REFRIGERATION RECOVERY FROM REACTOR FEED IN A PROPANE DEHYDROGENATION SYSTEM

TECHNICAL FIELD

[0001] The present invention relates to a process for recovering propylene from a propane dehydrogenation (PDH) process, and more particularly relates to recovering refrigeration from reactor feed in a PDH process.

BACKGROUND

[0002] Propane dehydrogenation (PDH) is a process step in the production of propylene from propane. PDH is important to the petrochemical industry because propylene is the second most important starting product in the petrochemical industry after ethylene. The purpose of a deethanizer and chilling train systems in a PDH process is to separate the cracked gas into a methane-rich tail gas product, a C2 process stream and a C3 process stream.

[0003] It would always be beneficial to improve a PDH process, such as by reducing refrigeration power requirements and/or reducing the size and cost of the compressor system. In particular, the refrigeration power required to provide process cooling in the –5 to 30°C range typically is high. Presently, the depropanizer column overhead stream is produced as a vapor product, which feed to the reactor system without recovery of refrigeration. Process cooling in the –5 to 30°C range is provided through propylene refrigeration.

BRIEF DESCRIPTION OF THE DRAWINGS

[0004] FIG. 1 is a non-limiting, schematic illustration of a portion of a PDH process as described herein.

SUMMARY

[0004a] In an aspect, there is provided a process for recovering propylene from a propane dehydrogenation process, the process comprising:

partially or fully condensing a depropanizer overhead stream against a relatively warm cooling medium at relatively high pressure;

letting down the liquid overhead stream in pressure; and

partially or fully vaporizing the liquid overhead stream against at least one process stream to provide refrigeration.

[0005] In one non-limiting example, there is provided a process for recovering propylene from a propane dehydrogenation process, where the process includes partially or fully condensing a depropanizer overhead stream

against a relatively warm cooling medium at relatively high pressure; letting down the liquid overhead stream in pressure; and partially or fully vaporizing the liquid overhead stream against at least one process stream to provide refrigeration.

[0005a] In an aspect, there is provided a system for recovering propylene from a propane dehydrogenation process, the system comprising:

a depropanizer column generating a depropanizer overhead stream (7);

at least one condenser for partially or fully condensing the depropanizer overhead stream;

at least one device (40, 42, 44) for letting down the pressure of the depropanizer overhead stream (7) as determined by back-pressure of a reactor; and

at least one chiller (40, 42, 46) for partially or fully vaporizing the depropanizer overhead stream (7).

[0006] In another non-restrictive version, there is provided a system for recovering propylene from a propane dehydrogenation process, where the system includes a depropanizer column generating a depropanizer overhead stream, at least one condenser for partially or fully condensing the depropanizer overhead stream, at least one device for letting down the pressure of the depropanizer overhead stream as determined by back-pressure of a reactor, and at least one chiller for partially or fully vaporizing the depropanizer overhead stream.

DETAILED DESCRIPTION

[0007] In a typical propane dehydrogenation process, fresh propane-rich feed as well as the propane-rich recycle from a C3 Splitter passes through a Depropanizer column to remove C4+ components. The purified propane-rich stream is recovered as a vapor overhead product that feeds directly to the reactor system without refrigeration heat recovery.

[0008] In one non-limiting embodiment, it has been discovered that the Depropanizer column overhead stream may be partially or fully condensed against a relatively warm cooling medium such as cooling water at relatively

high pressure. In one non-limiting embodiment, “relatively warm” is defined as between about 20°C independently to about 50°C, alternatively between about 28°C independently to about 34°C; where the term “independently” when used with reference to a range means any threshold may be used with any other threshold to give a suitable alternative range. In another non-restrictive version “relative high pressure” is defined as between about 10 independently to about 20 barg; alternatively between about 12 barg independently to about 15 barg. Other cooling media besides water may include, but not necessarily be limited to, air cooling.