

The Barton Soot Collector for coal boilers

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Coal is the common fuel for greenhouse heating on the South Island, and is also used by some growers on the North Island. New Zealand has huge coal reserves, and hence coal is ample available and relatively inexpensive. One of the disadvantages of coal is that it produces soot, which creates a black layer of dust on the greenhouse roof and wider surroundings. A cyclone can be used for soot removal, but that is quite an investment. Cucumber grower David Barton in Kaiapoi near Christchurch came up with a solution for soot removal that is so simple and so economic and yet incredibly effective. David invented and installed his first Soot Collector three years ago, and installed a second one at a new boiler last year. He is happy to share his knowledge and experience with other growers, and hopes the greenhouse industry will benefit from his invention.

Sea Freight Container

The Barton Soot Collector is a device to strip the soot from the flue gas (smoke) from a coal burner. The device is nothing more than a sea freight container with a vertical partition in the middle. The soot- loaded flue gas from the burner enters the container at one end, and virtually soot-free flue gas leaves the container at the other end. Then out it goes through the chimney, showing as a white plume of steam.

How it works

The principle of the Barton Soot Collector is that soot, being small particles heavier than air, settles when the travel speed of the smoke is low enough. This happens in the container. The smoke flows at high speed from the burner through the narrow flue gas channel and enters the much wider space of the container. Here the smoke loses its speed and some of its soot. It progresses steadily towards the back of the container, and around the separation wall. This wall extends the pathway, allowing more soot to settle. Initially David Barton intended hanging a steel mesh in the container for catching the soot. But the bare container worked perfectly and he concluded that the mesh was unnecessary. Admittedly little research has been done and no improvements have been made to this simple concept, because it seems to work perfectly well as it is.

Soot accretion

The effectiveness of the Barton Soot Collector is demonstrated by the amount of soot accrued in the container. David Barton has some figures from his experience with two such devices. The older of the two devices was installed three years ago, and is connected to a boiler that heats about 6000 m² of plastic greenhouses. The second device was installed in May 2004, and services a new boiler of 3.5 MW, which heats about 4000 m² of glasshouses and a plastic propagation greenhouse. The older boiler has no soot collection capacity itself, whereas the new boiler has a large volume where soot settles. Hence the older Soot Collector catches a lot more soot than the new one. David Barton routinely cleans the older Soot Collector every four months. After summer he usually removes a couple of cubic meter of soot from this device, whereas after the winter he gets an estimated six cubic meters. The new Soot Collector did not need cleaning since it was installed 10 months ago. It now contains about 1 m³ of soot, as a lot of soot was removed from the new boiler itself.

Safety

A warning from an expert is that the flue gases and soot can be hot and still flammable after coming from the boiler. He says that the Soot Collector is basically an extension of the fire channel of the boiler. Another warning is about the risk of inhaling the soot, which David Barton is well aware of. He says the Soot Collector is never opened when the burner is fired, i.e. when the flue gases are blown through the Soot Collector. Nobody should enter the device without protective clothing and a proper dust mask. When David Barton and his staff empty the Soot Collector, one person sprinkles water with a garden hose just outside the container to catch and wash down the dust cloud. Another person drives the tractor with a front-end loader, and scoops up the dust from the container floor. The dust sticking to the roof, walls and doors is shaken off and collected from the floor or caught in buckets. The protective clothing and gear used is handled with care, to avoid inhaling the dust afterwards.

Benefits

The benefit is obviously that soot is collected rather than thrown in the air. The chimney now produces white steam instead of black smoke. Without a cyclone or a Barton Soot Collector, all this dust would have landed on the greenhouse roof or elsewhere. David Barton normally washed his older greenhouses every 2 months, whereas now the last time he did it was 2-3 years ago and the roofs are still clean. Any dirt or dust on the greenhouse roof easily blocks 10-20% of the light or even much more. The rule of thumb in the Netherlands is 1% light equals 1% production. Even if this rule was not completely correct for NZ, still a dirty roof would cause substantial yield reduction. The general benefit of the Barton Soot Collector is that it significantly reduces the pollution associated with coal combustion.

Acknowledgements. *The Barton Soot Collector was invented by David Barton, Kaiapoi. Email: coolcuc@xtra.co.nz.*



Photo 1: The Soot Collector of David Barton ensures that the greenhouse roof remains clean, even right beside the boiler.



Photo 2: the latest Barton Soot Collector with connecting channels visible.



Photo 3: a look inside the first Barton Soot Collector, connected to the old boiler.



Photo 4: a look inside the new Soot Collector after 3 months.

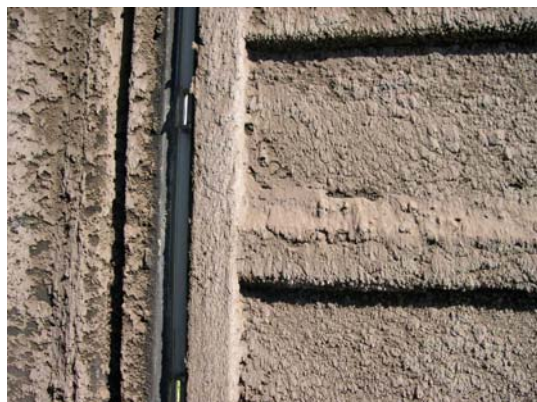


Photo 5: soot sticking to the walls and door