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THE KOLLER 2.5 SELF-CLAMPING CARRIAGE

Michael Duggan

ABSTRACT

The operating mechanism and rigging configurations of the Koller 2.5 carriage are described and a study of the carriage is summarised.

The Koller 2.5 carriage has a potential application on small haulers (75 kW to 150 kW) operating in small piece size of up to 1m^3 clearfell or late thinning.

Features of the carriage include; unlimited manual slackpulling capacity, the ability to clamp to the skyline without a "stopper" and the ability to pass over an intermediate support.

The combination of the Ecologger I hauler and the Koller 2.5 carriage was found to be a good match in the .7m^3 tree size in which it operated. Daily productivity during the study was calculated at 106 m^3 per eight hour working day.

INTRODUCTION

The Koller carriage is one of a number of self clamping carriages which have been developed and operated in Europe for many years, typically in conjunction with either small truck-mounted haulers or standing skylines. Because of the mechanical complexity of these types of carriage and their limited payload design (usually 2.5 tonnes), acceptance of the carriages by contractors outside Europe has been slow. The local carriage preference for small haulers has tended toward the simpler and cheaper Christy type carriage.

Figure 1 - Koller 2.5 tonne Carriage

While the Christy type carriages have been successfully introduced, two limitations with their operation include:

1. The skyline must be lowered for the skyline stop to be moved.

2. The skyline must be lowered at the landing.

A recent appraisal of New Zealand's cable logging resource (Olsen, 1989) projects 15 small haulers (producing from 80 to 100 tonnes/day) will be required in the 1991/1995 period. With much of this resource on difficult broken terrain, it is important that cable loggers have at their disposal a range of options to achieve and maintain high levels of production.

In the Skyline Carriage Survey (Hemphill, 1985) the Koller 2.5 was identified as

having potential for cable logging operations in New Zealand.

This Report details the operating mechanism of the carriage and reports on a study of the carriage being used in conjunction with an Ecologger I.

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THE CARRIAGE AND ITS OPERATION

(a) The Carriage

The Koller 2.5 SKA is an Austrian manufactured self clamping carriage, able to run on a multispan skyline setting without modification.

Koller also manufacture a 1 tonne and 5 tonne carriage. The 5 tonne carriage is used predominantly in the construction industry and is seen as having only limited application in logging. The 1 tonne Koller carriage is well suited to thinning operations where piece size is less than $0.5m^3$.

The carriage is primarily designed to operate as a gravity return (shotgun) manual slackpulling system. With a minor modification to the carriage, a tailrope can be used to provide mechanised slackpulling ability (Figure 2).

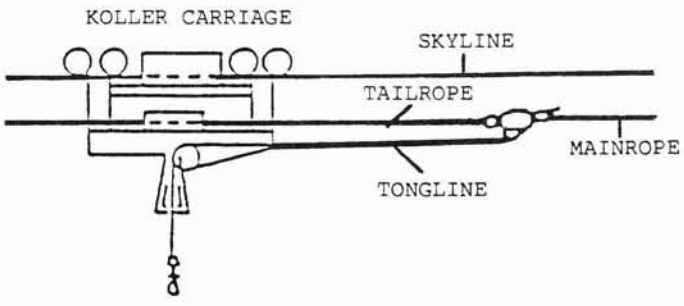

Figure 2 -Koller 2.5 carriage with powered slackpulling

When operated as a mechanical slackpulling carriage, the tailrope is attached to the mainrope, with the amount of slack available determined by the distance between the carriage and the point of attachment. Slack is pulled by continuing to haul in the tailrope once the carriage is clamped to the skyline. The versatility of the carriage and its ability to run over intermediate supports was seen by Hemphill (1985) as being a major advantage.

The carriage weighs 250kg and is available with a range of clamps for use on 18mm to 32mm skyline. The mainrope, however, is restricted to a maximum of 16mm. Where the mainline diameter is larger, either a length of 16mm rope can be added to the mainline or the tailrope can be used as the mainline.

Where the chordslope is in excess of 20% (12^o) gravity is sufficient to return the carriage (Samset, 1985).

Figure 3 - Drag being lowered from the carriage at the landing

The "belly" in mainrope which occurs when logging across a gulley can prevent the load hook from dropping out of the carriage. This problem can be fixed by using a shackle or an extra strop as additional weight.

Although normally supplied with a loadhook, a "T-bar" conversion and use of sliding strops improves load accumulation in small piece size.

(b) The Clamping Mechanism

As the carriage travels along the skyline, the front sheave powers a pump to drive hydraulic oil from a reservoir into a hydraulic accumulator. A valve regulates the oil pressure with excess oil being fed back to the reservoir. When the carriage changes direction, a cam activates a trip mechanism which clamps the carriage to the skyline and simultaneously releases the load hook from the load pendulum (Figure 4).

When the loadhook re-enters the pendulum with the drag attached, it becomes locked in by the loadarms and the release valve on the skyline clamp is activated.

The clamping cycle is repeated when the carriage arrives on the landing.

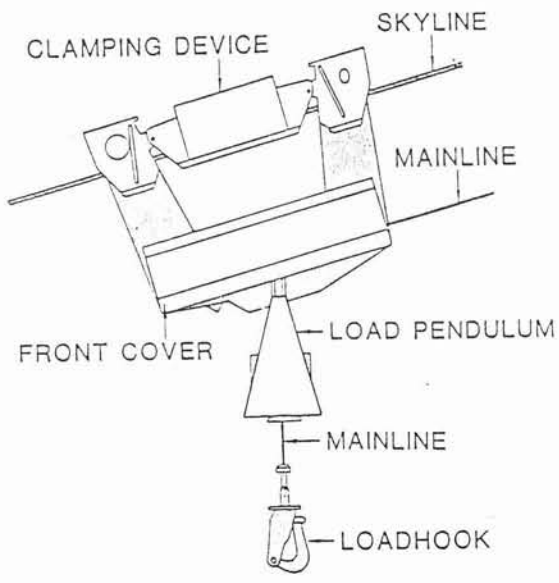

Figure 4 - Koller carriage

LOGGING SYSTEM AND STUDY METHOD

The carriage was studied in a clearfell operation on an Ecologger I hauler. The two drum hauler was rigged with 19mm skyline and 16mm mainline. Untrimmed trees were extracted uphill to the hauler before being two-staged to a separate landing for processing. Throughout the study three strops were flown, with no prestropping being carried out by the two breakerouts.

A continuous time study of the hauler was undertaken with each drag being scaled to determine drag volumes. The stand details are summarised in Table 1.

Table 1 - Stand Details

Stand age (years)	17
Stocking (sph)	1000
Average piece size (m^3)	.7

RESULTS AND DISCUSSION

A total of 143 cycles was recorded. The study results are summarised in Table 2.

The carriage performed well during the study and proved to be a good match for both the hauler and the 0.7m^3 piece size. While 0.5 mins per cycle were lost to carriage delays, the bulk of this was attributable to an adjustment of the load hook release mechanism which was undertaken during the study. The clamping mechanism worked well with no clamping related delays being recorded.

The manual slackpulling capability of the carriage resulted in fewer line shifts than can be expected with a standard gravity return carriage, whose lateral reach is limited to the length of the strops. The lateral hauling distances for the setting averaged 12 metres and on occasions exceeded 40 metres.

On average two pieces were extracted per cycle giving an average volume of 1.4m^3. Attempts to increase the payload beyond 2m^3 were limited by the hauler's line pull,

Table 2 - Study Results

	Time (mins)	Average Distance (m)
Raise load hook	0.22	
Outhaul	0.60	150
Lock carriage/drop load hook	0.33	12m
Lateral out	0.38	12m
Hook on	0.94	
Lateral in	0.33	
In haul	1.06	
Lock carriage/lower drag	0.22	7m
Unhook	0.64	
Delays		
- carriage related	.50	
- operational delay	1.15	
Total Cycle Time	6.37	
Drag Size (m^3)		1.4
Productivity (m^3) per available machine hour		13.2
Daily Production (m^3) (assuming 8 available hours)		106

which was insufficient to breakout the untrimmed trees. The trimming of the trees in the bush would allow an increase in payload capacity.

If the piece size being logged permits an average of three or more logs to be extracted, then the ability to prestrop logs should be used. When two or more logs are being extracted, the conical shape on the top of the load hook allows the sliding ring strops to slide over easily and allow the load hook to re-enter the carriage. (This is an advantage over the Christy type carriages. If sliding ring strops are used on the Christy carriage, they can become lodged above the ball on the mainline, preventing the ball re-entering the carriage).

In a previous trial in Marlborough, the carriage was successfully operated on a setting with two intermediate supports.

CONCLUSION

The Koller 2.5 is a versatile carriage, with the ability to pass over intermediate supports and to be rigged for mechanical slackpulling seen as major additional advantages.

While mechanically more complex (and more expensive) than the "moveable stop" type carriage, the self clamping carriage does not require the skyline to be lowered during the logging cycle. Operating without a "stop" also gives the breakerouts more flexibility when "spotting" the carriage for the next cycle.

The main application for the Koller 2.5 carriage is seen in the accumulation of drags of up to 2.5 tonnes, in small piece sizes up to 1.0m^3. A hauler of the Ecologger I/II capacity (100 to 150 kW) would appear to be the best match for the carriage.

If the piece size being logged permits an average of 3 or more logs to be extracted, then the ability to prestrop logs should be used. While problems can arise with the use of sliding ring strops passing over the ball on the Christy type carriage, the conical shape on the top of the load hook on the Koller caused no such problem.

The multispan capability is also seen as having potential on long span cable systems, should they be introduced to log unstable or inaccessible forests.

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For further information, contact:

N.Z. LOGGING INDUSTRY RESEARCH ASSOC. INC.
P.O. Box 147,
ROTORUA, NEW ZEALAND.
Fax: (073) 462-886 *Telephone (073) 487-168*