CLAIMS

1. A process for manufacturing a low-sulfur residual marine fuel oil, comprising:

producing high-temperature upgraded oil-gas by chemical upgrading of low-quality heavy component, reacting the high-temperature upgraded oil-gas by contacting and mixing with a blending component under high temperature conditions, homogenizing and stabilizing the mixture resulted from the reaction, and then separating the light component from the mixture, thereby obtaining the low-sulfur residual marine fuel oil; wherein the high-temperature upgraded oil-gas is a gas-liquid mixture at a temperature of 360°C or higher and the reaction temperature of the reaction is 80°C or higher.

2. The process according to claim 1, wherein the process further comprises further adding the blending component to the mixture after the light component is separated.

3. The process according to claim 1, wherein the process further comprises adding an auxiliary agent into the blending component to further improve the quality of the low-sulfur marine fuel oil.

4. The process according to any one of claims 1 to 3, wherein the low-quality heavy component includes one or more of residual oil, catalytic slurry, coking wax oil, ethylene tar, and deoiled asphalt.

5. The process according to any one of claims 1 to 3, wherein the chemical upgrading includes one or more of visbreaking, hydrogen donor thermal cracking, hydrogen presence thermal cracking, fluidized thermal conversion, delayed coking, and heavy oil hydroconversion.

6. The process according to claim 5, wherein the heavy oil hydroconversion comprises one or more of fixed bed, suspended bed, boiling bed, and moving bed heavy oil hydrogenation processes.

7. The process according to claim 5, wherein the fluidized thermal conversion comprises one or more of fluidized coking, flexicoking, fluidized catalytic cracking, and circulating fluidized bed processes.

8. The process according to any one of claims 1-3, wherein the blending component includes one or more of catalytic diesel, catalytic slurry, hydrotreated residual oil,

coking diesel, coking wax oil, ethylene tar, and straight-run diesel.

9. The process according to any one of claims 1 to 3, wherein the amount of the blending component used is 3 to 100% of the mass of the high-temperature upgraded oil-gas.

10. The process according to claim 1, wherein the reaction temperature of the reaction is 120°C or higher.

11. The process according to any one of claims 1 to 3, wherein the blending component is injected at one or more positions of the oil-gas outlet of the chemical upgrading unit used for chemical upgrading, the inlet of the homogenization and stabilization unit used for homogenization and stabilization, and the oil-gas transportation pipeline connecting the oil-gas outlet and the inlet of the homogenization and stabilization unit, and the high-temperature upgraded oil-gas is reacted by contacting and mixing with the blending component under high temperature conditions.

12. The process according to any one of claims 1 to 3, wherein the low-sulfur residual marine fuel oil has a sulfur content of less than 0.5%, and a kinematic viscosity of less than 500 mm^2/s at 50°C.