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Free cooling on the Mediterranean shore: Energy efficiency upgrades at PIC

Energy consumption is an increasing concern for data centers. This paper summarizes recent energy efficiency upgrades at the Port d'Informació Científica (PIC) in Barcelona, Spain which have considerably lowered energy consumption. The upgrades were particularly challenging, as they involved modifying the already existing machine room, which is shared by PIC with the general IT services of the Universitat Autònoma de Barcelona (UAB), with all the services in full operation, as well as the introduction of "free cooling"techniques in a location 20 Km from the Mediterranean sea. The upgrades targeted three distinct areas: First, the segregation of hot and cold air zones using and innovative horizontal layout, where hot air is channelled through openings in a false ceiling to a second story hot air plenum. This segregation allows increasing the cold air inlet temperature according to the latest ASHRAE recommendations. Second, the introduction of an outside air economizer which replaces obsolete CRAH systems with air-to-air heat exchangers. This system, built entirely from industrial components, also incorporates an adiabatic cooling module and enables the "free" removal of over 300 kW of IT heat load during 6000 hours a year. Third, the introduction of UPS systems based on IGBT technology, in order to better match the impedance characteristics of the IT load. In addition, a transversal activity has been done to fully integrate cooling and UPS infrastructure monitoring into PIC's overall IT monitoring framework based on Nagios. This required development of a ModBus/TCPIP gateway server.

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