

Isn't It GOOD?

Norwegian wood that is, or in this case, the Nordic country's latest and greatest sawmill. Kjeldstad Sagbruk & Høvleri AS may be hard to pronounce, but it's easy to see that the money in this operation comes from boosting value, not production.

by **Bill Tice**



W

hen it comes to primary mills producing value-added products, Norway's Kjeldstad Sagbruk & Høvleri AS could set the bar. European sawmills have always been a step ahead of their North American counterparts in producing value-added products, including fencing, flooring, decking, and garden furniture, but the Kjeldstad mill goes a step further. In addition to laminated beams, roof trusses and fingerjoint lumber in lengths up to 12 metres (40 ft), the family-owned and operated business engineers, produces and sells manufactured homes, cottages, garages and other buildings for the Norwegian and export markets.

"Even by European standards, what we are doing in value-added products would be considered innovative," explains Tor Kjeldstad, the company's technical director and grandson of founder Ingebrigt Kjeldstad. "We rebuilt our main sawmill two years ago, and at that time, we included improvements that would help us specialize in some of our value-added products, especially our K-Beam, which is a laminated beam that can be used for structural components such as floor joists, attic trusses, trussed rafters and internal studs and posts."

The company was founded in 1921 when Tor's grandfather built a small sawmill on the family farm just one kilometre from today's site, which is located in the town of Selbu. This central Norwegian town of approximately 4,000 residents is 70 km southeast of Trondheim, a 1,000-year-old





Above: The main breakdown line is a recently added Soderhamn system with log scanning and optimized rotation. It can be run by one operator.
Bottom left: Technical director Tor Kjeldstad with finished product ready to go. "We would never build a new mill just to produce lumber," he says in explaining the value-added complex.

city and Norway's third largest centre.

"The original mill had oil motors," says Tor. "In 1934, he built a new sawmill at the same location we are at today, and electric motors were installed, and have been used ever since."

The second and third generations of the Kjeldstad family continued to improve the mill in small steps, except during World War II. In 1950, the first planer mill was installed at the Selbu site, and then in 1987, the family bought a second mill in Hommelvik, near the Trondheim Fjord. The Hommelvik mill was closed in 2003 when the family rebuilt the Selbu mill at a cost of 160 million Norwegian Kroner (about \$30 million Canadian), which Tor says is the largest investment that has been made in the Norwegian sawmilling industry in the last 10 years.

"When we decided to rebuild Selbu, it took one year of planning and one year of construction," says Tor. "During that time, we only had one month where we couldn't process logs at the Selbu site, but we were able to stockpile product in anticipation of the shutdown, and we were able to move some of our production to the Hommelvik mill during that month. This enabled us to meet our

customers' needs and once the new mill was finished, we were able to consolidate our production and some of our employees from both mills to the one site."

Mill like new

Mill flow at the main sawmill at the new Selbu facility starts when logs are unloaded from trucks by Volvo equipment and measured with Rema Control scanning technology. The logs are sorted into eight different diameter classes, the butts are reduced, and then the logs are stored in the yard before being fed through a Cambio debarker that can handle diameters from 100 to 650 mm (3.9 to 26 inches). Following the debarker, the logs are processed through a log sorting and infeed system that was supplied by Ing fa Gøsta Hedlund AB. Logs are then scanned again by a Rema Control three dimensional laser scanner, which has SOPT software to analyze and optimize the log. Signals from the scanning equipment are then sent to the main saw line, which is from Swedish manufacturer Söderhamn Eriksson AB.

Prior to entering the first machinery group on the line, which includes a canter and two band saws, the logs are

rotated to achieve the best return possible. Various factors can be used as parameters for the optimization program, including volume, price, and return to the mill. The canter equipment is programmed to allow the machine to produce additional sideboards. These sideboards are sent to another canter edger. Because of the length of the line, the cants are moved in a "Z" configuration before entering a Söderhamn Eriksson 2500 chipping canter, which is equipped with 15 inch spiral blades. Curve sawing then takes place before the cants enter the second machinery group, which has four band saws and can produce four sideboards that are sent back to the first canter edger. The centre block is sent to the final machinery group, which has three band saws. The line can handle 50 cubic metres per hour (21,200 bdf or 31,900 bdf nominal*- See note at end). With 25% stoppage time factored in, the line is processing approximately 300 logs per hour.

"The entire line is frequency regulated," adds Tor. "That means that as long as the logs are a consistent dimension, there is almost no gap required between each log. The line is also very efficient because one operator can control the entire process."

From the main breakdown line, the boards are sent to a 30-bin sorter from Odden Verksted AS, a Norwegian manufacturing company that is well known in Scandinavia. The sorter is controlled by Rema technology and can run at up to 90 pieces per minute. The lumber is

then stacked with automatic stick placement before being sent to the kilns, which are Swedish-made 3 mm stainless steel WSAB models with a total annual capacity of 54,000 cubic metres (34.5 million bdf). One of the kilns has a capacity of 30,000 cubic metres (19.1 million bdf) and dries the lumber to 18% moisture content, while a second kiln, which is used for special boards that are dried to 10%, has a capacity of 6,000 cubic meters (3.8 million bdf). Two additional kilns each have a capacity of 9,000 cubic metres (5.7 million bdf). The kilns are powered with a bark-fuelled 4.5-megawatt energy system from Järnforsen AB, producing a chamber temperature of 75 degrees Celsius (167 degrees Fahrenheit). The kilns and energy system are fully automated and are controlled by one operator. On the weekend, an operator still monitors the kilns with a remote laptop computer. Following the kilns, the lumber is planed using an older model planer, which Tor says will be replaced with a modern system soon.

In-house value

From the planer, the lumber is either packaged for shipment to customers or is stored at the mill for use in one of the company's value-added processes. "Almost all of our lumber is planed and about 45% of our volume is remanufactured into value-added products," notes Tor. "Our goal is to raise that number to 70%."

The K-Beam, which has become the flagship product of

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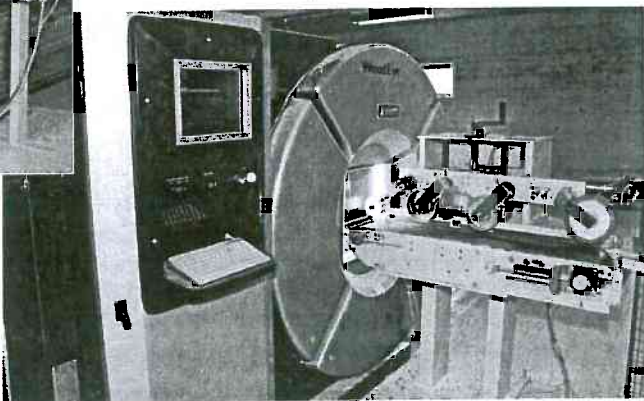
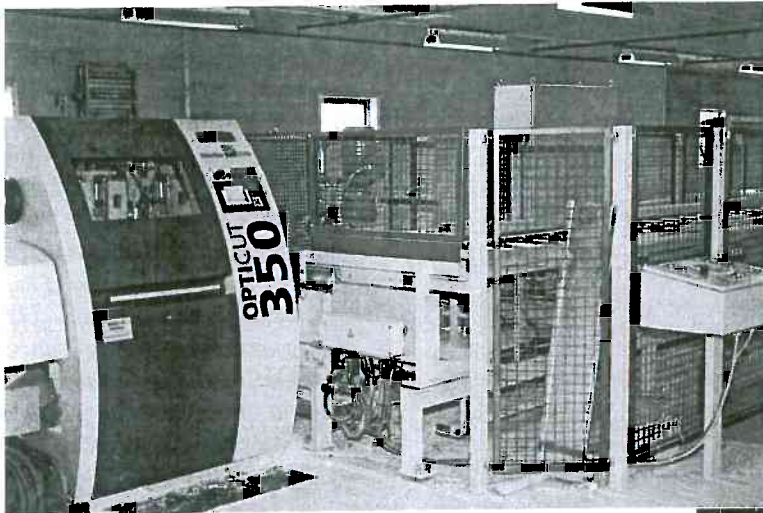
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the mill, is a laminated beam that has been tested by the Norwegian Institute of Technology and has received the approval of the Norwegian Building Research Institute. K-Beams can be manufactured up to 12 metres (40 ft) in

length and range between 36 mm and 70 mm (1.4 and 2.8 in) in thickness and between 250 mm and 300 mm (9.8 and 12 in) in depth.

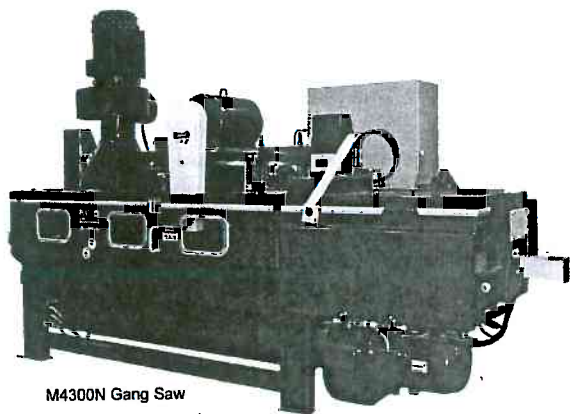
The K-Beams are manufactured from 6 metre (20 ft) long pieces of fingerjointed lumber and 19 mm (3/4 in) sideboards from the sawmill, which are dried to 10%. The sideboards are planed on three sides and processed through a Wood Eye Scanner, which checks for large knots and other defects. The sideboards are then sent to a Weinig Opticut 350, which cuts out the defects and produces boards that range in length from 150 to 900 mm (6 to 35 in). The fingerjoint process is also completed with equipment from the Weinig Group, including Grecon Dimter CF300 and HS 120



The value-added division takes 45% of the sawmill production, processing it through a Wood Eye defect scanner, Weinig (Dimter) OptiCut 350 chop saw, and an assortment of Weinig (Dimter) fingerjointing and glulam machinery.

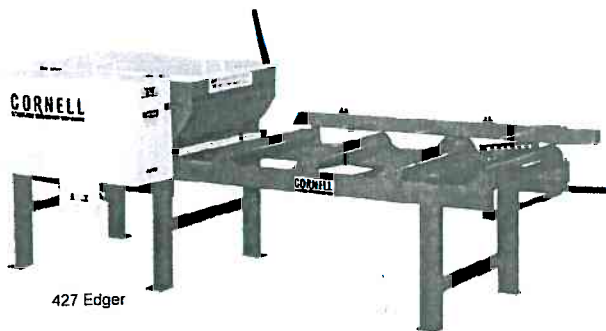
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machines. The components are positioned with the processed sideboards in the middle and the fingerjointed product on the outside, and then glued and pressed with a Contipress. "The resulting beam is actually a double beam," notes Tor. "This is then split into two beams and cut to the length specified by the customer."

For the buildings produced by Kjeldstad, company engineers produce plans and a complete material list for pre-cutting the walls, floors and roof. Most of the end products have a log round-wood style. The equipment used to create the profiles and the notches needed to put the building together is supplied by a local machine builder, Malum Produkter AS, who serve only the Norwegian market. The walls are constructed from lumber in various sizes, including 70 x 145 mm, 120 x 145 mm and 140 x 145 mm (2.75 x 5.7, 4.7 x 5.7, 5.5 x 5.7 in). The latter two

sizes are made from two pieces of laminated stock to prevent cracking, bending and twisting of the products. Most of the buildings are produced with spruce, but pine is also used to a lesser extent. Each log is numbered so that the building can be easily put together by the end customer in what Tor describes as a "system that is similar to Lego."

Most of Kjeldstad's products stay in Norway, with 90% of production consumed by the domestic market. Another 5% is shipped to the UK, with the balance going to Germany and the Netherlands. In total, the mill produces 60,000 cubic metres (38.3 million bdf) of product annually and employs 120 people on one shift for most of the year. A second shift is often added during the busy summer months.

"We are very happy with the direction we have chosen," adds Tor. "We would never have built a new mill for

only producing lumber. Sixty per cent of each log that we process through the new mill is converted into usable wood products, while before our rebuild we were only getting 50% from each log. This means we are producing 10% less chips and the additional volume is used as the boards that go into our K-Beam product. This gives us 10 times the value we were receiving from that 10% in the past." 

Converting cubic metres of lumber to bdf is tricky, since the actual dimensions differ: Norwegians make a full 2x4, whereas we make 1.5 x 3.5's, and get to sell air. Conventional conversions find 424 bdf per m³, but to be technically accurate, there are actually 638 nominal bdf per m³, so we use the latter factor. Anyway you convert, however, puts this mill's annual production of either 25.5 or 38.3 (nominal) million bdf on the low end of the Canadian scale.

Local Players

The Norwegian sawmilling industry produces 2.3 million cubic metres (975.2 million bdf or 1.47 billion bdf nominal) of wood products annually and has an estimated annual turnover of 8 billion Norwegian Kroner (\$1.5 billion Canadian) per year. There are approximately 200 sawmills in the country, which employ a total of 5,000 people. The population of Norway is approximately 4.5 million people.

The main products produced are building materials for the construction industry, and all products are graded according to Norwegian standards. A large percentage of construction lumber is kiln dried and machine stress rated (MSR). Secondary products produced by Norway's sawmills and value-added producers include wood panelling, flooring products, glulam, and components for joinery, furniture and such buildings as those produced by Kjeldstad. The main export markets for Norway's wood products include Japan, the UK, Germany, the Netherlands, Sweden, Denmark and Belgium.

Most sawmills in Norway are highly automated, and the industry promotes research and education. The country has its own research institute, the Norwegian

Institute of Wood Technology, and internationally, the Norwegian industry has links to the Nordic Timber Council and the European Organization for the Sawmill Industry.

Raw materials for the industry include spruce (47%), pine (33%), and hardwood (20%). Sustainability is ensured through progressive forest practices. The total standing volume of timber in Norway is 700 million cubic metres. Approximately 24 million cubic metres of timber reach maturity every year and less than half of this is harvested, for an AAC just over that of New Brunswick or half that of Alberta.



The resource is there for the long haul, although getting it to the mill can be costly.

K-bjelke

Laminerte bjelker til trekonstruksjoner



- enkel bearbeiding og montering

K-bjelken er en trebasert lettbjelke som består av 48 mm C24 fingerskjøtne flenser og 17 mm innerlameller i tre. På grunn av sin stabilitet er bjelken godt egnet til tak- og gulvkonstruksjoner. Bjelken har et fuktinnhold på 12% og kan fingerskjøtes i lengder opptil 12 meter. Det rektangulære tverrsnittet gjør at den er enkel å bearbeide, og gjør at forsterkninger i sammenføyninger er overflødige. Bjelken monteres på samme måte som tradisjonelt heltre. Midlere densitet: 500 kg/m³

- **Sterk**
- **Dimensjonsstabil**
- **Rektangulært tverrsnitt**
- **Estetisk tilnærmet likt limtre**
- **Behandlet som heltre**
- **Mange anvendelsesområder**

Godkjenning

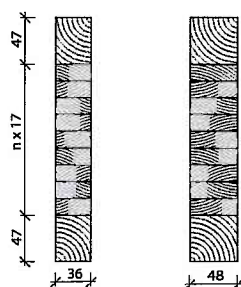
K-bjelken er typegodkjent i henhold til NBI teknisk godkjenning nr. 2365.

Produktkontroll

Fingerskjøting av bjelken er underlagt Norsk Limtrekontroll. Produksjonen av K-bjelken er underlagt overvåkende produkt- og produksjonskontroller gjennom kontrakt om NBI Teknisk Godkjenning.

Dimensjoner

36 x 250	48 x 250
36 x 300	48 x 300
48 x 200	



- **Bjelkelag**
- **Kantbjelker**
- **Takstoler**
- **Taksperrer**

Informasjon

For ytterligere informasjon henvises til teknisk godkjenningnr. 2365 på www.sintef.no/byggforsk

Les også om K-stender og våre andre produkter på www.kjeldstad.no

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