Ministry of Science & Technology

Robust, mobile OxyJani can cater to acute & chronic oxygen needs at grassroots level

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Indian researchers have designed a robust, mobile group oxygen concentrator that can be used in rural settings and also be rapidly deployed in emergencies in any location.

The second wave of COVID-19 led to an acute shortage of medical oxygen. While the crisis in the bigger cities was more about rapidly responding by overcoming supply chain limitations, in smaller cities and villages, the crisis exposed the chronic lack of medical oxygen infrastructure in the country.

Overcoming the crisis required two types of solutions -- 5 to 10 lpm personalized O_2 concentrators for home uses and 500 lpm PSA plants for large hospitals. While the 500 Ipm plants for hospitals were robust, they lacked the portability required for deployment on resource-poor settings, while personal concentrators were too fragile to be used on a sustained basis in a hospital setting. This created a need for a robust technology with necessary portability.

A team from Jawaharlal Nehru Centre for Advanced Scientific Research, an autonomous institute under the Department of Science & Technology, Government of India, developed a new solution with the name ‘OxyJani’ for addressing these novel challenges in adsorption science and engineering.

It was developed during the second wave of COVID-19, addressing the several novel design challenges posed for the sourcing of materials and the need in hospitals of different capacities.

OxyJani is based on the principles of Pressure Swing Adsorption (PSA) technology. The team replaced lithium zeolites (LiX) which is usually used in oxygen concentrators, with sodium zeolites which does not generate toxic solid waste and can be manufactured in India.

Although the science behind it is well understood, developing an engineering solution that can work with sodium in a portable device and fill this specific market gap when there are severe sourcing problems posed engineering challenges. Obstacles had to be overcome at each stage of the cycle, from working with the available zeolites to effective ways of dehumidifying and designing the right adsorption-pressure cycle.

The concentrator is modular and capable of delivering a range of solutions, conversion of medical air to medical oxygen, and is an entirely off-grid solution including all modules that can facilitate deployment in rural areas. Moreover, the waste from the 13X zeolite plant can be potentially a good agricultural input

material.

In this multi-group initiative, Dr S. V. Diwakar, Dr Meher Prakash, Professor Santosh Ansumali from JNCASR, and collaborators, Professor Arvind Rajendran from the University of Alberta and Mr. Arun Kumar (Eiwave Digitech) executed the OxyJani developmental efforts with the help of Mr. Ritwik Das (MS student). Technical advice was provided by Prof. M. Eswaramoorthy, Prof. Tapas Maji, and Prof. Sridhar Rajaraman. Professor G. U. Kulkarni, President, JNCASR and Professor Amitabha Bandyophyay of IIT Kanpur mentored developmental efforts. The financial assistance for the prototype was provided through JNCASR and the Nidhi Prayaas scheme of IIT Kanpur. The zeolite material was obtained through a generous donation from Honeywell UOP, Italy.

This new class of technology called “group concentrators” has the robustness of large PSA plants, portability similar to the personal concentrators, and is affordable too. The device is in the range of 30-40 lpm, which is potentially useful for ICU uses too.

Figure. *A modular design of the three different units so that solutions can be offered to different hospitals based on their needs.*

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SS/RP (**DST** Media Cell)

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