by Miklós Kozlovszky, Péter Galambos, and Tamás Haidegger

Mass Ventilator System

Many people infected by the life-threatening coronavirus could be saved worldwide by a mass respiratory system developed by a team of Hungarian research and development engineers, medical doctors, and mathematicians in recent weeks. The revolutionary design of MassVentil could play a particularly important role in the global fight against COVID-19.

The MassVentil system, which has been developed and tested in a laboratory environment, will be able to simultaneously ventilate 10 people at the preclinical stage, and up to 50 or more in the future, while protecting health-care professionals. "The new design is modular, and relatively portable, so it can be deployed and operated even outside regular hospitals, in emergency facilities, and temporary camps and halls," emphasized Dr. Miklós Kozlovszky, associate professor at Óbuda University, Budapest, Hungary and head of the project.

The COVID-19 epidemic, declared a pandemic by the World Health Organization in early March 2020, has so far claimed the lives of more than 150,000 people worldwide, and still counting. One of the key elements to treating patients with acute respiratory problems is continuous ventilation. Unfortunately, many of the pandemic victims didn't receive adequate level of care due to the lack of medical ventilators.

Not long ago, while the pandemic was advancing, Dr. Kozlovszky envisioned a ventilator that could be used for several patients simultaneously, i.e., one central machine could ventilate more than one person at a time (Figure 1).

The main benefit of the MassVentil concept is that while currently used ventilators can only support one person at a time, the new system consists of two main parts: a central gas transport system and patient-side specific units. The central inhalation and exhalation gas management allows more patients to be ventilated in a modular setup, saving more lives.

The system protects health-care professionals by transporting the contaminated exhaled air from the common hospital space, unlike currently used ventilators. The new equipment removes and filters exhaled contaminated air from the common space, significantly reducing the risk of infection for health-care staff.

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Dr. Kozlovszky highlights an important factor in connection with setting up temporary emergency hospitals or care facilities (Figure 2). Most equipment cannot be used without hospital infrastructure, such as wall-mounted air/gas technology or a continuous power supply. The MassVentil system also was designed to be installed outside health-care facilities, without advanced hospital infrastructure, and even in emergency camp environment. The system could be set up to ventilate dozens of people at the same time.

The Hungarian-led project involves international professionals, teachers, and students from several universities around the world who contribute their expertise to the success of the development. The MassVentil

MassVentil Initiative

The IEEE Systems, Man, and Cybernetics Society is proud to announce its support to the MassVentil initiative through a targeted Chapter Support grant of US$2000. We wish the best of luck to the developing team and their partners.

Stay safe! Wash your hands!

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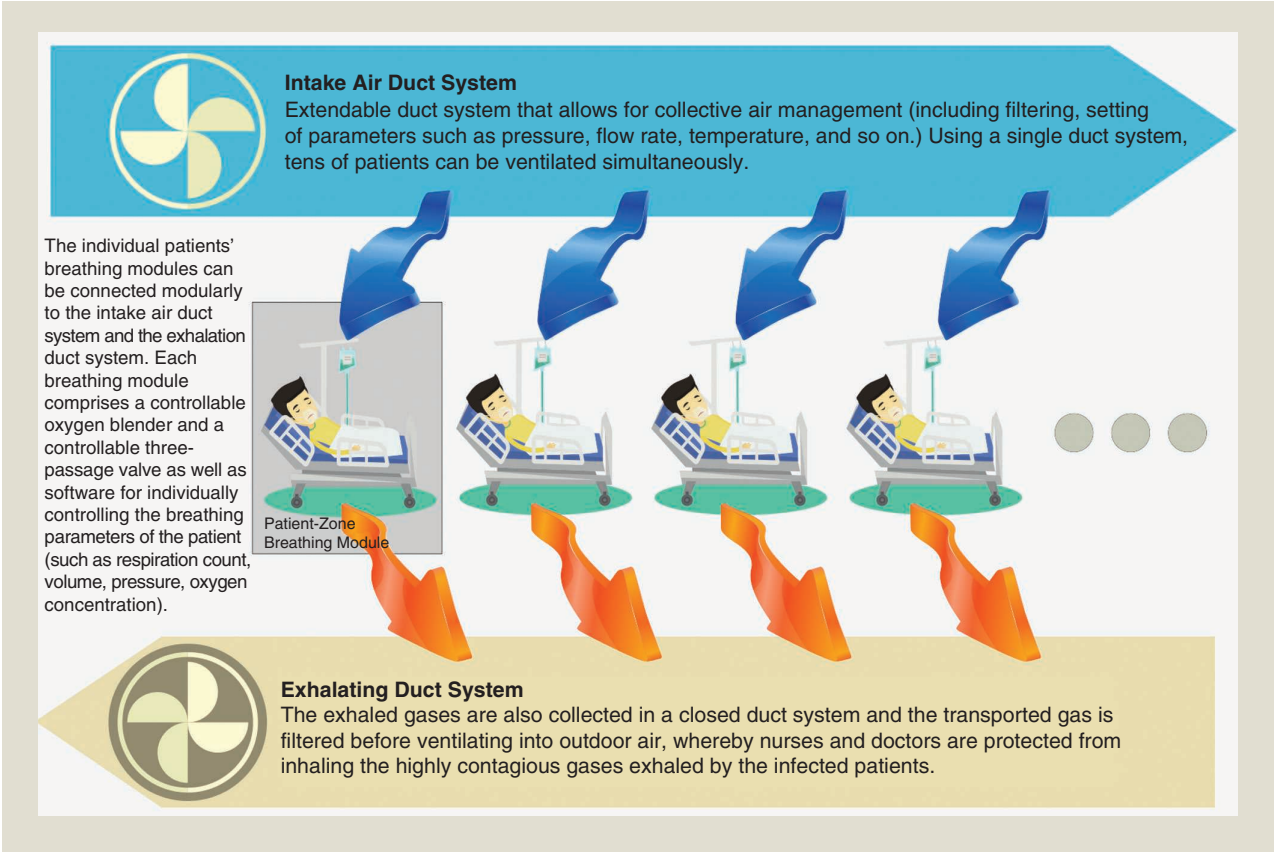

Figure 1. The basic concept of the MassVentil prototype, supporting numerous patients with one core air pump system. (Source: MassVentil; used with permission.)

project is based at Óbuda University and supported by many collaborating public and private partners (see "MassVentil Initiative") (Figure 3).

Mass Ventilator System Developer Community

Because the COVID-19 epidemic is spreading fast, Dr. Kozlovszky called on an international community including engineers, researchers, inventors, medical doctors, economists, journalists, physicists, mathematicians, lawyers, and university students. The MassVentil community members live in various countries and are of different nationalities. The members work in parallel on subtasks and stay connected online. (See "Contact and Further Information"). All community members of the team volunteered to contribute the best of their knowledge to this project. They strongly believe that together, their intellectual capital and our collective work

Figure 2. (a) Project lead Dr. Miklós Kozlovszky (IEEE Systems, Man, and Cybernetics Society member) and (b) some of the core team members [(from left): Bence Takács and László Szűcs (right), graduate students at Óbuda University] in action. (Source: Óbuda University; used with permission.)

Contact and Further Information

Development community: https://www.facebook.com/groups/222746815597257/
Facebook: https://www.facebook.com/massventilproject/
Website: http://massventil.org/en/massventil-project/

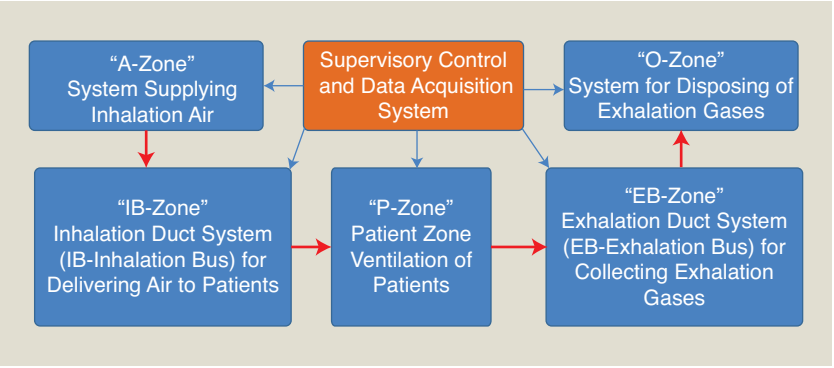

Figure 3. An overview of the structure of the MassVentil system concept. (Source: MassVentil; used with permission.)

Figure 4. The first prototype set up at the Antal Bejczy Center for Intelligent Robotics at Óbuda University. The laboratory was founded by Prof. Imre Rudas [1]. (Source: Óbuda University; used with permission.)

can be transformed to help human lives (Figure 4).

About the Authors

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Reference

[1] G. Eigner, T. Haidegger, and L. Kovacs, "Physiological and bioinspired systems development at Obuda University: Research activities in Budapest, a reach across related fields for the IEEE Systems, Man, and Cybernetics Society," *IEEE Syst., Man, Cybern. Mag.*, vol. 5, no. 1, pp. 33–36, 2019. doi: 10.1109/MSMC.2018.2873819. **SMC**