PRODUCTION OF MALEIC ANHYDRIDE FROM OXIDATION OF n-BUTANE

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Background: -

Maleic anhydride is truly a remarkable molecule which possesses two different types of chemical functionality that makes it useful in chemical application. It occurs as colourless or white crystalline flakes having the strong pungent odour. It is also called as 2, 5 furandione, dihydro-2,5-dioxofuran, toxilic anhydride, or *cis*butenedioic anhydride.

Process: -

Maleic anhydride is produced by the reaction of n-butane with molecular oxygen at the optimum temperature. The products formed during the reactions are maleic anhydride, water, carbon dioxide and carbon monoxide.

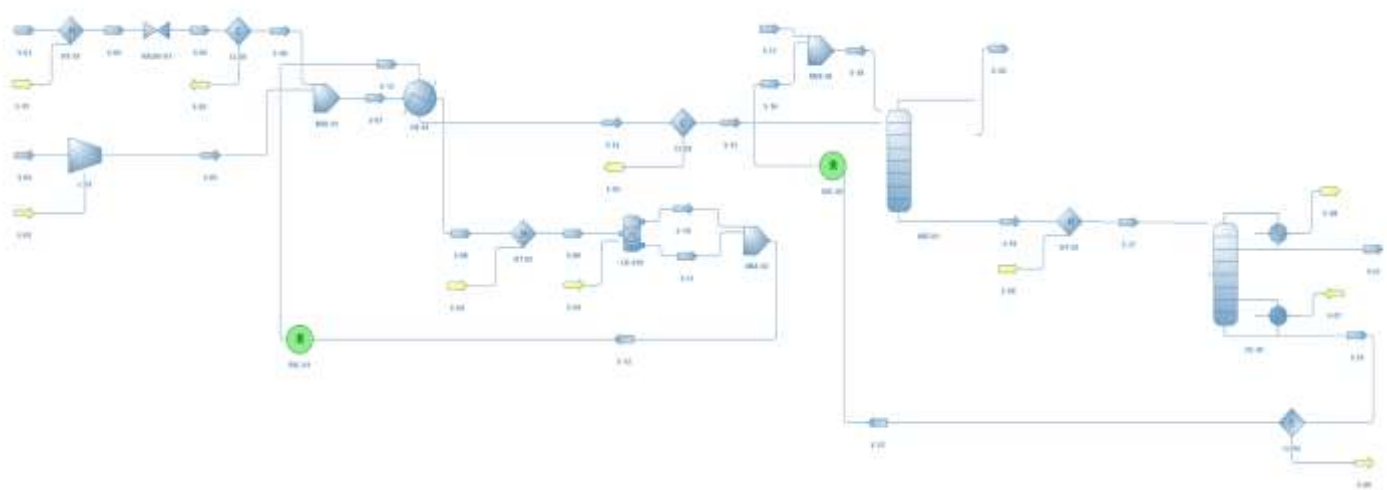
$$C_4H_{10} + 3.5O_2 \rightarrow C_4H_2O_3 + 4H_2O$$

Butane + Oxygen → Maleic Anhydride + Water

$$C_4H_{10} + 5.5O_2 \rightarrow 2CO_2 + 2CO + 5H_2O$$

Butane + Oxygen → Carbon Dioxide + Carbon Monoxide + Water

Initially two material steam (S-01 and S-04) containing the n-butane (275.291 k mol/hr) and oxygen (+ nitrogen : - 8770.83 k mol/hr) respectively is mixed in a mixer after gaining an optimum pressure. This mixed stream (S-07) enters the heat exchanger from which the cooling of stream takes place and the desired temperature and pressure for the reaction can be obtained. The temperature for reaction is between 300-500^{o}C and pressure is 275 KPa. Since the conversion reaction has taken place instead of catalyst therefore, the rate of reaction can be slow. After the reaction, absorption (Abs-01) process takes place using the Di-Butyl Phthalate as the absorbent. The absorption is liquid - vapour absorption, from which, the top gases (S-20) mixes with the top gases of distillation and the liquid part of absorber is treated as a feed in distillation tower. The top product of distillation tower contains the gases and the maleic anhydride that further get treated whereas, the bottom product contains the absorbent in maximum concentration and hence has participated in a recycle loop.



Results: -

Master Property Table								
Object	**S-15**	**S-14**	**S-13**	**S-12**	**S-08**	**S-07**	**S-04**	
Temperature	132	689.374	695	695	153.432	146.825	25	**C**
Pressure	90	270	270	270	285	285	101.325	**kPa**
Mass Flow	269042	269042	269042	269042	269042	269042	253041	**kg/h**
Molar Flow	9459.06	9459.06	9459.06	9459.06	9046.12	9046.12	8770.83	**kmol/h**
Volumetric Flow	98.3397	77.8759	78.3311	78.3311	31.27	30.7857	59.6028	**m3/s**
Mixture Molar Weight	28.4428	28.4428	28.4428	28.4428	29.7411	29.7411	28.8503	**kg/kmol**

Master Property Table					
Object	**S-24**	**S-20**	**S-18**	**S-01**	
Temperature	417.37	434.965	440.63	72	**C**
Pressure	101.325	101.325	101.325	925	**kPa**
Mass Flow	1001.99	336802	92021.8	16000.5	**kg/h**
Molar Flow	3.6	9689.22	330.6	275.291	**kmol/h**
Volumetric Flow	0.000295228	156.381	4.55484	0.00866721	**m3/s**
Mixture Molar Weight	278.33	34.7605	278.348	58.1222	**kg/kmol**

References: -

Sajjad Khudhur Abbas, (2015), “PRODUCTION OF MALEIC ANHYDRIDE FROM OXIDATION OF n-BUTANE”, Report, The National University of Malaysia