

# Technology for Medical Grade Oxygen Production for On-site Hospital Use

## CSIR-IIP has developed an Efficient Pressure Vacuum Swing Adsorption (PVSA) Process for the Generation of Medical Grade Oxygen (MO<sub>2</sub>) Meeting I.P. 2018-PSA-Oxygen Specifications for the Onsite Hospital Use

### Medical Grade Oxygen (MO<sub>2</sub>) a Lifesaver

- Oxygen, an essential element for respiration and combustion, makes up only about 21% of the air we breathe.
- Many industrial and medical applications require a higher concentration of oxygen than what is naturally present in the atmosphere. This is where concentrated oxygen comes into play, which refers to oxygen that has been processed to reach a purity level of at least 90%, with any moisture removed to a -100°F dew-point.
- Medical oxygen cylinders contain high-purity oxygen gas; no other types of gases are allowed in the cylinder to prevent contamination. As per Indian Pharmacopeia Standards I.P. 2018 (PSA) allowable composition of Medical Grade Oxygen (MO<sub>2</sub>) is 93±3% O<sub>2</sub>, CO<sub>2</sub>: ≤300 ppm, CO: ≤ 5 ppm

### Novelty of CSIR-IIP's PVSA vis-à-vis Conventional Technologies

- Two times higher dynamic nitrogen working adsorption capacity
- 50% lower adsorbent requirement per PVSA plant
- Higher capacity achieved due to the novel vacuum regeneration method applied during in-situ regeneration of N<sub>2</sub>-loaded bed
- Efficient design of adsorber internals to eliminate adsorbent attrition (no case of adsorbent powdering faced)
- Novel adsorbent configuration (layered bed) resulting in 10% savings in the adsorbent cost (adaptable design, need-based intervention) without loss of throughput or O<sub>2</sub> purity
- Fully indigenous and patented technology

### Impact of the Technology on Ground

- More than 150 MO<sub>2</sub> plants set up across the country with help of DRDO
- Technology transferred to 11 companies including MSMEs, PSUs, and MNCs
- 108 PVSA MO<sub>2</sub> plants of 500 LPM (1 Ton MO<sub>2</sub> per day) have been commissioned at government hospitals across the country under PM CARES funding
- All plants serving as primary source of MO<sub>2</sub> at hospitals for ~15000 patient
- Installed plants are generating MO<sub>2</sub> worth ~Rs 69 Cr annually, resulting in substantial savings to the exchequer (NPPA regulated rate of Rs 17.49 /m<sup>3</sup> Ex GST)
- CSIR-IIP's MO<sub>2</sub> technology footprint in 14 States and UTs across the country
- Generated employment of ~100 Technical person at licensees and ~400 persons at hospitals for 24\*7 operation of the plants
- Plants operating without any major issues since commissioning
- Apt example of CSIR's alignment to the "Atma Nirbhar Bharat Mission"



**TRL-3**  
Bench Scale Study  
Jun - Sept 2020



**TRL-5**  
Pilot Scale (100 LPM)  
Dec 2020 – Mar 2021



**TRL-7**  
Field Demo ACH, Pune  
May 2021



**TRL-9**  
Comm. (500 & 1000 LPM)  
April – June 2021

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