

Title: A method for the hydroprocessing of renewable feeds

The present invention relates to the hydroprocessing of feeds which may produce CO₂ as a by-product, such as when
5 processing renewable feeds. More specifically, sour waste water from one hydroprocessing unit is re-used as wash water for another hydroprocessing unit treating renewable feeds to reduce the risk of carbonic acid corrosion of the carbon steel equipment of that unit.

10 It is known that a hydroprocessing unit treating renewable feeds may require a certain materials upgrading, sometimes an extensive upgrading, to reduce carbonic acid corrosion of its water-wetted effluent piping and other equipment
15 made of carbon steel (CS) and piping using Duplex stainless steel (SS) or SS overlay. An example of a unit that produces sour water is a hydroprocessing unit that is treating petroleum-based feed stocks. Using the sour waste water - instead of condensate or treated water from the sour water
20 stripper - as wash water reduces the volume of waste water to the water treatment facility.

The idea underlying the present invention is to use sour waste water from units that process feeds containing nitrogen and sulfur as wash water for a hydroprocessing unit
25 processing renewable feeds with the double purpose of (a) reducing the risk of carbonic acid corrosion and (b) increasing the hydrogen sulfide concentration in the recycle gas to aid in keeping the base metal catalysts in the active sulfided state. This way, the use of Duplex or other
30 SS material to protect the equipment against carbonic acid corrosion is not needed.

CA 1 271 124 discloses methanol scrubbing of sour gases, especially CO_2 and H_2S , from gaseous mixtures, wherein the methanol contains alkaline reacting compounds to counteract corrosion and is regenerated for re-use by expansion, stripping and/or thermal regeneration. CO_2 is introduced into the methanol circuit at a location where the methanol is usually free of CO_2 , e.g. at the bottom of a thermal regeneration column, in order to suppress the formation of sulfide compounds, e.g. NH_4HS , capable of decomposing into H_2S upon contact with CO_2 at the top of the scrubber.

US 4.250.150 discloses a process for the treatment of gaseous mixtures, which contain sour gases, with organic solvents. The treatment is conducted in the presence of alkaline-reacting compounds in order to prevent any corrosion (caused by the formation of iron pentacarbonyls and sulfur-containing iron carbonyls) of apparatus parts made of iron or normal steel. An aqueous alcoholic solution acts as a physical absorbent. The sour gases referred to are CO and H_2S , and the alkaline-reacting compound is NH_3 or NaOH .

Summary

In one aspect, the present disclosure refers to a method for the hydroprocessing of renewable feeds in a hydroprocessing unit (unit A), said method comprising the use of sour waste water from another unit (unit B), which is processing feeds containing sulfur and nitrogen, as wash water in unit A, thereby changing the pH of the waste water from unit A to lower the risk of carbonic acid corrosion of corrodible steel parts in unit A,

wherein the renewable feed in unit A is directed to contact a material that is catalytically active in hydrogenating the renewable feed in the presence of hydrogen, and the effluent from said unit A is combined with the wash water stream which contains hydrogen sulfide and ammonia, and wherein the unit that produces sour water (unit B) is a hydroprocessing unit treating petroleum-based feeds.

10 **Description**

The present invention relates to a method for the hydroprocessing of renewable feeds in a hydroprocessing unit (unit A), said method comprising the use of sour waste water from the same or another unit (unit B), which is processing feeds containing sulfur and nitrogen, as wash water in unit A, thereby changing the pH of the waste water from unit A to lower the risk of carbonic acid corrosion of corrodible steel parts in unit A,

20 wherein the renewable material in unit A is directed to

contact a material that is catalytically active in hydrogenating the renewable material in the presence of hydrogen, and the effluent is combined with a water stream which contains hydrogen sulfide and/or ammonia.

5

WO 98/17743 describes a method and an apparatus for the treatment of fluid catalytic cracking (FCC) product gases. The method de-acidifies the wet gas from the FCC fractionation column before it is compressed for further processing, thereby reducing the volume and the corrosive nature of the gas stream as it is processed. In a preferred process for de-acidification, a gas-liquid contact surface is used to interact the gas stream with an ammonia solution to bind and remove the acid gases from the gas stream before the gas stream enters the main compressor. Specifically, an acid-containing (CO_2 and H_2S) hydrocarbon stream is de-acidified using an ammonia solution, and a sour water stream is generated and subsequently stripped.

20 The WO document mentioned above does not disclose the use of sour waste water obtained from a unit which processes feeds containing nitrogen (NH_3) and sulfur (H_2S) as washing water for a hydroprocessing unit that is treating renewable feeds containing carbonic acid (CO_2). Even though the de-acidifying step disclosed in the WO document is similar to that of the present invention, i.e. acid + base $\rightarrow$ salt + water, the process of the present invention involves the use of sour waste water as an active component in a hydroprocessing unit, whereas in the WO document, the generated sour water stream is just stripped.

30

In the prior art, sour waste water from hydroprocessing

units is typically routed to the sour water stripper for subsequent treatment. According to the method of the present invention, some of the sour waste water will bypass the sour water stripper and be pumped to the wash water surge drum of a hydroprocessing unit treating renewable feeds, with the purpose of being used as wash water.

As a second embodiment of the method according to the invention, chemicals containing nitrogen and/or sulfur, such as ammonia and/or hydrogen sulfide, can be added to the wash water to control the pH thereof.

The ammonia in the waste water from other hydroprocessing units will raise the pH of the waste water from the unit treating renewable feeds. The risk of carbonic acid corrosion of carbon steel is completely eliminated for $\text{pH} > 8.5$, but in many cases the risk will be insignificant already at $\text{pH} > 7.5$ to 8.

The hydrogen sulfide in the waste water from other hydroprocessing units can also create an iron sulfide (FeS) film that may protect the surface of carbon steel from further corrosion from CO_2 and H_2S . Even in low concentrations where a sulfide film may not form, some benefit from CO_2 corrosion is expected.

Using the method of the present invention, the volume of sour water requiring treatment in the sour water stripper is reduced. The sour wash water can also release some H_2S into the recycle gas to help keeping the recycle gas sour, thus reducing the amount of DMDS (dimethyl disulfide) that

may be needed to keep the catalyst sulfided.

In the method of the invention, the pH of the waste water from unit A is preferably raised to a value of 7.0 or
5 above. More preferably, the pH of the waste water from unit A is raised to a value of 8.0 or above, whereby the risk of carbonic acid corrosion of corrodible steel parts is eliminated.

10 The unit that produces sour water (unit B) is preferably a hydroprocessing unit that is treating petroleum-based feed stocks.

Claims:

1. A method for the hydroprocessing of renewable feeds in a hydroprocessing unit (unit A), said method comprising
5 the use of sour waste water from another unit (unit B), which is processing feeds containing sulfur and nitrogen, as wash water in unit A, thereby changing the pH of the waste water from unit A to lower the risk of carbonic acid corrosion of corrodible steel parts in unit A,
10 wherein the renewable feed in unit A is directed to contact a material that is catalytically active in hydrogenating the renewable feed in the presence of hydrogen, and the effluent from said unit A is combined with the
15 wash water stream which contains hydrogen sulfide and ammonia, and wherein the unit that produces sour water (unit B) is a hydroprocessing unit treating petroleum-based feeds.
2. Method according to claim 1, wherein chemicals containing nitrogen and/or sulfur are injected into the wash
20 water to control the pH thereof.
3. Method according to claim 2, wherein ammonia is injected into the wash water.
25
4. Method according to any of the claims 1-3, wherein the pH of the waste water from unit A is raised to a value of 7.0 or above.
- 30 5. Method according to claim 4, wherein the pH of the waste water from unit A is raised to a value of 8.0 or above.
- 35

6. Method according to any of the claims 1-5, wherein the sour water contains more than 100 ppm hydrogen sulfide.
 7. Method according to any of the claims 1-5, wherein the sour water contains more than 100 ppm ammonia.
- 5