

**We Claim:**

1. A gasification system (100) for a waste material, the system (100) comprising:
  - a drying zone (120) configured to receive a waste material feed and heat to produce a dried waste;
  - 5 a pyrolysis zone (130) downstream of the drying zone (120) configured to receive the dried waste from the drying zone (120) and heat to produce a pyrolysis product and a char;
  - a gasification zone (140) downstream of the pyrolysis zone (130), configured to receive the char and to gasify the char to produce a syngas;
  - and a burner (150) downstream of the pyrolysis zone (130), configured to receive the  
10 pyrolysis product from the pyrolysis zone (130) to produce a burner output gas, wherein
    - the pyrolysis zone (130) is additionally configured to receive a first part of the burner output gas to aid producing the pyrolysis product;
    - the gasification zone (140) is additionally configured to receive a primary oxidizer gas, a tertiary oxidizer gas, and a second part of the burner output gas to aid syngas  
15 production; and
    - the burner (150) is additionally configured to receive a secondary oxidizer gas to aid increasing temperature of the burner output gas.
2. The gasification system (100) as claimed in claim 1, wherein the waste material has a moisture content in a range from 10 wt.% to 25 wt.% and comprises cellulosic waste material,  
20 municipal waste, or a combination thereof.
3. The gasification system (100) as claimed in claim 1, comprising a heat exchanger (160) configured to transfer heat from the syngas produced in the gasification zone (140) to the contents of the pyrolysis zone (130) and the drying zone (120) for producing a circulating gas to be used in the drying zone (120) and the pyrolysis zone (130).
- 25 4. The gasification system (100) as claimed in claim 1, wherein the pyrolysis zone (130) comprises at least two zones, a primary pyrolysis zone (132) and a secondary pyrolysis zone (134) downstream of the primary pyrolysis zone (132), wherein the primary pyrolysis zone

(132) is configured to receive the dried waste from the drying zone (120) and to convert the dried waste to a partially pyrolyzed waste using the heat, and the secondary pyrolysis zone (134) is configured to receive the partially pyrolyzed waste and the first part of the burner output gas to fully pyrolyze the dried waste to produce the pyrolysis product and the char.

5        5. The gasification system (100) as claimed in claim 1, wherein the first part of the burner output gas comprises from 10 volume % to 20 volume % of the burner output gas and the second part of the burner output gas comprises from 80 volume % to 90 volume % of the burner output gas.

10        6. The gasification system (100) as claimed in claim 1, wherein the drying zone (120) and the pyrolysis zone (130), comprise a plurality of fans (170) configured to maintain each of the zones in isothermal conditions and thermally isolated from other zones.

7. The gasification system (100) as claimed in claim 1, comprising a pyrolysis product blower (180) to circulate the pyrolysis product from the pyrolysis zone (130) to the burner (150).

15        8. A process for waste material gasification using a gasification system (100), the process comprising:

supplying a waste material feed and heat to a drying zone (120) of the gasification system (100) to produce a dried waste;

20        pyrolyzing the dried waste in the presence of heat and a first part of a burner output gas of the gasification system (100) in a pyrolysis zone (130) to produce a pyrolysis product and a char;

gasifying the char in the presence of a primary oxidizer gas, a tertiary oxidizer gas, and a second part of the burner output gas in a gasification zone (140) to produce a syngas; and

25        burning the pyrolysis product in the presence of a secondary oxidizer gas in a burner (150) to produce the burner output gas.

9. The process as claimed in claim 8, comprising transmitting heat from the produced syngas to the drying zone (120) and the pyrolysis zone (130) using a heat exchanger (160).

10. The process as claimed in claim 8, comprising sustaining isothermal conditions in the drying zone (120), the pyrolysis zone (130), and the gasification zones (140).

11. The process as claimed in claim 8, comprising sustaining isothermal condition in the drying zone (120) in a temperature range from 100 ° C to 200 ° C, in the pyrolysis zone (130) in a temperature range from 300 ° C to 500 ° C, and in the gasification zone (140) in a temperature range from 700 ° C to 900 ° C.

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