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3/10/19

Alcohol Recovery System

for
Resonate Properties



Greetings Matthew:

Here is our proposal for the single-effect, falling film evaporation system with pot still capable of processing 370 Kg/h of feed and 350 Kg/h of evaporation for your review.

Project: Falling Film Evaporation System with Pot Still with optional Decarb System

Design capacity: Rated ethanol evaporation capacity of 350 Kg/hr

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350Kg/h Falling Film Evaporation, Pot Still and Decarb System

One. Process description

1. Selection of evaporating process and system's materials of construction selection:

1.1 Process selection: We are quoting a 350L/hr FFE Distillation System. The skidded system is equipped with a feed vessel, primary vacuum still with low pressure steam jacketing for efficient solvent evaporation. This system is utilized for continuous recovery of ethanol from solutions of 10:1 solvent to solute ratio or greater, and is equipped with surface-wiping anchor impeller assemblies to assure that a maximum of the recovered oil is discharged from the vessels upon completion of the recovery process and transfer between stages and out of the process.

1.2 Materials of construction: Based on the feed details and according to your request, the material of construction that contacts with the feed material is SS316L. The material of construction of the steel platform is SS304.

2. The working principle and process of evaporation process

2.1 Feed liquid flows through the working process system (for details see flow chart)

The cooling water inlet valve is opened, with water pressure maintained at 0.2Mpa. The vacuum pump is activated, so that the entire system is brought under an operating vacuum level of -0.090Mpa.

The raw material liquid feed pump is activated, so that the feed material enters into the first effect. The level in the first-effect separation chamber is set at the appropriate level within the parameters and reaches the design level.

When the material liquid of single-effect separation chamber reaches the required concentration, open the discharge valve to remove the concentrated liquid out of the system. The material goes to the concentration tank and continues to concentrate and is then discharged.

2.2 The steam flow in the work process (for details see flow chart)

Raw steam from the boiler goes through the client supplied pressure regulator valve station to reduce the steam pressure appropriately to ≥ 0.10 Mpa. The steam goes into the first effect



heater and pot still as heating source. Secondary steam generated in the first effect separation chamber and pot still goes into the condenser where it will be condensed into liquid alcohol and discharged by the condensate pump. The pressure of the evaporation chamber and separation chamber is controlled by the vacuum pump.

Two. Description of the parameters

1. Feed material technical parameters

(raw material liquid provided by client)

- (1) Feed material: Alcohol with extract
- (2) Total feed: 370 kg/h
- (3) Feed concentration (%): 95% ethanol

2. System equipment primary technical parameters

No.	Project	One-effect	Concentration tank
1	Rated alcohol evaporation capacity(kg/h)	350 (See Flow Chart)	
2	Total amount feed material solution (kg/h)	370	
3	Original material liquid PH value	/	
4	Raw steam consumption (kg /h)	110 (saturated steam)	
5	Raw steam pressure (MPa)	≥ 0.10 MPa (absolute pressure)	
6	Steam consumption ratio	~ 1100 kg Vapor /1000kg liquid	
7	Evaporation chamber steam temperature (°C)	90 ± 2 (Vapor phase)	
8	Temperature of material liquid (°C)	60 ± 2 (Vapor phase)	
9	Temperature of material liquid (°C)	60 ± 2 (Liquid phase)	
10	Steam latent heat (kJ/kg)	2257.2	



11	Steam enthalpy (kj/kg)	2675.8	
12	Circulation type of the evaporator	Falling film	Heat transfer type
13	Heat transfer coefficient (W/m ² ·k)	500	400
14	Temperature difference of loss (°C)	~1.0	
15	Exhaust steam pipe resistance temperature drop(°C)	~2.0	
16	Effective heat transfer temperature difference (°C)	28	
17	Inlet and outlet Temperature difference in heating chamber (°C)	~1.0	
18	Rated alcohol evaporation capacity(kg/h)	310	40
19	Calculation of heating an area (m ²)	5.2	150L Concentration tank and 50L Decarb Vessel
20	Design of heated area (m ²)	8	
21	Vacuum degree (Mpa)	-0.07	
22	Discharge solution Temperature (°C)	≤60	
23	Regeneration alcohol (kg /h)	350	
24	Circulating cooling water content (kg/h)	10000(Used in last effect refrigeration systems) NOTES: NOT the capacity of cooling tower, usually it is higher than this.	
25	Circulating cooling water temperature (C)	≤32 (Used in last effect refrigeration systems)	
26	Circulating cooling water pressure	≥0.20 (Used in last effect refrigeration systems)	



	(MPa)	
27	Total power (kw/h)	12.1

Three. Device main configuration

No	Device name	Unit	Amount	Main material		Area (m ²)	Outer surface material	Remarks
				Shell side	Tube side			
1	One-effect evaporation chamber	Set	1	SS316L	SS316L	9	Glass wool /304	Seamless mirror tube
2	One-effect separation chamber	set	1	SS316L	-	-	Glass wool /304	Polish inside and outside
3	Condenser 1	set	1	SS316L	SS316L	12	Polish inside and outside	Tubular
4	Condenser 2	set	1	SS316L	SS316L	10	Polish inside and outside	Tubular
5	Alcohol tank	set	1	SS316L		300L	Polish inside and outside	-
6	Pre-heater	set	1	SS316L		2	/	Plate type
7	Concentration tank	set	1	SS316L		150L	Polish inside and outside	-
8	Feed pump	set	1	IHD type Q=1.0m ³ /h, H=30m,P=2.2kw,material: SS316L;				
9	Discharge pump	set	1	IHD type Q=1.0m ³ /h, H=30m,P=2.2kw,material: SS316L;				
10	Alcohol pump	set	1	IHD type Q=1.0m ³ /h, H=30m,P=2.2kw,material: SS316L;				
11	Circulation pump	set	1	IHD type Q=2.0m ³ /h, H=20m,P=2.2kw,material: SS316L;				
12	Vacuum pump	set	1	2BV type P=5.5kw, material SS304 ;				
13	Process pipe and valves	set	1	All piping within the system accessories and control valves, Material: SS316L.				



14	Meters	set	1	Within the system for temperature display, pressure display, vacuum display.
15	Demister	Set	1	Supporting use, material SS316L. Stainless steel wire mesh.
16	Steel frame	set	1	For supporting the falling film system, material is SS304
17	Control system	set	1	For automatically controlling the liquid level, feed and discharge, etc. All appliances are explosion-proof

Four. The responsibility of the buyer and seller :

1. Responsibility of the seller :

1.1. Equipment manufacturing cycle:

The contract between the seller and the buyer commences after the receipt of an acceptable written order and down payment; the seller will complete production of the system exworks within **60-90 days**.

1.2. The seller will provide basic equipment construction drawings.

2. Responsibility of the buyer :

2.1 Buyer will provide for the evaporation system a total installed power of power of **16.5 Kw/h, 460V, 60Hz three-phase four-wire power distribution cable to the device on-site**, and access to the seller to the total control cabinet and the power equipment sub-cables.

2.2. Buyer will provide the system with a steam capacity of **130kg / h, raw steam pressure $\geq 0.10\text{MPa}$** , steam piping to the equipment on site, and access to seller's raw steam input connection to our system.

2.3. Buyer will provide the system with cooling water: **10000kg / h, water temperature less than $\leq 32\text{ }^{\circ}\text{C}$, water pressure: $\geq 0.20\text{MPa}$ to the device on-site**, access to the seller condenser cooling water import piping.

Five. Business offer:

1. 350 Kg/h single-effect falling film evaporator system with pot still



Equipment List:

No.	Device name	Specifications Model	Amount	Main material
1	Pre-heater	Heat transfer area : 2m ²	1	SS316L
2	One-effect evaporate chamber	Heat transfer area : 8m ² Shell : 6mm Tube : $\Phi 38 \times 2.0 \times 3000$ mm	1	SS316L
3	One-effect separate chamber	$\Phi 800 \times 2000 \times 6$ mm	1	SS316L
4	Condenser 1	Heat transfer area : 10m ² Shell : 6mm Tube : $\Phi 25 \times 2.0 \times 25000$ mm	1	SS316L
5	Condenser 2	Heat transfer area : 7m ² Shell : 6mm Tube : $\Phi 25 \times 2.0 \times 2000$ mm	1	SS316L
6	Alcohol tank	Volume : 300L/5mm	1	SS316L
7	Concentration tank/Pot still	Work volume : 150L Agitator motor : explosion-proof	1	SS316L
8	Concentration tank/Pot still	Work volume : 100L Agitator motor : explosion-proof	1	SS316L
9	Feed pump	IHD type Q=1.0m ³ /h, H=30m, P=1.5kw motor : explosion-proof	1	SS316L
10	Discharge pump	IHD type Q=1.0m ³ /h, H=30m, P=2.2kw motor : explosion-proof	1	SS316L



11	Alcohol pump	IHD type Q=1.0m ³ /h,H=30m,P=2.2kw motor :explosion-proof	1	SS316L
12	Circulation pump	IHD type Q=2.0m ³ /h,H=20m,P=2.2kw motor :explosion-proof	1	SS316L
13	Vacuum pump	2BV type P=4.0kw motor :explosion-proof	1	SS304
14	Electric control cabinet	/	1	/
15	Meters and temp sensor	Within the system in site temperature display, pressure display, vacuum display.	1	SS316L
16	Control system	PLC full auto with touch screen, with temp and liquid transmitter, automatically feed and discharge, steam auto adjust for falling film evaporator	1	/
17	Process piping	All piping within the system accessories and control valves.	1	SS316L
18	Connected piping	With jacket heating from 150l pot still to 100l pot stil	1	SS316L
19	Steam auto adjust valve	DN32,To automatically control the steam of 150L pot still	1	SS304
20	Auto discharge on/off valve	DN32, To automatically control the material output of 150L pot still	1	SS316L
21	Pneumatic regulating valve	DN32, temp control means of 100L pot still	1	SS304
22	Stainless Steel frame	Supporting the whole system, including the 150L pot still	1	SS304