11/20/2023

diamond-wire-sawmill

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Diamond Wire Sawmill for Lumber Poles Firewood Timber and more

This webpage QR code

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Global Energy is developing a Diamond wire sawmill for the home hobbiest, furniture maker, home builder, and small portable sawmill processor to increase profits.

PDF Version of the webpage (first pages)

https://globalmicroturbine.com/diamond-wire-sawmill.html

Diamond Wire Sawmill for Wood Products

The wood processing saw you've never heard of.

Good for HDPE, wood, rock, concrete, steel pipe, and many hard surfaces.

From the attached link: Advantages of diamond wire sawing include the thin kerf and flexibility to change cutting direc- tions. Advancements in new high speed diamond wire cutting machines have made this process suitable for wood machining.

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Advantages of Diamond Wire Sawing

A diamond wire saw cuts a smooth surface. The stainless steel wire is crimped with synthetic diamonds which produces a pure cut (similar to a waterjet).

Wire diameter (kerf) can be .10 mm to .70 mm. That's .00393 inches to .027 inches. A typical bandsaw is .104 (6 inch diameter wheel) to .025 inches for a 18 inch wheel. So there is less waste (less sawdust and more production).

Speed of the wire feed rate is adjustable and suggested not to exceed 2.5 meters per second (8.2 feet per second or 492 feet per minute). A typical bandsaw will be 1,000 to 3,000 feet per minute (or 16-50 fpm or 4.88-15 mps). Speed is slower and a wire saw does not require lubrication. However wire does require cleaning fluid.

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Effect of Feed Rate

Effect of feed rate. The faster feed rate in crosscutting of pine and oak in- creased the cutting forces but did not significantly affect the surface roughness.

For loop configuration: Higher feed rate, in general, generated higher cutting forces. This is particularly apparent in results of the net force. Higher feed rate generated higher net force for both pine and oak. On individual force compo- nents, higher normal forces were seen at a high feed rate in all cutting conditions. For the tangential force, an obvious ex- ception was the ripcut of pine. A lower- ing trend of tangential force was ob- served from a high (2 mm/sec.) feed rate. An extended test of the ripcut of pine with feed rates from 2.5 to 4 mm/ sec. was conducted to investigate tangential force at high feed rates. Results of the cutting force and surface roughness across a feed rate from 0.5 to 4 mm/sec. are shown in Figure 9. The lowering trend of tangential force stopped at 2 mm/sec. The specific tangential force, in general, remained in the 0.85 to 0.9 N/mm/mm range. Across thewide range of feed rates, the normal force continued to increase at higher feed rates. The net force, which combined the effects on normal and tangential forces, increased at high feed rates. Surface roughnessre- mained in the 2 to 3 μm Ra range, regardless of the feed rate.

Effect of Type of Wood

Effect of the type of wood. No distinguishing difference existed on the level of forces and surface roughness in oscillatory diamond wire saw cutting of pine and oak samples.

For looped saw configuration, The oak exhibited slightly higher cutting forces, particularly at high feed rate cutting. Such a distinct high cutting force for oak, which likely was caused by the wire speed effect, was not obvious in the oscillatory wire cutting. For oak and pine, the surface roughness was about the same at low feed rate. As the feed rate increased, the surface roughness for pine remained at the same, 1 to 2 μm Ra range. The force ratio (FN/FT) showed distinctly different levels for oak and pine. Oak had a lower FN/FT ratio.

Effect of Cutting Direction

Effect of cutting direction. The ripcut, in general, had higher cutting forces in both net force and normal and tangential cutting forces. The surface roughness, under various process parameters and for different types of wood, remained at about 3 μm Ra.

For looped configuration: For pine, the ripcuts generated distinctly higher tangential force and about the same level of normal force compared to that of crosscut. For oak, the ripcut had higher tangential force and, in general, lower normal force at a high feed rate. This phenomenon was also observed in the net force.

Effect of using Coolant

The coolant did not affect the tangential force significantly. It did, however, help to reduce the normal force by about 30 to 50 percent, particularly at the high feed rates (1.5 and 2 mm/sec.). The addition of coolant did not provide much help to reduce the cutting force at the low feed speed (0.5 mm/sec.). With coolant, the surface roughness increased for pine but decreased for oak. The reason for such an opposite trend, which may be caused by different material characteristics of pine and oak, is not known and requires further study.
In comparison, an oak sample surface was cut with a band saw for mutual comparison. The surface roughness was high, about 9.6 µm Ra. It was also noted that all diamond wire cut surfaces had the glazed texture.

Note: Compared to a bandsaw, the wire cut surface most likely does not require additional processing for sale.

Comparison to Laser Cutting

Diamond wire sawing is the most flexible cutting method in the field of quality assurance for component and material analysis. Thinnest cut-offs between 0.08 and 0.5 mm are possible. Due to the gentle cut, there is no significant heat input, so that even temperature-sensitive parts such as rubber can be cut. Both wet and dry cutting is possible. The cut-offs are usually precise, even and smooth. The cut edges are sharp-edged, without bridging. When cutting composite materials, there is no smearing between the different materials. Cutting heights of up to 375 mm are no problem. A disadvantage could be the cutting time due to the low feed rate, but this is less important in laboratories.

Laser cutting has become an indispensable part of industrial cutting technology. This process is used to cut components out of sheet materials. The cutting gap width of this cutting process is extremely small at 0.04 mm. The advantage is that two-dimensional contours can be easily created with the aid of a CNC-controlled laser head. However, the process is very slow due to its low feed rate and the acquisition costs of a laser machine are very high. The emission of irritant gases and dust must be taken into account. In addition, the thermal energy introduced alters the structure of the surface layer of the workpieces and is therefore unsuitable for metallographic analyses.