



AHU Pre Modification



AHU Post Modification



Pre cool coils being installed



Ambient Laboratory AHU Modification

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EMC²

CUTS

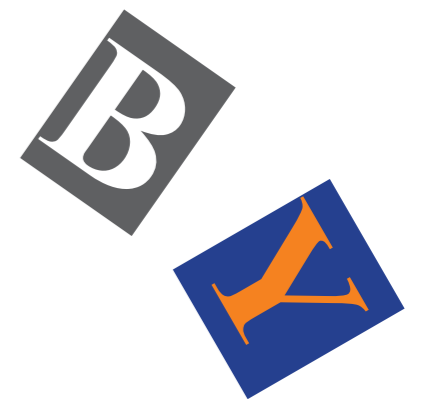
ENERGY

USE

EMC², one of the world's top hi-tech companies, will achieve annual energy consumption savings of 20 per cent at its facility in Cork, through ground-breaking use of energy saving technologies. A €2.5m project designed and managed by Arup will achieve annual electricity savings of 13 million Kilowatt-hours and an annual carbon emission reduction of 7,000 tonnes. Arup consultants present design

engineered by ARUP

and technologies installed in four areas: Ambient laboratories, Thermocycling laboratories, International Data Centre and CB2 Data Centres. Interfacing with the client's team to understand the manufacturing process and data centre requirements at concept engineering stage is critical to ensuring the successful delivery of a retro-fit free cooling project.



20%



“THIS IS A VERY SIGNIFICANT PROJECT WHICH MAKES A MAJOR CONTRIBUTION TO EMC’S COST COMPETITIVENESS AND SUPPORTS OUR ENVIRONMENTAL STRATEGY” SAID BOB SAVAGE, VICE PRESIDENT, MANAGING DIRECTOR EMC².

◀ Pictured during the installation of Dry Cooling equipment at EMC are L to R: Ken O’Mahony, EMC’s Director of Real Estate and Facilities, Europe, Middle East and Asia; Bob Savage, Vice President, Managing Director EMC and Sean Twohig, Project Manager, Arup.

EMC², one of the world’s top hi-tech companies, will achieve significant annual energy savings at its facility in Cork, through the use of free cooling and energy saving technologies.

EMC² specialise in the manufacture of cutting edge data storage devices and provide data management services and systems and this project will cut energy costs and improve competitiveness.

The EMC² project team identified key drivers from the outset and these included:

- Introduction of free cooling.
- Challenge existing operational parameters.
- No interruption to production.
- Client’s requirements.
- Construction methodology.
- Four areas: Ambient laboratories (10No), Thermocycling laboratories (4No), International Data Centre and CB2 Data Centres (2No)

The challenge for Arup was to design free cooling and energy saving systems for EMC² which could be incorporated into a “live” environment, without downtime to production. Given the favourable climate in Ireland and with the correct environmental ranges it is possible to avail of free cooling for over 8500 hours per annum. Bespoke engineering solutions were designed for three data centres, ten ambient laboratories and four thermocycling test laboratories at the Ballincollig, Co. Cork facility.



Arup Staff on Site

IT IS ONE OF THE MOST RADICAL INCORPORATIONS OF ENERGY SAVING TECHNOLOGIES AT A HI-TECH FACILITY IN IRELAND AND DEMONSTRATES THE POSSIBILITIES FOR RETROFITTING MAJOR INDUSTRIAL PROJECTS WHILST THESE REMAIN “LIVE”.
-- SEAN TWOHIG, PROJECT MANAGER, ARUP

Following the announcement of the SEAI Retro-fit grant, the project secured €500, 000 grant assistance. With dedicated Arup teams carrying out the engineering design and equipment procurement in parallel the design and tender process was completed in five weeks. The main contract was awarded in early September and the project was completed by the end of November, reflecting a timeline of just 18 weeks to design, tender, construct and commission. The four areas are discussed in more detail in the following sections.

Thermocycling Laboratories (4 no)

Thermocycling laboratories are used for data storage drive testing. The drives are tested within heat/cool temperature

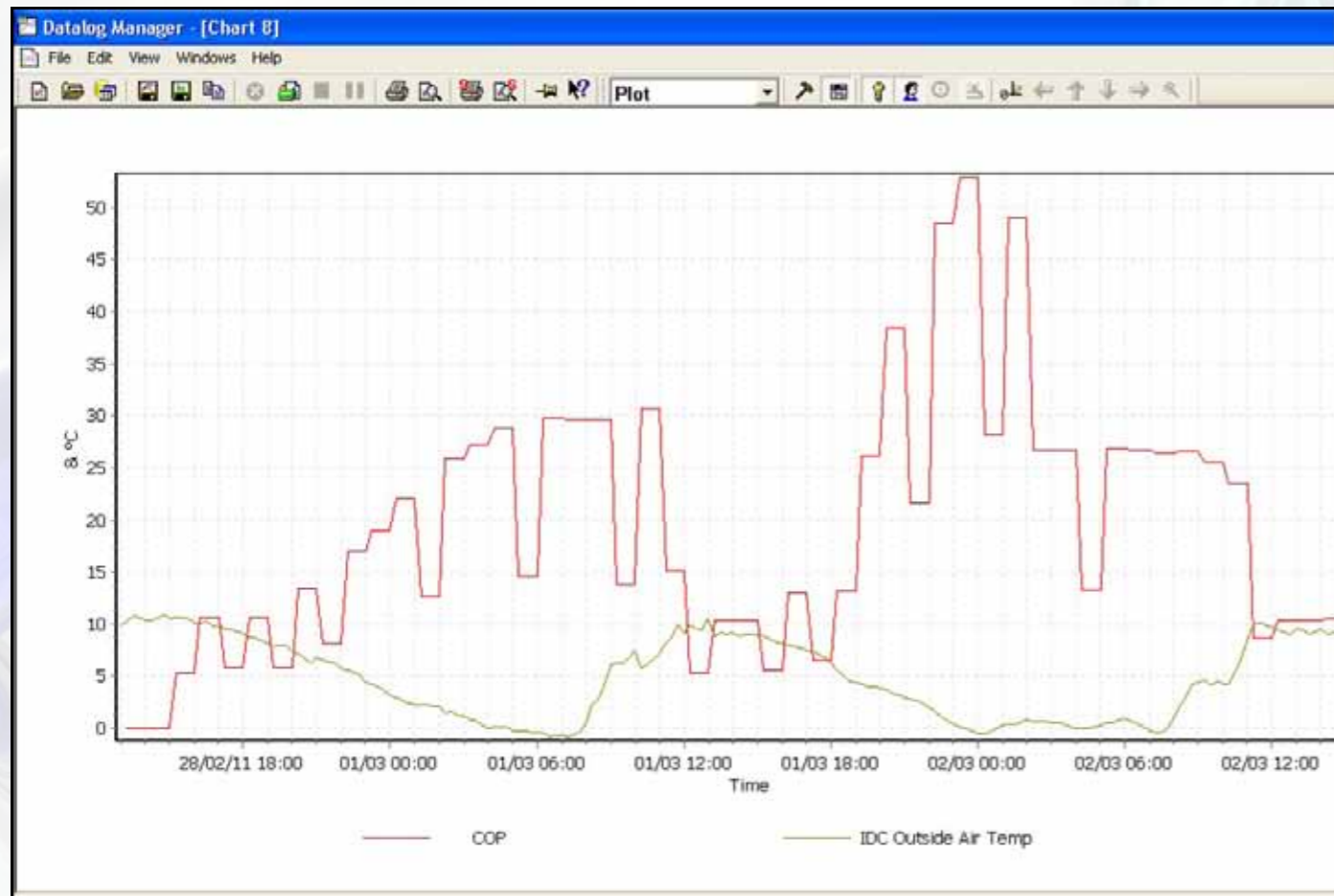
cycle and room temperature control is maintained to strict tolerances. Three full recirculation Air Handling Unit’s (AHU’s) provide air to each lab with a typical cooling load of 700kW. The retro-fit works carried out included:-

- 12 no. New pre-cool coils were installed into existing AHU’s
- 2 no. 400Kw dry coolers, associated pipework and pumps were installed on roof
- Variable speed drives were installed on all AHU’s
- Variable volume pumped circuit installed.

New pre-cool coils were installed into each Thermocycling AHU and piped to 2 no. 400kW dry coolers. Depending on ambient conditions the dry coolers will satisfy the cooling load or contribute a significant portion to it when

the laboratory is undergoing a cooling cycle. Variable speed drives (VSD’s) were installed on each AHU motor to reduce the air flowrate to the minimum required by the cooling load.

Volume control dampers (VCD’s) were installed under the floor grilles in one thermocycling laboratory. These are used to modulate air flowrate in response to the quantity of data cabinets being tested in the room, thus providing EMC² with demand driven ventilation control and reduced AHU running costs. Chiller consumption has been reduced for the Thermocycling system and due to the high temperature operating cycle the dry cooler system is expected to provide free cooling assistance throughout the year.



Dry Cooler COP Graph

Ambient Rooms (10no)

Ambient laboratories are used for data centre and data cabinet storage and operate at a constant air temperature. Three full recirculation AHU's serve each laboratory with a typical cooling load of approximately 350kW. The retro-fit works carried out included:-

- 10 Ambient labs provided with fresh air free cooling, 25 AHU's were modified
- 6 of the labs required extensive AHU modification to incorporate mixing sections and return fans
- Premium efficiency motors were installed on existing AHU's
- VSD's were installed on all motors
- Control strategy optimisation.

The new mixing sections operate on an air side economiser cycle and relative humidity is monitored to ensure that it remains within tolerances.

Plug type return fans in the new mixing sections provide the required air flowrate, operate at high efficiency and offer a reduced unit footprint.

As part of the retrofit works the control panels supplying each AHU were modified to remove the Star /Delta circuits and install VSD drives. These

provide variable speed control of both the supply and return fans within each AHU. The chiller plant serving these laboratories has seen consumption drop by up to 80% so far this year.

IDC (International Data Center)

The International Data Centre (IDC) consists of a number of refrigerant type computer room air conditioning (CRAC) units to meet the IDC data

centre load of 150kW. The retro-fit works carried out included:-

- CRAC units were retro-fitted with pre-cool coils
- 200kW dry cooler, associated pipework and pumps were installed
- Electronically commutated (EC) fans were installed
- Electronic expansion valves were installed on the refrigerant circuits
- Controls upgraded in computer room air conditioners (CRAC)



Thermocycling Laboratories Dry Cooler Installation

- Works carried out in a fire suppression protected zone
- Variable volume pumped dry cooler circuit installed.

All CRAC units were modified at the manufacturer's facility to accommodate new coils, EC fans and controls. This process reduced the amount of "hot" works undertaken in the data centre and ensured a high quality installation. The units were removed in accordance with the redundancy available in the zone. All other works, including pipework and electrical works were carried out in a live data centre environment with fire suppression systems.

The new pre cooling coils provide first stage cooling to the data centre, with the refrigerant coil providing cooling top-up where required. The graph notes the IDC dry cooler system coefficient of performance (COP) for the start of March; the average COP was 20 with a high of 57. Given the high run hours for this system significant energy savings are being realised.

CSC & CTC (Cork Global Solutions Data Centers)

The CB2 building includes two large data centres known as CTC and CSC. Both are served by chilled water based CRAC units from two independent chiller installations. The retro-fit works carried out included:-

- 2 no. 300kW dry coolers were installed onto CTC chiller farm
- 1 no. 300kW dry coolers were installed onto CSC chiller farm
- EC fans were installed in each CRAC unit and mounted in the floor void to improve efficiency
- New series pumping arrangement installed
- Modification of chiller controls to maximise dry cooler potential.

Both data centres have dry coolers integrated into the chilled water returns from the building. Continual operation of each data centre was essential and the dry coolers were integrated into the chilled water return pipework without loss of chilled water production.



IDC Dry Cooler Installation

Each of the units was retrofitted with EC plug fans. These fans operate at less than 3.9kW per CRAC unit compared with 6kW on the existing units. The EC fans were mounted in the CRAC unit such that the fans are located in the floor void as this increases the operational efficiency of the fan. Energy reductions of up to 20% are being realised.

The successful completion of this project was achieved through close collaboration with the EMC² project team, led by Eamonn O'Donnell.

Arup was responsible for multi-disciplinary concept and detailed engineering design, project and cost management, site support and reflects our commitment to deliver sustainable design from concept through to operation.

"This is a very significant project which makes a major contribution to EMC's cost competitiveness and supports our environmental strategy" said Bob Savage, Vice President, Managing Director EMC².

For further information please contact Sean Twohig or Tadgh Hickey of Arup. sean.twohig@arup.com tadgh.hickey@arup.com



CB2 Dry Cooler Pipework Installation