

Pure competence in air.

# REDUCE ENERGY CONSUMPTION WITH ZERAX<sup>®</sup> AND EC<sup>+</sup> CONCEPT



Building & Industry

**NOVENCO** 

SCHAKO Group



- EC<sup>+</sup> AHU efficiencies 85%
- Energy savings of 20-50%
- Lifetime 20<sup>+</sup>
- Complete plug-and-play
- Low sound levels
- Low maintenance costs
- ROI's between 12-18 months
- Sustainable production

# GREEN AMBASSADORS OF EC+

**NOVENCO Building & Industry is a worldwide leader in design, development and manufacture of ventilation products and systems on the technological forefront with respect to performance and durability. Together with Danfoss, we provide the most efficient system solution EC+, which radically reduces use of energy, hence increases efficiency of HVAC systems.**

## EC+ EFFICIENCY 85%



### ENERGY IN FOCUS

Today's high cost of energy as well as the increasing level of environmental awareness and political measures, spiral the search for modern and more efficient solutions in the field of energy saving. The environmentally responsible Danfoss EC+ concept in cooperation with NOVENCO is the latest market response to growing demands for energy saving. Conceived to increase efficiencies of HVAC systems, the EC+ concept offers to radically reduce use of energy in new-build AHU's and in existing systems. The concept prescribes components for optimal system design - permanent magnet (PM) motors, Danfoss VLT® frequency drives and NOVENCO's high efficient ZerAx® axial flow fans.

### THE EC+ CONCEPT

The concept builds on the idea of optimisation of the components that have the greatest effect on the overall system efficiency. In this context, the most efficient technologies are prescribed in the form of PM motors, Danfoss VFDs and ZerAx® fans. The combined system efficiency results from the following equation.

$$\eta_{\text{fan}} \times \eta_{\text{motor}} \times \eta_{\text{drive}} = \eta_{\text{system}}$$

With motor and frequency drive efficiencies both reaching above 95%, the ZerAx® efficiency of 92% brings the overall system efficiency to 85%.

### COOPERATION TO OPTIMISE AHU SYSTEMS

Danfoss and NOVENCO have joined forces to offer the most efficient system solutions for use in AHU's and other ventilation applications. The system components comprise the NOVENCO ZerAx® series of high efficiency fans, high efficiency IE4 and IE5 permanent magnet (PM) motors and the intelligent and high efficiency Danfoss VLT® frequency drives. With motor and frequency drive efficiencies both reaching above 95%, the ZerAx® efficiency of 92% brings the overall system efficiency to an impressive 85%, which is 20-25% better than the closest alternative solutions, such as direct-driven centrifugal plug fans with EC motors. It is the highest possible total system efficiency for AHU's available on the market.

### ADVANTAGES OF UPGRADING TO EC+

With its overall efficiency of 85%, the EC+ solutions are the most efficient, profitable and up-to-date available on the market. The high EC+ system efficiency promotes large economic savings and ROI's between 12-18 months. The complete plug-and-play solutions guarantee easy and fast retrofit of existing installations. The lifetimes of 20+ years and zero down-times assure very low maintenance costs. Furthermore, the environmental impact is diminished and CO<sub>2</sub> emissions are significantly reduced. All this leaves no doubt that EC+ solutions can maximise the energy efficiency of ventilation systems for the benefit of operators and the environment.

# THE EC<sup>+</sup> EFFICIENCY EQUATION



92%

NOVENCO ZERAX®  
HIGH EFFICIENT AXIAL FAN

x



95%

PM MOTOR

x



97%

DANFOSS VLT® WITH MOTOR  
INDEPENDENT TECHNOLOGY

=



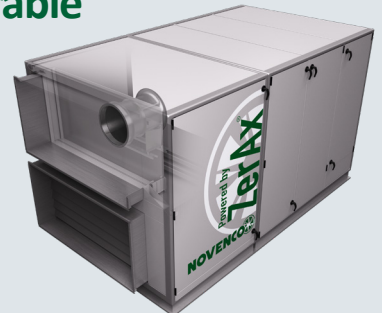
85%

**EC<sup>+</sup>**

## ENERGY SAVINGS WITH ZERAX® AND EC<sup>+</sup>

- AT LEAST 20 % COMPARED TO BEST-IN-CLASS EC FANS
- TYPICALLY 40% BY RETROFIT OF OLD PLUG FANS
- TYPICALLY 50% BY RETROFIT OF OLD CENTRIFUGAL FANS

The complete AHU length with ZerAx® fan is typically 30% shorter and lighter than a comparable system with plug fan.



System efficiencies of 85%



Energy savings of 20-50%



Lifetime of 20+ years



Complete plug-and-play



Low sound levels



ROI's between 12-18 months



Low maintenance costs



Sustainable production

# DYNAMIC PRESSURE IS THE KEYWORD

To maximise the energy efficiency of any ventilation system, fans must use both the static and dynamic pressures. The result is higher efficiencies, lower energy consumption, reduced operating costs and lower carbon emissions.

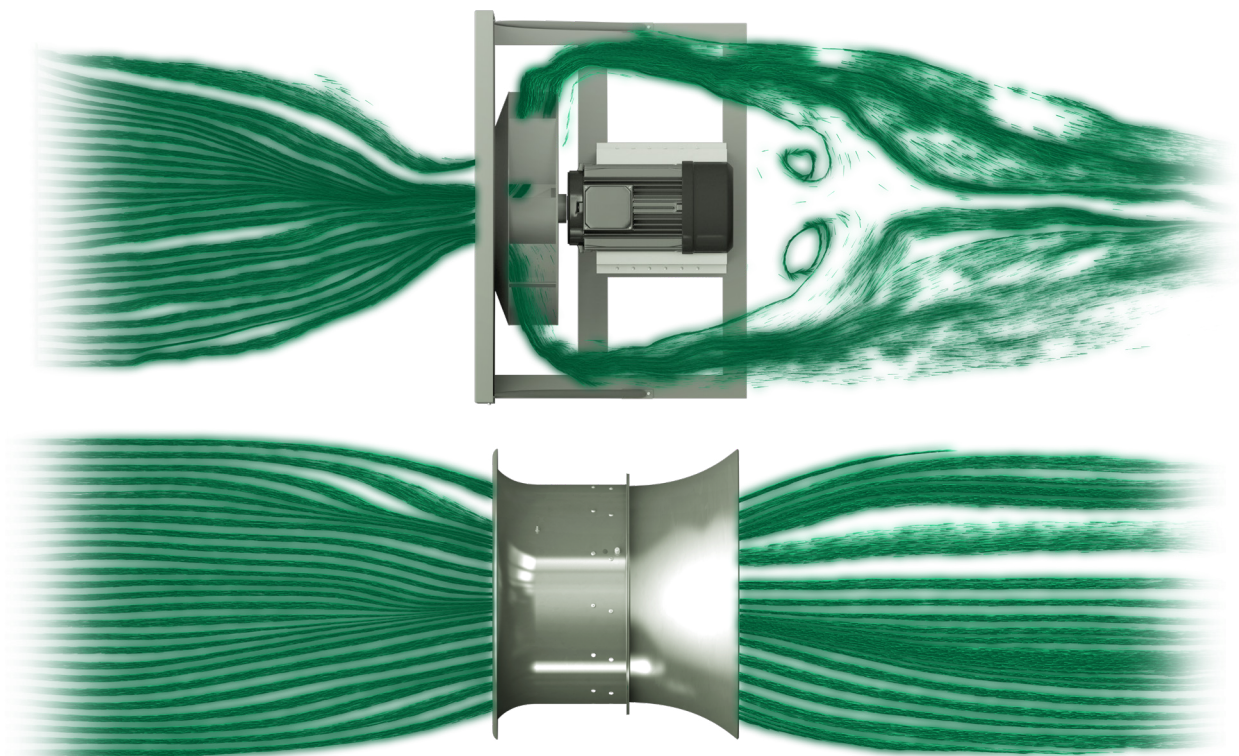
## DYNAMIC PRESSURE IS THE KEYWORD

HVAC systems which only utilise the static pressure cannot achieve efficiencies above 90%, as the dynamic pressure goes to waste.

To achieve the most energy-efficient ventilation system, fans that use both the static and dynamic pressures are required.

The efficiency of plug and centrifugal fans is calculated solely on the basis of the static pressure. This is because the systems are unable to utilise the dynamic pressure, which they literally throw away. Due to the design axial fans utilise both the static and

dynamic pressures, which in turn means that the efficiencies are based on the total pressure, which makes them capable of achieving efficiencies above 90%. Although plug and centrifugal fans are tempting because they appear simpler and more flexible than axial fans, they are an expensive choice in the long run – both in terms of operating costs and environmental impact. A high efficiency axial fan consumes less energy and reduces both costs and carbon emissions, hence the efficiency is a key critical parameter in fan solutions.



Difference in air flow between centrifugal fans and ZerAx® axial fans



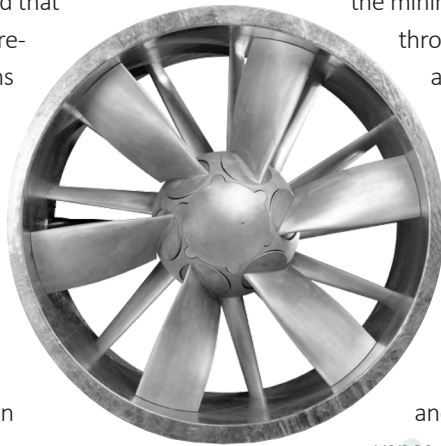
# PREMIUM FAN DESIGN FOR BEST PERFORMANCE

## NOVENCO - PURE COMPETENCE IN AIR

Since 1947 our design, development and operation of ventilation products and systems have given us vast experience. The efforts we put into research and development reflect our dedication and allow us to create products on the technological forefront with respect to performance and durability. This is what we consider necessary to stay in front in a world that changes constantly with new environment requirements and calls for innovative solutions from customers and the business environment. The challenges fuel our desire to create the next generation of ventilation products.

## ZERAX® - GREEN INNOVATION

The engineering of the ZerAx® fans is an unprecedented achievement in NOVENCO history. The ZerAx® revolutionises the design and performance of axial flow fans and is in fact an energy-saver of the future that redefines and heralds a new generation of axial flow fans with unmatched 92% efficiencies, low sound levels and a product lifetime of 20+ years. This makes the ZerAx® fans the best-in-class and ready to comply with future environmental legislation. The ZerAx® fans are strong and durable with form factors that in many cases result in smaller space requirements when replacing existing fans in AHU's. In new AHU designs, the compact form factor means that these can be smaller, less noisy and lighter. Hence, saving materials and space as well as maximising comfort levels with less sound compared to other fans. In retrofit programs, the ZerAx® ensures high levels of performance at minimum costs.



## SCULPTING THE PERFECT DESIGN

The cornerstone in the design of the ZerAx® is the airflow. Making this as unimpeded and efficient as possible optimises the fan efficiency. The inspiration for achieving this comes from the aviation industry and the design of rotors in jet engines, where creation of high thrusts is essential. The ZerAx® hub and rotor blades with the minimum blade tip clearance are ideal for shovelling air through the system. The curvature of the guide vanes after the rotor straighten the turbulences to remove air rotation and to ensure maximum pressure after the fan.

## LESS MASS AND STILL DURABLE

The rotation of the rotor requires energy and one way to reduce this is through use of light materials and optimal design. For these purposes, aluminium is a perfect choice, as it is both strong and light. Most rotating fan parts, as well as the guide vanes and motor mount, are of aluminium. The inner hub forms the only exception in the larger fan sizes, where cast steel is used in order to cope with the higher loads. The fan casing and inner tube are also of vital importance to the fan performance. The design must be strong and durable enough to withstand the loads and to minimise vibrations. Here the use of AluZinc gives the construction the sought after characteristics.

## PRECISION ASSEMBLY

The tolerances in the manufacturing of fan parts are essential for the ZerAx® performance and require high-precision machining. Assembly of the fans requires the same high accuracy to arrive at the top most efficient of axial flow fans, the ZerAx®.

## NOVENCO ZERAX® FANS

- ENERGY SAVINGS OF 20%
- 20+ YEARS LIFETIME
- COMPACT DESIGN
- EASY TO INSTALL OR RETROFIT
- LOW SOUND LEVELS
- ROI BETWEEN 12-18 MONTHS
- PVC-FREE
- RECYCLABLE MATERIALS



# CASE - VOLKSWAGEN GROUP, SPAIN

## THE PROJECT

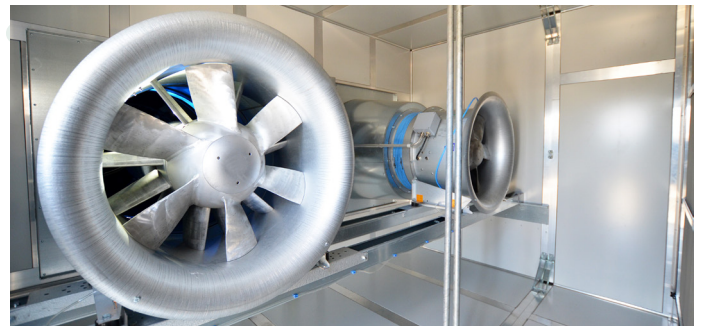
Since the beginning of 2017, Volkswagen has been intensively investigating the technical possibilities of high-efficiency axial fans and has carried out a whole series of tests, measurements and practical trials. In the beginning of 2018 it was time for the next step - implementation of the acquired knowledge and realisation of the obtained results in the form of new air handling technology. For the renewal of the ventilation system in one of the largest production buildings of the factory at Volkswagen Navarra in Pamplona, Spain, the EC<sup>+</sup> technology with highly efficient ZerAx<sup>®</sup> fans was chosen.

## TECHNOLOGY THE BEST IN CLASS

The high demands from the Volkswagen Group could only be met by the latest generation of air handling units equipped with the highly efficient ZerAx<sup>®</sup> axial fans from NOVENCO. The full potential of the EC<sup>+</sup> system is unleashed through the optimal interaction of the EC<sup>+</sup> technology components with ZerAx<sup>®</sup> axial flow fans, high efficiency permanent magnet motors and intelligent Danfoss VFDs.

## ENVIRONMENTAL EFFECTS

The Volkswagen Group assumes daily responsibility for the environment, whereby emissions receive special attention. Through innovation and impressive planning, the goal is to continuously reduce energy consumption and CO<sub>2</sub> emissions. For this strategic interest, the new device technology with ZerAx<sup>®</sup> fans fits perfectly.



NOVENCO ZerAx<sup>®</sup> axial fans in parallel operation

# CASE - JK TYRES, INDIA

## THE PROJECT

The high cost of energy and the increasing level of environmental awareness, spurred JK Tyres to search for modern and more efficient solutions in the field of energy saving for their tyre manufacturing plant in Chennai. After a large and exhaustive search for available solutions in the market, including EC fans, JK Tyres chose the market's most efficient and innovative solution known as the EC<sup>+</sup> concept. The concept has the potential to deliver efficiencies up to an impressive 85%. Not only the numbers, but also the most modern technology of the EC<sup>+</sup> concept, convinced JK Tyres to retrofit an old centrifugal fan in an existing air handling unit with an EC<sup>+</sup> solution consisting of a high efficient ZerAx<sup>®</sup> axial flow fan, a high efficiency PM motor and a Danfoss VFD - grade EC<sup>+</sup>.

## THE NUMBERS SPEAK FOR THEMSELVES

The original project expectations of 30% energy savings and an achieved implementation of more than 50% is pure proof of concept. It proves the magnitude of energy savings that is achievable by retrofitting centrifugal fans with ZerAx<sup>®</sup> axial flow fans in combination with the EC<sup>+</sup> concept.

## ENVIRONMENTAL EFFECTS

Not only have JK Tyres reduced their energy consumption, but by using the EC<sup>+</sup> technology, they have also significantly reduced their CO<sub>2</sub> emissions, which complements the environmental responsibility initiatives at the Chennai plant.



Before retrofit



After retrofit

# CASE - KEPPEL BAY TOWER, SINGAPORE

## THE PROJECT

Over 50 applicants applied to take part in the Green Buildings Innovation Cluster (GBIC) competition, arranged by the Singapore Buildings and Construction Agency (BCA), which is part of the Ministry of National Development of the Singapore Government. The objective of the GBIC program was the large scale demonstration of novel energy efficient technologies in the Keppel Bay Tower. The tower had already achieved Singapore Green Mark status as a low energy building and the aim with the GBIC initiative was to reduce the energy consumption by a further 20%. Out of the original 50 applicants, BCA chose 5 technology partners for the trial. NOVENCO Building & Industry's proposal to retrofit an existing plug fan in an AHU with a high efficiency ZerAx® axial fan was chosen due to the significant energy reduction potential indicated by measurements and verification techniques. The ease of the retrofit work was a further contributing factor.

## RETROFIT IN LESS THAN 10 HOURS

For the project the most modern technology of the EC<sup>+</sup> concept

with a highly efficient ZerAx® axial flow fan, high efficiency motor and Danfoss VFD was selected. The retrofit work was completed in an impressive time of less than 10 hours. The energy savings, as verified by Nanyang Technological University (NTU), who were appointed as independent adjudicators, were at least 43%.



Before retrofit



After retrofit

# CASE - ONE RAFFLES QUAY, SINGAPORE

## THE PROJECT

One Raffles Quay is owned by Raffles Quay Asset Management (RQAM) who are committed to sustainability in all aspects of construction, design and daily operations of the building. RQAM is investigating ways to reduce the energy consumption of their HVAC systems as a part of continuous efforts to reduce the energy consumption and carbon footprint in line with the Government of Singapore implementation of the 2030 Agenda for Sustainable Development. This involves retrofitting of existing AHU's, that operate with standard plug fans, with high efficiency fans. As the office space is occupied by many of the world's major financial institutions, continuous working of the HVAC systems is critical. In order to prevent costly downtime due to maintenance or operational failures, RQAM therefore required the AHU's to be fitted with at least two fans sized at 50% each.

## PROOF OF CONCEPT

NOVENCO Building & Industry conducted two Proof of Concepts (POC) with the highly efficient ZerAx® axial flow fans at the One Raffles Quay, to verify the feasibility and huge potential.

The results of the POC's were impressive, but more importantly also convincing - were the energy savings of 41% with a single ZerAx® fan installation and 53% with the twin ZerAx® fan option sized at 50% each.



Before retrofit



After retrofit

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13 CLIMATE ACTION



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