CLAIMS

1. A method for purifying biomass syngas under a negative pressure for producing oil, the method comprising:

introducing high-temperature syngas out of a gasifier via a top thereof, through a high-temperature water-cooling flue to a water-cooling quench tower, where water is sprayed into the high-temperature syngas for quenching a part of slag;

introducing the syngas from the water-cooling quench tower to a waste heat boiler of a water-tube type and a waste heat boiler of a heat-tube type, where waste heat is recovered in two sections at two pressures, by-products including middle pressure vapor and low pressure vapor are produced and supplied to external devices, and a heavy tar is condensed and recovered by the waste heat boiler of the heat-tube type;

introducing the syngas from the waste heat boiler of the heat-tube type to a Venturi scrubber in the absence of a filler for washing the syngas and removing dust;

introducing the syngas from the Venturi scrubber to a wet electric dust collector for conducting deep dust removal and tar mist removal; and

extracting the syngas by a coal gas draft fan, and transporting the syngas to a wet gas tank for storage or to a downstream process for use,

wherein the high-temperature syngas produced in the gasifier has a temperature of between 1000 and 1100°C, a dust content of lower than 20g/Nm^3, and a tar content of lower than 3g/Nm^3;

the high-temperature syngas is introduced out of the gasifier via the top thereof, through the high-temperature water-cooling flue (1), and into the water-cooling quench tower (2), where water is sprayed to decrease a temperature of the syngas to be 800 ± 20°C and to condense the slag;

the syngas is then introduced to the waste heat boiler of the water-tube type (3) for recovering middle temperature waste heat; the middle pressure vapor produced therein is supplied to the external devices; the syngas flowing out of the waste heat boiler of the water-tube type has a temperature of 450 ± 20°C;

the syngas is then transported to the waste heat boiler of the heat-tube type (4) for recovering low temperature waste heat; the low pressure vapor produced therein is supplied to the external devices; the syngas is cooled in the waste heat boiler of the heat-tube type (4), and the heavy tar is separated simultaneously and is collected by a chute; the temperature of the syngas flowing out of the waste heat boiler of the heat-tube type is decreased to 200 ± 10°C;

the syngas is then transported to the Venturi scrubber (5) in the absence of the filler to wash the syngas, remove the dust, and further decrease the temperature of the syngas, so that a majority of the dust, tar drops, and water soluble gas enter a washing liquid and are removed;

the temperature of the syngas after washing is 45 ± 2°C; the syngas is transported to the wet electric dust collector (6) to further remove the dust and the tar therein so that the syngas has both the dust content and the tar content of < 10 mg/Nm^3, the temperature of < 45°C, and the sensible heat recovery of higher than 80%;

the qualified syngas is extracted by the coal gas draft fan (7) and transported to the wet gas tank (8) for storage or supplied to the downstream process for use; and a flare (9) is in parallel connection with the wet gas tank (8) for combusting waste gas.

~~2. The method of claim 1, **characterized in that**~~

the high-temperature syngas produced in thegasifier has a temperature of between 1000 and 1100°C, a dust content of lower than 20g/Nm^3, and a tar content of lower than 3g/Nm^3;

the high-temperature syngas is introduced out of the gasifier via the top thereof, through the high-temperature water-cooling flue (1), and into the water-cooling quench tower (2), where water is sprayed to decrease a temperature of the syngas to be 800 ± 20°C and to condense the slag;

the syngas is then introduced to the waste heat boiler of the water-tube type (3) for recovering middle temperature waste heat; the middle pressure vapor produced therein is supplied to the external devices; the syngas flowing out of the waste heat boiler of the water-tube type has a temperature of 450 ± 20°C;

the syngas is then transported to the waste heat boiler of the heat-tube type (4) for recovering low temperature waste heat; the low pressure vapor produced therein is supplied to the external devices; the syngas is cooled in the waste heat boiler of the heat-tube type (4), and the heavy tar is separated simultaneously and is collected by a chute; the temperature of the syngas flowing out of the waste heat boiler of the heat-tube type is decreased to 200 ± 10°C;

the syngas is then transported to the Venturi scrubber (5) in the absence of the filler to wash the syngas, remove the dust, and further decrease the temperature of the syngas, so that a majority of the dust, tar drops, and water soluble gas enter a washing liquid and are removed;

the temperature of the syngas after washing is 45 ± 2°C; the syngas is transported to the wet electric dust collector (6) to further remove the dust and the tar therein so that the syngas has both the dust content and the tar content of < 10 mg/Nm^3, the temperature of < 45°C, and the sensible heat recovery of higher than 80%;

~~the qualified syngas is extracted by the coal gas draft fan (7) and transported to the wet gas tank (8) for storage orsupplied to the downstream process for use; and~~

~~a flare (9) is in parallel connection with the wet gas tank (8) for combusting waste gas.~~

~~3.~~2. The method of claim ~~2~~1, **characterized in that** both the high-temperature water-cooling flue (1) and the water-cooling quench tower (2) adopt membrane water-cooling pipe structures.

~~4.~~3. The method of claim ~~2~~1, **characterized in that** a design pressure in the waste heat boiler of the water-tube type (3) is equal to or larger than 1.6 megapascal, and a temperature of the syngas at an outlet thereof is 450 ± 20°C.

~~5.~~4. The method of claim ~~2~~1, **characterized in that** a temperature of the syngas at the outlet of the waste heat boiler of the heat-tube type (4) is controlled at less than 200°C to condense the heavy tar in this section and to collect the heavy tar by the chute.

~~6.~~5. The method of claim ~~2~~1, **characterized in that** a design pressure in the waste heat boiler of the heat-tube type (4) is 0.5 megapascal, and the low pressure vapor produced therein is supplied to the wet electric dust collector (6) for sweeping.