Reducing wood wastes from wood shops

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To be successful in the wood manufacturers and finishers business, shop owners must remain competitive. Reducing unnecessary waste and its associated costs should be an integral component of your plan.

This fact sheet covers methods to save wood wastes from the following "cut-up" operations: rough milling, gluing and product dimensioning. It will address those factors you can control to reduce wood waste and labor losses from woodshop operations.

While mistakes in finishing processes can sometimes be recovered by wash-off and refinishing, rejects from cut-up processes represent materials and labor losses that are usually unrecoverable, negatively affecting yields and profits.

The yield of useful parts or dimension from lumber is dependent on 10 major factors: grade of lumber, drying quality, cutting bill (including part sizes), operator's skill and decision-making abilities, part quality required, rough mill layout, kerf, edging practices, lumber size and lumber grading rules.

A key to evaluating a cut-up operation is to identify the reasons 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: knots and knot holes, cross grain, split end, check or honeycomb, stains, color contrast, left over (wrong size), planer skip or thinness, fuzzy or chipped grain, wrong moisture content, warp-cup or bow, side-bend, twist, open glue joints and poor vision or lighting during sorting.

Which of these factors are natural? Which are caused by drying or machining? Which can you control? How can you control them?

Rough milling

You can save significant wood if you take care when removing defects as you cut the rough lumber. Get the most out of your rough milling processes during planing, sawing and joining to save raw material costs, produce less wood waste and increase yields.

Some ways to do this are:

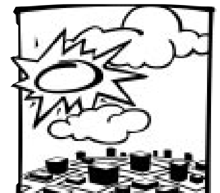
- ❑ Combine the cutting of multiple long and short lengths on the same rough lumber board to improve yield.
- ❑ Explore use of "rip first" methodology, automatic board advancing, and computerized vision scanning to identify defects and cutting patterns.
- ❑ Finger join two short sticks or boards end to end to form a longer one, resulting in less waste and better material use. You can use any piece shorter than seven inches. Equipment is available that can machine the joints, apply the glue, press the pieces together and quickly cure the joints (such as radio frequency fields).
- ❑ Make "ribbon wood" from short pieces of wood glued together for use where unmatched grain pattern is acceptable.
- ❑ Use wood with imperfections in new products, selling them as "naturals" or at reduced prices.

These approaches allow companies to convert low- or no-value wood into higher-value products for better material use.

Gluing operations

Gluing is a value-added process with pollution prevention (P2) opportunities for raw material savings and reduced labor loss. When working with gluing processes, shops should:

- ❑ Check the moisture content (MC) of the wood. Optimal MC is 6.25 percent to 7.25 percent. When MC is very low, the liquid in the glue (usually water) is almost immediately extracted from the adhesive by the wood. Unless the glue joint is completed immediately, this rapid absorption of liquid will lead to a weak joint due to premature thickening and setting of the adhesive. And the reverse is also true — for higher MCs, the length of time required for the glue to set is extended. If the joint is not allowed to fully set, the part may fail at the next manufacturing step, wasting wood and labor.
- ❑ Make sure the wood's MC is in equilibrium with the local air's moisture content; if not, the pieces of wood being



glued will change size. If they change size before the pieces are glued together, then it is likely the gap between the adjacent pieces will exceed 0.006 inches, meaning the glue joint between them will be weakened, causing warping or cracking.

- ❑ Keep glue containers covered whenever possible to prevent chemical vapors from escaping and keep out moisture and oxygen, prolonging shelf life.
- ❑ Perform periodic maintenance and calibration (where applicable) of glue applicators for proper transfer performance.
- ❑ Look for untrue or inactive surfaces that reduce effectiveness of gluing.
- ❑ Let glue set completely before removing the assembly from the press; otherwise the glued joint will be weak and become a stress point.

Product dimensioning

Product dimensioning consists of machining, sanding, and assembly of wood parts, and usually produces smaller pieces of wood waste and other related materials. Rejects from these operations are costly and usually cannot be recovered.

Moisture content affects machining quality and can lead to more rejects of parts. The effects of MC on machining quality are well documented, but often are ignored in the manufacturing operation. High MC, 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 — chipped grain becomes inevitable, shelling (especially in white pine) increases and dulling of the tools increases.

Low MC lumber is prone to warp, especially cupping, 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 aren’t 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, rendering the wood unusable. If you are drying your wood on site, stacking wood to promote even drying and conditioning will help avoid drying stress.

Dust collection

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

Dust collection is beneficial because it:

- ❑ 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;
- ❑ Collects and keeps the sawdust from becoming contaminated so that it can be recycled.

Wood waste

Some companies report a 45 to 50 percent return on raw wood purchased, wasting one half of their raw wood materials. Companies should explore opportunities to reduce wood waste from milling, dimensioning and gluing operations in order to increase volumes of usable wood from their woodpiles and increase their bottom-line profits.

Wood waste is costly for companies to dispose of, especially if their local landfill has closed and the waste must be transported to a waste facility.

Recycling options include:

- ❑ Use in particle board, chip core, laminates;
- ❑ Shredding or grinding for use as animal bedding, mulch or decorative landscaping material (This also reduces storage volume.);
- ❑ Use in pulp and paper manufacturing;
- ❑ Use as fuel for energy production;
- ❑ Use in composting operations.

Potential for recycling wood waste varies greatly from company to company and should be examined very carefully. Local options or on-site recycling operations offer more opportunities for generating income or appreciable savings. Greater transport distances to reuse markets and competitive landfill disposal costs reduce the economic potential for wood waste recycling.

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