

Meat Research Record

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AN EVALUATION OF THE BRENTWOOD MULTI-PURPOSE SHREDDER AS A PRE-BREAKER

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SUMMARY

A multi-purpose shredding machine, manufactured in Australia by Brentwood Engineering, was evaluated as a pre-breaker for bone-in rendering offals.

A selection of cattle heads, hooves, shin bones and sheep frames was processed. The machine successfully reduced the size of all the raw materials to even sized pieces suitable for rendering, without heating or emulsification of the product. Clean up of the machine was easily achieved using a hand held hose.

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CONTENTS

	<u>Page Number</u>
INTRODUCTION	1
MATERIALS AND METHODS	1
RESULTS AND DISCUSSION	4
CONCLUSION	6

INTRODUCTION

The Brentwood Shredder was brought to the attention of the Meat Research Laboratory as a robust, compact, Australian manufactured machine which might have potential within the Meat Industry.

Originally designed as a multi-purpose shredder the machine is available in four basic sizes. These range from the smallest, AZ-7 (with a 7.5 kW motor), to the largest, AZ-100 (with two 37.5 kW motors). The machines are currently used in a number of industries to reduce a wide variety of materials including metals, plastics, glass, wood, rubber, concrete and industrial wastes of all kinds.

The manufacturer's brochure advises that each model size can process approximately double the capacity of the immediately smaller model.

The AZ-7 costs approx. \$12,000 at present and each model size increase approximately doubles the price of a machine.

The shredder (Figure 1) is a ruggedly designed, simple, electro-mechanical machine with two horizontally mounted shafts which run in opposite directions at low speeds. There is a speed differential of approx. 15% between the shafts. Special alloy steel, heat-treated cutters are mounted on each shaft. The cutters on the lower speed clockwise rotating shaft deliver the raw material to the higher speed anti-clockwise rotating cutters to reduce the material to a manageable particle size.

The machines are fitted with anti-jamming controls which cause the drive to stop and reverse if something becomes jammed or causes the motor to overload. After reversing for half a revolution to relieve the jam, the drive recommences in the operating direction. Overrides or alarms can be fitted to operate if continuous jamming occurs.

A visual appraisal of the machine was made and two potential uses in the size reduction of rendering raw materials were apparent.

- a) as a pre-breaker for bone in material,
- and b) as a cutter for soft offals.

The manufacturer supplied a machine for our trials which were carried out in an export meat works.

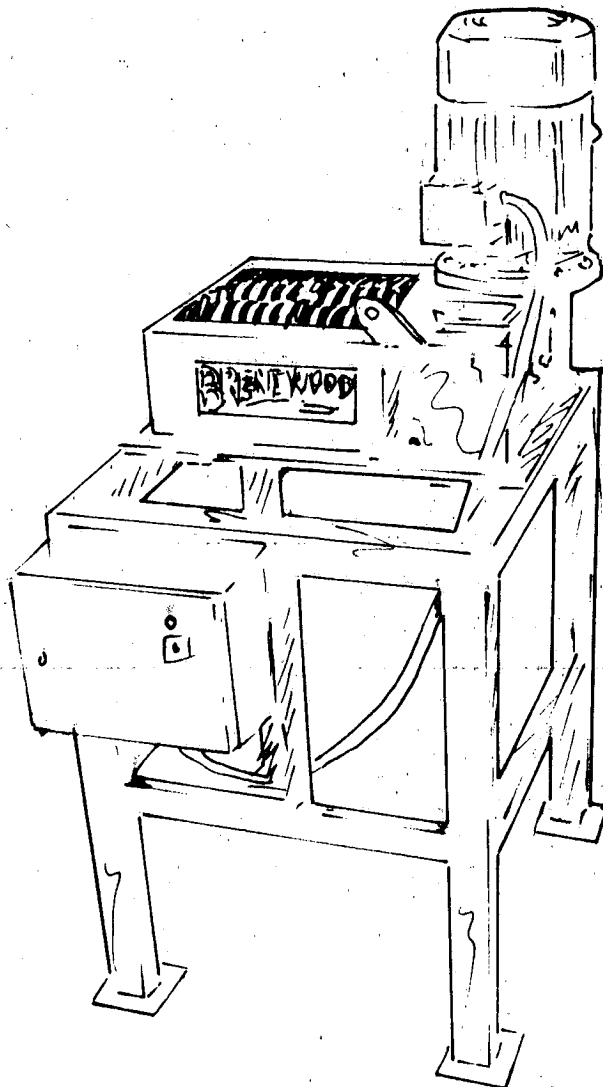
MATERIALS AND METHODS

The Machine

An AZ-7 model (the smallest model) was used. At the request of the authors the manufacturers had tightened the tolerances between the cutters in order that the soft offal cutting might be facilitated.

The AZ-7 has a 7.5 kW, 415V motor and the inside dimensions of the cutting chamber are 358 x 436 mm. Complete with the stand and feed hopper provided, it occupies a floor area of 920 x 800 mm with the top of the feed hopper 750 mm above the machine outlet and 1850 mm above floor level.

FIGURE 1: SKETCH OF BRENTWOOD SHREDDER (AZ7)
(FEED HOPPER REMOVED)



Material Assessment

A preliminary trial was undertaken to determine what raw materials could be processed through the machine and to inspect the material after processing.

A selection of soft and hard (bone-in) raw materials, including cattle heads, horns, hooves, intestines and bibles, were fed separately into the machine. The bone-in materials were broken down easily into discrete pieces approximately 10-25 mm cubed. Although the soft materials were cut and shredded into pieces, we considered the cutting action was less satisfactory than anticipated.

It was decided to quantify the machine's capacity to process bone-in raw materials as it stood and to alter the cutter size and arrangement before re-examining soft offal throughput.

Hard Material Assessment

Four types of raw materials were readily available for the trial; cattle heads, hooves and shin bones and boned-out sheep frames.

The cattle material was from large steers,

- a) whole heads (the lower jaw was occasionally separated from the head)
- b) hooves - front hooves with approximately 75 mm of leg, rear hooves with approximately 300 mm of leg
- c) shin bones - the remainder of the foreleg up to the knee joint (approximately 200 mm long) with the hide removed.

The sheep material was:

- d) sheep frames - boned out sheep frames consisting of the full length back bone with the rib cage attached.

Procedure:

The trials were conducted in two ways.

- a) The hopper was filled with the raw material and the time to process it was noted.
- b) From a) the approximate processing rate was calculated and the raw material was fed in at this rate to determine if material from a full hopper altered the processing rate to that from an empty hopper.

The material was processed as follows:

- a) cattle heads only
- b) cattle hooves only
- c) cattle shin bones only
- d) combination of heads and shins and hooves
- e) sheep frames only.

RESULTS AND DISCUSSION

Table 1 details the results from the processing trials.

The processing rate achieved using a full hopper could not be improved upon by individual feeding of raw material into an empty hopper thereby removing any potential bridging problems within the hopper.

Most materials were broken down into discrete even-sized pieces suitable for rendering. No heating or emulsification of the products occurred with any of the materials processed.

The accidental inclusion of a steel sheep gambrel with a batch of sheep frames served to demonstrate the robust nature of the machine. The steel gambrel was processed through the machine without damage to the cutters.

The machine was easily cleaned without the need for dismantling, using a firm jet of hot water from a hand held hose, after some dry cleaning.

TABLE 1: Processing rate of bone-in raw materials through a Brentwood AZ-7 Shredder

MATERIAL	PROCESS RATE TIME/UNIT (UNITS/HR)		COMMENTS
	<u>full hopper</u>	<u>empty hopper</u>	
(a) whole cattle heads	35 seconds/head (103 heads/hr)	36 seconds/head (100 heads/hr)	No jamming Material output was in discrete pieces av. size 10-15 mm square
(b) beef hooves	6 seconds/hoof (600 hooves/hr)	6 seconds/hoof (600 hooves/hr)	Occasional jamming (included in rate) machine went through unjamming cycle and continued. Material emerged in discrete pieces approx. 20-25 mm square
(c) beef shin bones	2.12 seconds/shin (1698 shins/hr)	2.10 seconds/shin (1714 shins/hr)	As for hooves
(d) heads, shins & hooves	56 seconds/set (64 sets/hr)	53 seconds/set (68 sets/hr)	The hooves & shins were processed prior to the heads whether heaped in together or fed separately.
(e) sheep frames	14 seconds/frame (257 frames/hr)	15 seconds/frame (240 frames/hr)	Occasional bridging of frames occurred in hopper. Material cut in discrete pieces approx. 20-25 mm sq. Some ribs came through in lengths up to 150 mm.

CONCLUSION

- The machine is eminently suitable for use as a pre-breaker.
- As a guide the machine could process the heads and feet from an abattoir killing approximately 65 head/hr, with no modification.
- The next size machine would be likely to handle heads and feet at a rate of 120-130 head/hr.
- Although soft offal was cut by the machine and would be suitable for a wet rendering operation it was felt improvement could be made by modifying the cutters. This is currently being undertaken and will be the subject of a separate report.

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The Brentwood Shredder is manufactured by:

Brentwood Engineering Pty. Ltd.,
Berkeley Road,
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