C L A I M S

1. A drying system (1) comprising a drying plant (2) and a heat pump assembly (3), the drying plant of the drying system comprising a spray drying apparatus (2) connected to at least one pre-treatment unit and at least one exhaust heat recovery unit, the drying plant operating with a process gas, and the heat pump assembly (3) including at least one heat pump (30) operating with a primary fluid and being connected to at least two heat sources and at least one heat sink by means of a number of heat exchangers (41-45, 51-59) in a fluid network with physically interconnected loops, in which a secondary fluid circulates,

wherein the system is configured to be controlled by flow, flow direction, pressure and temperature in respective parts of said fluid network to manage transfer of heat from each of the different heat sources to the secondary fluid, from the secondary fluid to the cold evaporation side of the heat pump, from any hot side of the heat pump to the secondary fluid, and from the secondary fluid to each of the different heat sinks in the respective parts of said fluid network,

wherein said at least two heat sources comprise

- dew point dehumidification in at least one of said heat exchangers (41) in the at least one pre-treatment unit of process gas entering the drying plant; and
- recovery in at least one of said heat exchangers (42) in the at least one exhaust heat recovery unit of latent and/or sensible heat from exhaust gas leaving the drying plant,

and wherein said at least one heat sink comprises pre-heating in at least one of said heat exchangers (51) of process gas used within the drying plant.

2. A drying system according to claim 1, wherein a heat source is provided in the form of cooling of a process gas side stream in at least one of said heat exchangers (45), optionally for cooling and/or pneumatic transport of a final and/or intermediate dried product.

3. A drying system according to any one of the previous claims, wherein the spray drying apparatus (2) comprises a drying chamber (21) with a primary process gas inlet (22) for drying gas connected to at least one of said heat exchangers (51, 52) and a secondary process gas inlet at an outlet (22) from the drying chamber (21) for transportation of dried material connected to at least one of said heat exchangers (54).

4. A drying system according to claim 3, wherein the spray drying apparatus (2) furthermore comprises at least one after-treatment unit (24) provided with at least a tertiary gas inlet connected to at least one of said heat exchangers (53), preferably also a quaternary gas inlet connected to at least one of said heat exchangers (45, 55).

5. A drying system according to any one of the previous claims, wherein the heat pump assembly (3) comprises at least one high temperature heat pump (30), the heat pump or heat pumps being able of simultaneously providing chilling energy of a temperature below 20°C at the respective cold side and heating energy at the respective hot side on different temperature levels for different heat sinks, comprising at least one intermediate level between about 35-90°C and a high temperature level exceeding 100°C.

6. A method for integrating a heat pump assembly operating with a primary fluid into a drying plant, resulting in a drying system according to claim 1, said method comprising the steps of

- connecting by means of a number of heat exchangers in a fluid network, in which a secondary fluid circulates, a) at least two heat sources, said heat sources comprising dew point dehumidification of process gas entering the drying plant, and recovery of latent and/or sensible heat from exhaust gas leaving the drying plant, respectively, and b) at least one heat sink comprising pre-heating of process gas used within the drying plant, to the heat pump assembly;
- controlling said fluid network by flow and temperature in respective parts of said fluid network to manage transfer of heat from the heat sources to the secondary fluid and from the secondary fluid to

the heat sinks with a view to optimizing the capacity of the drying plant and the specific energy demand per weight unit of product;

wherein the drying system is an open cycle system, and wherein account is taken of the absolute humidity and temperature of the ambient air at the location of the drying system when optimizing the capacity of the drying plant and the specific energy demand per weight unit of product.

7. The method according to claim 6, wherein the heat pump assembly is provided as a retrofit appliance incorporating a control device and piping, and wherein the method further comprises the steps of connecting the piping to the heat exchangers to form the fluid network.