

Case Studies in Castilla y León - Spain

Conference
HEATING WITH BIOMASS IN THE
TERTIARY SECTOR

Expo Athens exhibition centre
Thursday, 7 April 2011

Santiago Díez Castilla (EREN)



EREN – REGIONAL ENERGY AGENCY FOR CASTILLA Y LEON (SPAIN)

- EREN is a public organization of the Government of Castilla y León.
- It was created by Regional Law in 1997.
- Main objectives and functions:
 - To achieve a competitive and well balanced energy system.
 - To promote a reduction of energy intensity.
 - To reduce energy dependence from abroad.
 - To improve security and quality for energy supply.
 - To promote and develop energy programs and renewable systems.
 - To elaborate studies and recommendations for enterprises.
 - To advise in regional energy planning.
 - To develop energy rules and regulations.
 - To promote investments in the sector.
 - To manage subsidies.

Ente Regional de la
Energía



Energy situation

Concept	World	EU27	Spain	Castilla y León
Primary energy production (Mtoe/year)	12.000	850	31	5
Primary energy consumption (Mtoe/year)	12.000	1.800	147	10
Distribution of primary energy consumption (fossil - nuclear - renewable) (%)	81 - 6 - 13	79 - 13 - 8	83 - 10 - 7	92 - 1 - 7
Distribution of renewable primary energy consumption (hydraulic - wind - solar - geothermal - bioenergy) (%)	18 - 3 - 1 - 1 - 77	19 - 7 - 1 - 4 - 69	23 - 23 - 1 - <1 - 53	49 - 20 - 3 - <1 - 28
Distribution of biomass primary energy consumption (heat - electric - transport) (%)	-	50 - 37 - 13	70 - 23 - 7	62 - 26 - 12
Final energy consumption (Mtoe/year)	8.300	1.150	108	7
Distribution of final energy consumption (industry - transport - residential - services and agriculture) (%)	37 - 28 - 23 - 12	28 - 33 - 24 - 15	34 - 38 - 15 - 13	27 - 39 - 22 - 12
Primary Energy Intensity (toe/M€)	258	169	179	186
Primary Energy Consumption per Capita (toe/capita)	1,8	3,6	3,3	4,1

Thermal Bioenergy in Castilla y León. 2010

Type of project	Number of facilities	Power (MW _{th})	Thermal Energy Production (ktoe/year)	Primary Energy Consumption (ktoe/year)
Facilities with biomass	25.950	344	58	129
Facilities with biogas	5	2,9	1	1,3
Facilities with bioliquids	0	0	0	0
Total	25.955	347	59	130

- Historical development in wood and furniture industries.
- Incipient development of small facilities in the tertiary sector.

Thermal Bioenergy in Castilla y León. 2010

Thermal facilities	Number of facilities	Power (MW _{th})	Thermal Energy Production (ktoe/year)	Primary Energy Consumption (ktoe/year)
<i>Facilities with biomass</i>	Nº	MW _{th}	ktoe/year	ktoe/year
Thermal facilities in individual houses and buildings	5.565	140	15	20
Traditional firewood facilities	20.264*	65*	14	70
District heating	2	6,8	0,7	1
Thermal industrial facilities	119	132	28	38
<i>Facilities with biogas</i>	Nº	MW _{th}	ktoe/year	ktoe/year
Thermal use of biogas from sewage sludge	5	2,9	1	1,3
Thermal use of biogas from agricultural residues	0	0	0	0
<i>Facilities with bioliquids</i>	Nº	MW _{th}	ktoe/year	ktoe/year
Thermal use of bioliquids	0	0	0	0
<i>Total</i>	<i>25.955</i>	<i>347</i>	<i>59</i>	<i>130</i>

Thermal Bioenergy in Castilla y León. Future

Expected Future		Year			
		2013	2015	2017	2020
Power	(MW _{th})	535	700	1.100	1.200
Thermal Energy Production	(ktoe/year)	75	105	190	220
Primary Energy Consumption	(ktoe/year)	125	140	250	275

- Yesterday, there were some consumers who had their own biomass.
- Today, there are a lot of new consumers who buy biomass.

Thermal Facilities	Power (MW _{th})
Small domestic facilities	80
Automated boilers for buildings	695
District heating	80
Industrial facilities	340
Thermal use of biogas from sewage sludge	5
Total	1.200

Nowadays, we have quite an important number of examples in Spain

Residential and Tertiary Heating:	Year	Power
+ District heating in Cuéllar	1998	6 MW _{th}
+ District heating in Cuéllar Las Navas del Marqués	2005	1 MW _{th}
+ Casar del Puente Hotel in Boca de Huérgano	2005	50 kW _{th}
+ Buildings in Salamanca	200x	xxx kW _{th}
+ Sports building in León	2006	300 kW _{th}
+ Agricultural Engineering School in Soria	2007	500 kW _{th}
+ Cesefor Foundation in Soria	2007	300 kW _{th}
+ Environmental Centre in Valladolid	2008	250 kW _{th}



Case 1: Santa Bárbara Foundation

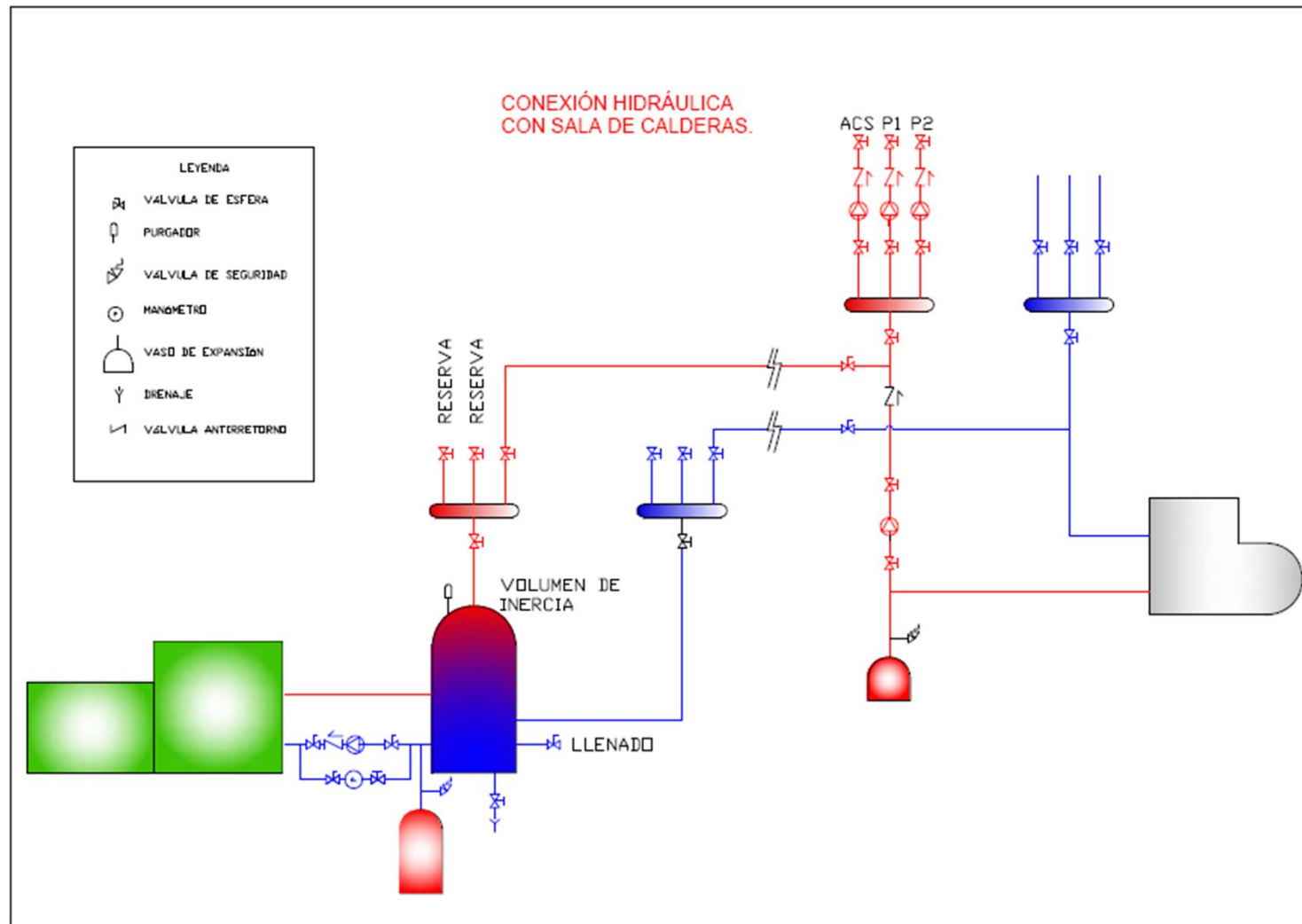


Case 1: Santa Bárbara Foundation

- 1 kWb multifuel boiler, 150 kW_{th}.
- Fuel: first a lot for testing, in normal, pellets.
- Final uses: heat and hot water, 50 MWh/year.
- Type of consumer: educational building, with 3 floors, 1.000 m².



Case 1: Santa Bárbara Foundation



Case 1: Santa Bárbara Foundation

- Demonstrative KWB boiler with a special assembly of boiler room and storage room.
- Several types of biomass tested considering maintenance service and monitoring, according to a specific protocol.
- Report of feeding systems events:
 - Storage room – intermediate hopper.
 - Intermediate hopper – boiler.



Case 1: Santa Bárbara Foundation



Case 1: Santa Bárbara Foundation

No incidents in transport system with different types of biomass.

Feeding problems with low quantity of pellets and chips in the storage room (rotary stirrer does not feed the stoker).

Slight slagging in ash box, combustion chamber and smoke pipe.

It is needed a setup tuning of fuel factor with chips.

Average heat production rate: 3,6 kWh/kg.

Case 1: Santa Bárbara Foundation

	Heat (kWh/kg)	Ash
Pine pellets	3,59	2,86%
Pine chips	3,07	1,53%
Oak chips	2,98	0,58%
Poplar chips	2,10	2,62%
Pineapple shells	3,68	1,37%
Hazelnut shells	3,57	1,75%
Almond shells	3,42	1,19%
Olive stones	3,41	0,67%
Pawlonian chips	3,33	3,00%

Case 2: Real Church of San Isidoro



Case 2: Real Church of San Isidoro

- 2 BIOTECH pellet boilers, power: 200 kW_{th}.
- Fuel: pellets, 50-100 t/year.
- Use for heat, 200-400 MWh/year.
- Type of consumer: huge religious building which is opened over 24 h/day, 365 days/year.



Case 3: Cenit Solar (private enterprise)

- 1 KWB multifuel boiler, power: 150 kW_{th}.
- Fuel: pellets, 30 year.
- Final use: heating and cooling, and hot water, 150 t/year.
- Type of consumer: office building, with 3 floors and an annex warehouse, 1.000 m².



Thank your very much.

www.eren.jcyl.es

eren@jcyl.es

diecassa@jcyl.es

T 0034 987849393

F 0034 987849390

Santiago Díez Castilla

