PROCESS FOR RECOVERY OF PROPYLENE FROM A PROPANE DEHYDROGENATION PROCESS

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 a methane-rich, C2-rich and C3-rich product from 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. It would always be beneficial to improve a PDH process, such as by reducing refrigeration power requirements, simplifying the design, and/or making the design more reliable.

BRIEF DESCRIPTION OF THE DRAWINGS

[0003] FIG. 1 is a non-limiting, schematic illustration of a PDH process as described herein.

SUMMARY

[0003a] In an aspect, there is provided a process for recovering propylene from a propane dehydrogenation (PDH) process comprising a PDH Reactor, the process comprising:

feeding dried process gas (1) from a Process Gas Dryer to a First Deethanizer Feed Chiller (20) and chilling it against propane;

sending the chilled dried process gas (2) to a First Deethanizer Feed Drum (22);

feeding liquid (4) from First Deethanizer Feed Drum (22) to a Deethanizer (24);

sending the overhead vapors from the First Deethanizer Feed Drum (22) to a Process Gas Compressor (PGC) (26);

cooling the discharge (3) from the PGC (26) against propane in a Second Deethanizer Feed Chiller (28), followed by propylene refrigerant in a Third Deethanizer Feed Chiller (30), and sending the discharge to a Second Deethanizer Feed Drum (32);

feeding liquid (6) from Second Deethanizer Feed Drum (32) to the Deethanizer (24);

chilling and partially condensing the vapor from the Second Deethanizer Feed Drum (32) in a Cold Box (34);

separating process effluent from the Cold Box (34) into vapor (7) and liquid phases in a First Cold Drum (36);

vaporizing liquid from the First Cold Drum (36) in the Cold Box (34) and recycling it to a first stage of the PGC (26);

reheating the vapor from First Cold Drum (36) to become a methane-rich tail gas product;

separating ethane and lighter components from C3 and heavier components in the Deethanizer (24);

partially condensing overhead vapor against Propylene refrigerant in an overhead Deethanizer Condenser (40);

separating process effluent from the overhead Deethanizer Condenser (40) into vapor and liquid phases in a Deethanizer Reflux Drum (42) and sending a vapor phase to Cold Box (34) and returning the liquid back to the Deethanizer (24);

feeding Deethanizer bottoms liquid (8) to a C3 Splitter; and

the Cold Box (34) superheating tail gas from First Cold Drum (36), a PGC Recycle stream (12), a C2 Rich Stream (11), and Propane

feed to the PDH Reactor while also subcooling liquid propylene refrigerant.

[0003b] In another aspect, there is provided a system for recovering propylene from a propane dehydrogenation (PDH) process comprising a PDH Reactor, the system comprising:

a Process Gas Dryer configured to feed dried process gas (1) to a First Deethanizer Feed Chiller (20) and chill it against propane;

a First Deethanizer Feed Drum (22) configured to receive the dried process gas (2) from the First Deethanizer Feed Chiller (20);

a Deethanizer (24) configured to receive liquid (4) from the First Deethanizer Feed Drum (22);

a Process Gas Compressor (PGC) (26) configured to receive overhead vapors from the First Deethanizer Feed Drum (22);

a Second Deethanizer Feed Chiller (28) configured to cool discharge (3) from the PGC (26) against propane;

a Third Deethanizer Feed Chiller (30) configured to cool discharge from the PGC (26) with propylene refrigerant;

a Second Deethanizer Feed Drum (32) configured to receive discharge from the Third Deethanizer Feed Chiller (30) and to send feed liquid (6) to the Deethanizer (24);

a Cold Box (34) configured to receive, chill, and partially condense vapor from the Second Deethanizer Feed Drum (32);

a First Cold Drum (36) configured to separate process effluent from the Cold Box (34) into vapor and liquid phases and recycling vaporized liquid to a first stage of the PGC (26);

an overhead Deethanizer Condenser (40) configured to partially condense overhead vapor against Propylene refrigerant;

a Deethanizer Reflux Drum (42) configured to separate process effluent from the overhead Deethanizer Condenser (40) into vapor (7) and liquid, sending a vapor phase to the Cold Box (34);

a line (50) directing the liquid from the Deethanizer Reflux Drum (42) to the Deethanizer (24); and

a C3 Splitter configured to receive bottoms liquid (8) from the Deethanizer (24).

[0004] There is provided, in one non-limiting example a process for recovering propylene from a propane dehydrogenation (PDH) process comprising a PDH Reactor, where the process includes feeding dried process gas from a Process Gas Dryer to a First Deethanizer Feed Chiller and chilling it against propane; sending the chilled dried process gas to a First Deethanizer Feed Drum; feeding liquid from First Deethanizer Feed Drum to a Deethanizer;