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Alternative Fuels for Transport and Heating: Wood Pellet Fires

This summary is based on notes taken at the meeting and should be used in conjunction with the presentation slides.

Ken has had a long interest and passion in all things to do with sustainability. This extends to his professional activities running Pellet Fires Gippsland. He finds it hard battling the entrenched habits of our consumer society. Dirty coal and gas, which was once a blessing, has now become a burden to us in Australia when the rest of the world has moved ahead. Wood pellet fuel was invented in 1928 in the US, but caught on with the 1970s oil crisis and with each crisis after that. In the US, pellets outsell oil. In Scandinavia they are used in power stations and in home basement boilers for heating. There are 28 manufacturers in the US compared with one in Australia.

Pellets

Pellets are made from plantation timber sawdust waste generated by saw mills. In producing 20mm timber fence palings, for example, each saw cut is about 5mm wide resulting in substantial waste. This typically goes into landfill or is tipped illegally where it may rot down to produce methane. The manufacture of pellets is audited by Government to ensure it is made only from plantation timber. While carbon is emitted as the pellets are burned, it is replaced by new plantation trees – a closed cycle that is officially ‘carbon neutral’.

The fuel is dried in a tumble dryer before being pressed into pellets and packaged in 20Kg bags - similar to briquette manufacture. It would also be possible to use nutshells, corn husks or any other biomass fuel that can be produced mechanically and delivered through an auger feed. What comes out of the mill is denser than firewood so a pellet will sink in water. Its moisture content is less than 8% compared with timber ~25% which is also highly variable. Pellet fuels are part of the Victorian Government Energy Concession Program with the same rebate as gas and electricity. You know exactly what you’re getting in value – with firewood you may only get \$100 worth of heat from a \$250 load.

Ease of operation

Typical consumption is about one tonne or 50 bags per winter which are easily stored in a corner of the garage. Pellet fires are easy to use. You simply tip fuel into the top of the stove and press the start button. It’s self-lighting so there is no need to open the door and no chance of logs rolling out - even children can use them safely.

Design of a typical pellet fire

Pellet fires look similar to gas or wood stoves. From the *fuel bunker* in the top, pellets are delivered with an *auger drive* to a very small *combustion chamber*. Only a handful of pellets burn at a time with intense heat using air delivered by a *combustion fan*. The delivery rate is controlled by a dial, buttons or thermostat, depending on the model and a perfect air:fuel ratio is maintained. Some models in Ireland can be switched on by mobile phone! A *convection fan* draws cold air from the room past the *heat exchanger* and back into the room. Ash remaining in the *ash pan* is only 1% by weight and only needs to be emptied once or twice a year straight onto the garden. Different models have different size hoppers, but a 20kg bag will burn for about 35 hours.

¹ To find out more <http://www.parkwoodfires.com.au> <http://www.pelletfires.com.au>
or google key words: wood pellets, wood pellet fires, wood pellet stoves, wood pellet heaters

Performance and efficiency

People often mix up the terms efficiency and performance. A fire may heat a large area if you put lots of fuel in, but may not necessarily be efficient. Pellet fires run at an efficiency up to 90% - six times greater than a wood fire. Highest efficiency is when running on low, but even on high it is in the high 80s. The models Ken deals with from New Zealand provide an output of ~10kW, but overseas you can get ones that are 20, 15 or 5kW; small ones to put in a caravan, or even wood pellet BBQs. There are free-standing models and fireplace inserts. Overseas, boilers are used for hydronic heating. Pellet fires start heating in 5-10 minutes and produce only 0.6 g/kG of particulate – 85% less than the Australian Standards (very weak compared with those in NZ). They burn with a clean pipe and no smoke so asthma sufferers are not affected. The 10kW model needs only a 3” flue compared with 6-8” for a normal fire - necessary to get rid of the heat. Running costs similar to natural gas and much less than for firewood or bottled gas.

Why so few?

Our society is used to natural gas, coal and electricity. Buildings tend to be over-heated in winter and over-cooled in summer. Most people really don't think about it and there's less awareness of environmental impact than there should be. In two or three generation's time, children will ask of their grandparents how could all that oil be burned up in the space of 200 years – it's disgraceful. We have a waste product here that is renewable - to be chopping down trees to heat houses is caveman stuff! Environmental standards in Australia are also very weak. It's seen as a political problem and politicians are very timid. The Department of the Environment should be second in the hierarchy, rather than treasury. Without the environment there would be no economy.

The time for pellet fires has arrived!

There are several people marketing pellet fires in Victoria, but only around 500 installed in Victoria. Only a handful in the audience knew about them. Ken is going overseas soon and will bring back a new Italian model to test out and then sell. He has been spreading the word at events like the Melbourne Sustainability Festival, Wonthaggi Energy Festival and Warrigul Farm World.

Questions

- There are 50 bags to the tonne at \$12/bag. He usually delivers one tonne at a time.
- Electricity consumption would be similar to other heaters with a fan. The fan and auger use 200 - 300W. The igniter runs only for about 5 minutes.
- There's no real fuel supply network in Victoria. He buys fuel in bulk from the mill in Northern NSW and delivers by the tonne. Several people are interested in setting up mills, but the Victorian market is only 500 tonne per year, although will gradually get bigger. In comparison, in Tasmania pellets are sold in Mitre 10 stores. Pellet Heaters Australia sell a Canadian heater and produce the pellets.
- His fires have a programmable timer and are thermostat compatible. Some just have push button start and dial up control.
- Heat be transferred to other rooms with a small ceiling register and inline fan.
- Sawdust needs to be dried first for maximum efficiency in a tumble dryer. This is heated by burning sawdust – similar to briquette manufacture. Both hard and soft woods are used. The testing labs take a sample of fuel and measure the kJ of heat per kg. Pellet fires run at about 90% efficiency, gas ones about 80% and wood fires ~50%. Air coming from flue is not hot showing that little waste heat going up the flue.
- Pellets are too dense to use in a regular fire.
- Humidity is not an issue as it's the air from the room that is heated.
- A pellet heater is about \$3500 - dearer than a wood, but similar to a gas. The cost installed would be about \$4200 – similar to a gas or wood fire. Flue installation is simpler and there's no gas to run, but the flue needs to be installed by qualified person.
- No sawdust from treated pine is used – plantation timber use is audited by the Government.

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