a unit for compression of siderurgical gases for supplying the combustion chamber; and
a duct for conveying the siderurgical gases burnt in the the combustion chamber to the boiler in which a recovery of heat is carried out for heating the condensed steam;
the combined-cycle plant being characterized by comprising a heat-exchange unit for transferring the heat generated by the compression unit to the condensed steam upstream of the degasser in the steam-turbine unit.

[0018] Thanks to the present invention the efficiency of the compression unit is improved, any energy dispersions are minimized, and the efficiency of the steam-turbine unit, and in particular of the degasser, is improved. According to a simulation conducted by the present applicant, it emerges that the embodiment of the present invention leads to an improvement of 3% both in the efficiency and in the energy produced by the combined-cycle plant.

[0019] The present invention moreover regards a method for the production of electrical energy in a combined-cycle plant.

[0020] According to the present invention, a method for the production of electrical energy in a combined-cycle plant is provided, which envisages:

supplying of the combustion chamber of a gas-turbine unit with siderurgical gases compressed by a compression unit;
supplying of condensed steam along a supply circuit to a degasser and, in succession, to a boiler of a steam-turbine unit; and
conveying the siderurgical gases burnt in the combustion chamber to the boiler in which a recovery of heat is carried out for heating the condensed steam;
the method being characterized in that, at least in part, the heat generated by the compression unit is transferred to the condensed steam upstream of the degasser.

[0021] According to a particular embodiment of the present invention, the siderurgical gases burnt in the combustion chamber of the gas-turbine unit supply the boiler.

[0022] Since the steam that has undergone condensation is pre-heated upstream of the degasser thanks to the heat-exchange unit, there is no risk of reaching temperatures below the threshold temperature in the boiler, and, hence, the problems of corrosion of the boiler are overcome even in the event of the heat of the burnt siderurgical gases being recovered in the boiler.

BRIEF DESCRIPTION OF THE DRAWING

[0023] The invention will now be described with reference to the annexed figure, which illustrates a non-limiting example of embodiment thereof, and in particular shows a scheme, with parts removed for reasons of clarity, of a preferred embodiment of the combined-cycle plant forming the subject of the present invention according to the appended claims.

BEST MODE FOR CARRYING OUT THE INVENTION

[0024] In the figure, the reference number 1 designates a combined-cycle plant for the production of electrical energy, which can be supplied both with natural gas and with gases with low calorific power, in the case in point siderurgical gases, in combination with or as alternative to one another. For this reason, the combined-cycle plant 1 is connected to a steel plant for supply of siderurgical gases.

[0025] In particular, by the term "siderurgical gases" is meant mixtures of gases produced in the steel plant 2 during the working cycles for the production of steel. Said siderurgical gases are identified, for example, by the acronym BFG (Blast Furnace Gas) if they come from blast furnaces, BOFG (Basic Oxygen Furnace Gas) if they come from electrical converters, or else COG (Coke Oven Gas) if they come from coke ovens.

[0026] The combined-cycle plant 1 comprises a gas-turbine unit 3, which in turn comprises: a compressor 4; a combustion chamber 5; a gas turbine 6; and a shaft 7, which can be turned about an axis A1 by the gas turbine 6 to actuate an alternator 8. The plant 1 comprises a steam-turbine unit 9, of which the annexed figure represents only: a condenser 10; a degasser 11; a boiler 12; and a circuit 13 for supplying steam that has undergone condensation from the condenser 10 to the degasser 11, and in succession, to the boiler 12.

[0027] According to an embodiment (not illustrated), the degasser 11 can also be integrated with the boiler 12.

[0028] The plant 1 comprises a compression unit 14 for compressing the siderurgical gases to an adequate pressure (generally higher than 20 bar) for the needs of the combustion chamber 5 into which they are introduced. The compression unit 14 comprises: a shaft 15 that can turn about an axis A2; two compressors 16 and 17 fitted on the shaft 15; a converter 18 of hydraulic torque, which is designed to transfer selectively the rotary motion from the shaft 7 to the shaft 15 and is provided with a hydraulic circuit 19; a mechanical coupling member 20; a multiplier 21; and a lubrication circuit 22. The converter 18 is able to transfer selectively the motion from the shaft 7 to the shaft 15 according to actuation of the hydraulic circuit 19 supplied with oil, whilst the lubrication circuit 22 is a closed circuit that supplies oil to the mechanical coupling member 20, to the multiplier, to the shaft 15 and to the compressors 16 and 17. According to a variant (not illustrated), the compression unit comprises a number of compressors greater than two, and compression of the siderurgical gases takes place in more than two stages.

[0029] The combined-cycle plant 1 comprises a duct