

Plant for treating waste products by injecting hot gas in the load to be treated and recycling the resulting thermolysis gases

5 The present invention is generally concerned with treating by thermolysis solid products or waste products whose disposal is harmful to the environment.

10 Document EP-A-0 610 120 discloses plant for treating solid waste products whose disposal is harmful to the environment including a dehydration area into which the solid products are fed, a thermolysis area downstream of the dehydration area, an outlet area in which the solid residues are cooled and pump means communicating via an extraction line with the thermolysis area to maintain it at
15 a reduced pressure and to aspirate thermolysis gases from it.

20 To enable thermolytic transformation in the total absence of free oxygen the dehydration, thermolysis and cooling areas consist of chambers isolated from each other in a substantially airtight manner.

 The dehydration and thermolysis chambers are provided with heating means such as catalytic radiator panels or flame burners using the thermolysis gases and/or (low price) commercially available combustible gases.

25 In the case of burners the enclosures of the aforementioned chambers are heated by radiation from the inside wall of the chambers heated by the burner flames. In this case heating is also assured by convection of the gases in the charge of products to be treated which is
30 assured by expansion of the gases generated in the corresponding chamber.

 The catalytic radiant panels are fed with pure oxygen or with air and with thermolysis gases resulting from thermolytic decomposition. In this case the carbon
35 dioxide and the steam generated by oxidation of the

thermolysis gases in the catalytic radiant panels can contribute to heating by convection and radiation.

Thus the temperature of the thermolysis chamber is maintained at around 600°C, for example, and the dehydration chamber is maintained at a lower temperature above 100°C, for example around 120°C.

The solid products to be treated are carried in wagons moved in the chambers by a mechanical rack and pinion type system, for example, or an electromagnetic type drive system. The wagons are designed so that the solid residues - glass, debris, metals, for example - remain in the wagons but are easily removable at the exit from the cooling chamber.

The solution described in document EP-A-0 610 120 is satisfactory overall. However, the use of burners in the dehydration and thermolysis chamber generates hot spots exposing the chambers to non-negligible mechanical stresses. These mechanical stresses can give rise to sealing problems which can be particularly troublesome because the penetration of oxygen into the thermolysis chamber can cause an explosion in the presence of hydrogen in the thermolysis chamber.

This risk of explosion is also present when catalytic radiator panels are used because they employ oxygen as a combustion-supporting gas.

Moreover, heating the chambers consumes external energy when commercially available combustible gases are used.

Finally, the thermolysis process is far from perfect in that a number of unburnt products remain after the thermolysis step.

Document GB-A-327 717 discloses the injection of hot gases into the charge of material by means of a wagon having a double bottom that is permeable to gases and is adapted to support the material. The double bottom is

provided with a connector defining a treatment gas inlet opening. The furnace receiving the wagon has notched rails on which the wagon travels and a gas feed pipe. When the wheels of the wagon enter the notches, the connector is in line with the pipe to enable fluidic communication between these two members.

Such provisions do not guarantee an optimal seal between the connector and the pipe and require the wagon to drop into the notches with great accuracy.

The present invention aims to alleviate these drawbacks.

It is generally aimed at improving the thermolysis step.

It also aims to provide plant for treatment of solid products whose disposal is harmful to the environment that is self-sufficient from the energy point of view.

A subsidiary aim of the present invention is to provide plant that is as little polluting as possible, which enables easily storable products to be recovered and which requires minimum maintenance.

To this end it proposes plant for treatment of solid products whose disposal is harmful to the environment, including a thermolysis chamber for thermolyzing solid products by input of heat, a hot gaseous fluid feed line constituting the heat input, discharging into the chamber, a line for extracting gases from the thermolysis chamber, a wagon for bringing the solid products into the chamber, fluidic connection means adapted to establish a temporary fluidic connection between the feed line and a connection area on the wagon and communicating with the area of the wagon for receiving solid products, characterized in that it includes a boiler fluidically connected to the extraction line and adapted to burn at least a part of the gases from the thermolysis chamber and means for recycling the combustion gases from

the boiler to produce the hot gaseous fluid.

Thus the invention teaches replacing the burners or catalytic radiant panels by the direct feeding of a hot gaseous fluid into the charge of waste products to be
5 treated. This avoids the creation of hot spots and any possibility of explosive reaction between oxygen and hydrogen. Moreover, the risk of unburnt products is reduced by feeding the gas directly to the charge.

These features additionally contribute to making
10 the treatment method of the present invention self-sufficient. The thermolysis gases formed in the thermolysis chamber are used in the production of the hot gaseous fluid to be fed into the same chamber.

If appropriate, the hot gaseous fluid can
15 advantageously include combustion gases from the boiler, thermolysis gases formed in the chamber and extracted therefrom beforehand via the extraction line, gases from treatment of the thermolysis gases formed in the chamber and extracted beforehand via the extraction line or an
20 inert gas (nitrogen, etc).

These provisions also contribute to making the treatment method used in the plant of the present invention self-sufficient.

In a preferred embodiment the plant further
25 includes a heat exchanger downstream of the extraction line in which the gases extracted from the thermolysis chamber via the extraction line flow as the hot fluid, a fractionating system downstream of the heat exchanger through which the gases cooled by the heat exchanger are
30 passed to obtain separated fractions respectively containing heavy hydrocarbons, light hydrocarbons, water and uncondensed gases at a low temperature, a recycling line connected to the heat exchanger downstream of the fractionation system so as to feed a part of the
35 uncondensed gases at a low temperature into the heat

exchanger as the cold fluid to heat it, this recycling line being connected to the feed line and passing through the boiler to heat the gases flowing in the recycling line by combustion of another part of the uncondensed gases at a low temperature in the boiler.

In accordance with preferred, possibly combinable features of the plant:

- the wagon includes a tank with regularly distributed nozzles discharging from the bottom of the tank and fluidically connected by a tubular system to the connection area,

- the fluidic connection means include a telescopic device mobile between a position of fluidic connection to the connection area of a pipe surmounted by a bellows and the other end of which is connected to the feed line and to a position away from the wagon,

- the bellow is mounted on the telescopic device with the facility for relative angular movement of the end of the bellows adapted to be applied to the connection area,

- it further includes pump means communicating with the chamber via the extraction line,

- the wagon is provided with rails on which the tubular system is mounted and in that rollers defining a rolling track for the wagon are mounted in the chamber,

- the wagon includes a tank with a grid forming the area for receiving solid products,

- the wagon includes a tank with a gas permeable bottom forming the area for receiving solid products and in that the fluidic connection means form, with this bottom, a double bottom in the connection position.

Aims, features and advantages of the invention emerge from the following description given by way of non-limiting example with reference to the appended drawings, in which:

- figure 1 is a schematic view of plant constituting a preferred embodiment of the present invention;

- figure 2 is a schematic elevation view in cross-section of the dehydration and thermolysis chamber of the solid products treatment plant from figure 1;

- figure 3 is a schematic elevation view in longitudinal section of the chamber from figure 2; and

- figure 4 is a plan view of the top of a part of the wagon forming part of the chamber shown in figures 2 and 3.

The plant shown in figure 1 includes an airlock 100 into which the solid products are fed followed by a thermolysis area 200 in which the solid products are first partly or totally dehydrated and then heated to their thermal decomposition temperature (known and fixed in advance), for example around 400°C (typically in the range 250°C to 750°C).

The thermolytic conversion is advantageously carried out in the total absence of free oxygen.

The thermolysis area is preferably followed by a cooling area 300 in which the solid residues of thermal treatment are cooled to room temperature, for example by water sprinklers.

An area 400 for unloading the wagons 2 is provided after the cooling area 300. The residues are tipped into a pool 500 from which they are then extracted and then sorted.

The areas 100, 200 and 300 are preferably chambers isolated from each other in a substantially airtight manner, for example by guillotine doors 101 actuated by cylinders, the doors between chambers 100 and 200, 200 and 300, and 300 and 400 being mobile transversely in airtight housings (registers). Airtight doors are also provided at the entry to chamber 100 and at the exit from chamber 400,

so that the airlock and the unloading area 400 are intentionally isolated from the exterior; they can be mobile vertically or horizontally or hinged, depending on the dimensions of the plant, the space available and the preference of the designer.

To prevent air entering the chamber 200 the products are fed in and the residues are extracted via airlocks which alternately and as required isolate the airlock 100 from the thermolysis chamber 200, when the products are fed into the airlock 100, and the thermolysis chamber 200 from the cooling chamber 300, when the residues are extracted from this third chamber.

The thermolysis chamber 200 is thermally insulated to limit heat losses.

The chamber 200 is maintained at a constant pressure which can be in the range 200 mbars to 1.2 bars. The same set point pressure can be chosen in the other chambers.

The pressure is maintained, for example, by pump means communicating with the chamber 200 via an extraction line 102, such as a blower described below.

During the thermolysis step the gases in the chamber 200 are aspirated via the extraction line 102 at a temperature which in this preferred embodiment is approximately 330°C.

They are then passed through a tube type heat exchanger 103 as the hot fluid.

They leave it at a temperature in the order of 200°C and are then fed via a recycling line 104 into various units of a fractionation system.

First the gases flow in a cooling circuit for separating heavy hydrocarbons. This circuit includes contact cooling means 105, known to the skilled person as an oil quench, a pump 106 and a heat exchanger 107.

The recycling line 104 discharges into the bottom

of the cooler 105.

The pump 106 and the heat exchanger 107 are on a branch connection 104' from the recycling line 104 which leaves the bottom of the cooler 105 and returns to the top of the cooler 105. An offtake line 108 for heavy hydrocarbons is connected to the branch connection 104' between the pump 106 and the heat exchanger 107. The cold fluid of the heat exchanger 107 is water fed via the line 109. This water is converted into steam which leaves via the line 110 connected to a steam exploitation unit (not shown).

The gases entering the cooler 105 are cooled by sprinkling heavy hydrocarbons previously recovered from the bottom of the cooler 105, aspirated by the pump 106, cooled in the heat exchanger 107 to a temperature in the range approximately 120°C to approximately 130°C and re-injected into the top of the cooler 105. Thus heavy hydrocarbons are formed continuously and in part taken off via the line 108 and in part recirculated to the cooler 105. The uncondensed gases leave the cooler 105 at a temperature of approximately 150°C and are fed via the recycling line 104 into a condenser 111 which cools them to a temperature of approximately 45°C.

The condenser 111 is fed with a refrigerant flowing in a cooling circuit including a pump 112 and a fan 113.

The condensed products accumulate at the bottom of the condenser 111 and are extracted from the latter and fed into a separator 114 (of the lamellar settling tank type) to separate the light hydrocarbons from the water and the organic substances dissolved in it.

The light hydrocarbons are extracted via the line 115 and the aqueous phase is fed via the line 116 into another separator 117, such as a distillation unit, to separate the water from the organic substances dissolved in it.

The water leaving the separator 117 is fed via a line 118 to water treatment plant and the soluble organic substances leaving the separator 117 via a line 119 can be fed from the line 119 to the boiler 120 to be burned in it.

5 In a similar manner, the light hydrocarbons can equally be fed from the line 115 to the boiler 120.

The uncondensed gases leaving the condenser 111 at a temperature of approximately 45°C are fed via the recycling line 104 into a water sprayer device 121 also known to the skilled person as a water quench. The device 121 washes the uncondensed gases to remove acids from them, such as hydrochloric acid.

10 To this end, water is circulated in the device 121 by means of a circuit 122 incorporating a pump 123. The circuit 122 includes a branch connection 124 which feeds the spent water to water treatment plant, for example the plant mentioned above.

A first part of the uncondensed gases leaving the device 121 at a temperature in the order of 45°C is re-injected into the heat exchanger 103 through a blower 125 which raises its temperature to approximately 100°C.

20 This part of the gases passes through the heat exchanger 103 as the cold fluid and leaves it at a temperature in the order of 300°C, after which it passes through a coil 126 in which the gases of this part of the uncondensed gases are heated to a temperature in the order of 650°C by combustion gases from the boiler 120.

On leaving the coil 126 the heated gases enter the line 127 feeding hot gases into the chamber 200.

30 Another part of the uncondensed gases is fed via the input line 128 to the boiler 120 in which it is burned to heat the part of the gases passing through the coil 126. The gases are circulated in the line 128 by a fan 129.

A third part of the uncondensed gases at a low temperature (approximately 45°C) is injected into the

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cooling area 300 via an injection line 130, to which a blower 131 is connected.

The hot gases recovered from this cooling area 300 are equally recovered on the extraction line 102.

5 The hot gases in the offloading area 400 are also recovered and fed into the bottom of the cooler 105 via a recovery line 132.

10 The combustion gases or flue gases produced by the boiler 120 are fed via a line 133 to a gas/gas heat exchanger 134 for heating the combustion-supporting air (or pure oxygen) used by the boiler 120 and arriving via the line 135 entering the heat exchanger 134.

15 To carry out the combustion the boiler 120 is equipped with multi-fuel burners so that it can burn not only the uncondensed gases but also the light hydrocarbons, the organic substances dissolved in the water and separated from the latter or any other liquid or gaseous fuel.

20 For situations which the net calorific value (PCI) of the thermolysis gas is too low for correct combustion, a fuel oil feed line 136 is connected to the thermolysis gas boiler 120.

25 A storage tank for storing thermolysis gas (not shown) can be provided so that combustion in the boiler 120 is not dependent on the instantaneous richness of the thermolysis gases from the chamber 200 or on the production of these gases with a net calorific value that is acceptable in terms of combustion performance. Compressor means (not shown) can also be provided to compress the gases before they are stored in the storage tank.

30 The skilled person will know how to choose appropriate valves for use at the respective locations of the plant described with reference to figure 1.

35 Note also that pressure and temperature control means, not shown, are installed on the various chambers 100 through 400 and on the boiler 120. Means for regulating

the flow of gas to each burner on entering the boiler 120, also not shown in figure 1, are provided at the input to the boiler 120. The skilled person knows how to choose and use such control and regulation means and means for
5 monitoring the quantity of oxygen in the boiler 120 or the quantity of hydrogen in the plant.

The solid residues leaving the cooling area 300 are wet treated to separate the fine minerals from the coal. The coal can be mixed with the tars recovered to make a
10 combustible mixture. The combustible mixture can be burned in the boiler 120, for example, or external to the plant, for example to produce electrical energy.

Using the above installation, the hot gases fed into the chamber 200 are enriched with hydrogen and
15 hydrocarbons (methane, ethane, ethylene) on contact with the charge of solid products to be treated, which raises the net calorific value of these gases (in practise from 4 000 kJ/kg to 18 000 kJ/kg - 19 000 kJ/kg), but also of other gases, in particular carbon dioxide, carbon monoxide,
20 etc.

It will be seen that this plant increases the net calorific value and the richness of the gases each time they pass through the charge.

In this plant dehydration and thermolysis are
25 carried out simultaneously and the treatment process is started by heating an inert gas (nitrogen, etc) or uncondensed gases stored beforehand.

Moreover, cooling the gases from the furnaces of the thermolysis chamber 200 protects the pump means.
30 Moreover, the gases to be recycled no longer contain water or tars and the latter can easily be stored or exploited as mentioned above, without fouling the plant.

Note further that the recycling means defined hereinabove here comprise the coil 126 forming a gas/gas
35 heat exchanger.

The internal structure of one of the dehydration and thermolysis furnaces of the chamber 200 and the structure of each wagon adapted to enter the latter will now be described with reference to figures 2 to 4.

5 The furnace 1 rests on the ground on four feet, only three of which, 11 through 13, can be seen in figures 2 and 3.

10 The feed line 102 discharges into the furnace 1 via conventional sealing means at the top of the furnace 1 and is extended by a hood 15. The latter extends as far as the immediate proximity of a wagon 2 and covers the upper end of a tank 16 for receiving solid products that is part of the wagon 2, the other components of which will be described in more detail below.

15 A hot gas feed line 127 also discharges into the furnace 1. Here the furnace 1 is sealed by means of conventional sealing means not shown in figures 2 and 3.

20 Fluidic connection means 20 adapted to establish a temporary fluidic connection between the feed line 127 and a connection area 21 on the wagon 2 will now be described.

25 The fluid connection means 20 include a telescopic device 22 mobile between a position of fluidic connection of one end of a rigid pipe 23 to the connection area 21 and a position moved away from the wagon 2. The other end of the pipe 23 is fluidically connected to the feed line 127.

30 To be more precise, the fluidic connection means 20 include a bellows 24 mounted on the telescopic device 22. One end of the bellows 24 is fluidically connected and sealed to the pipe 23 and its other end makes the temporary fluidic connection with the connection area 21 in the fluidic connection position.

35 The telescopic device 20 includes a stirrup member 25 the free ends of which are screwed to two opposite sides of a square section frame 26. Two lugs 27 extend the stirrup member 25 and each is pivoted to one of the other

two opposite sides of the frame 26 by means known in themselves. The stirrup member 25 is fixed to the frame 26 and the lugs 27 are pivoted to the frame 26 in a substantially middle area of each side of the frame 26 which are connected together at their ends and across their width.

The other end of each of the lugs 27 is attached to a flange or annular part 28 adapted to be pressed against the connection area 21 with a gasket 29 between them made from a material having some degree of elasticity and engaged in a groove in the annular flange 28.

One end of the bellows 24 is gripped between the flange 28 and a flange 30 screwed to the flange 28, only one of the screws 31 being shown in the figures. Similarly, the other end of the bellows 24 is gripped between flanges 32 and 33 connecting and sealing this second end of the bellows 24 fluidically to a frustoconical end of the pipe 23. The flanges 32 and 33 are bolted together, only one nut and bolt assembly 34 being shown.

By virtue of these features the feed line 127 is in fluidic communication with and sealed to the connection area 21 in the fluidic connection position of the telescopic device 20. Because of the gimbal type arrangement of the connecting means with limited pivoting of the lugs 27 on the frame 26 and because of the use of the bellows 24, the temporary fluidic connection can be effected with some degree of flexibility because of the possibilities of movement offered by the resulting arrangement.

Note further that the annular gasket 28 is also fitted over the first end of the bellows 24.

Note in this regard that a facility for limited angular movement relative to the stirrup member 25 about an axis perpendicular to that of the pivotal connection of the lugs 27 to the frame 26 can also be conferred on the

frame 26.

The stirrup member 25 of the telescopic device 20 is operated by a cylinder of which only the piston rod 35 is shown in figures 2 and 3. One end of the piston rod 35 is screwthreaded and passes through an opening in the base 36 of the stirrup member 25 connecting the lateral branches of the stirrup member 25 which are fixed to the frame 26. A shoulder on the piston rod 35 abuts against one side of the base 36 and a nut 37 is fitted to the screwthreaded end of the rod 35 and abuts against the other side of the base 36 in order to fasten the stirrup member 25 to the piston rod 35.

The piston rod 35 passes between the inside and the outside of the furnace 1 through a stuffing box 38 screwed to the bottom of the furnace 1.

Means for actuating the piston rod 35 can be of any type known to the skilled person, such as a pneumatic cylinder. They are not shown in figures 1 and 2.

A second bellows 38' surrounding the piston rod 35 to provide a seal is connected to the base 36 of the stirrup member 25 and to the stuffing box 38.

Returning to the subject of the wagon 2, the latter additionally includes two parallel U-section beams 39, 40 each of which rolls within the furnace 1 on a row of rollers 41, 42 mounted on brackets 43, 44 attached to the walls of the furnace 1 via a respective yoke 45, 46 fixed to the respective bracket 43, 44.

The rollers 41, 42 and the brackets 43, 44 are of course disposed on respective opposite sides of the telescopic device 20 so as not to impede its operation.

The wagon 2 is also guided laterally by a plurality of rollers 47, 48 on each side mounted in a similar way to the rollers 41, 42 except that they rotate about an axis perpendicular to that of the rollers 41, 42.

Means for moving the wagon 2 outside the furnace 1,

similar to those that have just been described, or other such means, can of course be provided outside the furnace.

As can be seen in figures 2 and 3, a plurality of nozzles 49 discharge from the bottom of the tank 16.

5 Their mounting on the wagon 2 will now be described in detail with reference to figure 4.

The tank 16 is square in shape and has four sheet metal side walls 50-53 welded to each other at their longitudinal ends.

10 Their bottom edges are bent inwards at right angles so that two opposite edges can be welded to the beams 39, 40. The other two opposite bottom edges are welded to parallel angle-irons 54-60 and 54'-60' perpendicular to the beams 39, 40. The other longitudinal end of each of these
15 angle-irons 54-60 and 54'-60' is fixed to one branch of the corresponding beam. The end brackets 54-60 and 54'-60' fixed to a side wall 51, 53 and to a respective beam 39, 40 are aligned in pairs and intermediate angle-irons 61-66 are provided between the beams 39, 40. The intermediate angle-
20 irons 61-66 are each aligned with two end angle-irons 54-60, 54'-60' and fixed at each end to one branch of the beam 39, 40 opposite that to which the end angle-iron 54-60, 54'-60' is fixed.

Note further that the bent edges of the side walls
25 50-53 of the tank are contiguous and that the central intermediate angle-iron cannot be seen in figure 4.

On this arrangement of beams and angle-irons is disposed a tubular system 70 comprising a central octagonal distributor 71 and a plurality of tubes 72-75 connected to
30 the distributor 71. For simplicity, only one tube of each type is identified in figure 4, although there are four of each type, as can be seen in figure 4.

The central distributor 71 includes two parallel superposed octagonal plates 76, 77, the top plate 76 being
35 slightly smaller than the bottom plate 77. Side walls join

the respective parallel sides of the top and bottom octagonal plates 76, 77 and are connected together at their longitudinal ends.

Each side wall has an opening to which is connected
5 the end of a tube, of the type indicated at 72 and 73, the other end of which is closed. Each of the tubes 72, 73 is perpendicular to the corresponding side wall. Four of these tubes, of the type indicated at 73 and disposed at right angles, comprise a first tube section 73' connected
10 fluidically to the opening in the wall and having a first diameter and a second tube section 73'' having a diameter less than this first diameter and extending the first section 73' by means of a frustoconical tube section 73'''. The tube sections 73', 73'' are substantially the same
15 length.

Four other tubes of the type indicated at 72 and disposed at right angles also comprise two tube sections 72', 72'' of which the one connected to the opening is longer than the other one. This latter section 72'' still
20 has a circular cross-section but the other section 72' is a flattened tube connected to the second section 72'' by a substantially frustoconical tubular element 72'''. Two circular cross-section tube sections of the type indicated at 74, 75 are fluidically connected at right-angles to each
25 of the flattened tube sections 72' in the vicinity of the tubular element 72'''.

The ends of these various tubular sections at the greatest distance from the side walls are closed and located in the immediate proximity of a peripheral flat bar
30 member 76-79 welded to the corresponding side wall 50-53 of the tank 16, perpendicularly to the latter. The bars 76-79 are also contiguous at their longitudinal ends.

The tubular system 70 rests on the angle-irons and the beams, one branch of each of the angle-irons being
35 flush with the corresponding branch of the U-section beam

39, 40.

The central distributor 71 is fixed to the nearest two parallel intermediate angle-irons 63, 64 in the following manner. The two parallel side walls of the distributor 71 nearest these angle-irons are provided with a hole for a nut and a fixing lug incorporating a smooth hole aligned with the hole in the lateral wall is welded to the intermediate angle-iron. A bolt is inserted in the two aligned holes and a nut is fitted to the free end of the bolt, near the fixing lug, with a washer between the bolt head and the side wall.

The octagonal bottom plate 77 of the central distributor 71 has a central circular opening 80. The peripheral area flanking this central opening defines the connection area 21 mentioned above, the circular opening 80 having substantially the same diameter as the bellows 24 at its free end. Note that the plate 77 is at the same level as the base of the U-section beams 39, 40.

As can be seen in figure 4, a nozzle 49 is disposed near the closed end of each of the tube sections 72'', 73'', 74, 75 having a closed end, near the middle area of each circular cross-section tube section 73', on each flattened tube section 72', at the crossing over of tube sections 74, 75 at a right angle and at the center of the octagonal top plate 76 of the distributor 71 to form an arrangement of regularly spaced nozzles 49 covering all of the bottom of the wagon 2. For simplicity, only five of the nozzles 49 are identified.

As seen better in the partly cut away view of the nozzle 49 in figure 2 or figure 3, the nozzles are screwed onto sleeves 82 which have an external shoulder at their base, forming projections on the tube sections, with a circular spacer 81 between them, a loose sealing washer 83 being received on the outside peripheral shoulder formed by each sleeve 82.

These nozzles or injectors have calibrated lateral holes (not identified) for injecting hot gases into the charge to be treated which are closed at their upper end. These calibrated holes typically have a diameter less than one millimeter.

The bottom of the wagon 2 further includes a bottom plate 84 (not shown in figure 4), such as a metal plate, with holes at the locations of the sleeves 82, resting on the tubular system 70 and disposed, at the level of the free washers 83, between the latter and the tubular system 70. This bottom plate is adapted to receive the solid products to be treated.

The bottom plate 84 is also fixed laterally to the peripheral bars 76-79 mentioned above, by means of screws inserted into screwthreaded holes that can be seen in figure 3, and two of which are designated 85. The other screwthreaded holes of the peripheral bars 76-79 which can be seen in figure 4 are of course identical to those designated.

If necessary, lateral wedging abutments can be disposed between the screwhead and the bottom plate 84.

Because of these features the free end of the nozzles 49 is fluidically connected and sealed to the circular opening 80 defined by the connecting area 21 and consequently, when the telescopic device 20 is in the sealed fluidic connection position, with the hot gas feed line 127.

Thus a wagon 2 laden with waste products to be treated can be brought up to the entry of the furnace 1 and then into the latter, rolling on the rollers 41, 42.

The telescopic device 20 is then operated to move the gasket 28 into sealed contact with the connection area 21.

When the wagon has been located under the hood 15 the pump means are operated to remove the oxygen present in

the chamber 200 via the extraction line 102.

A flow of hot gas is then fed via the line 127, the pipe 23, the bellows 24, the central distributor 71, the tubular system 70 and the nozzles 49 into the bottom of the charge to be treated in order to dehydrate and to thermolyze the solid products.

The gases leaving the furnace 1 are then treated as described above with reference to figure 1.

The telescopic device 20 is then retracted to allow the wagon 2 to be removed from the furnace 1, possibly after cooling.

In other embodiments means for guiding movement in translation of the stirrup member 25 can be provided.

Alternatively, the skilled person will also know how to design plant in which the wagon is brought up by a telescopic device in fluidic connection with a fixed hot gas feed line and a wagon and fluidic connection means enabling hot gas to be injected into the charge to be treated from the side or from the top, or even a combination of these modes of injection, possibly even with injection from the bottom, as described above.

The skilled person will also know how to replace the tubular system with a simple perforated grid, for example a grid of calibrated through-holes, constituting an area for receiving solid products to be treated, fluidic connection means being provided to establish a temporary fluidic connection between a hot gas feed line and these holes.

The tubular system could be replaced by a mesh of members forming passages with calibrated dimensions as required for a given application.

The nozzles could have a different shape, for example a "mushroom" shape with the part facing the receiving area of the wagon provided with calibrated passages.

The holes of the nozzles could be replaced with calibrated passages of different shape, such as slots, for example.

5 The skilled person will also know how to choose appropriate dimensions for the component parts of the plant in accordance with the present invention to suit the intended application.

10 It goes without saying that the preceding description has been given by way of non-limiting example only and that numerous variants can be proposed by the skilled person without departing from the scope of the invention.

CLAIMS

1. Plant for treatment of solid products whose disposal is harmful to the environment, including a thermolysis chamber (1, 200) for thermolyzing solid products by input of heat, a hot gaseous fluid feed line (127) constituting the heat input, discharging into the chamber, a line (102) for extracting gases from the thermolysis chamber, a wagon (2) for bringing the solid products into the chamber, fluidic connection means (20, 23, 24) adapted to establish a temporary fluidic connection between the feed line and a connection area (21) on the wagon and communicating with the area (84) of the wagon for receiving solid products, characterized in that it includes a boiler (120) fluidically connected to the extraction line and adapted to burn at least a part of the gases from the thermolysis chamber and means for recycling the combustion gases from the boiler to produce the hot gaseous fluid.

2. An installation according to claim 1 characterized in that the hot gaseous fluid includes thermolysis gases formed in the thermolysis chamber and extracted previously therefrom via the extraction line.

3. Plant according to claim 1 characterized in that the hot gaseous fluid includes combustion gases from the boiler.

4. Plant according to claim 1 characterized in that the hot gaseous fluid includes gases from treating thermolysis gases formed in the chamber and extracted beforehand via the extraction line.

5. Plant according to claim 1 characterized in that it further includes a heat exchanger (103) downstream of the extraction line in which the gases extracted from the thermolysis chamber via the extraction line flow as the hot fluid, a fractionating system downstream of the heat exchanger through which the gases cooled by the heat exchanger are passed to obtain separated fractions



respectively containing heavy hydrocarbons, light hydrocarbons, water and uncondensed gases at a low temperature, a recycling line (104) connected to the heat exchanger downstream of the fractionation system so as to feed a part of the uncondensed gases at a low temperature into the heat exchanger as the cold fluid to heat it, this recycling line being connected to the feed line and passing through the boiler to heat the gases flowing in the recycling line by combustion of another part of the uncondensed gases at a low temperature in the boiler.

6. Plant according to any one of claims 1 to 5 characterized in that the wagon (2) includes a tank (16) with regularly distributed nozzles (49) discharging from the bottom (84) of the tank (16) and fluidically connected by a tubular system (70) to the connection area (21).

7. Plant according to any one of claims 1 to 6 characterized in that the fluidic connection means (20, 23, 24) include a telescopic device (20) mobile between a position of fluidic connection to the connection area (21) of a pipe (23) surmounted by a bellows (24) and the other end of which is connected to the feed line (17) and a position away from the wagon (2).

8. Plant according to claim 7 characterized in that the bellow is mounted on the telescopic device (20) with the facility for relative angular movement of the end of the bellows (24) adapted to be applied to the connection area (21).

9. Plant according to any one of claims 1 to 8 characterized in that it further includes pump means communicating with the chamber via the extraction line.

10. Plant according to any one of claims 1 to 9 characterized in that the wagon (2) is provided with rails (39, 40) on which the tubular system (70) is mounted and in that rollers (41, 42) defining a rolling track for the wagon (2) are mounted in the chamber.



11. Plant according to any one of claims 1 to 5 characterized in that the wagon includes a tank with a grid forming the area for receiving solid products.

12. Plant according to any one of claims 1 to 5 characterized in that the wagon includes a tank with a gas permeable bottom forming the area for receiving solid products and in that the fluidic connection means form, with this bottom, a double bottom in the connection position.

13. Plant according to any one of claims 1 and 5 to 12 characterized in that the hot gaseous fluid includes an inert gas such as nitrogen.

