

Moog Supporting the Coronavirus Pandemic

Moog Inc at a Glance: A NYSE company, \$2.9B in revenue with approximately 12,000 employees globally providing critical control components and systems for end-market applications in Aircraft, Defense, Medical, Industrial and Energy. Moog headquarters is located in East Aurora, NY representing 3,500 employees locally. Website: <https://www.moog.com>

How is Moog responding to the Pandemic Response?

Moog is taking a 3-pronged approach: (1) focus on ramping up production to current customers with Moog standard products we believe is the fastest means to achieve the surge demand from critical OEM medical equipment providers such as ventilators & oxygen concentrators, (2) explore other OEMs which are not currently Moog customers to offer our products and capability and (3) explore collaborating with companies/customers to produce products or create derivative products, however realistically, we view this as a longer term approach beyond the meeting the current near term surge.

What is Moog current providing?

Components for Medical Equipment OEMs: Moog produces critical motion control components for life saving medical equipment including Ventilators, Oxygen Concentrators, Continuous Positive Airway Pressure (CPAP) machines, Heart and Lung Machines, IV Infusion Pumps, Dialysis Machines, and Blood Processing Equipment. Moog also manufactures motion control products that support critical medial infrastructure including critical care beds and laboratory testing equipment. Moog Medical Motion Control components form a critical part of the medical supply chain and directly impact the industry's ability to scale production and saving lives during the COVID 19 crisis.

These are Moog components used in medical equipment required to support the Coronavirus outbreak include:

Application	Moog Components used in Medical Equipment
Ventilators & CPAP	Brushless Motors and Blower Units (motor with integrated fan) that provide air flow to patients in Ventilation and CPAP equipment. Electronics to drive and control the motors in the Ventilator systems.
Oxygen Concentrators	Brushless Motor and drive systems for compressors in Oxygen concentrators enabling the use of portable oxygen concentrators in hospitals and home care.
Critical Care Beds	Brushless Motors and Blower Units (motor with integrated fan) that provide air flow to fluidized mattresses and therapeutic surfaces reducing patient recovery time.
IV Infusion Systems, Heart Lung Machines	Our Ultrasonic Sensors and electromechanical components are critical components in patient safety systems within IV infusion and life support equipment. The components monitor fluidic systems to prevent air being infused into patients or blockages in tubing that compromise treatment.

Moog has skilled people, knowledge, experience and the culture to rally to the cause! But faces critical challenges in scaling our supply chain and operations to meet the circumstances:

- Some OEMs have increased demand by approx. 20 times traditional levels. E.g. Philips Respironics, increased demand from 2,200 to 36,000 blower units per month to support Trilogy Evo Ventilator production (DX rating).
- The scaling of hospital capacity is driving demand for beds, Moog is experiencing a surge in demand for blower units that are used in mattresses by Hill-Rom.
- Moog faces supply chain risks for critical materials (Rare Earth Magnets, Magnet Wire, Electrical Steel, Piezoceramics, PCBAs and electronic components). These materials are sourced via global and domestic supply chains that are impacted by Coronavirus lock down orders increasing the typical lead-times 2-3X.
- Supply of sub-assemblies from offshore manufacturing centers in Costa Rica and Mexico may be impacted by their local governments policies.

To increase the supply of critical care equipment components Moog is taking the following actions:

Moog Initiative	Support Request
Moog is focused on scaling capacity across multiple sites to by producing new tooling, fixtures and automation. Enabling us to support the increased demand for critical components to OEMs with qualified Ventilation and IV Infusion solutions.	Funding is required to support the required investment to rapidly scale production to a level capable of supporting the pandemic.
Support the rapid development of domestic supply chains for critical materials: Rare Earth Magnets, Magnet Wire, Electrical Steel, Piezoceramics, PCBAs and electronic components.	Provide relief on the cost implication due to the shift to domestic supply chains, creation of local supply capabilities, forecasted material shortages, logistics and expedite fees.
Moog has established an outreach initiative to support OEMs who seek components and/or contract manufacturing capacity for Ventilator production from our existing ISO 13485 certified facilities. Moog will retool and develop controlled manufacturing process to support the supply of ventilators and other critical care equipment.	Moog is seeking funding to support the retooling of existing capacity enabling us to bring medical certified capability to the ventilator supply chain.
Moog is proactively identifying supply risks from our offshore manufacturing facilities and supply chain partners and developing mitigation strategies.	Support is requested to support cross boarder policies that ensure global supply chains are maintained and strengthened and support the risk mitigation costs.


Moog Devices (Pumps) and Administration Sets: Moog produces infusion pumps and enteral feeding pump devices and sells directly to care centers and through distribution. Moog is experiencing an increase in volume recently as result of the COVID response. The following provides more details:


Application	Moog Medical Devices
Infusion Pump Devices	Ambulatory infusion pump devices used to deliver medication, nutrition, and other fluids. The size and portability of our infusion pumps allow our pumps to be used primarily in the homecare environment, with some use in hospitals. https://www.curlinpump.com/
Enteral Feeding Pump Devices	Ambulatory enteral feeding pump devices used by patients of all ages to deliver fluid nutrition. The small size and rugged design allow patients to remain as active as possible, and live their life with the fewest limitations, while remaining compliant with feeding prescriptions. https://www.infinityfeedingpump.com/
Infusion and Enteral Administration Sets	Single-use disposable administration sets that are used in conjunction with the infusion and enteral pumps to deliver medication and nutrition to patients.


Summary: Moog is working proactively to support the surge in critical medical components and device demand providing standard product. In many cases, our current constraints are resources, capacity and ability for supply chain to handle larger volumes. We have reached out to others to provide our support and it's not clear we've been entirely successful getting to the right points of contacts at the primary medical equipment OEMs. In other cases, companies or individuals are reaching out to us for more start-up efforts and we're assessing these each on a case-by-case basis, however, many appear more speculative/opportunistic in nature.

Moog Primary Point-of-Contact:
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Moog Primary US Sites Producing Medical Components


Moog – Murphy, North Carolina		
Components	Brushless motors Blowers Units Drives and Controls	
Applications	Ventilators, Oxygen Concentrators, CPAP	
Total Sq. Ft.	150k	
Employees	400	Address
Production Volume	> 1M Units/ year	1995 NC-141, Murphy, NC 28906


Moog – Radford, Virginia		
Components	Brushless motors Blowers Units Drives and Controls	
Applications	Ventilators, Oxygen Concentrators, CPAP, Critical Car Beds	
Total Sq. Ft.	70k	
Employees	240	Address
Production Volume	300k Units/ year	1120 Rock Rd W, Radford, VA 24141

Moog – Salt Lake City, Utah		
Components	Ultrasonic and Electromechanical Assembly	
Applications	IV Infusion Systems, Heart Lung Machines	
Total Sq. Ft.	40k	
Employees	110	Address
Production Volume	150k Units/ year	2268 3270 W, Salt Lake City, UT 84119

Note: Moog Blacksburg Virginia facility not illustrated here, however, this operation produces slip rings for CT scan equipment amongst other end-markets slip ring components.

Moog Primary Sites Producing Medical Devices and Administration Sets

Moog – Salt Lake City, Utah		
Devices	Infusion and Enteral Devices	
Applications	IV Infusion Pumps, Enteral Feeding Pumps	
Total Sq. Ft.	42k	
Employees	170	
Production Volume	100K Units/ year	Address 4314 Zevex Park Lane, Salt Lake City, UT 84123

Costa Rica (Moog Captive Supplier)		
Devices and Administration Sets	Infusion and Enteral Devices	
Applications	IV Infusion Administration Sets, Enteral Feeding Delivery Sets, Clean Room	
Total Sq. Ft.	76k	
Employees	450	
Production Volume	30M Units/ year	Address El Coyol, Alajuela, Costa Rica, Post Code 20102