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ABB drives help keep football fans cool

Football fans in Qatar will soon be kept cool with the help of ABB variable speed drives (VSDs). Qatar who won the bid to host the 2022 Fifa World Cup and is undertaking a major building and refurbishment programme to put in place the stadia needed for such a prestigious international tournament.

The Qatar 2022 Bid Committee asked Desiccant Dryair Systems of Morecambe in Lancashire to provide the air conditioning systems for the new stadium in Doha, to reduce the air temperature from the 45 degrees C ambient often experienced in the country, to a more comfortable level both in the stands and pitch areas for the spectators and players. Desiccant Dryair Systems is the UK's leading designer and manufacturer of bespoke desiccant-based dehumidification air handling units (AHUs).

The bid committee was keen that the stadium should be as carbon neutral as possible and so the air conditioning uses Qatar's natural resource of the sun to provide high pressure hot water for absorption chiller and electrical power through PV arrays.

The Desiccant Dryair Systems Desiccant cooling AHU passes the air to be dried and cooled through two slowly rotating wheels. The first takes out moisture from the air via a silica gel desiccant, a chemical that attracts water. This reduces the moisture content from 20 g/kg to 10 g/kg of air. It then passes through the second sensible heat wheel where cooling is recovered from the opposing airflow and trimmed to the required temperature by a sensible mechanical cooling coil with the chilled water from the absorption chiller where the supply fan delivers the air to the stands and pitch areas.

The opposing airflow is the return from the stadium and is already lower in temperature and moisture than the fresh air being introduced. On entering the machine it passes through an evaporative cooler which drops the air temperature to the wet bulb value but it is saturated with moisture. This then passes through the sensible heat wheel but the wheel can only transfer the cooling effect not the moisture. This is how the cooling is achieved on the supply air second wheel.

The water removed from the air by the desiccant wheel needs to be evaporated from the silica gel so that it can be exhausted to the outside of the building. A regeneration process uses high pressure hot water from the solar field to regenerate the wheel through a heating coil. This water vapour is then removed from the building through the regeneration fan.

Each of the two units uses 10, ABB standard drives for HVAC, to control the rotors, as well as the process and regeneration fans and other ancillary equipment. The first rotor in the process revolves at an average speed of 12 revolutions per hour, while the second rotor revolves at 14 revolutions per minute, depending on the difference in air temperature between the two opposing airflows in the process. The greater the differences in temperature, the faster the rotors spin, allowing them to recover more energy.

Temperature sensors feed signals to the ABB drives via the building management system (BMS), ensuring they drive the rotors and fans at an appropriate speed to suit the ambient conditions.

Another part of reducing the carbon footprint of the stadium is the photovoltaic system which provides electrical power to the drives. Because the drives can alter their speed according to the demand, the drain on this supply is kept to a minimum. Overall, the system uses 1 MW of renewable energy, compared to the 1.3 MW of conventionally generated energy used by a mains powered system.

John Cross, managing director of Desiccant Dryair Systems says: “ABB provides the best quality and we always buy ABB motors because of the high level of service and support we receive. We are now also confident in the quality of ABB variable speed drives and that we can get an equally high level of support from ABB’s drive service network.”

ABB (www.abb.com) is a leader in power and automation technologies that enable utility and industry customers to improve their performance while lowering environmental impact. The ABB Group of companies operates in around 100 countries and employs about 117,000 people.

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Caption: Football fans in Qatar will soon be kept cool with the help of ABB variable speed drives.

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