

THE HINDU

TAMIL NADU

Auroville team designs low-cost ventilator prototype

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Components came from 3-D prints of car windshield wiper motor and muesli jar

A team of engineers and programmers has designed and developed two prototypes of life-saving medical ventilators that show promise in resolving the shortage, import-dependence and high costs associated with these emergency assist devices.

The prototypes — the basic non-invasive Tusky and the more advanced version Jasan — are currently in the medical testing phase in collaboration with experts at the Pondicherry Institute of Medical Sciences (PIMS).

Tusky is a low-cost, low-tech, portable, mechanised, non-invasive resuscitator that automates the process of manual ventilation for patients intended for resource-constrained environments, while Jasan was conceived as a cost-effective, compact, mechanised ventilator for both invasive and non-invasive ventilation of patients.

The whole experiment was set off by the COVID-19 crisis and the critical shortage of life-saving ventilators when the entire nation went into lockdown on March 24. The aim of the mission was simple, but urgent: to create a low-cost, low-tech ventilator with local resources.

“The Tusky design evolved out of open-source repertoire in the spirit of shared knowledge and prioritising accessibility for the common people,” said Samvit Blass, device designer and founder of Light Fish, an Auroville unit.

“The current model of tusky is fully mechanical, the next edition will have assist control to respond to breathing of patient. Jasan is a more advanced design which can respond to patient's breathing with full electronic display,” said a member of the support team in Auroville. While there are no comparable models in the market, the Tusky, for instance, would be priced at about ₹20,000 which makes it far cheaper than models that could cost upwards of ₹1-1.50 lakh.

The Jasan prototype was developed by a team of five engineers and programmers who came together to design a ventilator that was robust and easily manufactured in India. Essentially, the prototype is based on an ambu bag and a unique scissor design that allows for very precise control of volume and pressure. A 5-inch LCD screen shows volume and pressure curves, and an optional pulse oximeter displays the patient’s blood oxygen saturation on the screen, a press note from Auroville said.

How the project unfolded

Soon after the nation went into lockdown from March 25, a team in Auroville got together via Slack and WhatsApp to design a device that could be used in life-and-death situations in emergency triages and thereby overcome the dire shortage of assisted ventilators. The goal was to come up with a prototype “minimum safe” ventilator device of

last resort that would automate an ambu type manual resuscitator, which could be built in a short time, and with readily available materials in India.

Soon, a team of five experts in different fields began collaborating on the project with support from PIMS. Members worked individually and remotely most of the time and meeting in-person only for essential test-runs slowed progress down.

By mid-April, there emerged two approaches, and two designs worked upon by two multidisciplinary teams in parallel – what would be called Tusky and Jasan.

In the extraordinary time of the pandemic, even the smallest thing — like sourcing mundane things such as nuts and bolts — became a big hurdle, not to speak of sourcing supplies and precision machining. Other parts and materials could only be 3-D printed or salvaged from surprising sources — a car's windshield wiper motor or a muesli jar would become a key feature in one of the designs.

Auroville's Working Committee helped obtain passes to enable movement of essential materials into the township, and more importantly, for essential visits by medical experts who are core members of this collaboration.

These ventilators could be of use beyond COVID-19 because India is in need of affordable and reliable models which can be deployed in more hospitals and made accessible for home use by long-term patients, said Ali

Hasan Faiz Karnam, a specialist in Internal and Critical Care Medicine at PIMS and member of the COVID Task Force, Puducherry, who served as medical advisor to the project.

The teams are collaborating with medical professionals to iterate until the prototype is medically viable.

Crowdfunding is on to sustain Tusky through the phase of medical testing and approval. Open-source batches will then be donated to local clinics in need.

The next big step would be to pass clinical tests in-vitro and in-vivo. That would clear the path for getting relevant certifications and medico-legal approval. The team hopes to start testing the prototypes shortly and expect to have the first medically viable versions of both these designs in the next 12 to 16 weeks.