

ADDING WINCHES TO HYDRAULIC EXCAVATORS - ROLLER CRUSHING

Introduction

Within the New Zealand forest industry hydraulic excavators are commonly used in felling, truck loading, and roading operations (Ref^{1,2,3}). More recently the operational scope of such machines has widened to include harvesting operations such as shovel logging (Ref^{4,5,6}) and road line harvesting (Ref^{7,8}).

Recently a Bay of Plenty contractor further increased the versatility of the hydraulic excavator by attaching two hydraulic winches to his 40 tonne Komatsu PC 400 excavator. This enables the machine to carry out both roller crushing and cable hauling operations as well as the more traditional tasks mentioned earlier.

Specifications

Machine:

- Komatsu PC 400
- Operating weight: 52 tonnes
- Engine: 206 kW
- Boom and arm reach: 12 metres

Winches:

- Two Pullmaster HL 25-4's
- Each drum holds: 450m 5/8" swaged wire rope
- Full hydraulic interlock capacity
- Boom mounted blocks ensure the correct fleet angle for smooth spooling.



Figure 1 - Excavator roller crushing

Roller crushing

The machine is currently roller crushing light scrub in Wharerata forest near Gisborne using a twin rope, 5 tonne gravity roller which is 6 metres wide and 2.3 metres in diameter. This combination is proving more effective than tractor based twin rope systems because of the following factors:

- The raised cab gives very good down-slope visibility
- Hydraulic winches are driven in and out and are controlled by the main excavator control pedals. This means that the roller

can be steered in a similar manner to a Bell logger, guided across slopes on both uphill and downhill runs at any distance from the excavator.

- The height of the boom mounted blocks ensure that cables are above the scrub, aiding roller manoeuvrability and reducing rope wear due to ground contact.
- When the machine is operating, with the boom pointing in the direction of the roller and the bucket on the ground as a brace, positioning is fast, as often only the boom is moved (Figure 2).

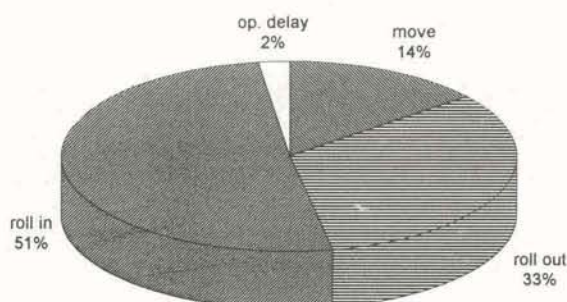


Figure 2 - Activity sampling of time spent roller crushing

The short study also indicated that production rates are as good as or better than those achieved by tractor operations (Ref⁹).

Limitations

- Production drops if the machine is used to crush flat areas or ridge tops. The contractor has found that using a tractor and roller for these areas markedly improves production rates.
- The cost of shifting the two machines and their high production capability mean that only very large contracts are worth tendering for.
- Currently no New Zealand companies are able to design suitable hydraulic control systems for these winches so total systems must be imported



Figure 3 - Mounting position of winches

Conclusion

Adding winches to suitable excavators increases the versatility of these machines and will increase machine utilisation.

The hydraulic excavator roller crushing operation visited was well suited to the broken terrain and looks a viable alternative to tractor systems for large scale operations. Smaller excavators could use winches for cable logging but roller crushing requires heavier machines.

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