



## Buildings in Pieksänmaa, Finland, heated with wood chips



*Arto and Mika Utriainen have been operating on wood chips business since the year 1978, when they started heating their farm buildings with wood chips. The farm is located in the municipality of Pieksänmaa in Central Finland. In 1981, they started contract work on chipping and in 1998, wood chips deliveries to customers. Today, they deliver wood chips on order to a number of small-consumers, and also attend to heat generation and maintenance at two stations. These heating stations of a village and a foundation property are invoiced on the amount of heat generated.*

### Wood chips for sale since the year 1998

Arto Utriainen is a pioneer producer and consumer of wood chips in his municipality. Since 1978, the buildings of his farm have been heated with wood chips made of wood harvested from his own forests. Initially, wood from several farms were chipped with a commonly owned hand-fed disc chipper. In 1981, Arto and

Mika Utriainen started contract work with a high-powered farm tractor at forest sites.

The chipping contract work was started in 1998 with a drum chipper of trademark Patu, still a prototype at that time. In December 2003 the chipper was sold and a new Forester 6045 LF drum chipper was taken into use. This new chipper is powered by a 160 hp tractor, which can also operate with a larger chipper. The average output is estimated at 60–80 m<sup>3</sup>/h of bulk volume.

Wood is chipped into a tractor-driven container of 35 m<sup>3</sup> for transport direct to the consumption site. Chips are also stored for securing deliveries in longer-term frost periods and in case of machine breakdowns. The chips store is an old covered flat bin, located logistically suitably between Jäppilä village and Pieksämäki town.

In 2003, the wood chips deliveries by Arto and Mika Utriainen amounted to 11500 m<sup>3</sup>, of which 1500 bulk m<sup>3</sup> was produced from own forests and 9600 bulk m<sup>3</sup> from surrounding forests. About 400 m<sup>3</sup> comprised wood residues from sawmills. About 20% of forest chips consisted of logging residue and 80% of improvement cuttings in young forests. About 5050 bulk m<sup>3</sup> were harvested with the support of Sustainable Forestry Fund. As regards raw material purchase, Arto and Mika Utriainen utilise mainly a local Forestry Association, which indicates the sites. At improvement sites of young forests, professional forest workers are employed, and to some extent also students of Nikkarila School of Forestry, who carry out logging and transports as traineeship work.

### All-round heating service

The office buildings and a number of dwelling houses of Jäppilä village were previously heated with heavy fuel oil by a heating container located in the centre of the village. The design of a new heating station fired with wood chips was initiated in 1997. Mr. Heikki Heimonen, a forest ranger, carried out an availability survey of energy wood in the region. Mr. Jari Komulainen, Project Manager of the Development Centre of Central Savo County was employed for leading the project on the new heating station. A committee on wood chips and heat was established for preparing the establishment of the heating station, the members representing the municipality, the local forestry association, the Development Centre, farm and forest owners, and wood chips contractors. A new site was chosen for the station beyond the planning area of the village. The foundation was cast in 2001. Arimax Bio 1000 boiler was set into operation on 13 April 2002. The heating station operates practically unmanned. The overall responsibility for heat generation and fuel deliveries was taken by Arto and Mika Utriainen. The length of the district heat network is about 1700 m and the space of buildings heated 35000 m<sup>3</sup>. There is capacity for extending the network. The emergency heating system, i.e. a separate 500 kW light fuel oil boiler and a 500 kW oil burner in the wood chips boiler, is located in the same space. In 2003, the consumption of wood chips amounted to 4050 bulk m<sup>3</sup>, and 2700 MWh heat was generated.

The vocational institute of Bovallius Foundation was planning the renovation of its light oil heating station for the year 2005, but as malfunctions were identified in the old oil-fired boiler in winter 2002, the purchase

of a new boiler had to be advanced. Alternatives of choosing another heating system were also surveyed. Bovallius Foundation contacted the Energy Office of Eastern Finland, which carried out a preliminary survey. The plan of heating station fired with wood chips was drawn up by Engineering Office Luoma Jari Ky. The old oil-fired heating station of 235 kW had to be replaced by a 300 kW heating one fired with wood chips. The timetable was urgent: the groundwork was started in spring 2002, and the station was set in operation on 11 December 2002.



*300 kW heating station of Bovallius Foundation, fired with wood chips.*

The heating system was delivered by Veljekset Ala-Talkkari. The boiler chosen was a LAKA PS 300 manufactured by Laatokattila. A spring unloader manufactured by Ala-Talkkari feeds wood chips to a screw conveyor. The chips are burned on a moving grate. A 300 kW oil-fired boiler, installed in the same container serves as a back-up heating system.

According to the representative of Bovallius Foundation, the heat entrepreneur system was chosen, as heating with wood chips requires more service and maintenance than an oil-fired one, and the employees of the vocational institute had no time for attending to heat generation. Arto and Mika Utriainen took the overall responsibility for the operation and fuel supply of the station. In practice, this involved responsibility for fuel availability, operability of the boiler, and continuous on-call-duty. The space heated is about 10200 m<sup>3</sup>. The length of the district heat network is 350 m.

In 2003, 1080 bulk m<sup>3</sup> of wood chips were combusted, equal to about 600 MWh heat.

### Wood chips deliveries on contractual basis

Arto and Mika Utriainen delivered 1900 bulk m<sup>3</sup> wood chips for the 500 kW boiler of Nikkarila School of Forestry in 2003. Wood briquettes and cutter chips were also used. A 500 kW light-oil boiler serves as emergency system.



*Wood chips storeroom of Nikkarila School of Forestry.*

Arto and Mika Utriainen also delivered 3200 bulk m<sup>3</sup> of wood chips to Naarajärvi Prison in 2003. The prison buildings are heated with a boiler of 800 kW manufactured by PLL Oy

Commercial greenhouses owned by Mr. Keijo Kolehmainen are also heated with wood chips delivered by Arto and Mika Utriainen. The main products are flowers around the year. Christmas flowers are grown from autumn to Christmas and then the greenhouses are left unheated for about 1.5 month. Heating is restarted in early February for the growing season of summer flowers. The greenhouses must be heated to some extent also in summertime, to avoid moisture and disease problems. The heat requirement varies a lot. In nighttime, rather much heat is required, while in daytime the greenhouses are warmed by solar heat. The heated space of the greenhouses is 7200 m<sup>3</sup>, and that of packing room and main building 1200 m<sup>3</sup>. The wood chips consumption in 2003 amounted to 900 bulk m<sup>3</sup>.



*Ash container of Nikkarila School of Forestry.*

	Jäppilä village	Greenhouses Kolehmainen	Nikkarila School of Forestry	Bovallius Foundation	Naarajärvi Prison
Output, kW	1000	300	500	300	800 (1500*)
Boiler type and manufacturer	ARIMAX BIO 1000 moving grate Thermia Oy	ARIMAX BIO 300 S Biojet combustion head Thermia Oy	LAKA PS 500 moving grate Laatikattila Oy	LAKA PS 300 moving grate Laatikattila Oy	PLL -KPA Oy moving grate
Design pressure of boiler, bar	4	4	4	4	4
Design temperature of boiler, °C	120	120	110	110	120
Temperature of flue gases	160	100 - 160	200	160	140
Fuel feed	Double screw feed	Screw feed	Double screw feed	Double screw feed	Screw feed
Chips consumption, bulk m <sup>3</sup>	4050	900	1900	1080	3200
Annual heat generation, MWh	2700	590	only delivery of wood chips	600	only delivery of wood chips
Heated volume of buildings, R-m <sup>3</sup>	35000	9400		10200	
Length of district heating network, m	1700			350	

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