



**KALYANI**

# **Kalyani Cleantech**

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**O-XEN 500,  
PVSA OXYGEN UNIT**



Kalyani Cleantech PVT LTD

# Introduction

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**With a successful journey spanning across 5 decades, Kalyani Group is a globally renowned conglomerate with an annual turnover of over US \$3 Billion. Worldwide, it has 15+ leading companies across various industries like Engineering Steel, Automotive, Industrial, Renewable Energy, Urban Infrastructure and Specialty Chemicals. A strong engineering global workforce of 10,000 adds to the many strengths of the group.**

**Kalyani Cleantech Pvt Ltd. (KCPL) is a manufacturing and solutions provider for sanitation products and waste management systems. .We are also into manufacturing & Solutions provider for commercial and industrial refrigeration solution in vehicle segment to amplify quality of Indian cold chain infrastructure thus reducing wastages in the supply chain.We have also started our new PVSA Oxygen Unit at Chakan Plant.**



- **Model No: O-xen 500**

Capacity: 500 LPM (30m<sup>3</sup>/hr)

Purity: @ 93+-3 %

Operating Pressure: 1.8 to 5.0 kg/Cm<sup>2</sup>g

Operating Temperature: Around 40 Deg C

Dew Point at Outlet: (-) 40 Deg C +-5

Cycle Time: Variable (45 + 45) to (90 + 90) Seconds Selected (70 + 70) Seconds

Type of Desiccant: Zeolite Molecular Sieve & Activated Alumina

Main Air Flow: Bottom to Top

Regeneration Gas: Top to Bottom

Outlet Pressure: Around 2.0 to 5.0 kg/Cm<sup>2</sup>g

- **Utility Requirements:**

- A) Electric Power**

Voltage: 415 Volts AC 3 Phase

Frequency: 50 + 5%.

Maximum Running Load: 50 kW

Total Connected Load: 51.1 kW

Average Running Load: 42 kW (variable with different operating parameters)

- B) Compressed Air**

Flow Rate (FAD) : 8.2 M<sup>3</sup> / Minute (290 CFM)

Pressure: 6.0-7.0 Kg /cm<sup>2</sup>g 8.0 Kg/cm<sup>2</sup>g max

Temperature: Ambient

Dryness: Pressure dew point better than (+) 6 Degree C  
(From Refrigerated type dryer)

Followed by filtration Unit (Coarse & Fine + ACF)

- C) Electric Power Load Break Up**

Air Compressor: 45 kW max

Vacuum Pump: 5.6 kW

Control Panel / PLC: 0.5 kW

Total Connected / maximum Load 51.1 kW

## • **PROCESS DESCRIPTION:**

The feed air system comprises of screw type air compressor, motor, fan type air cooler, starter and control system etc. The screw compressor has integrated / built in Refrigerated type dryer so as to reduce the moisture load on the desiccant and the condensed water is drained out through a timer operated auto drain valve. To further reduce oil contents from the air, an additional activated carbon is provided. The carbon filter element should be replaced after its normal working life of 3 to 6 months. Micron air filter is provided before oil filter to remove any particulate matters.

Thus, clean oil free air is available for continuous usage in the system.

Air is then passed through a twin tower unit filled with special grade of desiccant wherein moisture & nitrogen are selectively adsorbed. At a time, one set of adsorber remains in cycle (adsorption) supplying dry oxygen at the outlet while other goes under regeneration by depressurization followed by gas purging.

For high degree of regeneration to achieve maximum performance from Molecular Sieves, vacuum is applied as a pulling force to make the regeneration complete in all respect. To avoid any surges because of changeover from one tower to another, a suitable surge tank is provided.

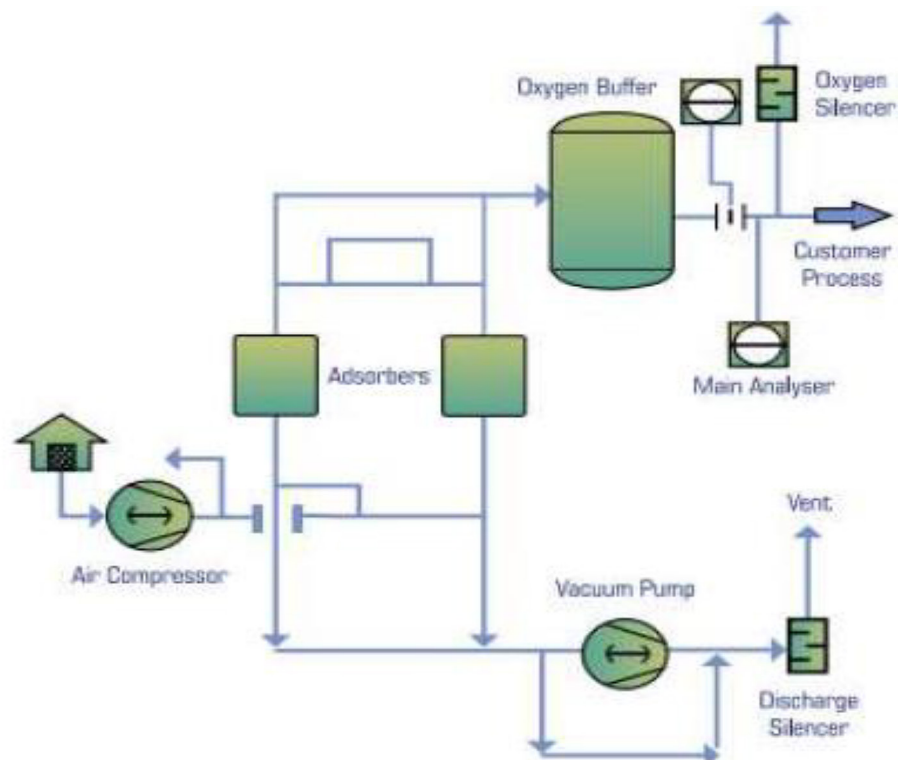
For the automatic changeover of adsorbers from one to another a suitable sequence timer/PLC and changeover valves with interconnecting piping are provided, thus making dry oxygen continuously available at the outlet through rotameter.

Total cycle time for adsorption/regeneration is of 2 x 45 to 2 x 90 seconds depending upon type of operating pressure, output pressure and required purities. The unit is selected with a time cycle of 70+70 seconds. All the above equipment's are complete with interconnecting piping and mounted on a common base frame as a skid.

## • Bill of Material Scope

| item  | Make   | Quantity per Unit |
|---|--|-------------------|
| Air Compressor with Ref. Dryer (with particulate & oil Filters) | Kaeser, Elgi, Atlas Copco, Anest Iwata, FS Curtis, / Equivalent make | 1 No.             |
| Vacuum Pump   | Akash / Everst / Shenovac / Kay International / Equivalent make      | 1 No.             |
| PLC   | Siemens / Schneider / omron  | 1 No.             |
| Control Panel components  | L&T / ABB / EE / AE / Siemens / Schneider / Equivalent make          |                   |
| Pressure Vessels  | Distributed local suppliers  | 6 No.             |
| Solenoid and change over Valves                                 | UFlow / Gaskon / festo / Equivalent make                             | 12 No.            |
| Pressure Switch   | Danfoss / Equivalent make  | 8 No.             |
| Rotameter   | veskeler / Gaskon / Equivalent make                                  | 1 No.             |
| Oxygen Analyzer   | Hemaki / Nucon / Equivalent make                                     | 1 No.             |

## • Process Flow Diagram:



## • **Adsorbent Towers**

Oxygen plant has 2 Adsorber towers and which contains the Zeolite Molecular Sieves along with Activated alumina. This mixed desiccant bed adsorbs nitrogen, and concentrates oxygen from the air during drying cycle. Pressure gauges are fitted on this towers to indicate the tower pressure and there is provision for refilling the desiccant.

## • **Air dryer**

Moisture in compressed air used in oxygen plant causes problems in the operation of the desiccant beds as well as solenoid valves and can adversely affect the process and product being manufactured. In order to avoid the above said problem and to supply the dry air an air dryer is required in this plant. Trident make Cold spell refrigeration dryer eliminates any water vapor remaining in the compressed air coming at the outlet of the compressor house. The dryers have been designed for nominal standard inlet conditions as per ISO 7183 in order to obtain a dew point under pressure of +3oC to +7oC.

## • **Air receiver**

Air receiver is connected in between the Air dryer and Adsorbent towers. This air receiver acts as a accumulator and the air supplied to this receiver must be dry air.

## • **Pre-Filter**

This filter avoids dust, dirt, foreign materials and moisture before entering into the Molecular sieves bed and damaging the working. Trident make pre-filter (5micron) is used in this plant.

## • **Fine filter**

This filter avoids dust, dirt, foreign materials and moisture before entering into the Molecular sieves bed and damaging the working. Trident make fine-filter(1micron) is used in this plant.

## • **Carbon filter**

This filter is used to remove oil and hydrocarbon vapour from the compressed air Stream before get into the desiccant bed. Trident make carbon filter(0.01micron) is used in this plant.

## • **After filter**

This filter avoids the desiccant particles from the adsorbent towers coming with the Oxygen after production. Trident make fine-filter (1micron) is used in this plant.

- **Bacterial filter**

Bacterial filters provide effective protection against various types of particles including bacteria, viruses, and moisture droplets in the oxygen out from the plant. This filters help to protect the patient, and the breathing circuit from contamination.

- **Inlet feed air solenoid pilot valves**

This valves allows the inlet feed air between the two adsorbent towers during drying Phase. Controls signals for valve operation is taken from the control panel and the pilot air required for this valve is taken from the air receiver.

- **Electronic control valve**

These valves open for a period of when the absorber is pressurized to deliver oxygen to the oxygen receiver for use.

- **Electronic auto drain valves**

Electronic auto drain valve (EDV) automatically removes condensate from the filters.

- **Pressure equalization valve**

After pressurization cycle on one of the absorbers, the purge valve will open for a period and pressure equalization between the adsorber towers will take place.

- **Pressure regulators**

The air pressure regulator controls the inlet air pressure before entering into the adsorber tower in the inlet side and control the delivery oxygen pressure at delivery side.

- **Pressure gauges**

These gauges indicates the air pressure inside the adsorbent towers and receiver.

- **Non return valves**

These valves prevents the back flow of oxygen into the adsorbent towers.

- **Oxygen sensor**

This sensor is used to indicate the product purity in terms of %of oxygen from the oxygen generator.

- **Ball valves**

These valves are used to open and shut off the inlet and product outlet from the receivers based on the requirement.

- **Exhaust solenoid pilot valves**

This valves allows the waste air from the two adsorbent towers during regenerating phase. Controls signals for the valve operation is taken from the control panel and the pilot air required for this valve is taken from the air receiver.

- **PLC Control panel**

The PLC (Programmable Logic Controller) process the inputs and outputs) to and from the system components and communicates with the touch screen.

- **Pressure relief valve**

This valve is in place to ensure that the pressure in the vessels does not exceed safe System working pressure. It will only open in the event of a serious malfunction. It is fitted in all vessels.







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