

## Fluid Boilers for Solid Fuel Combustion

Due to recent non-existing state energy policy and minimal guarantees for fuel-material and energy development, it is possible to define the following conditions for so called flexible heat equipment allowing to combust practically all the "combustible", allowing to combust fuels and some kinds of waste - gas, liquid, solid or in any of its mutual combination.

1. Available fuels are on the same level, none of them is preferred.
2. To react by change of fuel basis by flexible combustion device allowing to combust practically "all" at observing environmental requirements - to the offer of different fuels, to the change of price relations of fuels.
3. To allow an increase of heating capacity of heat production according to current requirements of the operator.
4. To respect presently the prepared legislative arrangements, resulting from the future membership in the EU, especially nowadays recommended limitation of CO<sub>2</sub> production.

Technology of hybrid fluidized combustion - one stage stationary fluidized combustion with fuel and additives injections into some places of fluid layer with utilization of dry additive method for desulphurization of flue gas in the fluid bed fulfills all the above mentioned requirements to the so called flexible heat equipment. The method guarantees reaching emission limits given by law with the control range of output 40 - 100% of nominal output and with efficiency of boiler 85 - 89%.

As a substitution of previously wide-spread grate-boilers 1600 U and 2500 U Slatina and RK 4 and RK 8 ČKD DUKLA and TATRA Kolín, we offer boilers with fluidized combustion technology FK with outputs 1 MW - 5 MW. For reconstruction of existing boilers onto the fluidized combustion boilers, there are modular fluid bottoms available, by its parallel sorting and running it is possible to reach the furnace with required size and output.

Block performance of FK boilers with the technology allows easy and quick assembly and allows adding other equipments (additives dosing, additives storage tank, storage tank and transport of make-up fuel, wet scrubbing of flue gas, dosing of pasty and liquid fuels). The technology also allows an increase of installed output or creating a stand-by source by addition of fluidized bed boiler FK (the transport and the fuel storage tank is common for both boilers) or creating a whole technology (including separate transport of fuel and storage tanks).

The boilers are supplied in the steam performance (superheated or saturated steam), low-pressure steam, hot-water and warm-water including fittings and garniture necessary for safety and reliable operation, including automatics, which controls operation of fluid furnace and enables communication with superior control system. The fluidized bed boiler is equipped with appropriate equipment for flue gas cleaning and pull-off fan.

Design, fabrication, tests and fittings fulfill all the requirements ČSN and other regulations related to the operation of such equipments.

### Fuels

The basic fuel of the fluidized bed boiler FK is additive brown coal hp1, hp2 and hp3. After charging the additive storage tank and after additive dosing into the boiler, it is possible to combust also undopped brown coal. Another applicable fuels are bituminous coal, wood chips, biomass. The boiler is designed in the way in order to allow combustion of few kinds of fuels alternately or at once.



## The outputs and performance of fluid boilers FK

Boiler output	Heat output [MW]	
	Nominal	Max
FK 1 MW	1	1,2
FK 2 MW	2	2,3
FK 2x 2 MW	2 x 2	2x 2,3
FK 3 MW	3	3,8
FK 2x 3 MW	2 x 3	2 x 3,8

## Technical parameters

Type of boiler	Warmwater boilers VFK	Middlepressure hotwater boilers HFK	Middlepressure steam boilers SFK
Design pressure	0,6 MPa	1,4 MPa	1,4 MPa
Max. provozní tlak	0,6 MPa	1,3 MPa	1,3 MPa
Boiler efficiency at nominal output	80 - 85 %	80 - 85 %	80 - 85 %
Control range of boiler	50 – 100 %	50 – 100 %	50 – 100 %
Temperature inlet water - min	70 °C	70 °C	-
Temperature of outlet water - max for pressure 1,3 MPa	110 °C	180 °C	-
Temperature of feed water - min	-	-	105 °C

## Arrangement of technology of fluidized bed boiler and the range of basic accessories

Fuel is brought into the storage tank of unmodified-fuel (9). From there the fuel is transported by a screw feeder (7) into the mill (11), from which the fuel falls into the storage tank of modified-fuel (10). From there the fuel is conducted by fuel conveyor (8) into the pneumatic feeder (7). By transport air is the fuel brought into the fluid furnace (14). The fluid furnace consists of the bottom with nozzles for inlet of fluidized and combusted air. The furnace walls form water cooled boiler walls (13) welded from the diphgram walls. Air for transport and combustion of the fuel is secured by high-pressure fan (17). For reaching the operation temperature of the fluid bed is the boiler equipped with start-up device (12) - burner for liquid fuels (possible to supply also a burner for natural gas, propane butan, etc.), which its warm flue gas will fire the fuel in the fluid bed. After fuel burn-off in the fluid bed is the fly ash wafted by flue gas into the convection part of boiler, where its first separation occurs. The separated fly ash falls into the dump, from where the fly ash is by fly ash conveyor (19) brought onto the place of storage eg. into a container (20). Behind the convection part is placed the flue gas filter (21) or other kind of flue gas separating from the solid particles (eg. wet wash-out). The fly ash caught in the flue gas filter is by the conveyor brought on the place of fly ash storage. Behind the filter, there is placed the flue gas fan (22), which carries the flue gas into the chimney.