

White Paper:

OEM-Certified Humidifier Pads for Inflight Humidification Systems

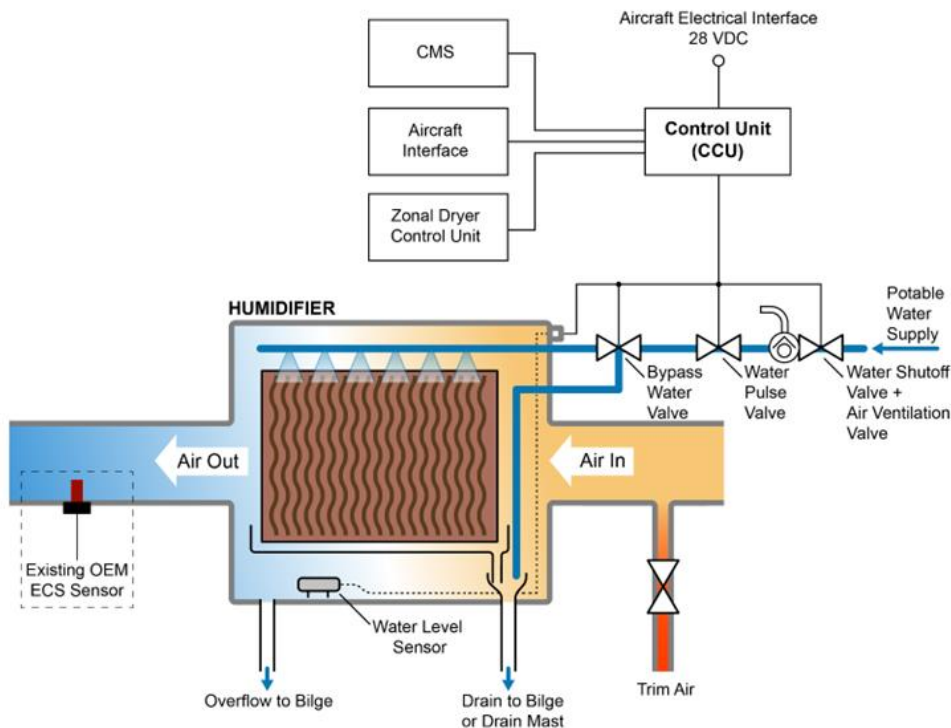
1. Introduction

This white paper outlines specific properties of CTT Systems' OEM-certified humidifier pads, developed and tested in close collaboration with Munters, to comply with OEM and line fit requirements from Airbus and Boeing.

The humidifier pad module ("pad") is a sub-system inserted in the OEM humidifier housing. Humidifier pads play a vital role in ensuring performance, safety, and long-term reliability of Inflight Humidification (IFH) systems.

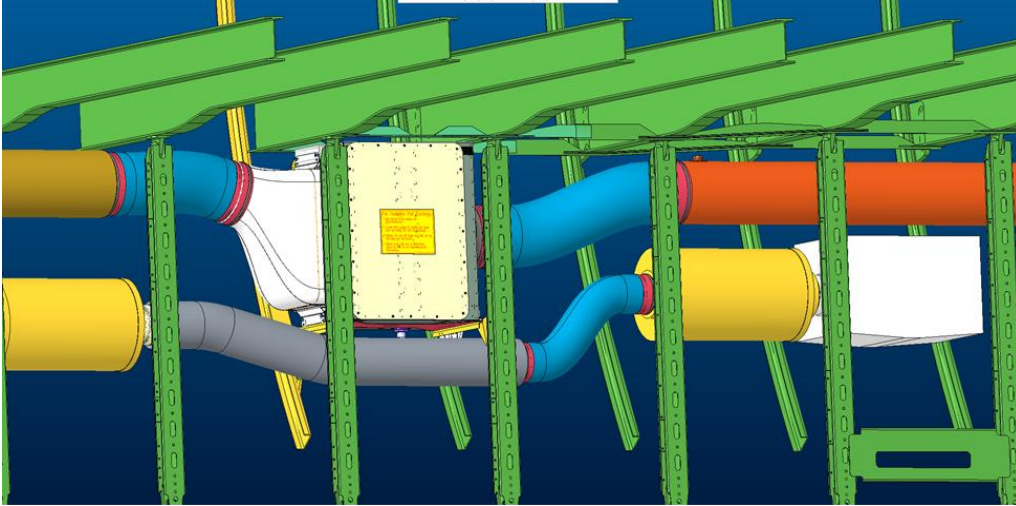
With more than 100 million operational hours accumulated since 2007, CTT's OEM pads provide a unique combination of application-specific materials and proven system performance.

The IFH system is integrated with both the Environmental Control System (ECS) and the aircraft water system, making pad media performance essential for airflow quality, hygiene, and system safety. The IFH system consists of humidifier housing, pad module, and control unit.



Picture 1. Schematic IFH system.

The IFH system is integrated into the air duct for a specific cabin section and thus part of the aircraft ECS. The IFH system, including the humidifier pad module, is also part of the aircraft water system, and thus the pad media is central for system performance and safety. After approx. 4000 FH (pending on design and certification approvals), the humidifier pad module shall be taken out and replaced.



Picture 2. Typical OEM Schematic IFH installation.

2. OEM Development of IFH system and aircraft humidification technology

CTT Systems has developed and certified complete IFH systems for:

- Airbus A380
- Boeing 787
- Airbus A350
- Boeing 777X

These OEM programs have provided CTT with extensive experience in ECS/water-system integration, certification processes, environmental testing, and long-term reliability data from over 3,000 IFH systems in global service.

3. Application-Specific Pad Media Engineered for line fit compliance

To meet stringent OEM requirements, CTT and Munters co-developed a new pad media – GX60-CTT, engineered specifically for line fit in aircraft.

Below are some of its specific properties and key features listed:

Evaporative media designed for spraying water	CTT's OEM humidifier pad media is uniquely designed for aircraft (not industrial applications) and supports application specific techniques by spraying small amounts of water in intervals, instead of flooding the humidifier pad media and thereby generating "free water".
Ceramic / composite structure	CTT's OEM humidifier pad media has added a ceramic layer, ensuring additional strength and more rigid structure.
Active carbon	CTT's OEM humidifier pad media has active carbon added to the ceramic slurry for odor control (and odor control is an OEM requirement).
High pH tolerance (from 3–11)	CTT's OEM pad media is suitable for varying water treatment conditions without degradation. CTT OEM pad media has high tolerance when using different potable water qualities, containing minimal organic compounds, allowing it to operate effectively across a wide pH range (3-11).
VDI 6022 ¹ certified and compliant	Hygiene standards.
Part of an FDA approved system	CTT's OEM pads are part of an FDA approved humidification system (and having the system FDA approved is a requirement for OEM certification). Since the IFH system is part of the ECS and the water system, it is important to ensure no negative impact on the quality of water nor the airflow to the specific aircraft zones. Change of OEM pad material requires new FDA approval for the IFH system.
Optimized pressure drop	OEM pad media has optimized pressure drop to comply with aircraft humidifier OEM system specification, targeted humidity level and airflow.

Approvals / Tests

Oversaturation / collapse	OEM pad tested to prevent collapse due to its own weight when wet (in case of oversaturation).
Bacteria/Legionella transfer, fungus resistance and fibers	To comply with OEM line fit requirements, FDA must approve the entire IFH system, including bacteria/legionella transfer, fungus resistance and harmlessness of fibers tests. Based on the required testing, by CTT and independent external test institutes, CTT's OEM humidifier pads are part of the system approved by FDA for safe system interaction with the ECS and water system.

¹ VDI 6022 involves a comprehensive approach that prioritizes indoor air quality, cleanliness, and safety. A product that fulfills these requirements ensures that the solution will support healthy and comfortable indoor air quality.

5. Proven Reliability in Commercial Service

CTT's OEM humidifier pads have been in continuous operation since 2007, accumulating more than 100 million operating hours. Ever since that day in October 2007 when the first A380 took to the skies, line fitted with two crew rest humidifiers, CTT has delivered more than 20,000 original pad modules to more than 70 airlines for in-service on A380s, Boeing 787s and A350s. That is a strong testament and compelling argument for many of CTT's customers.

6. Conclusion

To summarize, CTT's original pad modules offer the following capabilities:

- 1) **Quality and reliability:** CTT's pads are developed and tested to meet certification standards driven by OEM compliance, including rigorous quality requirements. CTT's aftermarket pad modules are identical to OEM pad modules, undergoing the same manufacturing and testing as the line-fitted pad modules. This helps ensure product quality and strict quality control of all original pad modules.
- 2) **IFH system compatibility:** CTT Systems' OEM-certified humidifier pads are developed and tested as integrated parts of the IFH OEM system, ensuring interoperability, safety, performance, and regulatory integrity.
- 3) **Application specific pad media:** CTT's pad materials are uniquely designed for aircraft and are application specific due to 1) the evaporative media itself and 2) the application of specific ceramic / active carbon coating.