Red Stag Timber Ltd: Waipa Mill
Background

- Built by the State in 1939
- Sold to corporates in 1996
- Private ownership in 2003
- Annual turn-over exceeds $200 million
- Full time staff of 293 and 50 contractors
- Biggest private employer in Rotorua
- Target structural timber market
- Timber mostly from certified sustainable forests
Some facts and figures

- 900,000 tonnes of logs p.a.
- 2x10 hour shift operation, 4 days per week
- Biggest sawmill in NZ
- Can cut 1,700 m$^3$ in one 10-hour shift
- Currently 450,000 m$^3$ sawn timber p.a.
- Equivalent to 110,000 km of 100x50!
- Future production increase to 650,000 m$^3$
- Site operation mostly energy-self sufficient and almost carbon neutral
Markets

NZ 60%

Asia/Middle East 20%

Australia 15%

Pacific Islands 5%
Log yard

- 900,000 tonnes of logs per annum (135 truck-loads per day)
Debarking

Bark burnt at energy centre
Sawmilling

- New sawmill replaces 2 old mills
- Structural timber sizes: 75-300 x 50 mm
- Timber in packets by size, grade and length
- Chip (33%): exported to pulp and paper
- Sawdust (10%): burnt at energy centre
- High level of technology
New Sawmill

100m/min - 2.0m gap
Technology
Edger/scanner and optimiser
Bin sorter

Bin sorter (98 bins) used to segregate timber by grade, size and length
Kiln drying

- About 80% of production is dried
- Dried from ~60% to about 13% moisture content
- Biggest energy user on site (98%)
- Batch and continuous counter current kilns
High speed planer

Rough sawn timber is gauged 410m/min (New 850m/min)
Structural grading

Gauged timber is graded on stiffness
Boards are (computer) graded on visual defects
Cut out defects
Finger-joint defect-free timber
Lengths produced 2-7.2m
Sizes: 70–190x45
Chemical Preservative Treatment

Dry timber is treated using either boron, CCA or LOSP
Wrapping
Despatch

Timber is despatched to customers in NZ and overseas
Energy centre

- 2x20 MW water tube boilers generate 54 tonnes steam per hour @ 42 bar
- Burns only untreated wood waste (shavings, bark, sawdust and off-cuts)
- Two staff per 12 hour shift, 24/7
- Generation of electricity up to 3.5 MW
- Site is largely self sufficient in energy
Current Site Energy Balance

Site 11kV Power Supply 5MW Load with no generation. Normally Import 1.5MW (Export 1.5 MW on Weekends)

6.3MW Cooling Towers
3.5 MW Generation

Boiler One
20MW 42 Bar
26 tph

Boiler Two
20MW 42 Bar
28 tph

60% Green Sawdust From Sawmill
40% Dry Shavings From Secondary Processing

Sawmill
450,000 M3 Sawn.

Secondary Processing

Timber Drying
42 Bar Steam
54 tph max

10 Bar to Kilns
35 tph average
56 tph max
Improving Performance of Existing Plant

- Understand total energy situation
- Understand opportunity, value and risk
- Operations
- Controls
- Reliability
Recent and Future Changes

- Recent 11kV Upgrade
- Continuous Kilns
- Another Kiln & Energy Available?
- New Biomass Boiler
- Additional Turbine or Replacement
- Future Site Energy Balance
11kV Upgrade

- Existing plant unable to operate at full capacity if turbine not operating.
  - Previous incomer 3MW, site load of 4.5MW
  - New sawmill to increase load to 5.5MW & higher kiln steam load.
  - Options considered were - additional back pressure turbine to allow 1 out of 2 running OK for site load or
  - Upgrade site power supply – Selected Option.
    - Site can operate without boilers and turbine (boiler trips, over-speed checks, etc)
    - Three week unplanned turbine outage June 2016…
    - Additional capacity for export on weekends?
Continuous Kilns

- Since 2010 two 8 MW continuous kilns commissioned
  - Each have drying capacity of 100,000 m³ per year.
  - Use only 70% of energy of batch kiln & reconditioning
  - Stable steam load.
Another Continuous Kiln?

- Last boiler built in 1995 (now 2 x 20MW installed)
- A third 8 MW continuous kiln to be commissioned October 2016.
- No existing kilns to be shut & new boiler planned for early 2018.
- Load challenges....
Unstable Steam Load!!! High start-up peaks

Solutions?

- Kiln header pressure control on batch starts to reduce peak flows
- Improve control of boilers, header pressure and rates
- Reduce generation (condensing) of turbine
New Biomass Boiler

- RCR Energy, 10MW wood waste, 13 tph, 400 deg, 42 bar.
# Possible New Turbine Generator

## Additional Backpressure Turbine
- **New Single Stage Impulse**
  - Lowest cost option
  - Install on the run
  - Inefficient
  - Two turbines to maintain

- **New Multistage Turbine**
  - Increased purchase cost
  - 20% more MW per T/steam
  - Install on the run
  - Two turbines to maintain

## Replace Existing Turbine
- **Double Single Stage Impulse**
  - Higher cost than backpressure
  - Plant down for installation
  - Inefficient – lose efficiency of current multistage STG.

- **Multistage Extraction Turbine**
  - Highest project cost
  - Plant down for installation
  - Potential to consider increasing condensing capacity
  - Delivers “Ideal” Solution
Proposed Site Energy Balance

Site 11kV Power Supply
- 6.4 MW Load with no generation.
- Normally 1.5 MW Import (Export 1.5 MW on Weekends)

Boiler One
- 20MW 42 Bar
- 26 tph

Boiler Two
- 20MW 42 Bar
- 28 tph

Boiler Three
- 10MW 42 Bar
- 13 tph

6.3 MW
- Cooling Towers

3.5 MW
- Generation

Biomass Boiler Fuel
- 60% Green Sawdust From Sawmill
- 40% Dry Shavings From Secondary Processing

Sawmill
- 450,000
- 750,000 M3 Sawn.

Timber Drying
- 10 Bar Steam Supply
- 35 57 tph Average

Secondary Processing

42 Bar Steam
- 54 tph max
- 67 tph max

57 tph
- 4.4 MW New Generation
When buying timber, insist on Red Stag Timber!