TERM PAPER

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By

Kummari Sumanth

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(Roll No: 21111026)

Under the guidance of

Saurabh Gupta Sir

(NITRR)

NATIONAL INSTITUTE OF TECHNOLOGY RAIPUR

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Kummari Sumanth,

21111026,

1st Semester, Biomedical Engineering,

National Institute Of Technology, Raipur.

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1 OXYGEN CONCENTRATOR

1.1 Abstract:

Nowadays human has everything like Food, water,shelter and moreover for their luxuriness they have there ultra luxury goods, but the main thing that there themselves are not there to enjoy all these i. e, HEALTH. Now life is the key role to have all these and the main and essential thing required is OXYGEN, which is the survival goods. We are getting oxygen but it was all polluted before reaching us, so inorder to have a good and energy rich oxygen we are intoducting a equipment named Oxygen Concentrator.

1.2 Introduction:

An oxygen concentrator is a device that concentrates the oxygen from a gas supply (typically ambient air) by selectively removing nitrogen to supply an oxygen-enriched product gas stream. They are used industrially and as medical devices for oxygen therapy.

Two methods in common use are pressure swing adsorption and membrane gas separation. Pressure swing adsorption (PSA) concentrators utilize multiple molecular sieves consisting of zeolite minerals that adsorbs pressurized nitrogen in fast cycles.

1.3 Explanation:

Working of Oxygen Concentrator: Oxygen concentrators using pressure swing adsorption (PSA) technology are used widely for oxygen provision in healthcare applications, especially where liquid or pressurized oxygen is too dangerous or inconvenient, such as in homes or portable clinics. For other purposes, there are also concentrators based on nitrogen separation membrane technology.

An oxygen concentrator takes in air and removes nitrogen from it, leaving an oxygen-enriched gas for use by people requiring medical oxygen due to low oxygen levels in their blood.Oxygen concentrators provide an economical source of oxygen in industrial processes where they are also known as oxygen gas generators or oxygen generation plants.

These oxygen concentrators utilize a molecular sieve to adsorb gases and operate on the principle of rapid pressure swing adsorption of atmospheric nitrogen onto zeolite minerals at high pressure.

This type of adsorption system is therefore functionally a nitrogen scrubber leaving the other atmospheric gases to pass through, leaving oxygen as the primary gas remaining. PSA technology is a reliable and economical technique for small to mid-scale oxygen generation. Cryogenic separation is more suitable at higher volumes and external delivery generally more suitable for small volumes.

At high pressure, the porous zeolite adsorbs large quantities of nitrogen, because of its large surface area and chemical characteristics. The oxygen concentrator compresses air and passes it over zeolite, causing the zeolite to adsorb the nitrogen from the air. It then collects the remaining gas, which is mostly oxygen, and the nitrogen desorbs from the zeolite under the reduced pressure to be vented.

An oxygen concentrator has an air compressor, two cylinders filled with zeolite pellets, a pressure-equalizing reservoir, and some valves and tubes. In the first half-cycle, the first cylinder receives air from the compressor, which lasts about 3 seconds. During that time the pressure in the first cylinder rises from atmospheric to about 2.5 times normal atmospheric pressure (typically 20 psi/138 kPa gauge, or 2.36 atmospheres absolute) and the zeolite becomes saturated with nitrogen. As the first cylinder reaches near pure oxygen (there are small amounts of argon, CO2, water vapour, radon and other minor atmospheric components) in the first half-cycle, a valve opens and the oxygen-enriched gas flows to the pressure-equalizing reservoir, which connects to the patient's oxygen hose. At the end of the first half of the cycle, there is another valve position change so that the air from the compressor is directed to the second cylinder. The pressure in the first cylinder drops as the enriched oxygen moves into the reservoir, allowing the nitrogen to be desorbed back into gas. Partway through the second half of the cycle, there is another valve position change to vent the gas in the first cylinder back into the ambient atmosphere, keeping the concentration of oxygen in the pressure equalizing reservoir from falling below about 90. The pressure in the hose delivering oxygen from the equalizing reservoir is kept steady by a pressure-reducing valve.

Older units cycled for a period of about 20 seconds and supplied up to 5 litres per minute of 90+ percent oxygen. Since about 1999, units capable of supplying up to 10 L/min have been available.

Classic oxygen concentrators use two-bed molecular sieves; newer

concentrators use multi-bed molecular sieves. The advantage of the multi-bed technology is the increased availability and redundancy, as the 10 L/min molecular sieves are staggered and multiplied on several platforms. With this, over 960 L/min can be produced. The ramp-up time - the elapsed time until a multi-bed concentrator is producing oxygen at ¿90 percent concentration - is often less than 2 minutes, much faster than simple two-bed concentrators. This is a big advantage in mobile emergencies. The option, to fill standard oxygen cylinders (e.g. 50 L at 200 bar = 10,000 L each) with high-pressure boosters, to ensure automatic failover to previously filled reserve cylinders and to ensure the oxygen supply chain e.g. in case of power failure, is given with those systems.

1.4 Applications:

Medical oxygen concentrators are used in hospitals or at home to concentrate oxygen for patients. PSA generators provide a cost-efficient source of oxygen. They are a safer, less expensive, and more convenient alternative to tanks of cryogenic oxygen or pressurised cylinders. They can be used in various industries including medical, pharmaceutical production, water treatment and glass manufacture.

PSA generators are particularly useful in remote or inaccessible parts of the world or mobile medical facilities (military hospitals, disaster facilities).

1.5 Portable Oxygen Concentrator

Since the early 2000s, many companies have produced portable oxygen concentrators.Typically, these devices produce the equivalent of one to five liters per minute of continuous oxygen flow and they use some version of pulse flow or "demand flow" to deliver oxygen only when the patient is inhaling. They can also provide pulses of oxygen either to provide higher intermittent flows or to reduce the power consumption.

The FAA has approved the use of portable oxygen concentrators on commercial airlines. However, users of these devices should check in advance as to whether a particular brand or model is permitted on a particular airline. Unlike in commercial airlines, users of aircraft without cabin pressurization need oxygen concentrators which are able to deliver enough flowrate even at high altitudes.

Usually, demand or pulse-flow oxygen concentrators are not used by patients while they sleep. There have been problems with the oxygen concentrators not being able to detect when the sleeping patient is inhaling. Some larger portable oxygen concentrators are designed to operate in a continuous-flow mode in addition to pulse-flow mode. Continuous-flow mode is considered safe for night use when coupled with a CPAP machine.

Common models retail at around 600 - 3,000 dollars . Leasing arrangements may be available through various medical-supply companies and/or insuranceCodisaster.or

1.6 Safety of Oxygen Concentrator

In both clinical and emergency-care situations, oxygen concentrators have the advantage of not being as dangerous as oxygen cylinders, which can, if ruptured or leaking, greatly increase the combustion rate of fire. As such, oxygen concentrators are particularly advantageous in military or disaster situations, where oxygen tanks may be dangerous or unfeasible.

Oxygen concentrators are considered sufficiently foolproof to be supplied to individual patients as a prescription item for use in their homes. Typically they are used as an adjunct to CPAP treatment of severe sleep apnea. There also are other medical uses for oxygen concentrators, including COPD and other respiratory diseases.

People who depend upon oxygen concentrators for home care may have life-threatening emergencies if the electricity fails during a natural disastdisaster.

1.7 Conclusion:

So on the whole life of human is only because of oxygen, oxygen is essential so we try to inhale purest form of it with the help of our Oxygen Concentrator. Its better to have an Oxygen Concentrator at home than having a Air conditioner or Fridge, if we live healthy we can buy any of those, for being alive healthy we require it.