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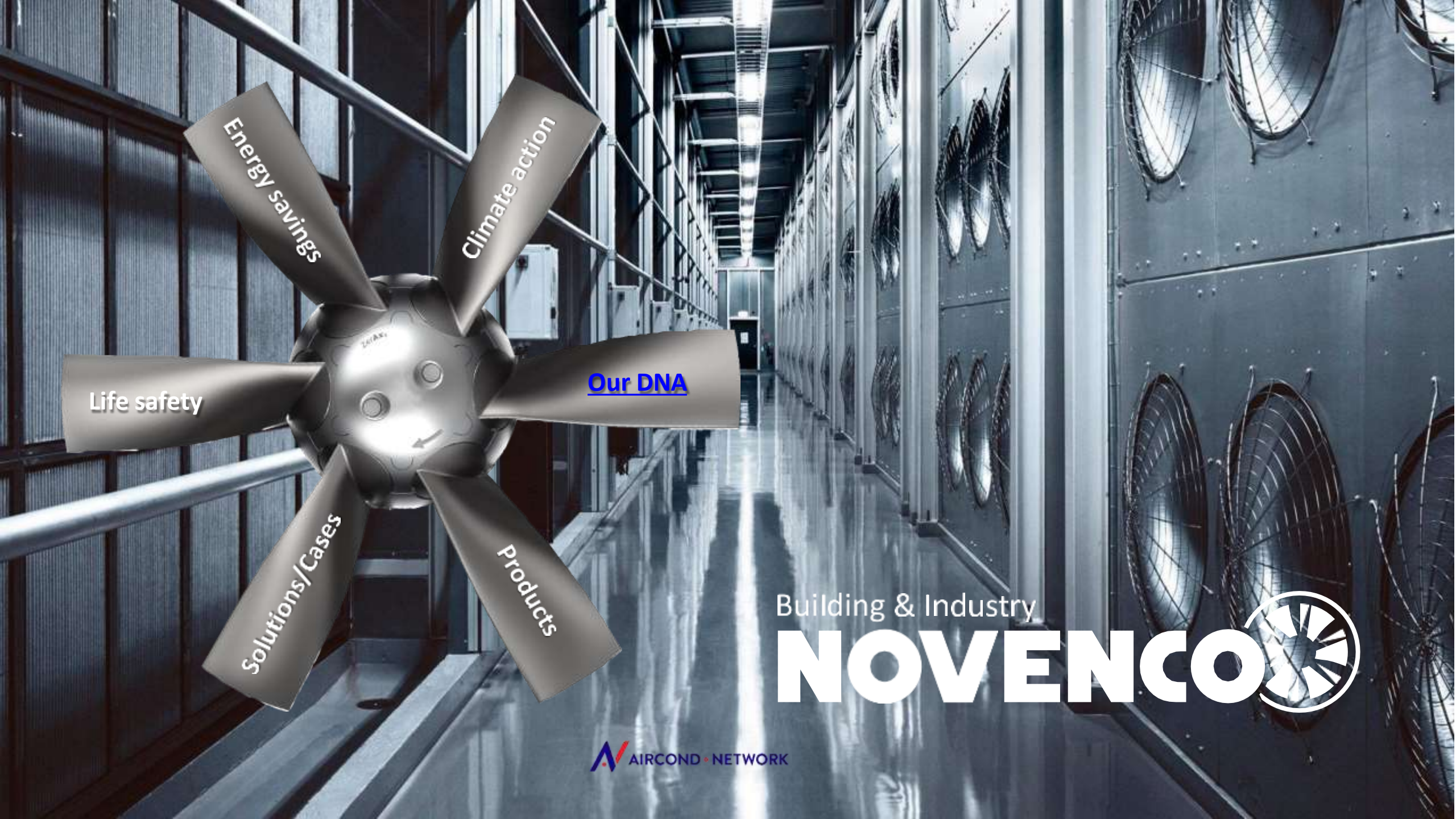
Building & Industry
NOVENCO
SCHAKO Group



Building & Industry

NOVENCO

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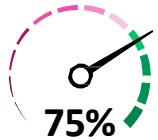
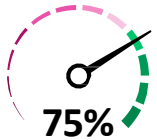
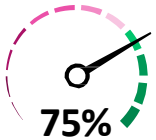
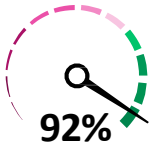
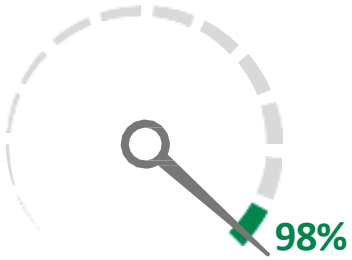
Fan type	**Centrifugal belt drive** Backward curved	**Centrifugal plug fan** Backward curved		**NOVENCO Axial ZerAx® fan** Vane axial
Motor	Induction motors		EC Motors IE4	Permanent magnet (EC) motors IE5
Speed control	**Fixed speed or VFD**		**Built-in speed control**	**VFD**
Impeller efficiency				
Total efficiency	Fan(75%)*Belt(95%)*Motor(91.2%)*VFD(97%) **≈63%**	Fan(75%)* Motor(93.7%)*VFD(97%) **≈68%**	Fan(75%)* Motor(93%) **≈70%**	Fan(92%)* Motor(95%)*VFD(98%) **≈85%**

Drive



Danfoss VFD® with motor independent technology

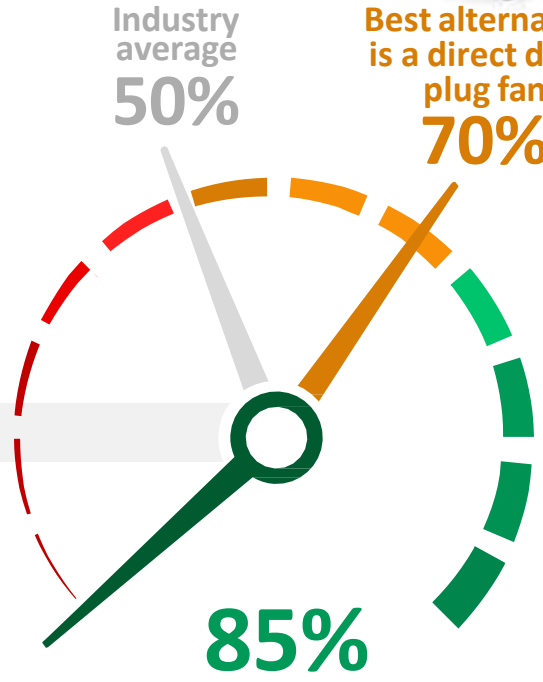
Motor

Permanent-Magnetic motor from preferred supplier

Fan

ZerAx® Fan by NOVENCO

EC+



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Air Flow Through Plug Fan & Zerax High Efficiency Axial Fan

Air Flow Through AHU Using (EC) Plug Fan

Air Flow acceleration Into fan opening losing energy.

Turbulences at fan outlet flow energy gets lost

Second air flow acceleration into ductwork

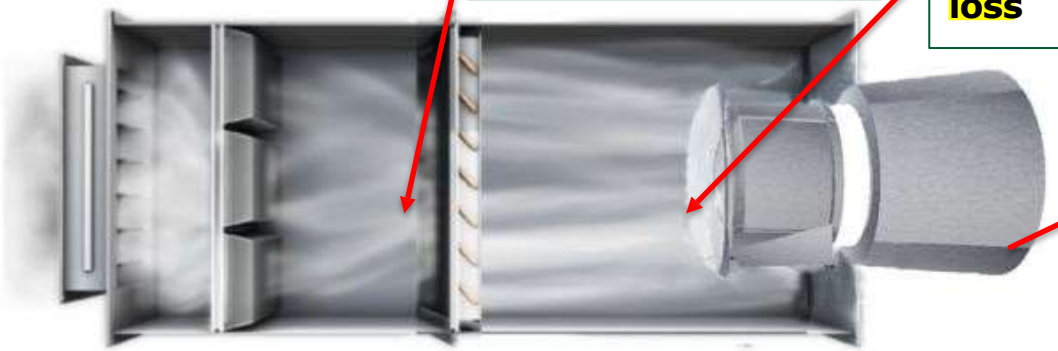
If more than one fan is installed air paths will collide losing energy

Air is discharged at 90° and bends a further 90° losing energy

Air Flow Through AHU using Novenco Zerax High Efficiency Fan

Uniform Air Flow through AHU

Laminar airflow results in reduced AHU internal pressure loss



Air is discharged directly into ductwork utilizing both static and dynamic pressure.

Factors that makes **NOVENCO ZerAx®**

Reach **92%** efficiency

BLADES TIP CLEARANCE HUB DESIGN GUIDE VANES FAN CASING **92%**

UNIQUE BLADE EFFICIENCY

- The design of the blades brings the efficiency up to 92%
- The highest level ever for ventilation fans
- Blades are adjustable to provide optimum performance for different applications

BLADES TIP CLEARANCE HUB DESIGN GUIDE VANES FAN CASING 92%

MINIMUM BLADE TIP CLEARANCE

The clearance between the impeller blade tips and the fan casing is decisive for the performance. Three critical factors make it possible for NOVENCO to have the smallest tip clearance ever achieved by the ventilation industry. It requires very high precision in:

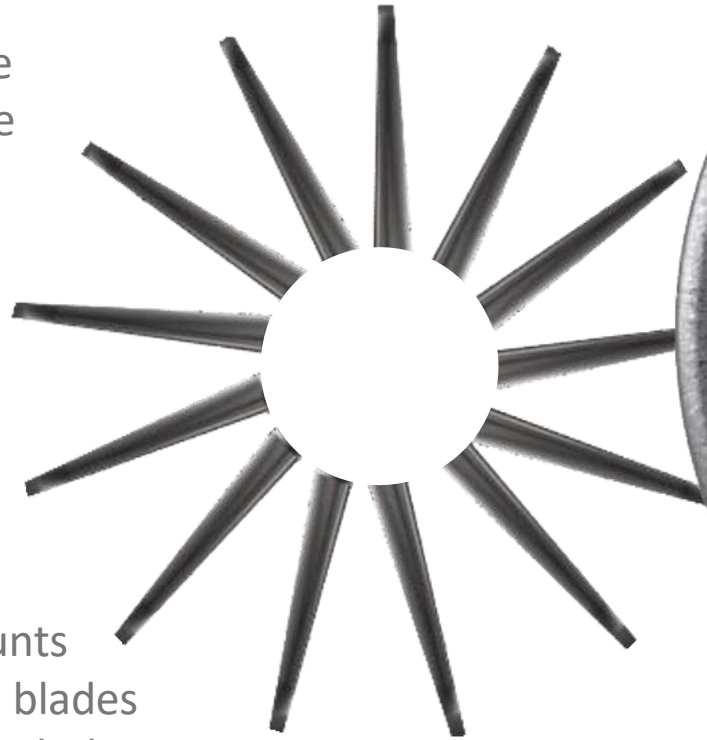
- Casing production
- Fan assembly
- Milling of impeller blades

INNOVATIVE HUB DESIGN

- The hub and hub cover are designed for optimum performance
- The design is similar to the hub design of jet engines
- Both hub and cover are casted aluminium

PROFILED GUIDE VANES

- The guide vanes are optimised to reduce air rotation after the fan
- The vanes ensure maximum dynamic pressure under all running conditions
- The vanes also mounts the motor, hub and blades causing minimum turbulence



DURABLE FAN CASING

- The fan casing is of strong material and kept short to optimise durability
- The design and material add rigidity and minimises critical vibrations
- 100% accuracy of the casing is a must to benefit from and make minimal tip clearance possible

IT IS ALL THESE FACTORS COMBINED

That makes ZerAx® reach **efficiency degree of 92%** - #1 fan in the world

BLADES TIP CLEARANCE HUB DESIGN GUIDE VANES FAN CASING **92%**

Singapore Projects References

Key Achievements

ORQ 41% energy savings for 1 x 100% option (1 Novenco Fan)
ORQ 53% energy savings for 2 x 50% option (2 Novenco Fan)

Keppel Bay Tower energy savings 43%

International Plaza air flow of existing system improved by 30%

New Saiver AHU, 35% energy savings over AHU with plug fan

Singapore Projects References

Key Achievements

DBS energy savings efficiency of 26%

GF completed New Daikin AHU, 55.9% energy savings over AHU with plug fan

UTAC energy savings of 38%

STC energy savings efficiency of 2 AHUs - 39% and 57%

Singapore Projects References

Key Achievements

MARINA SQUARE

MSQ energy savings efficiency of 32%

CHANGI airport singapore

Terminal 2 energy savings efficiency of 41%

Proof of Concept for Retrofit Application

Retrofit of Air Handling Units

Keppel Bay Tower

Together with Danfoss- Novenco, has successfully retrofit an old centrifugal fan in an existing air handling unit with a high efficient ZerAx® axial flow fan, high efficiency motor and Danfoss VFD at Keppel Bay Tower.

The improvement of the aerodynamic performance of the ZerAx® fan, the total static pressure of the AHU system is reduced.

	Baseline	Post	Remarks
Average Fan Power	13.53 kW	6.96 kW	Savings of 48.6%
Average Normalized Air Flow	31,355 CMH	30,095 CMH	4% difference 1,260CMH
Average Supply Air Temperature	12.43 deg C	12.67 deg C	
Average Total Static Pressure	1,067 Pa	669.75 Pa	
Specific Fan Power	0.433 W/CMH	0.230 W/CMH	Savings of 46.8%
Annual Energy Consumption	39,279 kWh	18,807 kWh	20,472 kWh per year (52.1 % savings)

Proof of Concept for Retrofit Application

Pre retrofit installation

Post retrofit installation

Total Energy Savings of 45-48%

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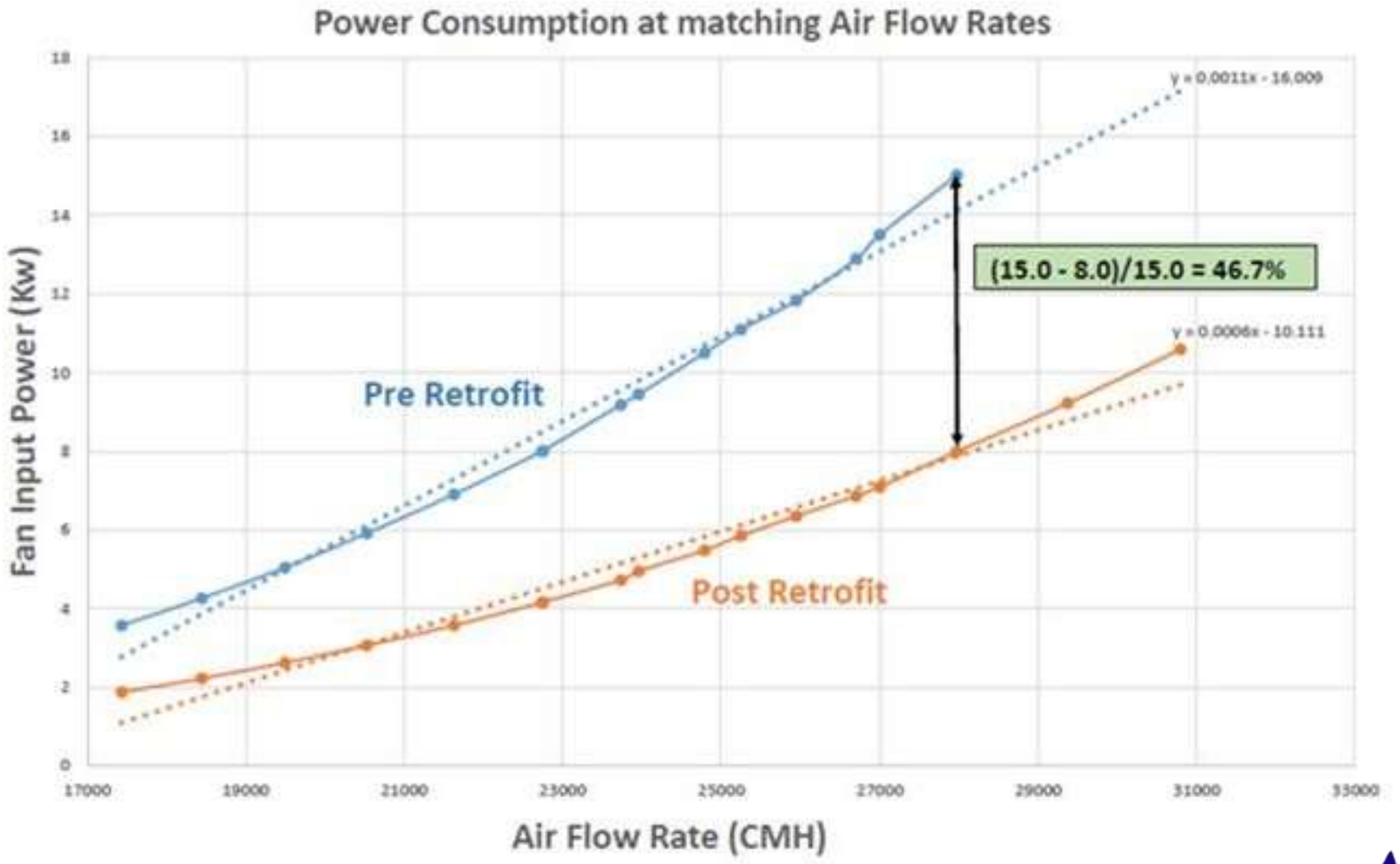
Pre and Post Retrofit Power Consumption at Matching Air Flow Rates



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Summary

High Efficiency Danfoss VLT with Motor Independence Technology (up to 98% efficiency)

+

High Efficiency PM Motor (IE5 up to 95% effficiency)

+

High Efficiency Novenco Axial Fan (up to 92% efficiency)

=

High Efficiency EC+ Solution

1. Commitment to save 25% at same air flow rate.
1. Achieved 45-48% at matching air flow rate.
1. Sound level reduced in office space.
1. Reduced maintenance due to removal of belts and pulleys.
1. Reports on site indicate that excellent conditions are being achieved in all areas of the office space.

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REMOVE INSERT INSTALL

Fast

Retrofitting of Air Handling Units

- ✓ Existing centrifugal fan is demounted
- ✓ Existing frame is removed
- ✓ New slides and frames are inserted
- ✓ ZerAx® slides in
- ✓ ZerAx® is mounted
- ✓ Ready to save up to **50% energy**

REMOVE INSERT INSTALL

Thank You