Title: PLANT AND METHOD FOR TREATING NON-FERROUS METAL SCRAP

Abstract: A plant (1) for treating non-ferrous metal scrap, consisting of a scrap treating oven (3), one or more diesel engines (5) fed with vegetable oil as a fuel, combustion fume conveying means (7) from said diesel engines (5) to said treating oven (3), a fluidized bed combustor (8) and fume conveying means (9) from the treating oven (3) to the fluid bed combustor (8).
PLANT AND METHOD FOR TREATING NON-FERROUS METAL SCRAP

TECHNICAL FIELD

The present invention relates to a plant and method for treating non-ferrous metal scrap.

Specifically, the present invention relates to a plant and method for treating aluminium scrap, to which explicit reference will be made in the description without therefore losing in generality.

BACKGROUND ART

It has been known for some time that new aluminium may always be obtained from waste aluminium without needing to extract raw material. Recycling aluminium may represent a considerable economic saving and be a precious help to environment conservation. With this regard, it is worth noting that the primary production of aluminium is obtained by means of extraction from bauxite, and that 95% of the energy absorbed during the steps of primary producing is conserved in the material, and put back into play when the scrap is melted again. Furthermore, for a better evaluation of the issue, it should be considered that, in virtue of its versatility, aluminium today is used in a wide range of fields of application, from transportation to constructions, from electronics to packaging, from furniture to plant engineering.

Although they allow an economic advantage with respect to the primary production of the metal, the
recycling techniques used until now, however, have the disadvantage of including a preliminary step of eliminating organic material, which requires a considerable waste of thermal energy. Such a preliminary step has the purpose of eliminating the organic load in a controlled and safe manner and of returning clean aluminium back into the manufacturing chain. The elimination of the organic load has the purpose of avoiding problems deriving from the uncontrolled combustion of organic compounds present in the scrap from the collection.

Furthermore, the aluminium recycling techniques require the milled aluminium scrap to be thermally dried and degreased. Such a treatment, if carried out by means of a burner having the flame on the load, may cause aluminothermy with the risks related thereto. The risk of aluminothermy derives from the presence of both aluminium dust and magnesium alloys, and furthermore from the possible presence of sparks deriving from the contact of flammable solids with the flame and capable of triggering the aluminothermy.

DISCLOSURE OF INVENTION

It is the object of the present invention to provide a treating technique of non-ferrous metal scrap which includes a preliminary step of eliminating the organic load in a more cost-effective manner as compared to the state of the art, while having a low environmental impact. Specifically, if the technique is
applied to aluminium scrap treatment, a further object is that the aforesaid preliminary step is free from the risks related to aluminothermy.

The object of the present invention is a plant for treating non-ferrous metal scrap, said plant being characterized in that it includes a scrap treating oven, one or more diesel engines fed with vegetable oil as a fuel, conveying means for the combustion fumes coming from said diesel engines into said treating oven, a fluidized bed combustor and fume conveying means from the treating oven to the fluidized bed combustor.

**BRIEF DESCRIPTION OF THE DRAWING**

The following example is provided by way of non-limiting illustration for a better understanding of the invention with the aid of the figure in the accompanying drawing, which schematically shows the plant according to the present invention.

**BEST MODE FOR CARRYING OUT THE INVENTION**

In the figure, numeral 1 indicates as a whole the plant object of the present invention.

The plant 1 includes milling means 2 responsible for milling the aluminium scrap, a treating oven 3 and an air conveying line of the milled scrap from the milling means 2 to a feeding device 4 of the material to the treating oven 3.

The treating oven 3 includes a revolving drum insulated with ceramic fiber of different density, an inlet head of the hot air with a revolving metal seal to
avoid the fumes from being released, an outlet head of the hot air and exhaust fumes with a metal revolving seal on the drum. The revolving drum includes a system for distributing the treatment fumes therein, the origin of which will be described below.

The plant 1 includes a plurality of diesel engines 5 adapted to be able to work with untreated vegetable oil, and each of which is connected to an electric generator 6. The exhaust gases coming from the combustion of the engines 5 are introduced in the treating oven 3 and are responsible for the treatment of the aluminium scrap inside the oven 3. The exhaust gases are conveyed from the engines to the treating oven 3 by means of a piping 7. Specifically, the exhaust gases from the engines 5 exit the engines at a temperature of approximately 500-520°C and have a low free oxygen content, thus considerably lowering the risk of combustion inside the revolving drum.

The plant 1 includes a fluidized bed combustor schematically indicated by numeral 8, which is provided with a second combustion air input system. Specifically, the fluidized bed combustor 8 includes a combustion chamber, an automatic burner for starting the combustor, a pilot flame with compressed combustion air, a photocell for detecting the presence of the flame, a modulating valve for adjusting the main flame, a lobe compressor for fluidizing the sand and a bypass system for relieving the overpressure.
At the output from the treating oven 3, the fumes are conveyed to the fluidized bed combustor 8 by means of a piping 9, which includes in turn a Venturi groove 10 for measuring the flow rate.

The plant 1 includes a heat exchange system, schematically indicated by numeral 11, connected to the fluidized bed combustor 8 and which uses the combustion fumes thereof. The heat exchange system 11 is responsible for the production of steam useful for the operation of a turbine 12 connected to a corresponding electric generator 13.

Connected to the fluidized bed combustor 8, the plant 1 includes a recovery system for the ashes from the fluidized bed combustor 8 itself.

The plant 1 finally includes an instrument electric panel, schematically illustrated by numeral 14, and including the start-up and adjustment controls of the various component parts, and a computer unit with a video for recording and processing the parameters of the operating process by means of specific software.

As apparent from the description above, the plant of the present invention allows to implement the preliminary step of removing the organic material from the non-ferrous metal scrap requiring a negligible consumption of energy.

Indeed, as described above, the plant 1 uses the exhaust gases of the diesel engines for eliminating the organic material in the scrap, while at the same time
the electric generators connected to the diesel engines 5 and to the turbine 12, respectively, produce electricity useful for the energy needs of the process.

Furthermore, the plant 1 is placed at an environmental zero-impact standard because it uses vegetable oil and biomass both as main fuel and as supporting fuel of the fluidized bed combustor, and because the organic content is conveyed by the treatment fumes and introduced into the post-combustion system having a fluidized bed.
CLAIMS

1. A plant (1) for treating non-ferrous metal scrap, said plant being characterized in that it includes a scrap treating oven (3), one or more diesel engines (5) fed with vegetable oil as a fuel, combustion fume conveying means (7) from said diesel engines (5) to said treating oven (3), a fluidized bed combustor (8) and fume conveying means (9) from the treating oven (3) to the fluidized bed combustor (8).

2. A plant according to claim 1, characterized in that said treating oven (3) includes a revolving drum in which the non-ferrous metal scrap is treated.

3. A plant according to claim 1 or 2, characterized in that it includes milling means (2) adapted to mill the non-ferrous metal scrap to be introduced into the treating oven (3).

4. A plant according to anyone of the preceding claims, characterized in that each of the diesel engines (5) is connected to a corresponding electric generator (6).

5. A plant according to anyone of the preceding claims, characterized in that it includes a heat exchange system (11) responsible for the production of steam useful for operating a turbine (12) connected to a corresponding electric generator (13); said heat exchange system (11) being adapted to use the combustion fumes from said fluidized bed combustor (8).

6. A method for treating non-ferrous metals
characterized in that it includes a step of producing energy, in which one or more diesel engines (5) connected to corresponding electric generators (6) are fed when running with vegetable oil, a step of treating milled non-ferrous metal scrap, in which the exhaust gases of said diesel engines (5) cross the interior of a treating oven (3) where said milled scrap is accommodated, and a step of post-combusting, in which the fumes from said treating oven are burnt inside a fluidized bed combustor (8).

7. A method according to claim 6, characterized in that it includes a second step of producing energy, in which a turbine (12) connected to a corresponding electric generator (13) is actuated by the steam from a heat exchange system (11) connected to said fluidized bed combustor (8).
INTERNATIONAL SEARCH REPORT

A. CLASSIFICATION OF SUBJECT MATTER
INV. C22B1/00 C22B7/00 C22B21/00 F27B7/08 F27B7/20
F27D7/02 F27D13/00 F01K23/06 F02G5/02

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
C22B F27B F27D F01K F02G

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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<th>Relevant to claim No.</th>
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<td>GB 2 229 801 A (STEIN ATKINSON STRODY LTD [GB]) 3 October 1990 (1990-10-03)</td>
<td>1-7</td>
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<td>page 4, paragraph 2 - page 5, paragraph 5; figures 1, 2</td>
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Further documents are listed in the continuation of Box C.

See patent family annex.

X

Special categories of cited documents:

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Date of the actual completion of the international search: 7 July 2009

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