

## **A-Grader**

### **A timely innovation for New Zealand's wood processing industry**

#### **A Scion Impact Statement 2008**

Every month in New Zealand over 100,000 cubic metres of timber is assessed by Scion's timber assessment tool, the A-Grader. This development has played a vital role in enabling the wood processing industry to meet higher standards of product quality assurance to consumers.

NZ Wood's media advertising campaign reminds us all of the beauty and resilience of timber as a natural, sustainable material and hence the material of choice for many applications. However, the biological base that underpins the concept of "renewable" and "sustainable" also lends itself to timber's greatest challenge – that of natural biological variability. No two pieces of timber are exactly the same. New Zealand, which draws its resource from fast-grown plantation forests, experiences a greater extreme of variation in timber stiffness and strength within a tree as opposed to countries that utilise timber from 100+ year-old forests.

In response to this variability, and the growing market demand for performance standards, the wood processing industry is rapidly moving to standardise the way it groups timber into stiffness classes and to provide greater certainty of performance to its customers. Knowing the stiffness of any given piece of timber allows the customer to decide how they will use it. Stiffer pieces can be used in more demanding (and therefore more valuable) applications such as trusses; less stiff pieces can be used in house framing; and the least stiff timbers can be used for packaging or lower-grade applications.

With the value of timber between two grades (e.g., MSG8 and MSG10) being about 10 to 15%, there is a great incentive for the wood processor to ensure their material is correctly graded. Knowing the stiffness of any one piece can also allow the wood processor to intelligently reconstitute it to produce a more valuable product. For example, the stiffness of a laminated beam is controlled by the stiffness of the outer layers. Thus, when making a laminated beam, the manufacturer places stiff pieces of timber on the outside and less stiff (lower cost) pieces in the middle, thereby maximising value and performance.



The A-Grader, developed some three years ago by Scion in conjunction with Taranaki-based Falcon Engineering, has provided a very acceptable solution to this market need.

The A-grader is a 'stress-grading' machine that uses sound waves to measure timber stiffness. Since the first prototype was built in 2005, the A-grader has been installed by a number of sawmills and remanufacturing companies. There are already some 14 operating in a variety of wood processing companies throughout New Zealand, which by any standards is a rapid uptake for a new product.

Traditional proof-testing methods for assessing timber stiffness use a mechanical displacement technique. This involves measuring the deflection of the timber under a known load. Although this does measure the stiffness directly, it is also mechanically complex and requires a substantial structure to

support it. The A-Grader exploits the relationship between acoustic velocity, density and stiffness. By measuring the density of a given piece of timber, and the velocity of an acoustic wave, the stiffness can be simply deduced. This is extremely fast (microseconds), requires a relatively small machine and can work on very small pieces of timber (down to about 250mm in length). It is also independent of the moisture content of the timber, or its width and depth.

The result is a simple machine, with a small footprint that easily fits into most wood processing operations. It is also highly versatile, allowing individual companies to modify it to their particular needs.

*“The development of the A -grader by Scion and Falcon Engineering for the stiffness grading of full lengths of lumber in sawmills and processing plants was the commencement for solving the problem of grading defected shorter lengths of timber.*

*With the assistance of Scion and Falcon, and in conjunction with McIntosh Timber Laminates, developments and adjustments were made to the existing process and machinery to accommodate this requirement. Since we have been using the A-grader we have been able to grade our defected timber in shorter, variable lengths, this after defecting for visual defects dependent on the proposed end usage. This has enabled us to separate the timber into various stiffness categories for finger jointing of laminates of the same stiffness grade and placing these in their required locations within a glulam beam.*

*The ability to do this has given us the confidence to be assured that McIntosh Timber Laminates glulam beams will meet the strength requirements as requested by the engineer. It has also helped us in testing and grading timber from different suppliers and locations to ascertain the best areas to source our timber supply from.*

*The overall outcome for McIntosh Timber and our customers is that we and they can be confident that the glulam beams they purchase from us meet the strength requirements that the beams are designed to and we can confidently claim as a manufacturer the grade as specified.”*

Grant McIntosh – Manager McIntosh Laminates Ltd.

The A-grader has found a niche in a number of applications where grading for stiffness was not previously possible. These applications include sorting green, rough-sawn lumber of random size and length; stiffness grading short blocks of lumber for finger jointing; sorting by density for efficient kiln drying; and stiffness grading on structural lumber of random lengths.

*“The A-Grader has been now installed for approximately three years and has been very beneficial to our organisation. This technology gave us a solution to the requirements of needing to stiffness test our framing production. We felt the A-Grader was technology fit for purpose and unlike anything else suitable at the time. We estimate that it has paid for itself every year we have had it running and would not be wanting to be without it.*

*The A-Grader has allowed us to produce more higher grade, structurally certified lumber than we otherwise would have been able to do. Without this technology we most probably would not be attempting to produce framing at all.”*

Mark Hansen, Director Rosvall Sawmill Ltd

The benefits A-Grader provided have been extensive. A recent independent review<sup>1</sup> of the A-Grader across all current sites has indicated both a variety of applications and benefits. The latter includes:

- *“Ability to meet market demand for MSG timber in New Zealand and Australia.”*
- *“More than 20% improvement in economic outturn”.*
- *“It was the difference between staying in structural products and not.”*
- *“Best value for money grading of timber in rough-sawn state.”*
- *“Cannot operate the sawmill without the A-grader if we want to be in the structural market.”*
- *“Absolutely integral to strategy on how we run the business.”*
- *“Helped us get a premium price initially but now everyone is doing it!”*

Falcon Engineering is another beneficiary of this development. This small and innovative engineering company has leveraged off this development to substantially grow its business. With an eye on the North American market, this may be only the beginning.

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<sup>1</sup> Review undertaken by J.A Drysdale and Associates Ltd 2008.