Method of producing methane and heavy hydrocarbons from marine vessels equipped with nuclear powerplant

FIELD OF THE INVENTION

The present invention relates to a method of producing at least one synthetic hydrocarbon product onboard a marine vessel equipped with a nuclear powerplant device, the synthetic hydrocarbon product is then subsequently distributed to a plurality of remote sites. The method comprises of intake of carbon dioxide, storing the carbon dioxide in the vessel, and nuclear powerplant device extracting hydrogen from seawater, and further reacting carbon dioxide and hydrogen into a Sabatier reaction system to produce methane – the methane may be distributed to a plurality of remote sites, or be further upgraded into heavier hydrocarbons such as methanol, ethanol, etc.

SUMMARY OF THE INVENTION

It is object of the present invention to provide a method of producing at least one synthetic hydrocarbon product onboard a marine vessel equipped with a nuclear powerplant device, the synthetic hydrocarbon product is then subsequently distributed to a plurality of remote sites. The method comprises of intake of carbon dioxide, storing the carbon dioxide in the vessel, and nuclear powerplant device extracting hydrogen from seawater, and further reacting carbon dioxide and hydrogen into a Sabatier reaction system to produce methane – the methane may be distributed to a plurality of remote sites, or be further upgraded into heavier hydrocarbons such as methanol, ethanol, etc.

The methane produced from the Sabatier reaction system contains water, and would have to be removed by means of condensation, prior to storing and distributing the methane product.

The methane may be upgraded into heavier hydrocarbons by means of Fischer-Trosph reaction, and depending on the product distribution dynamics (such as ASF product curve), a variety of heavy hydrocarbons can be produced onboard the marine vessel for subsequent distribution to a plurality of remote sites.

Sabatier reaction using carbon dioxide and hydrogen

In one preferred embodiment of the present invention, the nuclear powerplant device operates an

electrolysis unit to extract hydrogen from a seawater source within the vessel, and reacts the hydrogen with the carbon dioxide in a Sabatier reaction system to produce water and methane.

The methane is isolated, and may be stored in compressed form (compressed natural gas), or be liquefied to form liquefied natural gas (LNG).

In another preferred embodiment of the present invention, the marine vessel may intake carbon dioxide from a land-based or offshore distribution pipeline.

The use of a nuclear powerplant device (which encompasses fission reactors, fusion reactors and "cold fusion" reaction designs), can produce hydrocarbon products at a very competitive rate. Further, the nuclear powerplant device may only be refuelled at long operational intervals, reducing re-fuelling requirements.

Extracting syngas from carbonaceous feedstock

In another preferred embodiment of the present invention, a method of producing at least one synthetic hydrocarbon product onboard a marine vessel equipped with a nuclear powerplant device, the synthetic hydrocarbon product is then subsequently distributed to a plurality of remote sites. The method comprises of intake of a carbonaceous feedstock and the extraction of syngas from the said feedstock, said extraction process is operated and or powered by the said nuclear powerplant device. The syngas is then further processed and fed into a Fischer-Trosph reaction unit to yield at least one synthetic hydrocarbon product including but not limited to methane gas, methanol, ethanol and other heavier hydrocarbons.

The syngas extracted mainly comprises of carbon monoxide and hydrogen.

In one preferred embodiment of the present invention, the nuclear powerplant device operates an electrolysis unit to extract hydrogen from a seawater source within the vessel, and enriches the syngas blend's hydrogen composition (to increase the hydrogen content of the syngas extracted from the carbonaceous feedstock).

The syngas is then fed into the Fischer-Trosph reaction device to produce an intended hydrocarbon product for subsequent distribution to a plurality of remote sites.

In another preferred embodiment of the present invention, the nuclear powerplant device

operates an extraction process device for the purposes of extracting a syngas blend from the carbonaceous feedstock onboard the vessel.

The extraction process device may be a plasma arc pyrolysis unit, a gasification tower, or a hybrid or variation such as a hydro-gasification unit.

The advantage of using the plasma arc pyrolysis unit is that heat and an electric current are the requirements of the extraction process, while steam (H.sub.2.O) is usually required for gasification – the thermal deposition of the carbonaceous feedstock to extract syngas is the method in using pyrolysis.

The use of a nuclear powerplant device (which encompasses fission reactors, fusion reactors and "cold fusion" reaction designs), reduces the cost of energy required for the extraction process and potentially can produce hydrocarbon products at a very competitive rate. Further, the nuclear powerplant device may only be refuelled at long operational intervals, reducing re-fuelling requirements.

In another preferred embodiment of the present invention, the marine vessel may be an offshore rig structure, or moored tower.

In another preferred embodiment of the present invention, the marine vessel may be a barge.

In another preferred embodiment of the present invention, the marine vessel may be a FPSO vehicle.

In another preferred embodiment of the present invention, the marine vessel may be a dry-bulk carrier.

In another preferred embodiment of the present invention, the marine vessel may be a tanker-class vehicle.

In another preferred embodiment of the present invention, the marine vessel may be a VLCC vehicle.

In another preferred embodiment of the present invention, the marine vessel may be a ULCC vehicle.

In another preferred embodiment of the present invention, the marine vessel may be a moored platform.

In another preferred embodiment of the present invention, the marine vessel may be an offshore platform.

BRIEF DESCRIPTION OF THE DRAWINGS

Illustrative embodiments of the present invention will now be described, by way of example, with reference to the accompanying drawings, in which:

Figure 1 illustrates the present invention comprising of its main parts on a marine vessel.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

---------- NOT COMPLETE AT TIME OF SUBMISSION ----------

Modifications within the spirit and scope of the invention may readily be effected by persons skilled in the art. It is to be understood, therefore, that this invention is not limited to the particular embodiments described by way of example hereinabove.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A method of producing a hydrocarbon product onboard a marine vessel for subsequent distribution to a plurality of remote sites, comprising intake of carbon dioxide into vessel, and extracting hydrogen from seawater, further reacting hydrogen and carbon dioxide in a Sabatier reaction system to produce methane and water

2. A method as claimed in claim 1, methane is isolated and be stored in vessel for subsequent distribution

3. A method as claimed in claim 1, where methane is isolated and reacted in a Fischer-Trosph reaction system to produce heavier hydrocarbons

4. A method as claimed in claim 1, where extraction of hydrogen from seawater is operated by means of a nuclear powerplant device onboard the said marine vessel

5. A method as claimed in claim 1, where marine vessel performs intake of carbon dioxide from a distribution pipeline system

6. A method of producing a hydrocarbon product for subsequent distribution to a plurality of remote sites, comprising intake of carbon dioxide into a remote site plant, and extracting hydrogen from water, further reacting hydrogen and carbon dioxide in a Sabatier reaction system to produce methane and water

7. A method as claimed in claim 6, methane is isolated and be stored in remote site plant for subsequent distribution

8. A method as claimed in claim 6, where methane is isolated and reacted in a Fischer-Trosph reaction system to produce heavier hydrocarbons

9. A method as claimed in claim 6, where extraction of hydrogen from water is operated by means of a nuclear powerplant device fitted in the remote site plant

10. A method as claimed in claim 6, where remote site plant performs intake of carbon dioxide from a distribution pipeline system

11. A method of producing a hydrocarbon product for subsequent distribution to a plurality of remote sites, comprising intake of carbon dioxide into a remote site plant, and extracting hydrogen from water, further reacting hydrogen and carbon dioxide in a Sabatier reaction system to produce methane and water

12. A method as claimed in claim 11, methane is isolated and be stored in remote site plant for subsequent distribution

13. A method as claimed in claim 11, where methane is isolated and reacted in a Fischer-Trosph reaction system to produce heavier hydrocarbons

14. A method as claimed in claim 11, where extraction of hydrogen from water is operated by means of a wind-turbine powerplant device fitted in the remote site plant

15. A method as claimed in claim 11, where remote site plant performs intake of carbon dioxide from a distribution pipeline system

16. A method as claimed in claim 11, where remote site plant performs intake of carbon dioxide from a CO.sub.2 sequestered site

17. A method as claimed in claim 11, where remote site plant performs intake of carbon dioxide from a electric power generating plant

18. A method as claimed in claim 17, where electric power generating plant is a coal-fired plant

19. A method as claimed in claim 17, where electric power generating plant is a natural-gas fired plant

20. A method as claimed in claim 17, where electric power generating plant is a syngas-fired plant

21. A method of producing a hydrocarbon product for subsequent distribution to a plurality of remote sites, comprising intake of carbon dioxide into a remote site plant, and extracting hydrogen from water, further reacting hydrogen and carbon dioxide in a Sabatier reaction system to produce methane and water

22. A method as claimed in claim 21, methane is isolated and be stored in remote site plant for subsequent distribution

23. A method as claimed in claim 21, where methane is isolated and reacted in a Fischer-Trosph reaction system to produce heavier hydrocarbons

24. A method as claimed in claim 21, where extraction of hydrogen from water is operated by means of a solar powered device fitted in the remote site plant

25. A method as claimed in claim 21, where remote site plant performs intake of carbon dioxide from a distribution pipeline system

26. A method as claimed in claim 21, where remote site plant performs intake of carbon dioxide from a CO.sub.2 sequestered site

27. A method as claimed in claim 21, where remote site plant performs intake of carbon dioxide from a electric power generating plant

28. A method as claimed in claim 27, where electric power generating plant is a coal-fired plant

29. A method as claimed in claim 27, where electric power generating plant is a natural-gas fired plant

30. A method as claimed in claim 27, where electric power generating plant is a syngas-fired plant

31. A method of producing a hydrocarbon product onboard a marine vessel for subsequent distribution to a plurality of remote sites, comprising intake of a carbonaceous feedstock into vessel, and extracting a syngas blend comprising carbon monoxide and hydrogen, said extraction process is in communication with a nuclear powerplant device fitted onboard the said marine vessel

32. A method as claimed in claim 31, where syngas blend extracted is reacted in a Fischer-Trosph system to produce the said hydrocarbon product

33. A method as claimed in claim 31, where nuclear powerplant device is interconnected to a extraction process unit to perform said extraction of syngas from the said carbonaceous feedstock

34. A method as claimed in claim 31, where nuclear powerplant device is further connected to the marine vessel's propulsion system

35. A method of producing a hydrocarbon product onboard a marine vessel for subsequent distribution to a plurality of remote sites, comprising intake of a carbonaceous feedstock into vessel, and extracting a syngas blend comprising carbon monoxide and hydrogen, said extraction process is in communication with a nuclear powerplant device fitted onboard the said marine vessel

36. A method as claimed in claim 35, where syngas blend extracted is further enriched with additional hydrogen

37. A method as claimed in claim 35, where hydrogen enriched syngas blend is reacted in a Fischer-Trosph system to produce the said hydrocarbon product

38. A method as claimed in claims 35, 36 and 37, where additional hydrogen is produced by means of the nuclear powerplant device onboard the said marine vessel

39. A method as claimed in claim 38, where nuclear powerplant device may be further interconnected to a hydrogen extraction unit