MEDICAL APPLICATIONS *Application Note*

Total Thermal Management Solution for Ventilator Condensation Applications

BACKGROUND

A medical ventilator (see Figure 1) is designed to move a mixture of air and oxygen from separate sources into and out of a patient's lungs to either assist in breathing, or, in some cases, mechanically breathe for a patient who is breathing insufficiently or is physically unable to breathe.

Figure 1. Medical Ventilator

Each ventilator has an exhalation valve which allows exhaled gases to escape into the atmosphere and prevents them from being rebreathed by the patient. If condensation pools at the exhalation valve, the airflow measurement at this location may be skewed, resulting in the ventilator delivering an incorrect amount of air to the patient.

Airflow in medical ventilator exhalation valves is usually sensed by a hot wire anemometer rather than by a mass airflow sensor because a hot wire anemometer can tolerate fluids in the airstream.

A hot wire anemometer uses a very fine metal wire that is electrically heated up to a temperature above the ambient. Air flowing past the wire cools the wire. Because the electrical resistance of most metals is dependent upon the temperature of the metal, a relationship is obtained between the resistance of the wire and the airflow speed. The ventilator uses the resulting measurement to adjust the ingoing airflow to the patient. Condensation may cause the hot wire anemometer to become less accurate, changing the ventilator airflow to the patient.

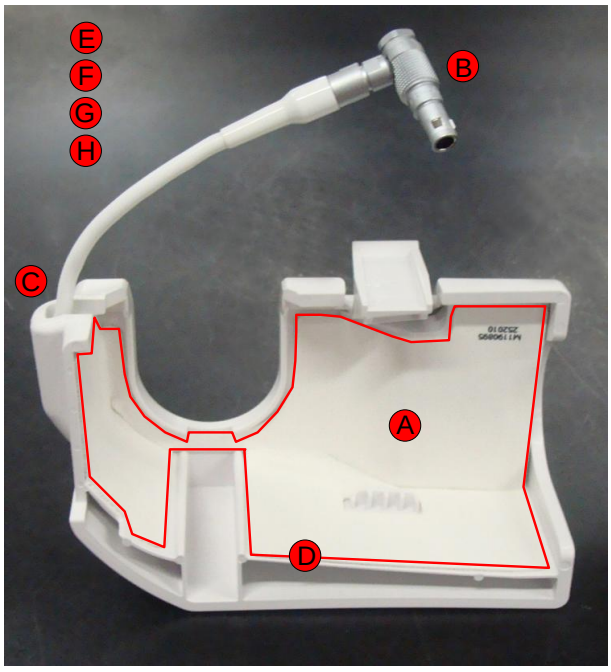
SOLUTION

A Honeywell flexible heater was customized to fit inside the ventilator exhalation valve cover (see Figure 2). The flexible heater is on continuously when the ventilator is powered up, keeping the exhalation cover and valve warm. This dries the condensation that pools at the exhalation valve, eliminating the undesired results of skewed airflow sensing.

Benefits to the patient/hospital:

- Accurate airflow measurement at the exhalation valve helps ensure that the correct airflow is being delivered to the patient, promoting improved patient care.
- Removable exhalation valve cover allows exhalation valve to be sterilized and reused.

Figure 2. Exhalation Valve Cover (Inside) and Benefits to the Exhalation Valve Cover/Ventilator Manufacturer



A **Custom color:** The silicon color of the flexible heater was matched to the exhalation valve color so that it matched the rest of the ventilator. This example uses silicone, but could also use Kapton®.

B **Custom connector:** The connector was customized to interface with the mating connector on the customer's ventilator.

C **Custom lead wire exit location:** The power harness was customized to specific customer requirements. This example has a round cable that terminates with a custom connector.

D **Custom geometry:** Honeywell cut a flexible heater pattern to fit precisely within the exhalation valve cover. This can be done on any kind of assembly.

E **Custom technical specifications:** Met application customer electrical and environmental characteristics.

F **Custom multiple wattage zones:** Provide uniform heat around multiple exhalation valve cover components.

G **Custom manufacturing:** Honeywell vulcanized the flexible heater to the exhalation valve cover in its factory and shipped the whole assembly to the customer.

H Flexible heater is easy to field retrofit as well as to integrate on new ventilators

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⚠ WARNING

PERSONAL INJURY

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Failure to comply with these instructions could result in death or serious injury.

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Specifications may change without notice. The information we supply is believed to be accurate and reliable as of this printing. However, we assume no responsibility for its use.

⚠ WARNING

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- Complete installation, operation, and maintenance information is provided in the instructions supplied with each product.

Failure to comply with these instructions could result in death or serious injury.

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E-mail: info.sc@honeywell.com

Internet: www.honeywell.com/sensing

Phone and Fax:

Asia Pacific	+65 6355-2828
	+65 6445-3033 Fax
Europe	+44 (0) 1698 481481
	+44 (0) 1698 481676 Fax
Latin America	+1-305-805-8188
	+1-305-883-8257 Fax
USA/Canada	+1-800-537-6945
	+1-815-235-6847
	+1-815-235-6545 Fax

Sensing and Control
Honeywell
1985 Douglas Drive North
Golden Valley, MN 55422
www.honeywell.com/sensing

Honeywell

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