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Manufacturing Energy Wood Pellets from Timber Plantation Harvest Residues

Canberra, 14 April 2011

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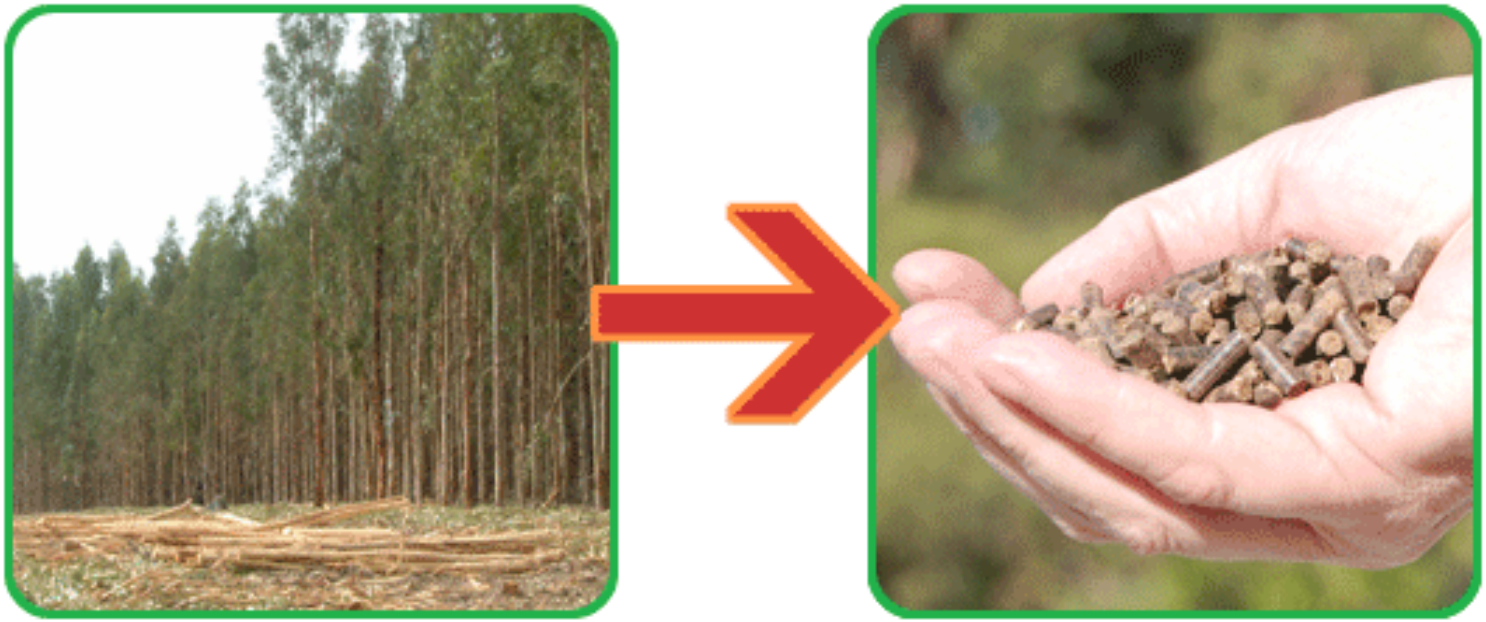
Plantation Energy Australia Pty Ltd (PEA) is a wood energy pellet manufacturing company utilising harvest residues from sustainably managed plantations as feedstock.



From This

To This

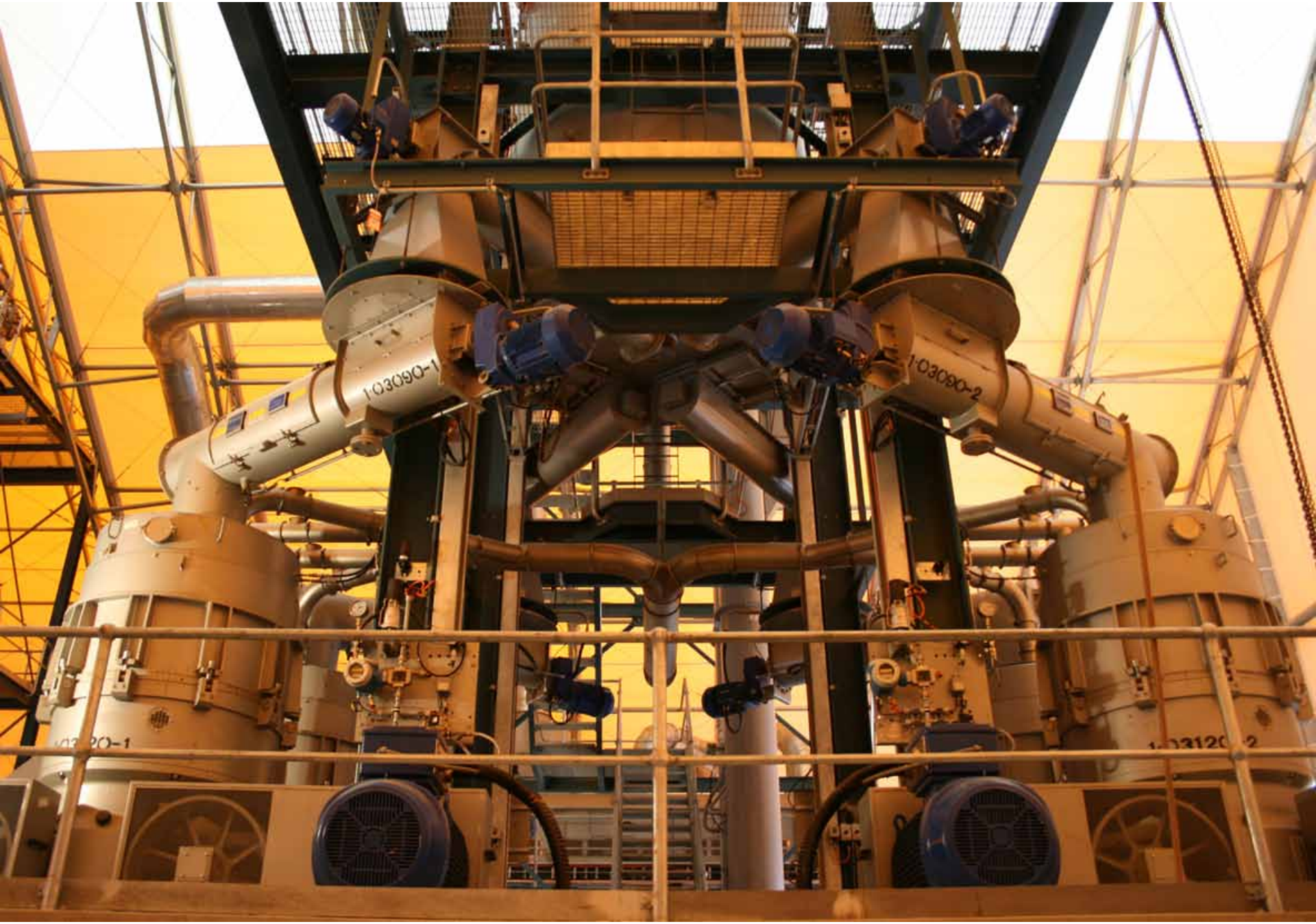
Albany Plant

1. 125,000 MT production capacity commissioned June 2009

2. Further 125,000 MT capacity commissioned in February 2010

3. Albany produces enough fuel to supply a 45 MWe power station

4. Constructed 25,000 tonne capacity export facility at the Albany port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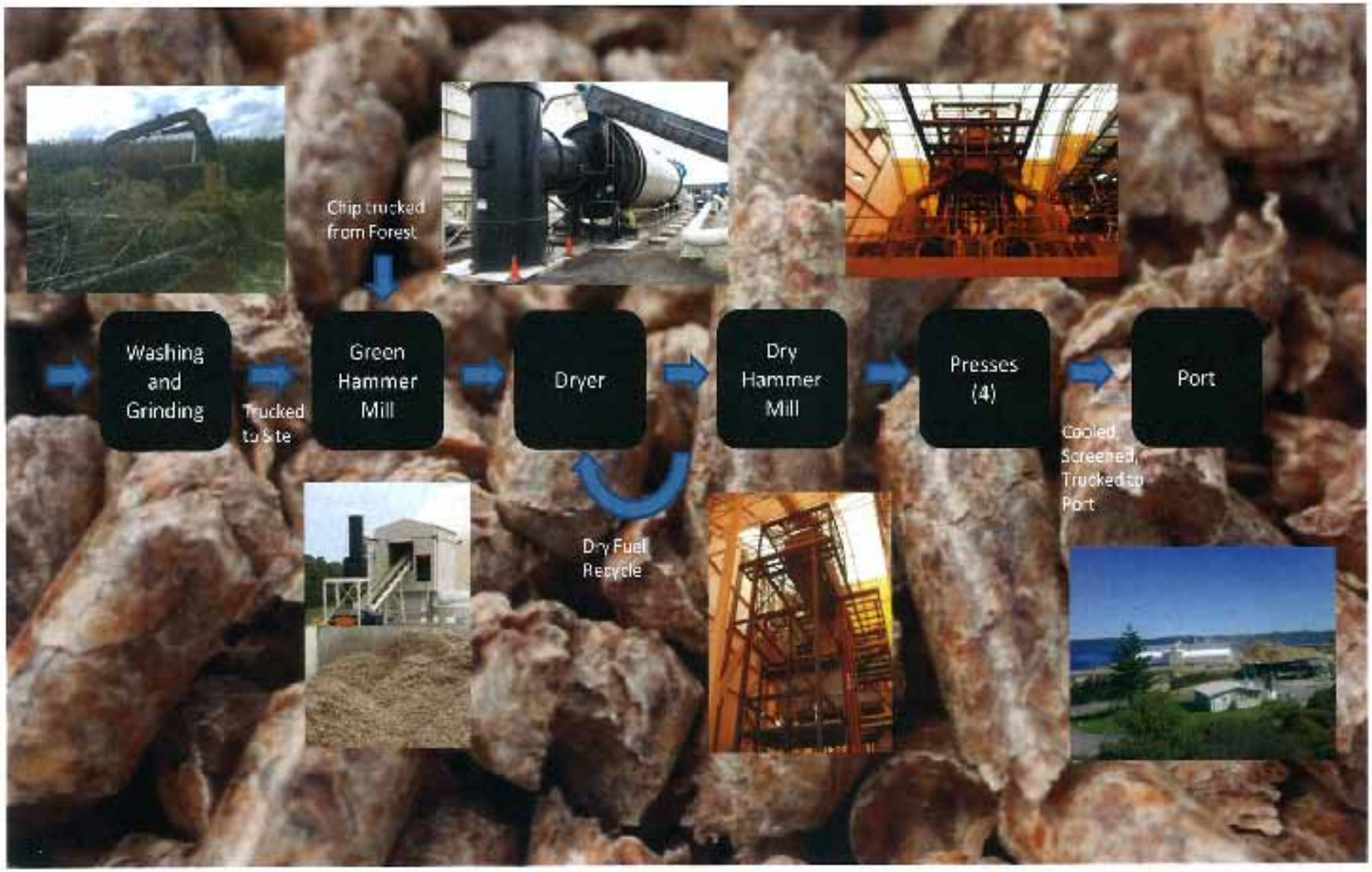
Process Flow Diagram – Pelletising Operations



Industrial Grade Fuel Pellet Specification

Physical Properties:

Origin	Woody Biomass
Form	Pellets
Diameter (D) and Length (L)	≥ 6 - ≤ 10mm (D) x 20 – 40mm (L)
Initial Deformation Temperature	1510
Bulk Density as received (kg/m^3)	≥ 600 – 750
Mechanical Durability (weight loss as a % after testing)	> 90 - < 97.7

Proximate Analysis:

Moisture (w - % as received)	≥ 5% - ≤ 10%
Ash (w - % of dry basis)	≤ 3.0%
Volatile Matter	70 – 90%
Net calorific value (MJ/kg as received)	≥ 16.9

Key Issues for the Manufacture of Fuel Pellets

- Raw Material Hygiene
  - Key issues – specification
    plant wear rates – specifically dies and rollers

Main Factor Influencing Hygiene is the Harvesting System Utilised

Short form, single grip harvester, delimb/debark at stump, forward log to stockpile, transport to fixed chipper. – Harvest residue left in rows and not economical to recover

Long form, feller bunch, skid whole tree to landing, delimb/debark with harvest head, log transported to fixed chipper. – Harvest residue left at landing

Feller bunch, skid to landing, flail delimb/debark, in field chip direct to transport. – Harvest residue left at landing

Feller bunch, forward whole tree to landing, delimb/debark with harvest head, infield chip direct to transport. – Harvest residue left at landing

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Inbound Logistics

Key issues – process rates
bulk density
particle size

Process Rates

Productivity in the plantation is critical to achieve economically viable feedstock. Processors are capital intensive and expensive to operate. Northern hemisphere machines have not been optimised for Australian species and conditions.

Systems have had to be developed to achieve the required productivity

The Albany plant requires 375,000 green tonnes per annum of feedstock at 40% moisture

Based on 48 weeks of operation, require over 1100 green metric tonnes per day of feedstock

Multiple in field harvesting operations with built in redundancy required to meet the plant raw material demand

Bulk Density and Particle Size

Impacts on processor productivity

Impacts bulk density for raw material transport

Bulk densities of processed harvest residue can vary from 120 – 250 kg/cu.m.

Truck movements range from 20 - 42 daily deliveries as bulk density decreases – obvious economic impact on raw material costs

Particle size is a key specification for the feed to the plant

Oversize particles cause blockages and production hold ups

Plant raw material reception tests developed to ensure particle size compliance

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Typical particle size of processed residue

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Materials Handling at the pellet mill

Key issues – raw material discharge systems
moisture content management
quality control testing

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Raw Material Discharge Systems

Processed biomass is very difficult to handle

Processed biomass does not flow and conventional tipping equipment is not effective

Hybrid system developed to handle processed eucalyptus biomass

Moisture Content and Quality Testing

Biomass is purchased by weight - stumpage

Contractor is paid by weight delivered – processing and transport

Moisture content of received biomass determines bulk density

Moisture content impacts on processor productivity in the plantation

High moisture content also impacts on dryer capacity and plant production

No off the shelf testing systems available

In house quality testing protocols and systems developed for moisture, particle size and sand content

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Storage and out turning of finished pellets

Key issues – mechanical damage
dust
moisture control
self combustion

Dust

Combustion risk

Occupational Health

Environmental impacts

Housekeeping issue

Moisture Control

Pellets are hydrophilic and must be stored under cover

Self Combustion

The storage facility has sensors to measure oxygen, CO, and temperature to manage this risk

Summary

Fuel pellets are an engineered product

Quality of raw material is critical to meet specifications

The ability to supply “in specification” raw material is not easy and has taken considerable learning

The integration of upstream harvesting systems for the primary and secondary products (biomass being secondary) is critical for the supply of cost effective in specification raw material

The continuance and growth of the plantation estate to provide adequate raw material for the long term future is a concern

Short rotation woody energy crops with efficient harvesting systems are potentially the future for pellet manufacturing feedstock