USDA Forest Service

Northeastern Area State & Private Forestry

Thin Kerf Sawing: A Technology Worth Adopting

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Introduction

Believe it or not, in the middle 1920's only 40% of a log was converted into primary product of manufacture (lumber, for example). In addition, 23% of the log of 70 years ago ended up as sawdust!

Today in the mid-1990's a typical circular sawmill converts 50% of the log into primary product with band mill conversionat about 57%. Saw Kerf averages 21% for the circular sawmill and as low as 12% for high production band mills. Obviously, saw mill efficiencies have increased since the 1920s but there is still much room for improvement. In addition, trends such as environmental constraints on timber harvesting, smaller logs from the forest, and an incresed demand for wood products makes it imperative that we improve sawmill efficiencies.

The good news is that technologies currently exist that can enable 70% or more conversion efficiencies at US sawmills. However, the adoption of new technologies such as "thin kerf" sawing have not yet become state-of-the-art in most eastern hardwoodmills.

What is "Thin Kerf" Sawing?

Saw kerf, generally speaking is the width of the path cut by the sawteeth as the saw blade moves through the log. "Thin Kerf" is a relative term, however, because it only has meaningwhen compared to something else. If circular saws are compared to band saws, then band saws would be considered "thin kerf" since they are generally 50% thinner than circular saws. If today's saw kerfs are compared with those of the past, we can generally say that today we have "thinner kerfs".

The saw kerf has a significant impact on conversion effiency (referred to as lumber recovery). A crude but effective way of calculating the amount of sawdust that develops during sawing is to determine the total wood usage per "pass" (logs being processed as a sawmill generally move or "pass" back and forth through the saw blade). Wood usage per pass includes the average thickness of the piece being sawn plus the saw kerf. For example, in cutting a board that is 1.125 inches thick with a saw kerf of 0.300, the total wood usage per pass is 1.425 inches. Calculating the saw kerf as a percentage of the total wood usage per pass results in 21% of the wood removed as sawdust or about one-fifth of the log resource. A band saw with a kerf of 0.140 inch would result in an increase in lumber recovery of about 10%.

Does it Work?

A recent study by the US Forest Service, State & Private Forestry (S&PF), demonstrated the potential of thin kerf sawing when used in combination with other lumber recovery practices. Twenty red oak logs in lengths of 4-6 feet and diameters between 12 and 20 inches were sawn with a saw kerf band saw (0.062 in saw kerf). Boards sawn were one inch thick and ranged in lengths from 2-6 feet. Lumber recovery or conversion efficiency for the 20 log sample averaged 82% which is 30% greater than the typical circular sawmill!

A similar study of small diameter (4-8 inches) red and white pine logs was conducted by S&PF. Using the same thin kerf band saw as noted above the lumber recovery for the 47-log sample was 67%. Sawdust averaged 12% for the study.

A third study conducted at a Missouri pallet mill in 1993, produced results very similar to the pine study. The Missouri mill reduced "short" hardwood logs (45 inches in length) to 5/8 inch thick pallet parts. The bandsaws utilized in the pallet operation had saw kerfs of 0.050 inch. The average conversion effiency at this mill was calculated at 69% which is remarkable considering 5/8 inch thick lumber, rather than one inch lumber, was produced. ("Thin" lumber such as 5/8 inch means more cuts and, consequently, more kerf removed, resulting in a reduced conversion efficiency. However, 69% is still very impressive!)

Implications

The US annual cut of timber for lumber products is equivalent to approximately 240 million trees. However, if our sawmills operated at a 70% recovery efficiency, we could get our annual harvest of lumber from 171 million trees. Thus, we could save the equivalent of 69 million trees annully if our recovery effiency improved from 50% to 70% in our primary processing industry. In addition, these same 69 million trees, if permitted to grow in the forest, would continue to absorb about 900,000 tons of carbon dioxide and produce about 650,000 tons of oxygen each year.

On a more local level, thin kerf sawing which results in improved recovery efficiencies will enable the use of lower quality and/or smaller diameter logs which otherwise may have little or no economic value. Consequently our forest management could be stimulated which will improve (and expand) the resource base and lead to more successful rural development efforts in retaining, expanding, and attracting wood-using industries.

Thin kerf sawing that increases lumber recovery and simultaneously reduces waste has the added potential benefit of keepingsome sawmills profitable and in-business. In effect, the adoption of thin kerf technologies can save jobs by enabling mills to continue to operate.

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