

New Generation of Pellets-Boilers

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The revival of biomass use was actively supported by R&D efforts to improve wood combustion technologies. The result of these efforts was a remarkable development which provided the basis for the growth of the market for wood boilers for domestic heating, industrial process heat applications and district heating. Converging forces for the market deployment of high-efficient and environment-friendly biomass-boilers are new standards in EU-member countries concerning efficiency and emissions of heating systems.

In low-energy housing biomass heating systems have to meet the requirements of both efficient and environmentally acceptable heating systems: High automation and operation safety, low noise and dust emissions, optimisation of efficiency and emissions to be achieved under operating conditions when the heat demand of the building is 30% below the peak heat demand, taking into account “stop and go” operation mode. Therefore, the ratio of burning period to interval period biomass heating systems has to be minimised by a buffer store, and the hot water preparation during the summer period should be covered by other sustainable energy sources, e.g. solar energy.

The operating comfort of biomass boilers could be improved by features of full automatic operation and a similar comfort as oil or gas fired boilers: *woodchips-* and *pellets-boilers*; Figure 1 and Figure 2. Within series production of small biomass heating systems, especially cost-effective products of pellets-boiler are offered on the market nowadays.

Pellets offer the possibility to use wood as a fuel without any reduction of convenience in comparison to heating oil or natural gas. Pellets are transported in a tank lorry and pumped dust-free into a storage. From there, they are fed to automatically working pellet furnaces; Figure 3. Operating data of pellets-boilers are documented in Table 1.

Pellets boilers are ideal auxiliary heating devices for solar combined heating systems; Figure 4.

Today, pellets boilers are fully developed in a number of options and environment-friendly in every respect. Heating with pellets is economical at the current (December 2002) price level of heating oil and natural gas.

Main elements of advanced pellets boilers are:

- controlled burning
- high automation and operation safety
- low noise and dust emissions
- high efficiency under operating conditions when the heat demand is 30% below the peak heat demand
- combination with solar thermal and/or heat recovery.

New on the market is a storage-integrated pellets-burner. This compact system supports both high efficient use of pellets and cost-effective installation; Figure 5a to 5d and Figure 6.

Table 1
Operating data of 15 Pellets-boiler from Austrian producers
 Tests : Bundesanstalt für Landtechnik, Wieselburg/Austria, 2002

Characteristically data	Load	Unit	Best	Worst	Average	Maximal allowed (2)
CO	100%	mg/MJ mg/Nm ³	9	218	72	500
			14	334	110	
	30%	mg/MJ mg/Nm ³	65	557	204	750
			99	857	312	
C_xHy	100%	mg/MJ mg/Nm ³	1	3	1,5	40
			1	4	2,1	
	30%	mg/MJ mg/Nm ³	1	11	3,8	
			1	17	5,2	
O₂	100%	%	5,1	9,4	7,3	
	30%	%	10,3	15,1	12,0	
Efficiency	100%	%	92,3	86,7	89,5	
	30%	%	92,8	83,4	87,6	
NO_x	100%	mg/MJ mg/Nm ³	52	101	76	150
			76	137	105	
Dust	100%	mg/MJ mg/Nm ³	5	22	10,5	60
			8	34	16,3	
Electricity demand (1)	100%	%	0,2	1,4	0,7	
Radiate emissions	100%	%	0,7	4,2	1,7	

1) Related to design load, 2) Legal code in Styria/Austria

More information:

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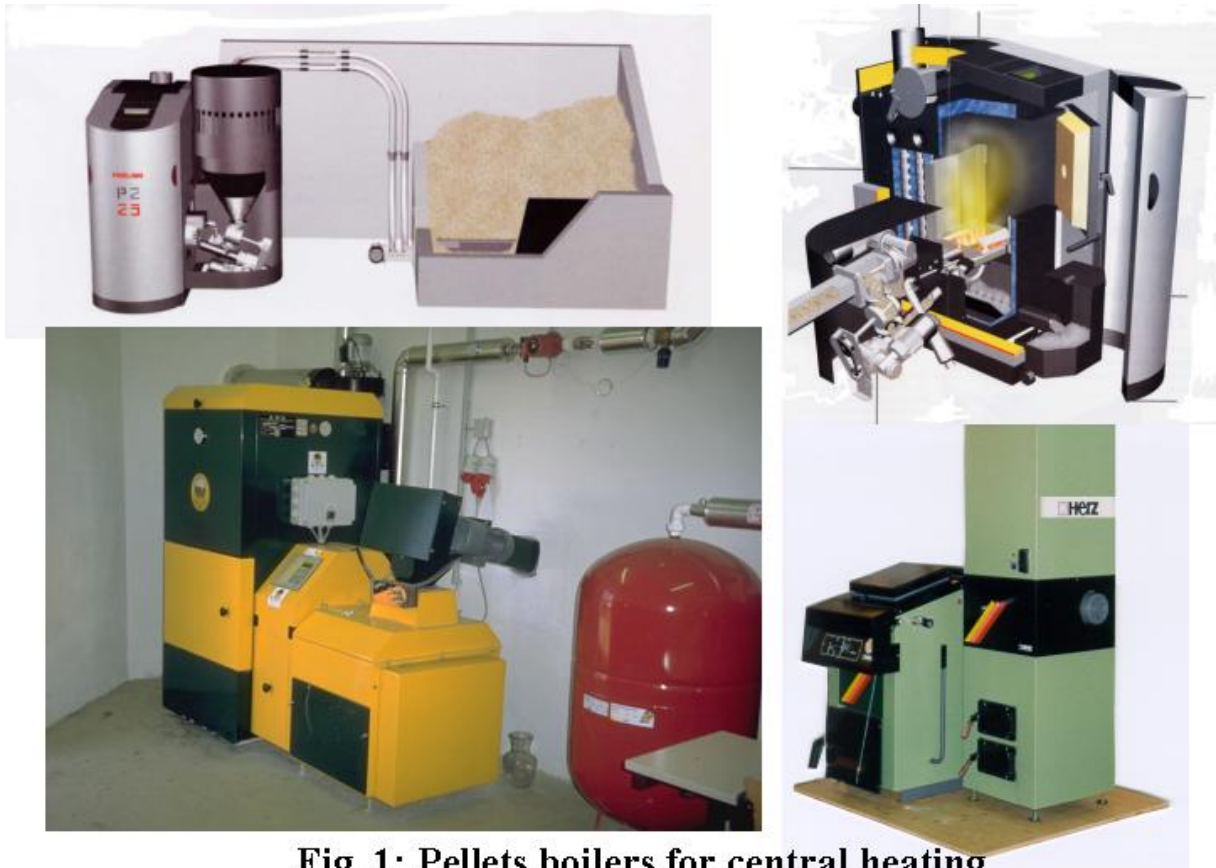


Fig. 1: Pellets boilers for central heating



Fig. 2: Pellets boilers for decentralised heating



Fig. 3: Pellets heating system for housing estates

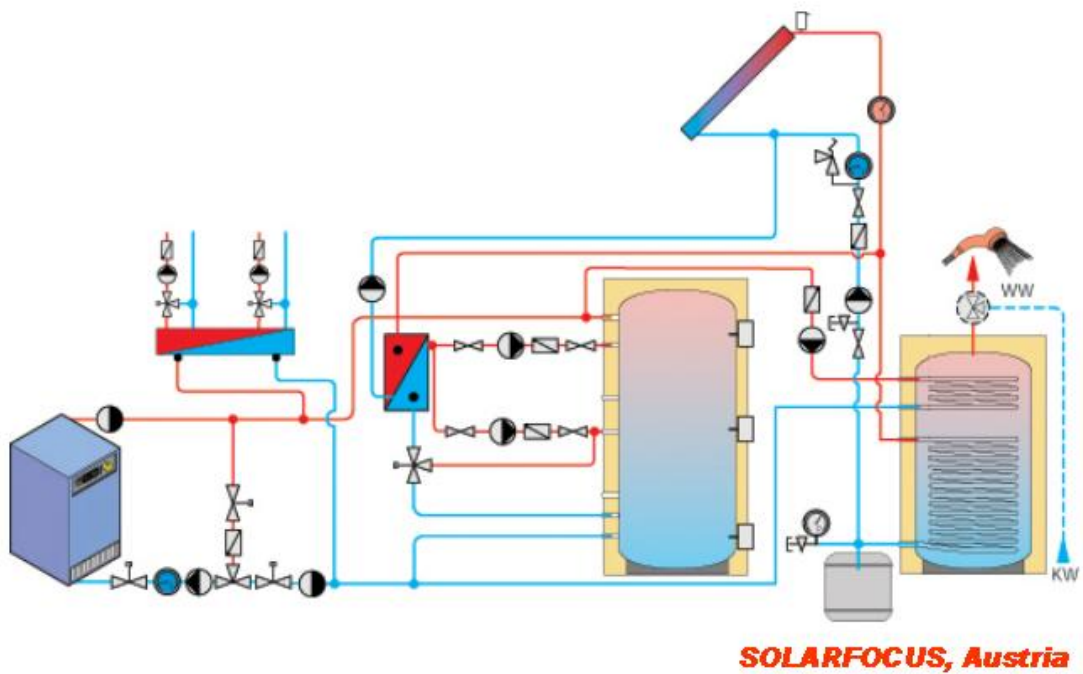


Fig. 4: Combined solar-pellets heating system



**Combined
Solar-Pellets Storage
Pellet^{plus}**

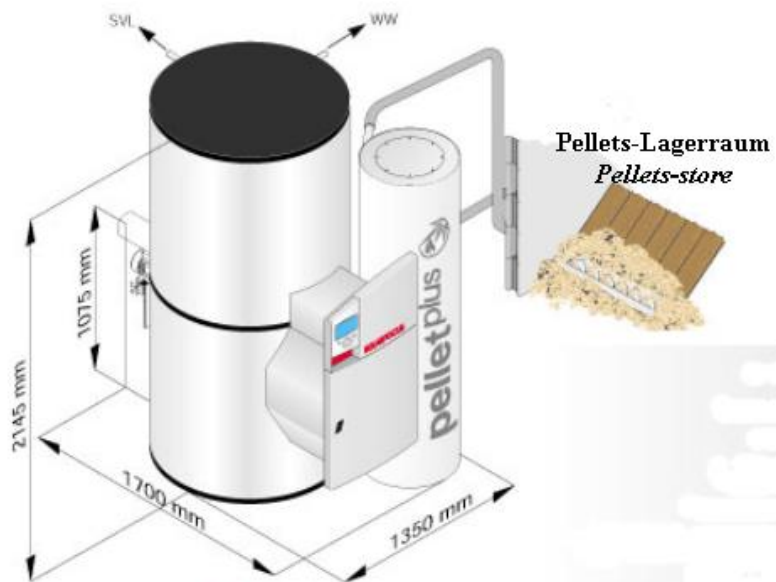
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**Load:
3,9 kW – 14 kW**

**Storage volume:
800 litre + 60 litre**

Fig. 5a: Combined solar-pellets heating unit

- SVL: Solar-Vorlauf**
Collector flow-pipe
- WW: Warmwasser**
Hot water
- HRL: Heizungs-Rücklauf**
Heating return-pipe
- HVL: Heizungs-Vorlauf**
Heating flow-pipe
- SRL: Solar-Rücklauf**
Collector return-pipe
- Entl.: Entleerung**
Emptying
- KW: Kaltwasser**
Cold water



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Fig. 5b: Solar installation for combined solar-pellets boiler

- 1 Thermo-Schichtladelanze
Loading tube for thermal stratification
- 2 Schichtrohr-Wärmetauscher
Tube heat exchanger
- 3 Low-Flow Wärmetauscher
Low-Flow heat exchanger
- 4 Trinkwasser-Wärmetauscher, Edelstahl
Hot water heat exchanger, high-grade steel
- 5 Isolierung, 90 mm, mit Alublech
Heat insulation, 90 mm, with Alu-surface
- 6 Heizungs-Vorlauf
Heating inlet
- 7 Heizungs-Rücklauf
Heating outlet
- 8 Solar-High-Flow-Wärmetauscher
Solar-High-Flow-heat exchanger

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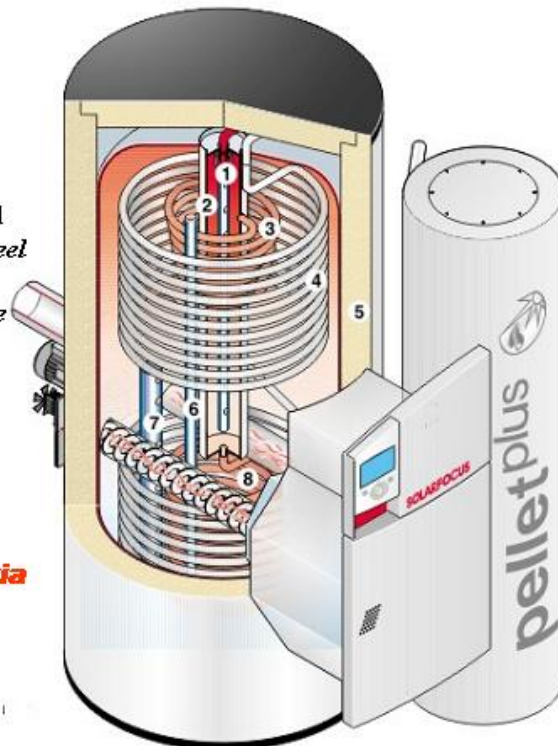


Fig. 5c: Water storage for combined solar-pellets boiler

- 1 Pellets-Vorratsbehälter
Pellets store
- 2 Saugturbine
Suction turbine
- 3 Förderschnecke, Antrieb 100 W
Screw conveyor
- 4 Edelstahl-Kesselkörper
Boiler, high-grade steel
- 5 Brennrost
Burner roast
- 6 Lambda-Sonde
Lambda Detektor
- 7 Glühstab, 260 Watt
Electrical heater
- 8 Sekundär-Luftklappe mit Stellmotor
Secondary-air flap with regulator motor
- 9 Primärluftkanal
Primary air-channel
- 10 Aschenraum und Türe
Ashes container and door
- 11 Wärmetauscher mit automatischer Reinigungseinrichtung
Heat exchanger with automatically cleaning
- 12 Saugzugbläsemotor, Leistungsregelung
Fan motor regulated by Lambda detector

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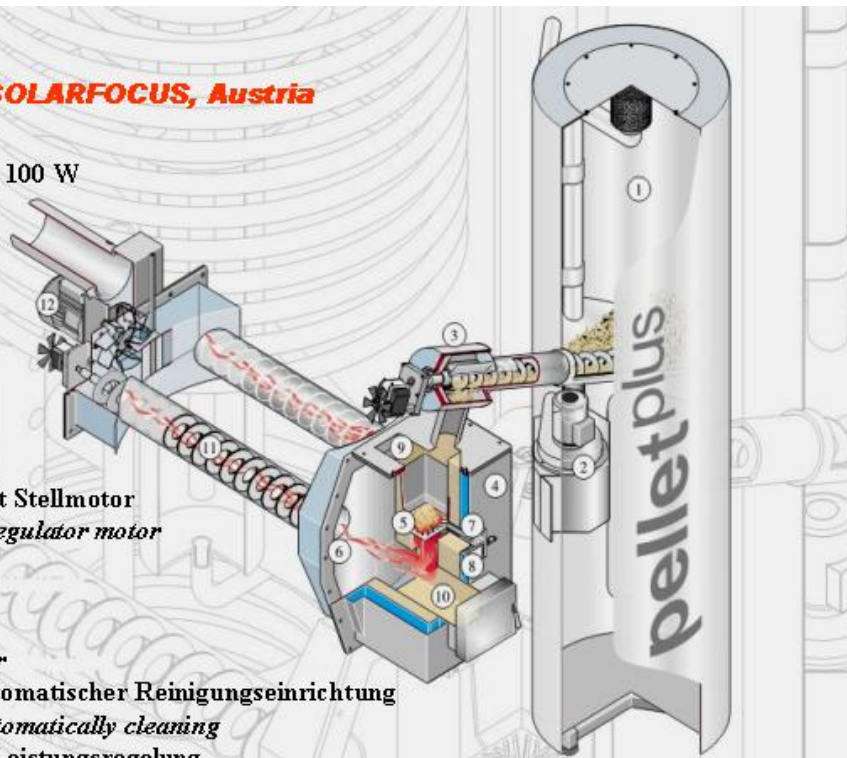


Fig. 5d: Pellets store and pellets burner

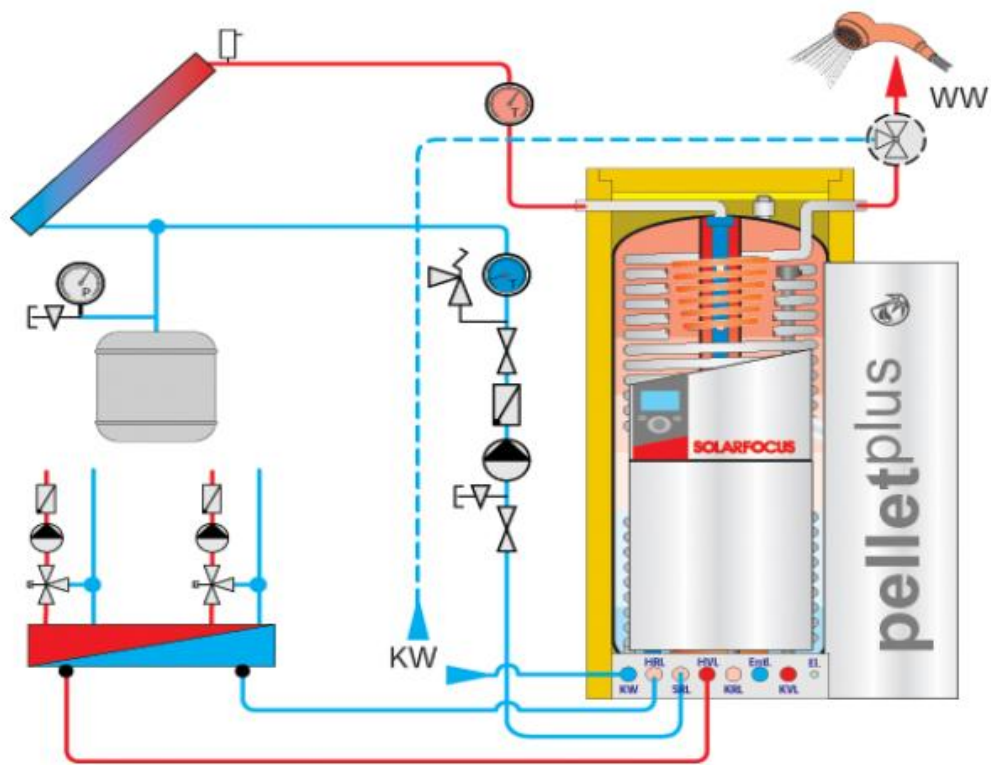


Fig. 6: Combined solar-pellets heating system

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