Section VI:

Product Dimensioning

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Process Overview: Machining, Sanding and Assembly

Machining, or sometimes referred to the finishing machine room, shapes the rectangular strips produced by the rough mill and the plywood produced by veneering and laminating into the finished dimensions specified for the furniture part (e.g. cabinet, millwork, etc.). Sanding rubs the wood with an abrasive to smooth or prepare the surface for subsequent finishing or coating steps. Sanding can be done by hand or with sanding machinery. Sanding can take place on parts before furniture assembly or during finishing in between coating steps. The typical operations of machining and sanding include:

- planing
- moulding
- shaping
- cutting
- tenoning

Assembly is where the parts are put together to make furniture or other items. The typical operations found in assembly are:

- assembly
- fitting
- repairing
- inspection

Potential Wastes: Solid and Hazardous

- wood, sawdust
- sanding belts
- machine tools
- spent glue
- volatile air emissions from the glue
- bolts, nails, staples

Waste Reduction Options/Case Studies/Checklists

Machining

The effects of moisture content (MC) on machining quality are well documented, but often are ignored in the manufacturing operation. High MCs, especially with lower density species such as aspen and basswood, lead to an increase in fuzziness when planing, boring, routing, and even sanding. On the other hand, higher MCs, reduce the likelihood of planer or roller splits, torn or chipped grain, and raised grain. A very notable decrease in quality machining occurs at moisture under 6 percent MC--chipped grain becomes inevitable, shelling (especially in white pine) increases, and dulling of the tools increases.

Problems increase when lumber is over-dried as warp, especially cup, increases, leading to movement of the pieces when first machined (such as in a gang rip saw). As a result, edges are not high quality--they are not flat or straight enough for many subsequent manufacturing operations.

Another MC related machining problem is casehardening (or drying stress). Casehardening shows up as immediate warp when machining. If the MC in the kiln is not uniform, then when the casehardening relief treatment (conditioning) is used, the driest lumber will have the stresses relieve quicker than the wetter lumber. If conditioning is too short, then there will be stress in the wetter lumber. If conditioning is extended, then the driest lumber will be subject to excessive regain of MC.

Dust Collection

As wood parts are machined and sanded, a substantial amount of sawdust is generated. Dust collection systems can provide safety and waste reduction benefits, but must be properly designed to be effective, safe and efficient. Adequate face and collection velocities are necessary for collection orifices, and appropriate velocities in the ventilation ducts must be provided to prevent particulate settling. Energy efficient systems have dampers to cut off branches that are not needed. Filters, bag houses, and cyclones are examples of mechanisms to separate the dust from the exhausted air.

Some state regulatory agencies have compliance issues with wood dust and it is recommended you contact your state for specific details.

Benefits

- improves worker health and safety by keeping the dust out of the breathing air and off the floor
- improves sanding efficiency by preventing dust from becoming embedded in the sanding belt
- extends equipment life and decreases maintenance by keeping dust away from machinery
- collects and keeps the sawdust from becoming contaminated with dirt and other contaminants so that it can be recycled

Cautions

- consult an industrial ventilation design manual or obtain assistance from a qualified engineer to assure that the system is safe, effective and energy efficient

Recycle Wood Waste and Sawdust (see Section V)

Utilize Proper Gluing Techniques (see Section V)

Checklist: Reducing Waste and Improving Yields

The yield of useful parts or dimension from lumber is dependent on ten major factors:

__ Grade of lumber
__ Drying quality
__ Cutting bill, including part sizes
__ Operator's skill and decision making
__ Part quality required
__ Rough mill layout
__ Kerf
__ Edging practices
__ Lumber size
__ Lumber grading rules

A key to evaluating a cut-up operation is to identify the reason why a particular piece of wood is going into the hog rather than into the pile of acceptable pieces. Some of the key factors are:

__ Knot, knot hole
__ Cross grain
__ Split, end
__ Check or honeycomb
__ Stain
__ Color contrast
__ Left over (wrong size)
__ Planer skip or thinness
__ Fuzzy grain
__ Chipped grain
__ Wrong moisture content
__ Warp--cup, bow, side-bend, twist
__ Open glue joint
__ Poor vision or lighting
__ Others:

Which factors

- **!** are natural?
- **!** are caused by drying or machining?
- **!** can be controlled? (how can they be controlled?)