Wood Chips Categories
Why do we screen chips?

When pulping wood chips (especially by the “Kraft” process) size is very important.

1% yield change = 5-10,000,000 $/Y change in mill revenue

Small wood particles do NOT dissolve!!
Chip Size Distribution

Example of a classification method: ChipClass™

Retained chips are:
- Overlong
- Overthick
- Accepts
- Pin chips
- Fines

Hole size/type:
- 45 mm round hole
- 8 mm slots
- 7 mm round hole
- 3 mm round hole
Chip Size Distribution

Too big and Too small chips and Issues:

**Too big:**

1. **Oversize / Overlong:**
   - physical handling problems
2. **Overthick:**
   - pulping chemical penetration problems,
   - yield loss, knotter rejects, shives

**Too small:**

3. **Pin chips:**
   - liquor circulation problems
4. **Fines:**
   - lower yield, higher dirt and bark, lower strength pulp (shorter pulp fiber length)
Generic Screening Processes

- Chips
  - Scalper
    - Gross Overs
      - Oversize Reduction
        - Oversize to Rechipper
          - Fines
          - “Good” Chips
        - Fines Screen
          - Fines
          - “Good” Chips
    - Or
      - Thickness Screen
        - Overthick
          - Overthick Treatment
            - Rocks
            - Good Chips to Digester
        - Fines Screen
          - Fines
          - Good Chips to Digester

Typically, sawmill or chip plant application

Typically, pulpmill application
Screening for Gross Oversize

Disk Scalpers, Scalping Screens
Screening for Gross Oversize

Gyratory screens (a.k.a. Rotary or Shaker)
Generally do fines removal also
Hole sizes / shapes
  Oversize: 1.5 to 3 inches
  Fines: 1/8 to 1/2 inch
Rechipping of Gross Oversize

- Many types of rechippers used
- Generally, results are not all that great

Examples:

<table>
<thead>
<tr>
<th>Type</th>
<th>%&gt;10mm thick</th>
<th>-7,+3mm Pins</th>
<th>-3mm Fines</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disk</td>
<td>10-35%</td>
<td>5-23%</td>
<td>1-8%</td>
</tr>
<tr>
<td>Drum</td>
<td>0-18%</td>
<td>9-33%</td>
<td>2-8%</td>
</tr>
<tr>
<td>Hogs</td>
<td>5-30%</td>
<td>17-40%</td>
<td>3-10%</td>
</tr>
</tbody>
</table>
Screening for Overthick Gyratory Screens

- Sizes range from 4 to 14 feet wide by 6 to 24 feet long
- Screens sloped 7 to 15 degrees
- From 2 to 5 inch circular motion
- Rotation speed from 180 to 300 RPM
- Can alter hole size inexpensively to alter performance
- Deck materials can be mild or stainless steel, to resist wear and corrosion
Screening for Overthick Gyratory Screens

- Thickness separation based on typically strong correlation between chip length, width and thickness for large chips
- Perform by stratifying chips into sizes
- Can get high removal efficiency, but generally high carry-over; I.E., Not real high performance index
- Relatively inexpensive to obtain and maintain compared to other ‘true’ thickness screens
Screening for Overthick Disk Screens

- Parallel shafts with intermeshed disks, all rotating in the same direction
- Space between disks (Inter-Facial Opening, or IFO) screens for chip thickness

![Diagram showing overthick disks and IFO].

Overthick Chips

IFO

Accepts
Screening for Overthick "Flat" Disk Screens

- Single-sized disk or alternating diameter disc pattern
- All shafts on one level, or “Raised-roll” configuration
Screening for Overthick
Roll Thickness Screen

- High performance index
- No expensive disk assemblies
- Easier to maintain slot opening precision
- Adjustable IRO
- Fully chromed surface
The DiamondRoll VIRO Thickness Screen has very accurate slot openings, which remain accurate after years of operation.

Bar screen misalignment requires regular adjustment.
Overthick Chip Reduction
Slicers

- Very efficient overthick reduction with some fines and pins generation
- 2 drums rotating same direction at different speeds
  - outer knife ring
  - inner anvil or paddle ring rotates faster, pushes overthick chips through 6 to 7.5 mm knife gap
How Slicing Works

vs. “Re-chipping”
Overthick Chip Reduction
Crackers and Conditioners

- Fissures overthick chips to allow liquor penetration
- No knives to change, or anvils to keep sharp
- Low fines and pins generation
Screening for Fines
Roll Fines Screen

- Rolls with targeted diamond knurled pattern
- Inter-roll spacing distance 0.5 to 3 mm
- Variable speed to significantly alter fines removal and accept fiber loss
- Used as secondary fines screen, and for pins recovery screen
Roll Fines Screen

- Separates fines and pins from acceptable chips
- Fines and pins sections possible for independent pins control
- Possible combination with Roll Thickness Screen
- Field adjustable for IRO and roll speed
- Works well in icy cold conditions
Chip Cleaning
Removal of Metal, Stones, Sand, Grit, etc.

- Non-ferrous metal removal: Eddy current separator
  - Need separate removal device
- Magnets for ferrous metal removal
Chip Cleaning
Chip Washers

- Rock removal for overthick chip treatment protection
- Sand and grit removal - often used in mechanical pulping
- Water issues – re-use requires treatment, high BOD as effluent, increase in moisture content
Air Density Separator System

- Separation zone
- Piping
- Cyclone and Vortex Breaker
- Discharge airlock
- Fan and controls
- Silencer
Chip Cleaning
Air Density Separators

- Rock removal for overthick chip treatment protection
- Will remove some dense wood - knots
- Quite efficient at removing dense tramp material
- Noisy, and require a lot of power for fan
ADS Rejects Are More Than Rocks

- Knots, compression wood, mud, ice lumps
- Few good wood pieces

- Air flow is adjustable to control the size and quality that is removed
- Measure air flow in the separation zone for best control
Screening for Overthick and Fines
System Alternatives

Flat Disk, etc. -> Gyratory

Feed

Flat Disk Screen

Overthick

Contaminant Removal

Accepts & Fines

Gyratory Screen

Fines

Overthick Reduction

Accepts
Screening for Overthick and Fines
System Alternatives

Gyratory only

Feed → Gyratory Screen → Overthick & Accepts → Contaminant Removal → Overthick Reduction

Fines

Accepts
Summary: Why We Screen Chips

Chip Size Distribution - Before Screening

Chip Size Distribution - After Screening

% Overthick

% Fines

System Performance Target

Source A

Source B

Source C