The most unusual aspect of the woodchip system that heats the large Fronius International factory in Wels, Upper Austria, is this:

It’s underground.

The heating plant is owned by Aigner Engineering, which supplies hot water under contract to Fronius, an international maker of welding machines, electronics, battery chargers, and solar-power equipment. At its Wels plant, Fronius uses the wood-heated water both for heating and for industrial processes.

Aigner builds an efficient, optimally sized heating plant underground because, it calculates, that is the cheapest way to provide heat.

“We like building our plants underground,” says Siegfried Aigner, managing director. “It really is the least-cost solution from the standpoint of operation and total cost.”

Commissioned in 2006 next to the Fronius factory, the heating plant is entered by stairs leading down from ground level to a locked door. There are three stacks that extend 10-12 meters (30-40 feet) above ground and an above-ground crane for removing ash. Woodchip fuel is dumped into the underground storage bin by the delivery truck using two ground-level bulkhead doors.

The Fronius factory being heated has 38,000 square meters (410,000 square feet) of floor space. Its heat needs require a capacity of 3.2 thermal MW (11 MMBtu/hour). Of those, 250 thermal kW (850,000 Btu/hour) are used as industrial process heat.

Aigner’s heating plant can produce a total of 2.8 MW (9.6 MMBtu/hour) of heat from three boilers: a 1.2 MW woodchip boiler, a 320 kW chip unit, and a natural gas boiler that can produce 1.3 MW. The two biomass boilers together produce 5.2 MMBtu/hour.

“When we build a plant, we optimize everything—we don’t build anything oversized,” Aigner explains. “Our wood boilers provide 98 percent of the total heat demand. Two percent come from the gas boiler, which is cheap in investment, but the costs for gas are about two times higher than for biomass. We would have to invest a lot extra to make one of our wood boilers bigger to cover that extra two percent heat demand.”

The plant burns 7,800 cubic meters (2,700 US tons) of woodchips per year, stored in an underground fuel-storage bin that can hold 600 cubic meters (21,000 cubic feet) at a time. Two wood suppliers contract to deliver the fuel, which they procure from area farmers. One supplier delivers a fine-grade fuel, suitable for the smaller boiler. The second provides rougher-grade chips, which the larger boiler can burn.

“We have about one week of wood storage here,” Aigner says. “Keeping the storage size low reduces our cost.”
Incentive for Long-Term Relationship

“We own and operate 10 plants like this, all within a 200-kilometer (125 mile) radius,” Aigner explains. “We can produce heat cheaper than our customers can themselves, because we have shared staff and maintenance costs.”

An operator visits the Fronius plant twice a week. Ash is removed automatically from the boilers, into a box down in the heating plant. The operator lifts the loaded ashbox with an electric winch to empty it into a dumpster that sits outside.

“Fronius put out a tender for bids to finance, build, own, and operate this plant,” says Aigner. “We got the contract. Part of the deal is that we rent the land from Fronius for 15 years. At the end of that time, we will renegotiate our contract. If that deal does not go through, or they award it to someone else, we can remove our boilers and walk away from the plant because it will be completely paid for at that point.”

Overall, the total system, including the underground building, cost Aigner Engineering €740,000 ($960,000 US). The company has a 15-year financing contract on the project’s capital costs.

Aigner is a third-generation family business in Austria, which started as a plumbing and heating company, then spun off new firms that provide municipal waste-treatment plants and biomass contract heating. Both Aigner and Fronius have an incentive to maintain a long-term relationship—Fronius because it has a stable source of heat, Aigner because its costs for producing that heat will decline once it has finished paying off the plant’s capital costs.

“In our heat pricing agreements, we use a very transparent rate structure, including both fixed and variable costs,” Aigner says. “That keeps everyone happy.”