dehydrogenation reactor. With regard to the reactor effluent stream, a water quench tower is used to cool the reactor effluent and condense the water therein, particularly if dilution steam is used to lower the partial pressure of the alkane or paraffin. The catalyst and fines contained in the reactor effluent stream cannot easily be separated from quench water, leading to excessive fouling in the equipment and consequential high maintenance costs. Thus, there is also a need for improved recovery of catalyst fines found in the effluent stream from the dehydrogenation reactor.

[0005] Some catalyst is entrained from the reactor and needs to be removed before entering downstream separation steps. The reactor effluent contains steam (water) from either dilution steam or stripping / fluidizing steam added in the reactor. After cooling the reactor effluent and condensing out the water in the effluent, separation of catalyst from water is problematic since the mixture becomes mud-like, which is difficult to filter or transport. Even if the catalyst is filtered, the resulting water-catalyst slurry is not suitable to be returned to the reactor for catalyst recovery.

BRIEF DESCRIPTION OF THE DRAWINGS

[0006] FIG. 1 is a non-limiting, schematic illustration of a process for using a fuel oil wash to remove catalyst from a fluidized-bed propane dehydrogenation reactor effluent described herein;

[0007] FIG. 2 is schematic illustration of another non-limiting embodiment a process for using a fuel oil wash to remove catalyst from a fluidized-bed propane dehydrogenation reactor effluent employing a flash zone described herein.

SUMMARY

[0007a] In an aspect, there is provided a method for recovering catalyst from a fluidized-bed propane dehydrogenation reactor effluent gas, the method comprising:

(a) cooling fluidized-bed propane dehydrogenation reactor effluent gas;

(b) contacting the cooled effluent gas with fuel oil in a wash section to wash out catalyst to obtain a cooled effluent gas essentially free of catalyst;

(c) withdrawing an oil-catalyst slurry from the wash section and circulating the oil-catalyst slurry through a filter thereby removing catalyst from the fuel oil giving filtered wash oil;

(d) returning filtered wash oil to the wash section as recirculated wash oil; and

(e) backwashing the filter thereby recovering catalyst.

[0007b] In another aspect, there is provided a system for recovering catalyst from a fluidized-bed propane dehydrogenation reactor effluent gas, the system comprising:

(a) a quench tower having an inlet for receiving the effluent gas, vapor-liquid contacting elements disposed above the inlet for cooling the effluent gas and washing out the catalyst;

(b) a gas outlet above the contacting elements for discharging cooled effluent gas essentially free of catalyst, and a liquid holdup zone below the inlet for collecting the fuel oil from the contacting elements;

(c) at least one filter operable in filtration and backwashing modes; and

(d) a filtration loop for circulating fuel oil from the liquid holdup zone through a filter and returning filtrate to the liquid holdup zone.

[0008] There is provided, in one non-limiting example a method for recovering catalyst from a fluidized-bed propane dehydrogenation reactor effluent gas, where the method includes (a) cooling fluidized-bed propane dehydrogenation reactor effluent gas, (b) contacting the effluent gas with fuel oil in a wash section to