

Case Study: PowerPax Chiller Installations – **Hilton Hotel Brisbane**

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In 2005 the Hilton Hotel at Elizabeth St in Brisbane came under new ownership. The new owners, ISPT, set about a modernization programme. Norman Disney and Young Brisbane office were engaged to identify improvements to the mechanical plant, in both functionality and energy reduction. The team at NDY was led by Associate Director, Phillip Carruthers.

The chiller plant supplies chilled water for the hotel, and half of the adjacent Wintergarden Shopping Centre.

The first step was to replace the cooling towers, which were long overdue for replacement. The new towers were supplied with VSDs on their fans.

The existing chiller plant consisted of three Luke centrifugals of 1800 kW each. The chillers were operating on R12 refrigerant which has a high ozone depletion potential and is only available in recycled supply. One of the chillers had failed permanently and was being “cannibalized” for parts to keep the other two in service. →



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⚡ At low load conditions in the hotel, particularly in Winter, the chillers were unable to unload sufficiently to stay on line, and were frequently cycled off, manually by the plant operators. Under these conditions a single chiller was unable to cycle back on again quickly enough to keep the conditions within the hotel stable, and a hunting situation occurred. Comfort conditions in the hotel fluctuated, the chiller was stressed due to frequent starting, and the fluctuating conditions had an adverse affect on the mechanical plant's energy consumption.

The plant required a chiller capable of a high capacity and the ability to turn down to a low load and stay there for a prolonged period, matching the air conditioning load of the hotel without the need to frequently cycle off. The new chiller also needed to have high efficiency at full load, and very particularly at part load conditions. Conventional chillers sometimes have a low turn down capability, however they tend to have oil migration problems under prolonged periods of low load operation. Chiller plants with conventional chillers generally require a low load chiller specifically for the purpose, a lower capacity machine which would match the air conditioning load, whilst operating at a higher chiller load to avoid short cycling and oil migration problems within the chiller.

The hotel's air conditioning load was re – evaluated and a PowerPax water cooled chiller of 1450 kW was selected to replace one of the existing Luke chillers. The PowerPax chiller is equipped with five Danfoss Turbocor TT300 compressors. The compressors are a two stage centrifugal configuration, are each fitted with integrated VSDs and utilize magnetic levitation bearings, eliminating the need for oil in the chiller, since the whole system is friction free. The chiller's Coefficient of Performance is extremely high, particularly at part load conditions where it can reach up to 13. Performance which is unattainable by conventional chillers. The chiller also exhibits excellent redundancy due to the number of compressors. In the rare event that one of the compressors is offline, continued chiller operation is assured by the remaining compressors.

Finn Air won the contract to carry out the chiller replacement works, which also included new pumps with VSDs and an Alerton control system fitted exclusively for the chiller plant. The chiller was built by PowerPax at it's Melbourne manufacturing facility, and it was commissioned by Airmaster Australia, one PowerPax's authorized service partners.

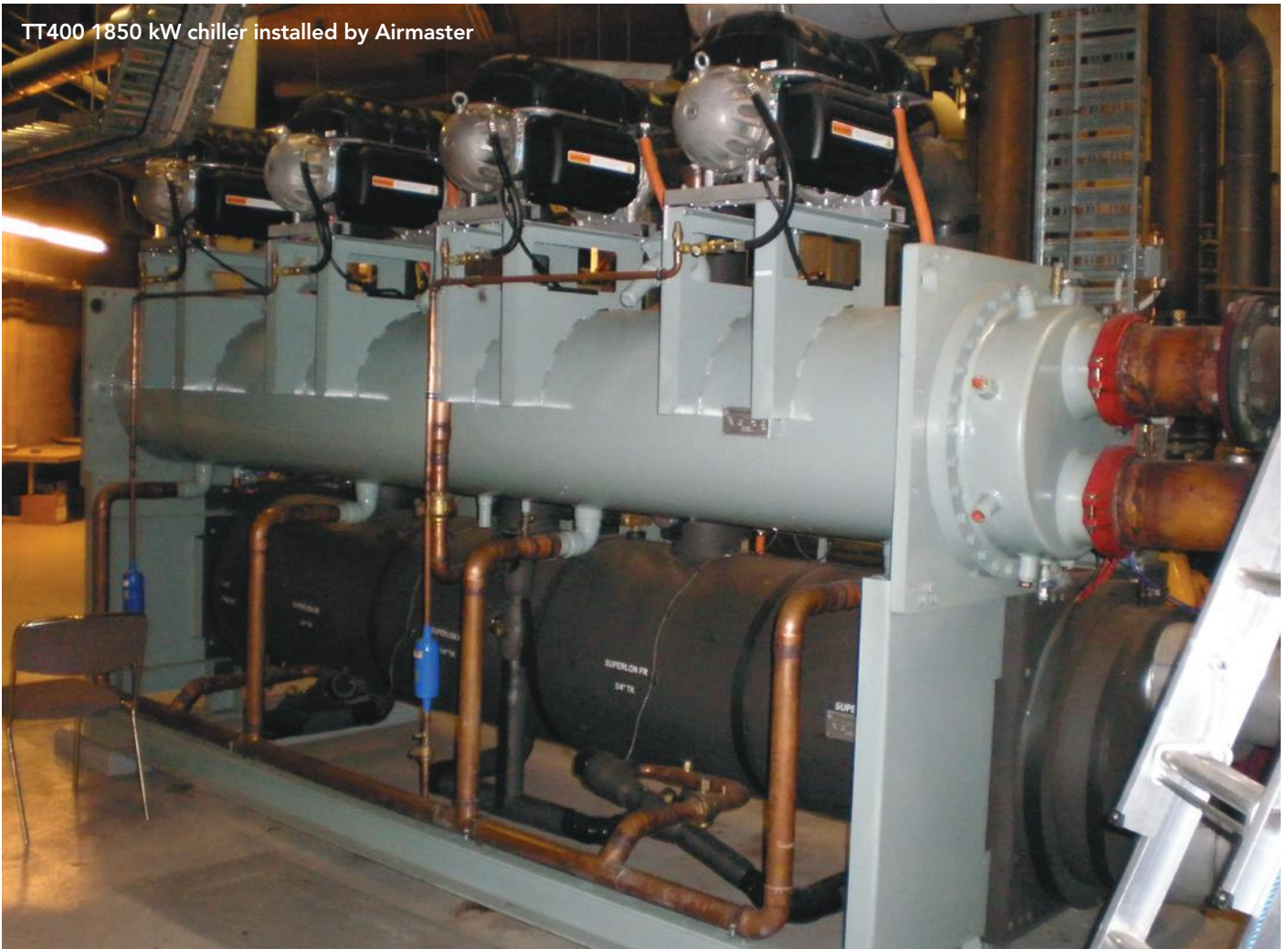
The installation ran smoothly and the chiller was integrated into the hotel's chilled water system. Some early teething problems were testament to the PowerPax chiller's redundancy characteristics. Garry Rodgers, the Manager of Facilities Management at the Hilton, said that early on the chiller required a compressor replacement. It was done with a minimum of fuss, and took just 3 hours to complete. During the time the compressor was off line, the chiller was kept running and the conditions in the Hotel and Shopping complex were held quite easily.

The Alerton chiller plant control system was configured to run the PowerPax chiller as much as possible. The remaining Luke chiller was only put into service when it's full, or close to full load operation could be utilized. Energy savings logged over the first year of the PowerPax chiller's operation revealed a huge reduction in energy, translating to an average energy saving of circa \$9,000.00 per month. Additionally, the conditions within the complex have been held steady, with the chilled water temperature graphed as a straight line.

Rodgers and Phillip Carruthers both report that the new PowerPax chiller draws only 20 amps during low load conditions and holds the conditions very nicely. The previous chiller drew up to 200 amps under the same conditions.

The chiller has operated reliably and efficiently since it's commissioning in 2005. The Hilton in Brisbane was the winner in the 2007 AHA National Awards for Excellence Best Redeveloped Accommodation Hotel.

TT400 1850 kW chiller installed by Airmaster



TT300 1450 kW installed by Finnair



Subsequent to the success of the installation in 2005, a second PowerPax chiller of 1850 kW was installed in 2008. The chiller plant control has been reconfigured to run both PowerPax chillers together as much as possible, so that their extremely high part load efficiencies can provide further energy savings. →



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← The Hilton, ISPT, and Norman Disney and Young took on the PowerPax experience early in PowerPax development as a chiller supplier. A fact which has not gone unnoticed by the company, which like any manufacturer with a new and innovative product, has had to endure initial scepticism followed by rapid expansion. Since the 2005 PowerPax installation at the Hilton there have been further successful PowerPax projects implemented by the Hilton, ISPT and Norman Disney and Young. PowerPax have recently delivered a new Adiabatic Evaporatively cooled packaged chiller for NDY's own new office in Melbourne.

PowerPax now enjoys the status of leading chiller supplier in Australia. ■

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