Revision: 1, Date: Jul 14, 2024

Please find bellow PR's comments,

1-Liquid Ammonia will pass through control valve (in vendor scope) and then enters a line routing to the ammonia storage tank at ***-36.5 °C***. Please confirm.

Confirmed.

2-please confirm no copper and copper alloys is used in this package.

Confirmed

3-Please confirm non-condensable gas purging system with automatic control valve (PCV) will be provided on condenser.

As per proven experience Design of MAYEKAWA, We have considered SOV that is working automatically based on volume of NCG using specific timer, and this SOV will be located on top of condenser that density of NCG is lighter than the ammonia.

4-Refrigerator package shall be auto start/stop by remote signal from control room. Please confirm.

Compressors can be started by remote signal from Control System manually before loading/Unloading of the Ammonia Tank.

5-Compressor loading shall be controlled automatically by pressure controller so as to maintain pressure of ammonia storage tank constant.

ULTIM confirms compressor loading is fully automated using suction pressure but on the basis of load sharing.

6-Oil contamination in return ammonia shall be less than 5 ppm(wt).

Confirmed

7- Capacity control from full load down to 25% of full load shall be provided.

Confirmed

8- Suction pressure shall be 0.05 barg (0.87 barA).

Confirmed

9-Requirement of winterization to be checked by vendor.

Not required

10-package shall be suitable for outdoor.

Confirmed

11- Stream 14 at vendor PFD, has a flow rate of 1042.6 kg/h with a vapor fraction of 0.1182. Therefore, liquid content of this stream will be 1042.6*(1-0.1182)=919.36 kg/h. However, at process data sheet, 1000 kg/h is specified as the net liquid ammonia flow rate ***without flashed vapor***. Inlet flow rate to the package shall be increased so that outlet liquid flow after control valve to be 1000 kg/hr at 0.05 barg .

To achieve the liquid flowrate of 1,000 kg at the outlet of the package at 0.05 Barg, the flowrate coming into the system shall be raised 1,142 kg/h.

12-PFD shall be submitted for 3 cases:
First: Suction temperature of ***-8.83 °C***
Second: Suction temperature of ***-36.5 °C*** (Min temperature)
Third: Suction temperature of ***9.5 °C*** (Max temperature), flow rate of 84 m^3/h See note 1 below

Vendor has revised the attached PFD Simulation per above request. LS Compressor rotor length was increased from to L to meet the capacities required

13- Package data sheet shall include process data, operating and design conditions for each case and material of construction.

VENDOR recommends to use the offered PFD as the guarranteed process conditions.

14-Regarding data sheet of condenser, temperature is not consistent with PFD. Over design on flowrate shall be considered for design of condenser.

Vendor confirms corrected the inlet temperature to condenser to match the compressor performance, and to adjust the flow to guarrantee 1,000 kglh liquid outlet during detail engineering based on PFD addressed in item 12 above.

Notes:
1. For the case 3, ULTIM has showed the maximum flow when the gas is entering at suction temperature of 9.5C. However, to meet the required capacity of 84 m3/h, one compressor will be running at low load load using the manual recycle valve(this case is even lower than 25% minimum operation requested before)