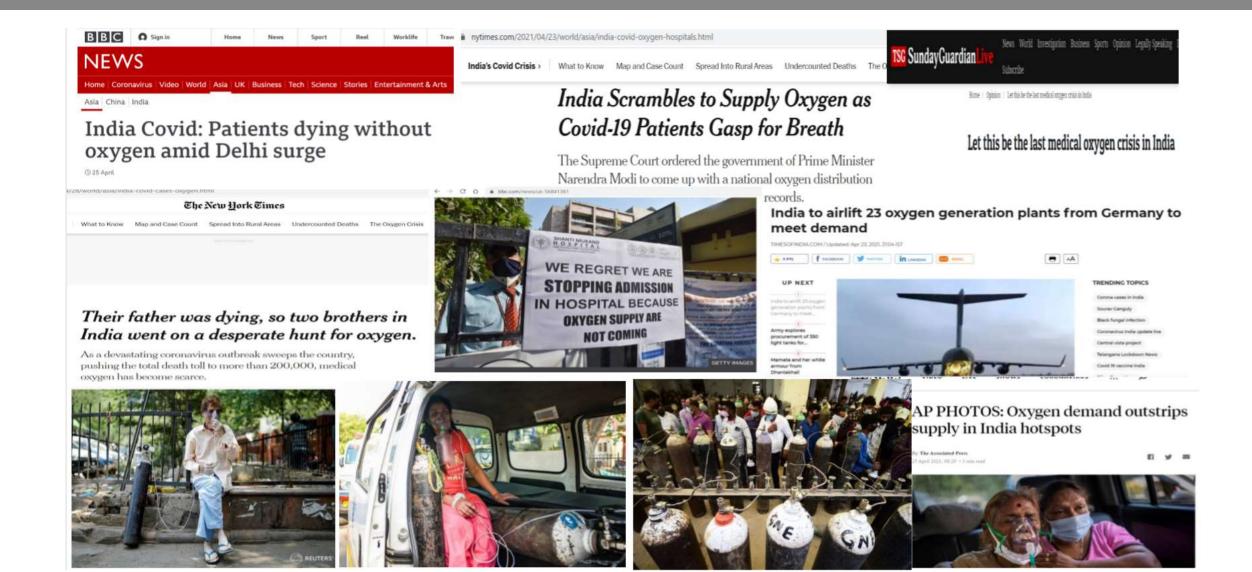


## India's Oxygen Crisis



## Difference Sources of Medical Oxygen

#### Cylinders



- Very common
- Mobile but can be heavy
- Require high pressure compressor for filling
- Require supply chain

#### Manifold systems



- Cylinder based
- · Require supply chain
- Require facility to have piping
- Relatively low maintenance
- Difficult to repair

#### Pressure Swing Adsorption (PSA)

#### Concentrators



- Mobile
- Do not require supply chain
- · Require electricity
- Require maintenance

#### Oxygen plants



- Do not require supply chain
- · Require electricity
- Require maintenance
- · May need piping
- Capable of filling cylinders

#### Liquid oxygen



- Space requirements
- Requires facility to have piping
- · Supply chain
- Suitable for larger facilities

## Models to Estimate Oxygen Need

Essential   Questions	Historical Oxygen Use	Facility-level estimation	Covid-19 health facilities estimation	
Our Goal	To estimate the amount of oxygen an existing facility needs	To estimate the amount of oxygen a facility will need	To estimate the amount of oxygen a health facility or system needs	
Our Data	Records of past oxygen use	<ol> <li>Number of general beds</li> <li>Number of critical care beds</li> <li>Or specific facility</li> </ol>	<ol> <li>Number of beds in each ward</li> <li>Health facility bed occupancy rate</li> <li>Hypoxemia rates by</li> </ol>	

infrastructure plans

disease area or ward

## Statistical Quantification as per Hosp. Size

Hosp	Critical	Total	Flow	Required	Flow	Required	Total
Size in	care	beds of	Rate(LPM*)/	LPM for	rate(LPM)	LPM for	Required
beds	beds	Hosp	Standard	standard	/Critical	critical care	LPM
		555.	bed	beds	care bed	beds	(Standard &
							critical care
							bed)
100	8	108	0.75	75	10	80	155
150	12	162	0.75	113	10	120	233
200	16	216	0.75	150	10	160	310
250	20	270	0.75	188	10	200	388
300	24	324	0.75	225	10	240	465

No of beds I Flow rate(LPM) = Required Flow rate(LPM)

Source: WHO formula

<sup>\*</sup>LPM = Liter Per Minute

## India's Oxygen Crisis

#### Quick facts from the ground

Indian Government is controlling Industrial Oxygen at the federal level

Procurement efforts are being currently made from Steel & Petrochemical Plans: Reliance, Tata, Jindal etc.

India's daily production capacity of **7127 MT per day**, 46% is industrial and **3842 MT is** used for medical consumption<sup>1</sup>

The medical consumption will increase to about 6,000 to 7,000 MT per day going forward with the current trajectory.<sup>2</sup>

# Our Response From Southern California Through JAINA

Southern California is taking the lead under the guidance and 24/7 work of Dr. Nitin Shah in the last 2 weeks. Here are some of the updates we have on that front:

3000+

Oxygen concentrators have already reached India



80% have a capacity of 6 or 7L/minute

10% have a capacity of 10L/minute

10% have a capacity of 5L/minute

## Oxygen Plants in a Nutshell

Step 1

Liquefied oxygen is produced by industrial plants (usually given to govt. hospitals and controlled by govt.)

Step 2

Liquefied oxygen is transferred and vaporized for further process Step 3

Oxygen gas is compressed in cylinders transferred to be used in hospitals at patient beds

With
Atmospheric O2

With

**Liquefied O2** 

Oxygen is concentrated from ambient air (21% Oxygen)

Oxygen is additionally compressed and distributed to hospital in cylinders

Oxygen is distributed to hospitals directly by installing pipes from the oxygen tank and

pressure regulators

OR

## **PSA Oxygen Plant**

#### What is PSA?

PSA = Pressure Swing Adsorption, oxygen generator plant is a unit, designed to concentrate oxygen from ambient air at scale, with output capacity varying according to calculated oxygen demand, typically ranging from 2 Nm3 /hr to 200 Nm3 /hr.

Distribution from PSA plants to hospital can either be piped directly from the oxygen tank to hospital wards or further compressed to fill cylinders



## **PSA Oxygen Plant**

#### **Details about PSA Plant**

- Produce medical oxygen 93%±3 from ambient air.
- Easy to install: Pre-assembled and skid-mounted, or containerised.
- 24/7 Oxygen production monitoring.
- Control panel / user interface, with numerical and graphical values.
- Life span of a minimum of 10 years.
- Alarm for low oxygen concentration.
- Alarm when automatic back-up engaged, as configured
- optional:
  - remote monitoring feature.
  - soft start or variable speed drive (VSD) compressor

## Cost, Timeline, Benefits of Oxygen Plants

#### **Liquefied O2 Plant**



**Cost vs Capacity** 

USD 165,000 to fill 1k bottles/day of 48L for 160-180 bedded hospital **Timeline** 

7-10 days

Long-term

Relies on nearby industrial plant for supply of liquefied oxygen.

Vendors

INOX Air
Products and
other vendors

#### **Ambient Oxygen Plant**



USD 80,000 for 250 bedded hospital at 100 cylinders/day

75 – 90 days. Negotiable Self-sustaining once the plant is installed at or near a hospital(s) Atmos Power and other vendors including in China

#### Info About Atmos Power Pvt. Ltd.

- ATMOS POWER have supplied and installed more than 300 projects globally.
- Atmos Plant Generate Oxygen as and when required Plug Switch on Forget
- Lower Operation Cost at facility
- Eliminate expense on purchase, receiving, monitoring hospital supply
- Monitor the Oxygen quality instantly
- Fully automated operation Men less
- Easy to install and maintain- Skid mounted pre-commissioned
- Purity of oxygen up to 93%
- No more explosion or fire hazard
- Generation cost Rs. 10 per Nm



# Cost Benefit Analysis

Description	Oxygen From Cylinder	Oxygen From Generator	
Basis of Calculation	8760 Hours/ Annum	8760 Hours/ Annum	
Cost of Oxygen Cylinder	Rs. 1200 / - per cylinder	NIL	
Handling Charges & Transportation	@ 10 %		
Power Consumption/hour	NIL	60 KWH	
Power cost per KWH	NIL	Rs. 8/-	
Cost of Oxygen per Nm3	Rs. 216.9	Rs. 16.00	
Invstment	NIL	Rs. 4,800,000/-	
Interest on capital Cost @ 18%	NIL	Rs. 864,000/-	
Maintenance cost @ 3 %	NIL	Rs. 144,000/-	
Final Cost of Oxygen per Nm3	Rs. 216.9	Rs. 38.10	
Savings Per Annum if Hospital running 24 Hours per day	NIL	Rs. (Cost difference per Nm3 x 30 x 8760) = Rs.( 178.8 x 30 x 8760) = Rs. 46,988,640/-	
Pay back period		12 – MONTHS approx.	

## Market Availability and Pricing

- Negotiated Price based on installed capacity:
   For 250 bedded hospital average needs 100 cylinders per day. Therefore we need a plant with capacity of 30NM3. Price for such plant 54 Lakhs + 12% GST
- Other Models Prices are as below :
  - 5Nm3/Hour equivalent to 17 Cylinders Per Day (upto 50 beds) @Rs. 18 Lakhs + GST
  - 10Nm3/Hour equivalent to 34 Cylinders Per Day (51-100 beds) @Rs. 29 Lakhs + GST
  - 20Nm3/Hour equivalent to 68 Cylinders Per Day (101-200 beds) @Rs. 39 Lakhs + GST
  - 30Nm3/Hour equivalent to 102 Cylinders Per Day (more than 200 beds) @Rs. 54 Lakhs + GST
- Above Price includes: Generators, Feed Air Compressor, Refrigerated Type Dryer, A Set off Filters, PSA Skid & 2m3 Storage Tank.
- Delivery Period: 75-90 Days currently
   Space Requirement. Room Length- 6.0 6.5 M, Width- 4.5 M, Room Height- 4.0 M

## JAINA Oxygen Plan Initiative Stages

Info

- 1. Fill out the Google Form prepared by Jayana Shah to capture hospital and sponsor info.
- 2. Suggest a plant/vendor if any by hospital along with cost estimates (between INR 20 60 Lakhs)

Approval

- 1. JAINA receives the application and approves it against set criteria (approval committee).
- 2. If there's no sponsorship JAINA publicizes it via newsletters looking for sponsors.

**Finance** 

- 1. JAINA receives 50% sponsorship (max \$75k) for the proposed plant.
- 2. JAINA matches dollar-to-dollar from \$27k to \$70k (matched by \$400k SMFT, \$200k Jaswantbhai, \$100k Maheshbhai) \*Money Transfer will be worked out preferably in 2 weeks.

# Video of Liquefied Oxygen Plant



## Video of PSA Oxygen Plant



### **Create Demand**

#### **Please Note:**

- 1. Total plants where match is available are limited.
- 2. Time is of essence. Summarizing the process:
  - ✓ Filling out applications
  - ✓ Finding sponsors and financing by sponsors
  - ✓ Approval by JAINA for a particular hospital
  - ✓ Selecting vendor and advancing money by hospital to start manufacturing the oxygen plant.
- 3. Transferring money from JAINA (finance committee) to hospital after app. paperwork



#### For more Information, please contact:

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