



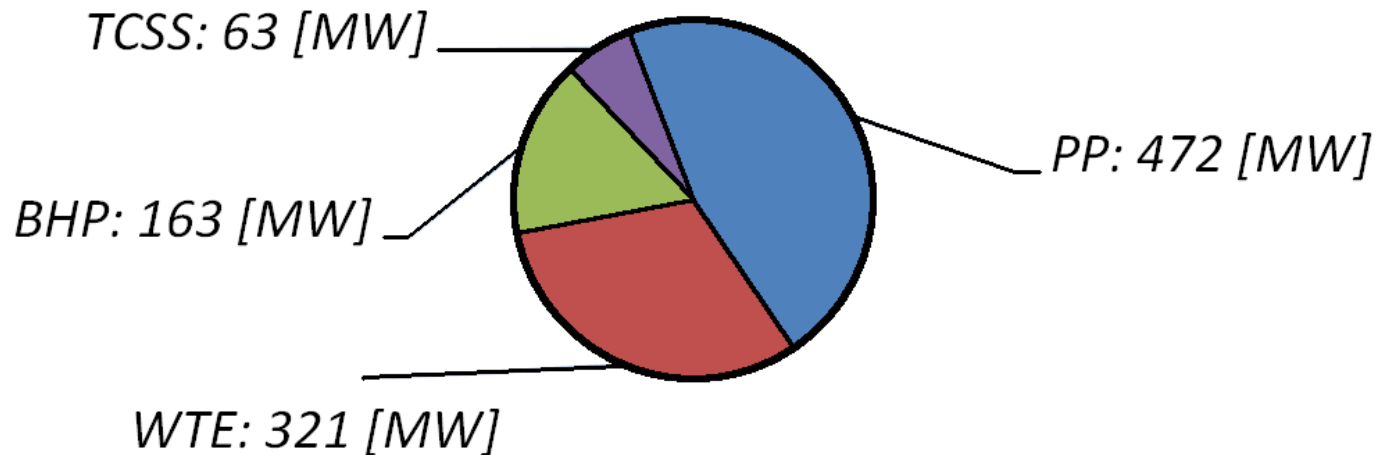
Biomass Utilization in Fluidized Bed Combustors in Austria, Flue Gas Cleaning

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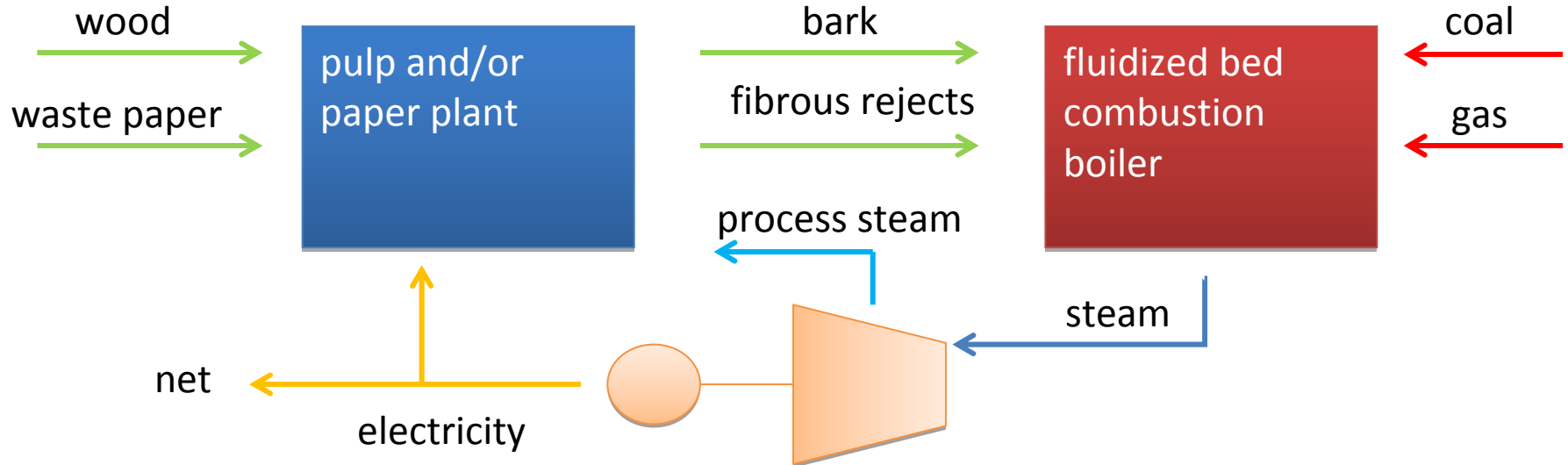
Situation in Austria

industrial sector	number of facilities	capacity range min/max	installed capacity	percentage
Pulp & Paper	8	13 – 133 MW	472 MW	46 %
Waste to Energy	7	3 – 110 MW	321 MW	32 %
Biomass heat- ant –power plants	3	47 – 66 MW	163 MW	16 %
Treatment of communal sewage sludge	5	1 – 20 MW	63 MW	6 %
total	23	1 – 133 MW	1.019 MW	-



Pulp and Paper related boilers

- Most of the boilers were installed between 1983 and 1996 to cover the main load of the energy demand of the related plants.
- Thermal capacity from 13 to 133 MW.
- Typical fuels are rejects of the P&P industry, bark and coal.



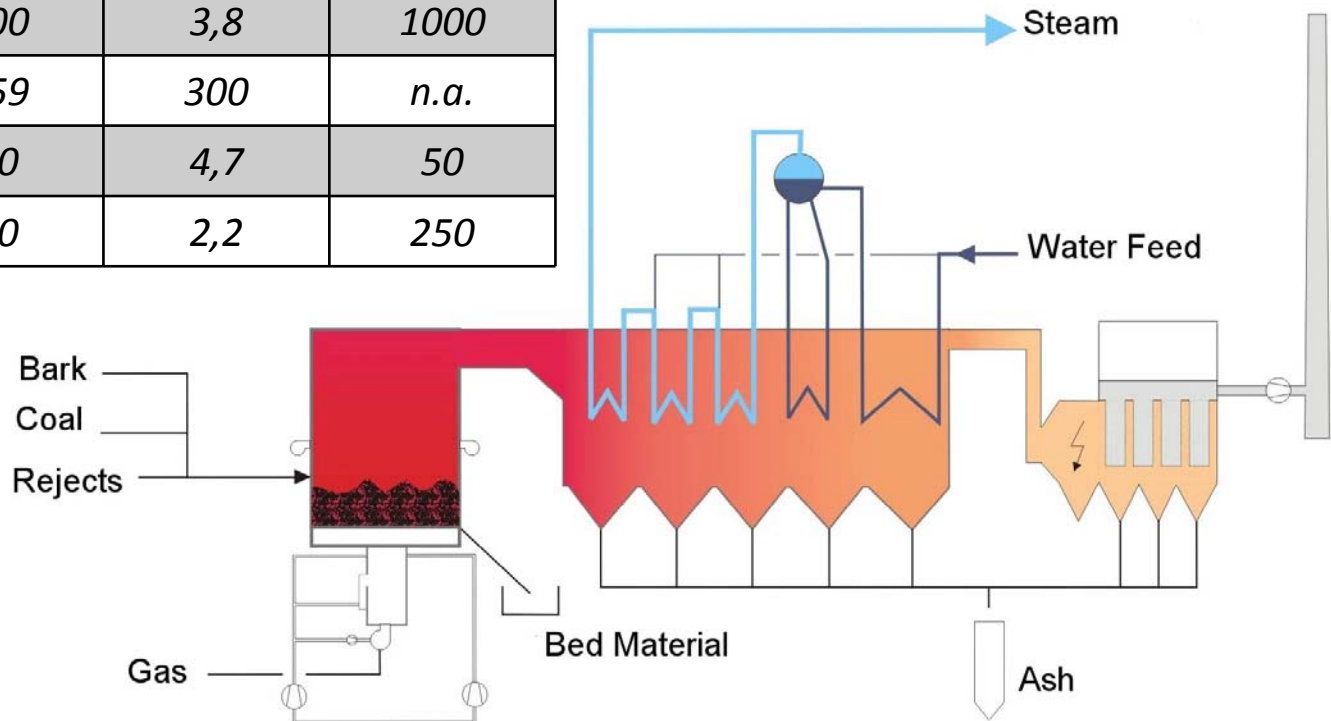
Example: Fuels



Fuel	consumption (t/year)	calorific value (MJ/kg)	Moisture (%)	ash content
Fibrous rejects	77.000	8 -11	35 -45	35 – 45
Bark	12.000	18 - 20	40 – 60	2 – 10
Coal	200	28-33	0,1 – 1	2 -3

Example: Flue Gas Cleaning

Emission Standard (mg/m ³)	Single measured (mg/Nm ³)	Emitted mass (t/year)	EG-K, half hourly av. (mg/Nm ³)
SO ₂	100	3,8	1000
NO _x	159	300	n.a.
Dust	20	4,7	50
CO	50	2,2	250

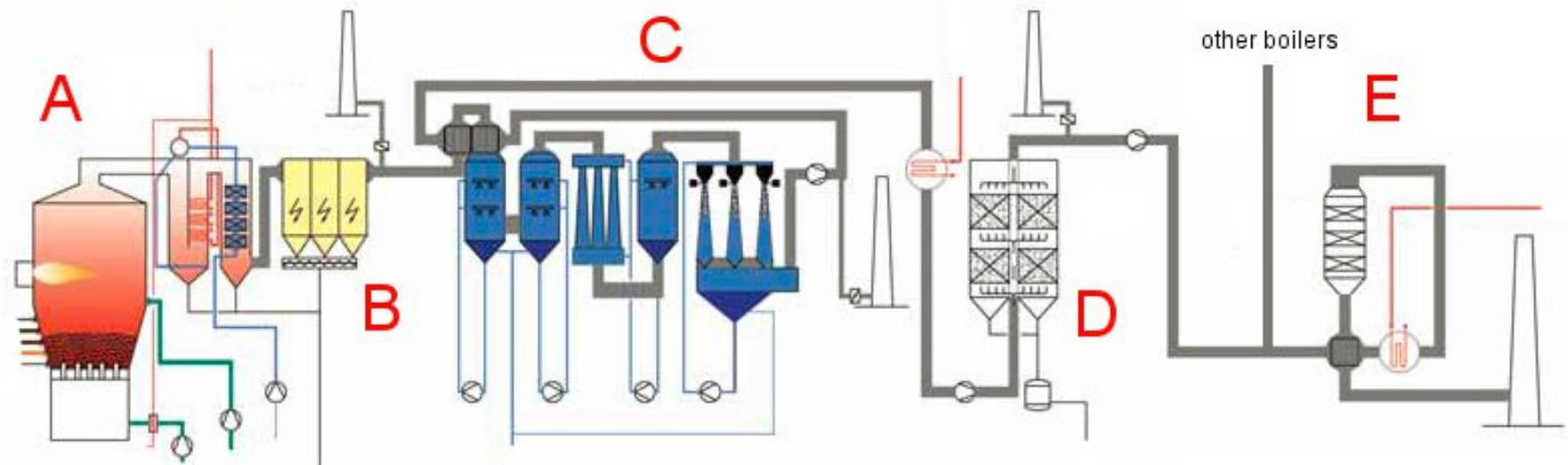


Treatment of Communal Sewage Sludge

- Boilers exclusively using sewage sludge
- 2 Boilers for decentralized treatment of communal sewage sludge (1 MW; ~3MW)

Example

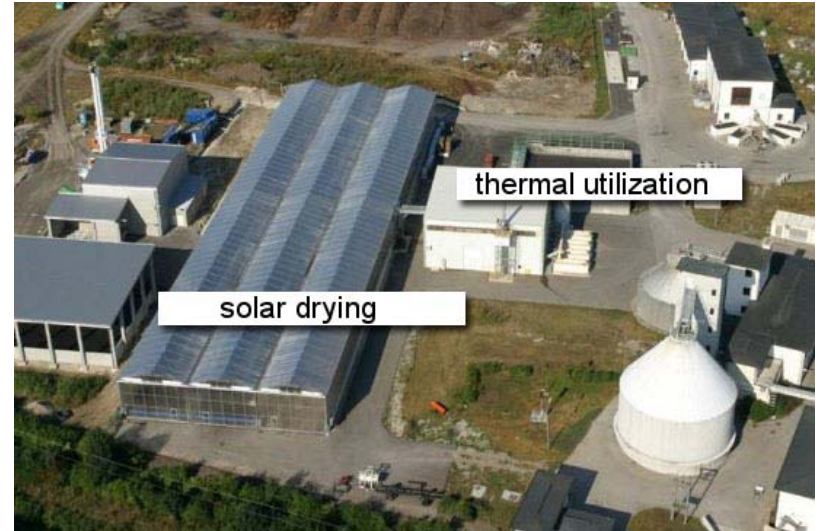
- 3 Boilers working parallel in the municipal area Vienna (3 x 20 MW)
- 95% communal sewage sludge
- 5% others
- 160.000 to 200.000 tons/year



A) fluidized bed boiler, B) electrostatic precipitator, C) wet scrubbers, D) fixed bed activated carbon absorber, E) selective catalytic reduction (SCR), [modified, Umwelterklärung 2006 Werk Simmeringer Haide der Fernwärme Wien Ges.m.b.H.]

Example

- Decentralized treatment of sewage sludge.



Sewage sludge
14.000 t/y
(70 % moisture)

Solar drying/
drying

Sewage sludge
(50 % moisture)

fluidized bed
combustion
boiler

750 kW
thermal

heat



Waste to Energy

- Since the tightening of the legal standards of the disposal of organic carbon thermal utilization of waste has increased.
- Advantages of FBC´s
 - Even operating conditions
 - Wide range of fuels quality
- Disadvantages
 - Requirements of the particle size distribution of the fuels
 - metal objects e.g. wire may cause problems in operation
 - increased investment cost

Example: Overview

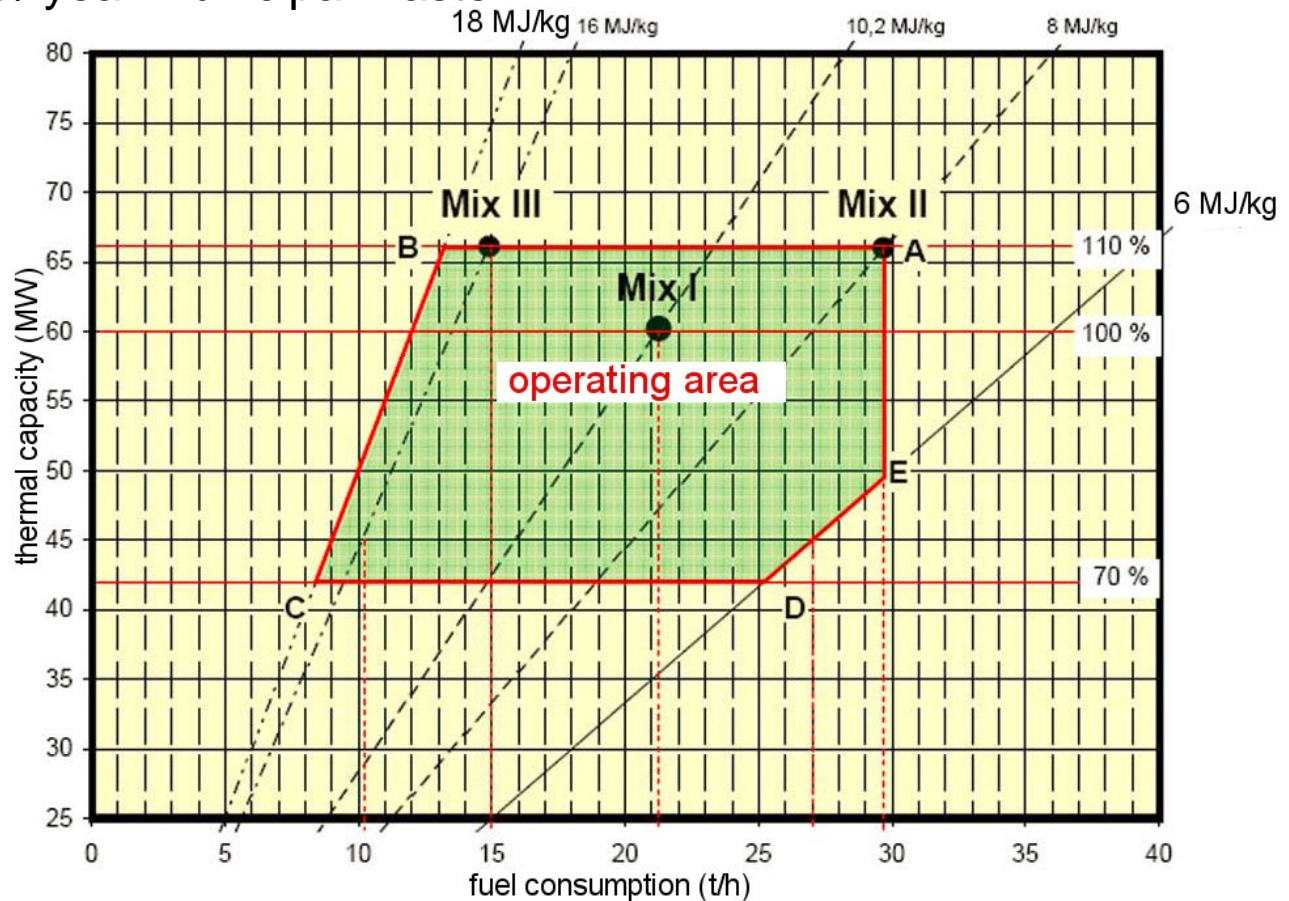
- Situated within a municipal area
- Provides district heating (max. 40MW)
- Provides electricity (max. 20MW)
- Fuel mixture of municipal waste and communal sewage sludge
- thermal capacity of 66 MW
- 170.000 tons / year



[Linz Strom AG]

Example: Fuels

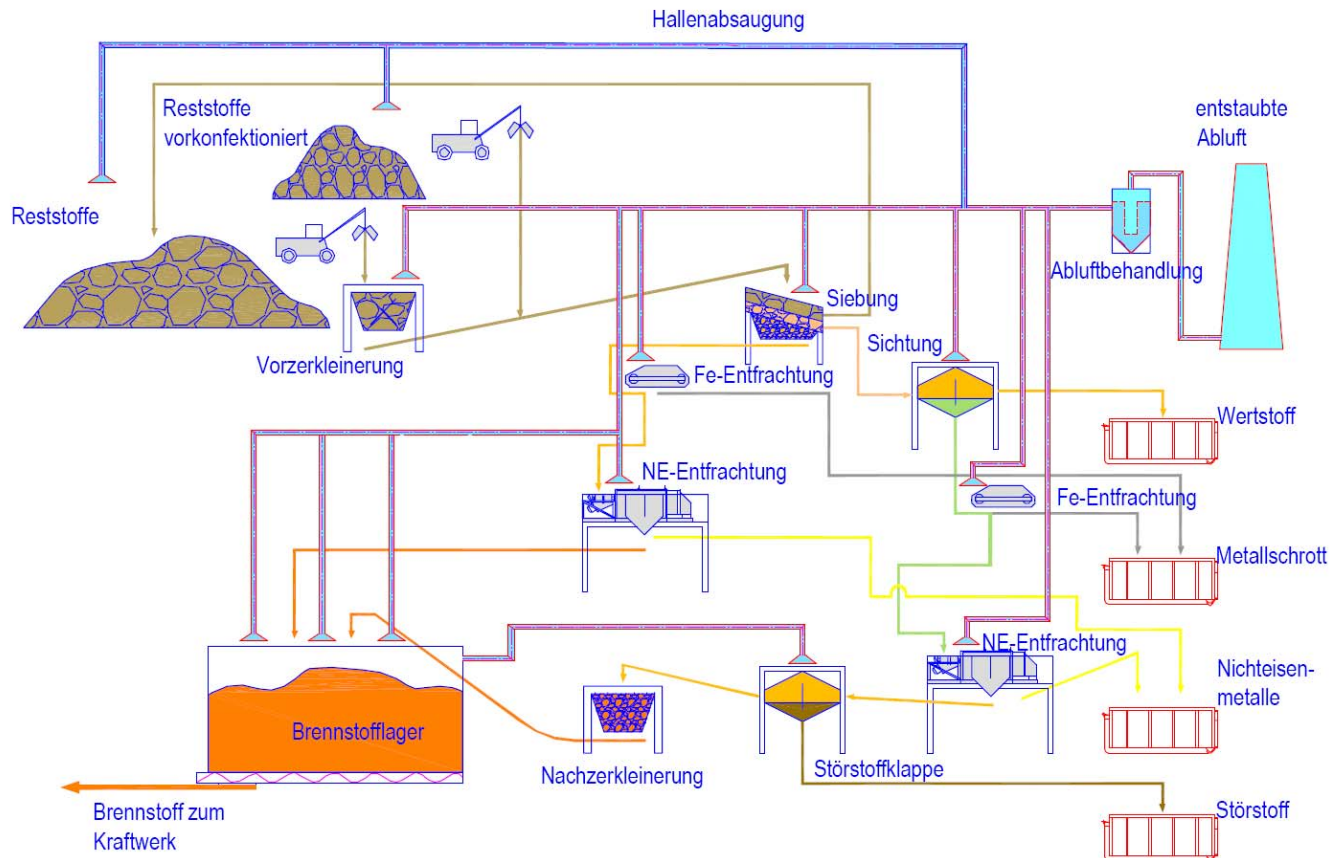
- 50.000 t / year communal sewage sludge
- 120.000 t / year municipal waste



[modified, Linz Strom AG]

Example: Fuels

- Sewage sludge and municipal waste is delivered by truck (by ship is possible)
- Municipal waste is conditioned mechanically on site



Example: Fuels

- Conditioned fuel is transported to the boiler by a 300m long closed belt conveyor



[Linz Strom AG]

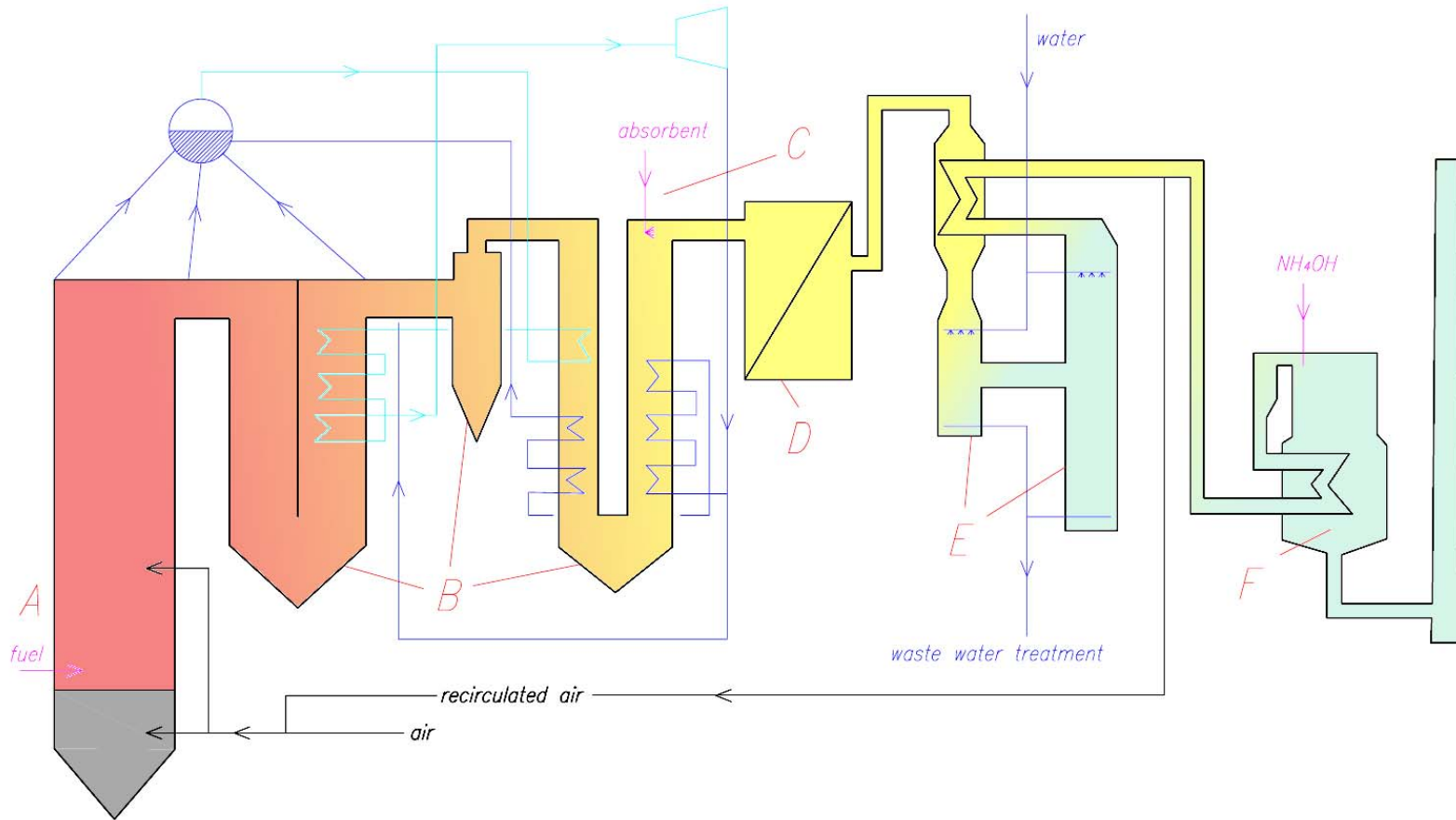
Example: Flue Gas Cleaning

- An elaborate flue gas cleaning system is required

emissions (mg/m ³)	hourly average	daily average	yearly average
NO _x	70	70	50
CO	100	50	50
SO ₂	50	35	20
Dust	8	5	5
PM 10	5	5	5
HCl	7	7	7
NH ₃	5	5	5
Cd +Ti	0,05	0,05	0,05
PCDD/PCDF	10 ⁻⁷	10 ⁻⁷	10 ⁻⁷

[Linz Strom AG]

Example: Flue Gas Cleaning



A) fluidized bed combustor; B) gravitational and/or centrifugal separators, C) dry flue gas cleaning, D) baghouse filter or electrostatic precipitator, E) wet scrubbers; F) selective catalytic reduction (SCR)



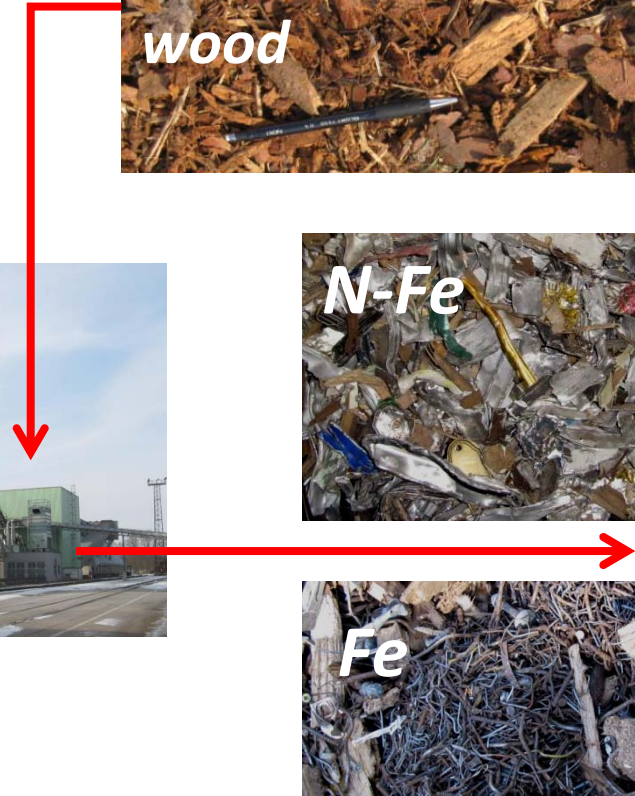
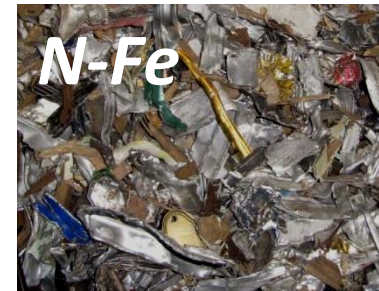
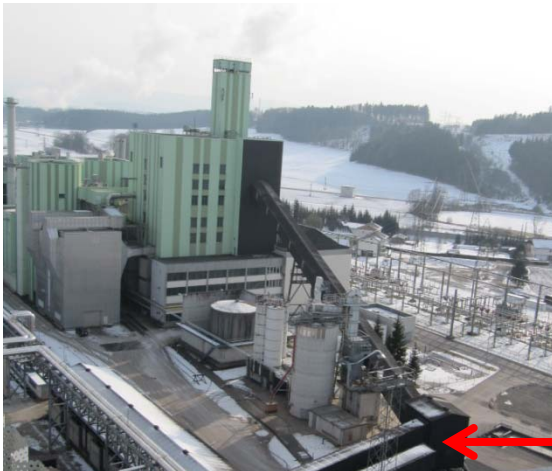
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Biomass heat - and power - plants

Example

- 50 MW thermal capacity
- 151.000 tons / year
- Provides district heating (max. 15MW)
- Provides electricity (max. 15MW)



Example: Fuels

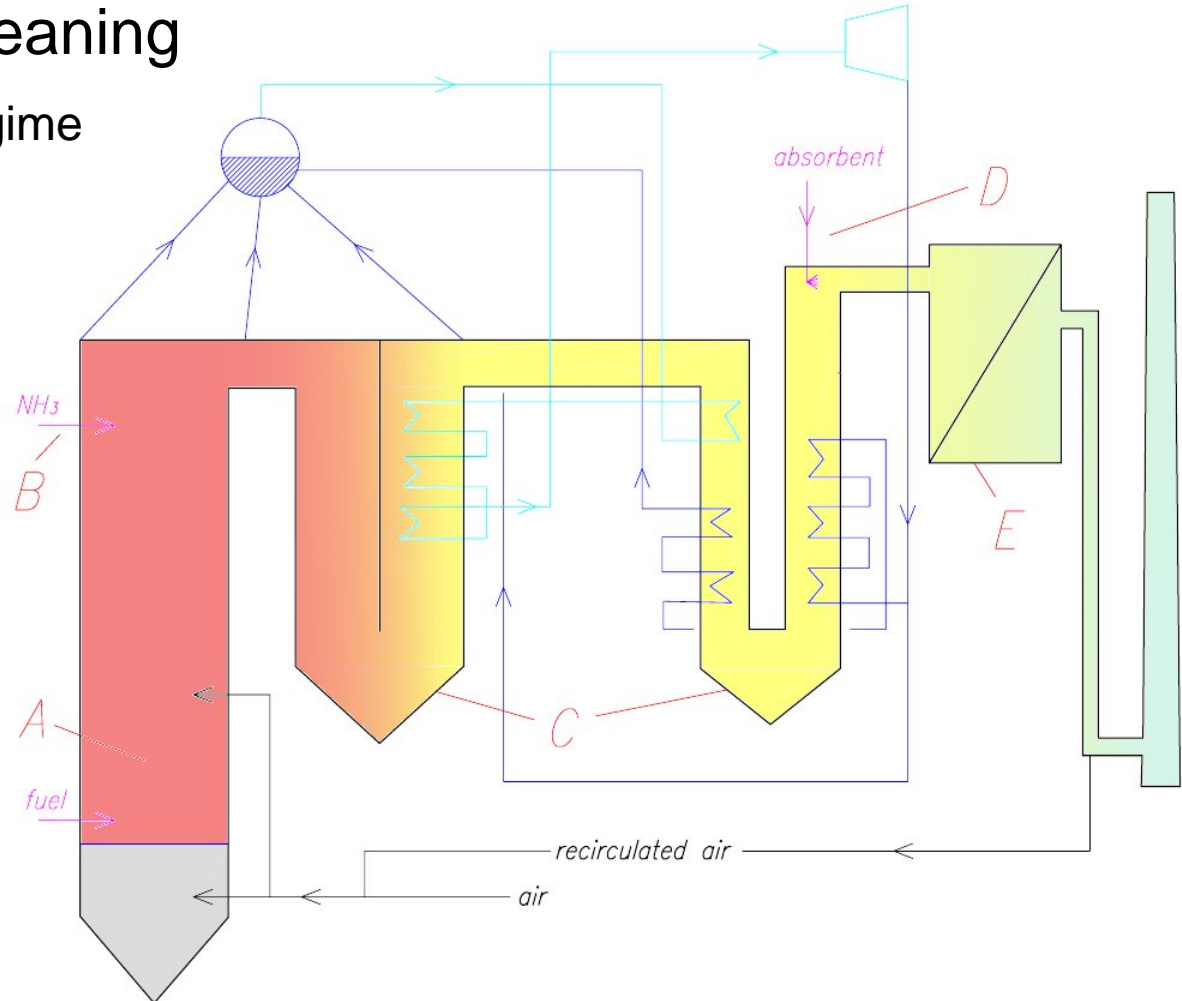
fuels	consumption (t /y)	Calorific value (MJ/kg)	moisture %
bark	27.000	6,6	50 – 60%
waste wood	51.000	13,3	20 – 30%
wood	52.500	10,5	35 – 45%
others	20.500	7,6 - 17	5 – 60%
total	151.000	-	-



Example: Flue gas cleaning

- differ to waste to energy regime
- SNCR except SCR
- no wet scrubbers

- A) bubbling fluidized bed combustor
- B) selective non catalytic reduction
- C) gravitational separator
- D) dry flew gas cleaning
- E) baghouse filter





Thank you for your attention!

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