Mold And Stain Control
Is It More Difficult Now?

- Absolutely until recently
- Global warming (only kidding)
- Slow markets/Long storage times
- Buyers market/public perception
- Everyone has this problem
- Universal Response- blame chemical
- Blame congress/the prez: Why not? We blame them for everything else
Outline

- Fungi in general
- Time in the woods
- Log decks
- Post-sawing
- Chemical capabilities
A Fungal Primer
Mold Life cycle

[Diagram showing the life cycle of a mold, including stages for spore germination, hyphal growth, spore production, and spores.]
## Fungi

<table>
<thead>
<tr>
<th>Fungal Type</th>
<th>Effect on Wood</th>
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<tbody>
<tr>
<td>Molds</td>
<td>Use sugars, increase permeability, pigmented spores on surface</td>
</tr>
<tr>
<td>Stain</td>
<td>Use sugars, increase permeability, stain wood</td>
</tr>
<tr>
<td>Decay</td>
<td>Use structural polymers, increase permeability, weaken wood</td>
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</tbody>
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Mold vs Stain

- Surface vs internal stain
- Species less important
- Both fungi grow in sapwood
- Removing surface fungus does not kill fungus inside
Requirements for Growth

- Oxygen
- Temperature
- Water
- Nutrients
PENICILLIUM
STACHYBOTRYS
Important Genera

- Stachybotrys
- Fusarium
- Penicillium
- Aspergillus
- Chaetomium
- Trichoderma
Mold Species

- 250 to 300,000 species
- 45 species on Douglas-fir sapwood lumber in the first 6 weeks
Factors Affecting Fungal Growth

- Sapwood Content
- Temperature
- Wood Moisture Content
- Time of Year
- Treatments
Insect Contributors: Ambrosia beetles

Ambrosia Beetle
Wood Deterioration  Wood destroying Insects

Ambrosia Beetle Damage in a Peeler Core
Metallic Wood borers
Longhorned beetles
Role of Processing in Stain

How fungi get to wood
Sapstain Spray

(Courtesy of P. Schneider, 2011)
Spray Boxes
Chemical Dipping
Anti Stain/Mold Chemicals

- Propiconazole
- 3-iodo-2-propynyl butyl carbamate (IPBC)
- didecyl dimethyl ammonium chloride (DDAC)
- Methylene bisthiocyanate (MBT)
- Tetrachloroisophthalonitrile
- Oxine copper
Fungicide vs Fungistat

- Fungicide kills spores and hyphae
- Fungistat stops growth but may not kill fungus
- Stain chemicals can be both, but do not function well against hyphae that are already in wood
Treatment Delivery

- Mostly surface- a little bit inside helps
- Must have sufficient amount/unit area (varies with product)
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- Must have sufficient amount/unit area (varies with product)
- Periodic chemical assessment is useful
- Periodic trials are also useful since inerts in product can change
Performance of Antisapstain Chemicals

![Graph showing the performance of Antisapstain Chemicals over time. The x-axis represents days after treatment, ranging from 30 to 180. The y-axis represents the degree of discoloration (%). Different chemicals are represented by different lines: Propi (red), Chloro (yellow), Cu-8 (green), IPBC/DDAC (cyan), and Control (blue). The graph shows how each chemical performs over time, with some chemicals showing better performance than others.]
Chemical Issues

- Fungi growing through the protective layer
- Mills using too little chemical
- Fungal resistance?
Role of Preinfection
Role of Storage before Planing

(Courtesy: P. Merrick, 2011)
Longterm Storage Issues

(Courtesy: D. Stallcop, 2011)
Bundle Storage Issues

(Courtesy: P. Merrick, 2011)
Who to Blame?
Who to Blame?
Old Logs

- Logs in deck 6 to 18 months- either in woods or in yard (it all counts)
- Wood is pre-infected- fungi more difficult to control
- Spores and hyphae from infected wood carried on saws to clean wood
- Delays between saw and planer
What to Do

- Control time in woods
- Control time in log deck
- Sprinkle decks
- Treat lumber ASAP or sooner
- Use proper chemical levels
Ideal Processing Times

- We say 24 hours
- Some use 14 days
- Obviously- 14 days is too long/24 hr is unreasonable
- 2 to 3 days would be ideal- but it is seasonal
- Once fungi in wood begin growing to surface - they become difficult to control
Reality

- Logs in woods for days to months
- Logs in deck for weeks to months
- Lumber held for days to weeks before final planning and treatment
- Lumber sits in depots for weeks to months
Ideal System

- Log flow tailored to production - 3 months max storage
- Treatment within 72 hours of sawing
- Good maintenance of spray booths
- Regular QC on lumber to ensure adequate treatment levels