Solarizing medical oxygen systems in India: Greening up to save lives

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Background

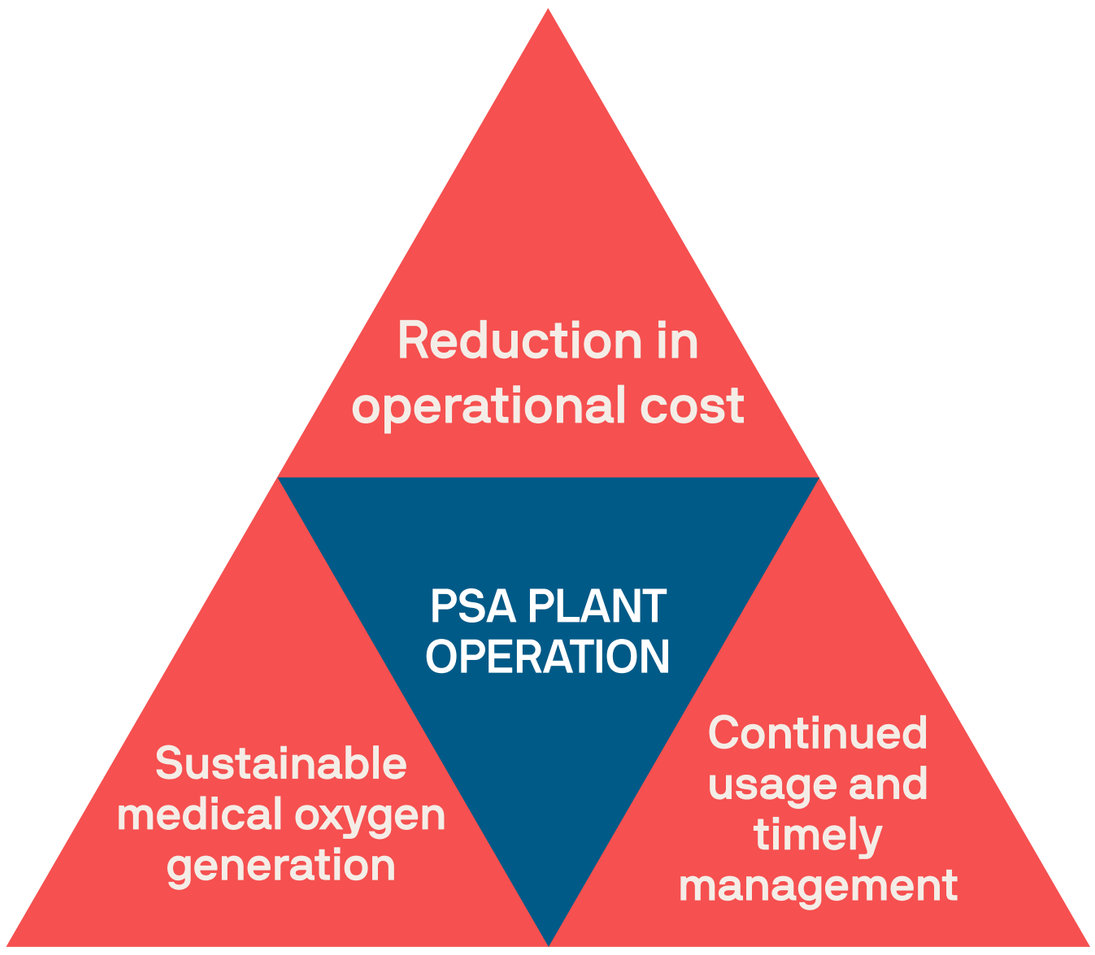
The Government of India (GoI) along with state governments has spent a large amount of resources in the procurement, commissioning, and installation of around 4,500 Pressure Swing Adsorption (PSA) oxygen generation plants for hospital site production of oxygen. However, many of these plants are being under-utilized due to the high operation costs, mainly electricity.[1] Experts have concluded that the electricity consumption in these oxygen plants is approximately 1 unit per Nm^3 (normal cubic meter) of oxygen. After excluding depreciation, the electricity cost is estimated to be 70-80% of the operational cost of these oxygen plants. Creating a low cost and environment friendly alternative, that uses geothermal energy sources, to conventional energy and diesel generators is pertinent for the sustainability of the PSA plants in the country.

Solarization, a green energy approach, offers an opportunity for sustainable and uninterrupted supply of electricity to power the PSA plants. This will not only lead to a lower electricity cost and promote the use of PSA plants but also reduce dependency on fossil fuel guzzling diesel generators, which adds to greenhouse gas emissions.

PATH, a leader in global health innovation, is implementing a pilot to solarize a PSA plant installed at the Government Children Hospital, Gundlupet, Karnataka in India, with an aim to reduce the fossil fuel consumption and run PSA on green energy.

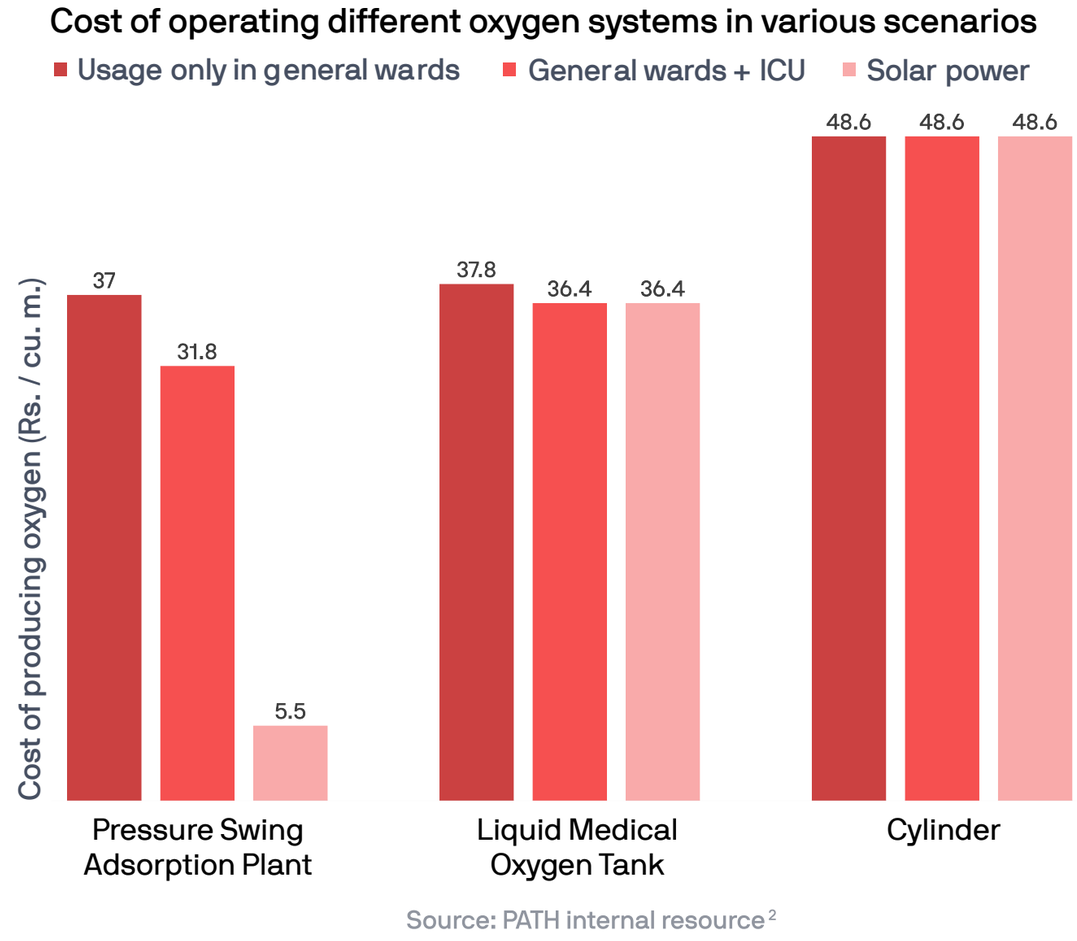
Criteria for site selection

- Regular power cuts and heavy dependence on diesel generator
- Lower latitude, the location should be closer to the equator
- The site should get the most number of hours of sunlight in a day
- High solar irradiance, power per unit area (surface power density) received from sunlight
- Least cloud cover in a day



Pyramid showcasing the outcomes of solarization of PSA plant operation

Cost of operating different oxygen systems in various scenarios



Source: PATH internal resource[2]

Cost

For a 500 litres per minute (LPM) PSA plant, a-200 kilowatts peak (kWp) solar panel system would be required and the procurement cost of the same would be around ₹1.6 crores (~$196,054).
1$=₹81.61

Equipment

- Solar panels
- Inverters
- Power optimizers
- Racking
- Performance monitoring and tracking systems
- Storage option

Expected results

- Pollution reduction, reduced carbon footprint, increased monetary savings, increased electricity savings.
- When the PSA plant is not running, the additional power generated will be utilized by the hospital and be stored as backup in the power grid.

~2,80,000 thousand units saved annually, i.e. **~₹21,56,000**

~266 tons of annual carbon emission savings

Conclusion

Solarization can lead to the improved utilization of PSA plants and easy access to medical oxygen. Studies and previous innovations suggest that solarization could help save more than ₹15 lakh in 1st year and over ₹7 crore over project life (25 years) equivalent of expenditure on electricity. It is also estimated that this could lead to greenhouse gas (GHG) emissions savings of as many as ~6650 tons of CO2 over the life of the power plant; this environmentally positive impact is equivalent to planting ~44,415 trees. Providing inexpensive and green power to medical institutions would play a great role in reducing their overall expenditure. These savings could be used for purchase of medicines and other necessary expenditure, as also for strengthening the infrastructure.

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