

87-079876/12 E17 J01 MITN 16.08.85
 MITSUBISHI GAS CHEM KK *AU 8661-192-A

16.08.85-JP-180168 (19.02.87) C07c-29/80 C07c-31/04

Synthetic methanol purificn. by rectification - with vapour and liq. recycle through side-by-side auxiliary distillation column and ethanol-rich side-stream removal

C87-033320

E(10-E4E1, 11-Q1) J(1-A2A) N(6)

MeOH produced by conventional catalytic reaction of CO and H₂ is purified by introducing into a rectifying column (RC) opt. after first introducing into a topping column (TC) and distilling with or without addn. of water to remove low boiling components from the top of the TC, and distilling in the RC to remove purified MeOH overhead and mainly water from the column bottom.

The improvement is that:

(A) an auxiliary distn. column (ADC) is provided side by side with the RC, with (B) a reboiler at the bottom of the ADC to evaporate the bottom components of the ADC.

(C) Vapour components are fed by a tube from a plate at the opt of the ADC to a vapour-phase portion on a plate slightly above the material feed plate (MFP) of the RC.

(D) Liq. components are pumped from the plate slightly above the MFP of the RC to a plate at the top of the ADC.

(E) Liq. components are fed, opt. via a pump, from the bottom of the ADC to a plate between the bottom plate and the MFP of the RC. (F) Liq. components are pumped from a plate between the bottom plate and the MFP of the RC to a plate near the bottom of the ADC.

(G) Distn. is effected while circulating vapour and liq. components between the RC and the ADC, and (H) purified MeOH is withdrawn from the top of the RC, and a side-stream rich in EtOH is withdrawn from the liq. phase portion of a plate in the middle part of the ADC.

ADVANTAGES

Process eliminates the defects of the Petlyuk-type distn. process and gives more efficient EtOH removal with energy saving and simply.

EMBODIMENTS

The ADC may be a conventional tray or packed column, and pref. has 1/5-4/5 of the plates of the RC, esp. 10-40 theoretical plates. Pref. in (C) vapours are fed to a plate between 9/20 and 17/20 of the no. of plates of the RC, counted from its top.

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Pref. in (E) the liq. is fed to a plate between 1/40 and 3/20 of the no. of plates of the RC, counted from its bottom.

Pref. in (F) liq. components are removed from a plate positioned between 1/40 and 3/20 of the no. of plates of the RC, counted from its bottom. Pref. RC is operated at a reflux ratio of 0.8-3, esp. 1-2.

EXAMPLE

Crude MeOH (obtd. from Cu-Zn catalysed reaction of CO and H₂ at 280°C/100 atmos.) was stripped of dissolved gases and low-boiling impurities in a topping column, then fed at 25.15 tons/hr. to the 58th plate from the top of the RC.

Side by side with the RC, an ADC (30 plates) was provided from which vapour phase at the top plate was recycled to the 53rd plate (from top) of the RC at 18.41 tons/hr. Liq. phase portion from this 53rd plate was pumped at 18.13 tons/hr. to the liq. phase at the top of the ADC.

Liq. phase portion on the 67th plate (from top) of the RC was fed at 10.93 tons/hr. to a liq. phase portion at the bottom of the ADC, and liq. phase was recycled from the bottom of the ADC to the 70th plate (from top) of the RC at 10.49 tons/hr. The reboiler at the bottom of the ADC controlled the amt. of vapour returned to the 53rd plate of the RC.

A side-stream contg. 7.8% EtOH was withdrawn from the 20th plate of the ADC at 160 kg/hr. The reflux ratio at the top of the RC was 2; 18.75 tons/hr. purified MeOH were withdrawn from the top of the RC with an EtOH concn. of 5.2 ppm (by wt.); and the amt. of MeOH lost in the side-stream was only 0.5% of the MeOH fed. (22pp1762RBHDwgNo 0/0).

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