Coherent Coal - New Prospect of Power and Problems Solving of Climate Change

Viktor Krasnobryzhev

E-mail: vkentron@gmail.com
Kiev, tel. +38 044 4059675, +38 097 5609593

As a result of experiments it is established, that the evolution of coal consumption economy demonstrates it's noticeable decrease being about 16 %. The maximum decrease is about 24 %.

Stable increase of greenhouse effect gas level in the atmosphere which is considered to be a cause of global climate change, dose not demonstrates the signs of slowing down. In this case the main and most large-scale sources of atmospheric contamination are power stations, automobile transport and metallurgy.

Understanding the delicacy of ecological problems the UE intends to reduce by 2020 the amount of greenhouse effect gas discharge by 20% as compared with 1990. That is why the introduction of more efficient and ecologically pure technologies into power engineering today is one of the urgent problems. It is connected with the necessity of both the protection of environment and the saving of power resources because these problems are connected and will become more acute due to the constant price increase for natural gas and oil.

In this connection with the use of the phenomenon of coherence the technology has been developed to control activation energy in combustion reactions and diffusion processes. That is the realization of coherent control of these processes kinetics and energetics for real decrease of CO_2 emission into the atmosphere due to the decrease of energy carrier's consumption.

Coal combustion is a phenomenon whose mechanism has still not been fully explained. It is known that chemical energy stored in coal and oxygen molecules released in the process of combustion equals thermal energy gained during the process of combustion, destructive energy of coal and oxygen molecules bonds and chemical energy of the fumes.

The combustion working process of coal happening I following formulas:

$$dA = TdS - dU \qquad (1)$$

And following process as:

$$\frac{dA}{dt} = \frac{TdS}{dt} - \frac{dU}{dt} \qquad (2)$$

As results first part of write of the formula explaining part of the energy which not taking part of the work we are writing following:

$$\frac{dA}{dt} = -\frac{dU}{dt} \qquad (3)$$

In combustion process we are receiving energy:

$$\frac{dU}{dt} = \frac{Q\,dm}{dt} = Q\frac{m\,k\,T}{\hbar}\exp\left[-\frac{Ea}{kT}\right] \qquad (4)$$

Q – calorific value of the coal; m – mass of the combustion of the coal; ħ - Planck's constant, Ea – energy activation of coal, k - Boltzmann's constant, T – temperature.

Supplying activation energy is essential to initiate combustion process of coal in order to break energetic barrier. This energy is taken from thermal energy and as a result the ideal heat of combustion is lowered by the quantity of activation energy.

Not only molecular but also spin dynamics playing a double part in elementary chemical acts is of great importance in combustion reactions. On the one hand it affects actively the reaction mechanism and kinetics by activation energy. On the other hand spin dynamics reacts very sensitively to the molecular dynamics of an elementary chemical act.

A coal coherent state can affect actively the kinetics of combustion processes. In the same time activation energy plays an important role in combustion processes. Its value can be determined by means of the "Free Kinetics" model, which makes it possible to carry out exact calculations for complex reactions such as combustion process. The experiments on the action of fuel coherent state on its activation energy have been carried out in Czestochowa Polytechnical Institute (Poland). The determination of activation energy value was carried out by means of the TGA/SDTA/851^e thermogravimeter of the Mettler Toledo firm.

The results of the measurements of brown coal activation energy in coherent state are given in Table 1 jointly.

Table 1.

State of coal	Activation energy	Decreasing activation energy
Equilibrium state	378 kJ/mol	0%
First coherent state	260 kJ/mol	31,2%
Second coherent state	164 kJ/mol	56,6%

The first experiment has been carried out in Poland with 10 pulverized-coal boilers of 220 MWh. In the course of the experiment of 8 days duration coal was coherent state being kept up by means of the activators located at the store of coal.

Within boilers brown coal is burnt up in amount of 10 mills. tons per year. During the experiment about 220000 tons of coal has been burnt up. In the course of the experiment the emission of CO_2, NO_x, and SO_2 in the atmosphere was evaluated. They entered computer base of the power station continuously. As a result of the experiment with pulverized-coal boilers the decrease of CO_2 emission for 13%, NO_x emission for 16% and SO_2 emission for 16% has been obtained. The dynamics of boilers operation improved. As an example in Fig. 1 there are graphics dependences of CO_2, $NO_{x,}$ and SO_2 emission change depending on capacity being generated. There is a direct dependence between the amount of coal being burnt up and CO_2 emission i.e. by the decrease of CO_2 for 13% the amount of coal being burnt up decrease for 13%.

The following experiment has been carried out on power station in Poland with 8 pulverized-coal boilers burning 4 million tons coal per year. The experiment was being carried out in April-June and September-October 2007.

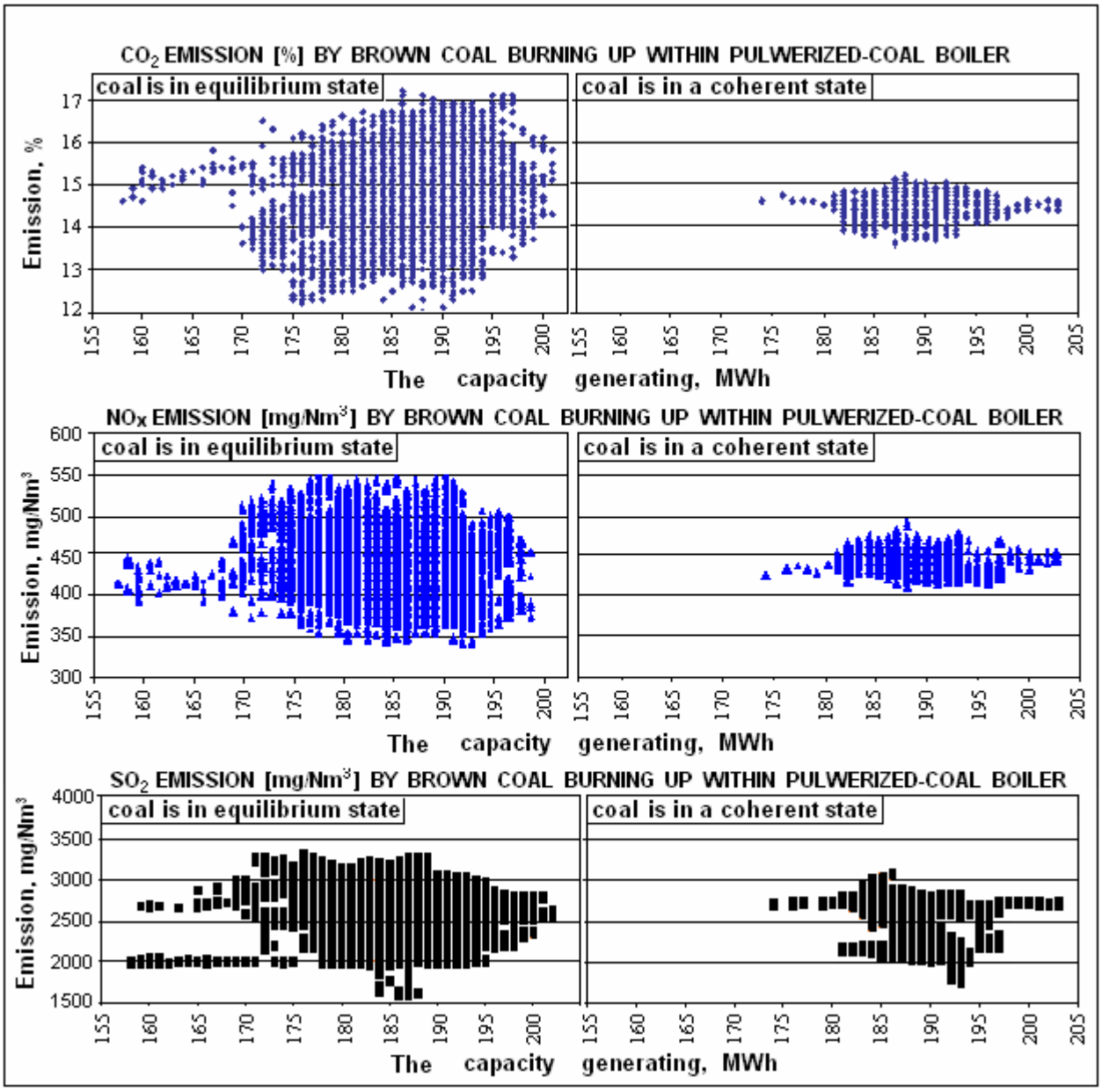

Fig. 1.

Technological features of power station stipulate coal storing of 500000 t. total amount. During the experiment coal coherent state in the stores was being kept up by means of activators located along the stores perimeter at their foot (Fig. 2).

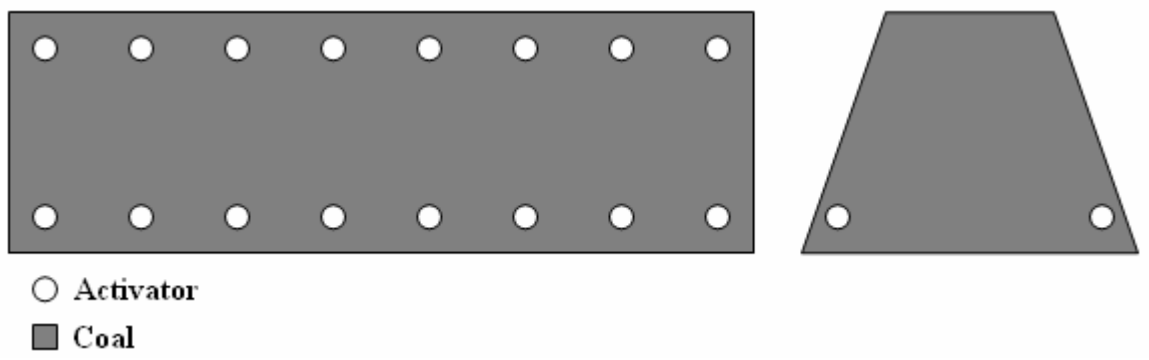

Fig. 2. The activators location of in stores of coal.

The graphic dependence of the change of coal energy consumption for electric energy generation above 200 MWh is represented in Fig. 3. The evolution of coal consumption economy demonstrates its noticeable decrease being about ~16%. The maximum decrease is about ~25%.

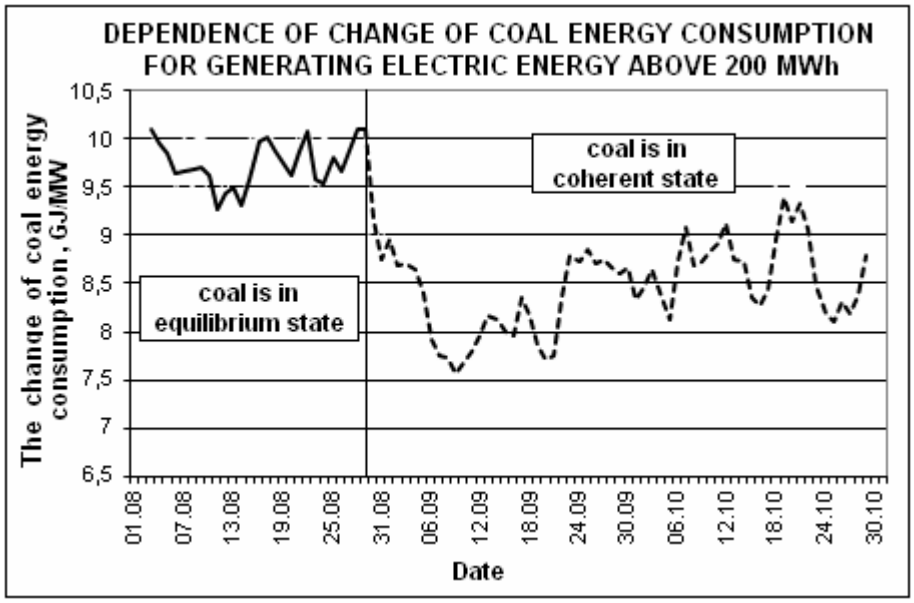

Fig. 3.

Reduction of a power consumption of coal of electric energy production from 24.09.07 is connected to substantial growth of injections of cooling water on a overheater with the purpose of adjustment of temperature superheated pair.

The developed technology is universal and does not demanding technical changes in production process of power station.