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Press Release

Breathing inspiration into medical technology

A University initiative in the Netherlands is helping save lives by developing and donating ventilators for lower-income countries.

Amongst the crisis of the current covid-19 situation, new ideas and collaborations have originated to help others in need. One of these is Project Inspiration, an initiative of Delft University of Technology in the Netherlands (TU Delft), where-by ventilators are donated to lower-income countries. The ventilator is designed such that countries can decide themselves whether to order a whole machine or partially replicate one. The goal of Project Inspiration is to assist countries with a shortage of breathing equipment and provide basic healthcare worldwide.

Gerwin Smit, an Assistant Professor at TU Delft and a specialist in arm and leg prostheses and medical aids, started Project Inspiration together with colleagues and students in March 2020 to address the expected shortage of ventilators in the then upcoming crisis.

The pandemic presented extra challenges for these medical engineers, such as a shortage of supplies due to the shutdown of the Chinese supply chain. Besides that, medical devices are subjected to a battery of tests before they can be placed on the market. It can take a lot of time for these checks, and in this situation time was of the essence. In the midst of this turmoil, Gerwin posed the question: how can we make a bunch of mechanical ventilators, certified and proven to operate safely, in a very short amount of time?

Firstly, the concept should have a proven track record, and therefore had to be based on an existing device. Secondly, it should contain simple parts that would be easy and quick to manufacture.

Gerwin looked at the history of respiratory devices and found the East Radcliffe Ventilator, a model commonly used in Europe from the ‘60s through to the ‘80s. He found that the National Museum of Boerhaave in Leiden in the Netherlands, a scientific museum with a large collection of medical devices, had one of these specific models. To analyse this machine, the project group needed to take a close look at it. Gerwin made a bold decision and asked the museum authorities if he could borrow the machine, and most important of all, if he could take it apart. The museum was hesitant, usually the staff wear white gloves to even touch the machines. After deliberation the museum agreed, given the unusual circumstances and the noble cause.

The ventilator was collected by Gerwin and some of his colleagues and carefully transported to their workplace where it was disassembled over one weekend. They analysed the concept and the basic principles, and came up with the first prototype just one week later.

The original machine contained a Parvalux motor as the driving force, with a bicycle hub and bicycle gear for speed control. Further research found that Parvalux was still in existence, a solid company with more than 70 years’ experience in designing and manufacturing fractional horsepower geared motor solutions. This came as a pleasant surprise since the original device is dated from the 1960s!

The team reached out to Lee Weston at Parvalux to help with selecting the right motor, and Parvalux responded by swiftly sending some samples. Selected was the PM11-S motor, a permanent magnet brushed DC motor. It is spring-loaded for quiet operation and has a high starting torque of up to three times full load. It features an adjustable brush rocker for excellent commutation and maximum brush life, which was essential considering people's lives will depend on it.

Initially the idea was to create a mechanical analog machine, aside from the motor which was to be the only electrical part. Pressure and tidal volume were measured with an analog pressure gauge and a spirometer. Since the original model was mainly mechanical analog, it had no warnings if the machine stopped working. Rethinking the concept caused a design shift as the team concluded the importance of adding a warning if the values were off. They got in touch with the company Interay Solutions b.v. which advised them what electronics to use.

For their final prototype they chose electronic speed control from maxon in the form of the ESCON 50/5, a small-sized, powerful 4-quadrant PWM servo controller. This provided fully stepless speed for their ventilator.

After finishing the final prototype, they needed help to scale up production. For this they got in touch with their partner company Apparatenfabriek ARA b.v., sister company to Interay Solutions b.v.

ARA produces mechatronic systems for original equipment manufacturers and is based in Aalten in the Netherlands. They were enthusiastic about producing the device themselves and offered their support. With the help of public and private funding, enough capital was gathered to proceed with the project.

Since then, Project Inspiration's first ventilators have been donated and delivered to Guatemala, Panama, and Tanzania. The whole device is modular, which offers the choice to order ventilators or produce the device themselves, based on the resources available to each country.

To share their gained knowledge with the world, all of Project Inspiration's blueprints are an available open source on their website.

A great example of the added value of Project Inspiration is Guatemala, where a team was set up to build the devices locally. Only the electronics like the alarm and monitoring system, which include the Parvalux motor and maxon controller, were provided from the Netherlands. With proof that the concept works, Guatemala is planning on making up to 300 ventilators thanks to Project Inspiration.

Find out more: Project Inspiration.

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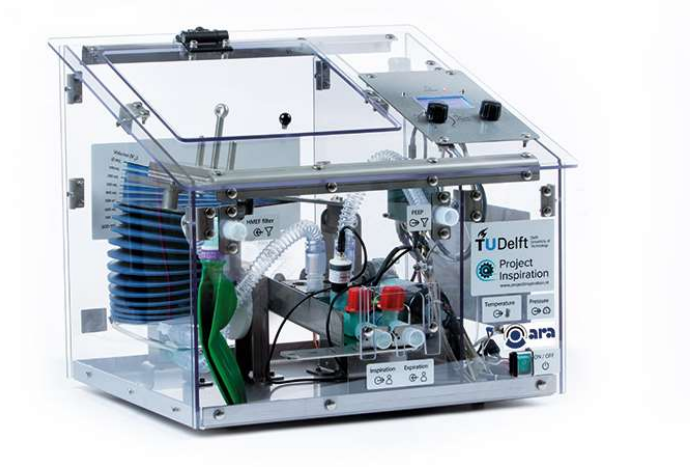
The press release is available on the internet at: www.maxongroup.net.au



Project Inspiration
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Prime Minister of Netherlands Mark Rutte visits Project Inspiration
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