

SELF LOADING LOG TRUCKS

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INTRODUCTION

This paper will introduce to you a transport concept that has, in past years been under estimated, under utilised and totally written off from a cost benefit point of view.

I will show you a system that will maximise the utilisation of a Log Truck while operating completely independently of loaders, dispatchers and logging gangs. A system that can reduce harvesting costs in smaller operations, is ideally suited to mechanical harvesting such as forwarder roadside operations, and can cope with fluctuations in market demand better than conventional transport modes. These vehicles suffer a small penalty in tare weight but compensate by offering the ability to pick up from more than one place, load other trucks and make deliveries irrespective of time or unloading facilities.

HISTORY

I suspect self loaders have been used in New Zealand at least since the 1950's. In early days they were front mounted Hiabs which were only partially hydraulic, used rope winches to lift the logs and used scissors rather than grapples to hold the logs.

These cranes required a great amount of skill to throw the scissors, balance the log and get it onto the truck without injuring the operator who stood on the ground, often between the logs and the truck. When loading a trailer, you had to park alongside and load across, again a feat of great skill as visibility was minimal and there was no room for error.

In later years, they progressed to hydraulic grapples, extendible booms and top seat controls which gave the operator better visibility.

Today most cranes are rear mounted, lighter, faster, easier to operate and can load both the truck and trailer in easy reach.

TARE WEIGHT

I will concentrate on a shorts Self Loader capable of carrying up to 6.5 metre logs on the truck and 8 metre logs on the trailer. A unit tare weight of 17 to 19 tonnes would be most common today, dependant on the make of truck and the number of bolsters and ancillary equipment added.

A tare weight of 17 tonnes is quite achievable today using a 9 tonne 8x4 Cab and Chassis, where the crane is attached directly to the truck, rather than on a demounter, and using a 3 axle trailer of around 3.6 tonnes.

The average 10 tonne metre crane weighs 2.4 tonnes with grapple, rotator and mounting bolts with an additional 2 tonnes being added in the Cab Guard, bolsters, crane guard, hydraulic tank, pump and hoses.

With a demounter, deck plates and extra guarding added, a truck tare of 13.8 to 14 tonnes is often the case.

This means that an 8x4 is the most logical truck to operate as a payload of 11 tonnes is still achievable. A 3 axle trailer would normally be added as a light tare with the ability to be piggy backed, make it the most sensible option.

THE CRANE

Your choice of crane would normally be dependant on piece sizes being handled. The most common size for short log handling is either an eight or ten tonne metre unit. For long log cartage, a crane of fifteen to eighteen tonne metres would be most common.

If you use Jonsered specifications, an eight tonne metre crane will lift 1,070 kgs at maximum outreach of 7.5 metres and at 3.6 metres can lift 2,160 kgs.

A ten tonne metre crane will lift 1,290 kgs at maximum outreach of 7.9 metres and at 3.9 metres can lift 2,610 kgs.

An eighteen tonne metre crane can lift 2,300 kgs at maximum outreach of 7.6 metres and will lift 4,250 kgs at 4 metres.

A 0.4 m3 or 0.5 m3 grapple would be most commonly used with either of these cranes. These grapples will close up to hold a 150mm diameter log and open out 2 metres tip to tip to give a good spread across the ground when gathering up logs.

There have been studies carried out to evaluate grapple size and conclusions drawn that what we use is too big, but a Self Loader needs to be versatile and when you arrive at a skid site to find 1 metre diameter logs you will appreciate the investment in a 0.5 grapple.

HYDRAULICS

Hydraulic systems are an area that has never been given enough consideration as in earlier years a small hoist pump drawing from a small tank with no filtration and pumping through a couple of lengths of steam pipe would be quite acceptable. It worked for years so why spend any more money on advanced systems.

Today's cranes should be perceived as an extension of the operators arms. He rides on the crane with his arms and feet attached directly to the controls, so its operation needs to be smooth and as fast as his mind and limbs can function. It is the same principle as a hydraulic excavator where the boom and slew functions can be run as fast as the operator wants.

Today's cranes have two valve banks, each operating three functions controlled by the driver's hands and feet. These functions operate the inner boom, outer boom, extension boom, slew, grapple and rotator. To speed up the operation it is common to have two separate hydraulic circuits.

To achieve this we use firstly, a twin pump drawing from one large reservoir. A 200 litre tank with return filtration would be recommended as this volume of oil will allow some cooling during prolonged operation. From the pump you need two high pressure lines, with inline relief valves, to the crane and two lines returning to the tank. The largest practicable lines must be used as smaller pipes cause back pressure which has a negative effect on the crane's performance and creates heat.

The cranes normally operate at around 4,000 psi pressure with flow rates of 70 to 100 litres per minute, so considerable attention needs to be paid to reducing restrictions, good filtration, and general system maintenance to ensure maximum performance and a long service life.

The slightest drop in pressure will be noticed by an operator so a well designed system will eliminate those "it doesn't lift like it used to" complaints that you soon get sick of.

There have been further advances made in speed and smoothness of operation using variable displacement pumps and pilot hydraulic controls which give the operator flow rates from 0 to 250 litres per minute. These controls are very easy for the operator to use and create an extremely fast crane ideally suited to handling small pulp and posts.

The variable flow means that it is produced at whatever rate the operator requires which, as opposed to normal constant flow circuits, will produce significantly less heat and draw only what engine horsepower is required.

DEMOUNTERS

New Zealand operators have been constantly improving detachable cranes, where the ability to remove the crane when not required, or leave it behind on a long journey is desirable.

Spear type demounters are the most popular where the crane is attached to two tynes which fit into pockets at the rear of the truck chassis. The spears are tapered to clear the trailer drawbar when turning and are held in place normally by just two pins. The hydraulic lines have snap couplings located at the rear of the truck chassis and removal of the crane can be done in around 5 minutes. It involves turning the crane around, putting the grapple on the ground, putting the legs down to take the weight, removing the pins and hydraulic hoses and driving the truck away. The more often the crane is removed the easier it is as mud and grit tend to bind the spears in the pockets and cause difficulties.

Some demounters that sit on top of the truck chassis are now being developed and while they are much easier to remove, they require a lot longer truck chassis to sit on, so require a shorter trailer drawbar to stay within legal lengths and reach of the crane.

By demounting the crane on journeys where you intend to return for the next load, extra payload of 2.5 tonnes can be loaded onto the truck. A demounter will cost between \$3-5,000 and will add around 200 kilo's to the tare weight, so is well worthwhile where longer hauls are anticipated and payload, rather than turn around time, is a priority.

TRAILERS

Three axle trailers are the most popular trailers used with Self Loaders, as they can be piggy backed on a crane truck with its crane attached. With a 6.5 to 7 metre load space on the trucks, a normal trailer can be accommodated. A technique to unload the trailer using the crane has been developed using a chain or bar across the back and front of the trailer chassis. The rear of the trailer is first swung out onto the ground and then the front can be lifted and swung off the truck onto the ground. The trailer can then be wheeled around behind the truck and the drawbar coupled to the truck in one movement.

This innovation has meant that Self Loaders can now get into some steeper jobs by carrying their trailers, can turn around on narrow tracks or skid sites, can unload their trailers, load up and drive out. Prior to this, turn around bays would have to be provided and access into skid sites was limited.

A technique of reloading trailers onto trucks has also been developed where the reverse procedure to unloading is applied, although great care is required. A light trailer and a crane of minimum 10 tonne metre capacity is necessary to do this, but the ability to put your trailer up after unloading is definitely a bonus in saving road user charges and maintenance costs, as well as giving the operator a more comfortable ride.

ACCESS PROBLEMS

In Wood Lot type operations where access is often difficult, a Self Loader can really excel, given the ability to leave the trailer at the roadside and cart out to it if necessary. This operation does not take long provided that log heaps are reasonable and the transfer distance not too great. In some instances the driver may have taken the trailer into a skidsite and then finds on the way out that he becomes stuck. The secret then is not to bog down but to either offload part of the trailer onto the ground or onto the truck, so that traction can then be regained. Often has been the case where we have had to unhook the trailer, drive forward and then attach a chain between the two and try to get moving that way.

Crane truck drivers tend to be rather creative in finding ways to get unstuck when no help is available. This, of course, is the difference between coming home loaded or empty. Some days a driver may chose to transfer several loads out to the roadside if weather conditions are a problem so that they are available to suit customer requirements.

COSTS

Of course to have a vehicle this versatile does not come without some cost. A new 10 tonne metre crane will cost in the vicinity of \$65,000 and a pump, PTO, oil tank, pipes, hoses and demounter, and additional \$15,000. Giving an all up cost of around \$80,000.

The manufacturers expected life of a crane is measured in lifting cycles, so in full time operation would equate to around 5 to 6 years, although 10 year old cranes are not uncommon. In 5 years they will devalue to around 30% of the purchase price depending on inflation and overseas exchange rates.

It would not be uncommon to carry out two major rebuilds in their lifetime at around \$5,000 each. Operating costs include oil and filter changes, as well as numerous hydraulic hoses. Hoses most prone to damage are the 4 hoses at the end of the gib going to the grapple and rotator which normally cost around \$120 each. The larger high pressure hoses between the pump and crane will perish near the ends eventually due to pressure surges and they cost significantly more. Grapples will need rebushing annually or bi-annually depending on the amount of use.

SUMMARY

Although these costs may seem rather daunting, the Self Loader is still a very effective means of loading and transporting logs. One of the greater costs in operating a conventional loader, be it rubber tyred or an excavator, is the labour cost which is eliminated with a Self Loader.

A Self Loader operates independently or within a dispatched system, can handle most lengths of logs, and can carry a payload not too dissimilar to many of today's modern convertible units.

With onboard scales it has the ability to load and separate different species or grades, make deliveries to more than one point and pick up a backload without having to make prior arrangements to be loaded.

It has the ability to fleet logs that have just been pushed up into a pile and to stack logs with extreme precision. For a nominal loading rate, thinnings operations can dispense with loaders, production gangs can operate with bells to fleet and stock pile, and generally the whole transport operation can be carried out 7 days per week, 24 hours a day without inconveniencing harvesting in any way.

THE FUTURE

I see the future of Self Loaders in New Zealand as very promising given the increase in annual harvests and the on slaught of smaller plantations that need thinning and harvesting using cost effective techniques. I see Self Loaders operating in harmony with forwarders as New Zealand is driven toward mechanisation by safety and health restraints. They will play a big role in "just in time" principles where log stocks will be carried in the forest and delivered to the customer on demand.

Crane technology is becoming so advanced that now operators have air conditioned cabins, weight systems in the grapples, and a whole host of hydraulic accessories to assist them.

Remote control systems are being tested now, so that the driver can stand on the ground or sit on a tree stump and load his truck and trailer. The possibilities are endless and the running costs minimal.

All it takes is a little imagination!

