

100 AREA

DIRECT CHLORINATION

Gaseous chlorine and ethylene react in a liquid 1,2-dichloroethane (common name = ethylene dichloride, EDC) medium to form EDC. Chlorine is fed directly to the direct chlorination unit at the required delivery pressure of 90 to 120 psig. The target pressure is 90 psig to maximize rates. Ethylene feed is reduced to a constant pressure of 120 psi. This is achieved using a pressure regulating valve upstream of the Reactor flow control valve. The two feed streams are then metered and introduced separately under flow control into each reactor. The ethylene and the chlorine react at about 120°F in the vertical pipe section of the reactor-exchanger in a stream of circulating EDC. The motive force for the EDC circulation is provided mainly by the thermosiphon effect resulting from the difference in liquid density in the two sections with some additional lift caused by the feed gas bubbles. The circulating EDC, heated by the exothermic reaction, is cooled as it circulates downward through the reactor cooler. Liquid EDC formed by the chemical reaction is continuously displaced from the reactor loop to the accumulator drum via a liquid overflow line originating at the bottom of each reactor exchanger loop. Crude EDC is pumped under level control from the accumulator to the EDC wash system.

Inert gases, unreacted ethylene, natural gas, oxygen and EDC vapor are vented from the top of each reactor and normally directed into the DC Vent Gas refrigeration system to liquefy and recover EDC from the reactor vent.

In the EDC wash system, the EDC is pumped through two acid wash tanks in series where the EDC is countercurrently washed with water. This wash water is pumped from the top of the tank back to the tank inlet to mix with and wash the incoming EDC. This treatment removes water-soluble impurities such as HCl and ferric chloride together with insoluble ferric oxide.

The EDC then proceeds through the two caustic wash tanks where traces of HCl, Cl₂, and ferric chloride remaining from the acid wash are neutralized. The caustic solution is pumped from the top of the tank back to the tank inlet as in the acid tanks.

The recycle streams from the High Boil Column and Vacuum Column are pumped into Final Wash Tank where the two streams are neutralized with caustic.

The bottom streams from the second caustic tank and Final wash tank joined together. The combined streams are sent to the North Crude EDC Storage Tank.

The Wash train waste water streams, along with the 200 area Hot Quench bottoms stream go into the TOC (Total Organic Concentrate) Tank. Before entering the TOC tank, the pH is measured; and caustic is added to neutralize any acid. Other waste streams entering the TOC tank are blowdowns from the purification sample disposal pot, the DC sample disposal pot, and the Incinerator Sample Disposal Pot. The TOC tank level is then pumped to the waste water separator. The TOC tank is no longer the responsibility of the 800 area operator, but the responsibility of the 100/200 area operator. The TOC tank vents to the waste water stripper condenser and the water is pumped to the waste water separator.

Make a process flow diagram of the 100 area using a P&ID for reference. Show control valve locations and learn the function of the area, and function, name and number of each major piece of equipment.

The following is a list of 100 area equipment names and corresponding numbers:

	NAME:	NUMBER:	
1.		Chlorine KO pot	
		MS-108	
2.	EDC Reactor	MR-102A/B	
3.		Reactor Cooler	
		TT-101A/B	
4.		Ferric Chloride Pot	MS-
		101	
5.		Crude EDC Accumulator	MS-
		103	
6	DC Rx vent exchanger	TT-103	
7.		DC Rx vent chiller	
		TT-104	
8.		Liquid EDC KO pot	MS-
		110	
9.		Freon Liquid Separator	MS-
		111	
10.		D.C. Chiller Compressor	
		GR-101	
11.	Oil Separator	MS-113	
12.		Oil Cooler	TT-
		107	
13.		Refrigerant Condenser	TT-
		105	
14.	Receiver	MS-112	
15.		Precooler	
		TT-106	
16.		1st Acid settling tank	MS-104
17.		2st Acid settling tank	MS-105
18.		1st NaOH settling tank	MS-
		106	
19.		2st NaOH settling tank	
		MS-109	
20.	Final Wash Tank	MS-107	
21.		Crude EDC Tank	
		MF-701	
22.		Static Mixers	
		SM-102, SM-103, SM-104,	
		SM-105, and SM-107	
23.	PUMPS:		
*	Crude EDC Product Pump	PP-101A/B	
*	1st Acid circulation	PP-104	
*	2nd Acid circulation	PP-105A/B	

*	1st NaOH circulation	PP-106	
*	2nd NaOH circulation	PP-109	
*		Hiboil Recycle Pump	PP-424
*	Final Wash Pump	PP-107	
*	Caustic Pump	PP-504A/B	
*		Process Water Pump	PP-609

24. D.C. REFRIGERATION UNIT

1.	DC Reactor Vent Chiller	TT-104
2.	Freon Liquid Separator	MS-111
3.	DC Chiller Compressor	GR-101
4.	Refrigerant Receiver	MS-112
5.	Oil Separator	MS-113
6.	Refrigerant Condenser	TT -105
7.	Pre-Cooler	TT -106
8.	Oil Cooler	TT -107