

FORM 2

THE PATENTS ACT, 1970
(39 of 1970)
AND
THE PATENTS RULES, 2003

**COMPLETE
SPECIFICATION**

(See Section 10; rule 13)

TITLE OF THE INVENTION

“METHOD OF PROCESSING FEED STREAMS CONTAINING HYDROGEN
SULFIDE”

APPLICANT

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The following specification particularly describes
the invention and the manner in which
it is to be performed

CLAIMS

1. A method, comprising:
 - providing a feed gas stream comprising hydrogen sulfide and hydrocarbons, wherein the feed gas stream comprises at least 5% by volume hydrogen sulfide;
 - separating at least a portion of the feed gas stream into a hydrogen sulfide stream and a hydrocarbon gas stream, the hydrogen sulfide stream containing more hydrogen sulfide, by volume percent, than the feed gas stream, and the hydrocarbon gas stream containing less hydrogen sulfide, by volume percent, than the feed gas stream;
 - processing the hydrocarbon gas stream to produce natural gas; and
 - combusting at least 34 mol% of the hydrogen sulfide in the hydrogen sulfide stream with an oxidant containing molecular oxygen to generate thermal power, where the molar ratio of molecular oxygen to hydrogen sulfide in the hydrogen sulfide stream and oxidant that are combusted is at least 1.4 to 1;
 - utilizing the thermal power in one or more of the steps of separating the feed gas stream into the hydrogen sulfide stream and the hydrocarbon gas stream when processing the hydrocarbon gas stream to produce natural gas.
2. The method of claim 1, wherein processing the hydrocarbon gas stream to produce natural gas comprises performing one or more of the steps of:
 - a) dehydrating the hydrocarbon gas stream;
 - b) removing metals from the hydrocarbon gas stream;
 - c) separating non-hydrocarbon gases from the hydrocarbon gas stream;
 - d) separating natural gas liquids from the hydrocarbon gas streamand
 - e) compressing the hydrocarbon gas stream to a pressure of from 1.7 MPa to 12.1 MPa.
3. The method of claim 1 or claim 2 wherein the thermal power generated by combusting the hydrogen sulfide stream is utilized to provide all of the power required for separating the feed gas stream into the hydrogen sulfide stream and the hydrocarbon gas stream, for processing the hydrocarbon gas stream to produce the natural gas.

4. The method of claim 1 or any of claims 2-3, wherein combustion of the hydrogen sulfide stream generates at most 0.1 grams of carbon dioxide per gram of hydrocarbons in the feed gas stream.
5. The method of claim 1 or any of claims 2-4, further comprising transporting to one or more facilities at least 90%, or at least 95%, or at least 99% of the natural gas.
6. The method of claim 1 or any of claims 2-5 wherein the thermal power generated by combustion of the hydrogen sulfide portion of the hydrogen sulfide stream is at least 100 MW, or at least 200 MW, at least 300 MW, or at least 400 MW, or at least 500 MW, or at least 1000 MW.
7. The method of claim 1 or any of claims 2-6 wherein at least a portion of the thermal power generated by combustion of the hydrogen sulfide stream is converted to electrical power.
8. The method of claim 1 or any of claims 2-7 wherein at least a portion of the thermal power generated by combustion of the hydrogen sulfide stream is converted to mechanical power.
9. A method, comprising:
 - providing a feed gas stream comprising hydrogen sulfide and hydrocarbons, wherein the feed gas stream comprises at least 5% by volume hydrogen sulfide;
 - separating at least a portion of the feed gas stream into a hydrogen sulfide stream and a hydrocarbon gas stream, the hydrogen sulfide stream containing more hydrogen sulfide, by volume percent, than the feed gas stream, and the hydrocarbon gas stream containing less hydrogen sulfide, by volume percent, than the feed gas stream;
 - processing the hydrocarbon gas stream to produce compressed natural gas; and
 - combusting at least 34 mol% of hydrogen sulfide in the hydrogen sulfide stream with an oxidant containing molecular oxygen to generate thermal power, where the molar ratio of molecular oxygen to hydrogen sulfide in the hydrogen sulfide stream and oxidant that are combusted is at least 1.4 to 1; and

utilizing the thermal power in one or more of the steps of separating the feed gas stream into the hydrogen sulfide stream and the hydrocarbon gas stream when processing the hydrocarbon gas stream to produce compressed natural gas.

10. The method of claim 9, wherein processing the hydrocarbon gas stream to produce compressed natural gas comprises performing one or more of the steps of:

- a) dehydrating the hydrocarbon gas stream;
- b) removing metals from the hydrocarbon gas stream;
- c) separating non-hydrocarbon gases from the hydrocarbon gas stream;
- d) separating natural gas liquids from the hydrocarbon gas stream
and
- e) compressing the hydrocarbon gas stream to a pressure of from 13.8 MPa to 27.6 MPa.

11. The method of claim 9 or claim 10 wherein the thermal power generated by combusting the hydrogen sulfide stream is utilized to provide all of the power required for separating the feed gas stream into the hydrogen sulfide stream and the hydrocarbon gas stream, for processing the hydrocarbon gas stream to produce the compressed natural gas.

12. The method of claim 9 or any of claims 10-11 wherein at least a portion of the thermal power generated by combustion of the hydrogen sulfide stream is converted to electrical power.

13. The method of claim 9 or any of claims 10-12 wherein at least a portion of the thermal power generated by combustion of the hydrogen sulfide stream is converted to mechanical power.

14. The method of claim 9 or any of claims 10-13, wherein combustion of the hydrogen sulfide stream generates at most 0.1 grams of carbon dioxide per gram of hydrocarbons in the feed gas stream.

15. A method, comprising:

providing a feed gas stream comprising hydrogen sulfide and hydrocarbons, wherein the feed gas stream comprises at least 5% by volume hydrogen sulfide;

separating at least a portion of the feed gas stream into a hydrogen sulfide stream and a hydrocarbon gas stream, the hydrogen sulfide stream containing more hydrogen sulfide, by volume percent, than the feed gas stream, and the hydrocarbon gas stream containing less hydrogen sulfide, by volume percent, than the feed gas stream;

processing the hydrocarbon gas stream to produce liquefied natural gas; and

combusting at least 34 mol% of hydrogen sulfide in the hydrogen sulfide stream with an oxidant containing molecular oxygen to generate thermal power, where the molar ratio of molecular oxygen to hydrogen sulfide in the hydrogen sulfide stream and oxidant that are combusted is at least 1.4 to 1;

utilizing the thermal power in one or more of the steps of separating the feed gas stream into the hydrogen sulfide stream and the hydrocarbon gas stream when processing the hydrocarbon gas stream to produce liquefied natural gas.

16. The method of claim 15, wherein processing the hydrocarbon gas stream to produce liquefied natural gas comprises performing one or more of the steps of:

- a) dehydrating the hydrocarbon gas stream;
- b) removing metals from the hydrocarbon gas stream;
- c) separating non-hydrocarbon gases from the hydrocarbon gas stream;
- d) separating natural gas liquids from the hydrocarbon gas stream

and

e) compressing the hydrocarbon gas stream to a pressure of at least 5.5 MPa;

f) liquefying the compressed gas stream.

17. The method of claim 15 or claim 16 wherein the thermal power generated by combusting the hydrogen sulfide stream is utilized to provide all of the power required for separating the feed gas stream into the hydrogen sulfide stream and the hydrocarbon gas stream, for processing the hydrocarbon gas stream to produce the liquefied natural gas.

18. The method of claim 15 or any of claims 16-17 wherein at least a portion of the thermal power generated by combustion of the hydrogen sulfide stream is converted to electrical power.

19. The method of claim 15 or any of claims 16-18 wherein at least a portion of the thermal power generated by combustion of the hydrogen sulfide stream is converted to mechanical power.

20. The method of claim 15 or any of claims 16-19, wherein combustion of the hydrogen sulfide stream generates at most 0.1 grams of carbon dioxide per gram of hydrocarbons in the feed gas stream.

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