

BWE BOILERS

BIOMASS CONVERSION/ BIODUST FIRING



WHY CONVERT FROM FOSSIL FUEL TO BIOMASS?

Biomass is a renewable and carbon-neutral energy source, and as such it is a sustainable alternative to fossil fuels. There is a strong political desire to implement renewable energy supply in many countries. This has led to economic incentives for biomass-based energy generation.

Also the emission of especially SO and NO_x tends to be lower for biomass than for fossil fuels. Therefore a biomass conversion of a fossil fired power station can reduce or even eliminate the cost of complying with current and future legislation. An additional advantage is that a biomass conversion allows older units to operate for an extended period under conditions that are both profitable and environmentally sound.

BIOMASS FIRING SYSTEMS

Special biomass characteristics require dedicated solutions that differ from coal firing systems. BWSC offers advanced biomass fuel preparation, dosing and firing systems based on our extensive experience in pulverized fuel (PF) firing.

Existing coal or HFO boilers can be converted to biomass firing, typically based on biomass pellets. This requires an upgrade of the fuel supply and preparation system as well as an evaluation of the boiler suitability and any necessary modifications. In most cases original fuels can be maintained and this increases boiler fuel flexibility.

FUEL SYSTEM

A pellets unloading transport and closed storage system is required. BWSC works in close cooperation with suppliers of such systems.

Silos can either be new silos or reused coal silos modified for pellets. Pulverizing machinery must be optimized for particle size distribution, capacity and power consumption. In some cases existing coal mills can be reused with only minor modifications.

A stable fuel supply is required and this can be obtained by proper design of the fuel dosing system. Fuel is always transported pneumatically to the burners.

REFERENCE PLANTS

Power plant	Country	Conversion type	Fuel before	Fuel after	MWth	t/h	°C	Comm. year
Uppsala HVC	Sweden	Fuel Conversion to Biodust Firing (PF)	Peat (100%) HFO (100%)	Bio oil (100%) Biodust (100%)	132	HOB ²		2018
Avedøre Power Plant Unit 2	Denmark	Fuel Conversion to Biodust Firing (PF)	Oil (100%) NG (100%) Biodust (70%)	Oil (70%) NG (70%) Biodust (100%)	800	1067	582/600 ¹	2014
Køge CHP Plant	Denmark	Upgrade/conversion to biodust	Woodchip (100%) Biodust (30%)	Woodchip (100%) Biodust (40%)	47	70	480	2014
Herning Power Plant	Denmark	Fuel Conversion to Biodust Firing (PF)	Oil (100%) NG (100%) Woodchip (45%)	Oil (100%) NG (100%) Woodchip (45%) Biodust (45%)	292	425	525	2009
Amager Unit 1	Denmark	Fuel Conversion to Biodust Firing (PF)	Oil (100%) Coal (100%)	Oil (100%) NG (100%) Pellets (45%)	352	500	562/540 ¹	2009
Avedøre Power Plant Unit 2	Denmark	Fuel Conversion to Biodust Firing (PF)	Oil (100%) NG (100%)	Oil (100%) NG (100%) Biodust (70%)	800	1067	582/600 ¹	2003
Herning Power Plant	Denmark	Fuel Conversions to Biograte Firing (GF)	Oil (100%) NG (100%)	Oil (100%) NG (100%) Woodchip (45%)	288	425	525	2002

¹ reduced steam temperature during biomass combustion

² heat only boiler

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DESIGN BASIS

To design a robust and reliable biomass solution the following issues must be considered:

- Biomass properties (particle size, moisture, chemical composition)
- Boiler pressure part design (especially superheater pitch)
- Reusable equipment (coal silos, mills, pipes)
- Footprint (mills, dosing units)
- DeNOx/FGD/Ash consequences
- Burner openings (number, sizing)
- Slagging/fouling potential
- Allowable boiler de-rating

PF BURNERS

The BWSC low NOx burners are applied for biomass dust firing allowing advanced air staging and high adjustability to achieve low NOx formation and stable ignition. The burners can be constructed to allow various fuels: biomass/coal/oil/gas.

PELLETS DOSING AND GRINDING WITH HAMMER MILLS (UPPSALA DESIGN)

