

CLIENT	BCPL	MOLECULAR SIEVES AND ADSORBENTS	JOB N°	8692Y	Rev
LOCATION	LEPETKATA - INDIA		SECTION	FPU	
UNIT	220 kta LLDPE / HDPE		ITEM	117-LZ-ADSC2	
			No. OFF	1	
			SERVICE	FEEDSTOCK PREP ADSORBENTS	
			PAGE	1/16	

1. GENERAL

This specification covers the minimum requirements for the adsorbents and molecular sieves used for purifying ethylene, comonomers (butene-1, hexene-1), pentane and hydrogen in the purification feed unit for LLDPE / HDPE plant of BCPL, Lepetkata, India.

The purpose is to remove water, carbon dioxide, alcohol, total combined nitrogen, carbonyls and peroxides from the raw material, which are poisons of the polymerisation process.

2. DESIGN BASIS

2.1 ETHYLENE

2.1.1 ETHYLENE PURIFICATION SCHEME

Upstream of this purification, the ethylene is treated to remove sulphur, acetylene, carbon monoxide and oxygen traces through several catalyst layers.

Two vessels are foreseen for this purification: 117-VV-932A/B. They will contain multiple layers of molecular sieves and adsorbents to remove trace amounts of water and other contaminants to acceptable levels, without the co-adsorption of olefins. Each individual treater will have the full capacity of treating the ethylene stream, while the other is off-line and being regenerated. For normal operations however, the two treaters will work in series.

Upstream of 117-VV-932A/B an ethylene cooler 117-EE-932 is inserted to cool-down ethylene feed to 43°C or other temperature as specified by supplier.

Support balls shall be inert type. Vendor to advise on selection to ensure the inert characteristics of the support balls.

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			PAGE	2/16	

2.1.2 CONDITIONS OF THE ETHYLENE STREAM

2.1.2.1 Ethylene Composition

The following table gives the ethylene feed specification before and after the purification process in 117-VV-932A/B.

Components to remove are Carbon Dioxide, Water, alcohols (as methanol) and total combined nitrogen.

Raw material	ETHYLENE	
Component	Required specifications at 117-VV-932A/B outlet	Specifications at 117-VV-932A/B inlet (after upstream treatments)
Ethylene	99.90 %v min	99.90 %v min
Methane	*	300 ppm mol max
Ethane	*	Balance
Hydrogen	*	2 ppm mol max
Propylene & Higher	*	10 ppm wt max
Acetylene (incl methyl acetylene)	*	1 ppm v max
Carbon Monoxide	*	0.1 ppm v max
Carbon Dioxide	0.1 ppm v max	7 ppm mol max
Oxygen	*	0.1 ppm v max
Total combined Sulphur (as H ₂ S)	*	1 ppm wt max
Water	0.1 ppm v max	5 ppm wt
Alcohol (as methanol)	0.5 ppm v max	Included in oxygenates
Total combined Nitrogen (as NH ₃)	0.2 ppm v max	1 ppm mol max
Total oxygenated Compounds (as acetone)	0.5 ppm v max	1 ppm mol

Notes:

* The supplier will indicate the components content in the effluent.

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			PAGE	3/16	

2.1.2.2 Ethylene Feed pressure and temperature

The conditions at the inlet of the treaters 117-VV-932A/B are the following:

- Pressure (2):

Minimum	:	30.7 kg/cm ² g
Nominal	:	32.2 kg/cm ² g
Maximum	:	34.7 kg/cm ² g
Mech. Design	:	56 kg/cm ² g
- Temperature :

Nominal	:	43°C
Mech. Design	:	120°C

2.1.2.3 Ethylene Flowrates

FLOW	
Minimum	(1)
Normal	33 323 kg/h
Design	37 000 kg/h

Note:

(1) Vendor to indicate minimum acceptable flowrate, to achieve the required specification.

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			PAGE	4/16	

2.1.3 117-VV-932A/B CYCLE LENGTH

The adsorption duration and regeneration frequency will be based on a 25 day cycle at design flowrate (equivalent to 28 days at normal flowrate).

2.1.4 117-VV-932A/B REGENERATION

Flowrate : by vendor
Warm purge : by vendor
Heat cycle : by vendor
Cool cycle : by vendor
Depressurisation/Repressurisation : by vendor

2.1.5 117-VV-932A/B PRESSURE DROP

The maximum pressure drop (at specified design flowrate) is 0.2 kg/cm² max for each vessel, i.e. 0.4 kg/cm² in total when the treaters are operating in series.

2.2 COMONOMERS: BUTENE-1, HEXENE-1

2.2.1 PURIFICATION SCHEME

One vessel is foreseen for butene-1 purification: 117-VV-941A. It will contain multiple layers of molecular sieves and adsorbents to remove trace amounts of water and other contaminants to acceptable levels.

One vessel is foreseen for hexene-1 purification: 117-VV-941B. It will contain multiple layers of molecular sieves and adsorbents to remove trace amounts of water and other contaminants to acceptable levels.

117-VV-941B is common spare of 117-VV-941A used during generation of 117-VV-941A. 117-VV-941A is common spare of 117-VV-941B used during generation of 117-VV-941B.

117-VV-941A and 117-VV-941B will be identical. Each individual treater will have the full capacity of treating the butene-1 stream or the hexene-1 stream.

Vendor to select adsorbent to minimize loss of comonomer (hexene-1, butene-1) by side reaction. Vendor to indicate the fraction of comonomer loss through the bed.

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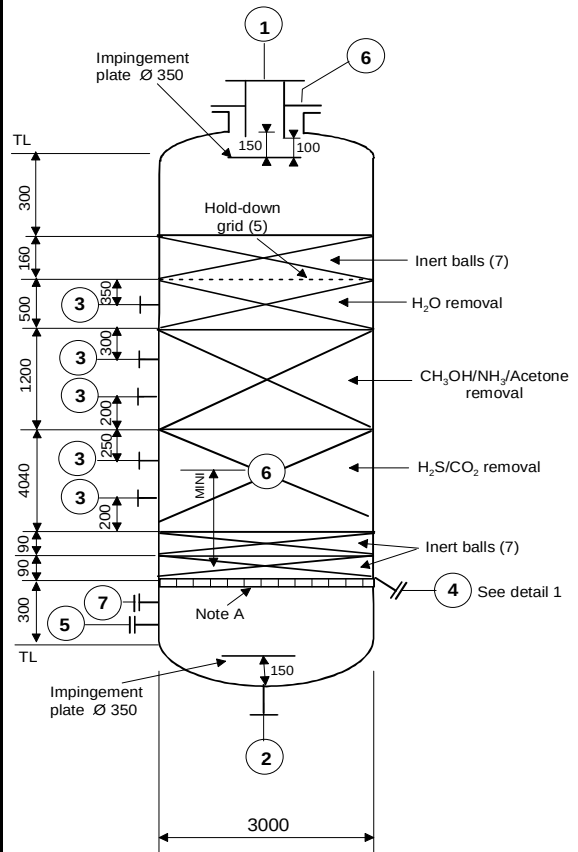
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			No. OFF	2	
			SERVICE	ETHYL. OXYGENATES TREATERS	
			PAGE	1/3	

	OPERATING	PROCESS DESIGN
PRESSURE	kg/cm2(g)	kg/cm2(g)
Normal Op.	32.2	56
Regeneration (N2)	4	10.5
TEMPERATURE	°C	°C @ kg/cm2(g)
Normal Op.	43	80 @ 56 (6)
Regeneration (N2)	270 (3)	-45 / 325 (3) @ 10.5
MATERIALS	L.T.C.S.	L.T.C.S.
CORR. ALLOWANCE	3 mm	3 mm

Fluid: Ethylene
Density: 39.01 kg/m3 @ 43°C
Insulation: YES (heat conservation)
Lower TL elevation above ground: (4)

REP	Nb	Dia. In	SERVICE
1	1	8	Inlet
2	1	8	Outlet
3	5	1 1/2	Temperature indicator (9)
4	1	4	Absorbent draw off
5	1	8	Handhole (1)
6	2	24	Manhole
7	1	2	Spare



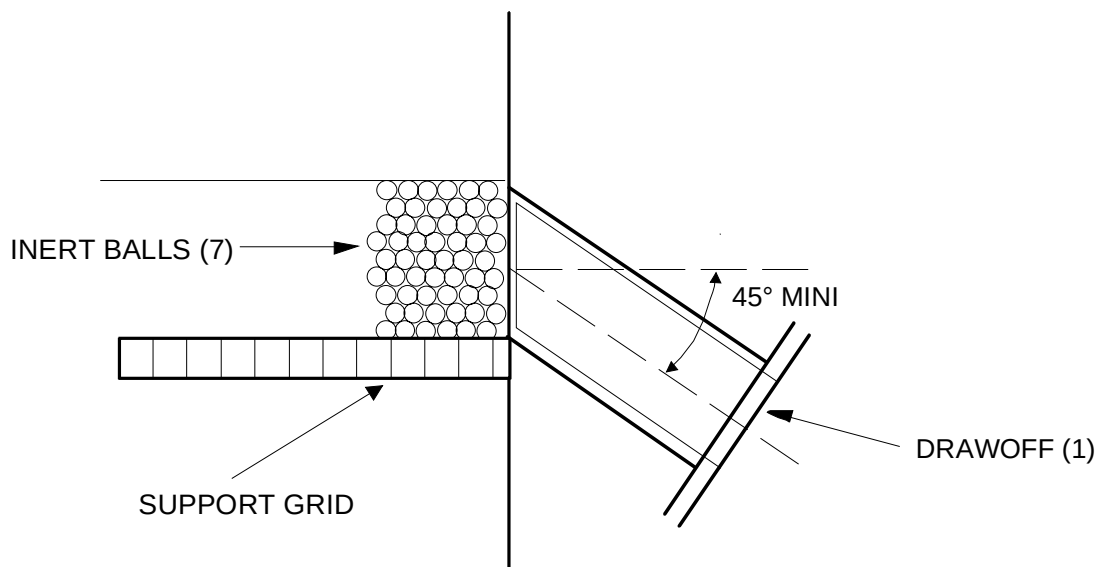
(*) CYLINDRICAL SHELL LENGTH ONLY.

DRUM ORIENTATION		VERTICAL		BOOT						
INTERNAL DIAMETER		mm	3000 (3)	INTERNAL DIAMETER		mm				
HEIGHT OR LENGTH (*)		mm	6680 (3)	HEIGHT OR LENGTH (*)		mm				
REV.	XA	0	1							
DATE	Jan 09	Aug 09	Sept 09							
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VESSEL

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			No. OFF	2	
			SERVICE	ETHYL. OXYGENATES TREATERS	
			PAGE	2/3	

DETAIL 1 - ADSORBENT DRAWOFF



PROCESS NOTES

- Complete with plug insert to ensure flush fitting with cylindrical shell.
- Adsorbent supply
Above adsorbents: 1.1 m³ of inert balls (Denstone D-57 1/2" or equivalent).
Adsorbents:
 - For H₂O removal: 3.5 m³ of UOP 3A-EPG 1/16" molecular sieve or equivalent.
 - For CH₃OH/NH₃/Acetone removal: 8.5 m³ of UOP AZ-300 7x14 mesh or equivalent.
 - For H₂S/CO₂ removal: 28.5 m³ of UOP CG-731 7x12 mesh or equivalent.
 Below adsorbents: 1.2 m³ of inert balls (0.6 m³ of Denstone D-57 1/8" above 0.6 m³ of Denstone D-57 1/4" or equivalent)
- DELETED.
- Elevation to allow easy emptying of adsorbents from bottom withdrawal nozzle.
- S.S. 20 mesh grid (0.85 mm opening).

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			No. OFF	2	
			SERVICE	ETHYL. OXYGENATES TREATERS	
			PAGE	3/3	

1
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6. -36°C after depressurisation at atmospheric pressure.

7. Denstone 57 or equivalent. Ball size to be given by adsorbent Vendor.

8. Detail Engineering to ensure that total ΔP from flange to flange is lower than 0.2 kg/cm².

9. Equally spaced in plan view around circumference.

MECHANICAL NOTES

A. Johnson screen grid type or equivalent (see note 8).

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