DEVELOPMENT OF NEW ZEALAND MECHANISED LOGGING EQUIPMENT

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INTRODUCTION

This paper summarises the development of Waratah mechanical logging equipment, and gives an equipment manufacturer's point of view on how future machinery developments can benefit the New Zealand forest industry.

To date, Waratah General Engineering Ltd. is the only firm in New Zealand that has a history of development of mechanised logging equipment. Unfortunately most of that development has been to the benefit of forest industries of other countries, with harvesters going into Australia and processors to Canada.

THE EARLY DAYS

In the 1970's there was real enthusiasm for mechanised harvesting in New Zealand. Contractors like John Ramsey and Brian Cochrane were operating feller bunchers, and throughout the 1970's there were over a dozen felling machines working productively. Several logging contractors were also applying themselves to the delimbing dilemma.

Cable-Price Corporation were major suppliers of feller-bunchers to the New Zealand market, importing a number of 20-inch and 24-inch Vulcan shear heads to mount on Hitachi base carriers. In 1978 Nelson Pritchard, a local logging contractor working in east Taupo forest, approached Cable-Price to build a feller-buncher that would also have some delimbing capability. Colin Dickinson of Cable-Price in Tokoroa, in turn approached Waratah Engineering to manufacture a delimber-feller-buncher to their drawings.

This first harvester was in operation in February 1979, supplying Winstone's mill at Karioi, and the second machine hit the bush soon after. The development was not highly successful. The units suffered constant structural failures of the boom, arm and hydraulic cylinders. The 10-tonne size base machine was also too small for the rugged job that was expected of it. During this period however, the contractor learned a lot about machinery maintenance, and the requirements for skilled management, good service backup, and better qualified operators on the job. As a result of discussions with Winstones about productivity etc., a third machine was ordered by Nelson Pritchard in early 1980.

Although Cable-Price manufactured the first two heads, they eventually withdrew from the project, mainly due to the lack of support from the local industry. At this point, Waratah Engineering took over the project.

What happened to that early enthusiasm for mechanical logging? Same as what was later to happen to Waratah Engineering , the enthusiasm evaporated, and mechanical logging in New Zealand went on the back-burner for 6 or 7 years.

FURTHER DEVELOPMENT OF THE DELIMBER-FELLER-BUNCHER

At that stage, Waratah went to the Development Finance Corporation seeking development funding for the further development of the delimber-feller-buncher concept. This however was turned

down after the DFC received some advice from somewhere in the logging industry that the Waratah DFB had no future in New Zealand. And they were right! It's success has been all outside New Zealand.

This doesn't make me feel bad, since the DFC ended up going broke and I'm still in business (just!). Waratah then employed our own mechanical engineer to look into the problems with the DFB. The design of the head itself was not too bad, but the boom and arm required extensive design modifications.

In March 1980, the third head was manufactured by Waratah in Tokoroa, renamed the Mark 3 DFB, and mounted on a larger base machine (Hitachi UH05). It was put to work in the east Taupo forests with the first two units, and was still working productively elsewhere up to a couple of years ago!

Interest in the DFB was starting to be shown from Australia. Waratah had been approached by Banbury Engineering Ltd in Melbourne, to exhibit the DFB at the machinery exposition FIME'80, but this machine was unavailable for the show. Instead, Waratah went to FIME'80 exhibiting Super 8 movies of the DFB at the Banbury stand, generating quite a bit of interest and comment (both good and bad!).

At this time in Australia, the Logma processor was King, and the concept of the DFB was a bit radical. Despite this, Banbury Engineering ordered DFB #4, which incorporated further design changes including a 4-inch topping shear. In August 1980, this machine was delivered into stock and trialled in a number of locations throughout Victoria and South Australia.

The machine was not all that successful in those trials, with the method of operation: stroking the standing tree, felling and bunching. When the machine was trialled at A.P.M Forests Ltd in Victoria, Oliver Raymond of A.P.M. Forests, suggested a different method of operation. This became known locally as the "double shuffle method": the tree was cut off with the shear, lifted and dropped through the delimbing knives, cut off at about a 5-metre length, then the boom was raised and the "gravity delimbing" repeated. This method enabled fast processing of tree lengths into random lengths for forwarder extraction.

This method required a modification to the hydraulic system to allow the operator to open the shear blades and to maintain separate control of the delimbing arms. After these modifications, this machine was designated the Mark 4 DFB, and was eventually purchased by Jack Carstein, a logging contractor operating for A.P.M Forests in the Morwell area.

At this time, around 1982, Waratah sold the first two 18-inch felling heads. The buyers were Lex McLean and Dave Nuttall, two ex-Kiwi logging contractors working in Tumut, N.S.W. who saw the light about contracting in New Zealand and got out! Waratah then sold a second Mark 4 DFB (machine #5) into Australia in May 1983, to Woods and Forests in South Australia.

This machine was not all that successful in that area, mainly due to the tight quality specifications, and low machine utilisation ("The Big Company Syndrome"!). The sixth DFB was purchased by Venturoni Bros. logging contractors in the Gippsland area of Victoria, in June 1984, and from that point on, business started to pick up. Jack Carstein bought a further two Mark 4 machines in 1984 and 1985, and the third felling head was sold to Colin Moreland a logging contractor in Mount Gambier in 1984, to help salvage the wood burnt in the Ash Wednesday fires.

In September 1985, Waratah made the giant leap forward from the parallelogram boom and built a boom featuring oil compensating cylinders. A Danfoss electro-hydraulic valve bank was installed, shear capacity was increased to 18-inch (45-cm), and a fourth delimbing arm was added. This unit was designated the Mark 5A DFB.

This machine (#9) was sold to Domino Industries and a second Mark 5 DFB was sold to Banbury Engineering. Both machines were displayed at FIME'86. One of these machines went to Tim Christian, and the other to Venturoni Bros., both logging in Gippsland.

Over the years, Waratah sold a total of 14 felling heads and 20 DFB's into Australia.

DEVELOPMENT OF THE WARATAH GRAPPLE PROCESSOR

Contractors liked the robust nature of the DFB, and at FIME'86 we were approached by several contractors from both Australia and New Zealand to build a heavy-duty grapple processor. This opened another phase in the development of forestry equipment for our company, and for mechanical logging in New Zealand and Australia.

An order for a grapple processor arrived from Keith Travers, a logging contractor in the Tokoroa area in July 1986. The processor head was designed, built and finally commissioned in February 1987. After that, we spent a lot of time, money and resources in modifications of the prototype. Originally, we tried a central track drive with two feed rollers, but we soon threw that idea away. Then we tried different types of rollers, and different designs for the delimbing arms, before we finally stuck with the design we have now. Initial trials with computerised length measuring were also undertaken on this prototype processor.

Some Australians had a look at the design of Keith Travers' machine and said it was too heavy for small excavator bases, so for the next processor we built it much lighter using high tensile steel plate. We eventually built nine of that model (Mark 2 grapple processor).

Around this time (middle of 1987), the Northern Pulp Ltd. thinning contract was let in Aupouri Forest, and a large construction company, McConnell Dowell Constructors Ltd decided to enter the logging business. Due to the constraints set out in the tender, mechanical logging was virtually the only option. McConnell Dowell looked at mechanised equipment all over Australia before they returned and ordered two Waratah grapple processors and two DFB's, thus becoming the first company to introduce fully mechanised thinning to New Zealand.

So the big gap between 1980 and 1987 when the New Zealand logging industry forgot about the local manufacture of logging equipment closed. The drought had broken...or had it?

McConnell Dowell's first processor (#2) was delivered in November 1987. The following month another grapple processor (#3) was delivered, but by the middle of 1988 they had found out that logging was more than "a materials handling exercise", they bowed out of logging, and Pat Clarkin took over the logging in Aupouri.

In July 1988, we did a deal with Equipements Denis Inc. of Ste-Hyacinthe, Quebec, to send two 3-roller processors over for the big logging exhibition, DEMO'88, and for subsequent trial. The conclusions from these initial trials were that the quality of delimbing was excellent, the length measurement was very accurate, and that the production potential was high.

In March 1989, Denis started to market the Waratah processor in Canada as the Denis DP550 model, and sent the unit to B.C. for further trials. The processor proved to be a versatile unit for Canadian logging conditions.

We formed an agreement with Denis to manufacture 10 more units, mainly for the West Coast, between September 1989 and January 1990. Then we sent a further 8 processors to Denis in Canada up to May 1990.

DEVELOPMENT OF THE WARATAH HARVESTER: HTH

Around late 1987, Dennis Smith, a logging contractor in Coffs Harbour, N.S.W. ordered the first Waratah heavy-duty Hydraulic Tree Harvester (HTH). This machine was commissioned in January 1988. The HTH head required a minimum 18-tonne size base carrier, and had 4 drive rollers, and a hydraulic chainsaw with a maximum capacity of 50-cm. The machine operated in Slash pine second thinnings in a third-row outrow system.

Dennis Smith's fixed head harvester was the first Waratah capable of felling, delimbing, and measured length cutting, and it became the forerunner of the machines used for felling and debarking of

eucalyptus species. The second fixed head HTH went to Perotti Bros. in Tasmania in August 1988.

The fixed mounting design of the HTH was changed to a hydraulic rotator mount, and the first single-grip feller-director type of Waratah harvester, the Mark 3 grapple harvester, emerged. This was mounted on a Komatsu PC180 and was sold to Colin Moreland in Mount Gambier in June 1988.

And then the nightmare started!

Delimbing quality, and length measuring accuracy was not of a high enough standard to meet the stringent South Australian specifications for sawlogs and preservation material (posts and poles). We spent considerable agonising months undertaking modifications to the delimbing knives and the length measuring device.

The next grapple harvester (Mark 4 model) was sold to Tim Christian in December 1988 and mounted on a Komatsu PC180 (ex-DFB Mark 5 base). We freighted it over to him, tried it out, freighted it back for modifications, and then had to send it back to him once the modifications were complete! This all comes down to the cost of development.

It is a MAJOR problem when the local industry is not involved in machinery development, and you end up developing machinery for another market. But you still need to test the machinery in a working environment close to the plant so that you can easily undertake modifications. This situation is not so bad now that we have our own plant in Australia.

In September 1988, Les Gilsenan, a logging contractor in Canterbury, ordered a 3-roller grapple harvester for felling and tree-length processing of radiata pine. His operation is highly successful. The long term availability and hourly productivity of the harvester has been high.

As a result of experience and modifications in Canada, Australia and New Zealand, we upgraded the design and decided to standardise on the one design for both the harvester and processor models. All parts are interchangeable, although there are slight differences in the body design.

From harvester #11 onwards, they were all production models.

To date we have manufactured 44 processors and harvesters, only 4 of which are in New Zealand.

THE WARATAH HARDWOOD DEBARKER

In early 1989, Waratah started developing a Hydraulic Tree Harvester unit specially designed for eucalypts. Initial trials were undertaken of various knife and roller designs using Keith Travers' machine. The first hardwood debarker unit (HTH #3) was sold to Tasmanian Pulp and Forest Holdings Ltd in Triabunna, Tasmania in March 1989.

The second hardwood debarker went to Muskett Logging Ltd, contractors for ANM Ltd in New Norfolk, Tasmania. Then we sold a third HTH debarker into Tasmania, and a further unit to Harris-Daishowa in Eden in February of this year. We have sold a total of 5 harvesters as debarkers, to date.

CURRENT SITUATION

After five years of design, manufacture, development and modification, we are now building production model harvesters, processors and debarkers for the Australian, Canadian and other world markets, and one day for the New Zealand market. In the middle of 1990, we opened a branch assembly plant and parts department out of Melbourne, Australia.

Waratah Engineering Ltd currently manufactures a range of forestry equipment that is suitable for mechanised radiata pine harvesting:

- Waratah DFB (a heavy-duty delimber-feller-buncher)
- Waratah Processor (delimbing, measuring and cutting to length)
- Waratah Hydraulic Tree Harvester (felling and processing to length)

- Waratah Hardwood Debarker (delimbing and debarking eucalypts)
- Purpose-built logging boom and arms for mounting harvester/processor heads
- Waratah heavy-duty hydraulic rotators
- Waratah log loader boom, arm and grapple to suit 20-24 tonne excavators.

The log loader boom is designed for mounting on a 24-tonne base machine, and is being exported to Western Australia. This is ironic since in the last few years many excavators within a 20-km radius of our plant have been fitted with imported American log loader booms!

Options for the Waratah harvester/processor include: felling shear or chainsaw head; length measuring system; delimbing knives for large or small diameter wood; softwood rollers or hardwood rollers.

FUTURE DEVELOPMENTS

Projects we are working on for the near future which should be of major interest to the New Zealand logging industry include:

- Development of a chainsaw feller-director head: 65-cm or 80-cm option
- Development of a larger processor for handling large piece-size : either for hardwood debarking or as a softwood processor.

We are also keeping the option open regarding the possibility of Australian manufacture, and we are currently opening up further overseas markets.

CONCLUSIONS AND RECOMMENDATIONS

These conclusions are based on over 12 years of machinery development in this country. We have manufactured 78 units of forestry equipment to date, and have only 7 units in New Zealand.

Firstly, to logging managers who are looking at an increasing wood availability and a labour force that isn't: Look at mechanisation (it's right here up the road from you!). Support your logging contractors: Make better use of the excellent general engineering facilities that we have in New Zealand. We can manufacture the low cost attachments that you need.

Secondly, to other machinery developers: If you are considering applying for Government funding for machinery development, don't bother! You will probably spend more time and effort in the application and in the subsequent reviews and audits than you receive in the value of the grant. Also, if you are fortunate enough to get the support of the local forest industry, you wouldn't need Government funding anyway!

But if you still persist in spending four to six hundred thousand on machine development and are considering local manufacture...reconsider! I certainly wouldn't recommend machinery manufacture in New Zealand to anyone! Take it to a country where your work will be appreciated...Canada, U.S.A., Australia.