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Oxygen Concentrator Generator

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Abstract
As we all know that Oxygen is very Important for us and oxygen is added as essential medicine on the list of the World Health Organization (WHO) , but it is still not easily available in countries which are developing, and they bear the greatest number of deaths of seriously ill newborn baby , children, and adult . Reasons for low oxygen supply are mostly associated with high price and lack of configuration to install and maintain suitable oxygen supply. Even at places where oxygen supply is easily accessible , due to missing accessories, patient access may be limited, deficient electricity or insufficient trained staff.
Luckily, for the management of oxygen therapy there is compelling evidence that oxygen concentrators are workable and economical plan of action , specially where piped oxygen systems oxygen cylinders and are unapproachable. Sustainable and good source of oxygen to multiple patients can be provided by good quality oxygen concentrators . Oxygen concentrator operates by taking air from the surroundings to deliver continuous, clean, and concentrated oxygen. Oxygen concentrator may run for at least five years or more than that, with affordable service and low maintenance.

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I. Project Introduction

As we all know that Oxygen is very important for us and oxygen is added as essential medicine on the list of the World Health Organization (WHO) , but it is still not easily available in countries which are developing, and they bear the greatest number of deaths of seriously ill newborn baby, children, and adult . Reasons for low oxygen supply are mostly associated with high price and lack of configuration to install and maintain suitable oxygen supply. Even at places where oxygen supply is easily accessible , due to missing accessories, patient access may be limited, deficient electricity or insufficient trained staff.

Luckily, for the management of oxygen therapy there is compelling evidence that oxygen concentrators are workable and economical plan of action , specially where piped oxygen systems oxygen cylinders and are unapproachable. Sustainable and good source of oxygen to multiple patients can be provided by good quality oxygen concentrators . Oxygen concentrator operates by taking air from the surroundings to deliver continuous, clean, and concentrated oxygen. Oxygen concentrator may run for at least five years or more than that, with affordable service and low maintenance.

Oxygen concentrator generator is a device that produces pure oxygen about 85%at the pressure of 50 PSI. The overview of oxygen concentrator generator is goodand it works very smoothly with 0 leakage. When we are working on it then we have learnt so much. We learn about pressure regulator, humidifier, air-separation pipe, solenoid valve (5/2), solenoid valve (3/2), solenoid valve (2/1), pressure gauge meter, oxygen flow meter, nuts and volts, arduino kit with wire plug, malecord and adapter.

Oxygen concentrator generator works through pressure swing adsorption system (PSA). It is a filtering with atmospheric air to provide patients with 85-90%. Firstof all we start compressor and connect the concentrator inlet pipe. Then we start compressor and set at a 35-80 PSI. When atmospheric air enter in the pressure regulator through compressor, then we inlet air regulator valve set at a 50 PSI andoutlet pressure regulator valve set at a 20-40 PSI.

First of all atmospheric air enter in the silica container where silica absorb all moisture of air as well as argon, carbon-monoxide, carbon-di-oxide then air passes through pipe and enter in the first zeolite container where using 13X Zeolite for remove or absorb 78% Nitrogen(N2). We are using two zeolite container for pure oxygen when in the first zeolite container absorb nitrogen then goes in second zeolite container and also help remove extra gases like carbon- monoxide, carbon-di-oxide etc.

Then pure oxygen enter in the oxygen reservoir and it goes into humidifier and delivered pure oxygen to the patient at a rate of about 85% concentrated oxygen.We provide 0-15 LPM oxygen.
Oxygen concentrator system is fully based on PSA, where we are using zeolite, silica, humidifier, oxygen sensor, pressure sensor, zeolite vessel, air separation pipe, silica vessel, capacitor, transistor, resistor, supporting frame, pneumatic valves and joints, joints and fittings and other items.

It works on the principle of separation of nitrogen and other harmful gases for peoples. Its main work is to deliver pure oxygen more than 85%. We are using atmospheric air for oxygen generation.

Oxygen concentration self-propelled electrically power device which supplies oxygen to atmospheric air by taking many types of air . This process is called pressure swing absorption system. Oxygen concentration provides 95% pure oxygen First the atmosphere is sent to a cross particle filter, then a compressor

MECHANICAL PROPERTIES

Component	Other names	Function
Compressor	Not applicable	Pressurizes and pumps air into the system
Control circuit	PCB, printed circuit assembly	Analyses the system state and controls the valves and compressor
Valve assemblies	Solenoid, check, rotary valves	Controls the flow processes for the sieve and exhaust
Sieve beds	Sieve columns, zeolite	Separates gases as air is moved in and out
Humidifier	Bubble humidifier,	Humidifies the delivered gas before inhalation
Product tank	Reservoir tank, accumulator tank, mixing tank, product	Gas accumulator for providing a steady and continuous flow
Oxygen monitor	Low oxygen alarm, oxygen concentration Sensor	Signals an alarm when oxygen concentration is below a preset level

In the above figure there are 2 types of oxygen concentrator
1. Stationary
2. Portable.

Where stationary has less in weight of 27 kg and has wheels that softly can moved by the user of the device. The device flows at the rate up to 10 liters per minute for continuous stream of an oxygen.
The portable concentrator has a lesser capacity output , and consumes less power compared lot the stationary ,can be used by an individual patient only.it is batteryoperated so it is capable of operating direct current.

- ALARM INDICATOR
- POWER SWITCH
- OXYGEN OUTLET
- FLOW METER
- INTAKE FILTER
- COMPRESSOR
- CONTROL UNIT
- PRODUCT TANK
- PRODUCT FILTER
- ZEOLITE TANK
- GROSS PARTICLE FILTER
- PRESSURE REGULATOR
- VALVE ASSEMBLIES
- HUMIDIFIER
- OXYGEN MONITOR
- FLOW METER

All the accessories are assemble in the one unit.
Now days there are many oxygens concentration Available in the market. But there is price is too high, so no all the people are buy this comfortably. So, we work on it and we are working How to reduces the prices.
We have to trying in low-cost best product with the produce maximum pure oxygen and work.

Our Architecture is based on Pressure Swing Adsorption process. The process is a static separation of air gases through a specific molecular sieve which is designed specifically to adsorb nitrogen from the atmospheric air under pressure in order to produce a oxygen enriched supply of air providing up to 90% pure concentrated oxygen

In this system we are using Three Tank. First of all, atmospheric pressure Come through Filter then two tanks for zeolite and last one for our pure oxygen tank.

First of all, atmosphere aur come through outlets and then pump send in the compressor then compressor compressed the Air. Then air Temperature will be increased. Then we are using Heat exchanger Heat exchanger will work to down to temperature. Then all compressed air store in one tank then All air passes through 2 Tank. Both of tank filled with Zeolite.

MATHEMATICAL MODELLING

Calculating oxygen flow rate using a rebreathing circuitQ1. What is the induction rate for a 15 kg patient ?
Ans. 15kg x 50 = 750
15kg x 100 = 1500
=>750-1500 ML/Min
So, we calculating flow rate L/M.750/1000=0.75
1500/1000=1.5
=>0.75-1.5 L/M.

Q2. What is the maintenance rate for a 15kg patient ? Ans. Maintenance rate(low flow) = 22-44 ML/KG/MIN
15 x 22 = 350
15 x 44 = 660
So, 330-660 ML/Min330/1000=0.33
660/1000=0.66
=>0.33-0.66 L/M.

Q3. Induction rate for 65 kg patient ?
Ans. We know that
a) Patient weight x induction rate = 65 x 50 =3250(Low)
b) Patient weight x Induction Rate = 65 x 100= 6500(High) {Induction Rate=50-100 ML/KG/Min.}
So, 3250-6500 ML/Min
Converting to L/Min
3250/1000= 3.25 and 6500/1000=6.5
=> 3.25-6.5 L/Min

Q4. Maintenance rate for a 65 kg patient.Ans. We know that,
a) Patient weight x maintenance rate (Low) = 65 x 22 = 1430
Rate = 22-44 ML/KG/Min.}
b) Patient weight x Maintenance Rate(High) = 65 x 44 = 2860
=> 1430-2860 ML/Min.

Converting in L/Min. 1430/1000=1.43 and 2860/1000= 2.86
{Maintenance
=> 1.43-2.86 L/Min.

NOTE: Using the above formulas, the amount of oxygen that is needed tobe supplied to a person of a specified weight can be calculated easily.

REGARDING OXYGEN DELIVERY

Q1. How much oxygen does one patient consume per day ?
Ans. Let us consider 1 patient and the delivery device be face mask throughoxygen concentrator, at a flow rate of 8 LPM (say).
So, the consumption per day in litres by 1 patient at 8 LPM be—
Now in 24 hours, converting it into minute for convenience in calculationbecomes-
24 x 60 = 1440 mins reqd.
Consumption per day at 8LPM =1440 x 8 = 11520 litres.
In cubic metres, consumption per day will be= 11520/1000= 11.5 metre cube Hence, we can calculate the oxygen

consumption per day in litre at any desiredflow rate.

SAMPLE CALCULATION OF BACKUP ENERGY REQUIREMENTFOR AN OXYGEN CONCENTRATOR

a)Concentrator power consumption (A)= 400 Watt b)Average duration of power outage per day(B) = 4 hours

c) Additional compensation for losses (C);-Batteries will lose capacities andrequire placement over time = 10%

d) Battery depth of discharge(D)=50%

Now,

1. Total concentrator backup energy requirement per day(E) =A x B x {1 + c/100}

=400 x 4 x (1.1)

=1600 x 1.1

= 1760 Wh

2. Total backup battery bank energy requirement = E x{ 100/D}

=1760 Wh x (100/50)

= 3520 Wh

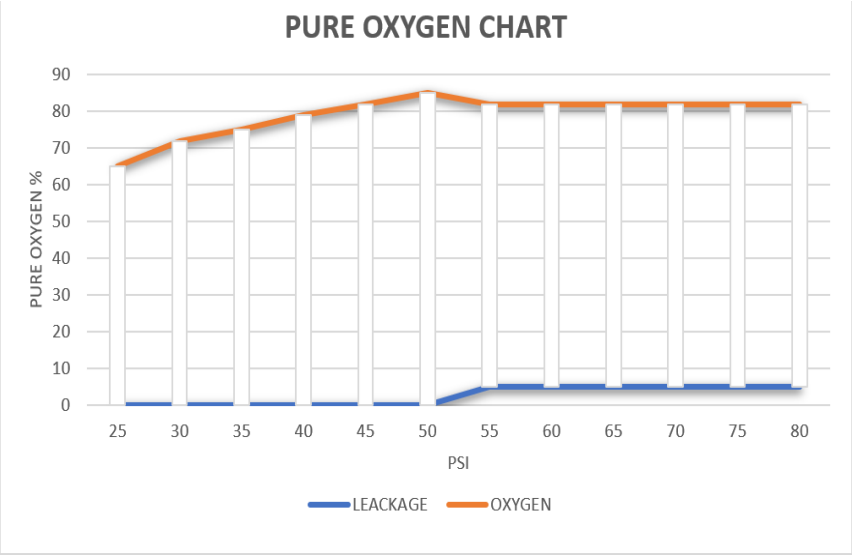
II. Results And Discussions

Main motive of this thesis was to look over and to find out the potency of a PSA method using a novel adsorbent for the utilization of O2 generation. Based upon the motive of the PSA process, there are various methods to use it. This process to the thesis's second result, which was to develop for max O2 regained and the building of a fast, well-organized process.

There are some important outcomes from the discoveries . Firstly, it can come into conclusion that the adsorbent used in this process has a rapid adsorption rate depend upon its capability to continue its planning when the feed gas speed was lifted to attain ten sec cycle. This makes this adsorbent convenient by fast PSA operation that demands higher adsorption speed. Regrettably , due to system limitations , the kinetic limit was not found. Secondly, repossession for the cycle used in the report indicated that an X type zeolite had a high recovery speed. This holds true even at lower pressure ratios of 2.49 and 3.49, but more zeolite does not. This permits the zeolite to produce a high outcome movement rate while let down BSF even at low pressure ratio, let the pump strength low requirement andminimize operating .

RESULT

- The model was tested successfully using the compressor (provided by theuniversity).
- The test was completed at a pressure of 50 PSI.
- Leakage was detected in the system when the compressor pressure was increased from 50 PSI.
- Different observations were taken at different compressor pressure and a graph was plotted between the amount of pure oxygen produced and simultaneous leakage was observed.
- The highest pure concentrated oxygen was found to be 85% at a compressor pressure of 50 PSI with 0 leakage as observed by the oxygen sensor device.
- The purity percentage of oxygen decreases with the decrease in compressor pressure. Ideally the compressor pressure is set to be 50 PSI.



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- The above chart shows the relation between the amount of pure oxygen coming out from the outlet and the leakage observed at different pressures.
- At a pressure of 25 PSI, the amount of pure oxygen observed is 65% with0 leakage
- At a pressure of 30 PSI, the amount of pure oxygen observed is 70% with0 leakage.
- At a pressure of 35 PSI, the amount of pure oxygen observed is 75% with0 leakage.
- At a pressure of 40 PSI, the amount of pure oxygen observed is 78% with0 leakage.
- At a pressure of 45 PSI, the amount of pure oxygen observed is 82% with0 leakage.
- At a pressure of 50 PSI, the amount of pure oxygen observed is 85% with0 leakage.
- When the pressure is further increased from 50 PSI, a downfall in oxygenpurity percentage is seen along with some amount leakage (say 2%).
- When the pressure is 55 PSI, the amount of pure oxygen observed is 82%with 5% leakage.
- When the pressure is 60 PSI, the amount of pure oxygen observed is 82%with 5% leakage.
- When the pressure is further increased to 65 PSI, the amount of pureoxygen observed is 82% with 5% leakage.
- When the pressure is assumed to be 70 PSI, the amount of pure oxygenobserved is 82% with 5% leakage.
- When the pressure is taken at 75 PSI, the amount of pure oxygen observedis 82% along with 5% leakage.
- When the pressure is 80 PSI, the amount of pure oxygen observed is foundto be 82% with 5% leakage.

SCOPE OF IMPROVEMENT

In Now a day technical specification play a very important role in any product. At this time everyone is looking for cheap and good stuff because we are working on the same. And the oxygen concentration that we are making will get a good hold in the market, for this we are working very well. As far as where we have lived, everything in this world should be shown and money should be invested accordingly. This means that the people we are working on oxygen concentration will work to give maximum pure oxygen.

Increase the availability of cost saving Parts and devices.

- The tank we are using in oxygen concentration for storage. That'll be our stainless steel. Total 3 tanks are being given to him, which will be cheap due to less capacity.
- Devices have dual outlets maximum oxygen outlets pressure and technical functions are important in pediatrics wards,
- There are many types of devices in future that may useful or not because there is some small issue is not completed.
- The rest of the devices that we are offering are smaller due to being portable which also costs less.

The system module based upon World Health Organizations recommendation of atomic number 8 treatment or should get modified correctly depend upon O2 requires evaluation.

Highest movement Production. The device id there in the market three, five, eight and ten L/mins units. O2 requires evaluation's analytical to determine max movement of the concentrators . Generally, a five L/Mins and

even extra productions provide O2 or more newborn sufferers with type 1 respiration failure at the same time. Thus, estimates that every child gets maximum two L/mins of O2, as long as NC or nasals catheter is used . A 5 L/mins device can assist grown humans and teenagers . An eight or ten L/mins device might come into effect of utilization for signs in the company of other supporting apparatus or adequate to carry up to four newborn sufferers.

III. Conclusion

The purpose of this thesis was to investigate and determine the effectiveness of a pressure swing adsorption method utilizing a novel adsorbent for the applicationof oxygen generation.

Depending on the purpose of the PSA process, there are a variety of ways to run it. This leads to the thesis's secondary objectives, which were to optimize for maximum oxygen recovery and the construction of a rapid, efficient procedure. The kinetic limit of the adsorbent in question was of particular interest.

Main motive of this thesis was to look over and to find out the potency of a PSA method using a novel adsorbent for the utilization of O2 generation. Based upon the motive of the PSA process, there are various methods to use it. This process to the thesis's second result, which was to develop for max O2 regained and the building of a fast, well-organized process.

There are some important outcomes from the discoveries . Firstly, it can come into conclusion that the adsorbent used in this process has a rapid adsorption rate depend upon its capability to continue its planning when the feed gas speed was lifted to attain ten sec cycle. This makes this adsorbent convenient by fast PSA operation that demands higher adsorption speed. Regrettably , due to system limitations , the kinetic limit was not found. Secondly, repossession for the cycle used in the report indicated that an X type zeolite had a high recovery speed. This holds true even at lower pressure ratios of 2.49 and 3.49, but more zeolite does not. This permits the zeolite to produce a high outcome movement rate while let down BSF even at low pressure ratio, let the pump strength low requirement andminimize operating .

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