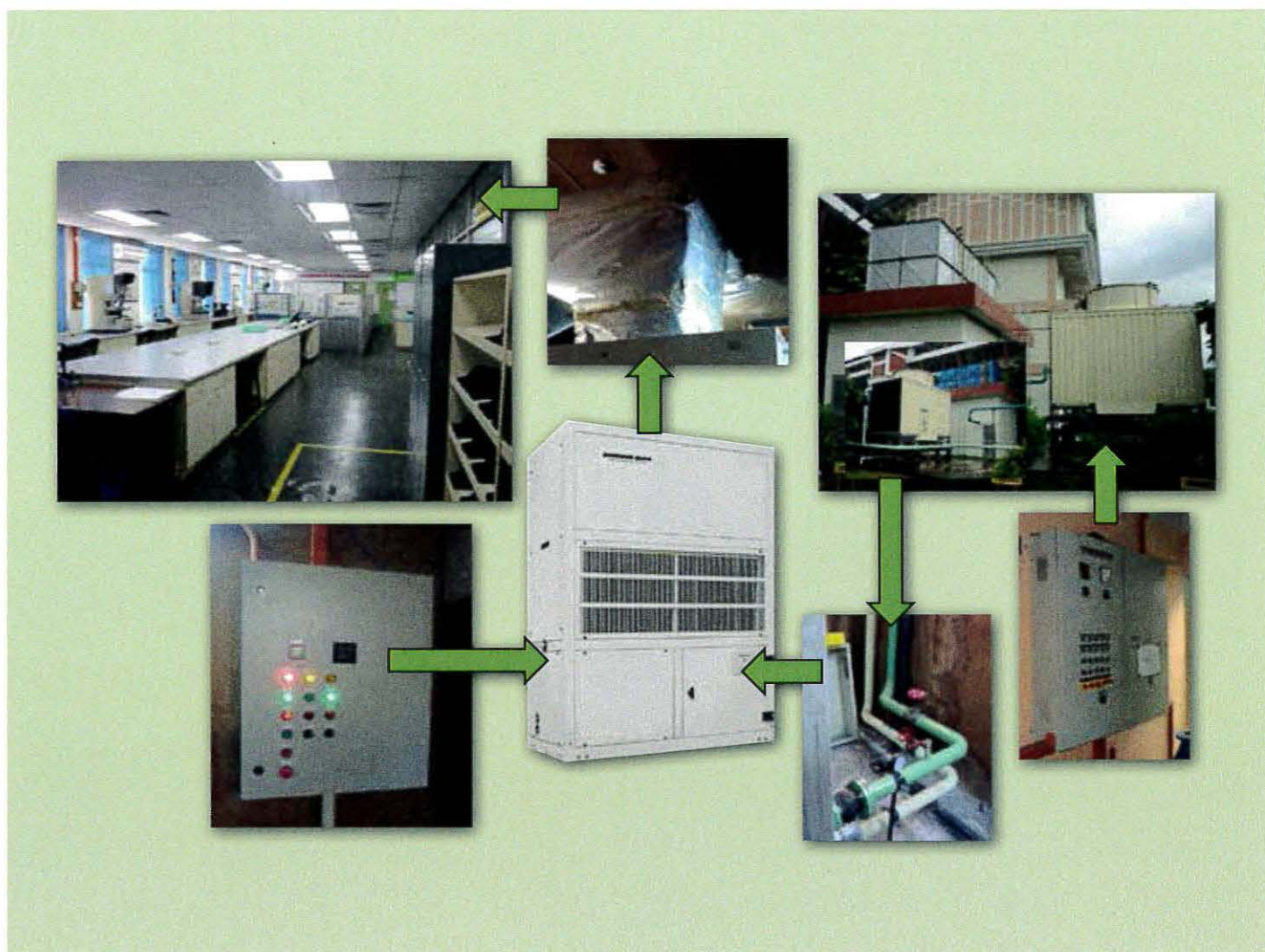


Tackling Sub-optimal Use of Electricity by Air Conditioning Units:

How Element Technology's Innovative System to Enhance Air Conditioning Efficiency



The environmental challenge

There are around 1.5 billion refrigerators and half a billion air conditioners on the planet. Together with industrial “chillers”, these cooling systems are responsible for the bulk of hydrochlorofluorocarbons (HCFCs). In addition to releasing heat-trapping chemicals that contribute to ozone depletion, cooling systems use large amounts of electricity, contributing to climate change. Efforts are underway internationally to deal with both types of environmental impacts.

Ensuring that the average global temperature rises less than 2°C by 2020 has become a focus of international climate change efforts. According to the United Nations Environment Programme (UNEP), achieving this target will require reform of energy systems, including major improvements in energy efficiency. Studies commissioned by UNEP found that, in order to close the “emissions gap” by 2020, which is necessary if the global temperature rise is to remain below 2°C on average, primary energy production will need to be 11% – 18% lower than it would be if “business-as-usual” were to continue through 2020.¹ A recent UNEP report notes that measures to improve the efficiency of air cooling and heating systems could significantly reduce energy consumption of buildings, decreasing their impact on climate change.²

At a Glance:

Advanced Thermal Control System (ATCS) Technology for Air Conditioning Systems

- Environmental challenge: Improve energy efficiency of air cooling systems
- Technology solution: Existing systems can be retrofitted with ATCS technology
- National technology dissemination: ATCS and associated know-how
- Transactions: Joint research, technology license
- Key players: University Teknologi Malaysia (UTM) Faculty of Mechanical Engineering, e Element Technology
- WIPO GREEN support: The ATCS technology has been uploaded to the WIPO GREEN database (www.wipo.int/green); services are available to facilitate transactions involving this technology solution.

¹ See Bridging the Emissions Gap, UNEP, 2011, at www.unep.org/pdf/UNEP_bridging_gap.pdf

² Bridging the Emissions Gap, UNEP, 2011, at www.unep.org/pdf/UNEP_bridging_gap.pdf

In Malaysia, air conditioning is estimated to account for over 60% of energy use in non-residential buildings. Office buildings in Malaysia tend to be maintained at temperatures well below 23 – 25°C, the level recommended under the Malaysia Green Building Index. Moreover, many of the cooling systems in use are old and/or energy inefficient. While the Government of Malaysia currently subsidizes energy, the cost of fossil fuels is rising and it is estimated that by 2020 Malaysia will be a net importer of such fuels. It is thus imperative that – for economic in addition to environmental reasons – energy efficiency of central cooling systems be improved in Malaysia. This situation is replicated in other countries.

The technology solution developed by UTM and e Element Technology

Researchers at the Universiti Teknologi Malaysia (UTM) Faculty of Mechanical Engineering have devised a system to improve the energy efficiency of air conditioning systems in non-residential buildings. The technology, the Advance Thermal Control System (ATCS), is a control system that can be used to retrofit many existing systems, resulting in substantial energy savings. While similar technology has been used previously for small capacity air conditioning systems, its application to medium range systems is novel.

ATCS is used to maintain a steady increase and decrease of the cooling capacity of the system, which saves energy compared to the peaks generated by users turning the system up and down. ATCS's thermal control system automatically matches the cooling capacity of the air-conditioning system with the variable daily cooling load imposed by the environment. In the process, energy use is optimized without over or under cooling. ATCS controls the activity of two or more compressor circuits in order to moderate the performance of the air conditioning system, aligning it with changing loads. It does so through a digital temperature controller, which sends signals from an embedded programmed controller unit in response to a range of feedback signals from the environment.

ATCS has been deployed in Malaysia with impressive energy and cost saving results. In one demonstration that took place at the UTM Faculty of Mechanical Engineering, involving retro-fitting of two air conditioning systems on the ground floor of one of the buildings, the deployment of ATCS resulted in energy savings of more than 50% during a 6-month period. In this and additional demonstrations, a steady temperature of 23°C was maintained in the building where, before the installation of the ACTS, the indoor temperature varied between 25°C and 17°C.

National technology transfer

This technology solution is under patent in Malaysia. The intellectual property (IP), which is owned by UTM, has been licensed to a start-up company called e Element Technology Sdn Bhd. In addition to the license, which enables e Element to use the technology, significant know-how about the system and manufacturing process continues to be transferred from UTM researchers to e Element Technology – and vice versa, due to a close, collaborative relationship between the Faculty of Mechanical Engineering and the company. e Element Technology is engaged in research aimed at preparing the technology for wider deployment in Malaysia, primarily in office buildings. In addition to driving commercialization of ATCS, e Element Technology provides services such as energy audit consultations.

Outlook for ATCS

ATCS has been uploaded to WIPO GREEN, and transactions involving this technology solution can benefit from the range of services offered by WIPO GREEN, including assistance with licensing and obtaining financing.

e Element Technology will consider engaging in joint research with public research and other organizations, to support deployment of ATCS in Malaysia and abroad. Deployment of ATCS in Malaysia will support the government's objective to expand green innovation and the deployment of new green technologies, at the same time reducing the country's carbon footprint and helping to alleviate climate change.

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