

Vodacom

Case study



About

Vodacom Pty Ltd is a pan-African mobile telecommunications company, with the largest number of subscribers of cellular networks in South Africa. The business provides GSM services to more than 50 million customers in Southern Africa, Tanzania, Lesotho, Mozambique and the Democratic Republic of the Congo.

The challenge

To meet the increase in demand for its data centre applications, Vodacom required a solution that would allow it to quickly roll out additional facilities without the time, high cost and logistical barriers associated with new builds, or the constraints of retrofitting facilities in existing buildings.

Vodacom was also keen to maximise energy savings by integrating the most advanced air conditioning equipment technologies and exploiting free cooling opportunities, an added challenge in tropical and subtropical Africa.

Airedale solution

- 2 or 3 x 40-95kW SmartCool™ dual circuit air cooled precision air conditioning (PAC) units
- 1 or 2 x 60-95kW condensers / dry coolers
- Three-stage indirect free cooling control achieved by adjusting fan speed, pump speed and control valve, supplemented by DX cooling where necessary
- Optimised head pressure control: the condensing pressure set point modulates to maintain the most energy efficient system operating point depending upon ambient temperature and room load
- Constant pressure control
- For comfort, and to prevent the ingress of unfiltered fresh air, a return air plenum air port above each air conditioning unit supplies one air change per hour (ACH) of filtered fresh air



In more detail

Vodacom hybrid data centre cooling

The solution

Cooling specialist Airedale came up with an innovative, hybrid data centre cooling plant. Each modular data centre consists of either a single 64m² module equipped with 2 x 40, 65, 75 or 92kW free cooling SmartCool™ downflow PAC units, or two 128m² modules containing 3 x 95kW SmartCool™ units deployed in a N+1 configuration.

The smaller module houses a secure, fully dual redundant energy centre accessed via its own entrance. Larger, separate fully dual redundant energy centre modules with power output capacities of 1600 and 3200 Amps per phase can also be attached to the data/GSM network modules allowing up to 1000m² of 'white' space to be constructed as required.

The SmartCool™ units have dual DX air cooled refrigeration circuits providing four stages of cooling, superior part-load efficiency and N+1 redundancy. To capitalise on free cooling opportunities, the SmartCool™ units are supplemented by an indirect air free cooling circuit connected to a roof-mounted hybrid condenser and dry cooler system. Inverter driven run/standby pumps are positioned in weather-proof housing with individual isolation valves and isolators on fans and pumps and a differential pressure sensor for each pump, thereby delivering the precise capacity match.

Under low temperature ambient conditions the pumps and fans run in isolation. As the ambient temperature increases, the three-way valve opens more fully, the pump speed increases, followed by the outdoor fan. If cooling demands cannot be met by free cooling alone, the first stage of DX cooling starts. The compressors then stage sequentially to meet the demand.

To maximise the relatively limited free cooling opportunities that exist in the African climate, the units were designed with a supply air temperature of 25°C.

The solution was developed in conjunction with Airedale's technical team in the UK and manufactured locally by Johannesburg-based, Airedale International South Africa, with installation and commissioning achieved within just 15 working days.

“ Airedale delivered with speed and urgency

Airedale delivered with speed and urgency, and the quality of their cutting-edge air conditioning plant designs will make a major contribution to Vodacom's strategy. The energy efficiency of the modular data facilities fully complements Vodacom programme to reduce the Group's overall carbon footprint.”

Fred R Weber, Pr Cert Eng, Pr Tech Eng, MSAI Mech Eng Senior Specialist – Vodacom Technical Facilities Division

Results

In order to achieve free cooling in the heat of Southern Africa, air temperatures are elevated to 25°C and 38°C for supply and return respectively; raising the supply temperature by 1°C from a more standard return air temperature of 24°C, brings annual energy savings of 110% using an air cooled system alone and 138% from a free cooling system.

By running the cooling at the lower return air temperature of 24°C, the units would deliver 22kW less cooling duty, increasing capital costs and floor space requirements.



Benefits

Modular system housing equipment and controls to meet varying cooling needs that can be rapidly deployed at any location and minimises drain on capital expenditure

Annualised EER of 5.63 achieved through 99% of the year in free cooling or partial free cooling

Redundancy and reliability provided by run/standby pumps; free cooling system independent from DX cooling system with two independent DX circuits and microprocessor battery back-up

Backward curved electronically commutated (EC) fans modulate to maintain constant floor void pressure and deliver up to 50% energy savings at part-load compared with AC equivalent units

Energy saving three-stage free cooling capacity control maximises the benefits of EC fans and inverter-driven pumps; maintains free cooling by preventing sudden increases in water circuit temperatures on compressor start-up