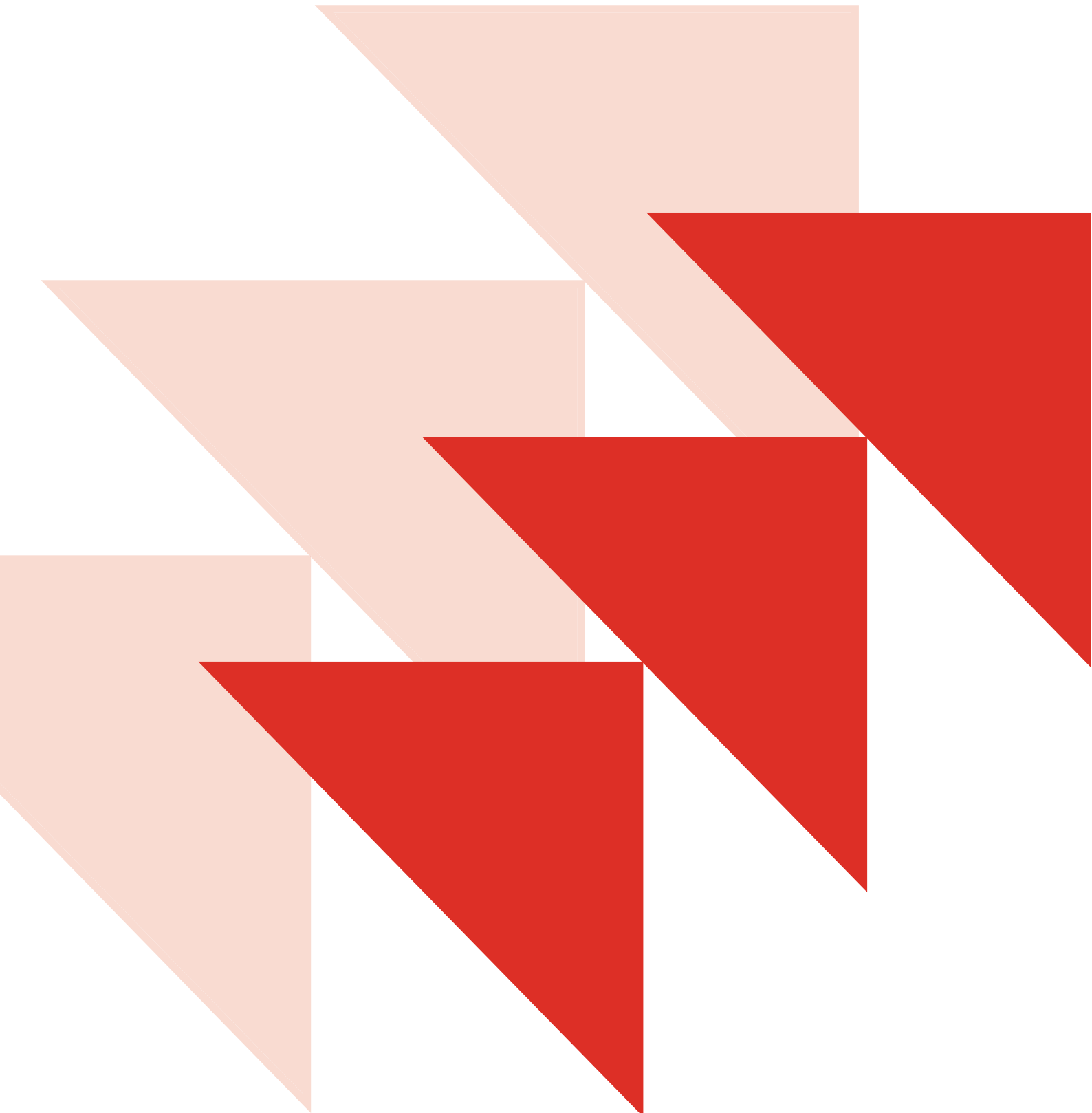


# ON-SITE OXYGEN GENERATION WHY PSA SYSTEMS ARE A GOOD CHOICE



*The consumption of oxygen in hospitals has been rising steadily for decades now. According to the sixth edition of Ward's Anaesthetic Equipment, significant changes in postoperative and ventilatory management are among the drivers of this rise in oxygen consumption. Thus the amount of oxygen consumed by a large hospital is commonly measured in hundreds of cubic metres (HCMs). Naturally, the bill for oxygen represents a major expense incurred by a typical hospital.*



Source: <http://medhanshhospital.com/anaesthesia.aspx>

*Hospitals obtain their supply of oxygen from one or more of these systems:*

- *Liquid oxygen supply systems (also known as cryogenic liquid systems)*
- *High-pressure cylinders*
- *Pressure swing adsorption systems (PSA systems, or oxygen concentrators)*

*This issue of Trident Notes compares the merits of these systems and points out that there is a strong case for selecting PSA systems in preference to the others.*

## Liquid oxygen supply systems

*At the heart of a liquid oxygen system is an insulated reservoir, known as a vacuum insulated evaporator, where cold liquid oxygen is stored in bulk. The reservoir may be a permanent installation or a portable, lightweight container. In either case it has a double-walled construction, with vacuum between the outer and inner shells. During normal operation, the liquid oxygen is made to flow out of the reservoir and pass through a device known as an ambient vaporizer. Heat from the surroundings warms the liquid oxygen in the vaporizer, causing it to turn into the gaseous form. This gaseous oxygen is heated further and delivered through a pressure regulator to the distribution line.*



*Liquid oxygen installation (Source: <http://rc.rcjournal.com/content/58/1/173>)*

**Advantages.** *Liquid oxygen systems are very effective sources of oxygen.*

**Disadvantages.** *(1) Refilling portable tanks requires dexterity. (2) Larger, permanent reservoirs require a lot of space and must be sited such that they are accessible to the tankers that refill them. Bulk liquid oxygen supply systems should be located in open areas without any overhead power lines. (3) Liquid oxygen cannot be stored for extended periods as it evaporates. Up to 20% of the oxygen may be lost to evaporation. Refilling must be carried out frequently.*





*PSA enables a health care centre to produce its own oxygen.*

*On-site generation of medical oxygen using PSA is safe, reliable and cost-effective compared with the other two methods described. The energy and area requirements of PSA systems are reasonable. The PSA process is an extremely clean operation.*

*The design and fabrication of on-site oxygen production systems are governed by the ISO 10083:2006 and ISO 7396-1:2016 standards.*

## Comparison

Factor	On-site oxygen production using PSA processes	Liquid oxygen supply systems	High-pressure cylinders
Capital cost	Investment required; but pay-back period (compared with high-pressure cylinders) less than 15 months	Investment not required	Investment not required
Recurring costs	Electricity	Cost of liquid oxygen and rent	Cost of oxygen
Space requirement	Medium	Most	Least; but depends on number of cylinders
Administration	Easy	Difficult	Difficult
Safety	Safe	Risk of uncontrolled release of oxygen	Risk of explosion
Logistics management	One-time—installation of the plant	Issues might arise when a tanker needs access to bulk-storage tank to refill liquid oxygen.	Issues might arise with the transport, storage and accessing of the cylinders.
Evaporation loss	None	Up to 20%	3% unusable

*From the foregoing comparison it is evident that on-site oxygen production using PSA is a very attractive option. Unnecessary overhead costs are eliminated with PSA systems. This option saves money. PSA systems are far safer than the other methods.*

