

Chamber made to **PROTECT EV BATTERIES**



With the ACS Dust Chamber, testing to ISO 20653 helps ensure EV battery housing designs will keep out dust and small particulates.

The ACS Dust Chamber's interior working volume was designed for a test article up to 50 cu.ft. The geometry of the chamber was critically sized for the specific devices under test.

Ingress protection testing against solid particulates, such as dust, is a crucial part of battery manufacturing. If a battery is not designed to keep dust out, small particles can infiltrate and wreak havoc on the delicate workings within the battery's housing.

A major vehicle OEM selected ACS, a specialized equipment maker, to design and build a self-contained test stand with a dust chamber, in accordance with ISO and client-specific standards. ISO 20653 testing determines the degrees of protection provided by enclosures of electrical equipment on road vehicles against foreign objects, water, and access. This test stand was designed to test the 5K and 6K regimes of ISO 20653. Among the client-specific requirements was the ability to test two different size batteries in a single chamber.

ACS engineered and built an environmental test chamber designed to the standard of keeping 2 kg (4.4 lb) of dust suspended per cubic meter of volume. After exposure in the dust chamber, the battery can be examined to see how much, if any, dust made it inside. The dust is circulated to a specific mass per unit volume and flow rate using a fan that was modified for this application.

The entire test stand is dust-tight, preventing it from creating a mess in the plant. Its footprint uses 8 x 8 ft (2.4 x 2.4 m) of floor space, stands 7 ft (2.1 m) tall and weighs less than 4000 lb (1814 kg). The unit can easily be moved and has a minimal power draw, requiring only 480V at 60A to operate.

The interior working volume was designed for a test article up to 50 cubic ft (1416 L). The geometry of the test chamber was critically sized for the specific devices under test. The volume of the test chamber was optimized to allow adequate airflow around the largest test article as well as minimize excess space for a test article with a smaller volumetric footprint.

By knowing the test article constraints, the ACS team was able to right-size the fan and keep the ISO dust on-hand to a minimum. An Allen-Bradley PLC on the unit allows the operator to control the du-

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ration and speed of the suspended air-dust mixture.

The automaker is now able to test degrees of protection against foreign objects, determining whether its batteries provide 5K ingress protection (dust-protected) or 6K ingress protection (dust-tight).

“One of the technical challenges with this project was to design the chamber and size the test stand for multiple battery sizes,” said David Suehs, engineering manager, Machine Design Group at ACS. “The ISO standard requires a 2 kilogram mass of dust per cubic meter. As the unoccupied volume interior to the chamber changes with the test article, the fan velocity and volume of raw dust product needed to be varied,” he noted.

Based in Verona, Wisconsin, ACS designs, engineers, and builds innovative equipment, machines, controls, and facilities for industry leaders in verticals including automotive, aerospace, and manufacturing. ACS has a regional office in Troy, Michigan, and serves customers across North America and around the world. For more information: acscm.com. ■