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A LOOK AT POLYPROPYLENE STROPS

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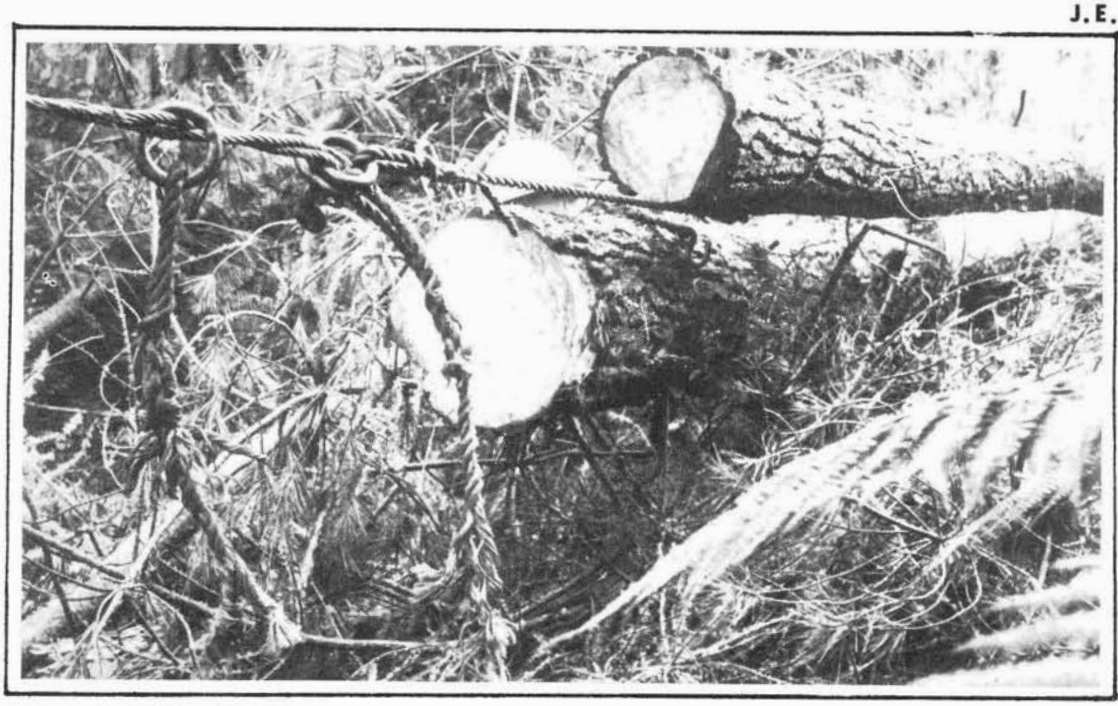


What use could polypropylene strops have in New Zealand logging? Currently we use wire rope of various lengths, sizes, and configurations. On studying overseas literature, however, LIRA felt that polypropylene could offer some advantages over wire, for certain operations. This report covers a study carried out by LIRA.

ACKNOWLEDGEMENTS

LIRA wishes to acknowledge the work carried out by Roger Gray of the Kaingaroa Logging Company, and the assistance of contractors B. Mannington, Matahina, and S.Palmer, Kaingaroa.

BACKGROUND

This is by no means an entirely new area for N.Z. Two other organisations have previously research the area of polypropylene for strops.

A 1975 report by C.J.Terlesk (Ref.1) notes the strength, lightness, ease of handling and comparative cheapness of polypropylene. Also the fact that it does not rot, has medium stretch characteristics, and is easily spliced. On the debit side, the report states that polypropylene will not stand as much abrasion as wire, and the life of the strops over a range of ground conditions and tree sizes, has not yet been established. The mean tree size in this report was 0.044m^3 and the rope 12 mm Superfilm.

Kaingaroa Logging Company Limited conducted trials, supervised by B.Mitai, using polypropylene logging strops. Two trials were undertaken, one in September 1978 and one in February 1979. From these trials Mitai noted that further studies needed to be carried out to assess capacity of strops, wear and durability, and production volumes on a per strop basis. Also that the polypropylene strops were much cheaper and easier to replace. The mean stem volume was 0.32 m^3 and the rope was 16 mm Superfilm.

FEATURES OF POLYPROPYLENE

The main features of polypropylene compared to wire rope are weight, cost, ease of handling, and in-field splicing. Comparative technical and cost data as at April 1979 for polypropylene Superfilm and wire rope commonly used, are listed below:

POLYPROPYLENE		WIRE ROPE	
20 mm Superfilm		13 mm Steelcore (6 x 31)	
Breaking strength 5330 kg		Breaking strength 10,800 kg	
Weight 0.18 kg/metre		Weight 0.71 kg/metre	
Cost $0.73/metre		Cost $2.21/metre	
Fittings		Fittings	
Logging ring	$ 6.56	Logging ring	$ 6.56
Strawline hook	$ 3.00	Midget choker hook	$11.06
Spring link fitting	$13.00	Press-on ferrule	$ 4.37
Quick release butt hook	$24.42		

The polypropylene strops can be easily spliced by anyone who knows how to splice ordinary hemp rope. The only aid required is a screwdriver. They are easier to handle in the bush as they don't kink like wire rope and most importantly, they don't have any sprags.

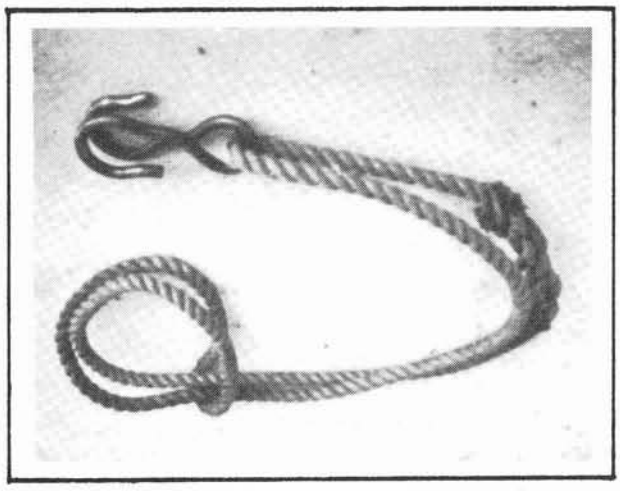
STROP CONFIGURATIONS

Two trials using the various strop configurations were carried out by LIRA. The first was at Matahina Forest in contractor Ben Mannington's operation. Terrain was flat gully bottoms to long steep slopes. The second trial was at Kaingaroa in contractor Steve Palmer's operation, in flat to gently rolling terrain. Both operations were skidder thinning in radiata of approximately 0.3 m^3 stem size.

The commonly used wire rope strops (2.7 m long) in those operations were fitted with a logging ring at one end and a choker on the other. Each cost $28.05 and had a 10,800 kg breaking strength.

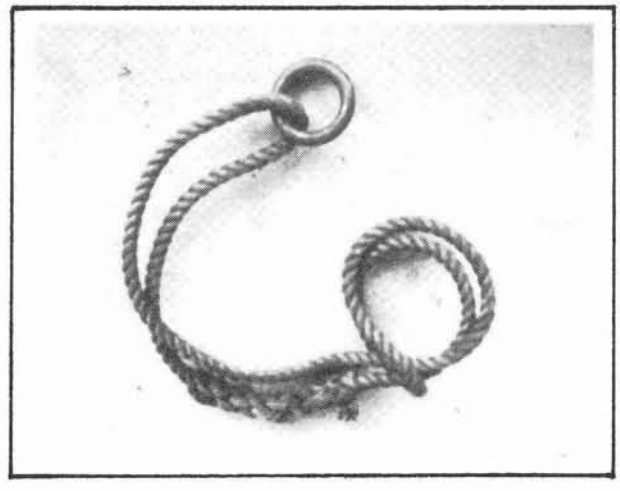
Four polypropylene configurations were tried, all 20 mm diameter Superfilm and compared with the wire rope strop layout as follows:

A



(a) A doubled length of polypropylene giving a 1.7 m long strop, with a spring butt hook which is a quick release attachment to affix it to the main rope. This strop was fixed to the log by a noose arrangement. Cost per strop was $26.87 and each had a breaking strength of 10,660 kg.

B

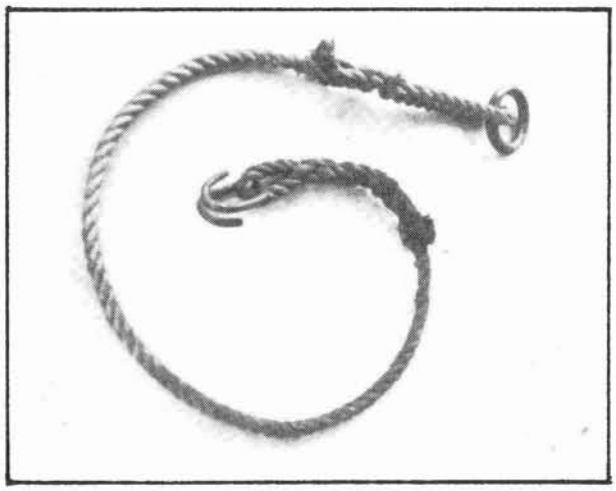


(b) A doubled length of polypropylene giving a 1.7 m long strop with a logging ring attached on it. The method of fixing the strop to the log was by a noose arrangement. The cost per strop was $9.01 and each had a breaking strength of 10,660 kg.

These two strops both had the following limitations:

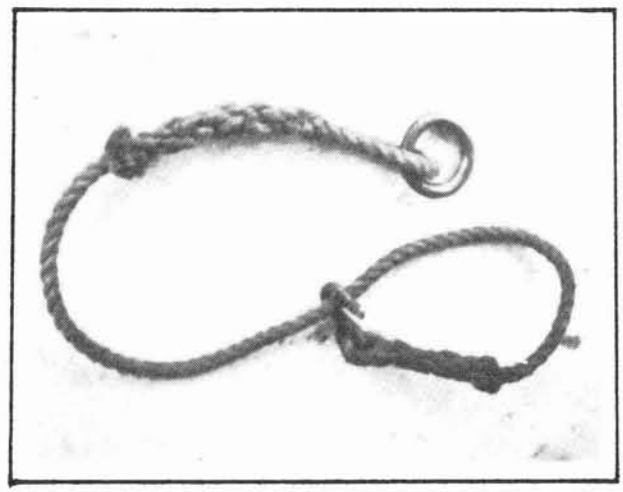
1) The butt hooks became entangled with themselves and in the slash, making it difficult for the breaker-out.
2) It was found that it was difficult to push the strops under the heads of logs that were buried in the ground.
3) The noose slipped over the heads of logs during winching because:(a) the breaker-out had not pulled the noose tight; (b) jolting of logs during initial break-out; (c) the faller had not left branch stubs on the end of the log.
4) If during break-out a log head got hooked behind a tree, all the rings had to be unthreaded until the offending strop could be taken off, and taken around the side of the tree.
5) Butt hooks became entangled in main rope making them hard to release.
6) Unhooking at the landing took considerably longer than with wire strops - the noose was too hard to get off, hence for these strops to be acceptable, another set of seven strops would be required so that the person on the skids could take them off at leisure.

C



(c) A single length of polypropylene 2.2 m long with a logging ring spliced onto one end and a steel spring link (locally made) on the other end. This reduced the breaking strength by half to 5,330 kg. Cost was $21.16 per strop. This strop was found to be too weak at the spring hook, it closed up and became difficult to remove, and if too large a log was put on, the log would slip off.

D



(d) A single length of polypropylene 2.2 m long with a logging ring spliced onto one end and a hook made of 12 mm steel, similar to a strawline hook, spliced onto the other end. Cost of this strop was $11.16 per strop and the breaking strength was 5,330 kg. This strop overcame the previous problems.

PERFORMANCE

The longest any of the strops lasted were one at 10 days continuous use, and one at 15 days continuous use, extracting approximately 40 drags per day. The reasons for the strops breaking were:

1) Logs being badly bound in the soft pumice and under other trees.
2) While pulling down hang-ups that had not been cut off from the stump.
3) Due to shock loading being placed on the strops, i.e. butt catching behind

a stump during extraction, sudden winching, etc.

4) Major abrasion caused by rubbing along the ground (by head pulling the strops are off the ground nearly all the time, thus reducing abrasion).

Wire rope strops last from 6 weeks to 6 months. Of the four configurations of polypropylene tried, configuration (d) appeared to be the easiest to use on both bush breaking-out and skid unhooking.

CONCLUSIONS

From these trials the easiest strop to use was the last configuration tried (d). However, this strop has only half the breaking strength of comparable wire rope, 5,330 kg as compared with 10,800 kg for 13 mm wire rope. To get a polypropylene strop of equivalent strength, it either has to be doubled and used as a noose (which is hard to get off at the skids), or a larger diameter rope used (which makes it too difficult to handle). To avoid undue breakages the machine operator has to be very careful during breaking-out and extraction to avoid shock loading. To avoid abrasions, strops need to be kept clear of the ground, which in many cases is impractical. Although the polypropylene strops are easier to make up and handle in the bush and are cheaper to purchase, the inconvenience of breakage and replacing strops frequently nullifies this.

F.R.I. reported no problem with breakage, however, both LIRA and KLC trials reported problems in this area. The strop and log sizes of these three trials varied considerable, as shown in the table below:

Trial	Configuration	Strop Size	Breaking Strength	Piece Size	Breakages	Length of Trial
FRI	Doubled	12 mm	4,060 kg	0.044 m^3	none	10 days
KLC	Doubled	16 mm	6,700 kg	0.32 m^3	3	1 day
LIRA	Doubled	20 mm	10,660 kg	0.31 m^3	none	3 days
LIRA	Single	20 mm	5,220 kg	0.31 m^3	all	up to 15 days

These joint results to date tend to indicate that polypropylene strops only seem suited to skidding operations where very small stem sizes are being extracted. Given the piece sizes of logs in stands commonly thinned, there is limited application for polypropylene strops. However, where very small piece sizes may be extracted, polypropylene has a place, providing operators are aware of their vunerability to shock loading and over loading. Resistance to abrasion has not been tested.

Polypropylene could have a place in methods with minimal shock loads, e.g. where slow load application allows a cushioning affect. This is possibly attainable in either helicopter logging or in some cable logging operations, where the load becomes fully suspended.

Ref.1. - NZFS Forest Research Institute, Economics of Silviculture Report No.86 1975 (unpublished), by C.J.Terlesk. "The Mercedes Benz Tractor Production Thinning P. Radiata".

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