CASE STUDY

Munters

Low dew point climate control

For battery research at University of Birmingham

Image courtesy of University of Birmingham

The University of Birmingham

The Energy Materials Group at the University of Birmingham focuses on the development of battery materials and manufacturing processes. Its aim is to build better batteries through research, which will help realise a sustainable economy and a carbon neutral future through the electrification of our transport sector and through increasing the utilisation of renewable energy sources.

The materials used in this vital battery research include lithium-ion, sodium-ion, and solid-state chemistries, and are extremely sensitive to moisture. Working with such reactive materials requires very dry climate conditions to prevent any damage or explosive reactions, and to ensure product integrity/quality.

Munters was approached by the University of Birmingham to build a bespoke turnkey battery dry room and HVAC plant that will create and achieve dry climate conditions of less than 1% relative humidity (-40°C dew point). Munters agreed to be the principle contractor for this project and looked to manage several of the University's contractors from concept through to completion.

The research team at the University of Birmingham had previously worked in existing Munters low dew point facilities installed in various industry and academic settings, so expectations of delivering a comparable facility here were extremely high.

Case study:

- Design, supply and installation of low dew point battery dry room at the University of Birmingham

Case study:

- Create and maintain precise and consistent control of low dew point conditions to -40°C with less than 1% relative humidity
- Ensure full compliance of regulations within grade II (2) listed building

The unique pillars that form part of the grade II (2) listed building

The unique pillars of the listed building built in the dry room

Working in a listed building

One of the key challenges encountered during this project was working within a listed building. The dry room is housed in the School of Metallurgy and Materials, in a grade II (2) listed building that comprises four offset squares built around a staircase.

"The added complexity of working within a listed building presented a number of challenges throughout the project," says Paul Richards, Project Manager for Munters. "These included working around pillars, matching existing building louvers that were over 20 years old, and complying with increased planning and building regulations".

Cables and pipework had to be fed through the buildings' existing risers, and all work had to be carried out with minimal disruption to University life.

Building the dry room and plant room

The battery dry room is approximately 50m^2, and is an unusual shape because it is designed around the pillars that are integral to the listed building. The room has an airlock at the entrance, which acts as an anti-chamber to acclimatize the air and reduce infiltration of humid air into the room. The airlock is fitted with a traffic light entrance system, and includes space to hang lab coats and outdoor clothing. This helps to keep lab coats dry, and prevents excess moisture from being brought in from outside.

"We've noticed a significant difference if you're wearing gloves (for example), when you enter the dry room," says Ben Pye, Deputy Dry Room Manager and Technician for the University of Birmingham. "If you then touch things, you can transfer some of that moisture, whereas if you have pre-dried gloves there is far less moisture transfer."

The battery dry room

Munters Desiccant Dehumidification System is installed in the plant room adjacent to the dry room

Inside the dry room

The dry room consistently maintains conditions to around -40°C dew point at a temperature of 20°C, with capacity for approx. 6 people. At times, the room has achieved as low as -65°C dewpoint (with fewer occupants). These conditions are created and maintained by the Munters desiccant dehumidification solution installed in the adjacent plant room. Both the dry room and the plant room were designed, installed and commissioned by Munters, the principle contractor for this turnkey project.

Equipment has been arranged to maximize the available space, working around the pillars and considering airflow through the room. “In a way it’s worked out well, working around the pillars,” says Scott Gorman, Research Fellow and the Dry Room Manager. “It means we have lots of wall space, as well as different areas that can offer the driest conditions [with dew points even lower than target]. This can be useful when working with certain materials”

The velocity profile throughout the room is affected by the equipment that is installed inside, so Munters advised rebalancing after equipment was installed to prevent light samples being affected by turbulent air.

“When something can move with just a static charge, then airflow will definitely have an impact. However, that was easily resolved by adjusting the levels” says Scott. Through the use of 3D CFD modelling, Munters is able to demonstrate how the airflow moves throughout the room.

Munters Desiccant Dehumidification System being delivered to site

Benefits of the system

The Energy Materials Group at the University of Birmingham has many collaborations with big companies, especially within the automotive industry. In the past, the team had to use glove boxes, which limit throughput, flexibility and commercial appeal.

"It's not possible to hand build thousands of things inside glove boxes" says Scott. Having the dry room facility enables the University of Birmingham to offer scaled up research services that would otherwise have been limited. "Having the dry room has certainly opened up new opportunities for us," says Scott Gorman. "Around half of the projects that are carried out each year will use the dry room regularly. It also gives us a unique selling point (USP), and the ability to offer certain things that other groups can't. The dry room allows us to bridge that gap between industry and academia."

Reliable performance

Munters and the University worked together to optimize the dry room design and ensure reliable climate control performance. In order to maintain a consistent -40°C dew point in the room, the supply air moisture (dew point) from the dehumidifier must be even lower, regardless of outside air conditions. The Munters system is high performing yet energy-efficient, which results in a cost effective solution for the University.

"Low leakage wall panels and ductwork and a positive pressure in the room are all also critical. We optimized our room and ductwork designs using CFD modeling to help ensure we would meet target dew point in all areas of the room," says Paul Richards of Munters.

For more information, visit: **munters.com/batterydryrooms**

CS-UNIVERSITY BIRMINGHAM-202101-EN

Find your nearest Munters office at **www.munters.com**