PRESSURIZED STEAM FLUIDIZED BED DRYING
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Pressurized Steam Fluidized Bed Drying (PSFBD)

Babcock Borsig Steinmüller GmbH has been active in power plant construction for many decades. The company has extensive experience in the treatment, transport and combustion of fossil energy carriers.

The entry into a new energy era on the basis of renewable energies is about to take place. Indigenous brown coal as fossil energy carrier will have to essentially contribute a stable energy supply during this time of transition in the next few decades. In the process, it will be necessary to use the coal reserves as effectively as technically possible. The efficiency potential is to be optimally exploited.

Predrying of raw coal is a process solution for efficiency improvement in brown coal-based power plants. The high moisture content of the coal of up to 60 mass % still results in energetic disadvantages in the existing pulverized fuel-fired power plants.

The coal is dried at high temperatures, the evaporated moisture remains unused to a large extent. In predrying, however, the energy of the evaporated moisture is used in the power plant process. Depending on the moisture content of the coal, this allows an efficiency improvement by 4 to 6 percentage points, considering pressurized operation of the drying system and utilization of the entire heat contained in the evaporated moisture in the power plant process.

The PSFBD technology contributes to saving of a valuable fossil energy carrier, reduction of CO₂ emission and safeguarding a stable energy supply by coal-fired power plants as an integral part of an optimum energy mix over the next few decades.
Babcock Borsig Steinmüller GmbH has intensively worked on the research of this technology jointly with partners from industry and science since 2001. In the process, Babcock Borsig Steinmüller was assigned the task of developing the steam fluidized bed dryer with vapour circulation as core of this technology.

In 2007, Babcock Borsig Steinmüller was entrusted by Vattenfall Europe Generation with the order for the process design, engineering, installation and commissioning of a complete coal drying system operating on the principle of pressurized steam fluidized bed drying at the “Schwarze Pumpe” location.

The plant has a raw coal throughput of 10 t/h, serves as pilot and test facility at industrial scale and has been successfully operated since 2008.

The plant could be stably operated for several weeks with the following properties:

- Stable pressure conditions up to 4 bar (abs)
- Throughput of raw brown coal up to 10 t/h
- Residual moisture in the dried brown coal 8 to 12%
- Production of dried brown coal up to 5 t/h

The vapour produced in coal drying is available at the pressure prevailing in the fluidized bed and the corresponding saturated steam temperature at the battery limit. It can be completely used in the power plant cycle for energy production.

On the basis of the results obtained in the pilot plant, Babcock Borsig Steinmüller developed a dryer concept with the following marginal conditions for use in commercially operated coal-fired power plants:

- Pressurized fluidized bed drying at 4 bar (abs)
- Throughput of raw brown coal 80 to 100 t/h
- Residual moisture in the dried brown coal 8 to 12%
- Production of dried brown coal 40 to 50 t/h

With the gained knowledge and the developed concepts PSFBD of raw brown coal can be used in planned commercial power plant concepts or retrofitted to existing coal-fired power plants.

Investments by owner / operators in this technology will pay off, for due to the improvement in efficiency they will save both fuel costs and costs in trading with CO2 emission certificates.