POLYCITY

SIXTH FRAMEWORK PROGRAMME

SUSTAINABLE ENERGY SYSTEMS

Demonstrator for clean biomass combustion in urban areas

Organisation name of lead contractor for this deliverable: **SWE**

Author: Jochen Fink

Table of contents

1 WOOD-FIRED COGENERATION POWER PLANT SCHARNHAUSER PARK . 3

2 TECHNICAL DATA 4

3 POWER GENERATION VIA ORC PROCESS 5

4 TOTAL INVESTMENT 6

1 Wood-fired cogeneration power plant Scharnhauser Park

In order to ensure an environmentally friendly heat supply of the area Scharnhauser Park, a wood fired cogeneration power plant was constructed and built by the company Stadtwerke Esslingen (SWE) and its partners. The ambition is to achieve a CO2 neutral production of heat for the whole district with a rate of 80%. State of the art feed grate firing including exhaust recirculation and a fully automated control of the vessel ensures a complete combustion and a minimum occurrence of thermal NOx-emissions.

Fig. 1 View on the biomass power plant

The heat produced in the biomass combustion chamber is transferred to a thermo-oil circuit via a special heat exchanger on top of the vessel. This allows a variable performance of the plant either in cogeneration-mode with production of electrical power or as a common district heating station. In this case the ORC module is bypassed and the heat is provided directly to the heat net.

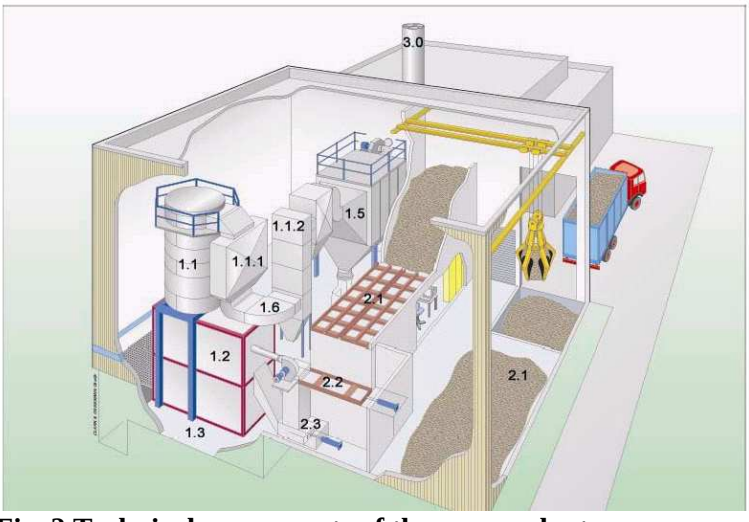

Fig. 2 Technical components of the power plant

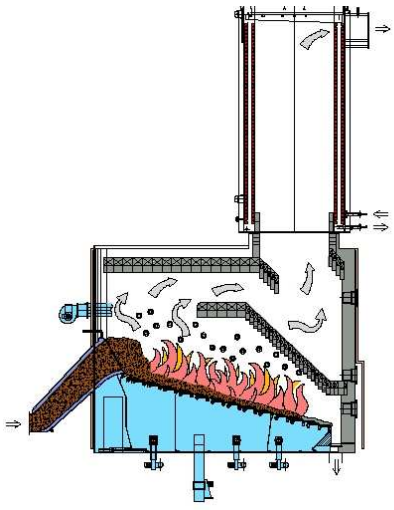

Fig. 3 Scheme of the biomass vessel

2.1 to 2.3	Fuel store, sliding floor activator and fuelportioning units
1.1	Thermo-oil heater
1.1.1	Economiser (thermo-oil and hot water)
1.1.2	Air pre-heater
1.2	Firing
1.3	Automatic ash removal
1.5	Dust removal zyclon and electro-filter
1.6	Smoke channel
3.0	Chimney

2 Technical data

Technical data biomass power plant	
Thermal power wood combustion	6000 kW_{th}
Electrical power ORC module	1000 kW_{el}
Thermal power ORC module	4650 kW_{th}
Capacity of wood storage	1400 m^3
Wood consumption full power	200^3/day
Annual wood consumption	63.000 m^3/year
Wood source Landscape conversation / forestation	70% / 30%
Heat production (final extension)	~ 38mill. kWh/year
Electrical power generation	~ 5.4mill. kWh/year
Fossil fuel savings	~ 40mill. kWh/year
Reduction CO_2 emissions	~7.000 tons/year
Start of construction	April 2003
Start of run	June 2004

Prescribed limits of emission in urban areas:

Emissions:	NOx	CO	dust	total carbon
[mg/m^3 exhaust]*	250	150	20	10

*Related to a rate of 11% O_2 in exhaust fumes

The exhaust gas cleaning is performed by a dust separator (cyclone) installed after the boiler, which retains the dust particles from the combustion chamber. The cyclone is attached to an electro-filter, which ensures that a dust content of 20 milligrams per cubic meter is not exceeded.

3 Power generation via ORC process

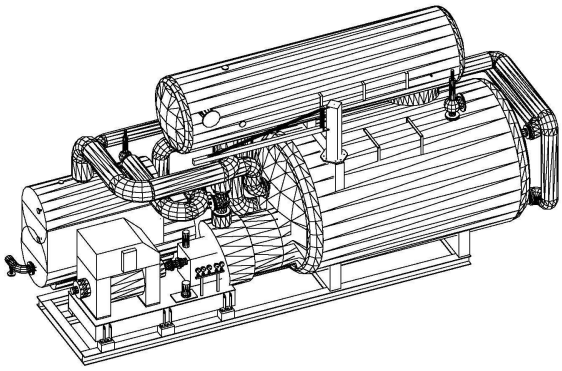

Fig. 4 Model of the ORC-Module

The generation of the electrical power takes place in an ORC process. This process does not require high pressure and can therefore be installed with relatively little operating and personnel costs. Additionally ORC units in general are characterised by a good partial load performance, a fact that is particularly significant, when the plant is operated within a heating network. The plant reaches a fuel consumption degree of over 80%

4 Total investment

	Net Investment in Euro
Wood firing with thermo-oil heater	approx. 2,100,000
ORC plant	approx. 1,650,000
Building and incidental costs	approx. 1,450,000
Total amount	**5,200,000**
State subsidy	738,000