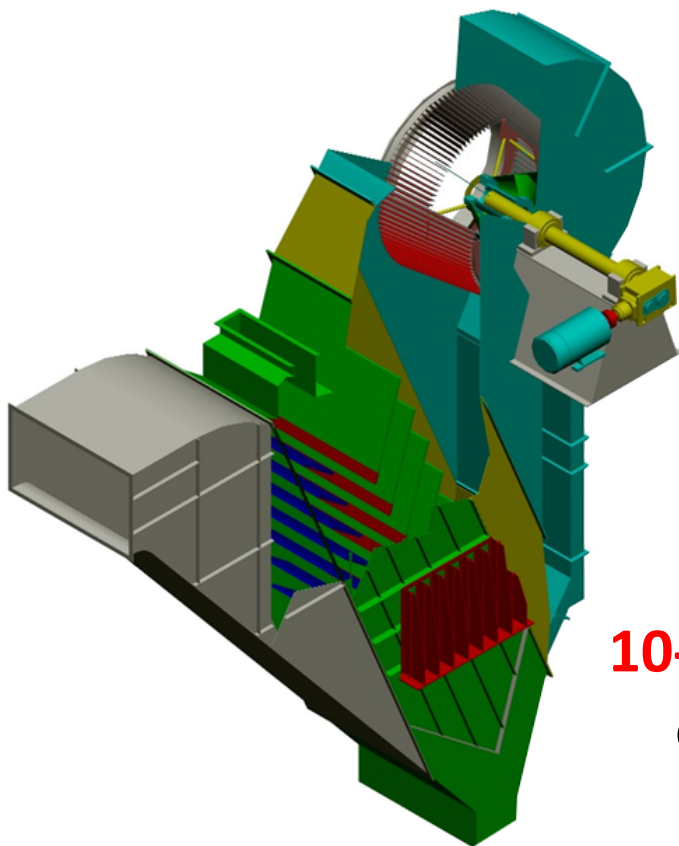


Ing. Office FTT, Germany

Thermo-aerodynamic separation lump coal - separation from fine fractions, drying, increasing quality of marketable coal



20-40% - Decrease
Composition of
small particles

2-3% Reduction
Humidity

5-10% Increase
Coal calories

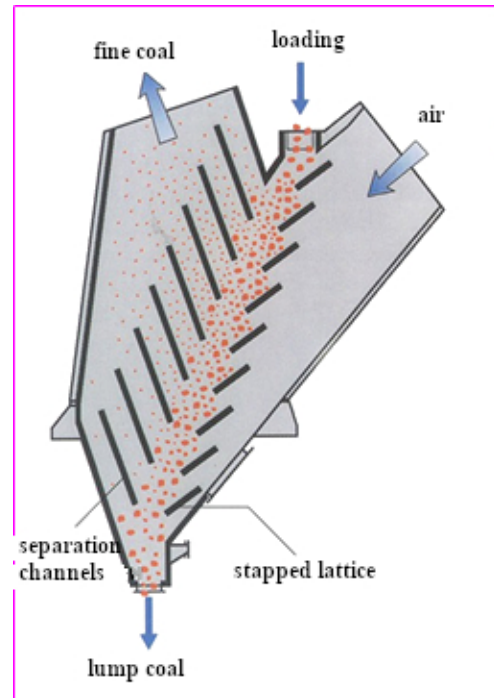
10-15% Decrease costs
of dust Coal-fuel

Thermo-aerodynamic separation

lump coal is performed to separate small particles and dust particles from the coal.

Thermo-aerodynamic separation is most suitable for large flows of lump coal. Static Separation is performed in an air flow across the movement of lump coal falling down in a narrow channel. There are no moving parts in the lump coal movement area, making the equipment affordable. Coal drying can be carried out simultaneously with separation.

Small and dusty particles in the composition of coal carry the greatest amount of moisture and mineral components. The separation of small particles from lump coal leads to a 2-3% decrease in the moisture content of a part of the coal, consisting of lumps of more than 3-5 mm, a decrease in the ash content of this part of coal and thereby an increase in the calorific value of lump coal by 5-10%.



The separated small and dust-like particles of coal, which have the largest outer surface, are dried during the separation process, which also leads to an increase in their caloric content. The separated fine coal particles can be used for various purposes:

- A. Serve for regrinding and burning in boilers of large coal-fired power plants or burners of industrial furnaces, drying plants at industrial enterprises. The supply of fine / pulverized coal to the input of coal mills reduces the energy consumption for grinding by 10-15%.
- B. Serve on centralized briquetting plants with briquettes mixed into lump marketable coal.

Briquetting of fine and dusty screenings is economically effective only for coals with an increased price, for example, coking coals. Achievement of good indicators of strength and water resistance of briquettes is achieved by using binders mixed with coal, for example, lime, molasses and petroleum products.

For thermal coal, brown coal, high-quality briquettes are more expensive than lump coal, therefore, almost all briquetting factories operating in the 70-80s years of the last century are currently closed.

Thermo-aerodynamic separator designs (Fa. Humbolt WEDAG)

Static separators are the simplest design with no moving parts and are used to produce two products:

- lump coal with a low content of fine particles
- mixtures of fine and pulverized coal classes.



Separation process: a narrow stream of falling lumpy coal is blown with a side stream of heated or cold air, which separates small particles from large ones. Separators also allow drying coal products, mainly fine fractions, heating or cooling coal or other industrial lump materials.

Separation products: coarse fractions of 3-50 mm and more leave the separator at the bottom and are conveyed by a conveyor to a warehouse or to be loaded into wagons. Small fractions are captured in cyclones and discharged into a separate bunker, then fed further to the place of further processing. The simplest and most versatile use of fines is to feed it for final grinding in coal mills to produce pulverized coal. This allows to reduce the energy consumption for grinding due to the loading of fine particles at the coal mills.

Drying of small particles of coal is carried out by feeding heated air into the separator, generated in special generators of hot gases or gases taken from sintering furnaces, power boilers, drying or other installations.



Increase the air temperature by 40 - 60 ° C also without external heating, due to the repeated circulation of air through the supplying dust fan, in which with each passage of air it heats up slightly (about 1 ° C at a pressure drop of 10 mbar).

The manufacture of the main units of static separators is usually carried out in the country of the Customer and is not very difficult.

The dimensions of the separators are calculated by the engineering organization according to the Customer's coal data:

- separator productivity, tons / hour,
- the size of lump coal, the content of fine and dust fractions,
- total moisture, moisture of fine fractions, equilibrium hygroscopic humidity,
- bulk and physical density of coal,
- elementary composition of coal, ash content, calorific value,
- the need for drying fine fractions,
- targeted use of fines, parameters of equipment, such as coal mills.

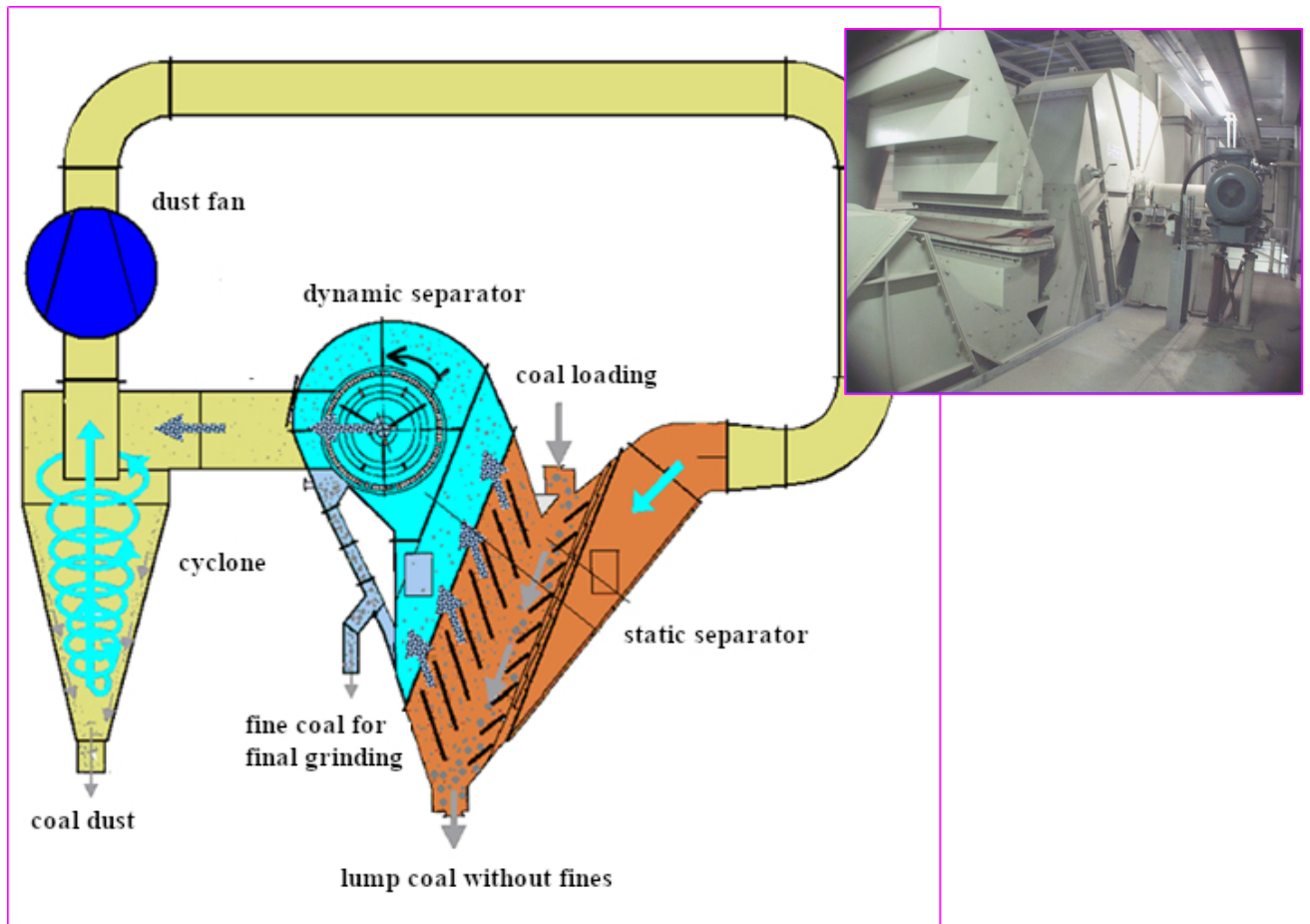


Static separators can be supplemented with a dynamic separation unit. This is done to separate the fine coal particles from the coal dust particles.

The dynamic separator is built into the air duct with fine coal particles leaving the static separator.

The dynamic separator is based on a "squirrel wheel" that rotates at a variable speed and a system of rotating static blades located around a central rotating wheel. External static blades can be set at different angles to the dynamic blades.

The rotation speed of the dynamic wheel and the angles of installation of the outer blades make it possible to control in a wide range the size of particles of fine fractions that can pass through the dynamic separator together with air.



The schematic diagram of a static separator and a separator with an additional dynamic separation unit are practically the same.

The dust fraction of the coal passes through a dynamic separator and is captured in a cyclone. The separator is adjusted in such a way that ready pulverized coal fuel is obtained in the cyclone. Large particles are bounced back by the dynamic separator, enter the receiving funnel and are removed from the separator through a separate branch pipe.

Large coal particles from the dynamic separator are combined with lump coal or separated into a separate fraction, sent, for example, to coal mills for grinding to the required size - they are converted into pulverized coal fuel.

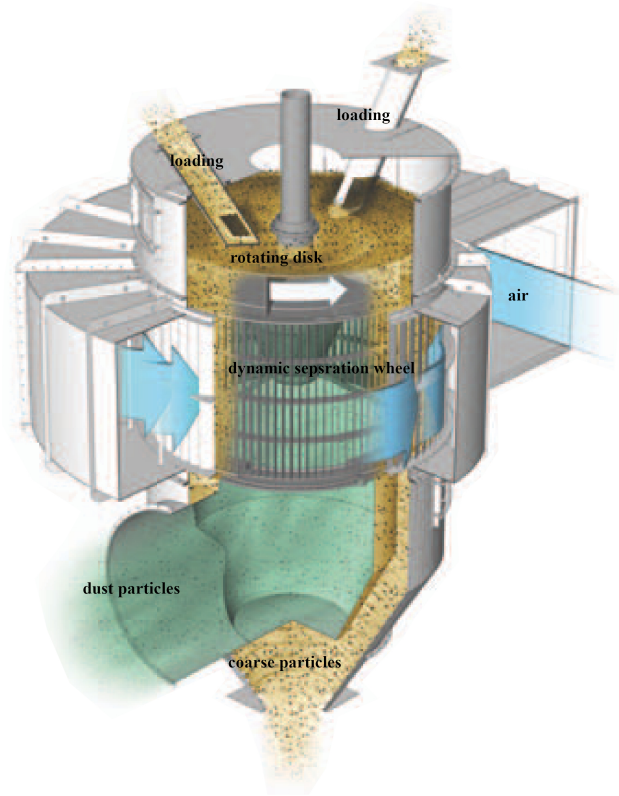
The separator with a dynamic block allows you to get three products: lump coal, fine coal, coal dust.

Dynamic block separators can be used in large thermal coal-fired power plants to improve the quality of coal and improve the efficiency of coal grinding processes.

Dynamic separators (Fa.Christian Pfeiffer) with separation of coal products into three fractions: coarse, medium and fine (PFM) provide the finest control of the particle size separation process.

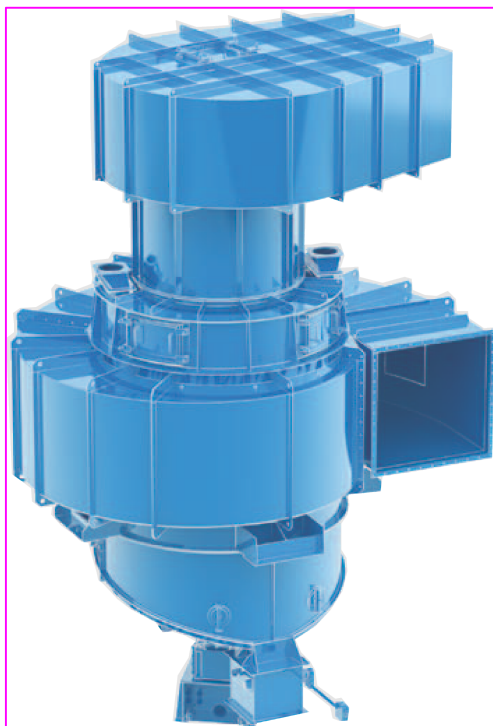
Coal, consisting of small particles, is fed into the separator from the top and falls on a rotating plate, which evenly scatters the coal in the volume of the separator.

The basis for dynamic separation is a central “squirrel-cage wheel” rotating at a variable speed and permanently mounted peripheral vanes with an adjustable angle of position in relation to the flow of gases with solid particles. Dynamic separators also allow drying or cooling of coal products



At coal-fired thermal power plants

static or dynamic separators are installed as part of coal dust preparation sections. This makes it possible to improve the operation of coal mills by feeding coal with approximately the same lump size for grinding and separating the finished pulverized fraction to the mill.

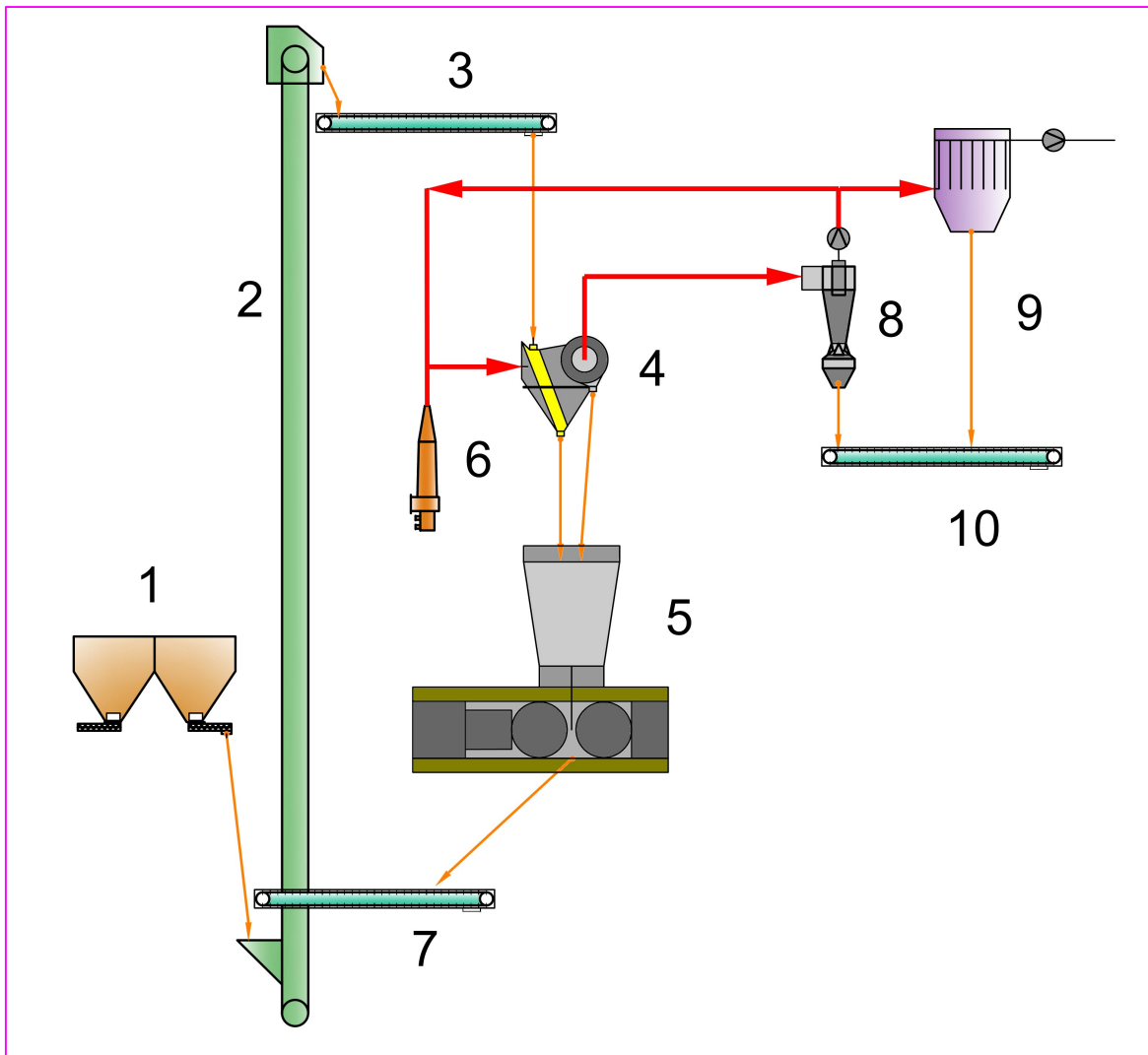


At coal preparation plants, separators can be effectively used to improve the quality of coal, for example, to reduce the moisture content of screenings of 0-13 mm by 2-3%. The fines can be used for combustion in the concentrator boiler room.

In ports or coal transshipment points, separators allow you to get lump coal without pulverized fractions and at the same time dry the coal. Separators are used to improve the quality of large flows of lump coal in the event of a complaint or refusal of the Customer from acceptance for exceeding the standard for the content of dust fractions, high humidity or calorific value lower than specified when ordering.

The safety of thermo-aerodynamic separators is determined as follows:

- coal does not accumulate in the separator,
- low temperatures of hot gases,
- the final moisture content of lump coal, fine or dusty fractions significantly exceeds the equilibrium hygroscopic moisture,
- coal particles do not heat up to dangerous temperatures,
- low oxygen content due to multiple gas circulation.



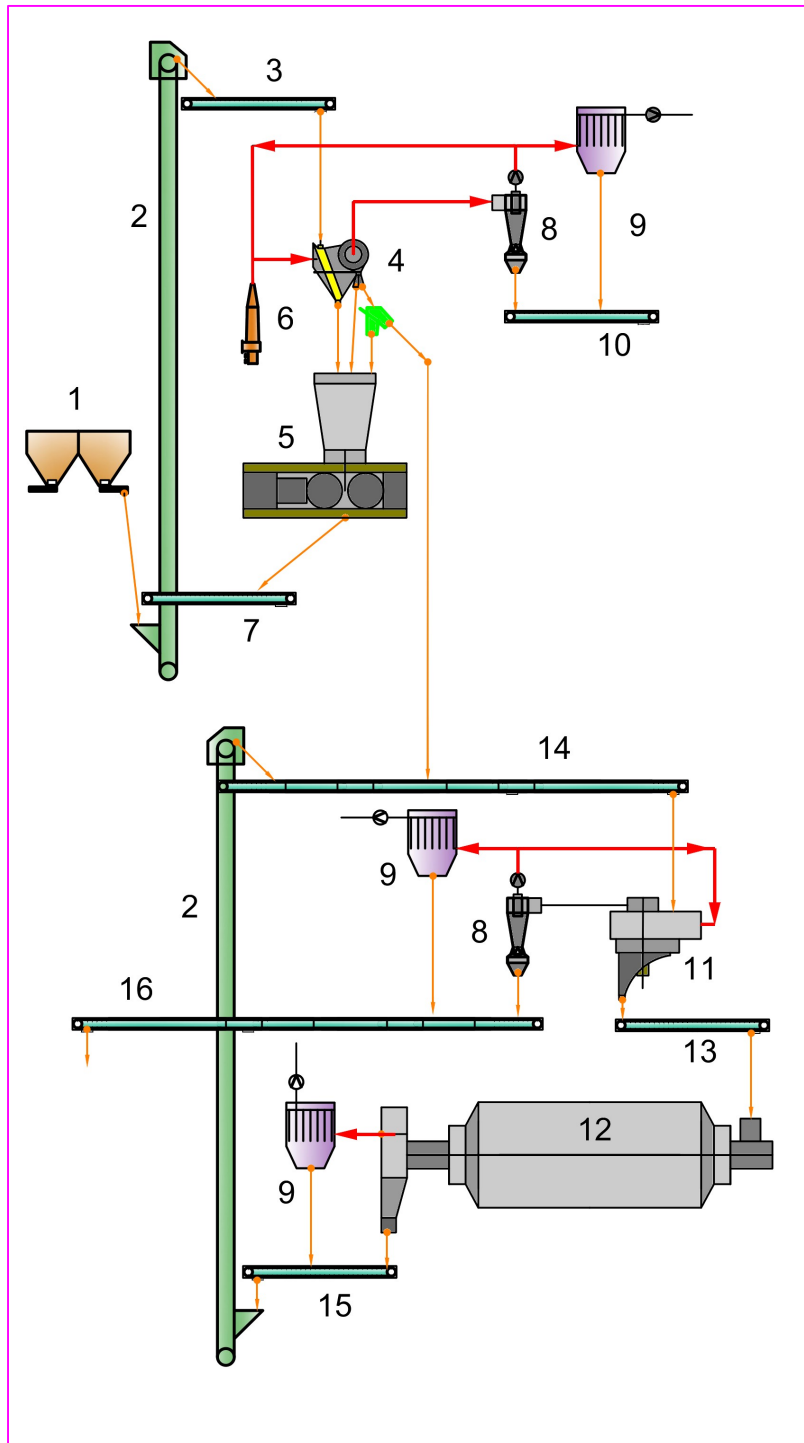
Installation diagram of a combined separator in front of a roller mill

1. Lump material hopper. 2. Elevator. 3/7/10. Horizontal conveyors.
4. Thermo-aerodynamic separator. 5. Roller mill. 6. Hot gas generator. 8. Cyclone. 9. Bag filter

A separator installed in front of the mill allows for the separation of fines before feeding the lump material to the mill. After shredding, the material is also fed to the separator. This creates an outer contour of material flow in a closed grinding circuit.

Scheme of two stages of grinding and grinding with separators

1. Lump material hopper.
2. Elevator.
- 3/7/10/13/14/15/16. Horizontal conveyors.
4. Static separator with dynamic block.
5. Roller mill.
6. Hot gas generator.
8. Cyclone.
9. Bag filter
11. Dynamic separator.
12. Ball mill.



In systems of medium and fine grinding, two separators are installed, for example the first

- static with a dynamic block to a roll crusher, the second - dynamic to a ball mill.

Two closed grinding-separation cycles are formed, which make it possible to exclude the ingress of intermediate grinding products into the final product. The use of separators allows you to optimize the modes of operation of grinding and grinding equipment, provides significant energy savings for grinding.

Hot air separators are widely used in various installations for grinding industrial products, when the design of the mill does not provide internal separation and return of particles for re-grinding. Examples are installations for grinding cement clinker, crushed stone, and other materials in roller mills, ball mills. Separators allow organizing "external recycle" - closed transportation of material for repeated grinding until the particle size is reduced to a predetermined level.

It is possible to set the desired fineness of grinding in a wide range by adjusting the separators from the control panel.

**FTT - Ing. Office Feuerungs - und Trocknungstechnologien
(combustion and drying technologies)**

Development, design, manufacture of equipment and complete plants:

- hot gas generators
- drying of explosive and fire hazardous materials in an environment with a low oxygen content, coal, organic raw materials for wood building boards, wood fuel,
- vertical tube dryers for coal, coal sludge
- installations for drying industrial materials: copper, zinc, pyrite, molybdenum, fluorite, titanium, barite, nickel, iron ore and other concentrates; industrial salts, bentonite clays, sand and other materials,
- granulation of mineral fertilizers
- heating of process gases
- evaporation of salt solutions
- thermal decomposition of nitrogen oxides behind the furnaces
- drying and granulating suspensions in spray dryers
- direct contact heating of production halls
- warming up equipment, thawing of railway cars,

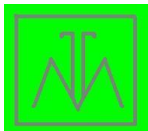
Installations for the preparation of pulverized coal for industrial enterprises:

- asphalt plants,
- factories for producing cement clinker,
- metallurgical enterprises,
- chemical enterprises,
- production of mineral fertilizers and other technologies.

We adapt technological equipment to operate on pulverized coal.

Research of technological processes for metallurgy:

- slag sublimation furnaces for the extraction of non-ferrous metals from slags,
- obtaining semi-coke from brown coal
- drying, dry dressing, processing and concentration of waste, briquetting of fuels, industrial dust and other materials.



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