ISSN 0111-4743

LOGGING INDUSTRY RESEARCH ASSOCIATION NEW ZEALAND

TECHNICAL RELEASE

Vol. 7 No. 2 1985

CLAMBUNK SKIDDER APPLICATIONS

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INTRODUCTION

Figure 1 - Clambunk skidder

The clambunk skidder was developed by mounting an inverted grapple (the "clambunk") over the rear bogies of a forwarder chassis. An hydraulic loader mounted behind the operator's cab is used to accumulate large payloads that are moved to the landing at relatively low skidding speeds. Figure 1 shows the basic configuration.

ACKNOWLEDGEMENTS

The help provided by tour hosts Rolf Johanssen in Sweden, John Wilby in Canada, and Bill Hermann in the U.S.A.; Tim White of Timberjack, Canada; and R. Vleeshouwer of Motor Holdings (Machinery) Limited, Rotorua, is gratefully acknowledged.

OPERATION

The clambunk skidder is driven backward from the landing to the bush (Figure 2). The clambunk is opened and trees are placed in it with the loader. Obviously, it is important that the operator plan his movements carefully for optimum machine placement during loading. Most operators feller-bunch the timber for the clambunk skidder, thus maximising the skidder loading rate, but this is not essential. It is usually necessary to reposition the skidder a couple of times before the payload of 10 to 17 tonne is accumulated in the bunk.

At the landing, unloading is accomplished by opening the bunk and moving the machine forward, dumping the drag.

Compared with conventional skidding machines, it may be seen that the clambunk skidder :

- has no winch and therefore must approach to within loader reach of every tree, and has no ability to winch logs past wet or adverse pitches.
- skids large loads, even in small timber.
- is best suited to dry, gentle terrain, with favourable grades.
- requires a large clear landing space for maximum production.
- requires more room to manoeuvre.
- is configured to travel smoothly over stumps.

The large payload capacity of the clambunk skidder makes it a highly productive machine, capable of skidding far more volume per day than conventional machines in small wood. On the other hand, intensive planning of all stump-to-mill phases is necessary to get maximum production.

Figure 2 - Clambunk travelling empty

APPLICATIONS OBSERVED

It is instructive to review the experiences of clambunk users on three distinct terrain types where they were observed operating - on flat ground that included some swamps in Sweden; on gentle well-drained terrain in British Columbia, Canada; and on a hilly clay site in Washington State, U.S.A.

Sweden

Hasselfors Bruks AB in central Sweden operates clambunk skidders, with Company crews, in clearcut logging with a mean tree size of about 0.4 m^3. Production averages 40,000 m^3 per skidder per 220-day year, with mean skidding distances of 350 m. Drag size averages 12 m^3.

Hasselfors fells its timber manually with butts toward the landing. A Logma slide boom delimber processes trees into bunches of about 15, ejecting tops and limbs on to the skid trail for additional flotation.

The clambunk skidder works well for Hasselfors in normal conditions of snow or rocky, well-drained flat terrain. Difficulties were observed, however, in swampy terrain with a slight adverse grade that would not have posed problems for a tractor or line skidder. Once the clambunk became stuck the only escape procedure was to repeatedly unload, move ahead a few metres, and re-load. It was clear that the clambunk skidder was not suited to swampy soils with even slightly adverse grades.

British Columbia, Canada.

A Swedish Kockums clambunk was observed operating in central British Columbia on well-drained gravelly soils, with favourable skidding grades of 10 to 20 percent. It was operated by a contractor for Northwood Pulp and Paper Co. in a clearcut with a mean tree size of about 0.7 m^3, that had been feller-bunched. These conditions were ideal for productive skidding.

A cycle time of 8 productive minutes (no delays) was observed, at an 80 m skidding distance, with an average drag size of about 14 m^3. Allowing for longer average skidding distances and normal delays, a production capability of 400 m^3 per day could be inferred - certainly better than conventional equipment.

However, the contractor was not able to maintain this production rate, because of downstream delays. The road had been rendered impassable to trucks or a loader by the spring breakup, so that the landing plugged quickly. At other times, there were difficulties getting timely loadouts, or of disposing of the large volumes that could be produced by the machine.

The Canadian operation, then, had another lesson. There must be adequate, timely uplifts of the machine's production.

Washington, U.S.A.

An innovative logging Company, Hermann Bros. Logging & Construction Inc. of Port Angeles, Washington, is enthusiastic about its success with the four Timberjack 520 clambunk skidders that it owns.

Hermann's operation was observed in clay hill country, with benchy slopes, averaging about 40% but having short pitches up to 60%. Practically all skidding was done on favourable grades. Natural midslope benches were extensively utilised for skidder access; sideslopes up to about 20% are acceptable for clambunk skidder operation. While some skidder capsizes have occurred, these have never caused damage or injury, as the loaded machine tips over very slowly. A few trails were cut with the skidder blade across slopes up to 50%. Another technique more commonly used on slopes inaccessible to the clam skidder was the "shovel logging" technique, that is, repeated swinging with a hydraulic loader, to move logs from ground as steep as 60% into a position accessible to the clam skidder (Figure 3).

The soil in the area was a moderately competent clay, without quite as much bearing strength as the Moutere gravels of Nelson province but much more competent than the heavy clay soils of the Gisborne area or the Far North.

Hermann was logging second growth Douglas fir, with some small-sized secondary pieces, having an average tree size of about 1.2 m^3.

Figure 3 - Hydraulic loader bunching for the clambunk

The wood was mostly feller-bunched, with trees over 60 cm diameter being cut by powersaw. Hermann finds that the clambunk loader can handle trees up to 100 cm diameter, but it is perferred to cut a 12 m log off the butt of all trees over 60 cm diameter prior to skidding. Feller-bunching is considered essential in timber averaging less than 45 cm dbh; above that diameter, hand cutting is acceptable.

The skidder and feller-buncher operators jointly plan the setting layout, aiming to have the bunches oriented at a 45° angle to the tracks, with the butts toward the landing. It is critical to have minimal adverse skidding, and plenty of landing room available.

Hermann's landings are organised for processing either by powersaw or by Hahn harvester (Figure 4). After the logs from one drag are cut, the loader places them aside unsorted. Then, while the landing crew is cutting the next drag, logs from the first drag are sorted. The landing operation is far simpler and safer than a normal 2- or 3-tractor landing, and congestion is less, provided that all material is loaded out hot. Where material has to be cold decked, the resulting congestion can seriously affect skidder production. Hermann regards its loader operators as more key employees than the skidder operators.

Figure 4 - Loaded clambunk at landing

The clambunk skidder receives excellent operator acceptance, because of the enclosed, comfortable cab and smooth travel. Operating competence is achieved reasonably quickly. It is especially important for the operator to learn to plan his machine movements for optimal loading.

Hermanns have found maintenance and repair costs to be low for the clambunk skidder, with variable operating costs running well below those of a D7 skidding tractor. The only consistent problems have been with the Cranab 9025 loader, which Timberjack has abandoned in favour of the Cranab 100 on skidders being manufactured now.

The level of soil disturbance observed in the area of operations was low. The ground pressure exerted by the loaded machine is about 48 kPA, and fewer passes over each track are required than with conventional equipment because of the large drag sizes.

Hermann's production for all four of its clambunks since they were purchased has averaged 335 tonne per machine per 9.5 hour day. This has been in timber similar to that described above, but generally on easier topography - typically 20% slopes. This production is achieved with a crew consisting of a skidder operator, a loader operator, and either a Hahn harvester or two powersaw operators processing at the landing. About 7% of the production is contributed by the loader "shovel logging" areas adjacent to the road when time is available. Production from the clambunk itself runs around 310 tonne per 9.5 hour day, or about 275 trees. It should be noted that Hermann is a high producer. Only the best operators could achieve this production level under similar conditions, which are considerably less favourable than in many New Zealand plantation forests.

Hermann's regard their D7 grapple Cat as a competitive machine only where distances are less than 100 m and mean tree diameter exceeds 75 cm.

POTENTIAL FOR NEW ZEALAND

Vast areas of terrain suitable for clam skidder operation exist in New Zealand, notably on the gentle sandy areas of the Far North and the central North Island. The incidence of a few steep gullies or adverse skidding grades does not pose a particular problem, as they can be skidded by conventional methods.

The production rates achieved by clambunks are clearly competitive with conventional machines in small wood.

Skidding costs are likely to be competitive with conventional systems. The Timberjack 520 is quoted at NZ$550,000, compared to NZ$276,000 for a bush-rigged Komatsu D65E tractor and arch. Depending on the timber, the clambunk is likely to outproduce the tractor by at least 50%, so that the per m^3 level of capital input would be only slightly higher for the clambunk. However, the clambunk has a labour requirement of the order of 30 to 40 percent of that of the skidding tractor, and lower repair and maintenance costs. Therefore, the economics are likely to be favourable for many New Zealand applications.

It must be remembered, however, that maximum production rates are achieved in feller-bunched wood. Productivity is likely to be less in hand-cut timber. Alternatively, feller-bunching is likely to cost more than hand falling. Skidding costs cannot be considered in isolation, but complete stump-to-mill economics must be examined to determine the true competitiveness of the clambunk skidder, and the conditions (piece size, skidding distance, etc.) under which it would be preferred to conventional methods.

A prime consideration is whether the user can be assured of a constant loadout of the high level of production. Otherwise the clambunk skidder may fail to meet expectations due to landing delays. Most small companies, of course, would not like to have a large proportion of their raw material supply sourced from one machine. The clambunk skidder therefore belongs in large scale operations.

The clambunk skidder has definite safety advantages, and produces less soil disturbance than conventional systems.

CONCLUSIONS

For large scale logging operations on favourable terrain, the clambunk skidder can have major productivity and cost advantages over conventional skidders. Much of the forested land in New Zealand is well suited. It is recommended that the larger companies operating in small to medium timber on easy terrain more closely investigate the clambunk skidder, considering the associated felling and processing functions, as an alternative to conventional skidders.

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