SRAM & MRAM GROUP

Medical Oxygen Generating Systems (MOGS)

BROTIE BRHO-15-100 Medical Oxygen Generator with Filling Station Proposal

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(Purity:≥93%,Capacity:15-100Nm3/h,Pressure:150bar for cylinder filling purpose)

Automatic Discharging System equipped

Medical OxygenGenerators

- Oxygen produced from atmospheric air with the help of molecular sieves
- Oxygen produced byOxygenGeneratorsare **economical ,safe and reliable**
- Oxygen is produced on"Demand" andNOTdependent on 3rdparty suppliers

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What is the presentsituation……?

- Hospitals all over the country buy oxygen in high pressurecylinders
- These cylinders are transported from the supplier in vehicles to thehospital.
- Some cylinders are also kept as standby (or)emergency
- The cylinders are connected to the hospital central pipe line system through a manifold
- 3 shift manpower is mandatory to maintain the stockof cylinders
- Regular follow up is essential with the supplier, to ensure oxygen availability in the hospital24x7
- If the supplier fails, due to ANY reason, the hospital starves ofoxygen
- Patients are diverted to some other hospital sometimes, because of lack of oxygen

This is how the cylinders are kept in thehospital ....

LIMITATIONS

The pressure of oxygen in this cylinder is 2200 psi

Cylinders are very heavy and damage any premises

Tobe carefully handled, as they can explode

Accidents have occurred in manyhospitals

Transportation costs keep increasingas fuel pricesare never constant

Also refilling prices keep changing atregular intervals

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Liquid oxygen in Tanks……

Liquid O2 tanks

Government permission is required for installation, because of explosive nature of high purityoxygen

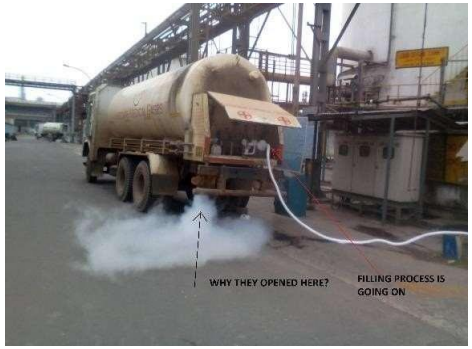
Cryogenic gas at freezing temperature arealways prone to frostbites and should be carefully handled by personnel

Transportation of Liquid oxygen by companies isalso difficult in many areas due to difficult terrains

These heavy vehicles pose a great threat to people in crowded Government hospitals

Hence refilling is preferred in the middle of the night only

Lastly, EVAPORATION LOSSES is inevitable due to High Pressure



Refilling vehicles

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Medical Oxygen Generators

- Air compressor, Dryer, storage tanks are the main components for producing oxygen from oxygen generators
- High Pressure Dry Air is injected into Pressure Swing Adsorption tank, filled with molecular sieves
- At differential pressures, Nitrogen gets adsorbed and Oxygen is released into the oxygen storage tank

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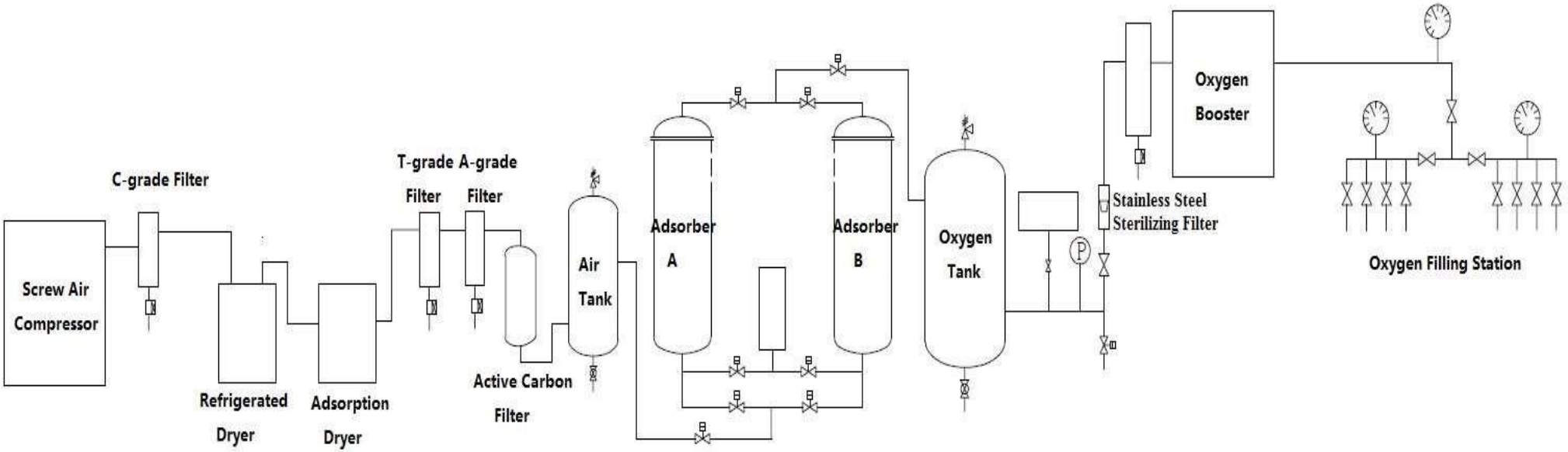

Air Compressing & Purification System

PSA Oxygen Generating System

Oxygen Compressing System

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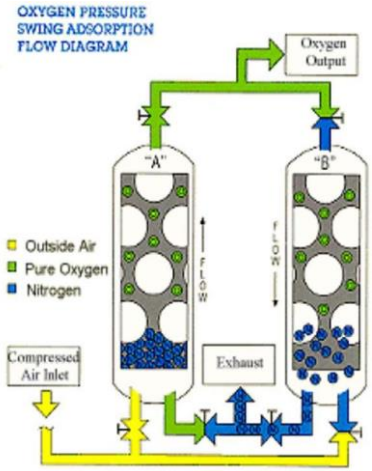

I. Air Compressor

Item	Screw Air Compressor	
Brand	FUCAI	
Type	FC50	
Air Output	4.7m^3/min	
Inlet Pressure	0.8Mpa	
Function	Provide compressed air.	
Power	37KW	

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II. Freezing Dryer

Item	Refrigerated Dryer
Brand	YANGTIANGAS
Type	YQ-069AH
Consumption	6.9m3/min
Power	2HP
Function	Cooling compressed air and removing water.

III. Adsorption Dryer

Item	Adsorption Dryer
Brand	YANGTIANGAS
Type	QE-069
Consumption	6.9m3/min
Power	2HP
Function	Remove water more efficient

IV. Filters

Item	First-grade Filter	Second-grade Filter	Third-grade Filter
Model	C-36	T-36	A-36
Air FilteringCapacity	7Nm³/min	7Nm³/min	7Nm³/min
Residual Oil Content	＜5 ppm	＜1.0 ppm	＜0.001 ppm
Water Content	Suitable for a large number of liquid.	Suitable for liquid water filter.	Suitable for water vapor coalescence.
Dust Particles	＜3 micrometers	＜1 micrometers	＜0.01 micrometers
Function	Suited to filter out liquid water, oil and solid particles from the compressed air.		

V. Active Carbon Filter

Item	Activated carbon efficient degreasing protectors	
Model	HDT-36	
Air Filtering Capacity	7m³/min	
Residual Oil Content	＜0.001 ppm	

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Function	Carbon molecular sieve will completely lose analytical ability, if it's poisoned by oil. Degreaser is the safety and security of preventing carbon molecular sieve from the oil poisoning.	
Material	Carbon Steel With Argon Welding Leak Proof	

VI. O2/N2 Separation System

Item	Specifications	Notes	
Model	Misha-15	Misha	
O2 Flow Rate	15Nm³/h	Standard	
Compressed Air Consumption	4.7Nm³/min	Standard	
O2 Purity	93%±2%	------	
Output Pressure	0.41Mpa	adjustable	
O2 Dew Point	—40℃	Atmospheric	
Power	0.6KW		
Operation	Full-automatic	Skid-mounted	
Material			Carbon Steel With Argon Welding Leak Proof

VII. Gas Buffer Tank

Name	Air Buffer Tank	O2 Buffer Tank	
Volume	0.6m3/1.0Mpa	1.0m3/0.8Mpa	
Size	Φ700x2140mm	Φ800x2150mm	
Function	Save compressed air.	Save O2 and provide a stable source of O2.	
Material	Carbon Steel With Argon Welding Leak Proof		

VIII. Oxygen Filling Station

Item	Oxygen Filling Ramp	
Filling Head	10pcs	
Function	The connection of oxygen generator with cylinders and filling the oxygen to cylinders.	

1. Equipment Configuration Table

No.	Item Name	Model & Specification	QTY	Remark
1. Air Compressing and Purification System				
(1)	Screw Air Compressor	30KW	1 Set	FUCAI
(2)	Refrigerated Dryer	YQ-069AH	1 Set	SRAM & MRAM
(3)	Adsorption Dryer	QE-069	1 Set	SRAM & MRAM
(4)	C-grade Filter	C-36	1 Set	Hankison, filter element Life time>6months
(5)	T-grade Filter	T-36	1 Set	Hankison, filter element Life time>6months
(6)	A-grade Filter	A-36	1 Set	Hankison, filter element Life time>6months
(7)	Active Carbon Filter	HDT-36	1 Set	SRAM & MRAM
(8)	Active Carbon	HT	Enough	LiyanJiangSu, Life time>6months
(9)	Auto-Drainer	OPT-A	2 Sets	JORC
(10)	Air Buffer Tank	0.6m3/ 1.0Mpa	1 Unit	Professional Pressure Vessel Factory
2. PSA Oxygen System				
1)	PSA Oxygen Generator	HDFO-15	1 Set	SRAM & MRAM
(1)	Adsorption Tank	— —	2 PCS	Professional Pressure
(2)	Molecular Sieve	MS-O	Enough	High quality made in China

(3)	Muffler	HDJ-20	1 PC	SRAM & MRAM
(4)	Electromagnetic Valve	4V210-08	1 Set	AirTAC
(5)	Pneumatic Valve	DN Series	1 Set	Burkert
(6)	Pipeline Globe Valve	DN32	1 Set	AirTAC
(7)	Glove valve for flow meter	DN25	1 Set	AirTAC
(8)	Metal Flow Meter	3.0-30Nm^3/h	1 Set	Changzhou Instrument
(9)	Electric Cabinet	JXF6050/25	1 Set	SRAM & MRAM
(10)	Oxygen Analyzer	P950	1 PC	Shanghai Changai
(11)	PLC	S7-200,Smart	1 Set	Siemens Germany
(12)	Relief Valve for sample gas	------	2 PCS	AirTAC
(13)	Fault self-diagnosis system	— —	1 Set	SRAM & MRAM
(14)	Pressure Gage	YA-100	4 PCS	SRAM & MRAM
(15)	Pipeline, Bracket, Pedestal	— —	1 Set	SRAM & MRAM
(16)	Oxygen Purity sound alarm system	— —	1 Set	SRAM & MRAM
2)	Oxygen Storage Tank	1.0m3/0.8Mpa	1 Unit	Professional Pressure Vessel Factory
3)	Sterilizing Filter	1m3/min	1 Set	Stainless Steel
4)	Monitoring System	— —	1 Set	SRAM & MRAM
3. Oxygen Pressurization System				
(2)	Oxygen Filling Station	HDF-10	1 Set	SRAM & MRAM

2. Utilities

User is responsible for providing water, electric power and space for equipment installation.

Environment Temperature: ≤38℃ with good ventilation condition.

Installation requirements:

a. Equipment should keep in a dry, clean and well-ventilated warehouse and clean the warehouse from corrosive substances. Waterproof cloth must be used when stored in open-air or in delivery and do not touch with the floor directly.

b. In door temperature should keep in -20℃ to 40℃, humidity ≤80% when install the equipment. If in special situation installation must be outside, do not forget rainproof, waterproof and dustproof.

c. rane and forklift to help to rise and fall the equipment. Keep the floor flat. Keep more than 800mm space from the wall or other equipment. Sewage draining exit should connect with pipe to out of the equipment.

5. SERVICES FORUSERS

SRAM & MRAM has an engineering and technical team which can always give you the most professional supports and services.

1. All equipment will be checked and tested before shipment to ensure they operatewell.

2. Our engineers will provide the installation guide, debug and applicationtraining. Engineers will conduct professional training to the staff, including theprinciple of equipment, structure and function, the routine maintenance, the use of plant and solutions. Trainings enable the

user's staff to have the ability of independent operation, maintenance and trouble shooting.

3. SRAM & MRAM will provide 24 hours hotline support. Engineers will respond within 1 hour once received response fromuser.

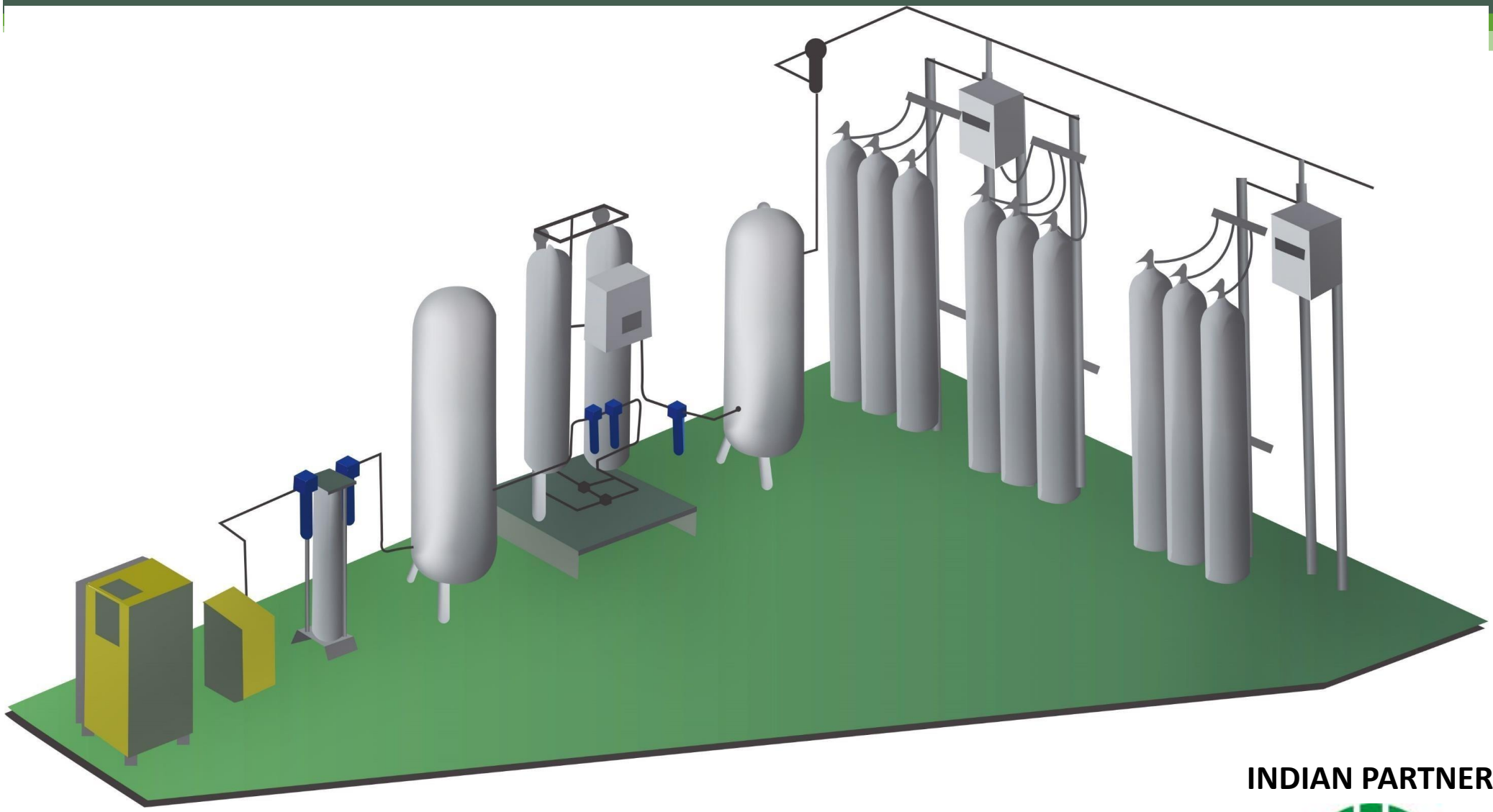
4. SRAM & MRAM provide guarantees for the equipment in 12 months. During the warranty period, any defects, faults and damage caused by our design, craftsmanship, manufacturing or material defects and any other issue caused by our company shall be handled by us without any charge. And out of the warranty period, we continue to provideservice.

5. SRAM & MRAM maintains adequate spare parts inventory in the types of user's

equipment, and provides user with the concessions supply of accessories and free technical advisoryservices.

6. Service on-site (Optional)
7. If the customer requires the on-site supervision, installation instruction, commissioning or training service from supplier, should afford all cost of the round-trip tickets, accommodation and three-meals, 750US$/ Day /engineer and translation.

   Technical support online isprovided.



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Medical oxygen generators – Oxygen 93% approval.....

- No separate manufacturing licenses required for installation according to Drugs & Cosmetics act, Sch K, page 416, item95

- Oxygen produced by molecular sieves 93% (± 3%) is a "Drug" approvedby
- * IndianPharmacopeia
- * USPharmacopeia
- * CanadianPharmacopeia
- * EuropeanPharmacopeia

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How to calculate the size of Oxygen Generator for a hospital ?

For e.g. 50-100 bedded hospitals……

- Operation theatres – 4
- 25 beddedICU
- 4Ventilators
- 50 beds with Oxygenpoints
- What will be the Peak requirement of oxygen for this hospital?

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Standard calculation of oxygen for ANY HOSPITAL..

- Bedside oxygen therapy……5 litres per minute
- Ventilators……10 litres per minute
- Anaesthesia machines in OT……10 litres per minute

- 50 bedded O2 points……(50x5 = 250 litres/min)
- 4 ventilators……(4x10 = 40 litres/min)
- 4 operation theatres……(4x10 = 40 litres/min)
- Total (250+40+40) = 330 litres per minute

(330 litres is equivalent to 0.3 cubic meters, which is 18 cub. meters per hour)

25 bedded ICU
4 Ventilators
4 operation theatres
50 beds with Oxygen point

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Choose a model from one of the oxygen generators in the table, to suit the hospital peak flow oxygen requirement

For e.g. 50-100 bedded hospital

Peak oxygen requirement is330 litres/min

Hence OG 750 model will suit the requirement

Similarly other models can selected based onthe Peak req

SCF/Hr	Nm3/Hr	Litres/min
25.00	0.70	11.67
50.00	1.30	21.67
100.00	3.00	50.00
175.00	5.00	83.33
250.00	7.00	116.67
375.00	10.00	166.67
500.00	13.00	216.67
650.00	17.00	283.33
750.00	**20.00**	**333.33**
1000.00	26.00	433.33
1250.00	33.00	550.00
1500.00	39.00	650.00
2000.00	53.00	883.33
2500.00	66.00	1100.00
3000.00	79.00	1316.66
4000.00	105.00	1750.00
5000.00	131.00	2183.33

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How to calculate the cost of production of oxygen using oxygen generators ?

2 aspects are vital for the calculation .. Power
Maintenance of the oxygen generator

POWER

- For e.g. OG750 will consume 26 KW power (air compressor &dryer)

This is equivalent to 624 units of electricity in 24 hours
If unit cost is Rs.6/-, then cost of electricity every day is Rs.3744/- a day

MAINTENANCE

Approx. cost of maintenance will be approx. Rs.2000/- per day

Total cost will be (3744+2000) = Rs. 5744 for producing 480 cubic meters of oxygen gas (equivalent) in 24 hours Finally cost of production can be valued as (5744/480) = Rs. 12.00 per cubic meter

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If the same has to be calculated for a 500 bedded hospital, then.....

- Fore.g.
- Operation theatres - 12
- 50 beddedICU
- 10Ventilators
- 100 beds with Oxygenpoints
- What will be the Peak requirement of oxygen for this hospital?

Standard calculation of oxygen for ANY HOSPITAL..

- Bedside oxygen therapy……5 litres per minute
- Ventilators……10 litres per minute
- Anaesthesia machines in OT……10 litres per minute

- 100 bedded O2 points…..(100x5 = 500 litres/min)
- 10 ventilators…..(10x10 = 100 litres/min)
- 12 operation theatres….(12x10 = 120 litres/min)
- Total (500+100+120) = 720 litres per minute

(720 litres is equivalent to 0.720 cubic meters, which is 43.2 cubic meters per hour)

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Choose a model from one of the oxygen generators in the table, to suit the hospital peak flow oxygen requirement

For e.g. 500 bedded hospital

If, Peak oxygen requirement is 720 litres/min

Hence OG 2000 model will suit the requirement

Similarly other models can selected based onthe Peak requirement ofhospital

SCF/Hr	Nm3/Hr	Litres/min
25.00	0.70	11.67
50.00	1.30	21.67
100.00	3.00	50.00
175.00	5.00	83.33
250.00	7.00	116.67
375.00	10.00	166.67
500.00	13.00	216.67
650.00	17.00	283.33
750.00	20.00	333.33
1000.00	26.00	433.33
1250.00	33.00	550.00
1500.00	39.00	650.00
2000.00	**53.00**	**883.33**
2500.00	66.00	1100.00
3000.00	79.00	1316.66
4000.00	105.00	1750.00
5000.00	131.00	2183.33

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How to calculate the cost of production of oxygen using oxygen generators ?

2 aspects are vital for the calculation… Power
Maintenance of the oxygen generator

POWER

- For e.g. OG 2000 will consume 80 KW power (air compressor & dryer)

This is equivalent to 1920 units of electricity in 24 hours
If unit cost is Rs.6/-, then cost of electricity every day is Rs.11520/- a day

MAINTENANCE

Approx. cost of maintenance will be approx. Rs.3500/- per day

Total cost will be (11520+3500) = Rs. 15020/- for producing 1272 cubic meters of oxygen gas (equivalent) in 24 hours

Finally cost of production can be valued as (15020/1272) = Rs. 11.80 per cubic meter

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What happens if the oxygen requirement is very less……..for e.g. 30-40 cylinders a day……Liquid oxygen is not possible in some hospital sites …

Choose model OG500 which can provide 13 cubic meters per hour, which is equivalent to 312 cub. meters in 24 hours (approx. 44.5 bulk cylinders)

POWER

- For e.g. OG500 will consume 16 KW power (air compressor &dryer)

This is equivalent to 384 units of electricity in 24 hours
If unit cost is Rs.6/-, then cost of electricity every day is Rs.2304/- a day

MAINTENANCE

Approx. cost of maintenance will be approx. Rs.1500/- per day

Total cost will be (2304+1500) = Rs. 3804/- for producing 384 cubic meters of oxygen gas (equivalent) in 24 hours Finally cost of production can be valued as (3804/384) = Rs. 9.90 per cubic meter

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Even lesser than that……..for e.g. 10-15 cylinders a day

Choose model OG175 which can provide 5 cubic meters per hour, which is equivalent to 120 cub.meters in 24 hours (approx. 17.5 bulk cylinders)

POWER

- For e.g. OG175 will consume 7.5 KW power (air compressor & dryer)

This is equivalent to 180 units of electricity in 24 hours
If unit cost is Rs.6/-, then cost of electricity every day is Rs. 1080/- a day

MAINTENANCE

Approx. cost of maintenance will be approx. Rs.850/- per day

Total cost will be (1080+850) = Rs. 1930/- for producing 120 cubic meters of oxygen gas (equivalent) in 24 hours

Finally cost of production can be valued as (1930/120) = Rs. 16.00 per cubic meter

In such hospitals, oxygen cost in cylinders ranges from Rs. 35-45 per cubic meter, because of the high transportation costs involved.

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CONCLUSION.....

Oxygen Generators produce oxygen 24x7 at site, without any interruptions, and has been working for the past 30 years, all over the world.

Cost of production (which includes electricity cost and maintenance) will vary from Rs. 10 to Rs. 16 dependingon the size of the generator.

In comparison, oxygen purchased from outside, definitely will be expensive

COST ANALYSIS & COMPARISON SHEET OF OXYGEN SUPPLY TO HOSPITALS

S NO	Cubic meter of oxygen at 65 psi pressure	Equivalent to litres per minute	Power consumption required in KW	Power required (24 hours approx)	Power tariff (DAILY)	Maintenance per day of Air compressor/Dryer/PSA plant (including service cost) after warranty period	Approximate cost of the Oxygen Generator with one year warranty - GST / Freight extra	COST OF PRODUCTION OF OXYGEN (Rs)	Monthly production of oxygen cub.meters	Monthly cost of oxygen spent by hospital on oxygen generators	Cost of investment per month (5 yr period taken into consideration)	Current cost of oxygen in cylinders - Rs.40/- per cubic meter (includes refilling cost+transportation+GST+manpower)	Current cost of liquid oxygen - Rs.20/- per cubic meter (includes refilling cost+transportation+GST+manpower)
1	0.70	11.7	2.2	52.8	422.40	500.00	18,00,000.00	55.00	511.00	28,105.00	30,000.00	20,440.00	10,220.00
2	1.30	21.7	3.0	72.0	576.00	600.00	21,50,000.00	38.00	949.00	36,062.00	36,000.00	37,960.00	18,980.00
3	3.00	50.0	5.5	132.0	1,056.00	700.00	25,55,000.00	24.50	2,190.00	53,655.00	43,600.00	87,600.00	43,800.00
4	5.00	83.3	7.5	180.0	1,440.00	825.00	30,00,000.00	19.00	3,650.00	69,350.00	50,000.00	1,46,000.00	73,000.00
5	7.00	116.7	9.0	216.0	1,728.00	1,000.00	35,00,000.00	16.25	5,110.00	83,037.50	58,500.00	2,04,400.00	1,02,200.00
6	10.00	166.7	15.0	360.0	2,880.00	1,200.00	42,75,000.00	17.00	7,300.00	1,24,100.00	71,250.00	2,92,000.00	1,46,000.00
7	13.00	216.7	15.0	360.0	2,880.00	1,350.00	48,00,000.00	13.60	9,490.00	1,29,064.00	80,000.00	3,79,600.00	1,89,800.00
8	17.00	283.3	22.0	528.0	4,224.00	1,650.00	60,00,000.00	14.40	12,410.00	1,78,704.00	1,00,000.00	4,96,400.00	2,48,200.00
9	20.00	333.3	25.0	600.0	4,800.00	1,800.00	65,75,000.00	13.75	14,600.00	2,00,750.00	1,10,000.00	5,84,000.00	2,92,000.00
10	26.00	433.3	30.0	720.0	5,760.00	2,250.00	77,75,000.00	12.85	18,980.00	2,43,893.00	1,30,000.00	7,59,200.00	3,79,600.00
11	33.00	550.0	37.0	888.0	7,104.00	2,500.00	90,25,000.00	12.15	24,090.00	2,92,693.50	1,50,500.00	9,63,600.00	4,81,800.00
12	39.00	650.0	55.0	1320.0	10,560.00	3,250.00	1,10,00,000.00	14.75	28,470.00	4,19,932.50	1,85,000.00	11,38,800.00	5,69,400.00
13	53.00	883.3	75.0	1800.0	14,400.00	4,000.00	1,38,75,000.00	14.50	38,690.00	5,61,005.00	2,31,250.00	15,47,600.00	7,73,800.00

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In emergency, when oxygen generators fail……?

There are alternatives and solutions, based on economicalstatus:

1. Install another oxygen generator as standby

2.Have own cylinders as back up. Filling is always done by the companies, at a nominalcost.

3.Have own cylinders and also a small booster compressor on site for filling them

Oxygen from generators can be filled into cylinders by using booster pumps.....

- The compressors can fillcylinders at 2200 psipressure
- Bulk and ward cylinders can be filled onsite
- No. ofcylinders which can be filled in 24 hrs depends on the size of the booster compressor
- Robust and reliable, have been workingfor more than 50 years

RIX compressors are from USA with service

Approx. cost Rs. 45.00 lakhs

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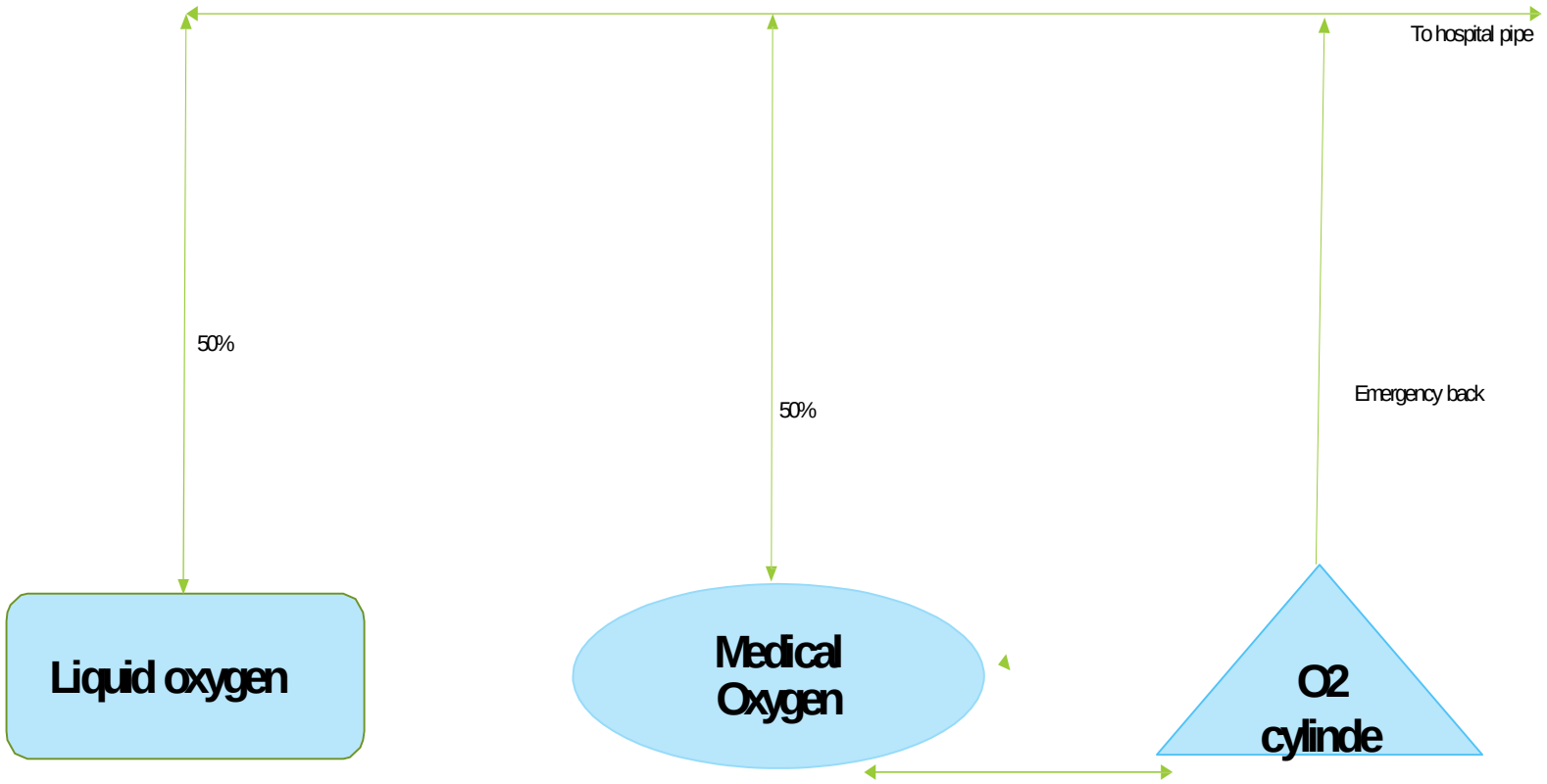
Suggestion
3 Different sources of supply to hospitals



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THANK YOU

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