MULTIPURPOSE EQUIPMENT
FOR INDUSTRIAL WASTE PROCESSING

Description
The equipment is designed for wasteless processing of solid fuel with separation of synthesis gas from the mineral component which is further recycled into ferrosilicon and a foamed silicate, a cheap highly porous heat insulator with improved thermophysical properties.

The mineral fraction can be composed of other industrial wastes, such as metallurgical slag, nepheline slime, mining or building wastes.

The production process includes the following steps:
1. Solid fuel passes through a bunker into a gas generator to be transformed into synthesis gas and a mineral component (ash-and-slag wastes).
2. The mineral fraction (or other industrial wastes) are further dosed and burdened to put into a melting furnace.
3. The burden material is melted and separated into a metal (ferrosilicon) and a silicate components.
4. The silicate component is foamed and sorted according to grain size of foamed silicate.

The production rate of the equipment is 35,000 m³ of foamed silicate a year, provided that a 3-ton furnace works in a three-shift mode 255 days per year. The output can be increased either by using another furnace, which allows a two-fold production growth with a minor additional investment, or by using a more capacious (5-, 7-, or 12-ton) furnace.

Production features:
- Power 100 kw-hr per 1 m³ of foamed silicate.
- Fuel consumption no
- Water discharge 50 m³/hr with return water use

Products from the mineral component:
- Foamed silicate, a hard highly porous material of various grain sizes:
  - sand – up to 5 mm,
  - debris – 5-20 mm,
  - gravel – 20-40 mm.
- Ferrosilicon, an alloy with transition and other useful components depending on the composition of the processed wastes.

Technical specifications
Foamed silicate:
- inflammability flammable;
- apparent density, kg/m³ 30-500;
- thermal conductivity, W/(m·K) 0.03-0.09;
- compression strength in the cylinder, MPa 0.05-0.9;
- loss on 15 freezing/thawing cycles, wt. % no more than 8;
- loss on silicate decomposition, wt. % no more than 8;
- loss on boiling, wt. % no more than 5;
- radioactivity, Bq/kg no more than 370.

Ferrosilicon:
- iron content, wt. % – 70-90;
- silicon content, wt. % – 30-10.

Technical appraisal and economic benefits
1. Universal processing of solid fuel and industrial wastes into commodity output.
2. Increased utilization of calorific efficiency of solid fuels. Conversion of synthesis gas into thermal and electric energy.
3. Processing of worthless industrial wastes into commodity products:
   • foamed silicate (new heat insulator);
   • ferrosilicon (flux addition for metallurgy).
4. Reducing man-caused environmental damage by
   • reducing waste-storage areas;
   • not requiring capital outlays for waste storage;
   • resolving environmental and economic problems related to storage and recycling of wastes, most often reactive.

**Application areas**
Foamed silicate is used:
• as sound and heat insulator in house building, civil and industrial engineering, in the temperature range of the insulated surfaces from –200 to +900 °C;
• as heat insulator for industrial equipment and pipe-lines;
• as a filler for heat insulating products (plates, shells, segments, etc.);
• as a filtering material sorptive to fluorine, arsenic, hydrogen sulphide, carbon bisulphide, and nitric oxides compounds.

**Development stage**
Pilot factory, possibility of pilot batch production.

**Patent situation**
No patents.

**Commercial offers**
Performing customer's orders for pilot batches.

**Estimated cost**
3 US$ per 1 m³ of foamed silicate.

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