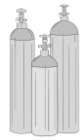
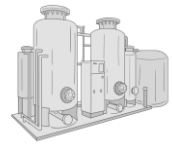
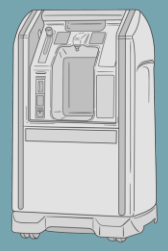
Christian Medical Association of India





System type	Concentrator	Cylinders	Oxygen Plant (PSA/VSA)	Liquid Medical Oxygen (VIE)
Description	Self-Contained; Electrically powered; Produces oxygen from ambient air	Refillable; Used to store and transport O2 in compressed gas form;	Onsite O2 generation; Supplies high pressure O2; Two technologies available: Pressure Swing Adsorption (PSA) or Volume Swing Adsorption (VSA)	Refillable onsite storage; Offsite production of liquid O2 at supplier site; Refilling by supplier;
Capacity	5 LPM/10 LPM (at 90% purity at full flow)	Varies with size Bulk cylinder – 7000 Liters at 50 PSI	50 LPM onwards, depending on size	Depends on the size of he, but 990 L is widely used
Clinical Application	Used to deliver O2 at the bedside. Can service several beds with the use of a flowmeter to split output flow	Can be used for all O2 needs, including facilities with unreliable power supply; Used as a backup for other systems	Can be used for all oxygen needs, including high-pressure supply.	Can be used for all oxygen needs, including high- pressure supply and in facilities where power supply is intermittent or unreliable
Pressure	Low (<5 PSI)	High	High (50 PSI)	High
Electricity Req.	500 W – 1000 W	No	100 LPM: 11kW 200 LPM: 15kW (8kW for VSA)	No
Distribution	Direct to patient with tubing or through a flowmeter stand.	A cylinder bank connected to central pipeline system (or) direct to patient with tubing and flowmeter	Connected to hospital central-pipeline with cylinders as backup	Connected to hospital central-pipeline
Costs (Pre-Covid)	Rs. 50,000 to Rs. 1,00,000/-	Filling: Rs. 350/- Rent: Rs. 10/- per day Purchase: Rs. 13,500 per cylinder	− 100 LPM: 30 Lakhs − 250 LPM: 45 Lakhs	Refill of 990 Liters costs about Rs. 14,000 (Trichy) (This lasts for about a day at 500 LPM)
Maintenance	Cleaning of filters and device exterior.	Regular checks of fittings and connections, regular checks of oxygen levels, cleaning exterior	− CMC Contract: About 2 Lakhs per year for a PSA Plant, includes: Service + Parts + Scheduled maintenance visits + Unlimited emergency Visits − Filters should be checked and replaced constantly with in-house technicians − If oil or water gets into Zeolite chambers, they will get damaged and should be replaced – Normally should last over 10 years If compressor fails, it should be serviced immediately or replaced – Good to have a standby compressor	Significant maintenance of system and piping required by highly trained technicians and engineers, can be provided as part of contract.
Merits	− Portable, onsite oxygen production − Continuous oxygen supply (if power available) at low running cost. − 'Y' Connectors can be used to share one concentrator with two patients if low flow is sufficient for each and also to use two concentrators for one patient if higher flow is required	− Mobile, Easy to refill (if filling facility nearby) − Can be used for all purposes − Easy to scale up (Rent/Purchase)	− Can be cost-effective for large facilities. − Continuous oxygen supply − Can be used to fill cylinders: 200 LPM plant can fill 50 cylinders per day (However, very expensive to setup high pressure: ~ 1 Cr)	− Compact: 1 litre = 861 litres of Oxygen − Can be used for all purposes − High output for small space requirement.
Drawbacks	− Low pressure output (<5 PSI), usually not suitable for CPAP or ventilators. − Requires uninterrupted power/ UPS backup − Requires backup cylinder supply. − Requires maintenance.	− Vulnerable to supplier/transporter disruption − Requires transport/ supply chain. − Exhaustible supply. − Risk of gas leakage. − Risk of unwanted relocation.	− High capital costs. − Long lag periods − Needs a lot of space − Requires uninterrupted power. Needs adequate infrastructure. − High cost & maintenance for piping. − Requires backup cylinder supply. − Risk of gas leakage from piping system.	− Not available unless in a major city − Requires transport/ supply chain. − Above 1000L requires explosives permit − Exhaustible supply. − High cost & maintenance for piping. − Requires backup cylinder supply. − Risk of gas leakage from piping system



Where to be used:

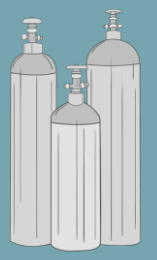
- To deliver O2 at bedside

Suitable for:

- Places where there is continuous power supply/in presence of UPS
- 'Y' connectors can be used to share one concentrator with two patients (for low flow) or use two concentrators for one patient (for high flow)
- Flow rates of 5L/min - 10L/min

Not suitable for: Use with Bi-PAP or ventilators

Can be used with: O2 cylinders as backup



Where to be used:

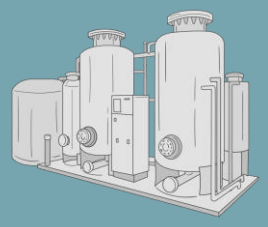
- Directly to supply o2 to patient or in conjunction with cylinder banks. Easy to refill and scale-up

Suitable for:

- Places with unreliable power supply

Not suitable when: There isn't a reliable transport system or supply chain to refill

Can be used with: All O2 systems as a backup



Where to be used:

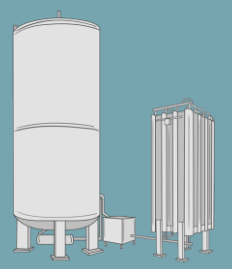
- All O2 needs - especially for high-pressure oxygen supply
- 200 LPM plant can be used to refill 50 O2 cylinders per day

Suitable for:

- Places with uninterrupted power supply required for continued flow of O2

Not suitable when: Low capital, space. Low maintenance budgets

Can be used with: O2 cylinders as backup



Where to be used:

- All O2 needs - especially for high-pressure oxygen supply
- Offsite production of liquid O2 and refilled by supplier onsite

Suitable for:

- Facilities where power supply is unreliable and high pressure O2 is required
- Small spaces that need a high output

Not suitable for: Small cities, unreliable supply chains

Can be used with: O2 cylinders as backup

Rough estimation of demand for Oxygen Plants:

Short Term: Connect load to bank of cylinders and measure time to empty
Long Term: Connect kWH meter to Oxygen plant and divide units consumed by kW consumed per hour to estimate number of hours run

To estimate your O2 supply requirements, please refer: https://opencriticalcare.org/oxygen-supply-demand-calculator/

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