Presentation of Beehive Burner at Pacific Inland Resources, Smithers. History, components and method of operation.

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HISTORY

Beehive burners have been a method to dispose of wood residue in sawmills for many years. For many area's their days are numbered. At PIR we had the small burner at the studmill, and planer, old and new sawmills. The following is probably typical of all beehive burner operations.

The stud mill's burner, which was shut down in 1978 when the new sawmill was built. Its controls consisted of an underfire fan, a couple of overfire fans, and a manual top damper control. Wood waste was put into the burner, it was lit, we hoped it would burn, and at weeks end, the fire was left to die. On occasion, it was cleaned out.

The planer burner, built (approx.) 1972, had sophisticated controls (for those days). A Barber Coleman controller and chart recorder. It controlled the dampers, and overfire fans, but like its cousin down the road, it was largely ignored until later years. Burning shavings certainly gave it a hot fire, but never a clean burn. This burner was larger than the fuel supply required, therefore the efficiency was poor. The planer burner was shut down in the mid 1990's, when air quality was becoming a community concern. The shavings were trucked to the sawmill burner.

The old sawmill burner, was closed down in 1978, its controls were similar to the planers except Honeywell manufactured it. These controls were transferred to the new burner.

The new sawmill burner operated until 1996 with the old controls. Shavings from the planer were dumped into the burner conveyor. These ignited before they hit the fire, and did not achieve full combustion, a major source of fly ash. Because of the volatility of the shavings, the temperatures were all over the map, depending upon the volume of the shavings dumped.

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In the early to mid 90's, the public became concerned with the emissions from the burners, which, admittedly were not managed well. In the past, no one paid much attention to the burners. With the public outcry more attention was paid. Experimentation with fuel control, the identification that balsam and spruce/pine bark and shavings burned differently, air control in and out was experimented with. Holes, spaces and openings were given careful attention, when air was induced and not were scrutinized. We found that you could get as much smoke at 1000 degree's (F) as at 500 degree's depending upon the mixture of fuel/air in and air out. The old Honeywell controls just didn't provide the flexibility required. In 1996 a new Programmable Controller (PLC) based program was developed by Brian Northup, PIR Electrical Supervisor. This PLC gave us the ability to independently control the over and underfire fans and air control dampers, and the top dampers. A hopper / blower system was installed for the shavings, which put the shavings at the base of the fire instead of dropping them from the top of the burner to the pile some 50 feet lower. More importantly, we could now give different parameters for different fuel species and moisture contents quickly. We have the ability to physically see the burner via closed circuit television, and from within the mill, see and or adjust the various parameters. A new saying at PIR is, "where this is smoke, there is an army of personnel". Although our permit allows us to exceed our goal, our goal (from Hank Ketchem CEO) is zero emissions. As soon at the burner hiccups, we examine it and take corrective action. Other changes taken more recently is the ability to shut down the burner, and store fuel, and the ability to augment the fuel supply when the burner is operating. A dedicated burner operator complete with a Caterpillar 960 also has been added who monitors and augments the fuel as required on a 24-hour 5-day basis. Since 1996, as required by permit, we have certified opacity readers on staff, who take their readings on a regular basis. These Opacity readers are re-certified twice per year. The temperature recorder is monitored and charts forwarded to MELP.

Many of our competitors have visited our site to see and hear about what we have done to our burner, we've freely shared our experience, and PLC Program.

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We have been searching for alternatives to dispose of the brown wood residue, included a study undertaken by EPCOR (Edmonton Power Corporation) in conjunction with Houston Forest Products, and Canfor, for a wood fired co-generation project in Houston. Other options investigated include but not limited to a briquette plant, bio-oil, bark board, on site heating systems for the dry kilns.

We have installed a hog system (grinds the wood waste into small particles), which permits us to ship hog fuel to EUROCAN. When Eurocan is operating they take about 30% of the hog fuel provided.

Currently we can utilize all of our white wood through NewPro (panel board plant in Smithers), the cattle and dairy farmers in the valley (bedding material), and Eurocan in Kitimat (pulp process and fuel).

PIR is proud of the effort that our staff and crews have made to improve the operation of the burner, and the willingness to embrace change, and investigation into alternate methods for disposing of our wood residue.

TECHNICAL OPERATION OF BURNER

NOTE: Spruce/Pine temperatures shown un-bracketed, [Balsam temperatures in square brackets]. Species, volumes, and weather conditions affect the various temperatures.
NOTE: Temperatures shown vary depending upon species, moisture content and other conditions, and are for general information only.

Automatic PLC Temperature Controls.

- Two Underfire Fans, start as soon as power is turned on, there is a delay between the two fans.
- High Temperature Alarm – (red strobe light signal in mill) 608 d C. (1125 d F.)[635]
- Overload Alarm for any and all motors - (red strobe light signal in mill).
- Winches, Open, Underfire Dampers Close, All fans stop at 848 d C. (1558d F.)

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- Over Fire Fans, running above 592 d C. (1100d F.) [621]
- Under Fire Dampers are open between 0 and 579 d C. (1075d F.)
- OverFire Dampers Close, less than 496 d C. (925d F.)
- OverFire Dampers Open, greater than 608 d C. (1125d F.)

Shavings System has been removed since shipment to Eurocan began.

- Shavings Fan, starts with underfire fans
- Shavings Feed runs continuously between 149 d C and 320 d C. (300 – 607d F.)
- Shavings feed modulates (runs for 60 seconds, off for 180 seconds) between 320 d C and 426 d C. (607 – 798d F.)

Winches Open;
NOTE: A takes precedence over B .

A: ALL winches open if temperature is greater than 551 - 565 d C. (1050d F.)

B: Stage 1 – 385 d C to 426 d C. (725 – 798d F.)[413 – 454]
Stage 2 – 468 d C to 482 d C. (875 – 900d F.) [483 – 510]
Stage 3 – 511 d C to 551 d C. (952 – 1025d F.)[538 – 579]
Stage 4 – same as stage 3.

Winches Close;

- Partial close [less than 551].
- All winches close [less than 454].

Manual Controls

Full auto/manual controls are available for;

Winches, Underfire Fans, Overfire Fans,
Shaving Fan - Shavings Auger

Bee Hive Burner Pictures – Legend.

1. 001 Beehive burner, fuel infeed on left (burner not running)
2. 001 Beehive burner, fuel infeed on left (burner running)
3. 004 Beehive burner, dome area, top dampers and screen.
4. 006 Inside Beehive burner, looking at top dampers and through screens.

5. 010 Inside Beehive burner, burner floor and **two of 28** underfire air inlet.
6. 005 Looking through base of beehive burner, access for cleaning.
7. 008 Inside Beehive burner, looking out access door.
8. 012 Control room and underfire air pipes.
9. 015 Overfire fan and damper controls.
10. 011 Top damper winch controls.
11. 014 Burner Control Room, Pushbuttons, PLC (computer) and Chart recorder.
12. 013 Chart recorder (Burner down).
13. 002 Beehive burner on right, Hog on left, with burner fuel feed conveyor.
14. 016 Hog system.
15. 018 Hog outfeed conveyor.
16. 019 Hog storage area.