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# Press Release

## Battling COVID-19 One Pump at a Time

**In response to the COVID-19 pandemic, the Winnipeg Ventilator project had to make some critical choices in design and component selection, particularly for the DC motor used in the mechanical pump design.**

Faced with a growth in the number of cases of COVID-19 worldwide, the Canadian government quickly took a concerned look at the number of ventilators they had available in the case of an overflow of hospital cases. Although the World Health Organisation (WHO) understands that nearly 80% of people who obtain the virus get better on their own; once a patient enters the hospital, the chances that they will need a ventilator can increase considerably.

Designed and manufactured by StarFish Medical is the Winnipeg Ventilator 2.0. It's a mechanical ventilator for use in emergency situations to complement the availability of currently approved and marketed ventilators in case of a surge in cases beyond normal capacity.

The ventilator had to be very flexible in order to support a variety of patient needs at different times. The Winnipeg Ventilator monitors inspiratory tidal volume, airway pressure, percentage of O2 and respiratory rate. It also includes a number of alarms to recognise when measured values fall outside of acceptable parameters. The expected duration of use per patient is up to fourteen days of continuous ventilation. Some key features of the Winnipeg Ventilator 2.0 include compatibility with both wall and bottle oxygen sources, the use of ambient air rather than needing an air supply, and an intuitive and easy to use interface.

### Motor Selection

StarFish Medical had used maxon DC motors for a number of past projects and found them to be highly efficient but, most importantly, reliable. The motors are delivered with a great deal of useful technical data for each model, typically making it less of a challenge to narrow the choices down to a few options. Yet, the project was advancing so quickly that the StarFish Medical team was forced to make an initial motor choice in advance of determining the exact requirements for the project. The primary objective at the time was to find a motor that was readily available and provided enough of a performance margin to offer guaranteed success.

maxon technical support, in collaboration with the StarFish Medical design team, proposed a brushless DC motor without gearing that was selected based on the application requirements and availability to adequately supply the motor along with a short lead time. StarFish Medical factory capacity was secured through maxon's South Korea factory to meet the initial demand schedule.

Adapting the original design to use a brushless DC motor added some interesting challenges to the design process. Fortunately, the StarFish Medical team had prior experience in making such adjustments and were able to adapt their existing design plans to make the switch quickly and easily. As a balance to their

design capabilities, StarFish Medical found the maxon electric DC motor straight-forward to use. StarFish Medical developed customised software and hardware to take full advantage of the motor selection rather than using an off-the-shelf standardised option.

**Ventilator Motor Requirements and Operation**

The DC motor drives a ball screw actuator that controls the piston position to provide “breaths” from the ventilator to the patient. The StarFish Medical team chose a 200 watt motor, which gave them some manoeuvrability for variations in torque and speed. The requirements included a maximum speed of 215 mm/s, maximum acceleration of 7.2 m/s2, accel/decel ramp to a maximum speed of 0.05 s, and a number of cycles from 1.5M to 15M. One of the flexible requirements for the operation was for the system to very quickly change from an inhale stroke to an exhale stroke if the ventilator sensed patient distress.

StarFish Medical made an initial order of 7,500 EC-i52 motors with ENX Hall effect sensors (see image). Because of their optimised magnet ring, these motors offer a very high torque density and a low cogging torque. The multi-pole internal rotor is extremely dynamic. Overall, the motor’s solid design, using steel flanges and a steel housing, makes it suitable for a wide range of applications where performance and long duty cycles are required.

Selecting the right motor for your design can take a sharp turn sometimes when availability becomes a primary factor. Working with a partner that has the experience and expertise in your industry and is sensitive to your delivery needs is key in making a selection that fulfills your requirements. In the case of the Winnipeg Ventilator, maxon was able to use their experience and knowledge from many years of working with medical companies to help make suggestions on product selection to meet StarFish Medical’s urgent need.

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


*After careful design consideration, StarFish Medical chose to use maxon's EC-i 52 motors for the Winnipeg Ventilator project © maxon Group*

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**The Swiss specialist for quality drives**

maxon is a developer and manufacturer of brushed and brushless DC motors. as well as gearheads, encoders, controllers, and entire mechatronic systems. maxon drives are used wherever the requirements are particularly high: in NASA's Mars rovers, in surgical power tools, in humanoid robots and in precision industrial applications, for example. To maintain its leadership in this demanding market, the company invests a considerable share of its annual revenue in research and development. Worldwide, maxon has more than 3000 employees at nine production sites and is represented by sales companies in more than 30 countries.