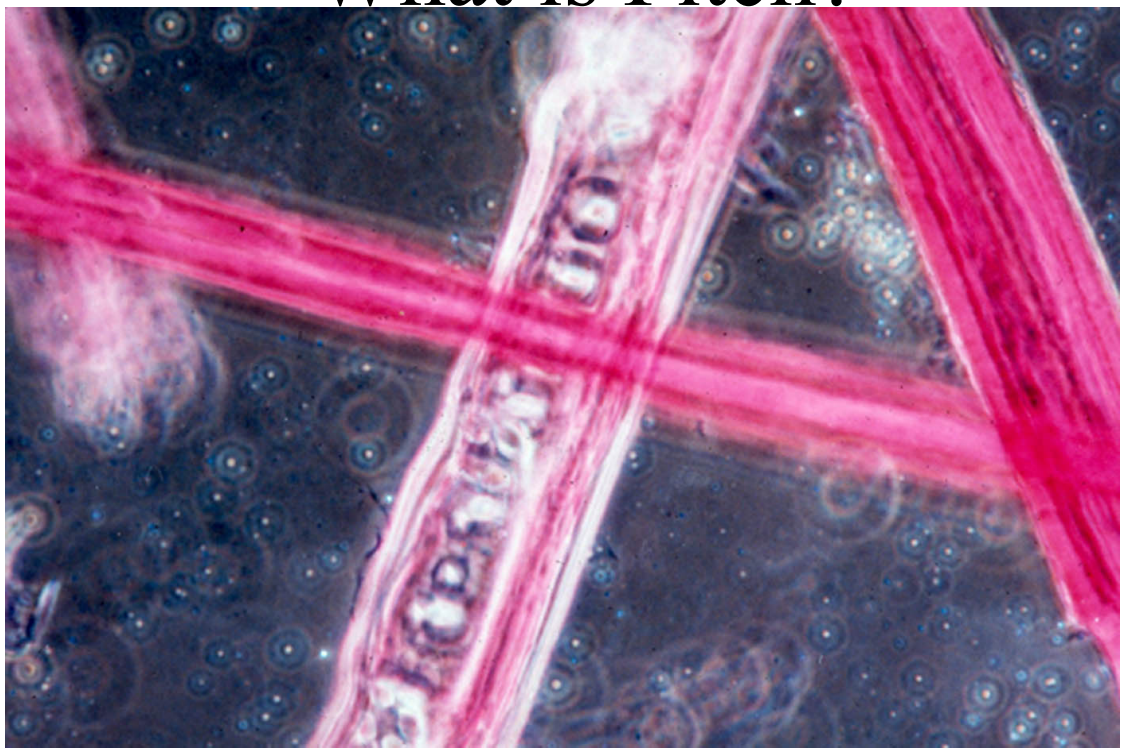


What is Pitch?

- Hydrophobic, Colloidal Particles
- 0.2-2.0 Microns
- Dilute Oil-in-Water Emulsion
- Negatively Charged
- Unstable Dispersed State
- Dark, Tacky, Layered Deposits

DCM Extractives	10-20%
Ca	30%
Silicone	25%
CO3	20%

What is Pitch?



Illustrates the hydrophobic characteristics of colloidal pitch

Components of Pitch

SAPONIFIABLES

- Fatty Acids/Salts
- Resin Acids/Salts
- Fatty Esters

UNSAPONIFIABLES

- Waxes
- Fatty Alcohols
- Sterols
- Terpene Alcohols

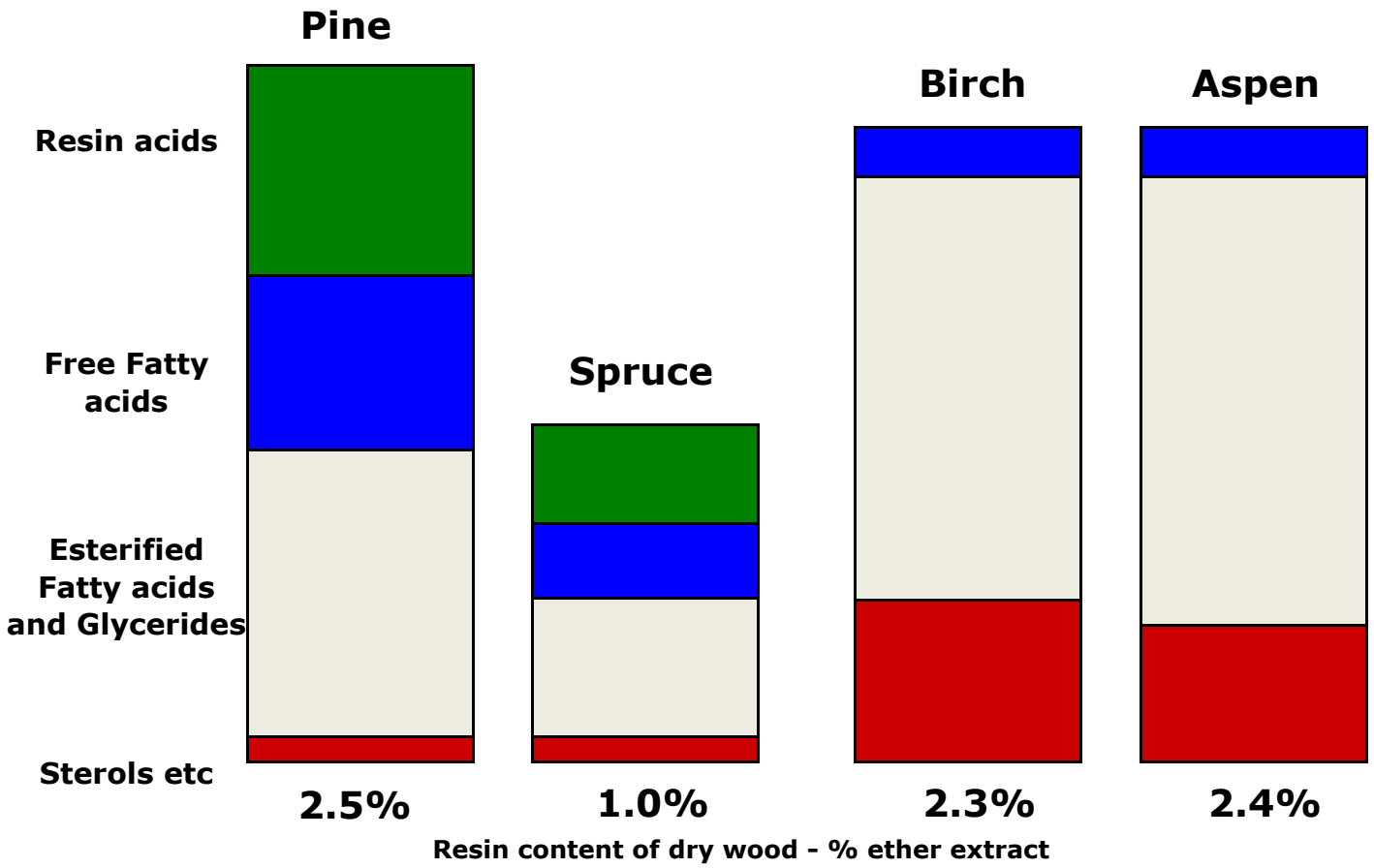
Wood Chemistry – Species Detail

Table 3-2. Chemical Analysis of Certain Softwoods and Hardwoods as Determined at Forest Products Laboratory, Madison*

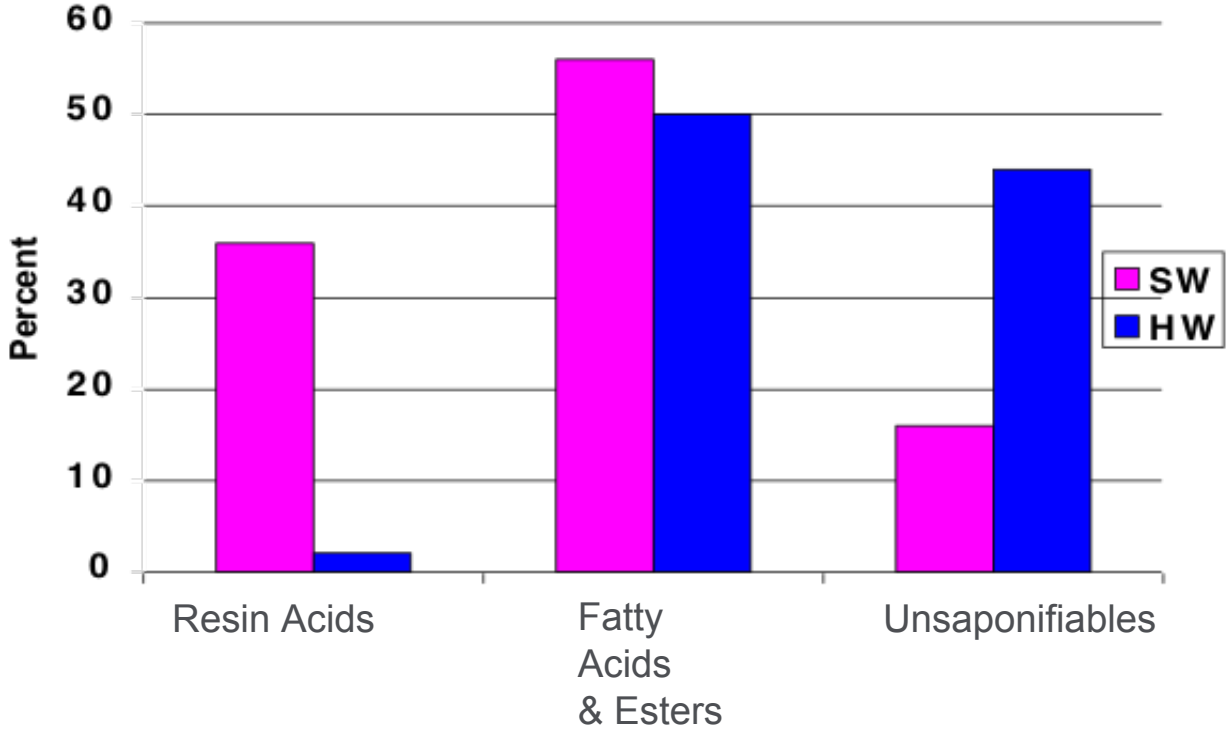
Species	Shipment No.	Holocellulose, %	Alpha cellulose, %	Lignin, %	Total pentosan, %	Solubility in				Ash, %
						Alcohol benzene, %	Ethyl ether, %	1% NaOH, %	Hot water, %	
Noble fir (*Abies procera*)	2657	61.3	42.8	29.3	9.0	2.7	0.6	9.6	2.3	0.4
Western larch (*Larix occidentalis*)	2815	66.5	50.0	26.8	7.8	1.4	0.4	13.4	4.9	0.4
Engelmann spruce (*Picea engelmannii*)	2659	67.9	44.3	26.3	9.2	2.8	1.4	12.2	3.7	0.2
Slash pine (*Pinus elliottii*)	2404	68.5	46.1	28.0	8.6	2.6	2.0	9.9	2.5	0.2
Western white pine (*Pinus monticola*)	2660	64.3	42.3	25.4	7.9	8.3	5.6	15.6	3.7	0.3
Red pine (*Pinus resinosa*)	2607	71.2	46.8	26.2	10.0	3.5	2.5	13.4	4.4	
Douglas-fir (*Pseudotsuga menziesii*)	2655	67.0	50.4	27.2	6.8	4.4	1.2	15.1	5.6	0.2
Western hemlock (*Tsuga heterophylla*)	2765	74.0	52.5	27.8	9.2	1.6	0.8	9.2	0.4	0.3
Red maple (*Acer rubrum*)	2731	71.0	44.5	22.8	17.1	2.5	0.8	17.9	4.4	0.7
Yellow birch (*Betula alleghaniensis*)	2732	72.5	51.0	22.7	22.6	2.6	0.8	15.4	2.7	0.8
Beech (*Fagus grandifolia*)	2733	75.7	51.2	21.0	20.2	1.8	0.7	14.7	1.5	0.5
Quaking aspen (*Populus tremuloides*)	2861	78.5	48.8	19.3	18.8	2.9	1.0	18.7	2.8	
Chestnut oak (*Quercus prinus*)	2741	75.7	46.8	24.3	19.2	4.7	0.6	21.1	7.2	0.4
Basswood (*Tilia americana*)	2735	76.7	48.2	20.0	16.6	4.1	2.1	19.9	2.4	0.7
American elm (*Ulmus americana*)	2734	72.9	55.2	20.5	16.2	2.0	0.5	14.3	1.6	0.4

* All percentages based on moisture-free wood.

Wood Chemistry – Extractives Detail



Pitch Components in Hardwood and Softwood

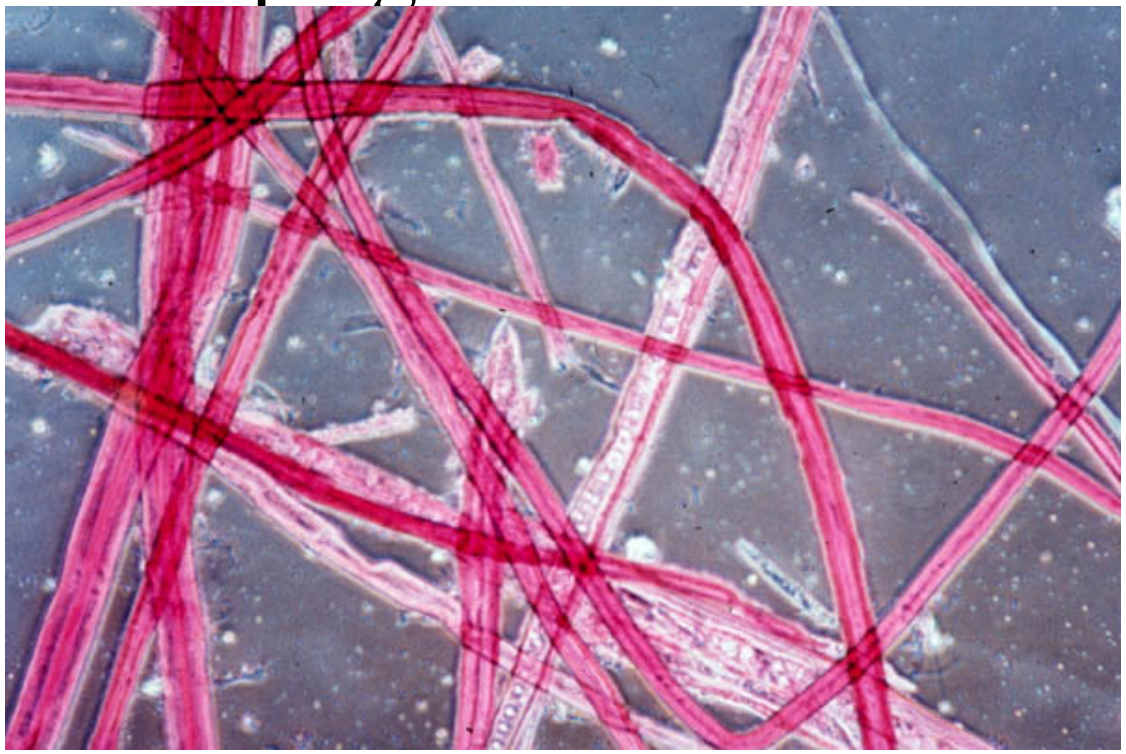


All percent based on extractives

Factors Impacting Type & Volume of Deposits

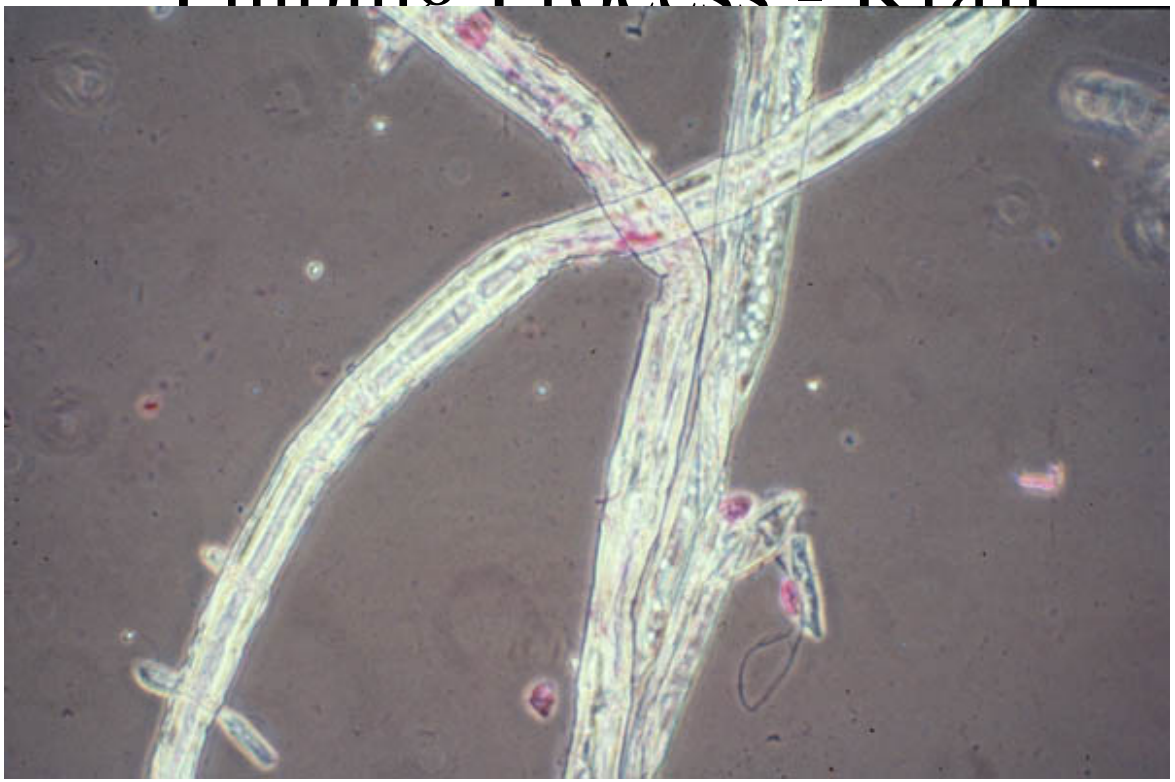
- Type of Wood
- Seasoning of the wood
- Time of Year
- Pulping Process
- System Additives
- Washing
- Bleaching

Pulping Process - Kraft



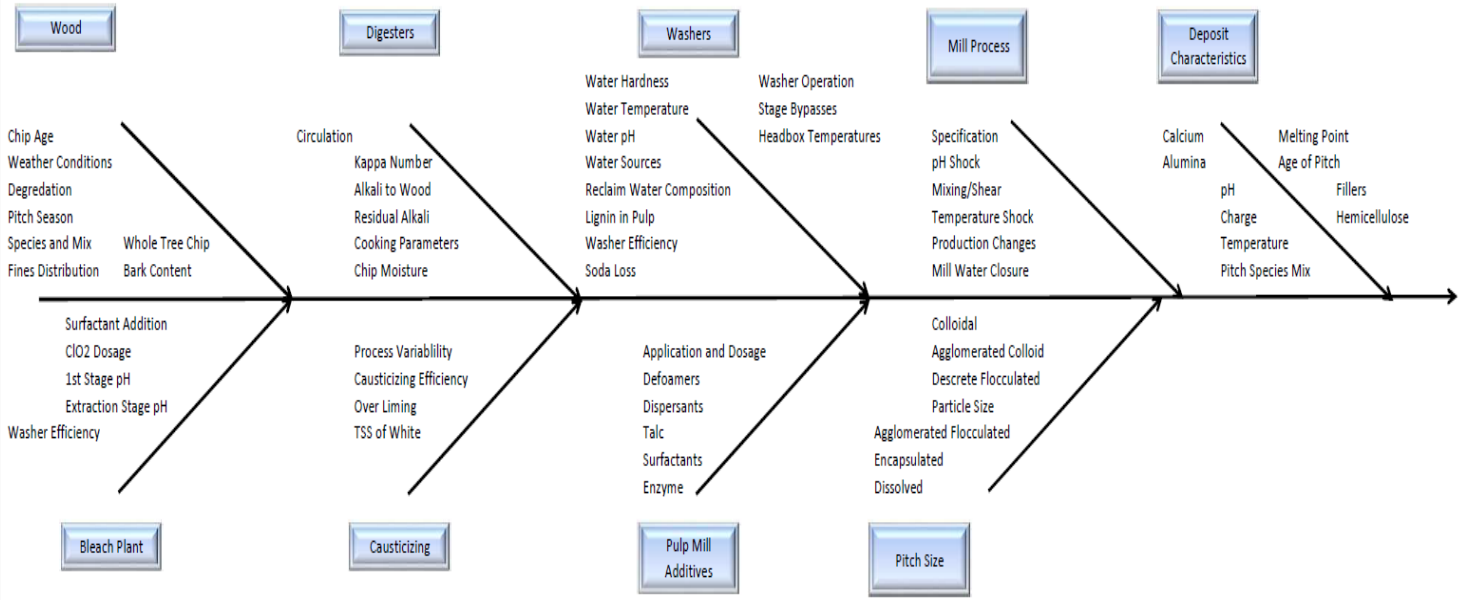
Kraft fiber from BSW with pitch agglomerates and fibers containing lignin.

Pulping Process - Kraft



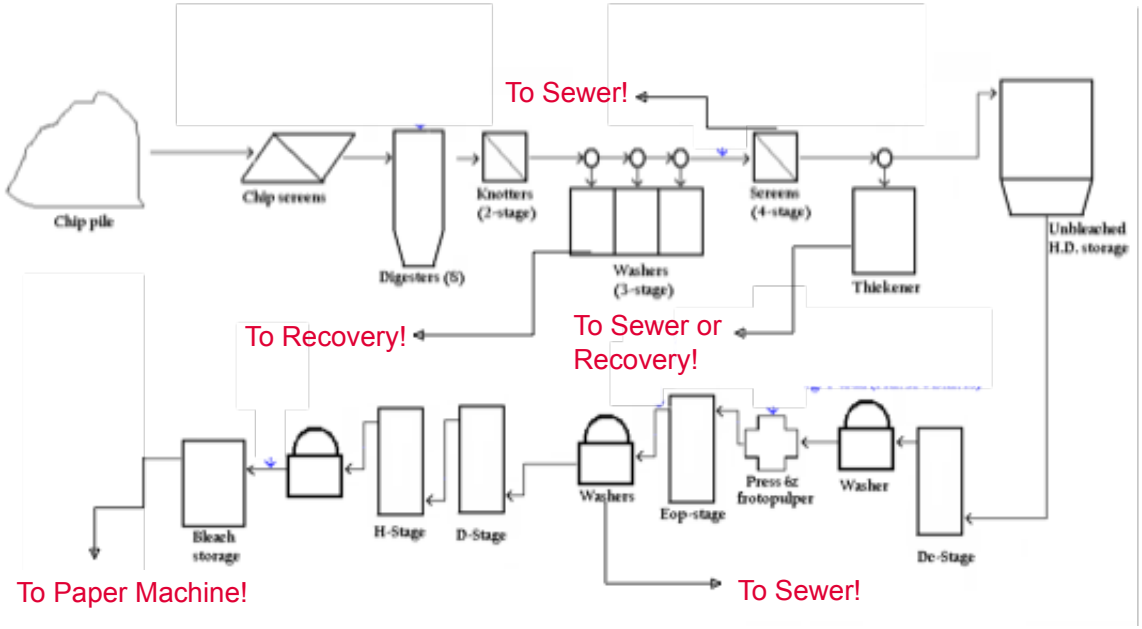
Bleached Kraft fiber showing small pitch agglomerates.

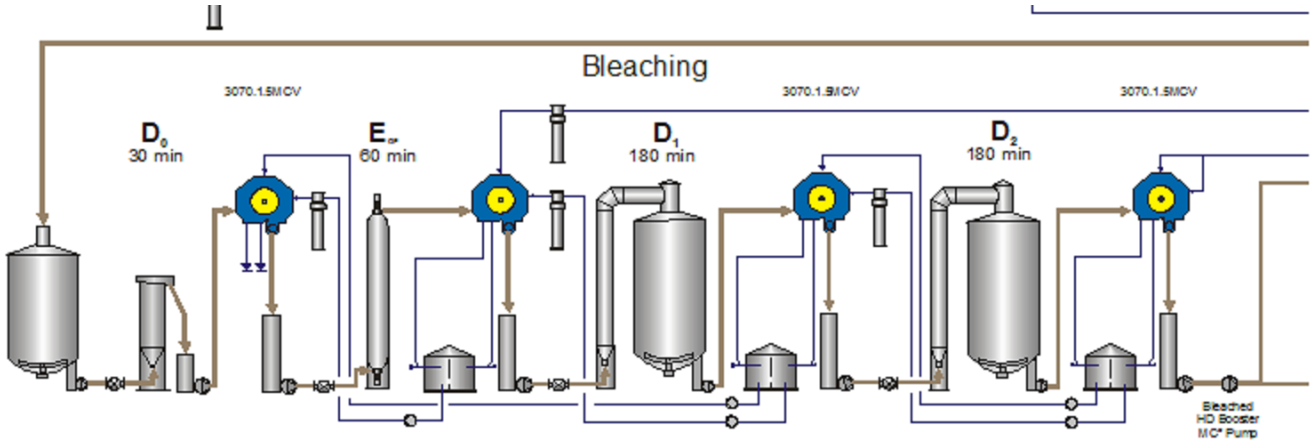
Fishbone of Pitch Controls/Causes



Pitch Control Programs

Pitch Control:
Focus on Exit Points!

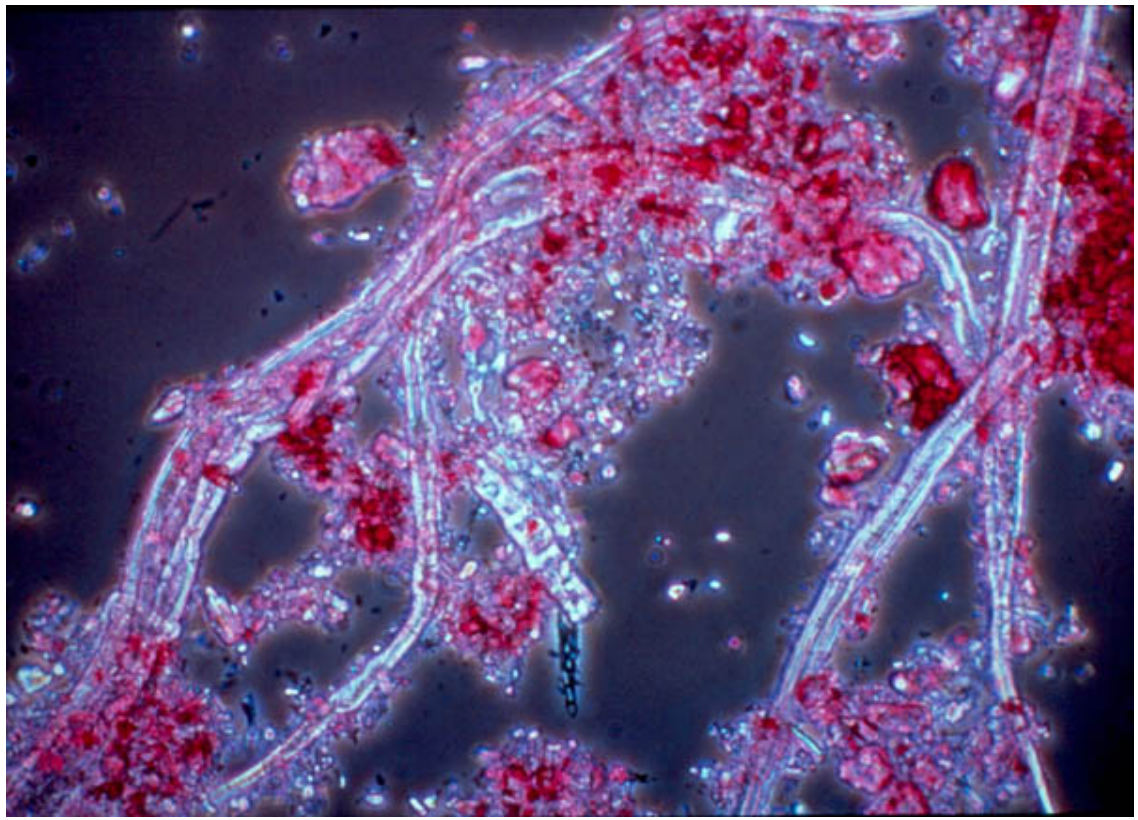




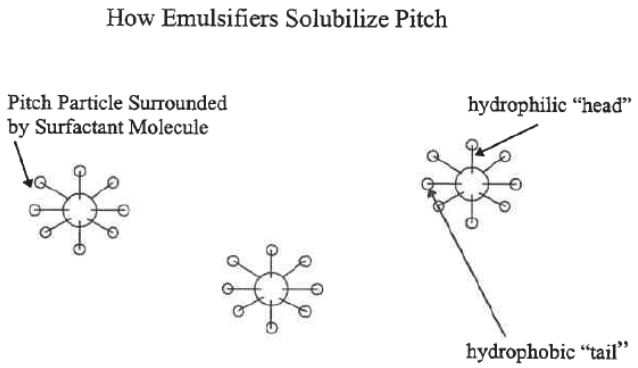
Pitch Control Agents

- Talc
- Dispersants
- **Surfactants**
- **Wash Aids**
- **Detackifiers**

Talc particles coated with pitch



Pitch Dispersion - Mechanism

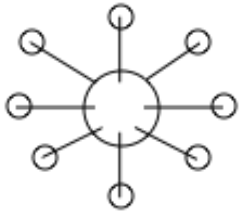


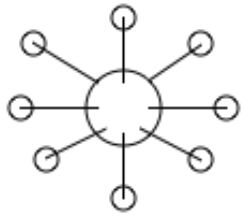
Surfactant mechanism on pitch is through solubilization

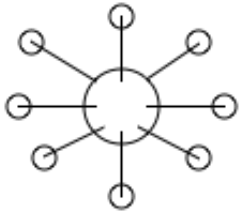
Use treatment before washer: These soluble salts can be easily washed out in the washer.

A more thorough treatment on pitch application will be shared separately

Surfactants/Emulsifiers







Advantage

- Low dosage required
- Clean up old deposits
- Helps washing
- Easy to control

Disadvantage

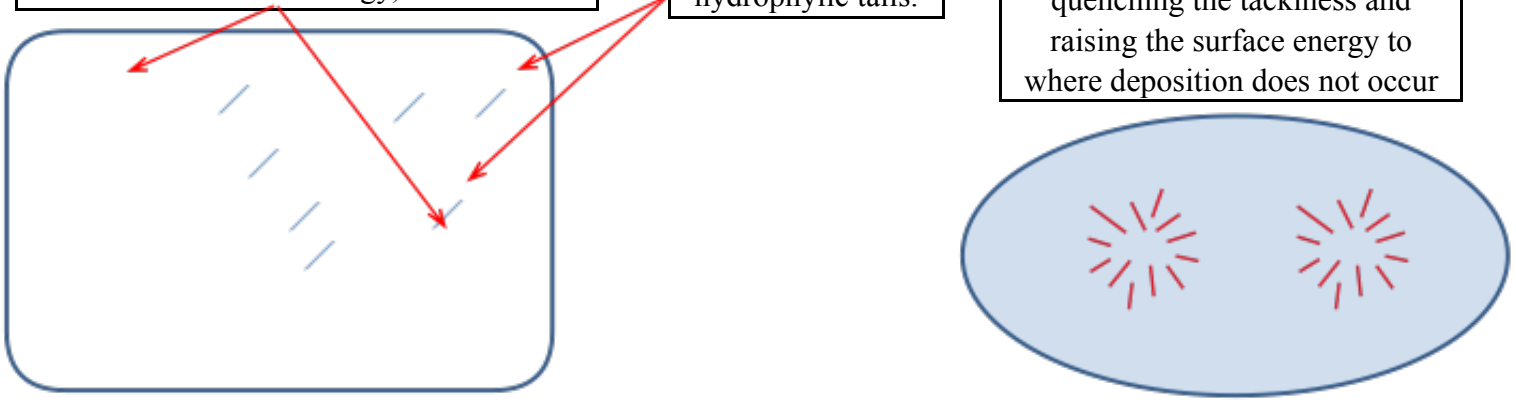
- May hurt sizing
- Foam
- May break loose old deposits

Synthetic Stickies – Detackification - Mechanism

The edge of a stickie contains hydrophobic tails, these tails are low surface energy, and are attracted to felts, wires, and rolls (all containing higher surface energy).

A detackifier contains both hydrophobic, and hydrophylic tails.

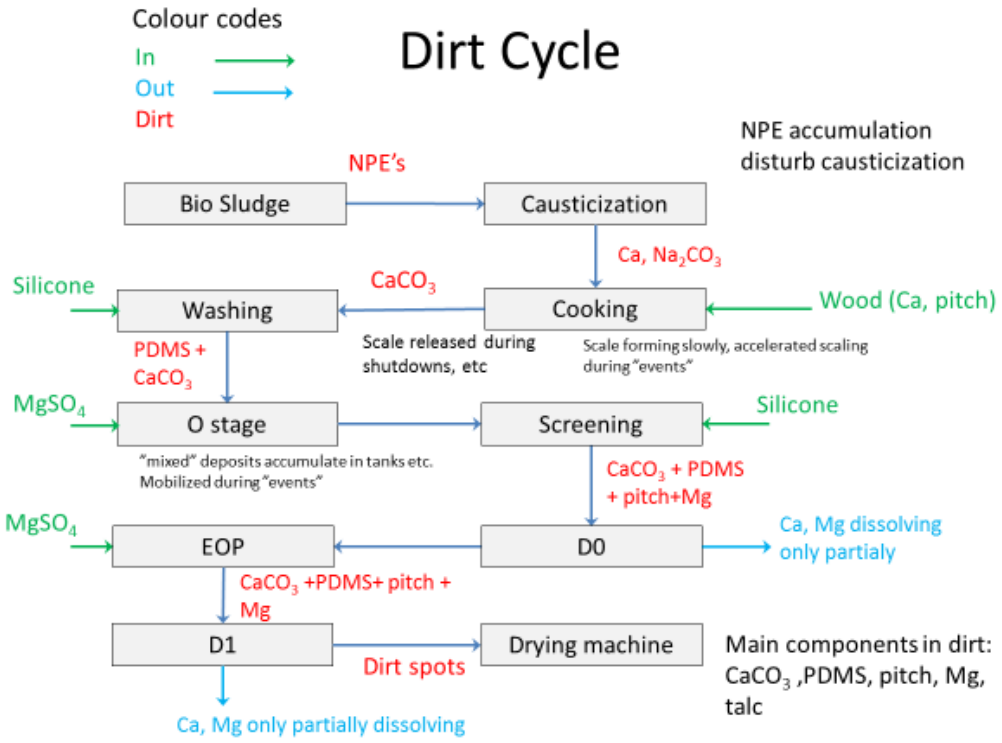
The hydrophobic tail of the detackifier is attracted to the hydrophobic edge of the stickie, quenching the tackiness and raising the surface energy to where deposition does not occur



How to Approach a Pitch Problem

- Determine the Nature of the Problem
- Collect Deposit Samples
- Check for System Additives
- Evaluate the Current Program
- Build a DCM extractives baseline
- Blender shear test
- Pitch Plates or time stamped photos
- Microscopic Analysis

Questions


Colour codes
In
Out
Dirt
Dirt Cycle
NPE accumulation disturb causticization
NPE's
Bio Sludge
Causticization
Ca, Na_2CO_3
Silicone
$CaCO_3$
Washing
Cooking
Wood (Ca, pitch)
PDMS + $CaCO_3$
Scale released during shutdowns, etc
Scale forming slowly, accelerated scaling during "events"
$MgSO_4$
O stage
Screening
Silicone
"mixed" deposits accumulate in tanks etc. Mobilized during "events"
$CaCO_3$ + PDMS + pitch+Mg
$MgSO_4$
EOP
D0
Ca, Mg dissolving only partialy
$CaCO_3$ +PDMS+ pitch + Mg
D1
Drying machine
Dirt spots
Main components in dirt: $CaCO_3$,PDMS, pitch, Mg, talc
Ca, Mg only partially dissolving