

Timber treasure of the deep

BY PHIL WHYTE

IT'S ANOTHER COLD, dark, still and deathly quiet day at the bottom of Oosta Lake. It has been like this for decades since the hydro dam was finished and the lake created by flooding the valley and its forest.

But not for much longer. For this is the day

that the submerged spruce trees meet the Sawfish – a machine that could be straight out of the pages of Jules Verne.

The box-like yellow submarine glides in from the gloom and grapples a tree. It attaches an airbag and inflates it, then saws

the stem off about 70cm above the lake bed, leaving it to float up to the mother ship on the surface.

Yes, this is a logging story with a difference. Still using a felling head, but different in every other way.

Submerged trees await harvesters

SAWFISH WAS DEVELOPED by Triton Logging Inc, a Canadian company based near Victoria, British Columbia.

The genesis of the idea came from company founder Chris Godsall, who worked on log transport in his early days – floating logs down to mills. Many sank, but recovery was costly and often unviable using traditional methods.

At the same time there was an increasing awareness of the timber resource submerged during the 20th Century hydro construction era. It is estimated that 300 million trees in 45,000 forests have been flooded by dams worldwide, with an estimated market value of \$50 billion.

The first Manapouri hydro scheme was New Zealand's most celebrated tree flooding proposal, but in the end the lake level wasn't raised. However there are drowned trees in Monowai, possibly Hauroko, and some of the hydro lakes along the Waikato.

These submerged trees have been preserved by the dark water with a minimal oxygen content.

So Godsall formed Triton and the company developed the Sawfish in the

Glulam (glued and laminated) beams made from wood logged under water by Triton Logging.



Triton Logging founder and CEO Chris Godsall.

early years of this century. The company's engineers concentrate on design and manufacture of the Sawfish, and there are up to 25 employees in the harvesting division. The marketing division completes this multi-tiered business, and is concentrating on Canada's well developed 'green' consciousness.

Triton spokesman Jim Hayhurst says that harvesting underwater forests to supply 'rediscovered' timber is a good fit with the demands of the environmentally-friendly marketplace. Once wood logged underwater has been kiln-dried it can be used as architectural grade, old growth timber for applications including structural beams, panelling, cabinetry and furniture.

The highly valued old growth timber harvested from lake beds by Triton's Sawfish is classified as 'rediscovered' wood, certified by the Rainforest Alliance's Smartwood programme. Godsall says that Triton's harvesting process doesn't disturb a fish habitat, because fish don't live in a submerged forest.

Triton's products are between 5% and 25% more expensive than comparable surface harvested plantation timber, but Godsall expects Triton will become more price-competitive as more Sawfish are manufactured and put to work.

He expects Triton to be supplying 76 million board metres by 2012, placing the company in the top 20 Canadian suppliers, as well as operating in four other continents. 

A Sawfish robotic harvesting operation. The Sawfish in the foreground has grappled a tree, and will attach and inflate an airbag before its 55 inch chainsaw fells the tree. Multi-purpose tethers link the Sawfish to its operator on the barge above.



The Sawfish's eight cameras enable its operator to follow its progress. The robot is directed by joysticks which will be familiar to any loader or mechanised harvester operator.

Traditionally, underwater harvesting has been carried out using divers attaching lines to trees which were then hauled to the surface by cranes. This method is slow and disturbs the lake bed. It is also haphazard, time-consuming, dangerous, manpower intensive, costly and limited to trees 25 metres below the surface. As 80% of the

world's submerged trees are located deeper than 25 metres, Triton Logging Inc founder Chris Godsall went looking for a better way.

The idea was to build a remote controlled submersible robotic felling head – the Sawfish. Triton Logging spent several years in R&D. In developing the remote-controlled, robotic felling machine, Triton also had to

work through all aspects of underwater logging, raising the cut stems to the surface and then transporting them to the mill.

Since 2004 Triton has used Sawfish to log two lakes – Oosta Lake and Lois Lake – in its home province of British Columbia. The company estimates that about 5% (15 million) of the world's submerged trees are in BC, and has licences to log many more reservoirs. To date Triton has been harvesting softwoods, including radiata, spruce, douglas fir, cedar, and hemlock.

Triton's underwater logging operations are carried out from barges with operator stations. The Sawfish itself is an aluminium-cased box measuring 3.5 metres long x 2m wide and 1.5m high, weighing 3.5 tonnes on land and slightly buoyant in fresh water. Triton Logging has three Sawfish, each costing more than \$NZ 1.3 million to manufacture. The early models were powered by 30kW electric motors, but the motor in the latest model has been beefed up to 56kW for greater manoeuvrability and speed.

The custom-designed Sawfish felling head has a similar mechanism to a land-based mechanised feller. Grapple arms grip the tree and the 140cm chainsaw

cuts it, leaving a stump about 0.7m, depending on tree type. Triton says Sawfish can fell trees of any diameter, and the noise generated is far less than that caused by a surface felling operation.

The Sawfish is connected to the operator station on the barge above by a multifunctional tether, providing the power source, fibre optic communications, navigation, and supplying air to the airbags. Each Sawfish carries up to 70 of these reusable canvas airbags. The operator directs the Sawfish using joysticks similar to those fitted to excavator type loaders and mechanised fellers, and follows its progress via CCTV monitors – the robotic feller has eight cameras.

"The Sawfish can operate at any depth – some reservoirs are 350 metres deep," Triton spokesman Jim Hayhurst told *NZ Logger*. "Each Sawfish can harvest 50 trees an hour. Often two Sawfish operate from different ends of the same barge, with each Sawfish having a predetermined cutting area. One Sawfish barge has five to six men. Add another Sawfish and you will need 1-2 more people."

The operators prefer working at night because it's easier to see through water, as

The 3.5 tonne Sawfish being prepared for a day's harvesting.



The surface operation during Triton Logging's Ootsa Lake harvesting project.

sunlight causes light to diffuse. It can also be calmer at night which makes the topside team's work easier.

Two Sawfish harvesting 50 trees an hour should mean production of 750 stems in an eight hour day?

"It is always difficult to establish an average harvest rate, though we understand why everyone wants one," Hayhurst replied. "The fact is, rates depend on a whole host of factors – just as in land logging – such as tree spacing, environmental conditions, species, etc. We have decided not to proclaim an average rate going forward as these published rates are often taken out of context and can be misleading.

"The simple answer is that we can harvest faster than any other underwater system, and we can harvest competitively with virtually any land-based system."

Generally one barge is used as the base for one or two Sawfish and their operator stations. Other barges are used to carry the recovered stems.

"The barge type, set-up and ownership arrangement varies from location to

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location and depends on a number of factors," Hayhurst said. "Often we will use a standard/local grapple loader for both log retrieval and Sawfish launch/retrieval. On our Ootsa Lake operation, the barge could carry approximately 200m³."

The airbags bring the trees to the surface above the harvesting site. A custom-designed tug outfitted with either hooks or a grapple drags the stems to the barge, where they are hauled out of the water by the grapple loader.

"Many times a mill is located on the edge of a reservoir as these areas are forest-industry dominated anyway. So the barge can go directly to the mill, reducing trucking

costs. Otherwise, multiple barges are unloaded and wood is trucked for milling," Hayhurst said.

Triton usually finds work by making proposals to waterway owners, as well as being asked to come and clear a lake.

"We have categorised each of the most promising reservoir opportunities in the world and are actively engaged with authorities on obtaining harvest licences. As well, we have been invited by Governments and reservoir managers (hydro companies, industry) to clear reservoirs for safety ... most applications for harvest licences will eventually go through Government," Hayhurst said.

He added that Australasia was one of the regions Triton was investigating for potential submerged timber.

"Each operation requires a licence from the governing body. This is usually the local government, and also involves other stakeholder support. Triton's track record of

harvesting success, stakeholder engagement and environmental performance make the process of achieving consensus and consent where we work that much simpler."

Sawfish has other possible applications. "[It] has not been used in salt water, but certainly could be with minor modifications. There are few, if any, salt water submerged forests, but we have been approached to

cut dock pilings in harbours and Sawfish is ideal for this kind of work," Hayhurst said.

The substantial upfront cost of developing the Sawfish has given Triton Logging an advantage over many logging operations. The cost and rate of extraction are similar to land-based logging, and the company does not have to rely on the development of roading and other infrastructure.

Unmanned robotic felling, and the use of floatation for bringing the logs to the platform, means the harvesting operation has few hazards. It is environmentally friendly, involving negligible impact on lake beds.

And the future? Triton Logging aims to have schools of Sawfish moving in on the millions of submerged trees around the world. ^(NZL)

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