James Henderson (541) 886-8821
Dennis Henderson (541) 569-2261
Elwayne Henderson (541) 886-9000

75241 Upper Diamond Lane
Wallowa, OR 97885
FAX: 541-886-9871

HENDERSON LOGGING, INC.

February 15, 2008

Bioenergy Systems of Hawaii, Inc.
P. O. Box 1935
Kihei, HI 96753

Dear Jeff,

Thank you Rick, Jeff and James for the opportunity to be a part of your study and possibly part of the production of your great project in Maui. We think there is an economic future in bio-mass products and production. You have put a lot of effort into securing product and opening doors to make this whole project happen.

Joe and I have discussed logistics and machinery needs for all three areas that we looked at and have come up with suggestions for each, trying to utilize most of the same equipment. We have two size classes of wood products, which make chipping and grinding a challenge. Some products will need to be hauled to the co-gen site in log form and some in chip form. In Maui, the biggest challenge we see is the transportation systems. Moving product from point A to B. In the Northwest, most of our road systems were built to transport logs. In Maui, ranchers with jeeps or tourists on bicycles are the main users of the road systems.

KULA FOREST PRESERVE

Primarily burnt Radiata Pine, some Redwood – small amount cypress. 100' strip each side of center line of road. 75 acres – about 5 acres light volume, rest runs about 25,000 BDF/acre. Will average about 5 tons/m – wood was burnt in January of 2007. Wood is still solid – very little rot in stand. Average tree height is about 80' tall. Average DBH 20".
Slope – 5% to 60%
Most of the area needs to be skidded to the road and the trees directionally fell toward the road. Processed and deck in wide spots on road. Road needs to remain open for traffic. 15 min max. Closure, flaggers. Needles were consumed in fire, limbs and tops will amount to about 5% of weight.
25,000/ac for 70 ac = 175,000/BDF
5,000/ac for 5 ac = 25,000/BDF
200,000 BDF

200,000 @ 5 T/m = 1,000; 1,000 tons x 5% = 1050 tons = 10 days of operation.

With the size of wood on this strip, we suggest that a log loader with a winch be used from the road to skid, process and land all material from this strip. With trees ranging from 6" DBH to 4' DBH – (Diameter breast high), the most efficient way to handle this wood will be using a chain saw and feller to directionally fall to road and buck into 20' logs for transportation to the co-generation site in log form. The road is not suited to pull a chipper to the woods or use chip vans to haul away from site. Haul in log form to a tube grinder or a horizontal grinder. Part of the limbs from trees will need to be left on site to stabilize soil from erosion. Grass seed site when operation is complete. We think that Glen and Lance from the State will be great to work with. Therefore, this volume will probably increase. Cost of felling, skidding, bucking and landing will run approx. $25/ton. Hauling, if road is improved downhill to co-gen site will run approx.
6 trips/day @ 16 tons /trip
12 hr day @ $80/hr = 960
96 tons @960 - $10/ton
Chipping and handling at co-gen site will run about $15/ton. Roads and maintenance $5/ton. $55/ton – This price includes all close out work for the sale area, i.e. grass seeding, road and brush scattering on skid trails.

RICE RANCH

We met with Henry Rice on Thursday morning. A very pleasant fellow probably in his mid-70's. His ranch consists of approx. 1000 acres of Black Wattle and a few acres of Eucalyptus trees. His main objective was to stop the spread of Black Wattle and clean up his stand of Eucalyptus trees. He has concerns about erosion and getting his grass stands to come back. Ground topography runs from 5% slope to about 80% in the sharp ravines. Black Wattle is a very dense wood. Weight is about 15#/board ft. Tree size varies from sprouts to trees 14 DBH. The tallest trees run 40' in height. Our estimation of tonnage is 20 tons/acre. Mechanical harvesting will work on most acres. Our suggestion is to use a disk felling saw (see illustration), mounted on a track-hoe/loader. By using a quick coupler, one can switch from cutting to bunching product in a matter of minutes. The cost of this type of arrangement would be approx $250,000 for a used machine including a grapple, hot saw and back hoe bucket. A forwarder with bunks and a loader grapple would be used to move material to roadside where it can be chipped in the woods. The cost of a good used forwarder will run approx $180,000. Roads can all be constructed with the track-hoe with a six-way blade. Portable bridges can be used to cross all major ravines and creeks. Design attached. Cost/bridge approx $10,000 ea. can be moved and reused in another location with about 10 hrs worth of machine time. Due to outside traffic and safety concerns, steel gates will need to be put in place and locked. Approx. $5,000/gate, installed. One needs to be concerned with all water developments and water lines. There is also a disc golf course within the area to work around. Our concern with Black Wattle eradication is the thick layer of seed pods on the ground. They will sprout and grow after harvest. Our suggestion is to chip Wattle trees on the woods roads and haul chip to co-gen site.

Our suggestion would be to use a portable track type chipper that would handle up to an 18" tree. This size of chipper would allow for severe crooks and sweeps to feed into chipper. We have found good, low hour machines for around $200,000 to $250,000. Chip vans would need to be shorter than 25' to negotiate corners and narrow roads. Approx. 15 tons of chips per trip would be hauled.

Cost of product delivered to co-gen site will cost about $60/green ton.
Fall & bunch $15/T
Forward to road $12/T
Chip $8/T
Haul $14/T
Roads, bridges, Gates & grass seeding $11/ton

HALEAKALA RANCH

In our estimations this ranch has the most product and the most potential to be a continuing source of wood fiber. With 30,000 acres in the ranch, they have a lot of area to be treated. Observations show about 1000 acres of eucalyptus trees that cruise approx. 50,000 BDF/acre. Of this volume about 25,000 BDF/acre could be harvested to clean up the stand. They have 300 acres of Radiata Pine that runs about 35,000 BDF/ac., in which about 20,000 BDF/ac needs to be removed to put the stand back to health.

This ranch has the best growth potential of the ranches that we looked at. More rain fall in this area and deeper soils. This has the best terrain to work. Slope runs from level to about 45%. Ground is not as broken with ridges and gullies as the Rice Ranch. Our suggestion for equipment to harvest the Eucalyptus forest would be hand felling and bucking material. Because of size, mechanical processing will not work. A track feller buncher with a set of yarding drums is our suggestion. With this machine one could interchange tools on the boom from a hot saw, to a log grapple and heel rack to a back hoe bucket for normal construction. Since this area doesn't have many roads into a lot of the stands, a forwarder skidding machine would work well. Logs would be cut into 20' lengths, shovel logged to trails with the feller buncher and loaded onto the forwarder, then transported to the main haul roads. By hauling these logs instead of dragging them, environmental conditions can be met. Forwarders have a lot going for them in this application. They can haul about 15 tons/trip, travel at about 15 mph max. and can haul logs up or down slopes up to 45%. Very low ground pressure, large ties, will not tear up grass, and can land or off-load their own load. This puts the logs to sites that trucks can come pick up their loads with a minimal amount of new road construction. This type of equipment can handle the whole job – both Eucalyptus and Radiata. A small dozer would be handy to smooth roads and close roads when harvest is done. Cost/ton on board truck would run about $35/ton. This includes roads, falling, bucking, shovel logging, forwarding to hauling site and loading trucks. Erosion control (water bars, drainage and grass seeding). Production would be about 200 green tons/day with a 3-man crew. Hauling products to co-gen site will be the biggest challenge. Roads will not handle trucks with trailers because most roads are narrow with sharp corners, making it unsafe to haul bigger loads. To haul away the production generated/day 13 to 14 trips @ 15 tons/load would be required @ 2 ½ hrs/round trip, 5 trips ea/day @ 12 ½ hrs/day x $90/hr for truck and driver = $1,125/truck x 2 = $2,250/day x 6 days/week = $13,500 – 60 trip @ 15 t5ons/trip = 9001 = $15/ton hauling cost. Chipping cost runs about $5/ton – total cost $55/ton, logged, hauled to co-gen site and chipped.

Of course this would not be the only way to perform this work, but these are our best suggestions. They are based on our effort to minimize the machines needed and to do the work most efficiently. Also included are photos of the trees from each of the ranches so you can see what we are working with.

Sincerely,

Elwayne Henderson

Elwayne Henderson
President

THIS IS HALF OF A 16' BRIDGE

1. MAIN BEAM

2. END CAP, TYP 1" (NOT SHOWN IN END VIEW)

3. 7½ x 7½ (ACTUAL) PRESS TREAT TIE BOLTED TO BEAMS ON 17" CENTERS

4. PLANKING 2 OR 3 x 12 P.T.

5. RAIL SPACERS, 7½ x 7½ P.T., LONG ENOUGH TO CATCH 2 TIES

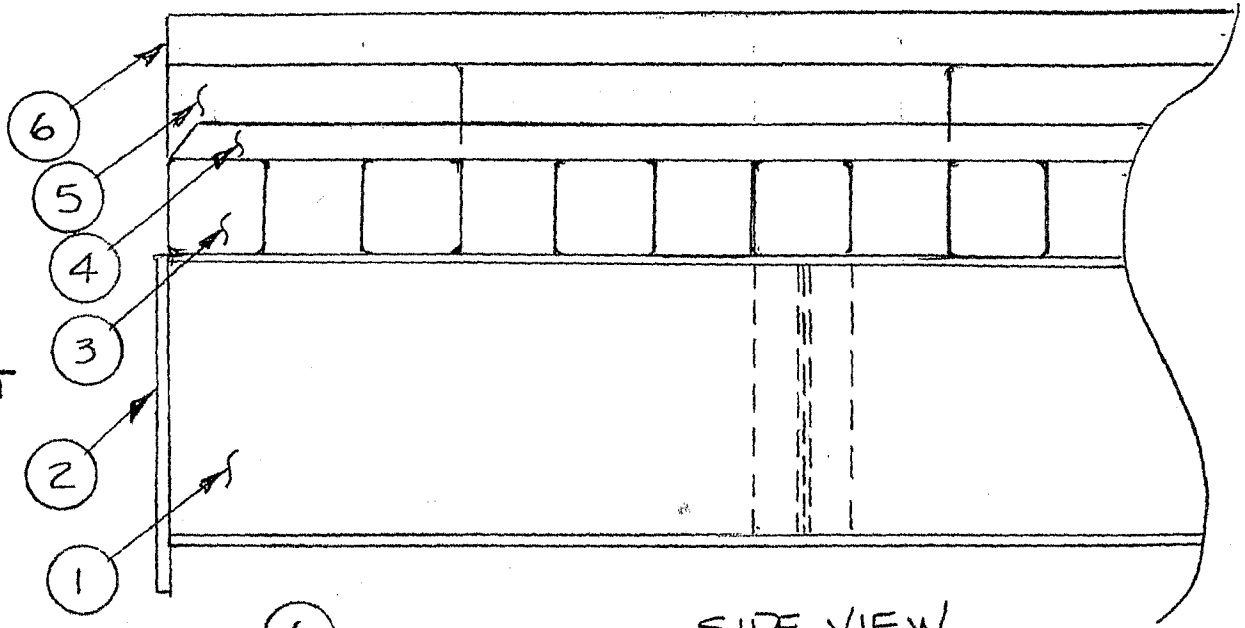
6. RUN-OFF RAIL 4 x 12 P.T.

7. X BRACES, 4 x 4 x ¾ ∠ SPACED ABOUT EVERY 10'

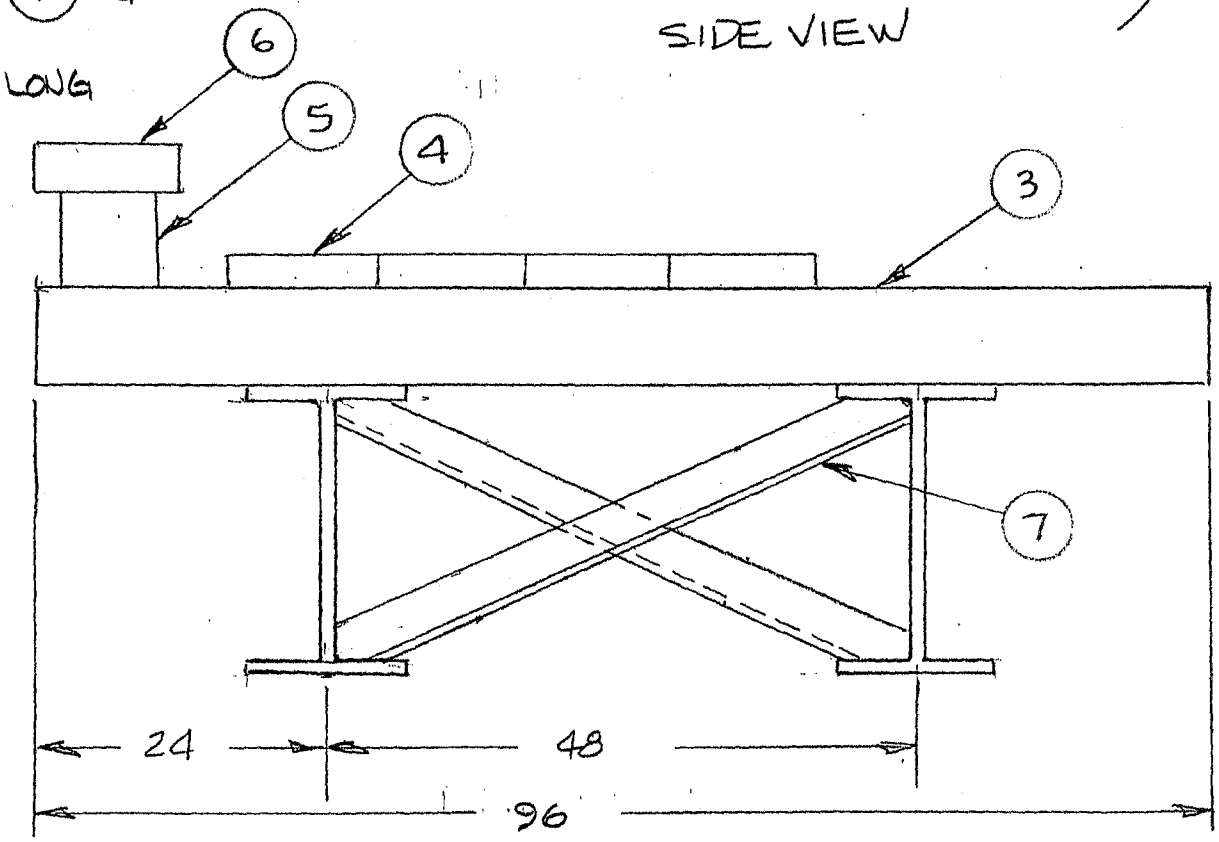
BRIDGES RUN FROM 20' TO 40' FREE SPAN

DESIGN LOAD SHOULD BE 150 K (TOTAL FOR 2 HALVES

BEAMS ON 40' MEASURED AS 24 x 55LB WF



SIDE VIEW



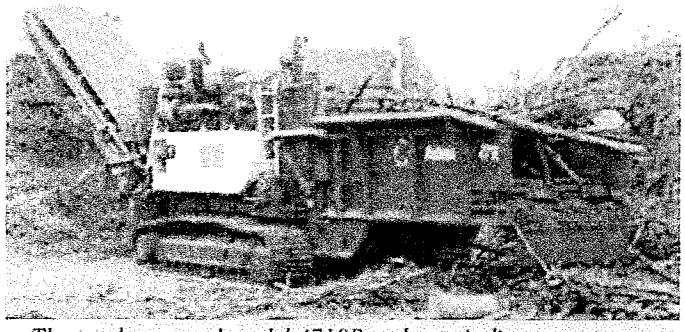
END VIEW

Track Mounted
Heavy-Duty
Waste Recycler

Model 4710B

High Production
Waste Wood
Grinding with the
flexibility of
track mounting

The Peterson model 4710B Horizontal Recycler is a track mounted version of the popular model 4700B trailer mounted Horizontal Recycler. Power options include a 630-horsepower Caterpillar C16 diesel engine or the C18 with ratings from 700 to 765 horsepower. The recycler has 18 inches (457mm) of ground clearance making this model particularly suited for land clearing operations or other applications where mobility is desired. Track mounting also reduces material handling costs in conventional recycling yards as well.



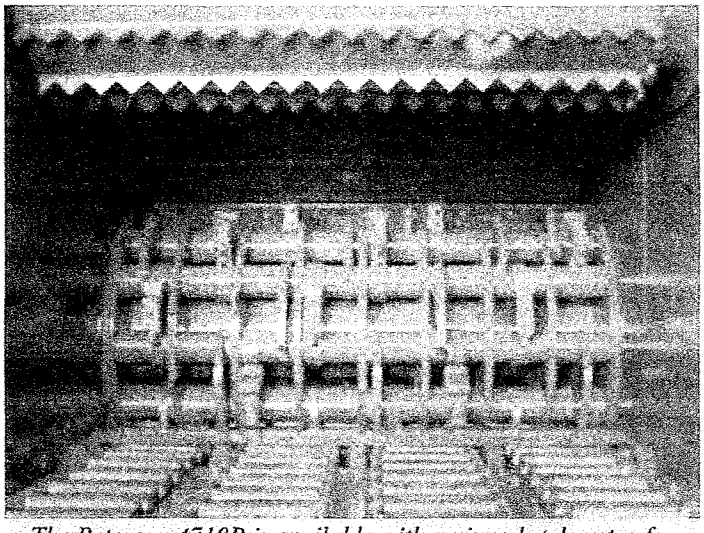
The track mounted model 4710B makes grinding more efficient just about anywhere

The 4710B features Peterson's Adaptive Control System, which controls all components of the feed system to optimize output. This system senses variations in the engine load and adapts the operating parameters to produce the maximum amount of material at all times.

Peterson's three-stage grinding process with an up turning rotor and large grate area enables the 4710B to produce materials to exact specifications. Quick-change multiple grate system makes it easy to customize grate configurations to produce a wide variety of finished materials. Grates are removed through an access door on the side wall of the 4710B.

Unique to Peterson Recyclers is our innovative latching Impact Release System, which minimizes damage from contaminants in the feed material. The anvil and first grate open upon a severe impact, allowing contaminates to be ejected, and then re-latch to permit continuous grinding.

Another major innovation on the 4710B is Peterson's Impact Cushion System. Urethane cushions allow movement of the compression roll/anvil housing pivot shaft, cushioning impacts due to contaminants in the feed material. A shear pin helps protect the shaft from catastrophic damage in the event of a severe impact.



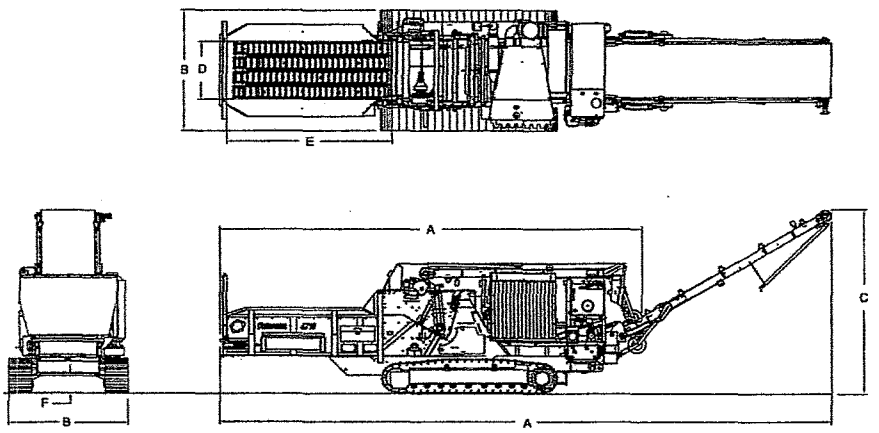
The Peterson 4710B is available with a pinned style rotor for demanding applications

Rotor options include a "drum" style rotor for compost/mulch applications, and a "pinned" style for higher impact or contaminated applications such as land clearing and construction & demolition (C&D).

Peterson specializes in developing delivery and processing equipment that turns low-grade organic materials into high value products.

Peterson

4710B



General Dimensions

A	Operating Length	52'-6 1/4" (16006mm)
	Travel Length	36'-2 1/4" (11032mm)
B	Width (630 hp)	10'-7 3/8" (3255mm)
	Width (765 hp)	11'-6" (3505mm)
C	Discharge Height	15'-9 3/4" (4820mm)
D	Hopper Width	60" (1524mm)
E	Hopper Length	14'-2" (4318mm)
F	Ground Clearance	18" (457mm)

External Dimensions

Length - Operation	52'-6 1/4" (16006mm)
Length - Travel	36'-2 1/4" (11032mm)
Width - Operation (630 hp)	10'-7 3/8" (3235mm)
Width - Operation (765 hp)	11'-6" (3505mm)
Width - Travel	10'-3 1/2" (3137mm)
Height - Travel	12'-3 1/2" (3747mm)
Height - (Export) Travel	12'-3 1/2" (3747mm)
Weight	approx 74,000 to 79,000 lbs (33566 to 33834 kg) *depending on engine and options*

Tracks

Ground Clearance	1'-6" (457mm)
Undercarriage	Hitachi ZX230LC
Track Type	Triple Grouser, 23.6 in (600mm) wide
Travel Speed	1.2 / 2.2 mph (1.9/3.5 kph)
Ground Pressure	10 lbs/in² (69 kPa)

Powertrain

Engine	Caterpillar C16
Horsepower	630hp (470kW) @ 2100rpm
Clutch	PT Tech HPTO14
or	
Engine	Caterpillar C18
Horsepower	700–765hp (522–570kW) @ 2100rpm
Clutch	Twin Disc wet disc clutch HP600S
Fuel Tank Capacity	300 U.S. gal (1135.59L)
Main Hydraulic Tank Capacity	105 U.S. gal (397.46L)

Feed System

Total Hopper Capacity	7.4 yd³ (5.7 m³)
Hopper Width	60" (1524mm)
Hopper Length	14'-2" (4318mm)
Drag Chain Size	WDH110
Hopper Loading Height	7'-4 3/4" (2253mm)
Feed Opening (width x height)	60" x 37 3/8" (1524 x 949mm)
Compression Roll dia (tip to tip)	33 1/2" (851mm)

Rotor

Rotor Shaft Size	4 15/16" (125.40mm)
Rotor Width	63 1/2" (1613mm)
Rotor Speed	1050rpm @ 2100rpm (engine)
Drum Rotor	
Rotor Diameter	38" (965.20mm)
Number of Bits	25
Bit Size (width x height)	2 3/4" x 5" (70mm x 127mm)
Pinned Rotor	
Rotor Diameter	38" (965.20mm)
Number of Bits	24
Bit Size (width x height)	2 3/4" x 5" (70mm x 127mm)

Grate Data

Number of Grate Sections	4
Total Grate Area	4023 in² (25955cm²)
Rotor Coverage	187 degrees
Grate Thickness	1" (25.4mm) or 1 1/4" (31.2mm)

Discharge System

Discharge Conveyor Width	54" (1372mm)
Conveyor Speed	450 ft/min (137.20m/min)
Discharge Height (top of head pulley)	15'-9 3/4" (4820mm)

Optional Equipment

- Air Compressor
- Magnetic Pulley
- Grate Hangers
- On-board Water Tank & Pump

Production – C16

Greenwaste	300 yd³/80 US tons (229 m³/73 metric tons) per hour
Scrap Board	375 yd³/55 US tons (287 m³/50 metric tons) per hour

Production – C18

Greenwaste	360 yd³/95 US tons (275 m³/86 metric tons) per hour
Scrap Board	425 yd³/65 US tons (325 m³/59 metric tons) per hour

Peterson

PO Box 40490 • Eugene, OR 97404
800.269.6520 • 541.689.6520
www.petersoncorp.com

Find out more about the entire Peterson product line at:

Peterson

Estimated Owning and Operating Cost 4710
(C-18 765 hp)

Fixed Costs

				$/SMH	$/PMH
Purchase Price	$515,000				
Years of depreciation	5				
Scheduled machine hours (SMH) / yr	1,500				
Machine Utilization	90%				
Productive machine hours (PMH) / yr	1,350				
PMH total	6,750				
Total hours of depreciation	7,500				
Hourly depreciation				$51.50	57.22
Residual value	$128,750	25%			
Interest rate:	8.5%			$15.86	17.62
Insurance per year	$15,450	3%		$10.30	11.44
Fixed cost total				*$77.66 /hr*	*86.29 /hr*

Variable Costs

Fuel/gal	$3.00				
Fuel consumption / hr	26.3				
Fuel cost / hr				$71.01	$78.90
Engine Maintenance				$10.02	$11.13
Misc rebuild				$3.09	$3.43
Hyd. Oil, Filters, Grease etc.*				$1.62	$1.80
	Cost	Quantity	Hours		
Bits - Std	20.45	22	58	$6.99	$7.77
Grates - 1"	724.28	4	489	$5.33	$5.92
Anvil - Std	910.00	1	610	$1.34	$1.49
Hammers - Pinned Rotor	582.83	22	4,300	$2.68	$2.98
Rotor Wear Liner Set - Std	2,669.22	1	1,382	$1.74	$1.93
Compression Roll Wear Liner	641.53	1	1,540	$0.37	$0.42
Rotor Bearings	1,746.45	2	3,800	$0.83	$0.92
Discharge Conveyor Belt - Std	5,165.00	1	5,240	$0.89	$0.99
Main Drive Belt Set	2,096.00	1	2,179	$0.87	$0.96
Infeed Chain	921.29	4	3,260	$1.02	$1.13
Life time maintenance labor	$32.00	20%	1,350	$5.76	$6.40
Variable cost total				*$113.56 /hr*	*$126.18 /hr*
Fixed and Variable Cost Total				$191.22	$212.47 /hr

		Scheduled Machine Hours	Productive Machine Hours
Material type	Logging Slash		
Production (tons/hr)	→	55.39 /hr	61.54 /hr
Cost per ton	→	$3.45 /ton	$3.45 /ton
Scheduled machine hours	1,500		
Productive machine hours	1,350		
Annual Production (tons per machine)	83,079		
Annual Total Cost	**$286,829**		

The costs and production results provided in this analysis are based on the best available information in average conditions. Actual results will vary due to variations in material, support equipment, grate size, skill of the operator and maintenance practices. Peterson therefore does not guarantee that these results will apply to all conditions.