invelt servis s.r.o.

SUPPLIER PLAN

MAIN ACTIVITIES

„TURN-KEY“ SUPPLY OF BOILER ROOMS

Designs, supply, assembly, tests and putting to the operation

- Thermal power plants
- Energy centers for refineries, sugar refineries, paper mills, food industry, chemical industry etc.
- Cogeneration units
- Power stations
- Incinerators

REPAIRS, MODERNIZATIONS, RECONSTRUCTIONS & OPTIMIZATIONS

Routine repairs, changes of fuel basis, changes of parameters, optimization of emissions

- Thermal power plants
- Power stations
- Energy centers
- Incinerators
- Machine rooms

TESTS, PUTTING TO THE OPERATION, OPERATIONS

- Thermal power plants
- Power stations
- Energy centers
- Incinerators
- Machine rooms
- Desulphurizing units

DESIGN AND ENGINEERING

- Elaboration of the studies
- Elaboration of documentation for the Territorial Statement
- Elaboration of documentation for the Building Control
- Construction and calculations
- Elaboration of the Basic Design documentation
- Elaboration of the Detail Design documentation
- Elaboration of the Start-up Project and Testing Program
- Elaboration of the Operational Regulations

CONSULTING SERVICE

- For energy industry and heating industry

BOILERS

CONSTRUCTION

- Modern boiler construction with using of know-how of Company.
- All walls of pressure part of boiler are designed as diaphragm, warranting absolute tightness of flue tract of boiler.
- Project of boilers for wide range of fuels – natural gas, liquid fuel (light fuel oil, heavy fuel oil), black coal, brown coal, biomass, municipal waste.
- Thermal and stress analysis of boilers.
- Definition of the needs of followed-up equipment.
- The equipment in accordance with Government Regulations No. 26/203 according to harmonized standards (especially ČSN EN or by customer request) including certification.
- Preparation of manufacturing documentation.

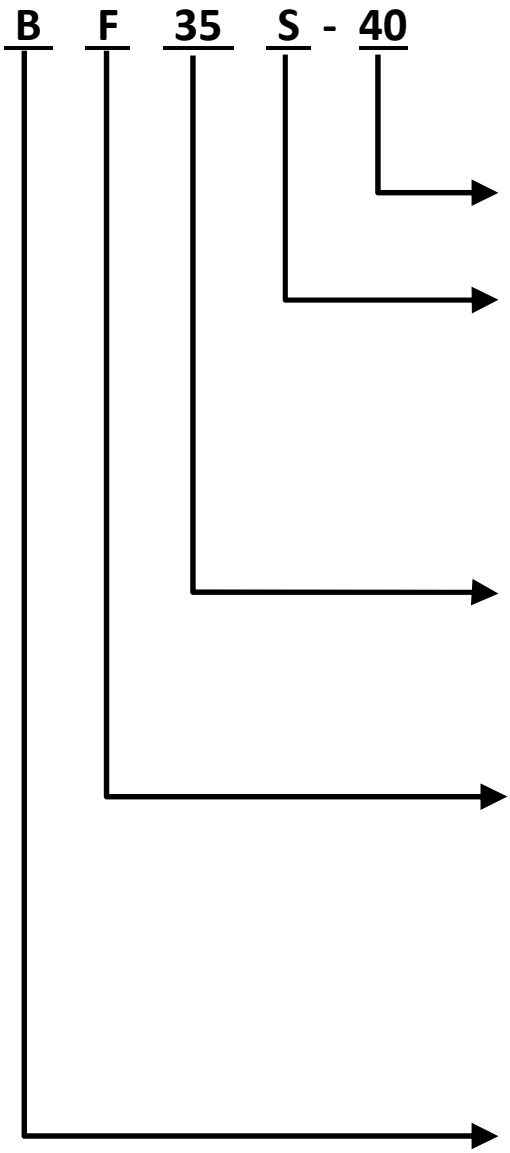
ADVANTAGES OF OUR BOILERS

- High efficiency
- Wide control range
- Low self consumption
- Low maintenance costs
- High reliability

BOILERS

Example of model number of boiler

Example:



Fluidized bed boiler for biomass,
steam output 35 t/h, steam pressure 4 MPa (40 bar)

Steam pressure (only for steam boilers)

Type of produced medium

Type of medium	Designation
Steam	S
Hot water	W

Output
Steam for steam boilers [t/h]
Heat for hot water boilers [MWt]

Combustion technology

Technology	Designation
Pulverized boiler	P
Grate boiler	G
Fluid	F

Type of fuel

Fuel	Designation
Biomass	B
Coal	C
Gas	G
Liquid fuel	O
Flue gases	FG
Municipal waste	W

STEAM BOILERS

Steam coal boilers

- Fluidized bed

Fluidized bed boiler	Steam output	16 ÷ 150	t/h
	Steam pressure	1,4 ÷ 10	MPa
	Steam temperature	220 ÷ 540	°C

- Pulverized

Pulverized boiler	Steam output	35 ÷ 200	t/h
	Steam pressure	3,8 ÷ 6,5	MPa
	Steam temperature	445 ÷ 540	°C

- Grate

Grate boiler	Steam output	4 ÷ 35	t/h
	Steam pressure	1,4 ÷ 3,8	MPa
	Steam temperature	220 ÷ 445	°C

Steam boilers for biomass

- Fluidized bed

Fluidized bed boiler	Steam output	16 ÷ 100	t/h
	Steam pressure	1,4 ÷ 10	MPa
	Steam temperature	220 ÷ 540	°C

- Grate

Grate boiler	Steam output	4 ÷ 25	t/h
	Steam pressure	1,4 ÷ 3,8	MPa
	Steam temperature	220 ÷ 445	°C

Steam boilers for municipal waste

- Grate

Grate boiler	Steam output	16 ÷ 75	t/h
	Steam pressure	1,4 ÷ 10	MPa
	Steam temperature	220 ÷ 540	°C
	Consumption waste*	5 ÷ 24	t/h

*) considered average heating value 10MJ/kg

STEAM BOILERS

Steam boilers for gas

- Boilers for gas

Boilers for gas	Steam output	4 ÷ 200	t/h
	Steam pressure	1,4 ÷ 10	MPa
	Steam temperature	220 ÷ 540	°C

Steam boilers for liquid fuel

- Boilers for liquid fuel

Boilers for liquid fuel	Steam output	4 ÷ 200	t/h
	Steam pressure	1,4 ÷ 10	MPa
	Steam temperature	220 ÷ 540	°C

Steam boilers for combined fuel (oil - gas)

- Boilers for combined fuel

Boilers for comb. fuel	Steam output	4 ÷ 150	t/h
	Steam pressure	1,4 ÷ 10	MPa
	Steam temperature	220 ÷ 540	°C

Flue gas steam boilers (utilized)

- Flue gas boilers

Flue gas boilers	Steam output	4 ÷ 150	t/h
	Steam pressure	1,4 ÷ 10	MPa
	Steam temperature	220 ÷ 540	°C

HOT WATER BOILERS

Hot water boilers for coal

- Fluidized bed
- Pulverized
- Grate

Fluidized bed boiler	Heat output	11 ÷ 80	MWt
	Water temperature	70/90/130	°C
Pulverized boiler	Heat output	36 ÷ 125	MWt
	Water temperature	70/90/130	°C
Grate boiler	Heat output	2,8 ÷ 45	MWt
	Water temperature	70/90/130	°C

Hot water boilers for biomass

- Fluidized bed
- Grate

Fluidized bed boiler	Heat output	18 ÷ 80	MWt
	Water temperature	70/90/130	°C
Grate boiler	Heat output	2,8 ÷ 25	MWt
	Water temperature	70/90/130	°C

Hot water boilers for municipal waste

- Grate

Grate boiler	Heat output	11 ÷ 45	MWt
	Water temperature	70/90/130	°C

Hot water boilers for gas

- Boilers for gas

Boilers for gas	Heat output	2,8 ÷ 125	MWt
	Water temperature	70/90/130	°C

Hot water boilers for liquid fuel

- Boilers for liquid fuel

Boilers for liquid fuel	Heat output	2,8 ÷ 125	MWt
	Water temperature	70/90/130	°C

Hot water boilers for combined fuel (oil – gas)

- Boilers for combined fuel

Boilers for comb. fuel	Heat output	2,8 ÷ 125	MWt
	Water temperature	70/90/130	°C

Flue gas hot water boilers (utilized)

- Flue gas boilers

Flue gas boilers	Heat output	2,8 ÷ 125	MWt
	Water temperature	70/90/130	°C

BOILERS OF FLUIDIZED BED

- Proven technology for burning fuels on solid grate with a fountain fluidized layer.
- The possibility of burning a wide variety of solid fuels - with large heated value range – coal, biomass including pellets and mixtures of these fuels.
- Burning with fluid technology warrants fulfilling of low emission limits in achieving high efficiency of boiler – up to 92 %.
- Boilers can be supplied in steam or hot water execution. They are designed for full automation control of operations.
- The advantage of these boilers is a large control range from 20 to 100 % without use of stabilization, possibility of long maintaining of boiler in hot reserve (min. 24 hours) and easy restart without the use of gas burners.
- Boilers are suitable as energy sources from output 16 t/h.
- The basic output series 16 – 150 t/h can be adjusted according to the customer requirements.

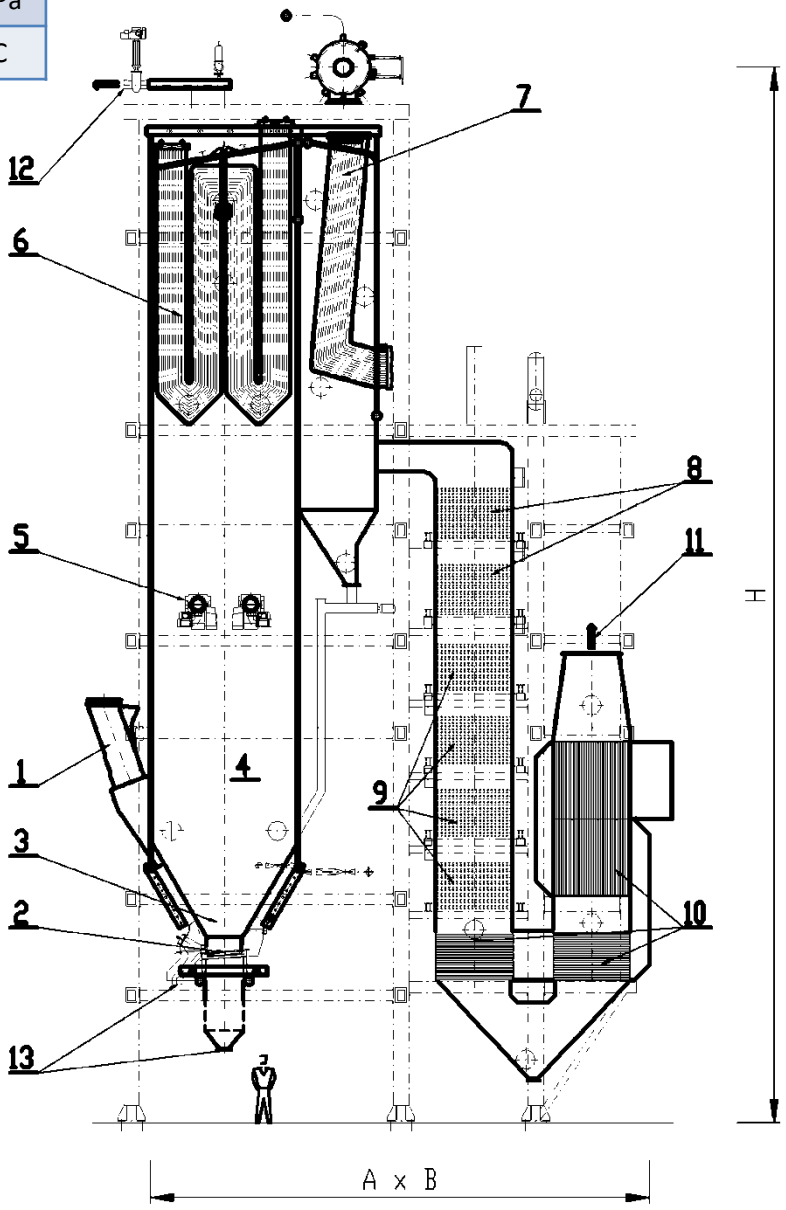
Fluidized bed boiler	Steam output	16 ÷ 150	t/h
	Steam pressure	1,4 ÷ 10	MPa
	Steam temperature	220 ÷ 540	°C

Fluidized bed boiler for biomass
(steam)

Steam parameters: 45 t/h, 6,7 MPa, 495 °C

Dimensions: A – 13 m
B – 6 m
H – 27,5 m

Legend:
1. Fuel input
2. Stationary grate
3. Fluidized bed reactor
4. Combustion chamber
5. Ignition gas burners
6. Platen steam super heater
7. Platens of super heater/evaporator
8. Convection steam super heater
9. Blocks of economizer
10. Blocks of air heater
11. Flue gases outlet from the boiler
12. Steam outlet from the boiler
13. Removal of bed ash/clinker



PULVERIZED BOILERS

- Proven technology for the combustion of brown and black coal.
- The possibility of co-burning of pellets and biomass with suitable granulometry.
- Achieved efficiency up to 91 %.
- Boilers can be supplied in steam or hot water execution. They are designed for full automation control of operations.
- Control range from 35 to 100 % without use of stabilization.
- Boilers are suitable as bigger energy sources from output 35 t/h with a character of permanent operation.
- The basic output series 35 – 200 t/h can be adjusted according to the customer requirements.

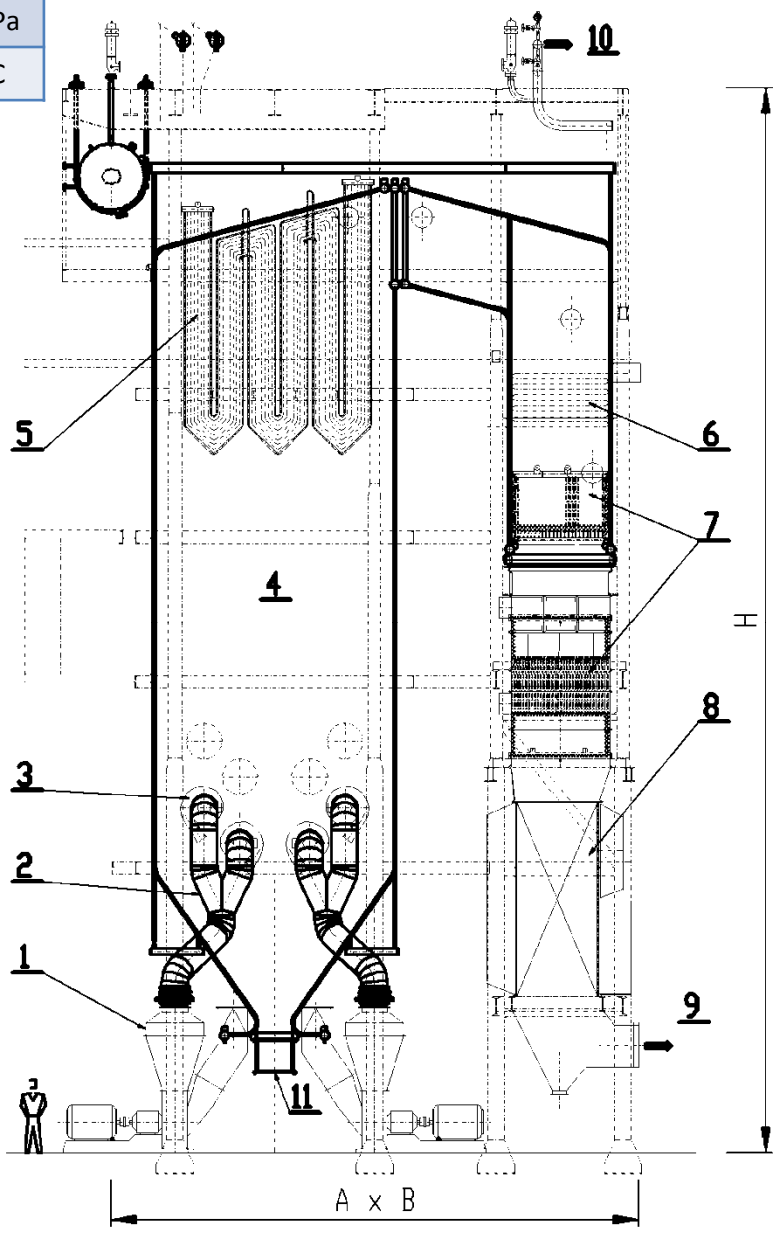
Pulverized boiler	Steam output	35 ÷ 200	t/h
	Steam pressure	3,8 ÷ 6,5	MPa
	Steam temperature	445 ÷ 540	°C

Pulverized coal boiler (steam)

Steam parameters: 75 t/h, 3,73 MPa, 445 °C

Dimensions: A – 13 m
B – 12 m
H – 25,5 m

Legend:
1. Coal mills
2. Pulverized ducts
3. Pulverized burners
4. Combustion chamber
5. Platen steam super heater
6. Convection steam super heater
7. Blocks of economizer
8. Air heater
9. Flue gases outlet from the boiler
10. Outlet of the overheated steam
11. Clinker removal



GRATE BOILERS FOR BIOMASS

- Proven technology for burning wood chips, sawdust, bark, pellets and mixtures of these fuels.
- Achieved efficiency from 88 up to 90 %.
- Boilers can be supplied in steam or hot water execution. They are designed for full automation control of operations.
- As combustion equipment is used oblique sliding grate, whose sections are powered by hydraulic cylinders.
- Boilers are suitable as smaller sources of energy with lower requirements for operations.
- The basic output series 4 -25 t/h can be adjusted according to the customer requirements.

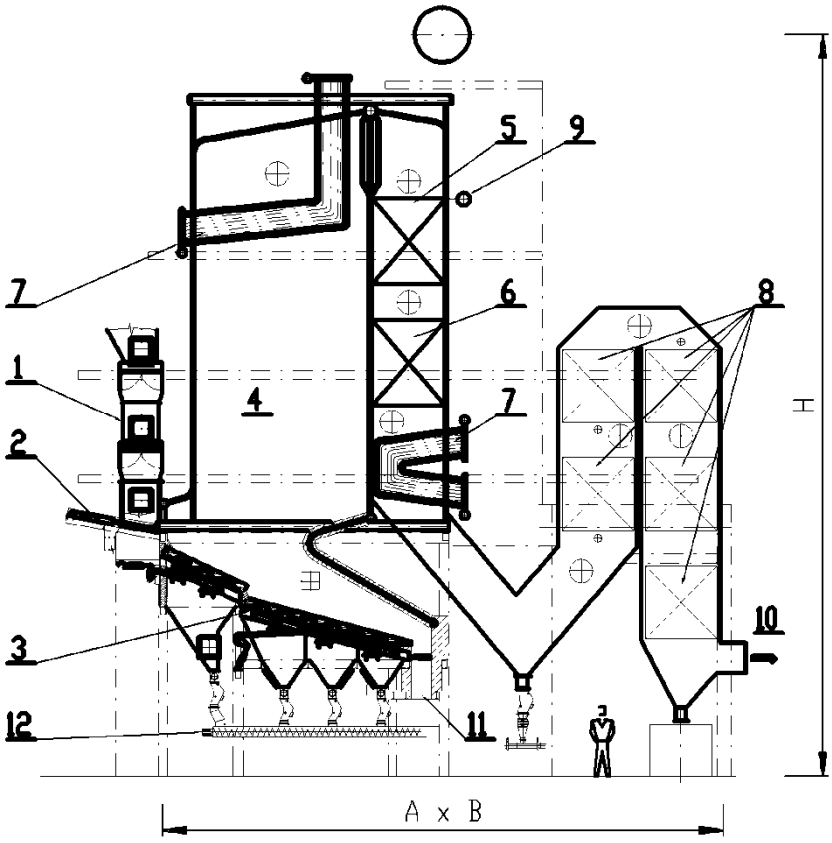
Grate boiler	Steam output	4 ÷ 25	t/h
	Steam pressure	1,4 ÷ 3,8	MPa
	Steam temperature	220 ÷ 445	°C

Grate boiler for biomass (steam)

Steam parameters: 16 t/h, 3,8 MPa, 440 °C

Dimensions: A – 14 m
B – 5,5 m
H – 20 m

Legend:
1. Fuel inlet
2. Fuel feeder
3. Grate
4. Combustion chamber
5. Outlet part of the steam super heater
6. Inlet part of the steam super heater
7. Platens of evaporator
8. Blocks of economizer
9. Outlet of the overheated steam
10. Flue gases outlet from the boiler
11. Clicker outlet from the boiler
12. Equipment for removal of fly-ash



COAL GRATE BOILERS

- Proven technology is suitable for burning of brown and black coal of granulation from 0 to 30 (max. 40); The boilers allow to burn even mixture of coal and wood waste in a proportion approx. 80 % of coal and 20 % of wood waste (sawdust, wood chips).
- As equipment of combustion is used chain grate with a movement from back to front; fuel is cast to the grate with the mechanical overthrow rotors, which includes the fuel feeder.
- Grate boilers are suitable solution as smaller sources of the permanent output with lower requirements for operations.
- The basic output series 4 – 35 t/h can be adjusted according to the customer requirements.

Grate boiler	Steam output	4 ÷ 35	t/h
	Steam pressure	1,4 ÷ 3,8	MPa
	Steam temperature	220 ÷ 445	°C

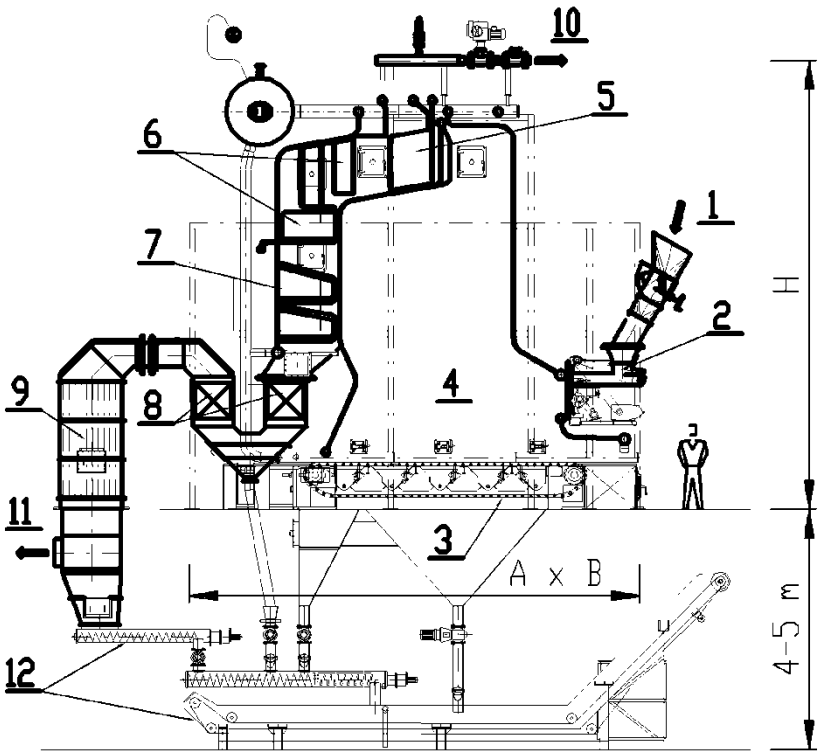
Parameter	Brown coal	Black coal
Grain size	0 až 30 (max.40) mm	
Proportion of grains	0 až 2 mm; max. 40%	
Volatile matter	-	min. 20%
Min. heating value	11,7 MJ/kg	-
Max. heating value	-	25,0 MJ/kg

Boiler for combined fuel (steam)

Steam parameters: 16 t/h, 3,8 MPa, 440° C

Dimensions: A – 9,4 m
B – 2,9 m
H – 9,2 m

Legend:
1. Fuel input
2. Fuel feeders and overthrow rotors
3. Grate
4. Combustion chamber
5. Outlet part of the super heater steam
6. Inlet part of the super heater steam
7. Convection evaporator
8. Blocks of economizer
9. Air heater
10. Outlet of the overheated steam
11. Flue gases outlet from the boiler
12. Equipment for removal of clinker and fly-ash



GAS AND MAZUT (FUEL OIL) BOILERS

- The boilers allow burning of gaseous or liquid fuels, eventually their combinations.
- Boilers are supplied individually according to the needs and requirements of the customer.
- Possibility of steam and hot water execution, horizontal or tower configuration.
- The boilers can be used as sources for permanent operations in base load, even for peak operations; they allow with its characteristics full automation of the operations and low requirements for manipulation.
- During the combustion of gas is minimum water temperature at inlet from 60 to 70 °C, during the combustion of liquid fuels, the minimum temperature is determined depending on the sulfur content in the fuel.
- The efficiency of boilers during burning gas is up 96%, during the combustion of mazut (fuel oil) reaches a value up to 93 %.
- The basic output series 4 – 150 t/h can be adjusted according to the customer requirements.

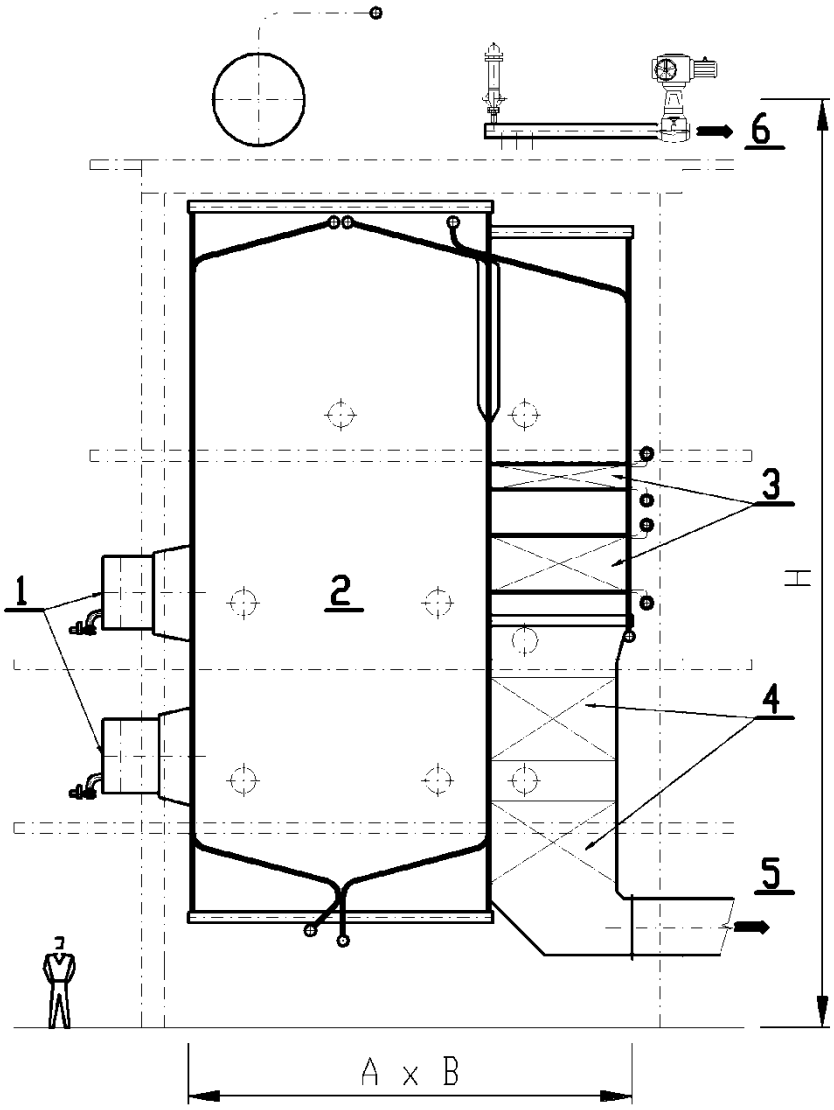
Boilers for combined fuels	Steam output	4 ÷ 150	t/h
	Steam pressure	1,4 ÷ 10	MPa
	Steam temperature	220 ÷ 540	°C

Boiler for combined fuel (steam)

Steam parameters: 110 t/h, 4,1 MPa, 380 °C

Dimensions: A – 8,7 m
B – 5,2 m
H – 18,2 m

Legend:
1. Combined burners
2. Combustion chamber
3. Blocks of the steam super heater
4. Blocks of economizer
5. Flue gases outlet
6. Steam outlet from the boiler



BOILERS FOR INCINERATORS

- Incineration of the municipal waste is a progressive method of the liquidation of the waste, which has significant ecological potential, since it solves the issue of large municipal landfills.
- Modern methods of construction boilers for incinerators ensure lasting security and compliance with emission limits. As essential part of the whole block is also the equipment for subsequent cleaning of flue gases, which is not included to the supply of boiler.
- Possibility to produce steam and hot water.
- To ensure ignition of the fuel and then eventual stabilization of burning are boilers equipped with gas burners, which also ensure minimum temperature in combustion chamber necessary to limit the formation of toxic compounds.
- Boilers for incinerators are adapted and designed for full automation of regulation and control in required output range.
- The basic output series 16 – 75 t/h can be adjusted according to the customer requirements.

Grate boiler	Steam output	16 ÷ 75	t/h
	Steam pressure	1,4 ÷ 10	MPa
	Steam temperature	220 ÷ 540	°C
	Consumption waste*	5 ÷ 24	t/h

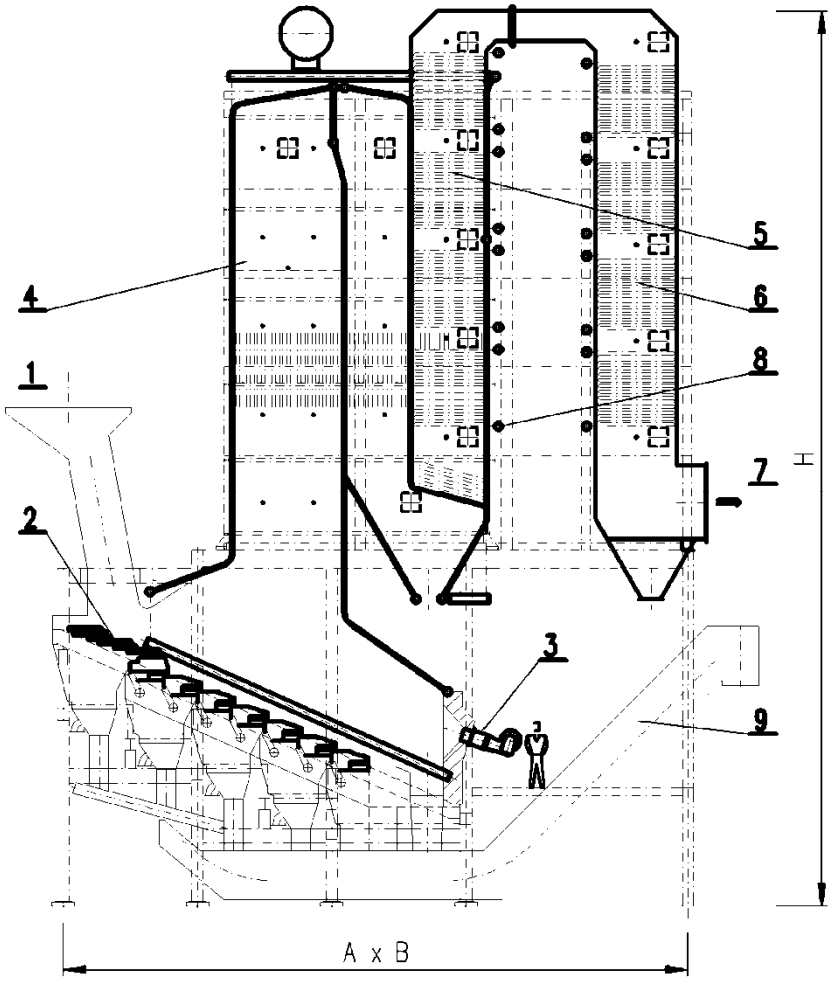
*) considered average heating value 10 MJ/kg

Grate boiler for incinerators (steam)

Steam parameters: 14 t/h, 4 ,0 MPa, 360 °C

Dimensions: A – 17 m
B – 14,5 m
H – 24 m

Legend:
1. Fuel input – hoppers shaft
2. Sliding grate
3. Gas burner
4. Combustion chamber
5. Blocks of the steam super heater
6. Blocks of economizer
7. Flue gases outlet
8. Steam outlet from the boiler
9. Removal of ash/clinker



FLUE GAS BOILERS (UTILIZED)

- Boilers use residual heat of the flue gases from the outlet of combustion equipments – combustion turbines or industrial furnaces.
- Boilers are supplied individually according to the needs and requirements of the customer.
- Possibility of steam and hot water execution.
- Arrangement horizontal or vertical (tower).
- The boiler is assembled in the place from the individual assembly parts and blocks.
- To achieve the required parameters (heat output, temperature of outlet steam or water) can be used afterburner burners for gas or liquid fuel.
- One or two pressure execution.
- Heating of the network water.
- The basic output series 4 – 150 t/h can be adjusted according to the customer requirements.

Flue gas boilers	Steam output	4 ÷ 150	t/h
	Steam pressure	1,4 ÷ 10	MPa
	Steam temperature	220 ÷ 540	°C

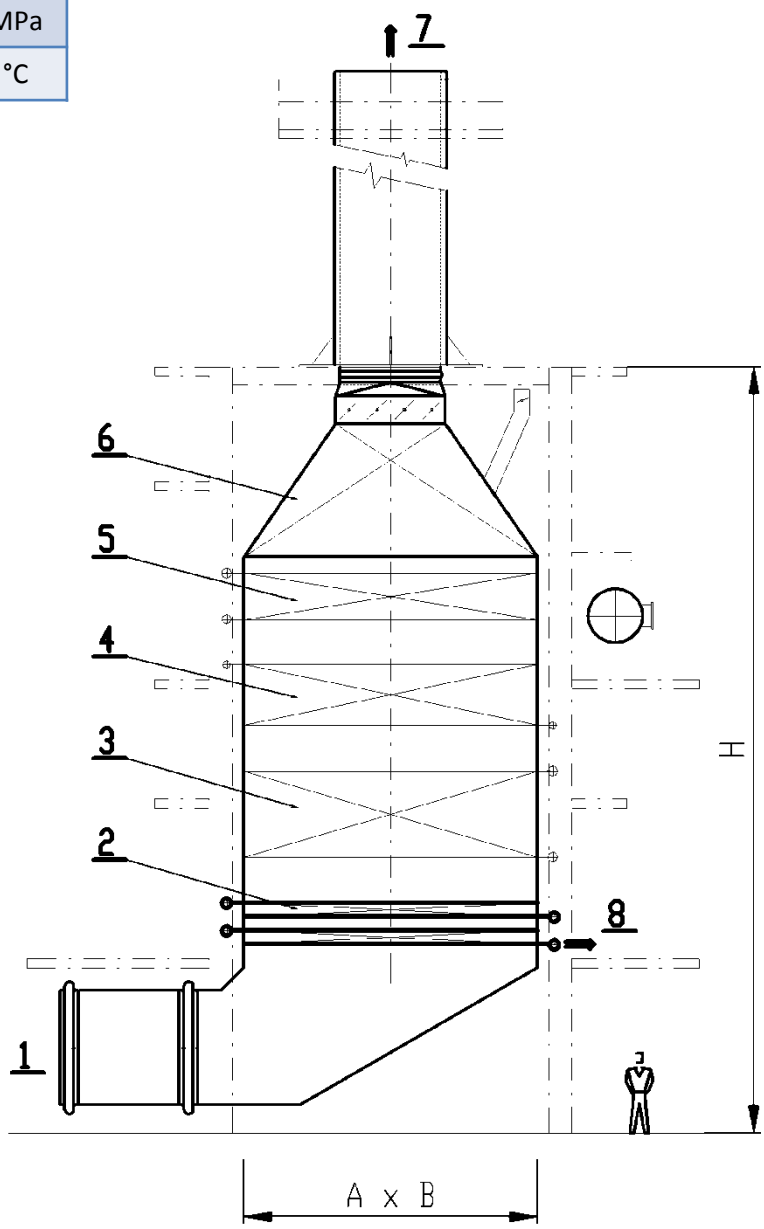
Flue gas boiler (steam + hot water)

Steam parameters: 20 t/h, 4,1 MPa, 445 °C

Water parameters: 70/110 °C, 5,3 MWt

Dimensions: A – 6,4 m
B – 2,5 m
H – 16,7 m

Legend:
1. Flue gases inlet from combustion turbine
2. Blocks of super heaters
3. Evaporator
4. Economizer
5. Block of the hot water heaters
6. Muffler
7. Flue gases outlet from the chimney
8. Seam outlet from the boiler



TRANSPORTABLE GAS AND MAZUT BOILERS

- Transportable boilers are suitable solution for rapid construction of the source with low investment costs.
- The boilers are designed for combustion of gaseous and liquid fuels, eventually for combined combustion of these fuels.
- Possibility to produce steam and hot water.
- The pressure part of the boiler is completely manufactured and assembled in the factory including insulation and sheeting, and thus is delivered to the customer; in the customer at the boiler room is finished the assembly of boiler by burner, armature and individual blocks of economizer.
- On the side of the flue gases the boiler is pressurized and therefore does not need smoke fan.
- The boiler operates in a fully automated operation and in the case of requirement of the customer it can be equipped by the equipment for unattended operation in the range of 24 to 72 hours.
- The efficiency of boilers during burning gas is up 96 %, during the combustion of mazut the value reaches up to 93 %.
- Wide power range.
- The basic output series 2,8 – 125 MWt can be adjusted according to the customer requirements.

Boilers for comb. fuels	Heat output	2,8 ÷ 125	MWt
	Water temperature	70/90/130	°C

Transportable boiler (hot water)

Water parameters: 90/150 °C, 20 MWt

Dimensions: A – 10 m
B – 2,8 m
H – 4 m

Legend:
1. Combined burner
2. Blocks of hot water heater
3. Flue gases outlet from the boiler
4. Water inlet to the boiler
5. Hot water outlet