

## **New Plasma Arc Furnace for Brown Coal Combustion**

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Coal is still actively used in thermal power stations all over the world. Coal quality is not always high. Many countries have brown coal fields which are not actively used, because brown coal is difficult to ignite, its combustion efficiency is relatively low and exhaust gases are ecologically harmful. In order to solve these problems thermo-chemical preparation is necessary. Usually other organic fuels are added to brown coal for this purpose. This decreases economic efficiency of combustion process and does not provide necessary improvement of ecological parameters. Plasma combustion systems appear to be a good alternative.

We develop new plasma arc furnace for brown coal combustion. The main novelty is that we use long plasma arc which acts directly on coal-air mixture. Usually plasma combustion systems use non-transfer plasma torches with complicated construction and low service life. Plasma arc in such torches is unstable and there is a big loss of energy on anode cooling.

We use long plasma arc for brown coal combustion. This became possible after we have designed and constructed new fixed, stable current power supply with rectangular volt-ampere characteristics. This was crucial for stable functioning of long plasma arc. Our power supply also allows modification of arc length in wide range. Usually instability of current – variation of current density takes place in long arc due to modification of arc filament resistance. With our power supply this is automatically compensated by voltage modification. Automatic modification of voltage allows also increase of arc length – together with arc length its resistance is modified, but current is stable due to automatic voltage modification.

Our plasma arc furnace has simple construction. Plasma arc is created between two carbon electrodes and acts directly on coal-air mixture. There are no losses of energy on anode cooling and consumption of electrodes is very low. This should allow important increase of the brown coal combustion efficiency and ecological parameters of the furnace. Our experiments confirmed stable functioning of the furnace. Experiments continue in order to find more effective regimes of combustion which will allow also significant improvement of ecological parameters.