YASKAWA

Lumber Mill Solution Upgraded with Energy Efficient Matrix Drives

U1000 Provides Best Option for Size, Harmonic Performance and Regenerative Capability

Automating Lumber Mills with Variable Frequency Drives

Sawmills and lumber mills take freshly cut logs and process them into construction grade wood of all shapes and sizes. The process of turning a log into a usable piece of lumber has more or less stayed the same; the largest change to the manufacturing process is that it has become largely automated. In order to accomplish the advances in industrial automation, leading edge processors are incorporating variable frequency drives.

Application Overview

Logs go through many stages during the lumber manufacturing process. To prep the logs for the Sawmill, the logs are taken in, roughly sorted, and debarked. The logs are taken to the Sawmill to be decked (sorted by requirements such as intended use, tree type, size, etc). Once decked, the logs are profiled using a variety of saws and profilers. Then the logs are broken down into cants (unfinished log sections) and flitches (unfinished planks). The Cants are broken down into multiple flitches using a resaw. Chippers, edgers, and planners are then used to square the lumber. Lastly, the ends of the flitches are trimmed down to standard lengths of lumber

Each of these stages uses drives and motors. Some of these application have periods of regenerative energy. Regenerative energy occurs when the load overhauls the motor and turns the motor into a generator. Regeneration can occur when two machines work against each other or if a load is constantly working toward pushing a system to go faster. A common example is a heavy loaded downhill conveyor.

These drives and motors represent a bulk of the loading for a lumber plant. This means a large chunk of the utility loading will be non-linear loading. As a result, utilities and customers alike are paying attention to the harmonic content of their systems, to limit harmonic distortion of the power supplied to the load.

The Challenge: Selecting Drives for a New Sawmill

Recently a Southeast U.S.-based lumber company purchased a new facility as part of its expansion. It was looking to outfit its new plant with new equipment. A big portion of its renovation was the installation and commissioning of the variable speed drives for many of the plant processes.

A multi-year sales process was conducted with the assistance of a local electrical systems integrator, certified electrician, and contractor. The process started as all lumber projects began using conventional VFD and braking resistors. The VFDs needed to be capable of operating a multitude of demanding lumber applications from conveyors to band saws to log chippers.

There were many customer requirements over the course of the project. The regenerative content of each of the applications was unknown, making dynamic braking selections difficult. The equipment in the plant was to be new, but the structure itself was fixed. Therefore, limited space was available to store much needed electrical equipment. The customer also intended on using Allen-Bradley Controllogix PLCs to communicate to the drives over Ethernet/IP. The final requirement came not from the customer but the utility company. Many non-linear loads were going to go live when the plant began production. The utility company feared there would be very large amounts of harmonic currents, which would impact the utilities company to generate clean voltage to their customer. Therefore, the utility company gave the customer a harmonic target of less than 5% iTHD (current total harmonic distortion) at the point of common coupling (PCC).

The Solution

One solution suggested was to use conventional drives with braking resistors for any regenerative energy and passive filters for harmonic compliance. These would all be packaged into conventional motor control centers (MCC's).

However, after a lot of consideration, the plant selected a different solution that employed Yaskawa U1000 Matrix Drives, due to their compact size, harmonic performance, and inherent regenerative capability (100% continuous).

Compact Size

The Matrix Drive solution was able to drastically reduce its size over the competitor MCC solution by providing Type 1 end cap kits to wall mount the drives. By taking advantage of a 50% reduction in size, the customer was able to mount many drives in one location.

Energy Savings

The Matrix Drive solution provided inherent energy savings capability. The Matrix Drive's bidirectional IGBTs allow instant and automatic switching from a motoring state to a regenerative state and place the extra energy back onto the line. The Matrix Drive, with its built-in regenerative capability, simplified the selection process by eliminated the need to determine which applications required dynamic braking and how large of a package to use. Hand calculated results were provided to the customer to show that the Matrix Drive is actually a better economical solution than any standard drive with 50% duty braking package (without even considering harmonics). The highly efficient Matrix Drives (typically 98% efficient) provide economical operation even during motoring conditions. The customer is already seeing a 50% reduction in their utility bill compared to its other plants that have used drives with braking packages.

Facilitating IEEE 519 Compliance

The Matrix Drive is a total green solution. Each of the drives is capable of meeting less than 5% iTHD at the input of the drive. The Matrix Drive is also great at maintaining low harmonics throughout the speed and load range. Using the Matrix Drive provided the best chance of facilitating compliance with the utility company's THD target.

On-Site Training

To aid in the understanding of the Matrix Drive and its capabilities, Yaskawa hosted an on-site factory training class. Drive training was provided for the Matrix Drives as well as training for connecting Yaskawa drives to an Allen-Bradley PLC. Yaskawa application and training engineers brought drives and PLC to the site for the drive and network training sessions.

Ethernet/IP Integraton Made Easey

The class clearly illustrated Ethernet/IP integration is easy with Yaskawa drives. The Yaskawa engineering team eliminated all concerns they had using the Allen-Bradley PLCs. They showed the complete process for installing and setting up Yaskawa drives on an A-B Ethernet/IP network. They showed that any Yaskawa drive can be installed onto an A-B PLC in less than a minute.

The electrical integrator, an avid user and installer of AB drives, was skeptical of the ease of Ethernet/IP installation even after the training class. However, his tune was quickly changed after the first series of drives were installed. "The first drive can be a little tougher to setup, but after the initial installation is complete, each additional node is so much easier than installing Allen-Bradley Drives."

Benefits Summary

Yaskawa made the complicated simple by providing the fastest to commission compact, low harmonic, and regenerative drive in the market. The customer was so pleased that they planned an expansion that included Matrix drives on various other processes.

Matrix Drive Benefits

- Compact size
- Ease of Drive Installation
- Low input current harmonics (facilitated IEEE-519 compliance)
- Built-in 100% Continuous Regenerative Capability
- Ease of Ethernet/IP network installation

On-Site Training

- Drive Training
- Ethernet/IP training

Local Support

- Startup, maintenance, troubleshooting by certified electrician

Aftermath

Nearly one hundred Yaskawa Matrix Drives have been successfully installed at the new lumber facility. The lumber machines using Matrix Drives come from a variety of lumber machine OEMs. Matrix Drives were used on every application in the lumber process. Motors for applications less than 10 HP (such as the cant turner) up to 250 HP (cutter head) all utilized drives with Matrix technology.

Below is a list of all the motors operated by Matrix Drives during the lumber process

Log Processing (15 HP through 125 HP)
- Debarker Infeeds/outfeeds
- Debarker Ring
- Feedworks
- Log Conveyors
- Pinball Kickers
- Saws
- Scanners
- Stem Deck
- Stem Singulator

Sawmill (5 HP through 50 HP)
- Angle Rollcase (Centered and Straight Rolls)
- Angle Rollcase Feed Chains
- Auto Rotation Conveyors
- Cant Turner outfeed Rollcase
- Band Saws
- Chippers
- Log Conveyors
- Positioning Rolls & Spike Rolls
- Profilers
- Quad Roll
- Queue transfer table
- Scanning Center Chain
- Shape Gang Saw
- Sharpchain
- Side Flitch Tipple
- Side landing table
- Side lug incline transfer
- Side to lug transfer
- Side Transfer to Resaw
- Side trim board belt
- Side Trim Board Chains

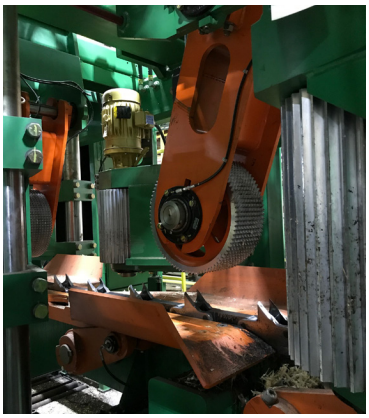
Resaw (5 HP)
- Initial Rollcase

Sorter (5 HP through 60 HP)
- Backlog Table
- Revolver Lug

Infeed Table (5 HP through 60 HP)
- Bedroll Bridge
- Pineapple
- Pineapple Press Roll Positioner
- Shifting Pineapple Positioner
- Powered Sheer Chain
- Powered Sheer Positioner

Planner (5 HP through 250 HP))
- Feed Roll
- Press Roll Positioner
- Setworks
- Cutterheads (Top/Bottom/Side)

Linear High-speed Grader (5 HP through 10 HP)
- Infeed Bridge
- Feed Frame (infeed/outfeed)



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