

ENGINEERING
TOMORROW



>45%

energy savings with
Danfoss-NOVENCO
EC+ concept

Keppel Bay Tower

1 HarbourFront Avenue

Case story | EC+ concept with VLT® HVAC Drive FC 102

Retrofitting today's buildings for a **Zero Energy future**

The situation

A landmark in Singapore's Keppel Bay waterfront area, the 18-storey Keppel Bay Tower is a true testament to Keppel's commitment to sustainability and unrivaled energy efficiency.

Following a retrofit project implementing the Danfoss EC+ concept for optimal system efficiency—featuring Danfoss AC drives, NOVENCO axial fans, and high efficiency motors—Keppel Bay Tower achieved energy savings of more than 45% in AHU operation, which contributed to making it Singapore's first BCA Green Mark Platinum Zero Energy commercial building.

Discover how Keppel Bay Tower reduced AHU power consumption by more than 45% with the Danfoss VLT® HVAC Drive FC 102 and the high efficiency EC+ concept.

The challenge

In 2018, Keppel Land leveraged a grant from the Building and Construction Authority of Singapore Government (BCA) under the Green Buildings Innovation Cluster (GBIC) Programme to implement and test new energy-efficient technologies at Keppel Bay Tower to reduce the building's energy consumption.

The tower had already achieved the BCA Green Mark Platinum status but the aim of the GBIC initiative was to reduce energy consumption by a further 20%.

Danfoss, along with long-term partner NOVENCO, proposed retrofitting an existing centrifugal fan in one of the building's air handling units (AHU) with the high efficiency EC+ concept engineered to boost the efficiency of HVAC systems in both new-build AHUs and in existing systems.

The Danfoss-NOVENCO EC+ concept proposal, which leverages the high efficiencies and integration ease of VLT® HVAC Drive FC 102, motor, and ZerAx® fan, was reviewed by industry experts appointed by the BCA and independent researchers. They could clearly see energy reduction potential in the EC+ concept combining some of the most innovative technologies in the market—while offering an easy retrofit to minimize downtime and inconvenience.

“The Danfoss-NOVENCO EC+ solution replaced traditional fan systems in the Keppel Bay Tower AHUs, integrating Danfoss AC drives to permanent magnet motors (IE5) with great ease. Independently validated energy savings were over 45%”

Deepinder Chani, Director Commercial Buildings
at Danfoss Drives

**<10
hours**
for retrofit work





The solution

As one of five technologies chosen for the GBIC initiative, the EC+ concept enables significant reduction of energy use in AHUs by means of three components: intelligent Danfoss VLT® frequency drives, NOVENCO's highly efficient ZerAx® axial flow fans, and IE4 and IE5 permanent magnet (PM) motors.

The concept is characterized by two key factors—namely the high efficiency of each of the individual components as well as their intelligent interaction. The result is a seamless, fully compatible solution that enables realization of its full potential delivering optimum system efficiency. Also, the EC+ concept offers a low-risk solution by utilizing only time-tested, proven technologies.

Unlike the centrifugal fan, axial fans utilize both the static and the dynamic pressures. The ZerAx® fan is therefore more efficient, consumes less energy, reduces operating costs, and lowers carbon emissions—plus, it reduced the sound level significantly.

Variable speed drives enable energy efficient application control, which makes them key to achieving energy savings in building operations. A HVAC-dedicated drive with built-in intelligence, the Danfoss VLT® HVAC Drive FC 102 is known for its high reliability, low total cost of ownership (TCO), and many application functions. This made it the perfect match for Keppel Bay Tower as a modern building fitted with a wealth of sophisticated solutions.

The retrofit—done in January 2019—was completed in less than 10 hours.

Advantages of the EC+ concept:

- ✓ Optimum system efficiency thanks to optimum component efficiency
- ✓ Free choice of motor technology
- ✓ Device installation and operation remain unchanged
- ✓ Manufacturer independence for all components
- ✓ Ideal for both retrofitting and new builds
- ✓ Wide range of rated powers for induction, PM, and synchronous reluctance motors

The outcome


The EC+ AHU retrofit delivered energy savings of more than 45% for Keppel Bay Tower—as well as a more pleasant environment for the building occupants thanks to the lower sound level. This result played a significant part in the 22.3% reduction in the building's annual energy consumption as of February 2020—exceeding its initial target of 20%.

Recognizing the company's efforts, Keppel Bay Tower was therefore certified by the BCA as a Green Mark Platinum Zero Energy building—the first commercial building of its kind in Singapore. And its new high-efficiency air distribution system based on the EC+ concept was one of the key contributors to this achievement.

Today, Keppel Bay Tower utilizes Danfoss-NOVENCO EC+ in all their AHUs and Keppel Land is considering similar retrofits across several other buildings.

“The achievements at Keppel Bay Tower are in line with what we see at many similar retrofits around the globe. The EC+ concept has proven capability to significantly impact global CO₂ emissions from buildings.”

Jesper Therbo, Global Director,
HVAC & Refrigeration at Danfoss Drives



22.3%
reduction in annual
energy consumption

Any information, including, but not limited to information on selection of product, its application or use, product design, weight, dimensions, capacity or any other technical data in product manuals, catalogues descriptions, advertisements, etc. and whether made available in writing, orally, electronically, online or via download, shall be considered informative, and is only binding if and to the extent, explicit reference is made in a quotation or order confirmation. Danfoss cannot accept any responsibility for possible errors in catalogues, brochures, videos and other material. Danfoss reserves the right to alter its products without notice. This also applies to products ordered but not delivered provided that such alterations can be made without changes to form, fit or function of the product. All trademarks in this material are property of Danfoss A/S or Danfoss group companies. Danfoss and the Danfoss logo are trademarks of Danfoss A/S. All rights reserved.