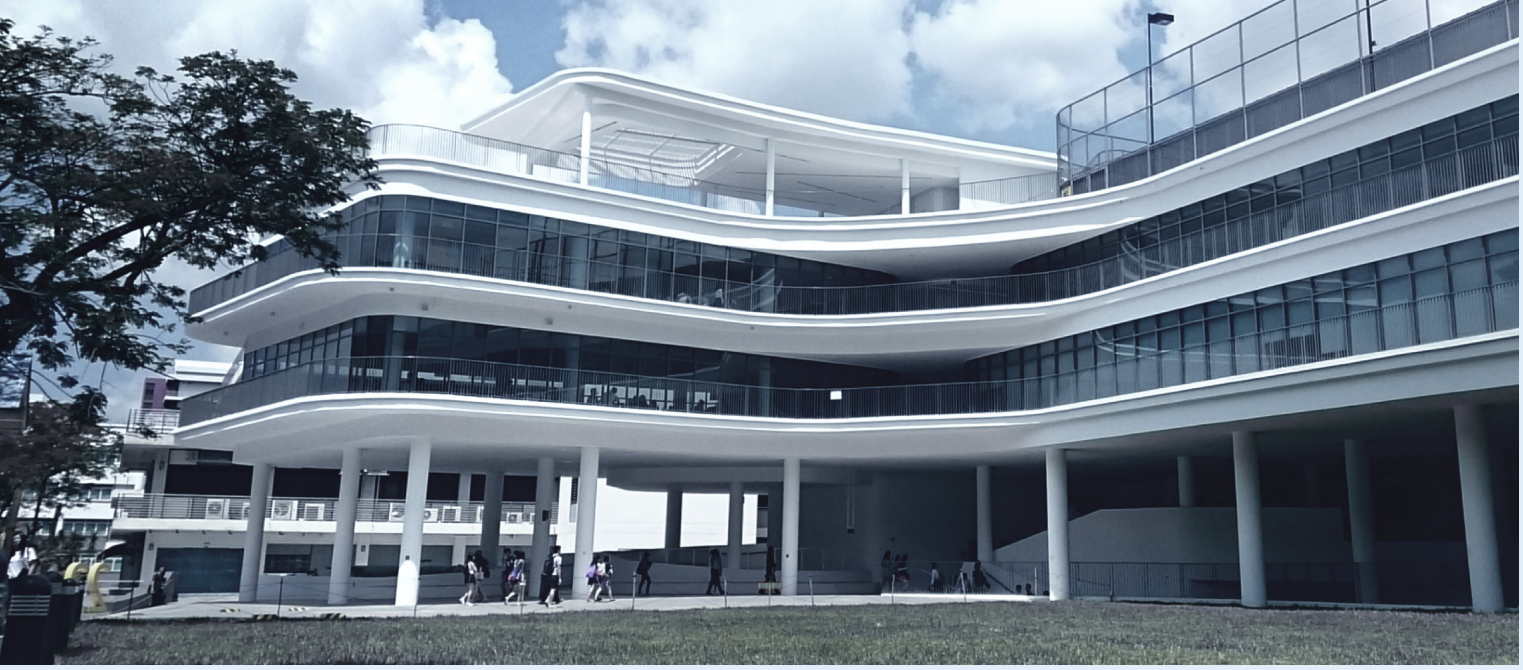

Grundfos Distributed Pumping Case Study - Ngee Ann Polytechnic

Pump energy use reduced by 54% using smarter chilled water system design

Increased ΔT By 28%

Reduced energy from 9.4KW to 4.3KW

Energy savings of 54%

Located in Singapore, Block 22 at Ngee Ann Polytechnic (NP) is a mixed-use building housing a cafeteria, sports hall, student lounges and office spaces. The building was finished in 2014 and runs on a third-party BMS with a constant load profile. Its total cooling area is approximately 6000 m^2. The Singapore Building Construction Authority has certified Block 22 as a Green Mark Platinum building.

HVAC is responsible for about 60% of the building's total energy consumption. To uphold its Green Mark Platinum rating and achieve even higher energy savings, NP's management and the Environmental & Water Technology Centre of Innovation (EWTCOI) decided to revisit its HVAC system design, which is based on a chilled water loop. The goal was to identify ways to push energy savings while maintaining a cool, comfortable environment throughout the building.

With a constant load profile, it's not possible to throttle the primary pumps sufficiently during partial loads as it causes certain areas of the building to receive too little flow of chilled water. This causes over-pumping, which reduces overall system efficiency. Valves fundamentally control the flow by reducing pressure.

Block 22 was using a conventional fixed differential pressure control strategy, which resulted in too much pump pressure and ultimately wasted energy.

Grundfos worked with EWTCOI to retrofit the system with Distributed Pumping, which places smart pumps throughout the building to automatically adjust the flow for the required cooling load. This promises to save at least 50% on the chilled water pumping power and optimise system performance at all times.

Before the Distributed Pumping system was applied, a baseline measurement for cooling tonnage and total energy consumption for the chilled water loop was made over a six-week period. This included weather information to be able to normalise data when determining a benchmark for the Distributed Pumping solution.

GRUNDFOS

Possibility in every drop

Solution

Grundfos' Distributed Pumping solution comprises 15 MAGNA3 Distributed Pumps, 4 TPE3 primary pumps and our unique solution expertise. The commissioning process during installation was extremely efficient. Initial pump settings were configured via the Grundfos GO REMOTE app and the flow limits were adjusted directly in the BMS for each pump. This delivered significant time savings compared to using traditional balancing valves, control valves or PICVs (Pressure Independent Control Valves).

Result

During operations, the Distributed Pumps continuously measure the air duct temperature and automatically adjust their pumping speed to achieve the desired temperature. The system auto balances any load, providing optimal comfort for tenants.

Block 22's baseline system with balance and control valves had a Delta T of 5.3°C. The retrofitted Grundfos system with Distributed Pumps increased Delta T by 28%. Avoiding the valves reduced pumping power from 9.4 kW to 4.3 kW, resulting in a total pump energy savings of 54%.

"The occupants' comfort is high on our priority list – and so is maintaining our Green Mark Platinum rating. Grundfos' Distributed Pumping helps us achieve both."

Visit grundfos.us/pei to learn more about Department of Energy (DOE) pump energy index (PEI) requirements and PEI ratings on specific Grundfos models.

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