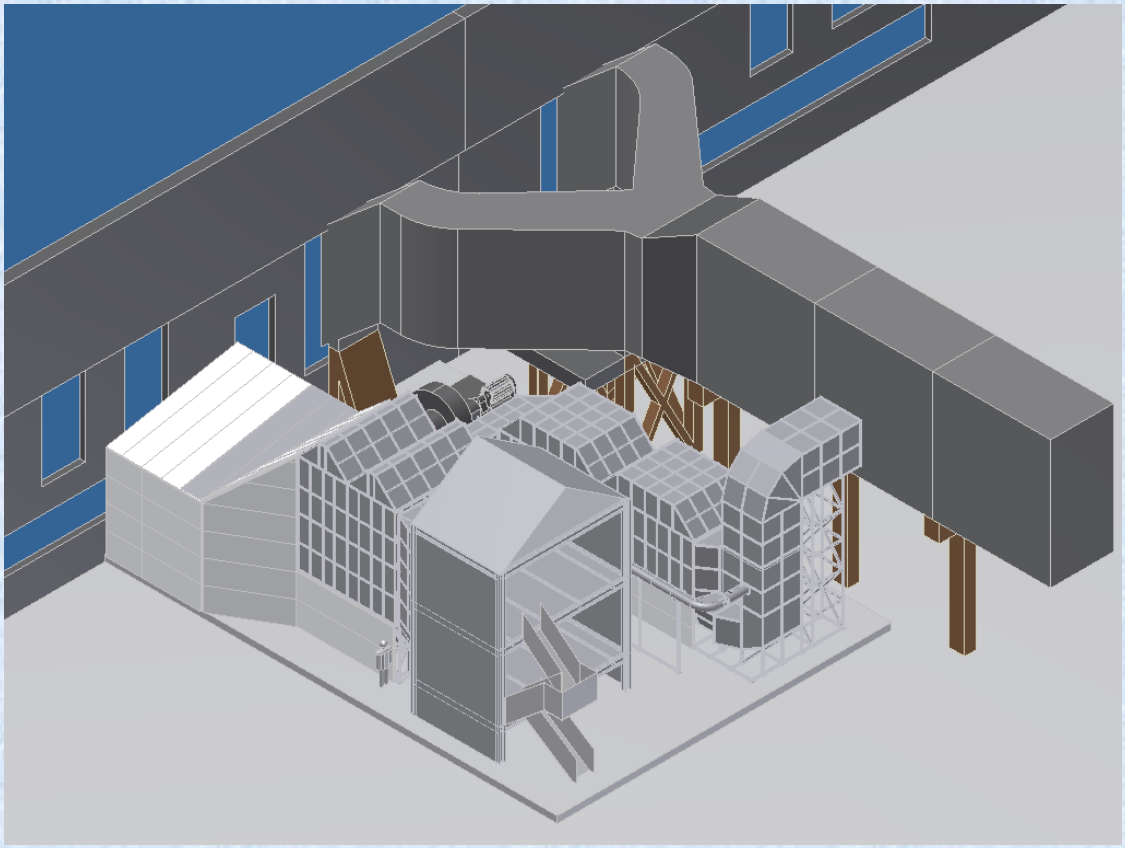
National Research Tomsk Polytechnic University

Institute of Power Engineering
Department of Nuclear and Thermal Power Plants

Technology and project of installation of drying of flue gas with the utilization heat of water vapor condensation.



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Tomsk - 2011

Features of gas-fired boilers

$$CH_4 + 2O_2 = CO_2 + 2H_20$$

The combustion products of natural gas contain water vapor (about 150 g per 1 kg of dry gas) which are carried away through the chimney.

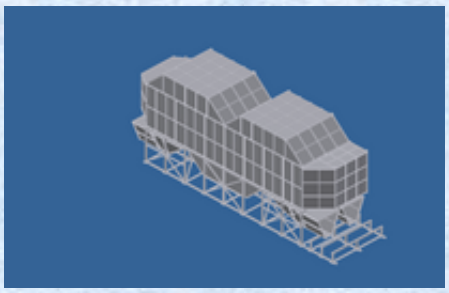
If this water vapor would be condense via some device, then it is possible to obtain the amount of heat sufficient to heat the 7 kg of air on 50 °C
(for example, from -20 to +30°C).

Integrated energy-saving solution.

1. ***Drying of the flue gases.***
   - Reduction of the dew point.
   - Prevent the condensation in the chimney.
2. ***Heat utilization of flue gas.***
   - Using the heat of water vapor condensation contained in flue gases for heating industrial premises and heating the air for the boiler.
3. ***Improving boiler efficiency.***

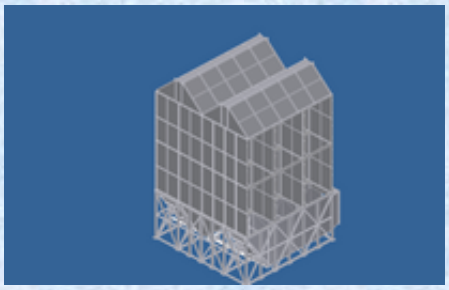
Constructional features

The heat exchanger and the condenser are collected from the unificated packages with an area of heat transfer 206.6 m^2 and weight 1203 kg.



The heat exchanger

Area of heat transfer: 3306 m^2
Weight: 27 tons.
Number of the unificated packages: 16



The condenser

Area of heat transfer: 4959 m^2
Weight: 36 tons.
Number of the unificated packages: 24

Energy characteristics

The used volume of flue gas	Vdg = 33,44 m^3/s
Reduction of flue gas temperature after the adding of heated air	to 85 °C
Reducing of vapor's dew point temperature	to 42 °C
Thermal capacity	Q = 11,9 MW
Heating the air	from -15 to 32,6 ˚C
The volume of heated air	Vv = 194 m^3/s
including to the boiler supply	Vk = 116 m^3/s
Amount of condensate	Gк = 13,5 t/h

Improving boiler efficiency by 2,3%

Assessment of economic efficiency

The number of hours with a negative temperature outside air - 5000 h/year.
The capital investments - 27 million rubles.
The thermal capacity of the unit - 11 MW
for ambient temperatures from 0 to - 20 °C .
Annual cost reduction will be 27.5 million rubles.
for natural gas costs 2.62 rub./m3
The payback period of installation is less than one year.

Areas of application installations:

- Power plants, which use natural gas.
- The local gas-fired boiler plants.

Contact Information

Technological solutions elaboration provide employees of the department of nuclear and thermal power plants, Power Engineering Institute, National Research Tomsk Polytechnic University, which has a patent № 2436011.

РОССИЙСКАЯ ФЕДЕРАЦИЯ

ПАТЕНТ

НА ИЗОБРЕТЕНИЕ

№ 2436011

УСТРОЙСТВО УТИЛИЗАЦИИ ТЕПЛА ДЫМОВЫХ ГАЗОВ И СПОСОБ ЕГО РАБОТЫ

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Заявка № 2010127110

Приоритет изобретения 01 июля 2010 г.

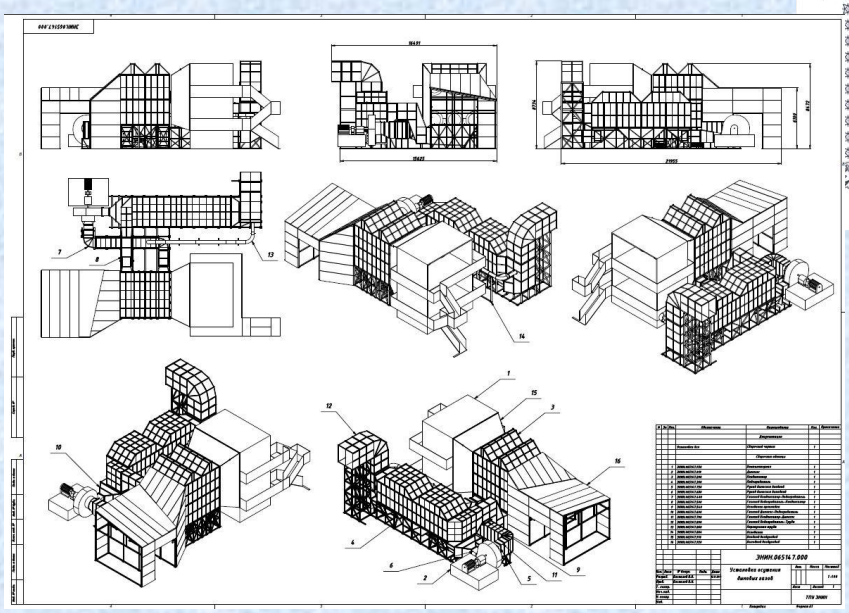
Зарегистрировано в Государственном реестре изобретений Российской Федерации *10 декабря 2011 г.*

Срок действия патента истекает 01 июля 2030 г.

Руководитель Федеральной службы по интеллектуальной собственности, патентам и товарным знакам

Б.П. Симонов

The projects performs Design Institute, part of the TPU. There are licenses for all kinds of design work.



Each solution is developed by the requirements and parameters of the customer.

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