



Department of Conservation  
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## Wood Utilisation Research Centre

**DEBARKING SMALL DIAMETER LOGS USING  
A MOBILE FLAIL CHAIN DEBARKER**

**K.J. White**

**March 1990**

**W.U.R.C. Technical Report No 15.**

**Limited Distribution**

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# DEBARKING SMALL DIAMETER LOGS USING A MOBILE FLAIL CHAIN DEBARKER

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## SUMMARY

Evaluation trials of a range of eucalypts (*Eucalyptus* spp. L' Herit.), turpentine (*Syncarpia glomulifera* (Sm.)), and pine (*Pinus radiata* D. Don and *P. pinaster* Ait.) showed that a flail chain debarker has potential for debarking both hardwood and softwood thinnings, including stringy-barked species.

All species tested debarked satisfactorily, except that turpentine butt logs required two passes to remove the bark.

Further trials in late summer, when debarking is generally more difficult, are required to make a complete evaluation of the machine.

## INTRODUCTION

The regrowth eucalypt resource in Western Australia is increasing in area, and provides an increasing proportion of annual forest production. To enable economic procurement and utilisation of the resource, new machinery and techniques need to be developed.

One of the main problems confronting the timber industry at present is the lack of a cost-efficient method of harvesting and debarking the small diameter regrowth resource. Many conversion plants have debarkers designed to handle large diameter mature logs which require low feed rates, and these are totally unsuitable for small diameter regrowth logs.

Harvesting machinery which can debark regrowth thinnings in the forest has the advantage that bark, small limbs and leaves are mulched, giving nutrients recycling, and site access is improved. The removal of bark from chip logs for pulp production and logs for charcoal production increases payloads on trucks by up to 30 per cent.

The 'G.E.' tractor-drawn chain flail debarker is a mobile low cost machine with forest debarking facilities. It has a minimum power requirement of 45 kW for a hydraulic power supply driven by power-take-off shaft from the tractor.

The specifications of the unit tested are:

Gross weight	2020 kg
Height	1.56 m
Length	3.35 m (including drawbar)
Width	2.0 m
Ground clearance	300 mm
Capacity	30 - 300 mm log diameter.

Horizontal toothed infeed and outfeed rollers, powered by a hydraulic drive, feed the logs through two sets of flailing chains attached to drive shafts (also in a horizontal plane), one above the log and one below. The feed speed is adjustable using a control valve at the rear of the machine, and forward and reverse drive of the feed rollers is also possible.

The flail chains bruise the bark away from the log surface, and break it into small pieces suitable for removal on belt or chain conveyor if set up in a static location.

The outfeed rollers have a feed restriction to eliminate possible injury from ejected logs at high speed.

The debarker has a nominal maximum feed rate of 60 m/min, but in operation the feed speed is determined by log size, species (and hence bark type), and time from felling to debarking. Initial trials at W.A.C.A.P. in Manjimup in August 1989 indicated satisfactory removal of various bark types, including stringy bark, from commercial eucalypt and pine species (Breidahl 1989). The debarker was on loan from Bunnings Ltd, Manjimup, for this one-day trial.

Trials of the chain flail debarker were conducted at the Department of CALM's Wood Utilisation Research Centre (W.U.R.C.) at Harvey in November 1989, using manual feeding and removal of logs. The debarker was powered by a Massey Ferguson 290 55kW tractor, and the movement of logs to the infeed deck and removal after debarking was done using a Cat 930 wheel loader with logging forks.

The following species, including fresh and stockpiled logs, were tested in the trial:

Jarrah ( <i>E. marginata</i> Donn ex Sm.)	- fresh cut and water stockpiled
Marri ( <i>E. calophylla</i> R. Br.)	- fresh cut
Tasmanian blue gum ( <i>E. globulus</i> Labill. subsp. <i>globulus</i> )	- fresh cut
Rose gum ( <i>E. grandis</i> W. Hill ex Maiden)	- fresh cut
Turpentine ( <i>Syncarpia glomulifera</i> (Sm.) Niedenzu)	- water stockpiled
Maritime pine ( <i>Pinus pinaster</i> Ait.)	- fresh cut
Radiata pine ( <i>P. radiata</i> D. Don)	- fresh cut.

The fresh logs had been cut for a maximum of five days while those stored under water spray had been stockpiled for a minimum of six months. All species had a range of diameter classes from 50 mm to 300 mm large end diameter.

The effects of feed rates and log orientation (crown first as opposed to butt first) on sapwood damage from the flailing chains were assessed. Production rates were not evaluated as earlier trials had established production potential of the machine. The logs were fed in one at a time, but the turpentine butt logs required a second pass through the debarker to reach an acceptable standard.

## RESULTS AND DISCUSSION

A total of seven species were tested to evaluate both the efficiency of bark removal and standard of round wood finish (i.e. the amount of sapwood damage) after debarking (Table 1). All the smooth-barked species debarked freely, and the bark removed did not accumulate around the feed rollers. The two pine species were debarked easily with no bark accumulation, but both the jarrah and turpentine, which have stringy bark, accumulated bark around the drive or feed rollers, necessitating a reduced feed rate to remove the bark efficiently.

**Table 1**  
**Sapwood damage caused by chain flail debarker**

Species	Diameter (mm)	Damage	Comments
Jarrah *	50 - 300	Minor	Unsuitable for recreational rounds
Marri	100 - 250	Moderate	Unsuitable for fencing and recreational rounds
Tasmanian blue gum	75 - 300	Moderate	Only suitable for chipwood and mill logs
Rose gum	75 - 300	Minor	Unsuitable for poles or rounds
Turpentine *	100 - 250	Minor	Suitable for rounds. Two passes needed for butt logs
Maritime pine	50 - 250	Minor	Too severe for pine rounds or SEC poles
Radiata pine	50 - 250	Moderate	Too severe for pine rounds or SEC poles

\* Logs will be milled to evaluate damage depth and effect on recovery.

The general performance of the flail chain debarker for debarking material from 30 mm to 300 mm diameter is excellent for products requiring further processing e.g. chipwood, small mill logs, thinnings for charcoal manufacture, etc. The method is not suited to round timber for landscaping, poles for copper-chrome-arsenic treatment, or rounds for building construction or fencing because of the sapwood splinters produced.

Production rates are comparatively high, and this limited trial indicated that they would exceed the manufacturer's quoted rate of 60 m/min, depending on the species (i.e. bark type) and log size. Breidahl (1989) quoted feed rates from 46 m/min for jarrah to 94 m/min for rose gum, with logs having a similar range of diameter.

While working in a fixed location such as bush landings or mill landing areas, bark must be removed from around the machine after debarking every eight to ten logs (100 - 200 mm diameter) unless an elevator is available to remove waste material.

The appearance of bark removed from freshly felled or stockpiled jarrah logs was similar, although the power requirement to debark logs stored under water spray was higher, with a noticeable reduction in tractor revolutions while debarking these logs.

The quality of finish on mill logs of a suitable size for the W.U.R.C. is quite satisfactory, but the restriction of 300 mm throat opening would mean approximately 40 per cent of the logs currently stockpiled would not feed through the existing machine. A throat opening of 400 mm in a portable unit would enable debarking of at least 90 per cent of the logs.

In the W.A.C.A.P. trial, Breidahl (1989) found that jarrah, Tasmanian blue gum, and rose gum could be debarked more easily than karri (*E. diversicolor* F. Muell), marri, maritime pine and radiata pine. However, yellow stringy bark (*E. muellerana* Howitt) was more difficult.

The trials of the flail chain debarker conducted by W.A.C.A.P. and the W.U.R.C. indicate that the system has potential in cost efficient preparation of specific products, in both hardwood and softwood thinning operations in the forest areas of Western Australia. All species tested debarked satisfactorily, with turpentine the only species requiring two passes of the butt logs to remove all the bark. Further trials in late summer (when sap flow is at a minimum and debarking is more difficult) are required to complete evaluation of the machine.

## REFERENCE

BREIDAHN, R.D. (1989). Debarking small diameter eucalypts and pine logs using a tractor drawn flail chain debarker. W.A. Chip and Pulp Company, Manjimup. Limited distribution.