



Toase-che Park Sanati Gohar Ofogh  
Petrochemical Co.  
**CONCEPTUAL, BASIC and DETAIL DESIGN  
ENGINEERING OF STYRENE PARK OFFSITE**



Document Title : Duty Specification for Refrigeration Unit

Document No.: EI027-000-ED-PR-SPC-003

Rev. R1

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**STYRENE PARK OFFSITE**

**Document Title:**

**Duty Specification for Refrigeration Unit**

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**REVISION RECORD SHEET**

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1	X	X						37							
2	X	X						38							
3	X							39							
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## 1. SCOPE

This specification covers the minimum requirements for Refrigerator.

## 2. SERVICE / UNIT DESCRIPTION

Item: RU-0001 A/B

Service: Refrigeration system of styrene storage tanks

Number of units: 2 (2 X 100%)

Type: Condenser/evaporator

Styrene from styrene storage tanks (TK-0001A/B), will be pumped by P-0004A/B/C/D to Styrene refrigeration units.

These units will maintain the temperature of styrene inside the storage tank at 15 C.

## 3. Refrigerator System Design Basis

- The refrigerator shall be designed to provide 165 kW/unit  
The refrigerator shall continuously cools styrene from 15.2 °C to 5 °C.
- The refrigerator shall be automatically and continuously controlled to maintain styrene outlet temperature at 5 °C.

Vender shall offer refrigerating capacity control range in his quotation.



The refrigerator shall be supplied as a complete skid-mounted package including the following components, but not limited to:

- Compressor with motor
- Evaporator
- Condenser
- Lubrication system
- Local control panel
- Locally mounted instruments

Outline flow diagram of the refrigerator is shown in Attachment-1.



- Refrigerant is **Propylene**. (Vendor to confirm)
- The refrigerator shall be designed and constructed for at least 1 years (7920 hrs/year) of uninterrupted continuous service and for at least two years operation without major overhaul or inspection.
- The refrigerator is to be installed outdoors without any shelter and in hazardous area classified as IEC class 1 Zone 2.

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- The refrigerator shall have a noise level not to exceed 85 dB(A) at/m apart from the skid at ear level.

- The Equipment shall be suitable for outdoor installation on offshore saline:

Outdoor Conditions:

Max. Ambient Design Temperature. 85 °C

Expected Extreme Temperature 52 °C

Min. Ambient Temperature. 5 °C

Max. Relative Humidity 80 %

Min. Relative Humidity 65 %

- APPLIED STANDARD FOR VESSEL AND HEAT EXCHANGER ARE AS FOLLOWS;

- OIL SEPARATOR : Vendor's Standard
- OIL COOLER : Vendor's Standard
- CONDENSER : ASME SEC,VIII DIV,1 and TEMA
- DRYER FILTER : Vendor's Standard
- EVAPORATOR : ASME SEC.VIII DIV 1 and TEMA

## 4. Equipment Design Basis



### 4.1. Compressor

- 1) Compressor shall be of screw or Centrifugal type.
- 2) Materials of construction for compressor shall be specified by Vendor.
- 3) Capacity control device shall be operated by **Styrene** outlet temperature controller and automatic control modes.

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### 4.2. Evaporator and Condenser

- 1) Design basis on styrene side of Evaporator are as follows.
  - Fluid name: styrene
  - Flow rate : 40.6 m<sup>3</sup>/hr for each circulation pumps (Pumps A / B)
  - Inlet temperature : 15.2 °C
  - Outlet temperature : 5 °C
  - Density : 909.6 kg/m<sup>3</sup> at 15.2 °C /918 kg/m<sup>3</sup> °C at 5 °C
  - Viscosity : 0.82 CP at 15.2 °C / 0.96 CP at 5 °C
  - Specific heat : 167.1 kJ/kgmol °C at 15.2 °C /164.4 kJ/kgmol °C at 5 °C
  - Molecular Weight : 104.2 kg/kgmol
  - Freezing point : -30.6 °C

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- Inlet pressure : **Vendor To Advise**
- Allow. Press. drop: MAX 8 m Liq
- Design pressure : 6.8 barG & FV
- Design temperature : by vendor
- Corrosion allowance: 3.0mm for carbon steel.
- Connection flanges : ASME 150 lb, Raised Face

- 2) Evaporator and Condenser shall each be of shell and tube construction.
- 3) Materials of construction for Evaporator and Condenser shall be specified by Vendor.
- 4) Evaporator and Condenser shall be constructed in accordance with ASME SEC. VIII Div.1.
- 5) Evaporator and Condenser shall be provided with valved vent and valved drain connections.
- 6) Minimum size of vent and drain shall be 3/4" for carbon steel and 1" for stainless steel.

### 4.3. Lubrication system

- 1) Lubrication system shall be of the force feed type with oil pump supplying oil under pressure to bearings and others.
- 2) Lubrication system shall include the following components, but not limited to:
  - Oil reservoir with an earth lug made of type 304 stainless steel and a thermostatically controlled oil heater
  - Main and Stand-by oil pump with motor drive
  - Oil cooler
  - Twin full-flow oil filters with replaceable elements and a continuous-flow transfer valve
  - Oil pressure control valve
  - Oil temperature control valve
  - Locally mounted instruments
- 3) Oil pump shall have momentary switch to permit manual operation of the pump when compressor is not operating.
- 4) Oil pump shall be located outside of oil reservoir to permit its maintenance while the refrigerator is in operation.
- 5) Pipes and fittings downstream oil filters shall be Type 304 stainless steel.
- 6) The other materials of construction for lubrication system shall be specified by Vendor.

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#### 4.4. Other requirements

- 1) Base plate shall be provided with an earth lug made of Type 304 stainless steel and lifting lugs for a four-point lift. Leveling screws shall be put on the main load bearing beams of base plate to facilitate leveling on the job site.
- 2) Removable coupling guards shall be supplied for all couplings. (Non-Sparking type)
- 3) All equipment shall have nameplates of corrosion resistant metallic material.



#### 5. Piping Design Basis

- Vender shall furnish all piping with its mounted appurtenances within the confines of base plate.
- Carbon steel pipes size 1-1/4", 2-1/2", 3-1/2", 5", 7", 9", 22" and 26" inches shall not be used.
- Other material pipes size 1-1/4, 2-1/2, 3-1/2, 5, 7 and 9 inches shall not be used.
- Design of piping systems shall achieve the following:
  - 1) Proper support and protection to prevent damage from vibration or from shipment, operation and maintenance.
  - 2) Proper flexibility and normal accessibility for operation, maintenance and thorough cleaning.
  - 3) Installation in a neat and orderly arrangement adapted to contour of the machine and not obstructing access openings.
  - 4) Elimination of air pockets.
  - 5) Complete drainage through low points without piping disassembly.

#### 6. Instrumentation Design Basis

- Local start and stop switches mounted on Local control panel shall be used for the refrigerator operation.
- Local control panel shall be provided with relay circuits
- Other requirements on instrumentation shall be in accordance with the following specification.

Specification for Package Instrumentation; EI027-000-ED-IN-SPC-004

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## 7. Thermal Insulation Design Basis

- Thermal insulation will be carried out by others on site.  
Vender shall submit a drawing which shows:
  - equipment and piping to be thermally insulated
  - Insulation thickness for each equipment and piping Vender shall also submit a detail insulation procedure.



## 8. Electrical Equipment

- The Refrigerator driver shall be induction motors and in accordance with the following specifications:
  - Specification for Electrical Requirements for Packages; EI027-000-EB-EL-SPC-001
  - Specification for Low Voltage Motors; EI027-000-EB-EL-SPC-002

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## 9. GUARANTEE

- Performance  
Refrigeration capacity 165 kW/unit specified in Clause 3 shall be guaranteed
- Vendor shall guarantee and warrant on all equipment and component part supplied by vender

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## Attachment #1



Toose-eh Park Sanati Gohar Ofogh  
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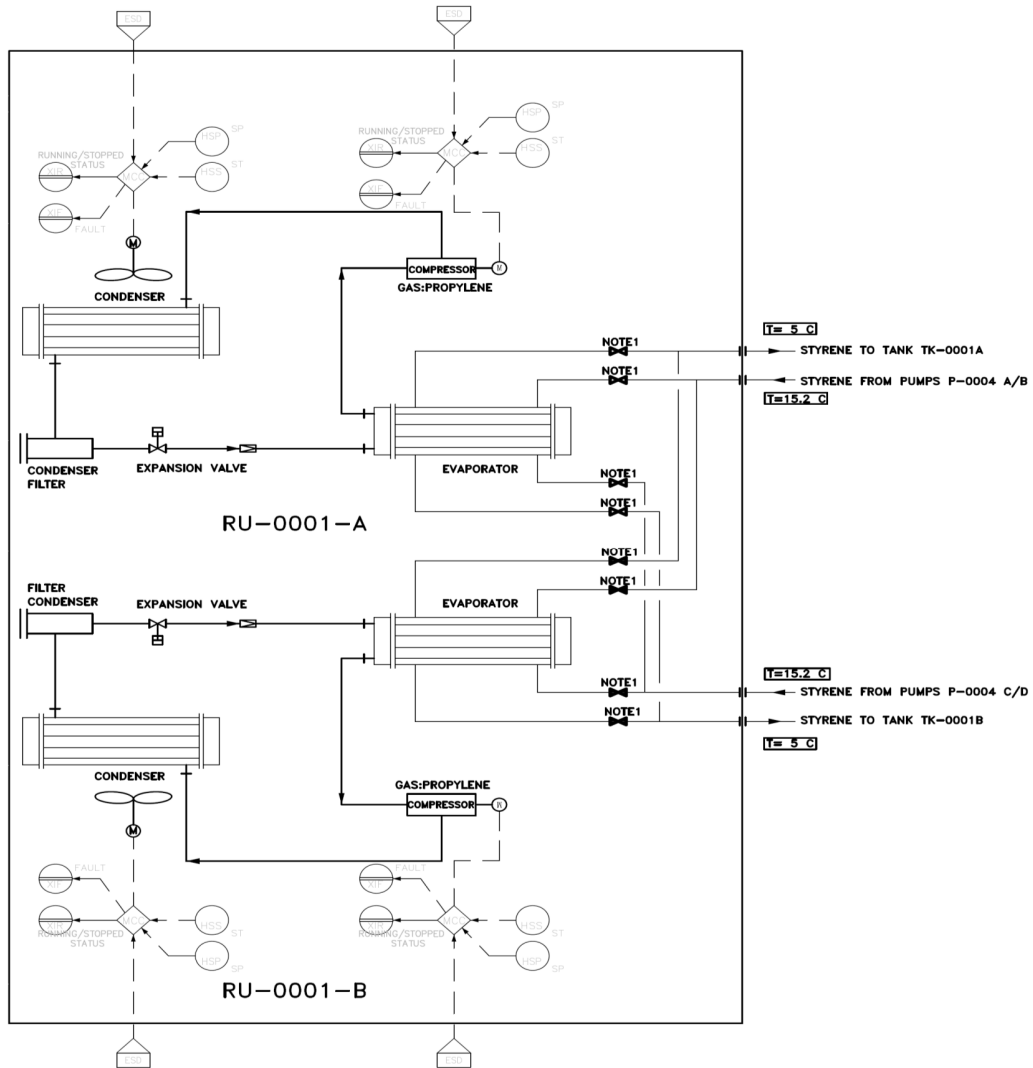
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NOTE1 : VENDOR TO ADVISE THE CONTROL PHILOSOPHY OF THE VALVES SO THAT THE SPARE UNIT COULD BE USED AUTOMATICALLY IN CASE OF FAILING THE RUNNING UNIT.

**NOTE**

This flow scheme is only a typical flow.

Vender shall show all his supplying equipment, piping and instrumentation including his battery limits such as **inlet & outlet, drain pints and etc in P & I Diagram.**

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