Abstract: Present invention relates to a transportable pellet production plant with an autonomous power supply. The plant comprises a chipper 1, a chip chamber 6, a gas generator 8, a chip dryer 4, a coarse gas purifier 9, a fine gas purifier 10, a chip grinder 13, two pelletizers 16, and two internal combustion engines 2 and 14 for running all equipment in the entire production plant. Internal combustion engines 2 and 14 are designed to run on combustion gases generated in the gas generator 8 by burning chip mass and where gases are cleaned in the coarse gas purifier 9 and in the fine gas purifier 10. Transportable pellet production plant with an autonomous power supply is designed to be used in places where an abundance of combustible waste material is available, such as in the logging areas.
TRANSPORTABLE PELLET PRODUCTION PLANT WITH AN AUTONOMOUS POWER SUPPLY

Technical Field

[0001] Transportable pellet production plant with an autonomous power supply is intended for production of wood pellets from wood waste mainly in the logging areas, but it can be used also on demolition sites of wooden buildings, in agriculture or elsewhere, where there is an abundance of combustible raw material.

Background Art

[0002] There is a commonly known stationary pellet production plant, wherein partially autonomous energy supply and partially non-renewable energy is used, at that the use of autonomous energy is limited to the use of exhaust gases of an engine for drying chips.

[0003] There is a known transportable pellet production plant, comprising a liquid fuel powered energy source for electricity generation, and where the manufacturing equipment is driven by electric motors.

[0004] There is a known transportable pellet production plant, comprising a chipper, a chip chamber, a chip drier, pelletizers and transporters; as a power source for the equipment a liquid fuel or a gas fuel gas turbine generator or gas turbine is used, whereby the electric energy produced this way is used for electric engines of the production plant and the exhaust gases are used for drying chips for manufacture of pellets (CA2536005A1).

[0005] There is known technology for production of pellets, by which a part of the chip mass is gasified and the acquired gas is used for heat treatment of chips and for driving a transporter (EP1950272A1).

[0006] The known pellet production plants are dependent in full or in part upon non-renewable energy carriers. At that renewable energy carriers are primarily used to produce electricity required to run equipment.

[0007] Since for starting electric motors high starting current is needed, electric generators must have much higher capacity than is actually needed for the production of pellets, or use of current converters is required. In view of
the above, pellet production plants driven by electric motors are uneconomical.

Disclosure of Invention

[0008] The object of the invention is to provide a transportable pellet production plant, which does not depend on external energy sources and which uses an autonomous energy supply, allows to reduce costs for the manufacture of pellets, is environmentally friendly and which is convenient to service.

[0009] To meet this purpose a transportable pellet production plant with an autonomous power supply has been developed, comprising equipment driven by the internal combustion engines fueled by gas, which is produced in the same plant by gasification of a part of chip mass in a gas generator.

[0010] To obtain the necessary means to ensure the achievement of the above-mentioned purpose, a transportable pellet production plant with an autonomous power supply (hereinafter referred to as "production plant") is provided, which comprises a raw material chipper, a chip drier, a chip chamber, a gas generator, a coarse gas purifier, a fine gas purifier, a chip grinder, two pelletizers, transporters, piping and two internal combustion engines, whereas one engine is intended for running a chipper and transporters and the other engine is intended for running two pelletizers, and a control unit.

[0011] The devices of the production plant are installed in two standard containers, that can be lifted on a truck and are transportable to the location of raw material.

[0012] On the work site the standard containers are placed next to each other, taking into account the placement of devices therein and their connectivity; an awning is fitted above the working area in front of the chipper and pelletizers.

Brief Description of Drawings

[0013] The figure shows a conceptual scheme of a transportable pellet production plant with an autonomous power supply.

Best Mode for Carrying Out the Invention

[0014] The exemplary embodiment of the transportable pellet production plant
with an autonomous power supply, shown in the drawing, comprises a chipper 1, an internal combustion engine 2 for running the chipper and a transporter 3 from a chip dryer to a chip chamber, a chip dryer 4, a transporter 5 from the chip dryer to the chip chamber, a chip chamber 5, a transporter 7 from the chip chamber to the gas generator, a gas generator 8, a coarse gas purifier 9, a fine gas purifier 10, gas piping 11, a transporter 12 from the chip chamber to the chip grinder, a chip grinder 13, an internal combustion engine 14 for running pelletizers, a transporter 15 from the chip grinder to two pelletizers, two pelletizers 16, a control unit 17 for controlling devices in the production plant, a standard container 18, a standard container 19 and an awning 20, which is fitted above the service area of the chipper and two pelletizers.

[0015] Whereat the chipper 1 and the internal combustion engine 2 for running the chipper and all other equipment, except for pelletizers, the transporter 3 from the chipper to the chip dryer, the chip dryer 4 and the transporter 5 from the chip dryer to the chip chamber are placed inside the standard container 18.

[0016] In order to ensure the safety, the standard container 19 is divided by a partition wall into two separate spaces, whereas the outer wall of one space is a grid wall and this space is fitted with the gas generator 8, the coarse gas purifier 9, the fine gas purifier 10, the transporter 7 from the chip chamber to the gas generator and the control unit 17.

[0017] The other space is fitted with the chip chamber 6, the chip grinder 13, two pelletizers 16, the internal combustion engine 14, the transporter 12 from the chip chamber to the chip grinder and the transporter 15 for transporting chips from the chip grinder to two pelletizers. The piping 11 ensures that the gas moves from the generator 8 in the standard container 19 into the chip dryer 4 in the standard container 18, and from the chip dryer 4 through the coarse gas purifier 9 and through the fine gas purifier 10 into the internal combustion engine 2 and into the internal combustion engine 14.

[0018] The transporter 15 is intended to transport chips from the chip dryer 5 in the standard container 18 to the chip chamber 6 in the standard container
19.

[0019] For accommodation of the production plant standard 20-foot sea containers are used, which can be lifted to the trucks and can be transported to the location of the raw material, such as a logging area.

[0020] At the destination the standard containers 18 and 19 are placed next to each other, taking into account the placement of devices therein and their connectivity. Then the standard containers 18 and 19 are fastened in place and an awning 20 is fitted above the service area of the chipper 1 and pelletizers 16.

[0021] To complete the running order of the production plant, the production plant is connected with gas piping 11 and the transporter 11 is installed.

[0022] In order to start the production of pellets, some previously stored chips are fed into the gas generator 8. Then the gas generator 8 is started by means of the control unit 17.

[0023] The gas generated by gasification of chips, the temperature of gas being +450°C, is led via the gas pipeline 11 to the chip dryer 4. As a result of drying of the chips, the gas temperature decreases. The gas cooled to a temperature of +35°C is first led through the gas piping 11 into the coarse gas purifier 9, then led into the fine gas purifier 10 and further into the internal combustion engine 2. Subsequently by means of the control unit 17, the internal combustion engine 2 and chipper 1 are started. Then the chip transporter 3 from the chipper to the chip dryer, the transporter 5 from the chip dryer to the chip hopper, the transporter 7 from the chip hopper to the gas generator, the chip grinder 13 along with the transporter 12 from the chip hopper to the chip grinder 13 and the transporter 15 from the chip grinder to the two pelletizers 16 are started. Finally the internal combustion engine 14 as well as two pelletizers 16 are started.

[0024] The raw material is introduced into the chipper 1. The chips obtained from the chipper 1 are transported to the chip dryer 4 by the transporter 3. Dried chips with humidity of 14-16% are transported from the chip dryer 4 to the chip chamber 6 by the transporter 5. A part of the chips is transported from the chip chamber 6 to the gas generator 8 by the transporter 7 and the other part of the chips is transported to the chip grinder 13 by the
transporter 12 and from there further to two pelletizers 16 by the transporter 15. Finished pellets leave from said pelletizers 16.

[0025] In order to reduce the emission of exhaust gases into the environment, the exhaust gases of the internal combustion engines 2 and 14 are led into the piping 11 in the chip dryer 4.

[0026] The environmentally clean technology according to the present invention allows to use combustible waste just where it forms and value it as a high-quality fuel without using external energy sources, such as liquid fuels, natural gas or electricity transmitted from electricity grid.

[0027] All energy needed for starting and running of the equipment in the presented production plant is obtained from the raw material processed in the production plant, being gasified in the gas generator.

[0028] The mechanical energy obtained by burning gas originating from the gas generator in the internal combustion engines is used to start and run the equipment in the production plant.

[0029] By burning gas once more in the internal combustion engine, the amount of harmful ingredients in the exhaust gases decreases twofold.

[0030] Compared to the use of a gas turbine generator in the production of pellets, twice as much heat is produced.

[0031] The yield of the present production plant is 1000 kg/h of solid chips, 800 kg/h from this being pellets. The humidity of chips entering the pelletizer is 14-16%. The energy consumption of the production plant is 90 kW/h.

[0032] Because the internal combustion engines are used for running equipment in the production plant, where the internal combustion engines run on gas, which is obtained from the raw material used for the production of pellets, a part of which is gasified in the gas generator, and there is no need for external energy carriers to start and run the production plant, it is possible to produce pellets in this production plant with much lower manufacturing costs than in known production plants.

[0033] The costs of pellets manufactured by the present production plant are 40% cheaper than by known production plants.

[0034] Moreover this production plant is environmentally friendly. In this pellet production plant instead of non-renewable energy sources only renewable
energy sources are used.

[0035] This production plant is designed primarily for use in logging areas. This production plant can also be used on a demolition site of wooden buildings, in agriculture, or elsewhere, where an abundance of combustible materials can be found, which can be used to produce pellets, as well as the energy necessary for running of the production plant.

[0036] Therefore when using the present production plant, it is not important, whether viable power lines, gas lines are nearby or not, and there is no need to transport liquid fuel to run a production plant.

[0037] Trucks are to be used only for transporting standard containers containing a production plant from one place to another. At other times the trucks can be used for other purposes.
Claims

1. Transportable pellet production plant with an autonomous power supply, comprising a chipper (1), a chip dryer (4), a transporter (3) from the chipper to the chip dryer, a transporter (5) from the chip dryer to the chip chamber, a chip chamber (6) and pelletizers (16), characterized by comprising a gas generator (8), an internal combustion engine (2) for running the chipper, a transporter (7) from the chip chamber to the gas generator, a coarse gas purifier (9), a fine gas purifier (10), gas piping (11), a transporter (12) from the chip chamber to the chip grinder, a chip grinder (13), an internal combustion engine (14) for running pelletizers, a transporter (15) from the chip grinder to pelletizers, a control unit (17) and two standard containers (18, 19), whereas one standard container (18) comprises the chipper (1), the internal combustion engine (2) for running the chipper and all other equipment except for pelletizers, the transporter (3) from the chipper to the chip dryer, and the chip dryer (4); whereas the other standard container (19) is divided into two separate spaces by a partition wall, whereas the outer wall of one space is a grid wall and said grid walled space comprises a gas generator (8), a transporter (7) from the chip chamber to the gas generator, the coarse gas purifier (9), the fine gas purifier (10) and the control unit (17); whereas the other space comprises the chip chamber (6), the chip grinder (13), the transporter (12) from the chip chamber to the chip grinder, the internal combustion engine (14) for running pelletizers, the transporter (15) for transporting chips from the chip grinder to pelletizers, and two pelletizers (16).

2. Transportable pellet production plant with an autonomous power supply according to claim 1, characterized in that, the internal combustion engine (2) for running the chipper (1), transporters (3, 5, 7, 12, 15) and the chip grinder (13) is intended to be run by combustion gases generated in the gas generator (8) by burning chip mass, which are cleaned in the coarse gas purifier (9) and the fine gas purifier (10).

3. Transportable pellet production plant with an autonomous power supply according to claim 1, characterized in that, the internal combustion engine (14) for running two pelletizers (16) is intended to be run by combustion gases generated in the gas generator (8) by burning chip mass, which are cleaned in
the coarse gas purifier (9) and in the fine gas purifier (10).

4. Transportable pellet production plant with an autonomous power supply according to any of claims 1 to 3, *characterized in that*, in the running production plant the standard containers (18 and 19) are placed next to each other, taking into account the placement of devices and their connectivity inside said containers.

5. Transportable pellet production plant with an autonomous power supply according to claim 1, *characterized in that*, the exhaust gases from internal combustion engines (2 and 14) are directed into the piping (11) passing through the chip dryer (4).

6. Transportable pellet production plant with an autonomous power supply according to claim 1, *characterized in that*, there is an awning (20) above the service area in front of the chipper (1) and the pelletizers (16).