EUROVENT
MIDDLE EAST

HVACR
Leadership
Workshops

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Agenda

1. Food Retail Stores - A focus on Energy Efficient Refrigeration
2. How Air Curtains can be used to reduce thermal energy losses in the retail sector
3. Doing More with Less: Smart Stores and Energy Efficiency
4. Energy Savings through the Enterprise Management Platform
5. Case Studies on Air Conditioning and Refrigeration Retrofits in the Retail Sector
6. Moderated discussion

Food Retail Stores: Energy Efficient Refrigeration

John Austin-Davies

B.Sc., C.Eng., M.I.Mech.E., F.Inst. R.

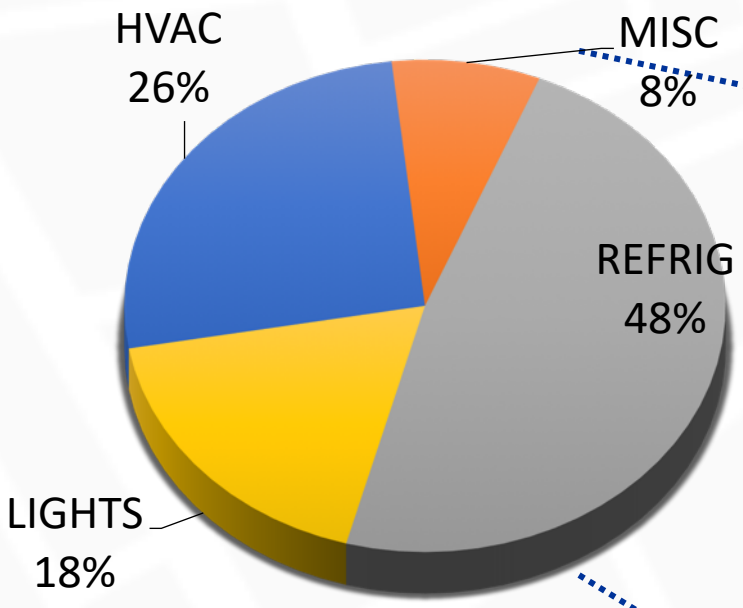
Agenda

- Food Retail Multiples – Key Demands of Refrigeration
- Refrigeration Energy Analysis
- Techniques to Improve Energy Efficiency
- The relationship between energy efficiency and the worldwide environmental initiatives

The Key Demands

- Safety
- Food Preservation with Top Quality
- Reliability
- Lowest Operating Cost
- Environment Sustainability

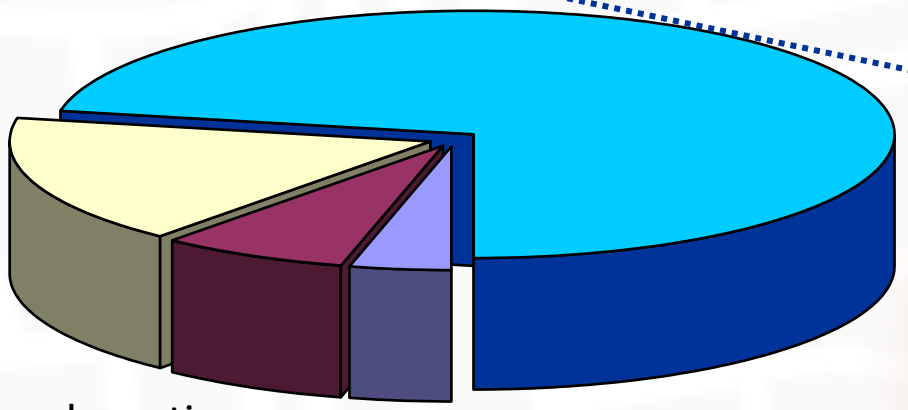
Energy Pi



90% 10%

Compressor & Condenser

72%



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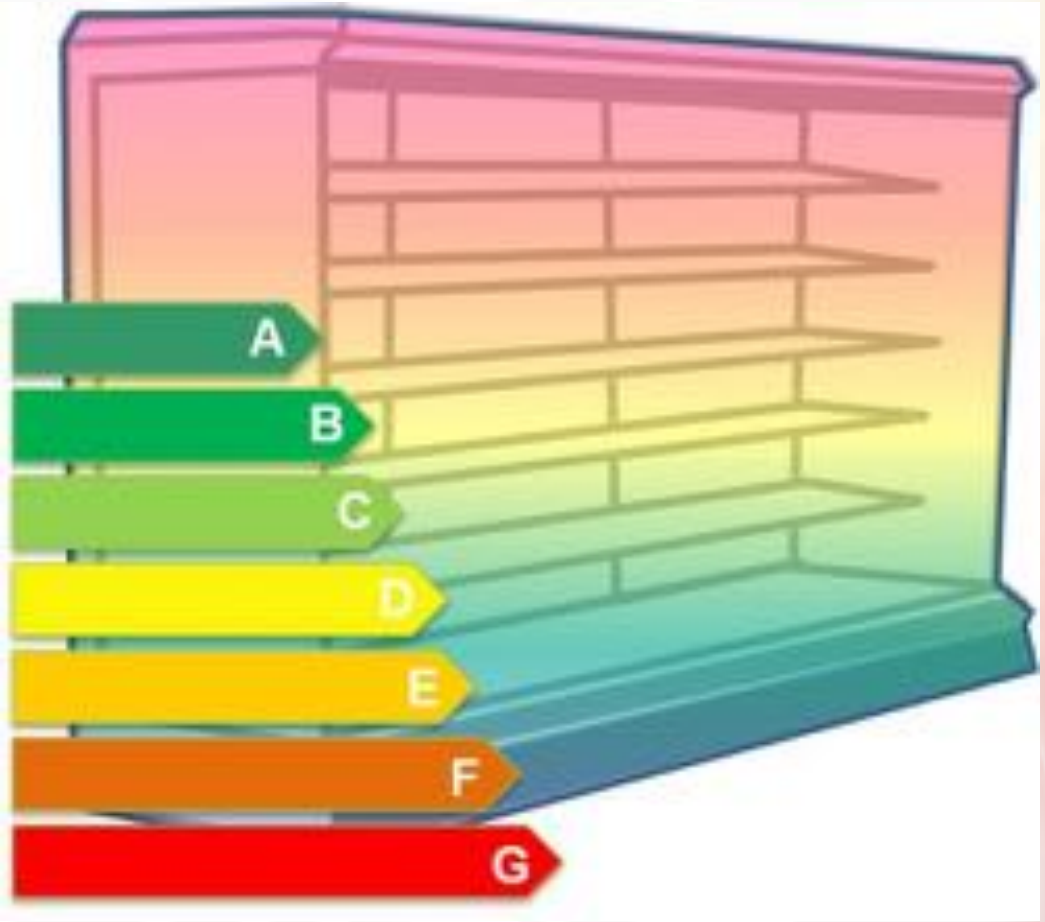
Food Preservation with Top Quality



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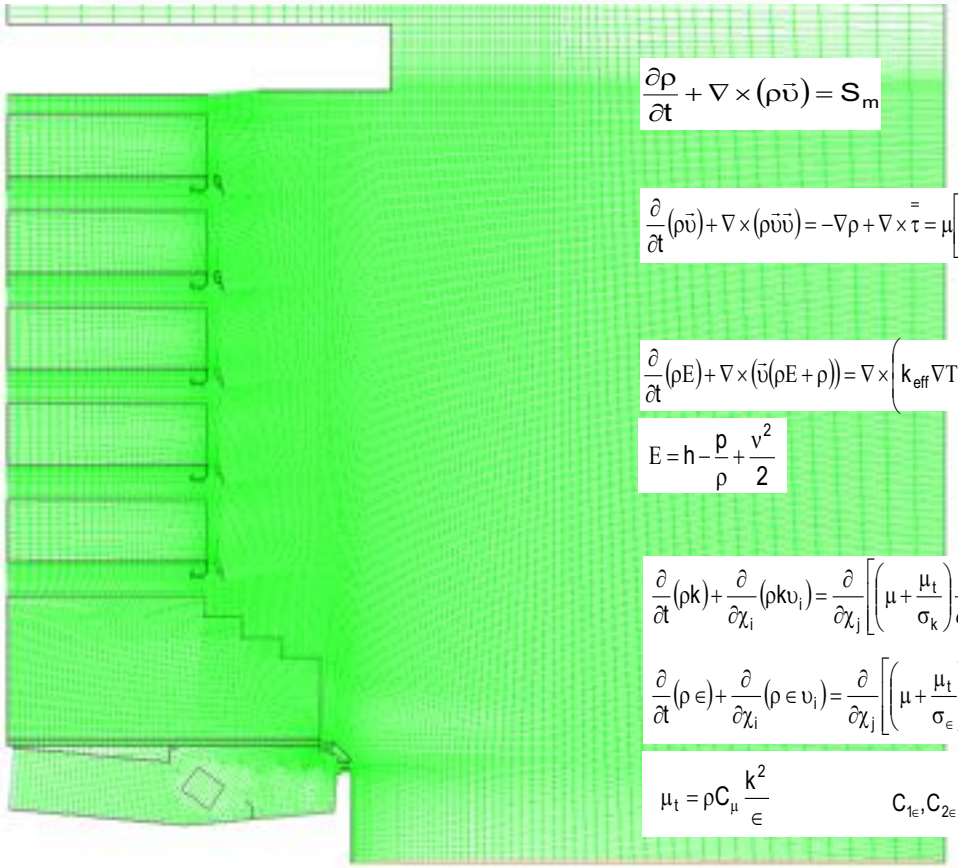
CFD – Computational Fluid Dynamics



$$\frac{\partial \rho}{\partial t} + \nabla \times (\rho \vec{v}) = S_m$$

$$\frac{\partial}{\partial t}(\rho \vec{v}) + \nabla \times (\rho \vec{v}\vec{v}) = -\nabla p + \nabla \times \bar{\bar{\tau}} = \mu\left[(\nabla \vec{v} + \nabla \vec{v}^T) - \frac{2}{3}\nabla + \vec{v}I\right] + \rho\vec{g} + \vec{F}$$

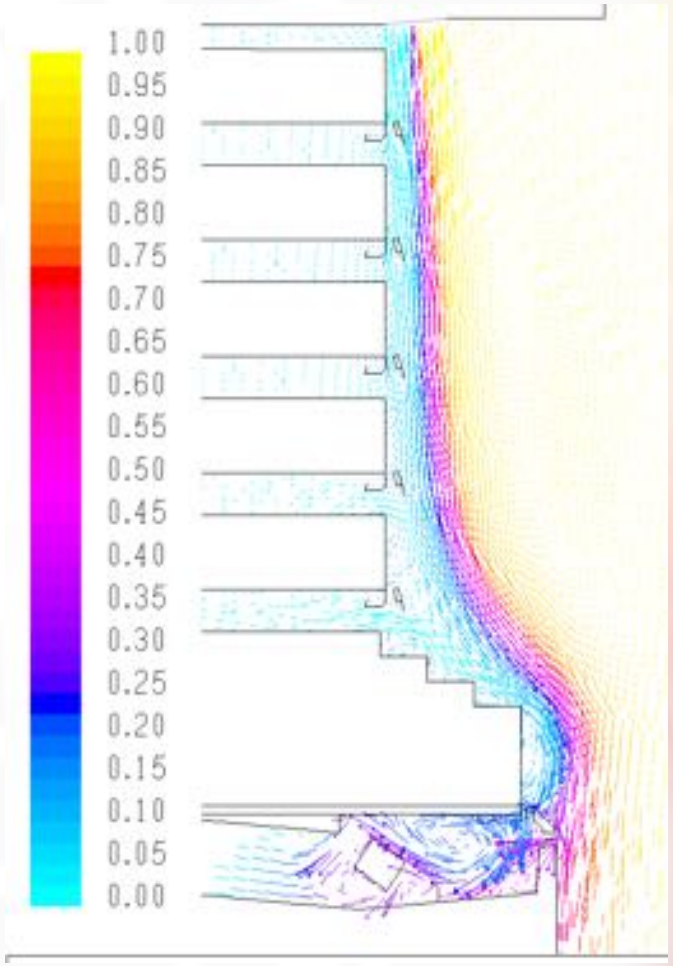
$$\frac{\partial}{\partial t}(\rho E) + \nabla \times (\vec{v}(\rho E + p)) = \nabla \times \left(k_{eff}\nabla T - \sum_j h_j \vec{J}_j + (\bar{\bar{T}}_{eff} \times \vec{v})\right) + S_h$$

$$E = h - \frac{p}{\rho} + \frac{v^2}{2}$$

$$\frac{\partial}{\partial t}(\rho k) + \frac{\partial}{\partial \chi_i}(\rho k v_i) = \frac{\partial}{\partial \chi_j}\left[\left(\mu + \frac{\mu_t}{\sigma_k}\right)\frac{\partial k}{\partial \chi_j}\right] + -p\overline{q'u'}\frac{\partial u_j}{\partial \chi_{i\,j}} + -\frac{1}{p}\left(\frac{\partial \rho}{\partial T}\right)_{pgi}\frac{\mu t}{Pr_t}\frac{\partial T}{\partial \chi_i} - p\epsilon$$

$$\frac{\partial}{\partial t}(\rho \epsilon) + \frac{\partial}{\partial \chi_i}(\rho \epsilon v_i) = \frac{\partial}{\partial \chi_j}\left[\left(\mu + \frac{\mu_t}{\sigma_\epsilon}\right)\frac{\partial \epsilon}{\partial \chi_j}\right] + C_{1\epsilon}\frac{\epsilon}{k}\left(p\overline{q'u'}\frac{\partial u_j}{\partial \chi_i} + C_{3\epsilon}\frac{1}{p}\left(\frac{\partial \rho}{\partial T}\right)_{pgi}\frac{\mu t}{Pr_t}\frac{\partial T}{\partial \chi_i}\right) - C_{2\epsilon}\rho\frac{\epsilon^2}{k}$$

$$\mu_t = \rho C_\mu \frac{k^2}{\epsilon} \qquad C_{1\epsilon}, C_{2\epsilon}, C_\mu, \sigma_k, \text{and} \sigma_\epsilon \text{ are constants}$$



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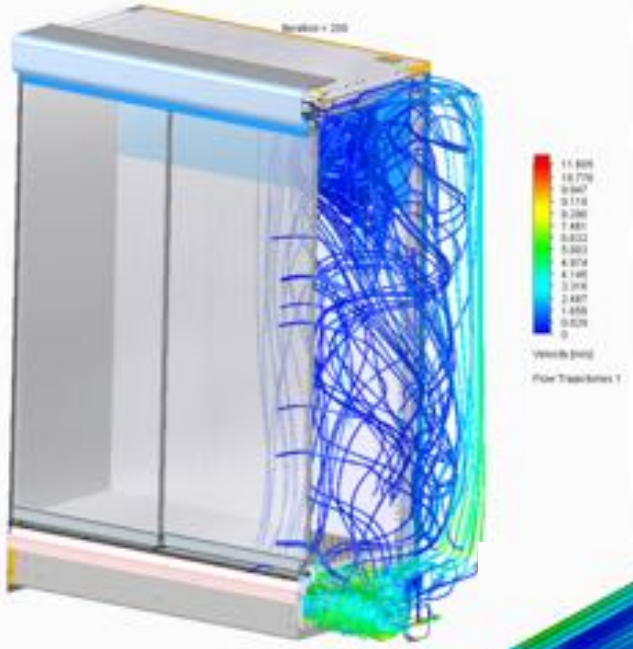

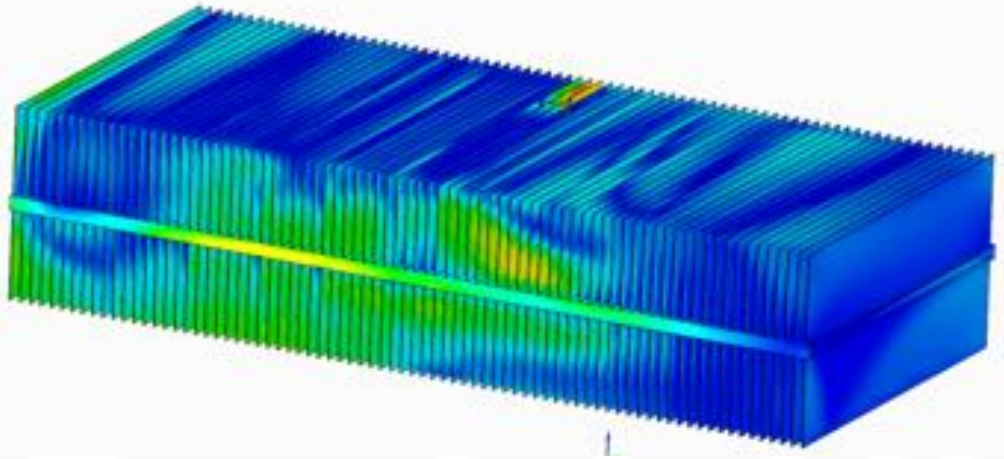

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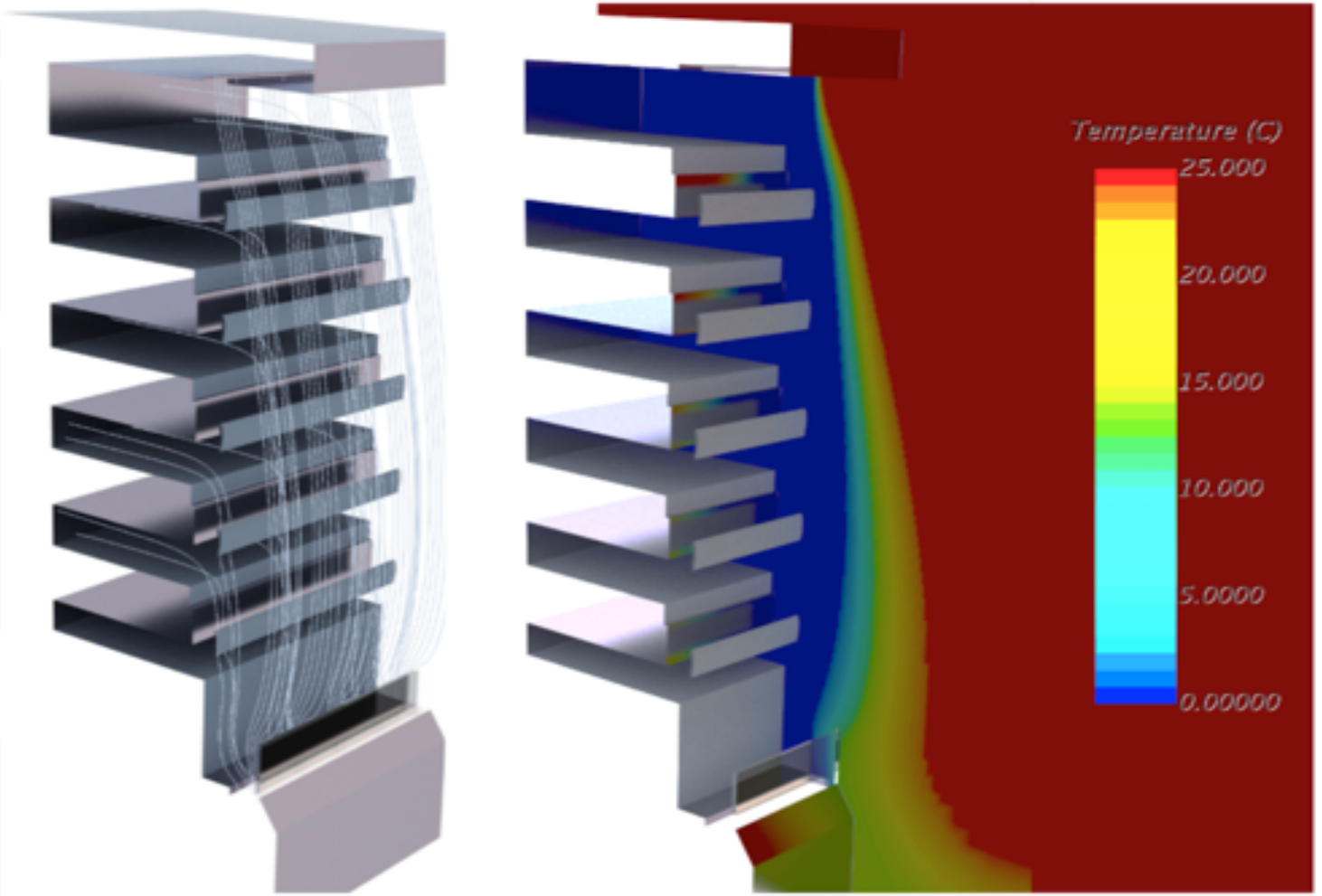
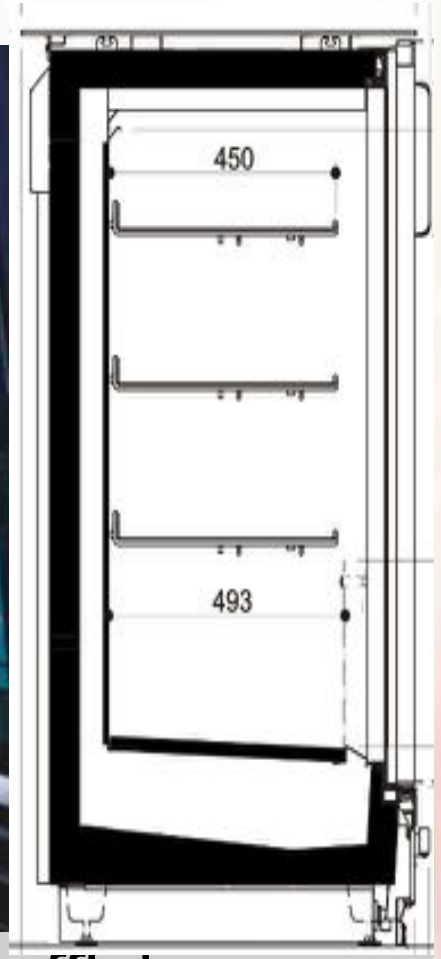


- Shelf-edge devices save approx 15% v traditional open

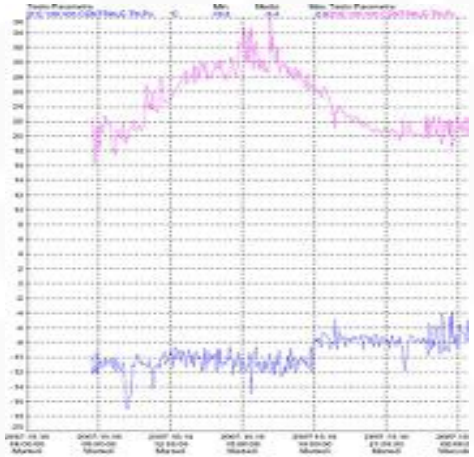
- Glass-door chill saves approx 50% compared with open



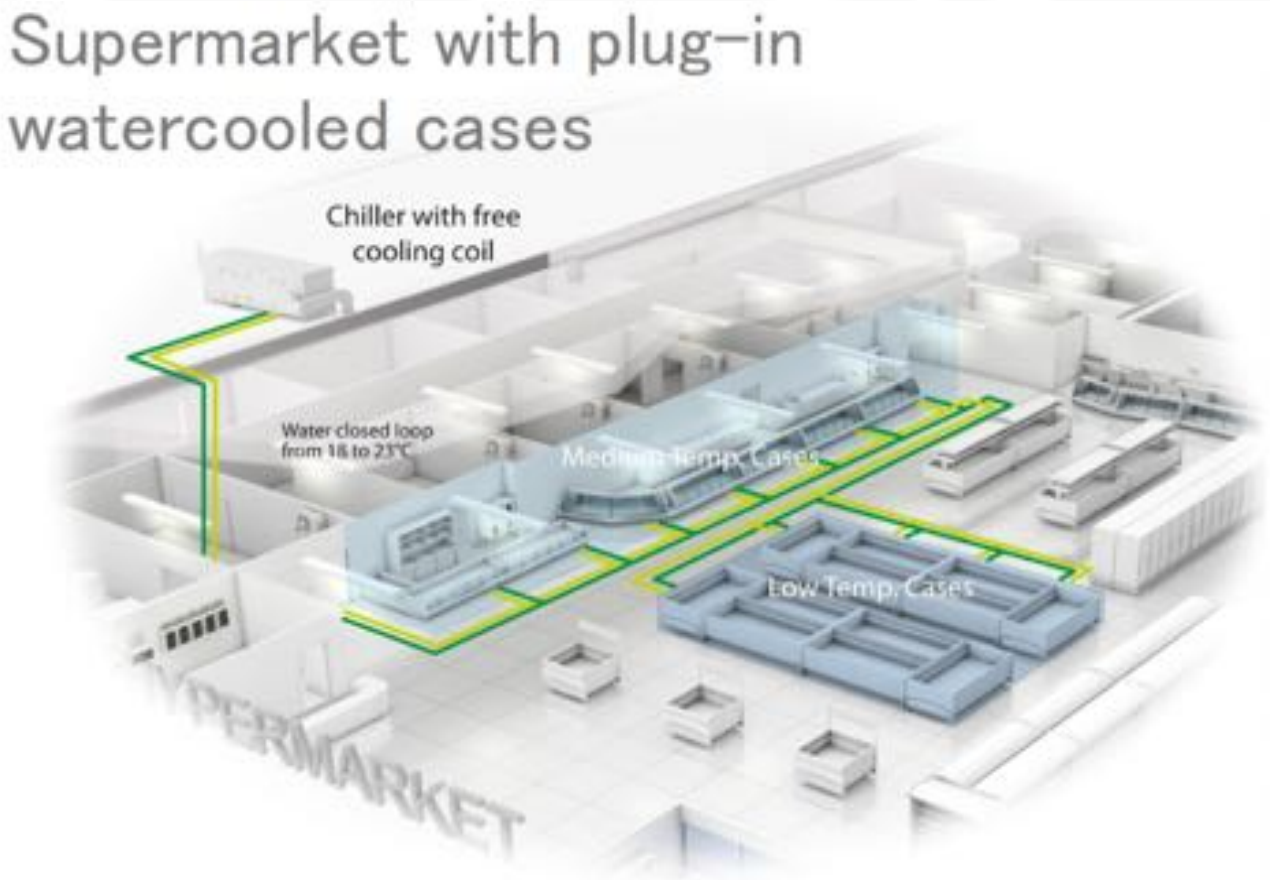
- Frozen – Insulation and Glass Door Technology efficiency

Other means for energy efficiency

- Design, Installation and Commissioning of Variable Speed Drives
- LED lighting specialisation
- Frozen cabinet zero-energy doors
- High efficiency fans



Reliable Operation – Minimum Refrigerant Leakage



- Full size supermarket cabinets

- Low refrigerant charge, in self-contained units ... factory tested

- No high pressure refrigerant distribution

- Installation without machinery room

- Water chiller can be combined into A/C

- Heat is not added into sales area (not as typical plug-in cabinet)

- Each unit is optimised for efficiency

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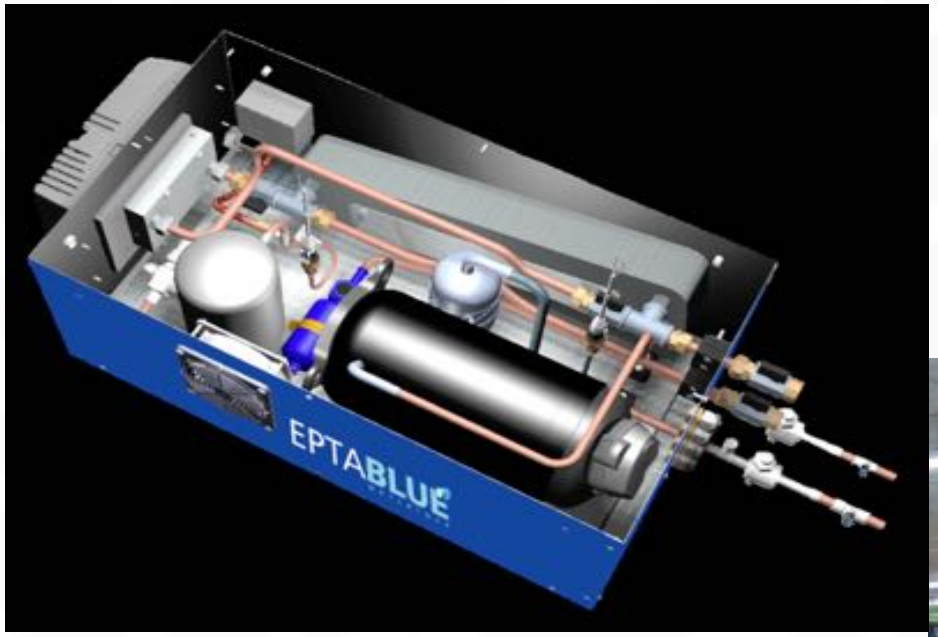
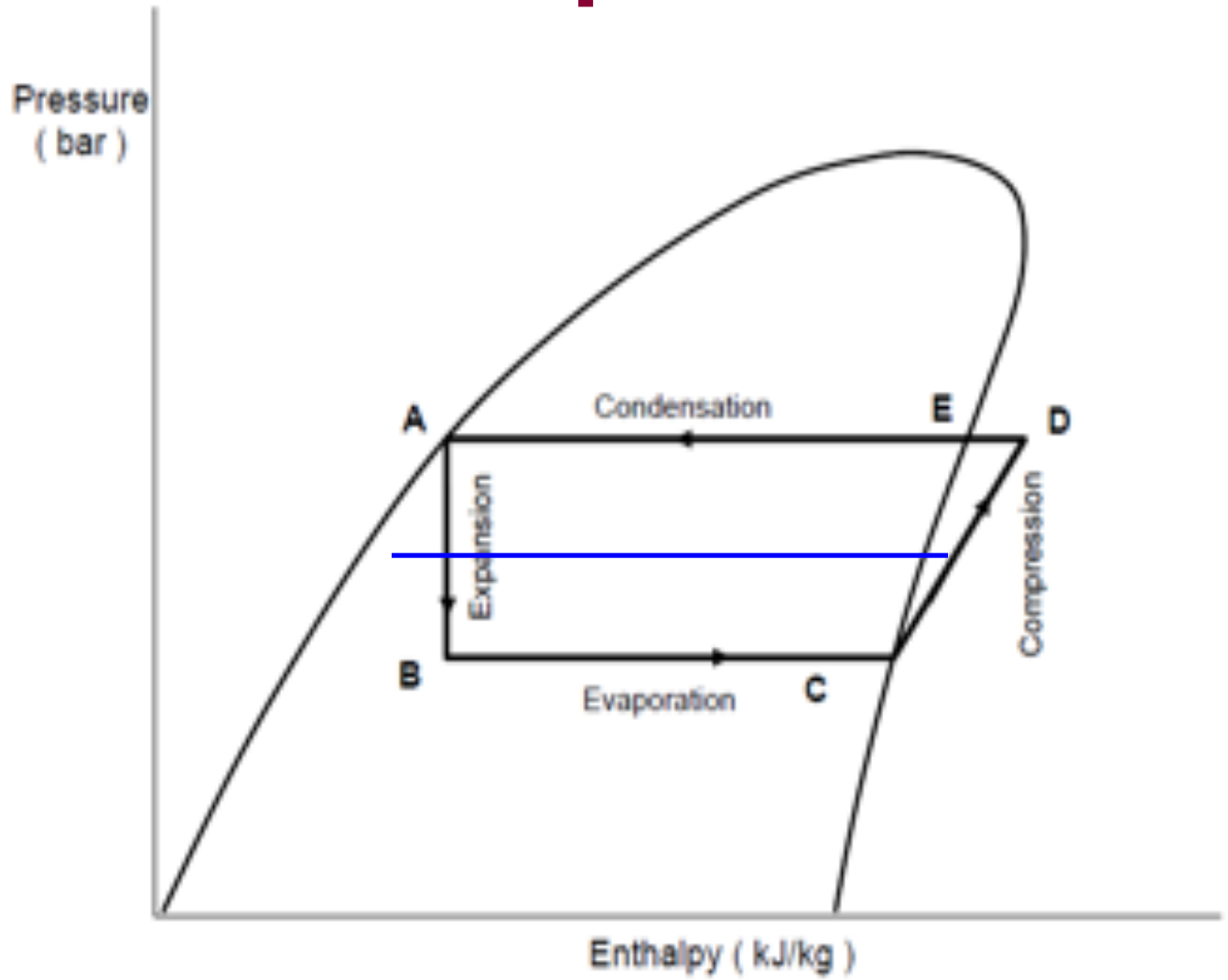
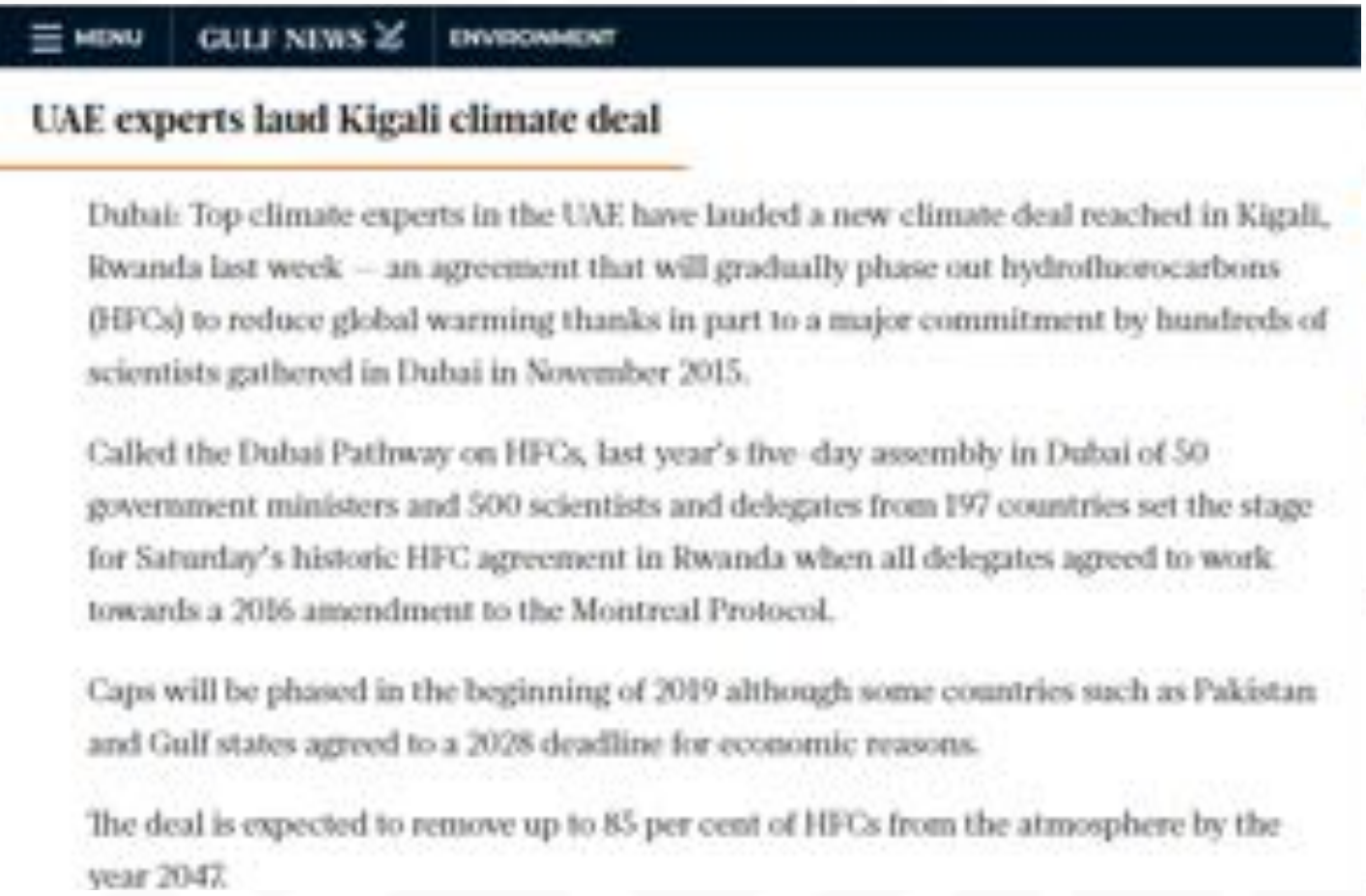
Water-Cooled … Integrated



Water-Cooled … Optimised





MENU GULF NEWS ENVIRONMENT

UAE experts laud Kigali climate deal

Dubai: Top climate experts in the UAE have lauded a new climate deal reached in Kigali, Rwanda last week — an agreement that will gradually phase out hydrofluorocarbons (HFCs) to reduce global warming thanks in part to a major commitment by hundreds of scientists gathered in Dubai in November 2015.

Called the Dubai Pathway on HFCs, last year's five-day assembly in Dubai of 50 government ministers and 500 scientists and delegates from 197 countries set the stage for Saturday's historic HFC agreement in Rwanda when all delegates agreed to work towards a 2016 amendment to the Montreal Protocol.

Caps will be phased in the beginning of 2019 although some countries such as Pakistan and Gulf states agreed to a 2028 deadline for economic reasons.

The deal is expected to remove up to 85 per cent of HFCs from the atmosphere by the year 2047.

GULF NEWS

OPINION

Editorials Op-Eds Letters Columnists

Dubai Pathway successful in planning end of HFCs

Montreal Protocol is one of the few bright spots in the human race's battle to save the planet

Published: October 16, 2016 16:57
Gulf News

The terrible way that the human race has abused its planet is abundantly clear. Global warming, endemic pollution and a destructive reliance on unsustainable energy are only a few indications of a much wider danger that casual abuse can continue to the long term destruction of the planet's biosphere. Therefore it is heartening when we find examples of the global community taking action to stop the crisis.

HFC Phase-Out – The Kigali International Agreement

	Non-A5 (developed countries)	A5 (developing countries) Group 1	A5 (developing countries) Group 2
Baseline HFC component	2011-2013 (average consumption)	2020-2022 (average consumption)	2024-2026 (average consumption)
Baseline HCFC component	15% of baseline	65% of baseline	65% of baseline
Freeze	-	2024	2028
1st step	2019 - 10%	2029 - 10%	2032 - 10%
2nd step	2024 - 40%	2035 - 30%	2037 - 20%
3rd step	2029 - 70%	2040 - 50%	2042 - 30%
4th step	2034 - 80%	-	-
Plateau	2036 - 85%	2045 - 80%	2047 - 85%
Notes	Belarus, Russian Federation, Kazakhstan, Tajikistan, Uzbekistan, 25% HCFC component and 1st two steps are later: 5% in 2020, 35% in 2025	Article 5 countries not part of Group 2	GCC (Saudi Arabia, Kuwait, United Arab Emirates, Qatar, Bahrain, Oman), India, Iran, Iraq, Pakistan

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Greenhouse Warming Refrigerants

- **R404A=3,922**
- R410A=2,088
- R407A=2,107
- R407F=1,825
- R134A=1,430
- HFO1234yf=5
- R1270=2
- **R290=3**
- **R744 (CO_2)=1**

Each refrigerant is measured by considering the release of 1Kg of refrigerant compared to CO_2 … so for example, R404A has a GWP (Global Warming Potential) of 3922 CO_2 equivalent (the release of 1Kg has the same effect of release of nearly 4 Tonnes CO_2!)

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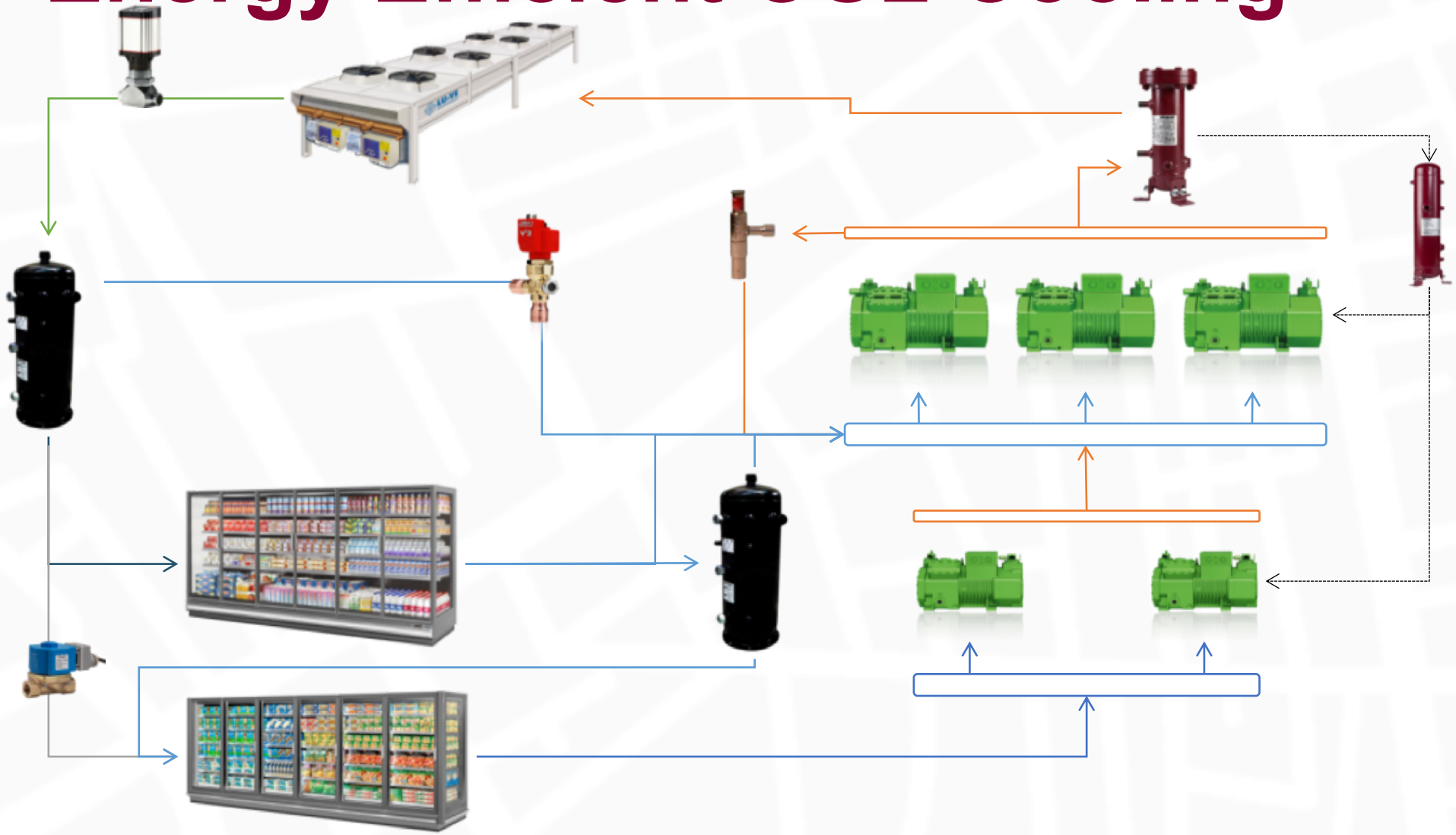
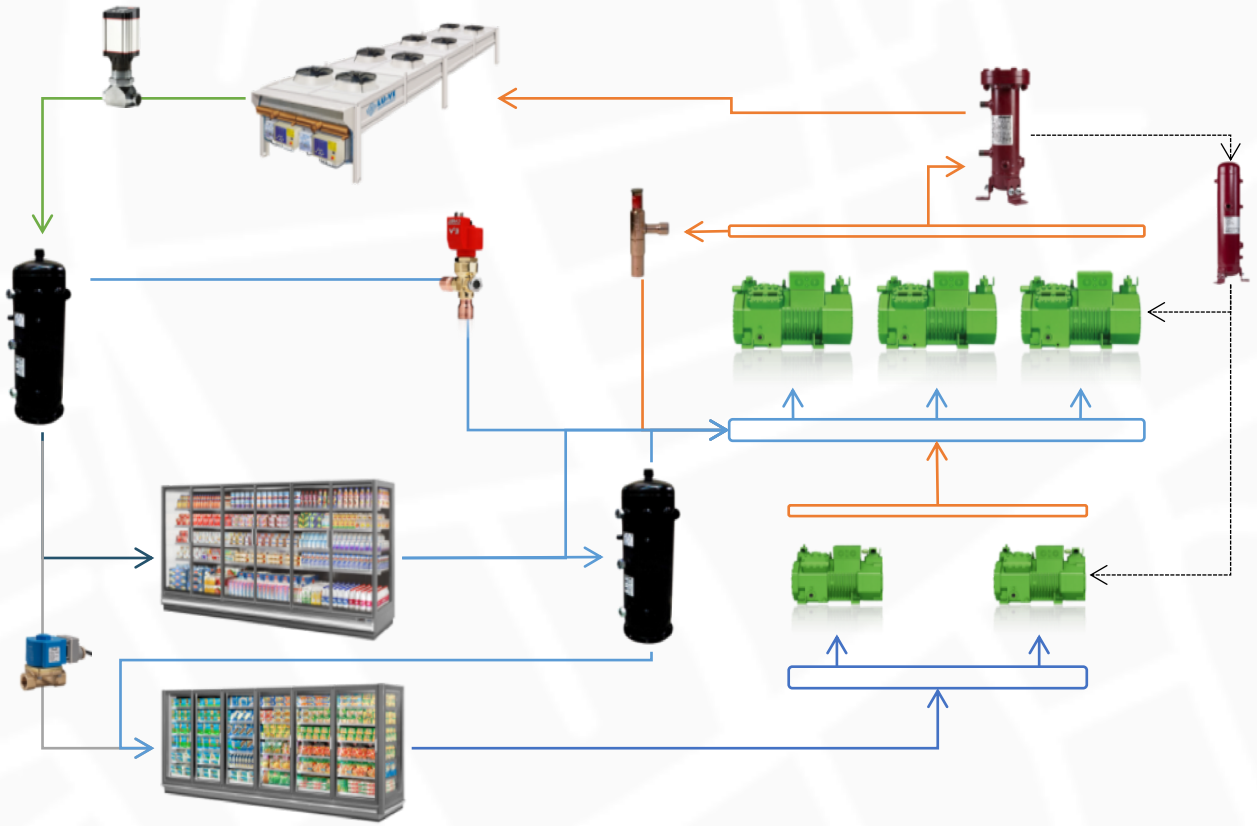
Energy Efficient CO2 Cooling





- A Simple mechanical solution, hence **reliable**
- Reduced oil temperature combined endorsed by
- Improved efficiency during **all climatic condition**

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Summary

- The most **Energy Efficient** refrigeration system starts with a focus on **technology in design** of the Cabinets and Coldrooms
- **Alternative systems** are available to Optimise Efficiency ... Important to recognise best application
- The Middle East states are now preparing for **HFC phase-out** legislation ... this is achievable whilst improving efficiency
- **CO_2 systems** that are Energy Efficient and Reliable in hot climates are now well proven


Thank You

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Benefits of Air Curtains in Cold Storage Applications

Jan Svallingson

Business Development Director, Frico

Agenda

- Introduction
- Open Door Facts
- Alternatives used today
- Solutions and Functions
- Case Studies
- Air Curtain Types
- Summary and Benefits

Air Curtains

Key energy saving opportunities

Applications

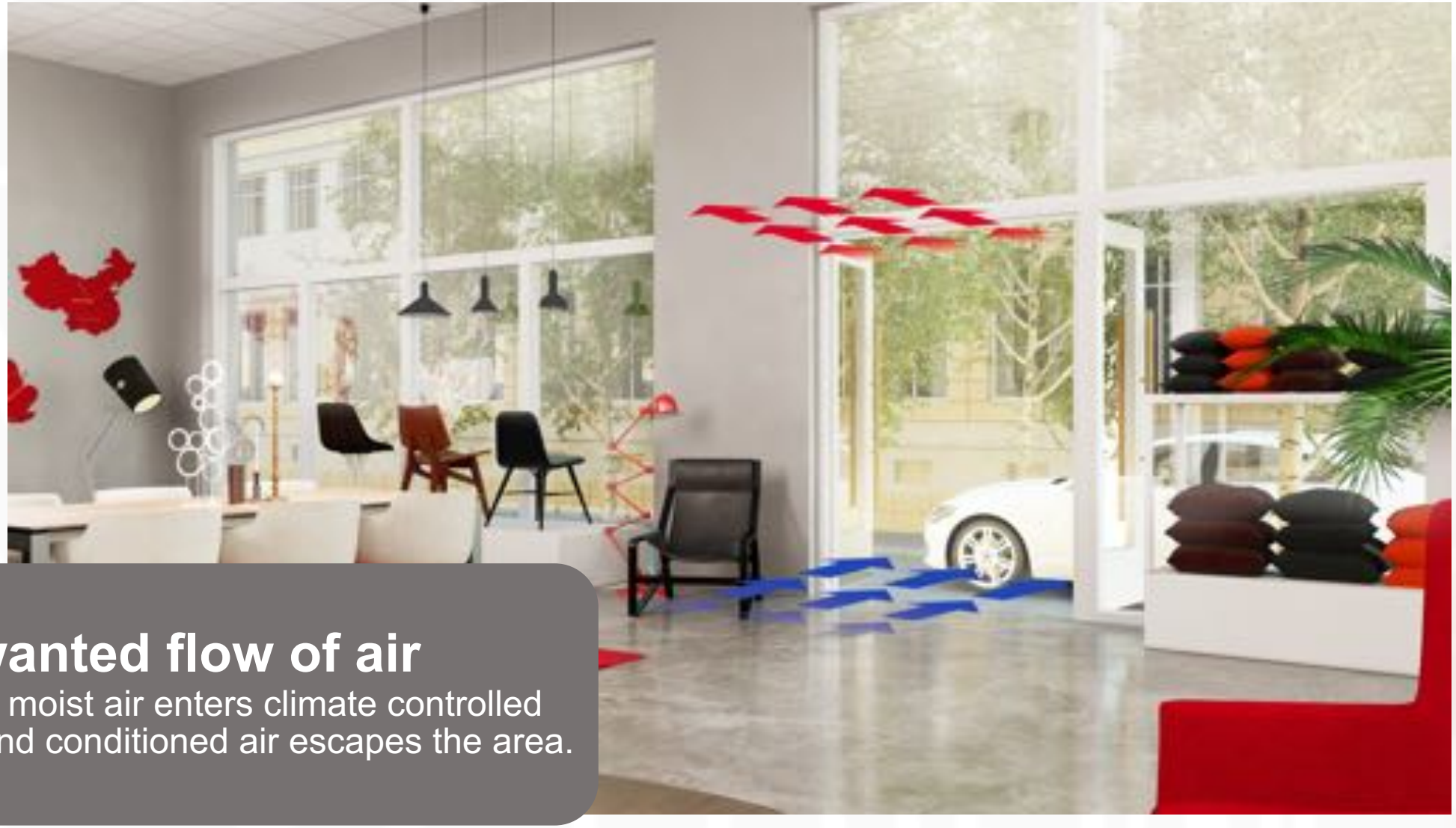
Energy savings by using Air Curtains

- Air Curtains protect the cold chain
- Safe operation compared to PVC strip curtains
- Hygienic application
- Reduced maintenance requirements

Open Door Facts

Open door

An open door has an huge impact on the energy consumption



Unwanted flow of air

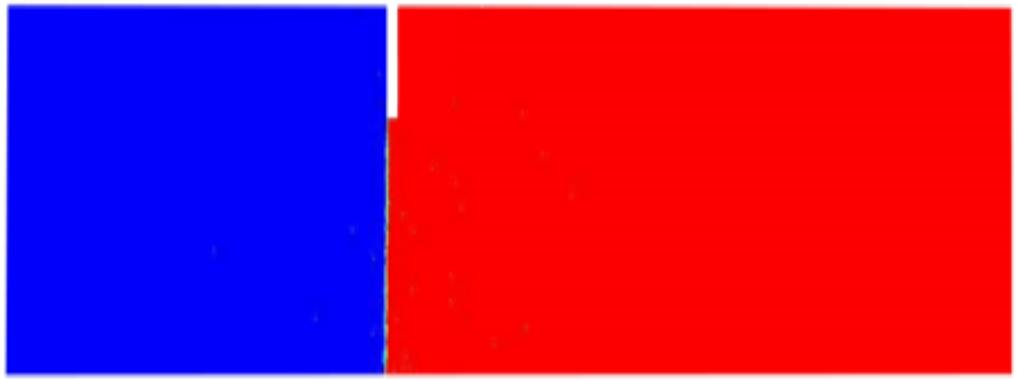
Warm, moist air enters climate controlled area and conditioned air escapes the area.

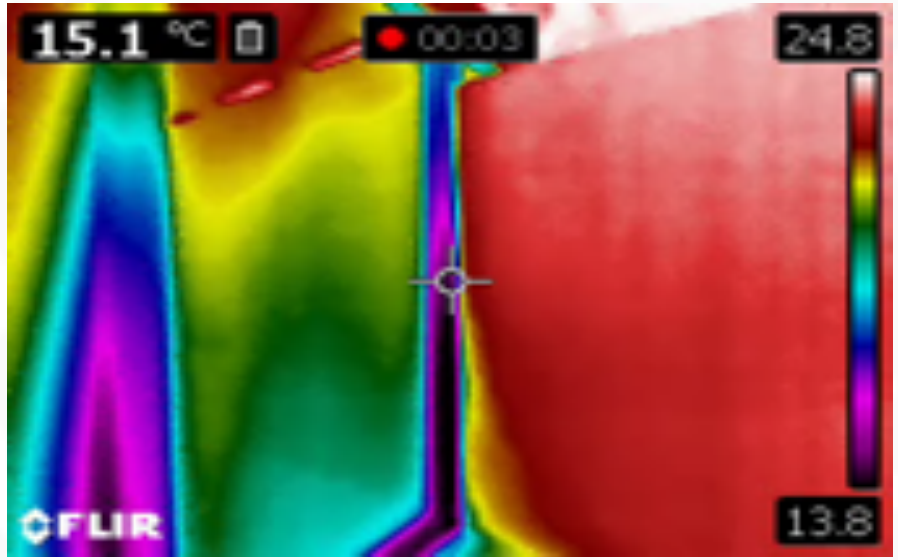
Inflow of particles and insects

Unclean environment, poor indoor air quality and discomfort

Open doors

When a door opens the pressure and density difference between the inside and outside air leads to an exchange of air - warm, moist air enters top third of the opening and cold air escapes bottom third.





No barrier

Nothing to hinder particles and insects from entering.

Alternatives used today

Alternatives used in cold storage

Plastic strips are a safety hazard due to the low visibility and the bacterial impact. They quickly get unclean and break easily.

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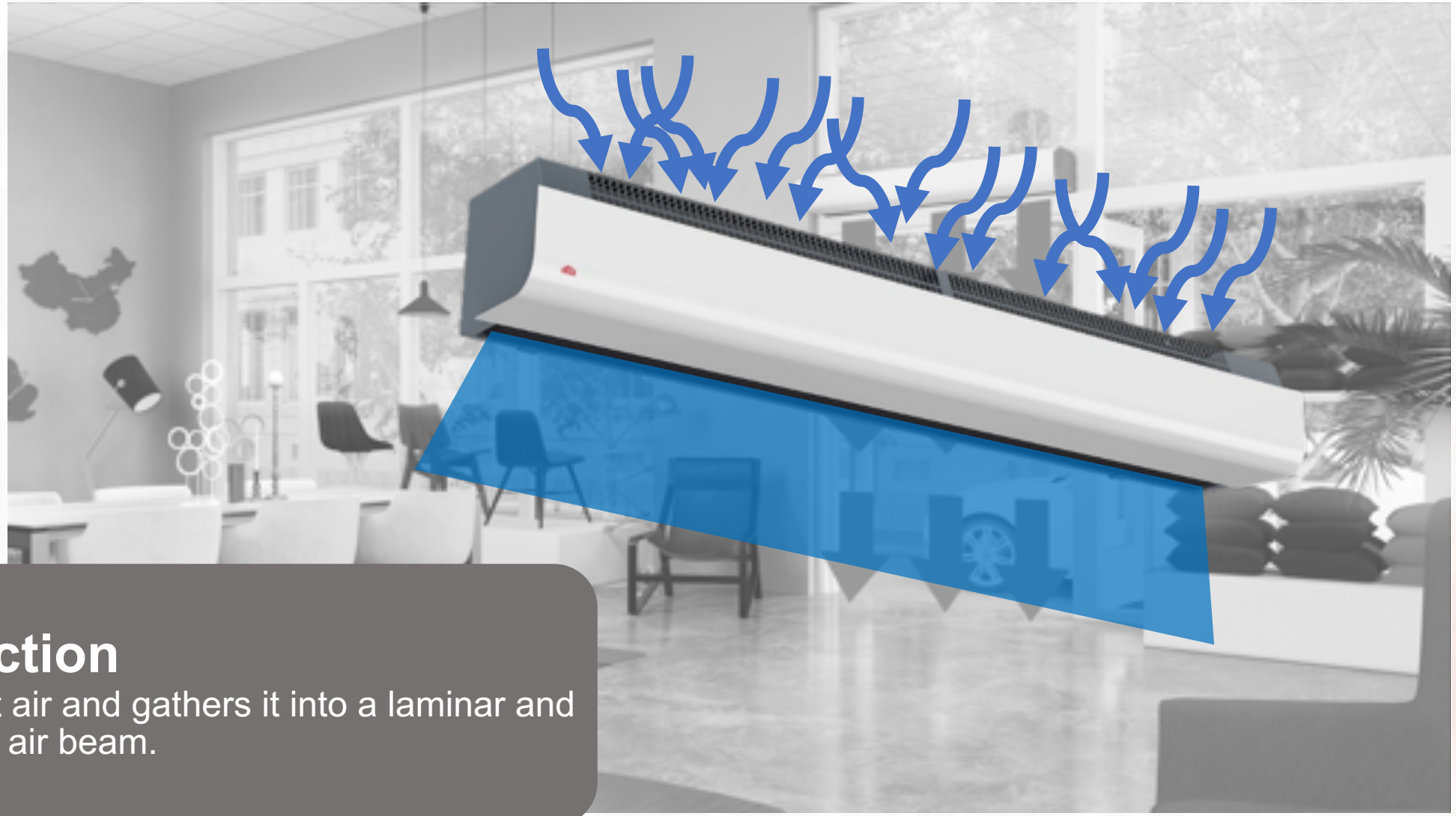
Air Curtains as a Solution and Function

Solution

Installation of air curtains is frequently used for doors

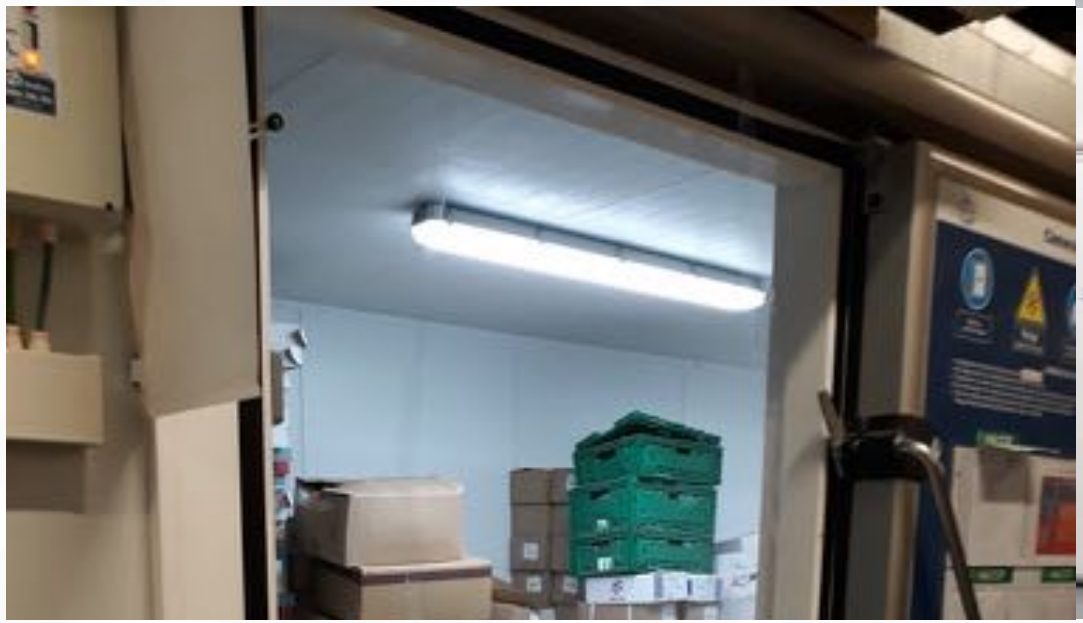


Function

Collect air and gathers it into a laminar and unified air beam.

Improves Visibility

By replacing the plastic strips with air curtains you get an uninterrupted view of the storage area.



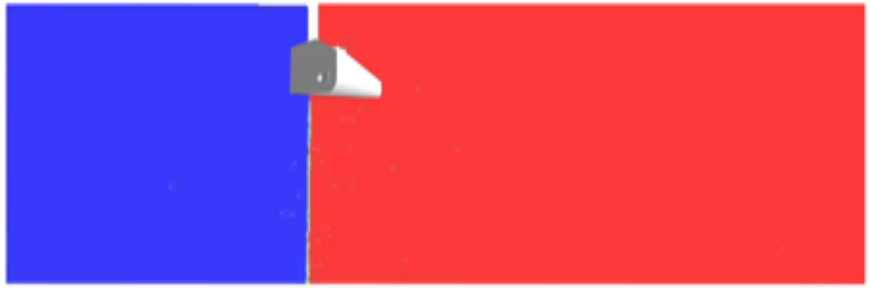
Ice Build-Up

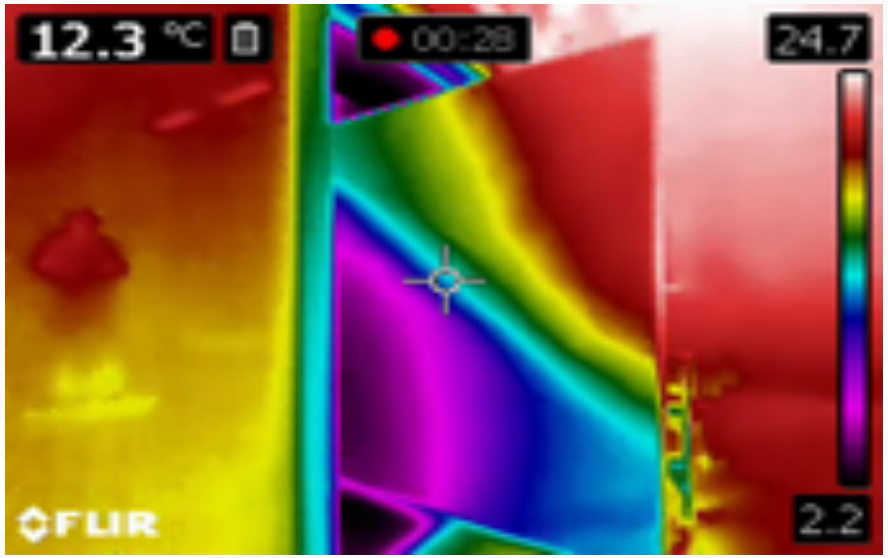
Inflow of warm, moist air lead to ice and frost building which generate frequent defrost and service along with safety hazards.

Reduced ice and frost building by restraining inflow of warm, moist air with an air curtain.

Air barrier

Air curtains reduce the opening size and thereby restrain the warm, moist air from entering controlled climate areas, at the same time conditioned air is retained in the area it was intended for.



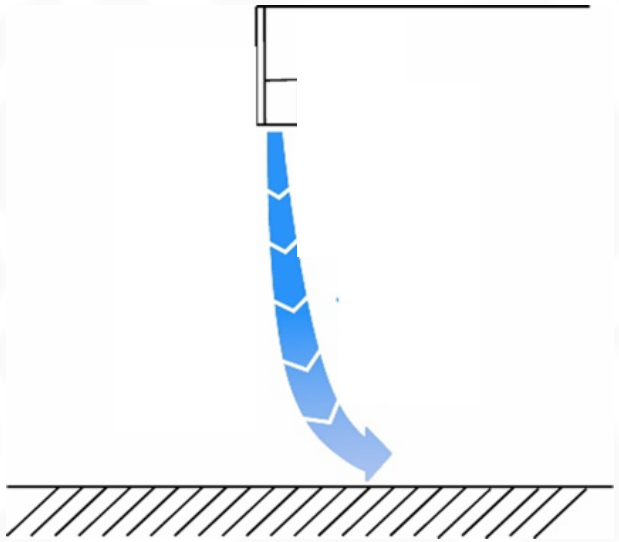


Reduced infiltration of particles and insects.

Key Benefits of Air Curtains

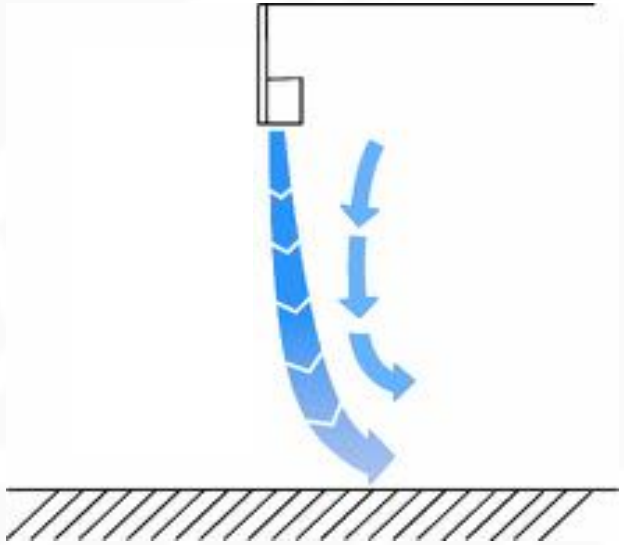
Reduce

Reduce the size of an opening



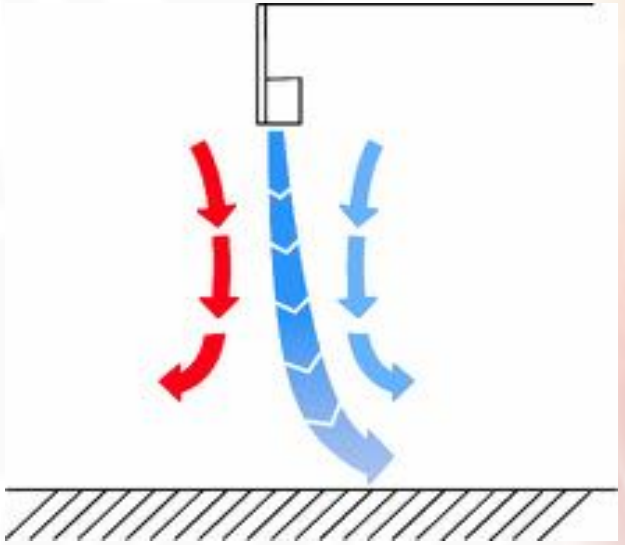
Retain

Keep the cooled air



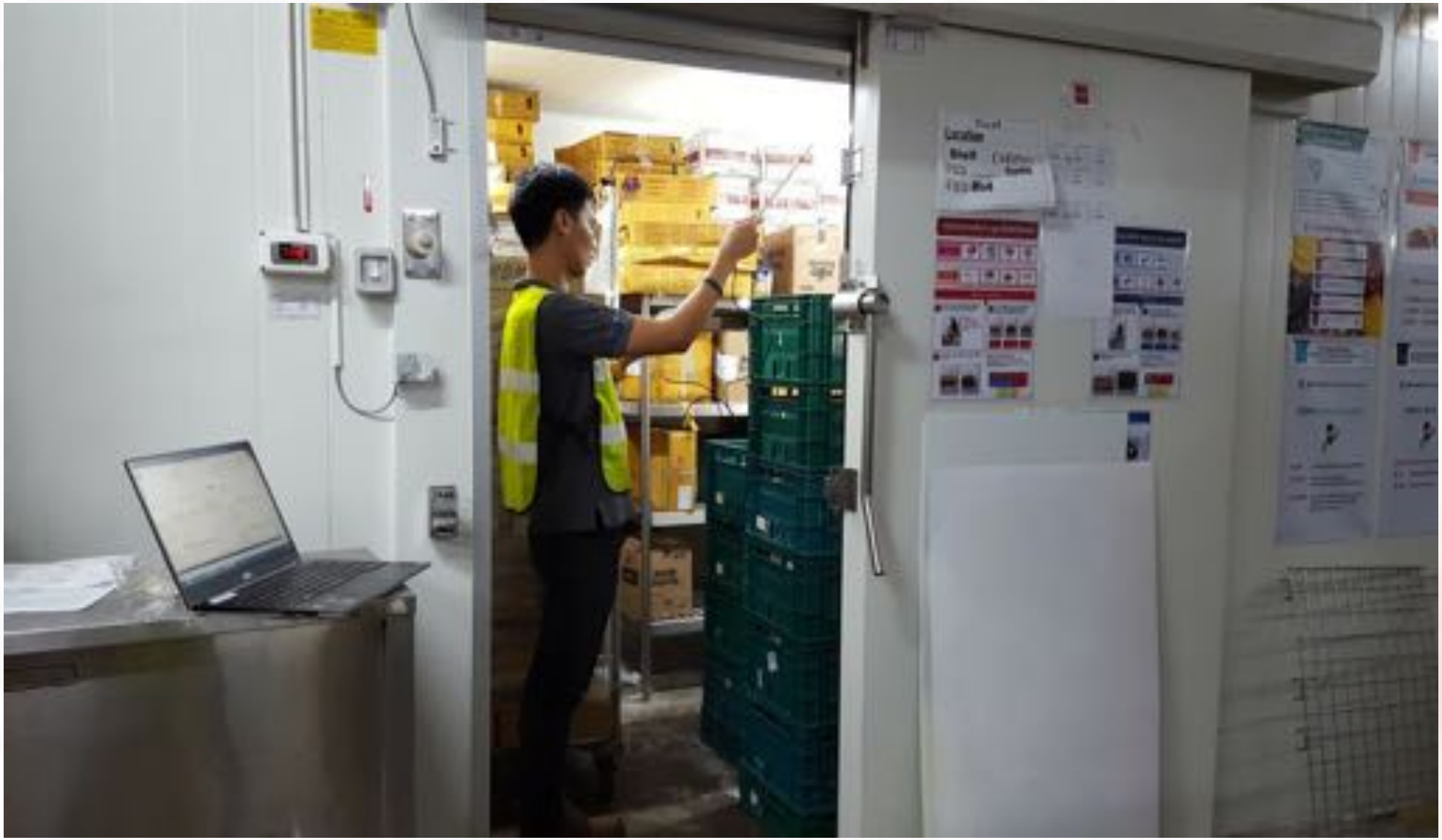
Restrain

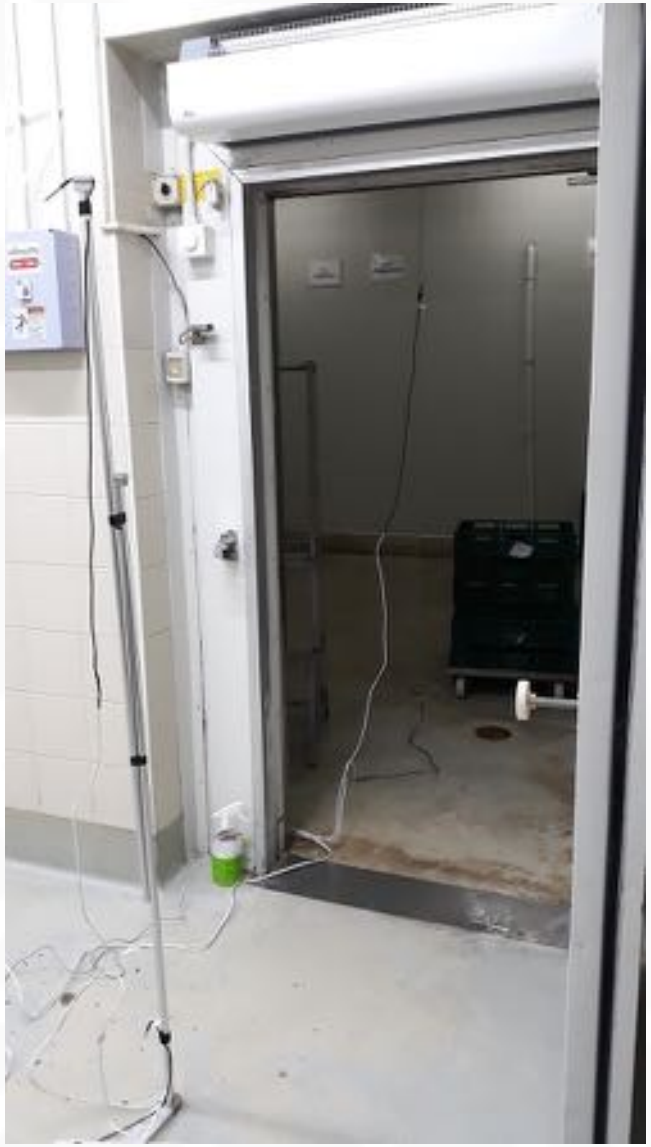
Hold back the warm air



Case studies

Impact on total energy consumption



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BLACK & WHITE
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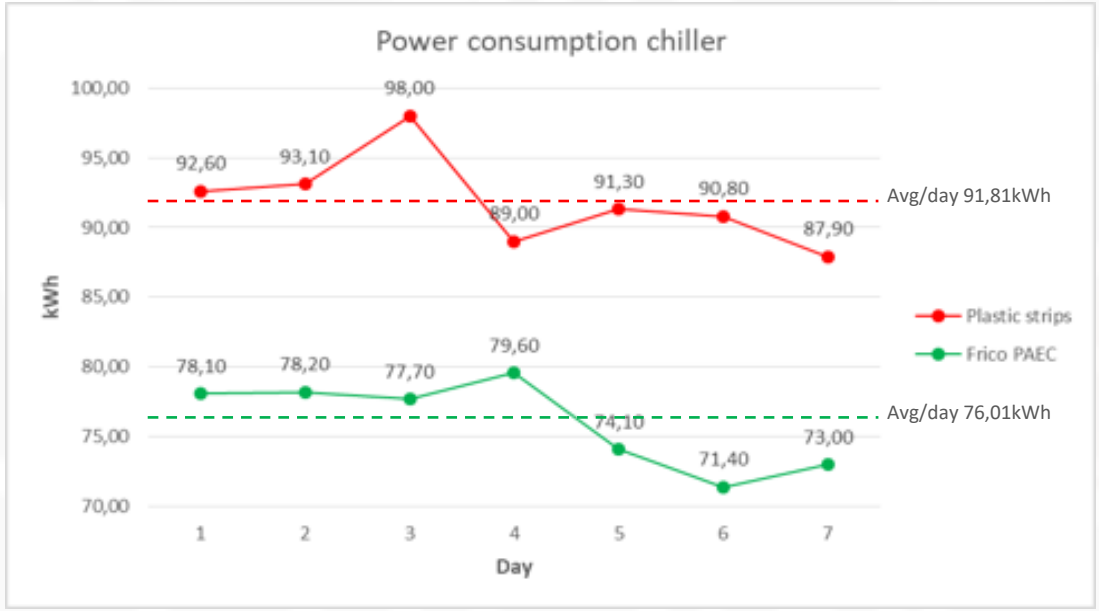
CASE STUDY – FREEZER ROOM

One freezer ~20sqm
Inside temp ~-23°C
Outside temp ~30°C

Total consumption for cooling per month with plastic strips
~2754kWh

Total consumption for cooling per month after removal of plastic strips and installing air curtain
2280kWh

~27% or 474kWh
Less energy waste per month



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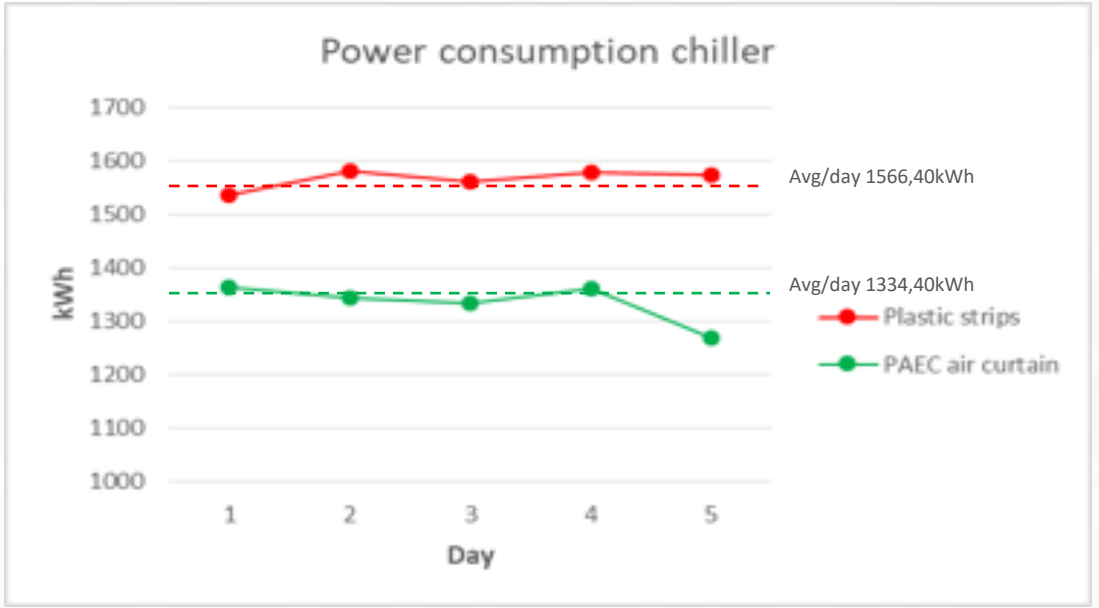
COLD STORAGE

Six cold rooms 15-30sqm
Inside temp ~0°C
Outside temp ~30°C

Total consumption for cooling per month with plastic strips
~46992kWh

Total consumption for cooling per month after removal of plastic strips and installing an air curtain
40032kWh

~15% or 6960kWh
Less energy waste per month



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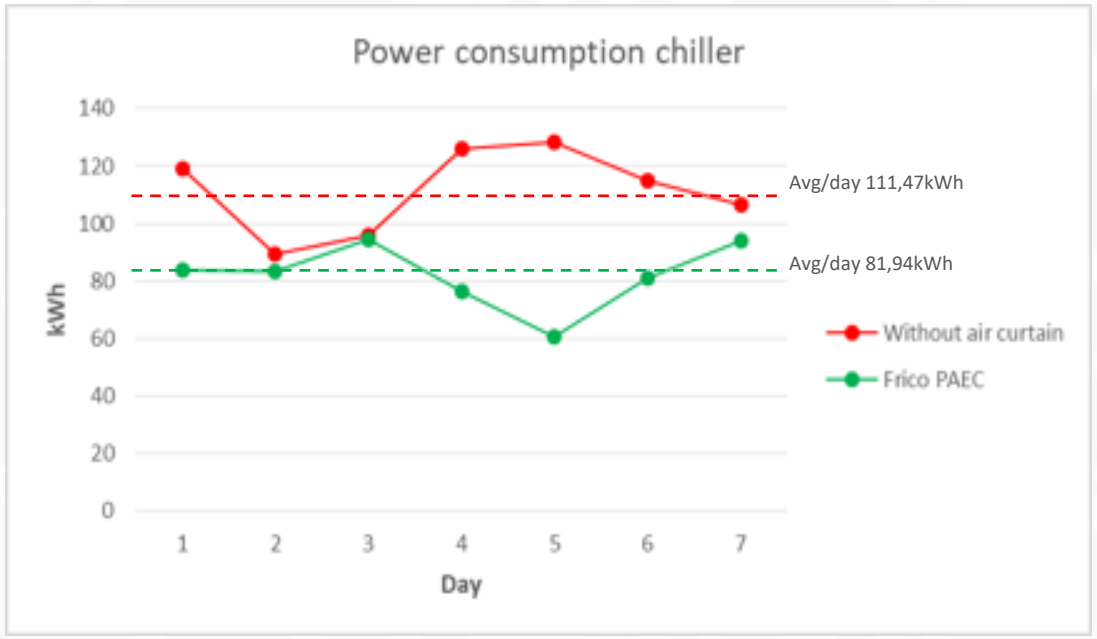
CONVENIENCE STORE

200sqm - ~1000 visitors per day
Inside set temp 24°C
Outside temp ~35°C

Total consumption for cooling per month without any protection
~3344kWh

Total consumption for cooling per month with air curtain
2458kWh

~26% or 886kWh
Less energy waste per month



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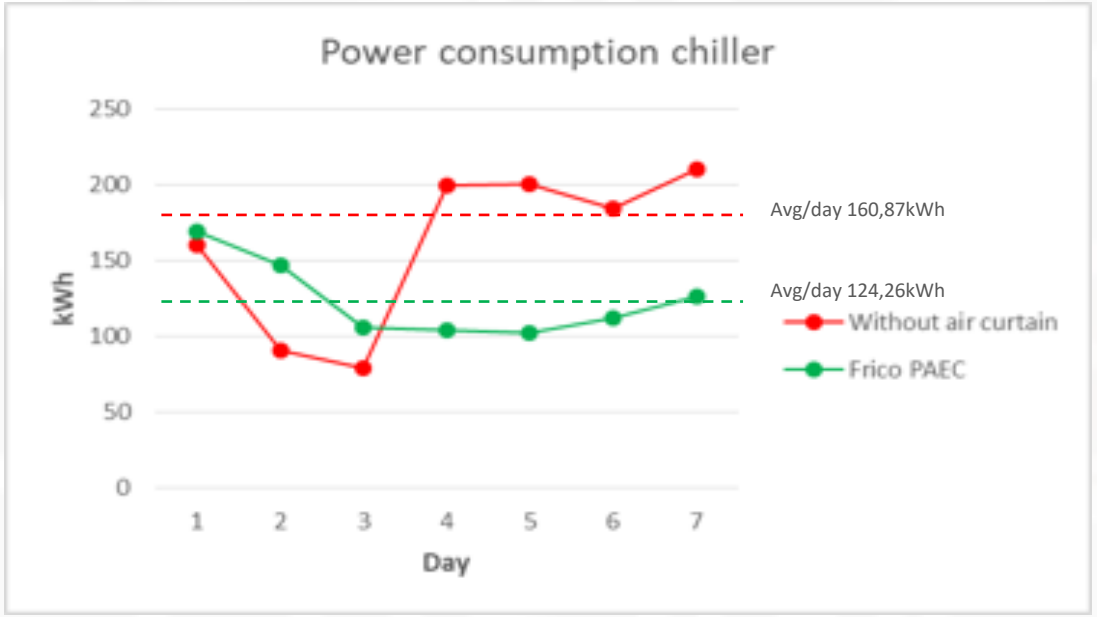
Case study- Convenient store

200sqm - ~1000 visitors per day
Inside set temp 24°C
Outside temp ~35°C

Total consumption for cooling per month without any protection
~4826kWh

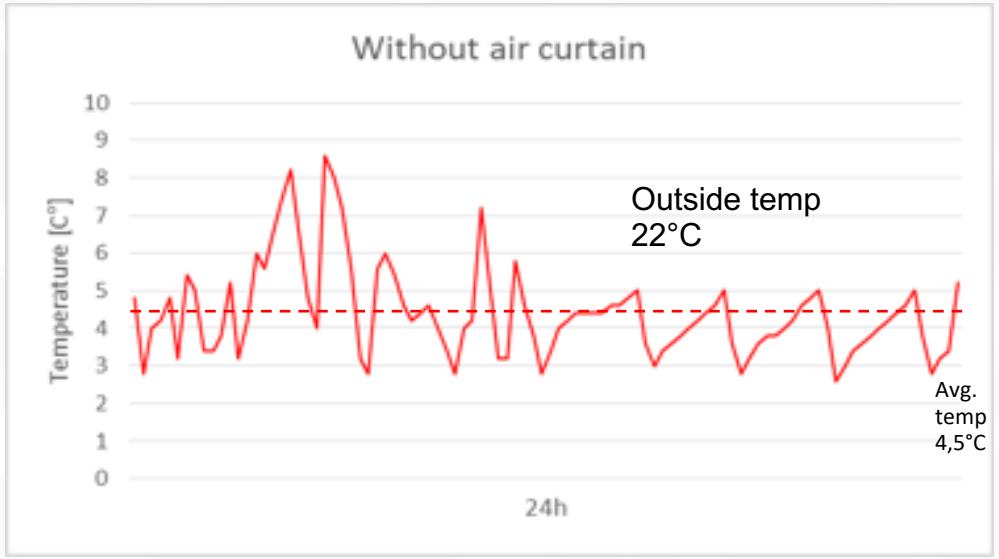
Total consumption for cooling per month with air curtain
3728kWh
~23% or 1098kWh
Less energy waste per month

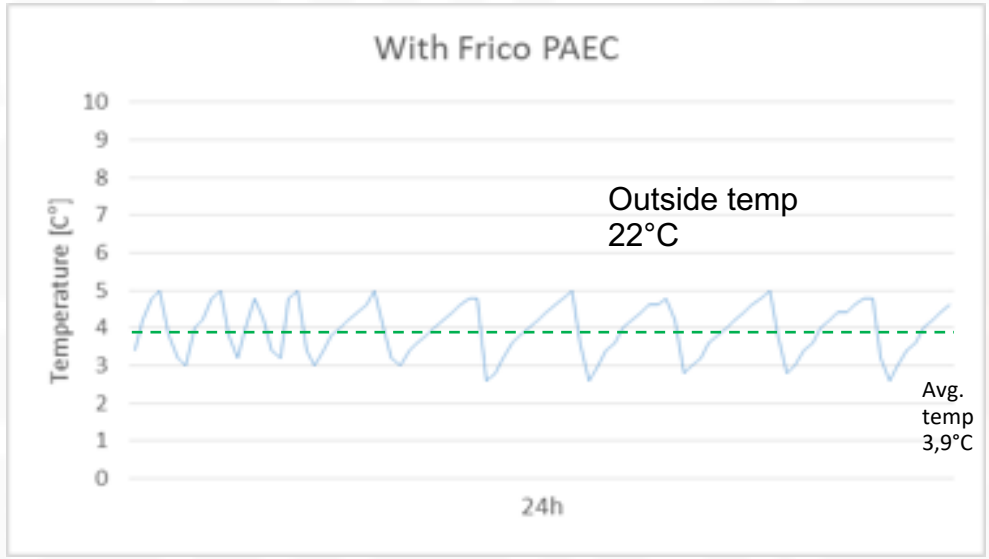


Temperature fluctuation

Without air curtain the fluctuation in temperature in the climate controlled area generate high loads on cooling equipment.

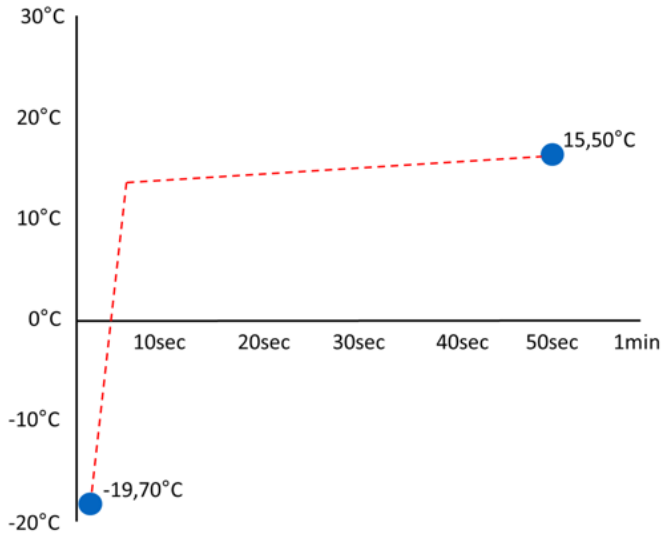
With air curtain with optimized fan speed the temperature is more even and the high temperature rises are restrained.



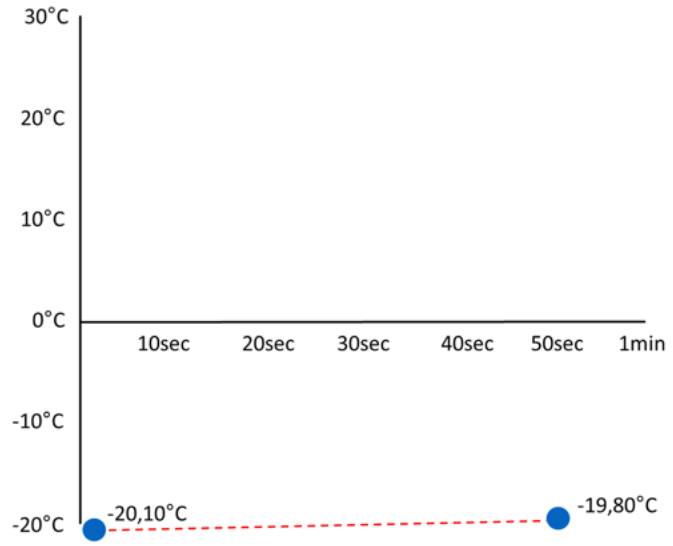


Temperature increase

High temperature increases inside the freezer room without any protection when the door is open – outside temp ~34°.



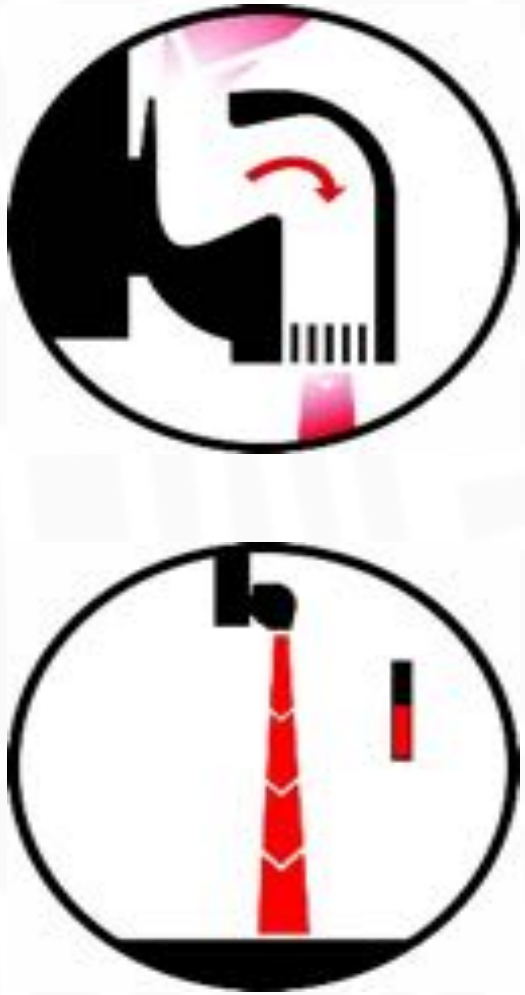
After installing an air curtain the inflow of warm, moist air is restrained and the coolair retained in the area it is meant for – outside temp ~34°.



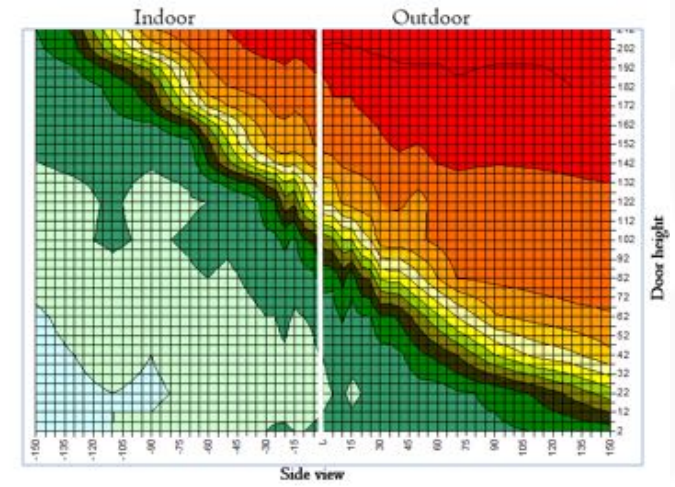
Air Curtain Characteristics

IMPULSE

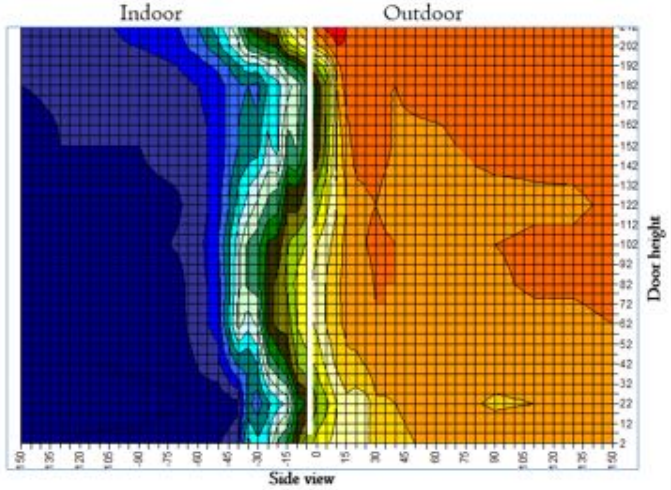
The combination of correct air velocity and air volume gives an optimized impulse



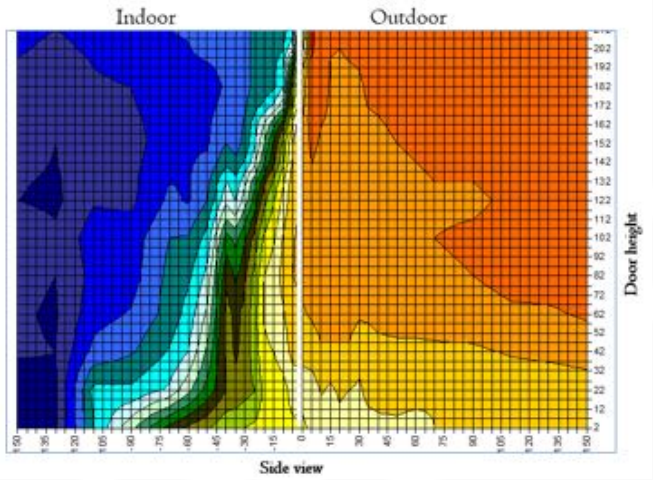
Without air curtain



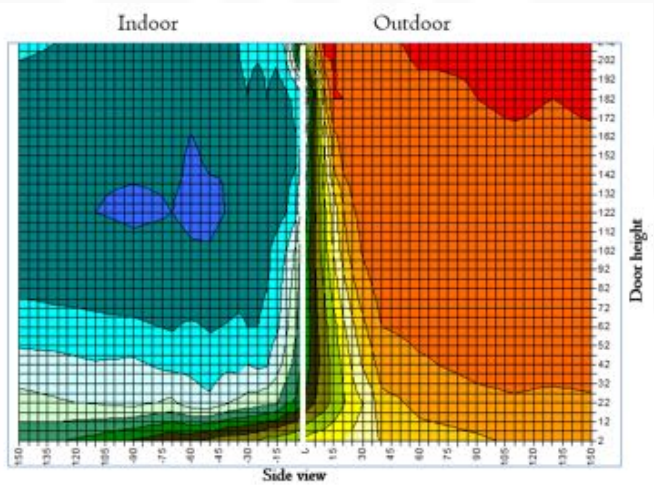
Optimal installation



Too low speed



Too high speed



Sound

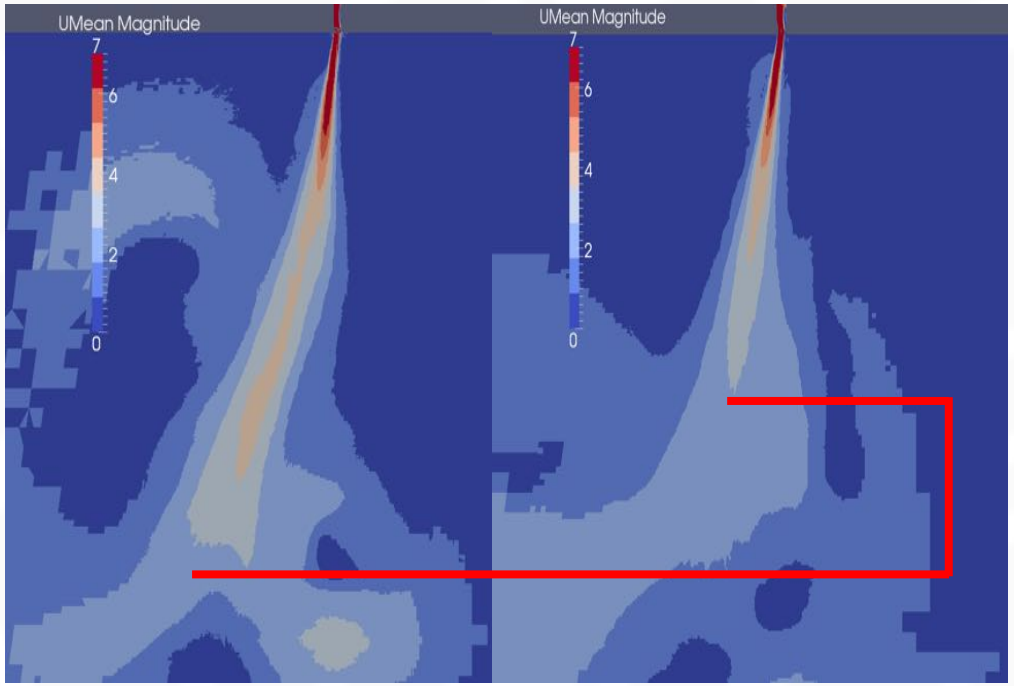
- Low sound levels because the sound bounces off the ceiling

OUTLET GRILLE DESIGN

A powerful, laminar and uniformed air beam with low turbulence and strong throw length

Grille Design A Grille Design B

Grille Design A Grille Design B



CFD Analysis showing comparison between two air curtains with the same air volume but different air beam characteristics. Grille A shows considerably better performance owing to the outlet grille design.

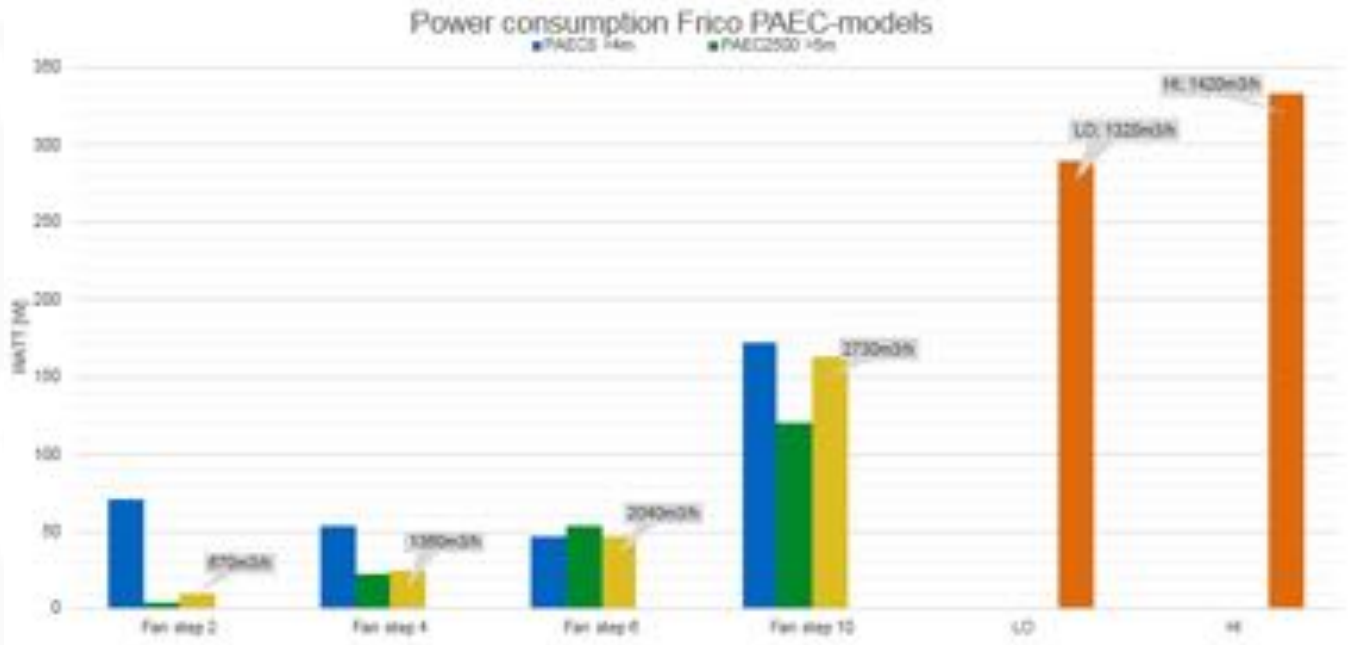
EC Air Curtains

The EC-motor allows for step-less control of the fan speed, giving the possibility to achieve optimised fan-speed and energy savings in every installation.

+

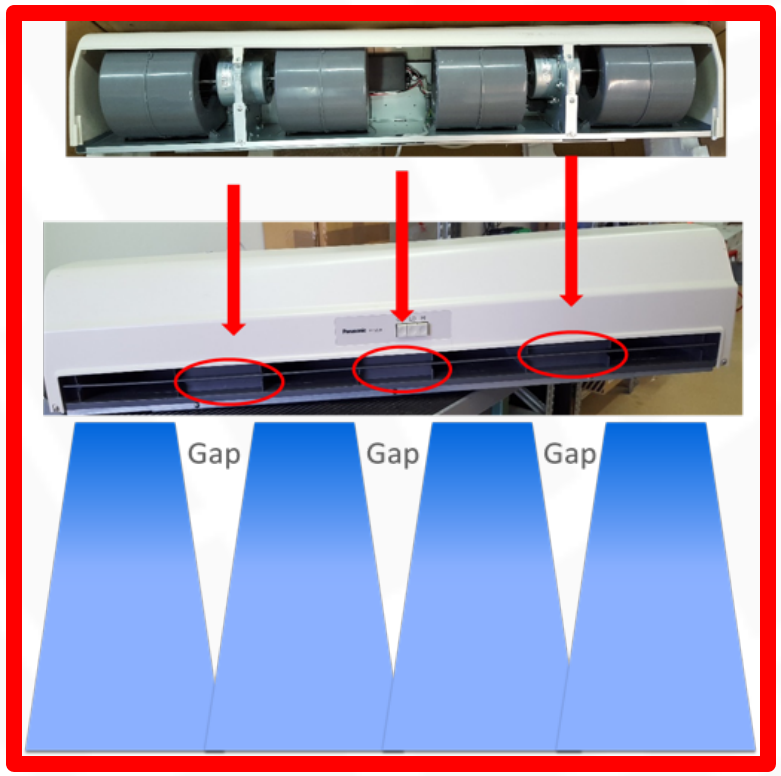
EC Air Curtains

The energy saving is not only at maximum power, but also especially in lower power operation dependent on demand. PAEC has 0-10 step-less control of the fan, in the diagram only four (4) fan settings is presented.

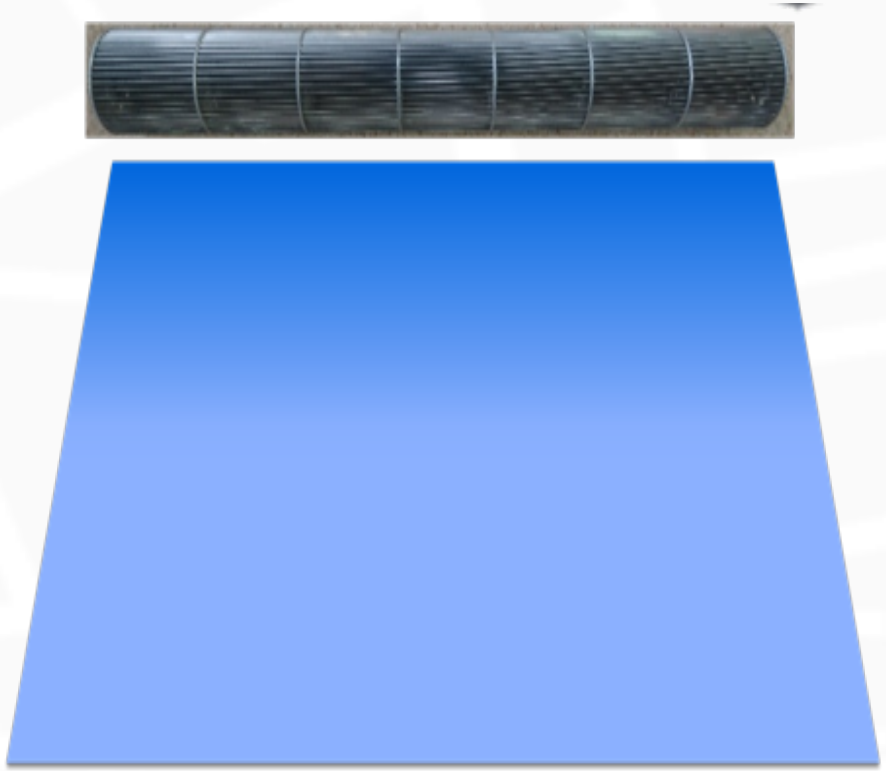


CROSS FLOW FAN

A powerful, laminar and uniformed air beam without gaps



Radial Fan



Cross Flow Fan

OPTIMAL SOLUTIONS

High speed sliding doors + air curtain

Freezer door + Air Curtain

SUMMARY AND BENEFITS

Less kWh consumption + Less condensation means less defrosting and maintenance + Improved visibility and less accidents

=

Protection of the cold chain by using Air Curtains

Thank you!

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Agenda

1. Food Retail Stores - A focus on Energy Efficient Refrigeration
2. How Air Curtains can be used to reduce thermal energy losses in the retail sector
3. **Doing More with Less: Smart Stores and Energy Efficiency**
4. Energy Savings through the Enterprise Management Platform
5. Case Studies on Air Conditioning and Refrigeration Retrofits in the Retail Sector
6. Moderated discussion

Doing More with Less: Smart Stores and Energy Efficiency

Alexander Abrass

Sales Director of Cooling, MENA

Danfoss Turkey, Middle East & Africa

Agenda

- Turning Challenges into Opportunities in the Food Retail Industry
- Cold Stores and Unrealised Potential
- A Holistic Approach - Energy Efficiency & Smart Stores
- Summary

Turning Challenges into Opportunities

The food retail industry is more challenging than ever:

- **New consumer demands**
- **New technologies**
- **Low profit margins**
- **Regulatory uncertainties**

Despite challenges in the industry, multiple opportunities exist to:

- **Optimize Food Safety**
- **Think ahead with Big Data**
- **Combat Climate Change**
- **Maximize Energy Efficiency**

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Cold Stores
Hold unrealised potential for efficiency gains

WHAT IF YOUR SUPERMARKETS COULD:

- Reduce your carbon footprint and grow your bottom line
- Redistribute and sell more energy than you use to local energy grids
- And ensure that all this can be monitored and managed in real-time from one location

Up to **50%** more energy savings

Up to **60%** reduction in CO^2 emissions

24/7 monitoring for improved food safety

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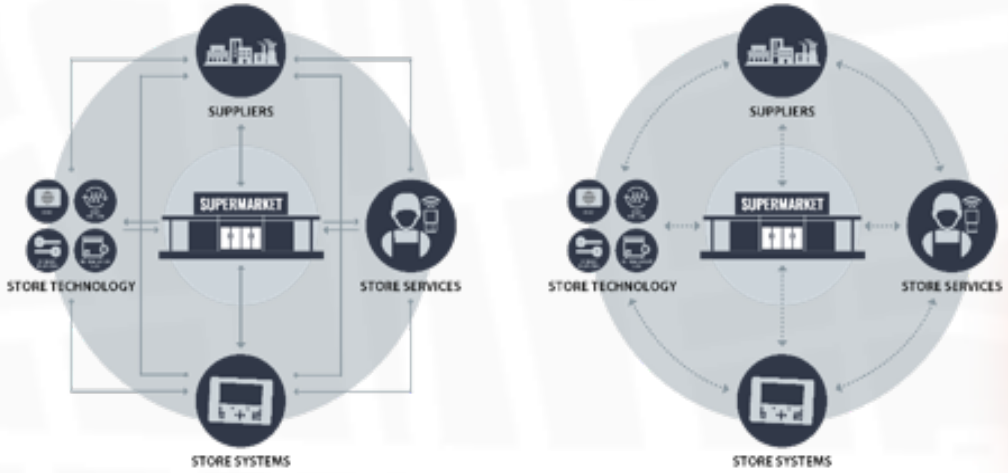
A Holistic Approach

Integrates all enablers of energy efficiency into one solution

- Interconnected digital technologies
- Multiple cross-store applications
- Refrigeration, HVAC and lighting
- Automatic and remote monitoring
- Enterprise-level data collection
- Smart-grid integration
- Staff training

Disparate Store technology vs **Integrated Store technology**



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An end-to-end solution to store efficiency

Maximising store efficiency

1. STORE DIAGNOSTICS
2. OPTIMISATION POTENTIAL
3. JOINT ACTIVITY PLAN
4. IMPLEMENTATION
5. SMART DATA MONITORING
6. COMMISSIONING AND OPERATION
7. CONTINOUS STORE PERFORMANCE

Smart Store Solutions

Levels of improvement through the use of Smart Stores

Smart Store Solutions
Levels of Improvement

LEVEL 1
MONITORING AND MANAGMENT

- Alarms and deviations
- Optimisation of existing equipment
- Cooperation with local contractors

LEVEL 2.
CASE CONTROL

- Decentral adaptive superheat control
- PO optimisation
- In connection with a store refurbishment

LEVEL 3.
NATURAL REFRIGERATION

- From HFC to CO_2
- Training technical staff
- In connection with a store refurbishment

LEVEL 4.
HVAC/R INTEGRATION

- Integration of refrigeration and air conditioning
- Heat recovery system installation

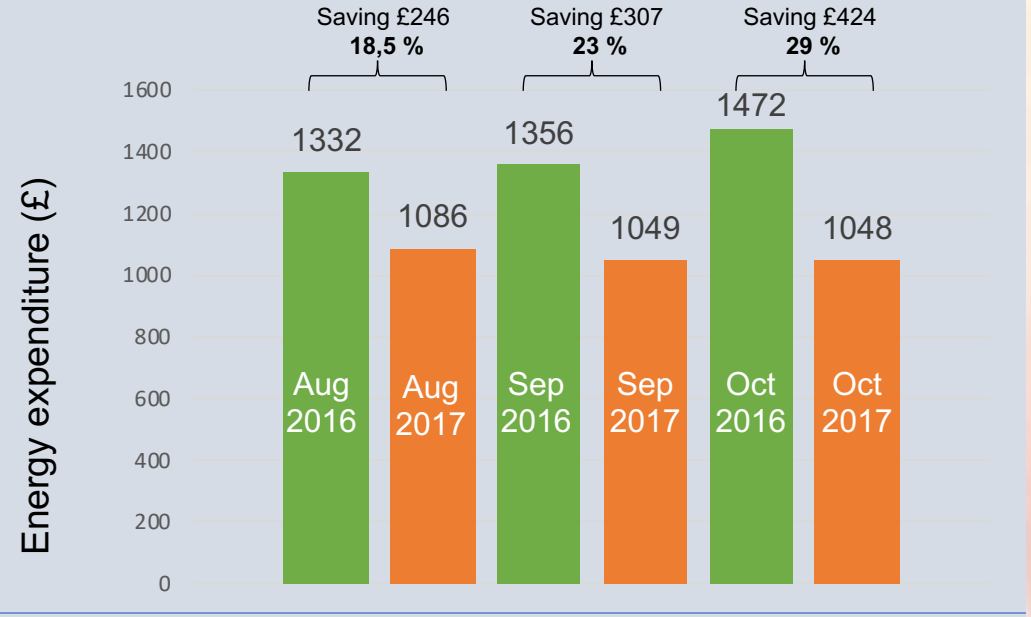
LEVEL 5.
SMART ENERGY

- Demand Response/Smart Grid
- Photovoltaic
- Battery & cold storage
- E-mobility

Level 1 - Monitoring and Management

ACTIVITIES	✓ Monitoring of stores (HVAC, Ilumination, Others) ✓ Adressing alarms (managed services) ✓ Fine-tuning of stores
ENERGY SAVINGS	5-10% of total store energy
EVIDENCE	➢ Cases from small to large store pilots ➢ Minor investments in equipment. ➢ Activities in cooperation with local contractors

CONVENIENCE STORE PILOTS SHOW A SIGNIFICANT INCREASE IN MONTHLY SAVINGS

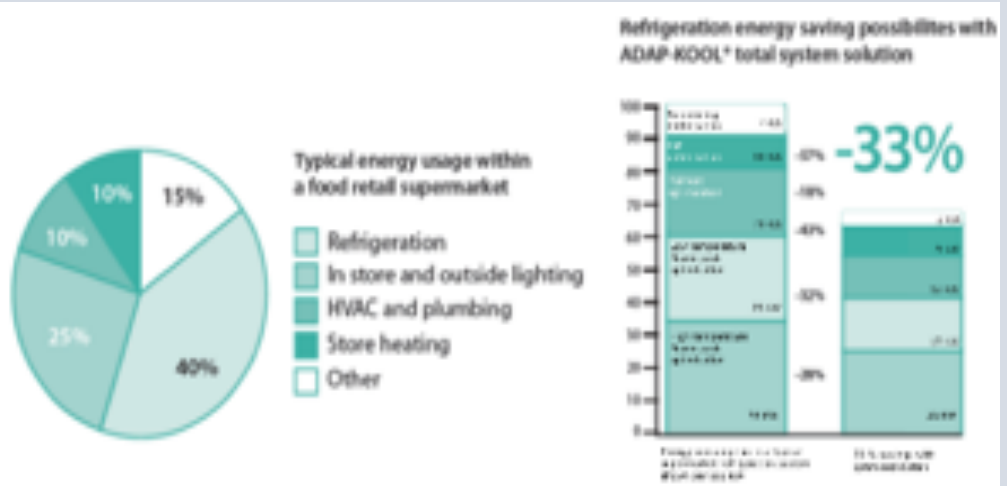


20-29% SAVINGS

Level 2 – Case Control

ACTIVITIES	✓ Move from TXV or Centralised control to decentral adaptive superheat control
ENERGY SAVINGS	11-20% on Refrigeration
EVIDENCE	➢ Cases from small to large store pilots ➢ More accurate) with PO Optimisation
COMMENTS	▪ Standard in most Supermarkets and Hypermarkets in Europe ▪ Typically done in connection with a major store refurbishment

ENERGY SAVINGS IN SUPERMARKET REFRIGERATION



33% SAVINGS

Level 3 – Natural Refrigeration

ACTIVITIES	✓ Move from HFC to CO_2 solution ✓ Guide retailer in selecting the right solution ✓ Training of technical staff and contractor
ENERGY SAVINGS	10%+ on Refrigeration
EVIDENCE	➢ Cases and calculations for medium to large stores
COMMENTS	▪ Focus has been CO_2 solutions for medium to large stores ▪ Typically done in connection with a major store refurbishment

POTENTIAL SAVINGS WITH EJECTOR AND PARALELL COMPRESSION

System	Energy Saving vs. R404a	Compressor Saving vs. Booster
Booster	- 11%	0%
Parallel compression	7 %	15 %
Gas ejector	10 %	18 %
Liquid & gas ejector	22 %	27 %

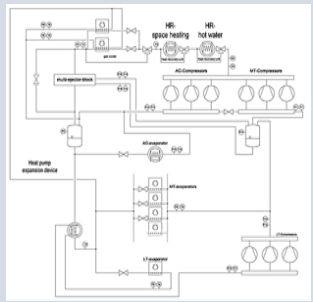
22% SAVINGS

Level 4 – HVACR Integration

ACTIVITIES	✓ Integrate the Refrigeration and Air Conditioning rack into one system ✓ Install heat recovery system.
ENERGY SAVINGS	25%+ on HVAC
EVIDENCE	Cases and calculations primarily from CO_2 installations in Europe – both hot and cold climates
COMMENTS	CO_2 and heat recovery is a perfect combination, due to very high tempertures in CO_2 system

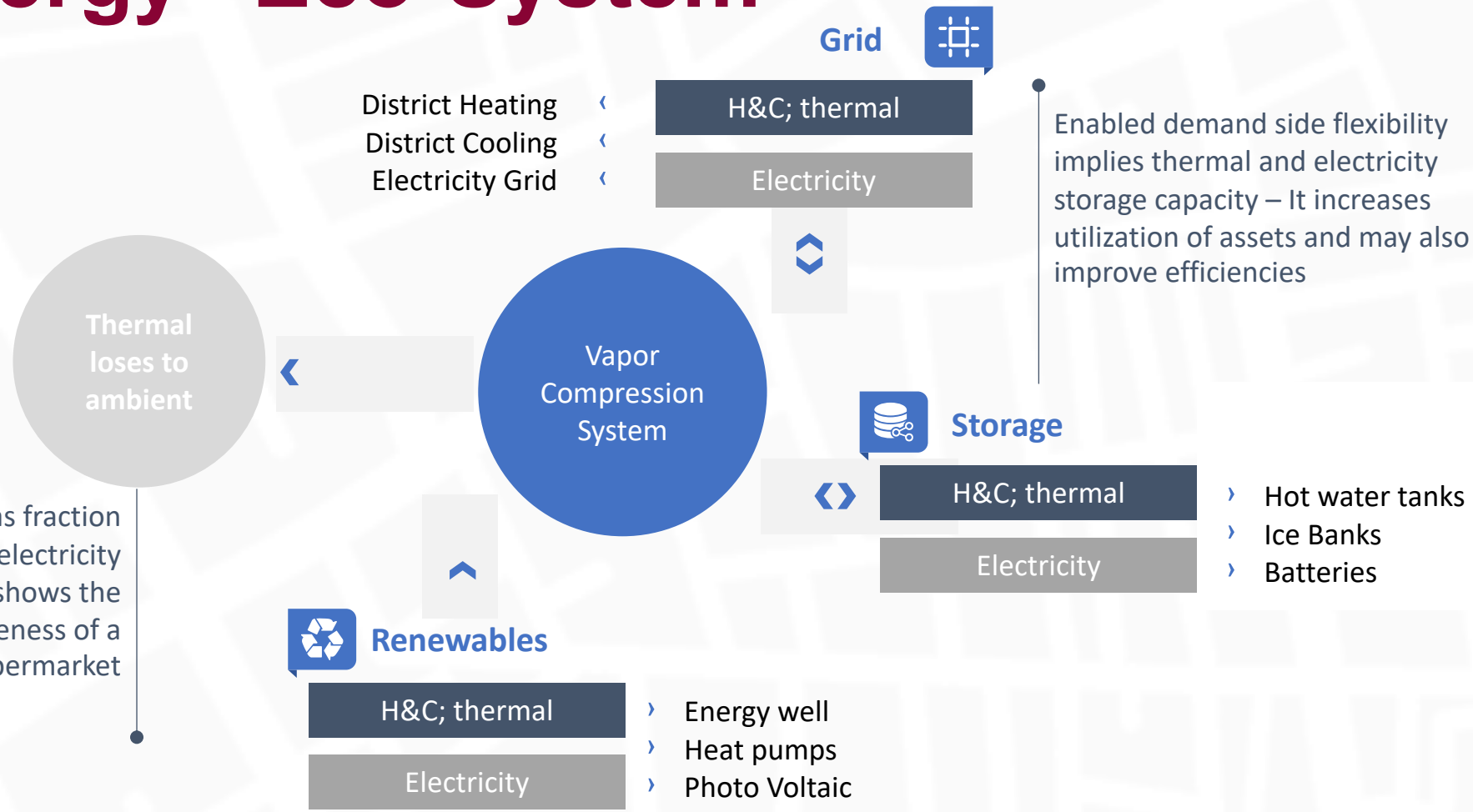
ALL NATURAL HVACR INTEGRATION

For every investigated operation conditions, the refrigeration system with the running vapour ejectors reduced the total energy power consumption mainly between 15 and 30% depending on the ambient temperatures and corresponding AC requirements.



15-30% SAVINGS

The Supermarket is a key factor in the Energy “Eco-System”



Summary

- The retail industry is faced with multiple challenges which can be turned into opportunities
- Cold stores show unrealised potential for energy savings
- Smart Stores provides a platform for integrated energy management through a holistic approach

Thank you!

Agenda

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6. Moderated discussion

Digitalisation for Energy Transformation in Facilities

Arul Joseph
Director – Digital Solutions,
Johnson Controls, GCC

Krishna Sankaran
Director – Energy Solutions,
Johnson Controls, GCC

Agenda

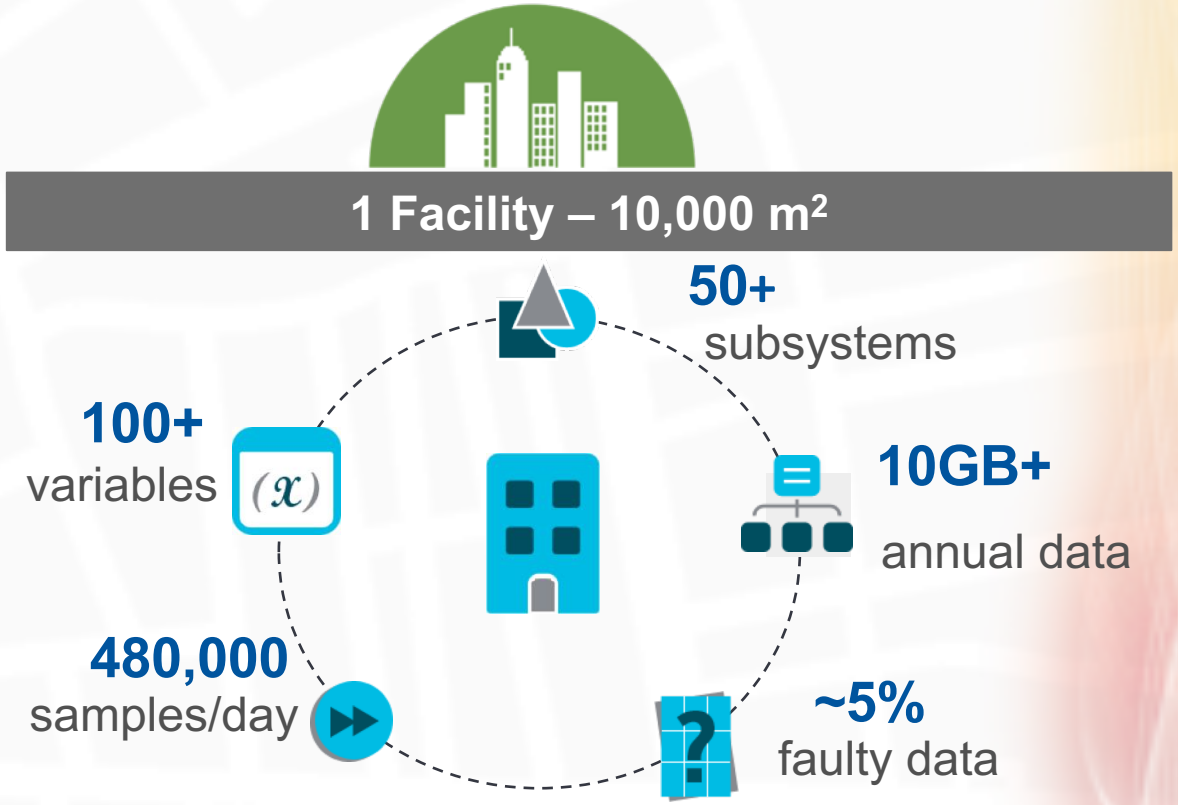
- Overview of Data Management
- Shift to Digitilisation
- Benefits of Analytics
- Key Takeaways

Overview of Data Management

- **Facilities are complex to maintain**

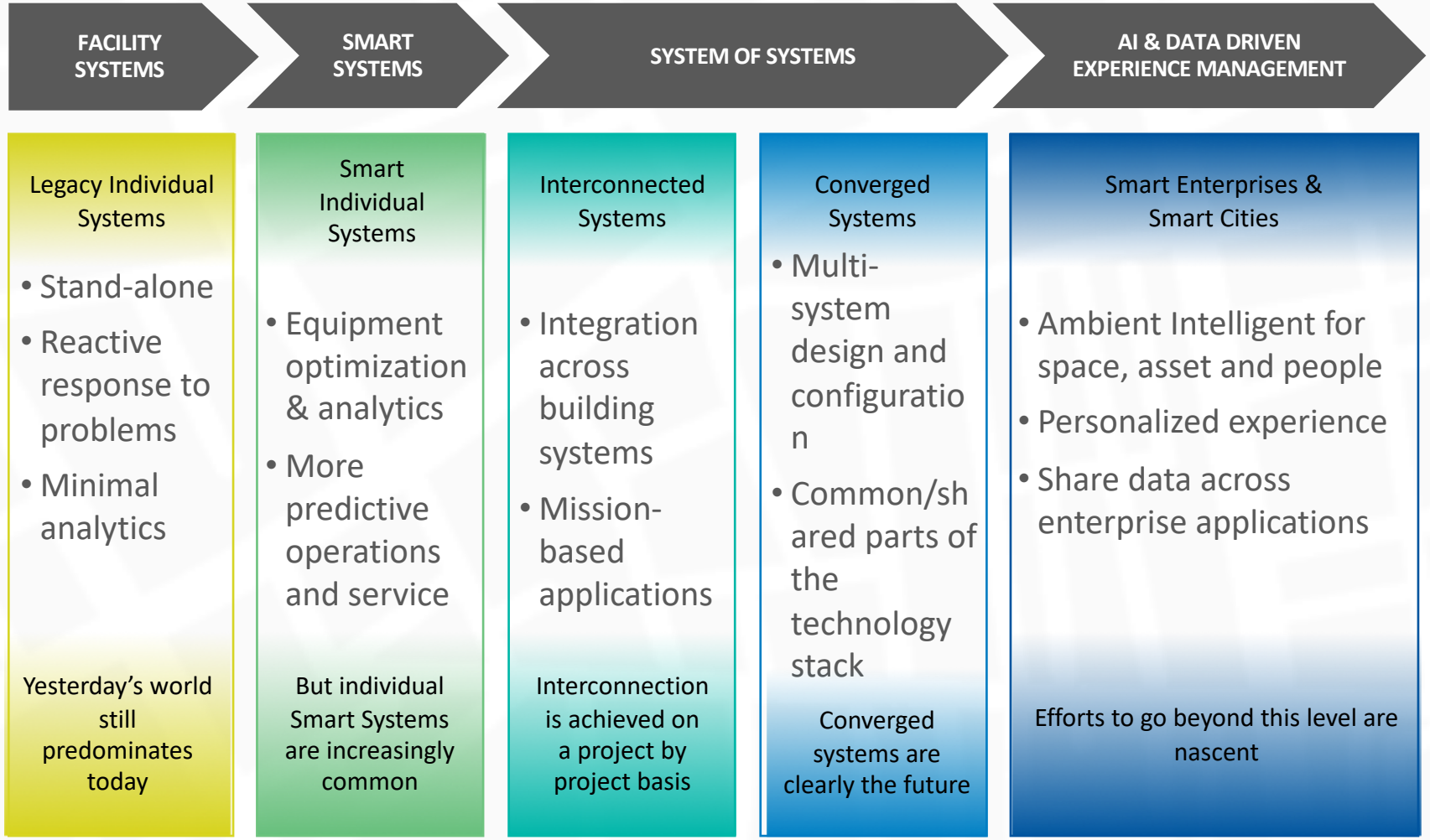
- Lifespan of **40+** years outlives most systems
- Mix of systems, suppliers and protocols
- Dynamic ecosystems
- Changing regulations and building codes over time

- **Facilities are rich data ecosystems**

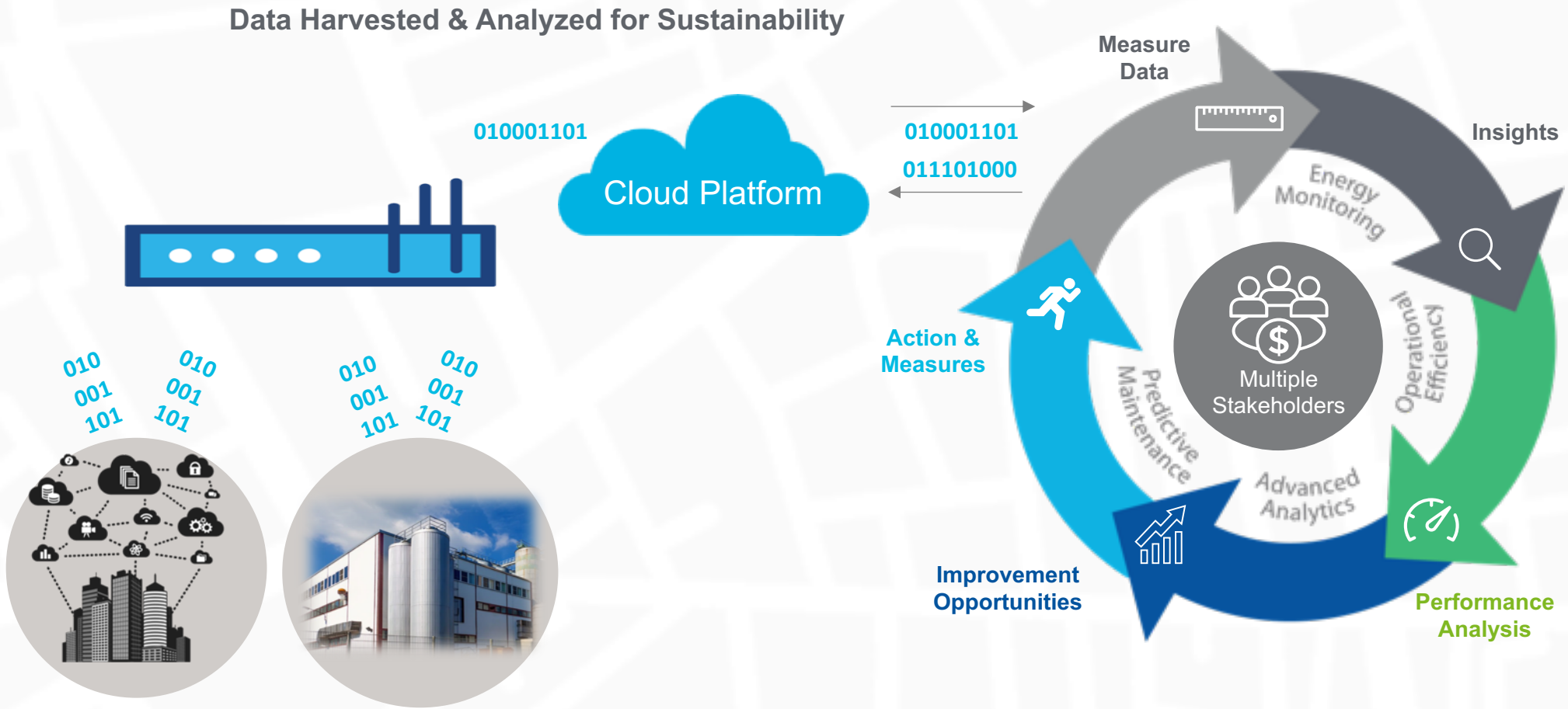


Shift to Digitilisation

- **There is a shift from stand-alone systems to connected & converged digital platforms**

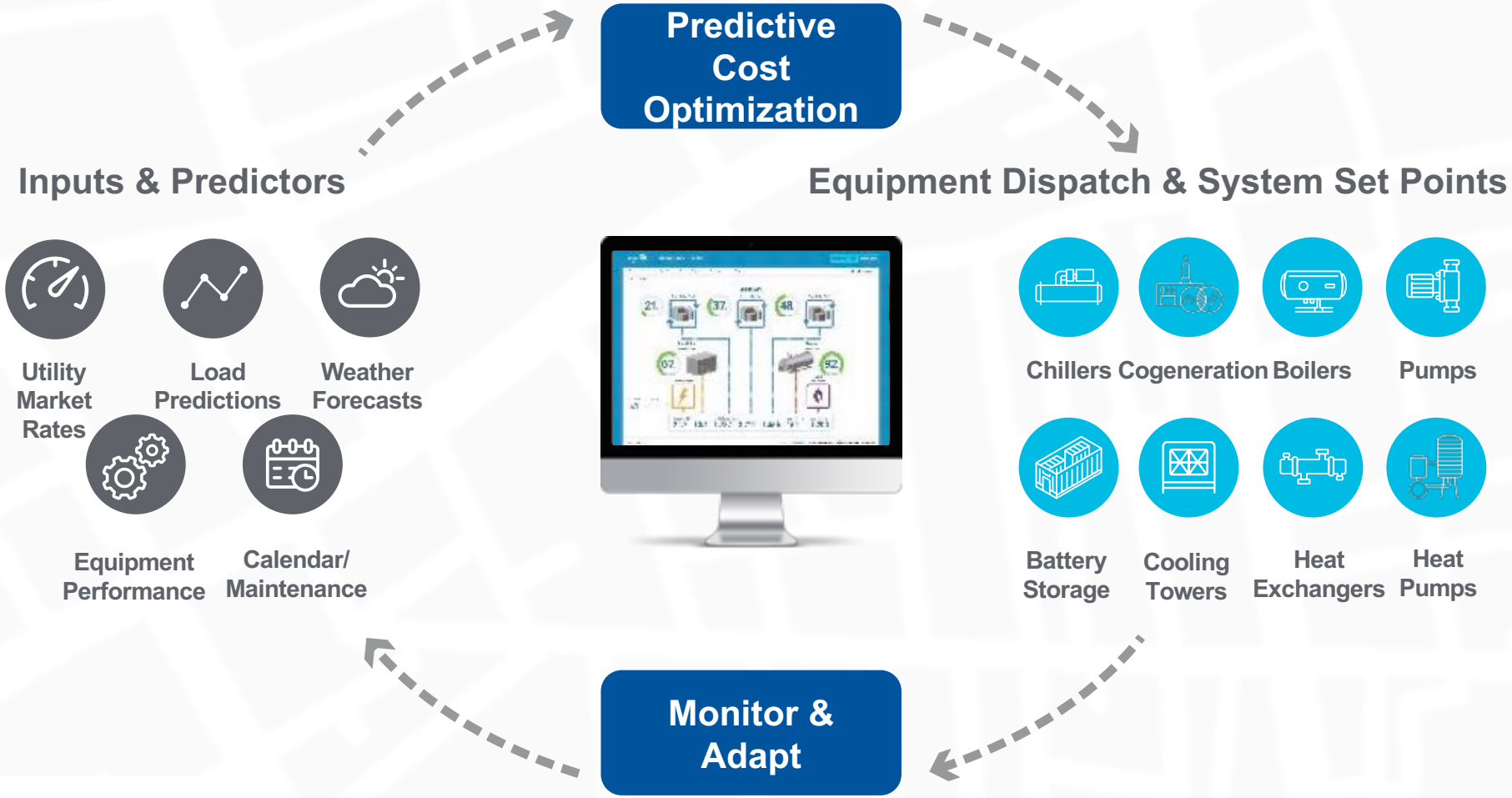


- **Digitalization pulls together data that is traditionally stored in disparate systems and creates a robust picture of energy use**



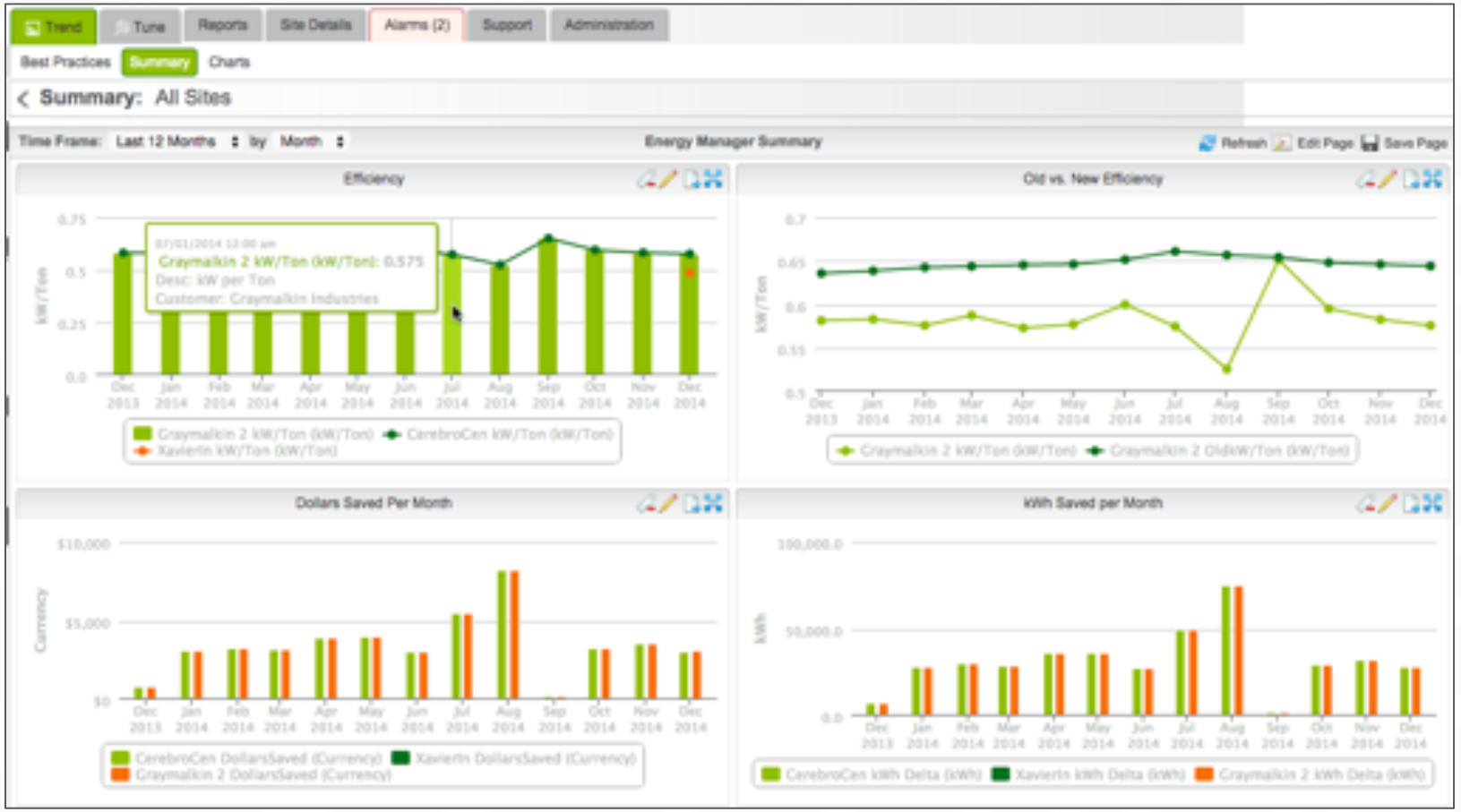
- **Digitalization helps delivers key outcomes seamlessly across the enterprise**

- **Predictive cost optimization algorithms respond to a myriad of ever-changing inputs across facilities**



Benefits of Analytics

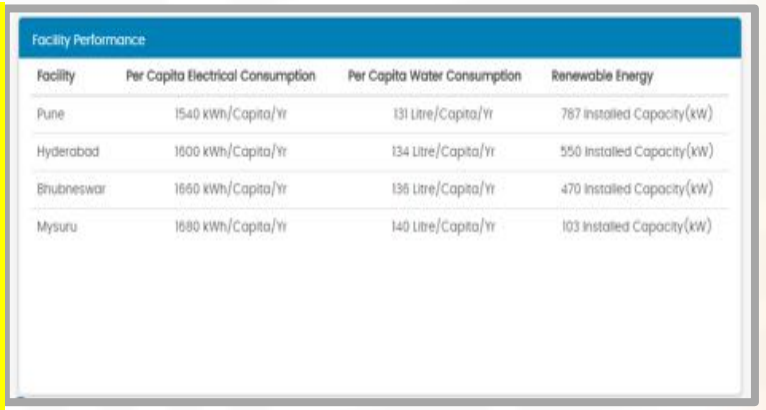
- **Analytics helps any Facility operators obtain their ENERGY PERFORMANCE**



- **Analytics helps Facility operators drive SUSTAINABILITY**

Sustainable Operations

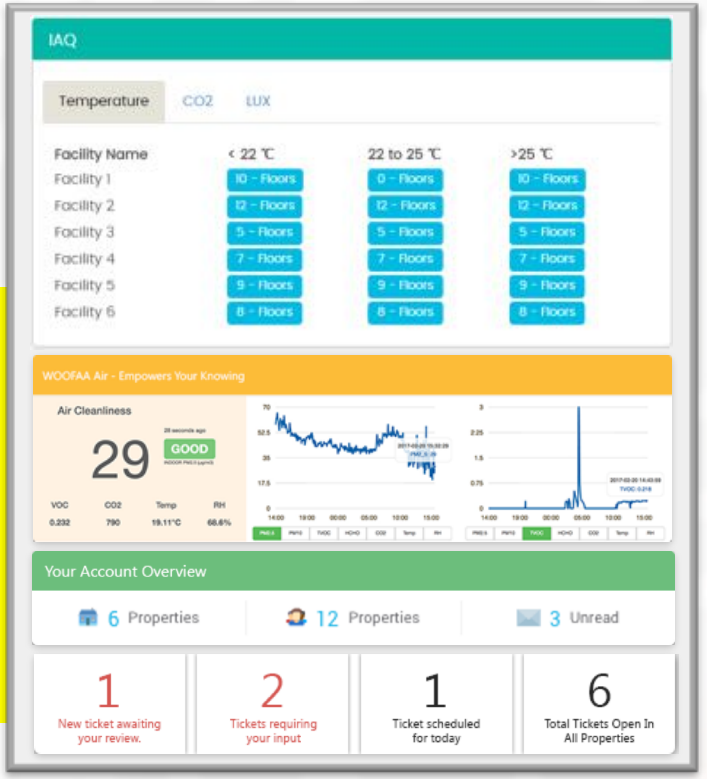
- Portfolio Sustainability information at one place
- Understand how each facilities contribute to your sustainability agenda
- Strategize sustainability initiatives around degrading facilities

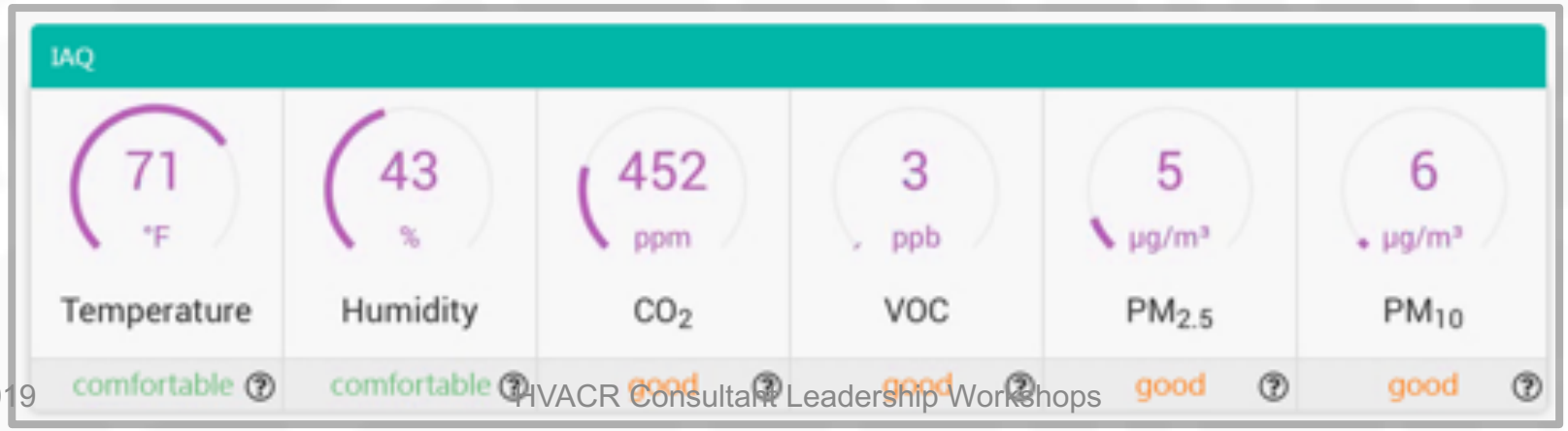


- **Analytics helps Facility operators drive Occupant Experience**

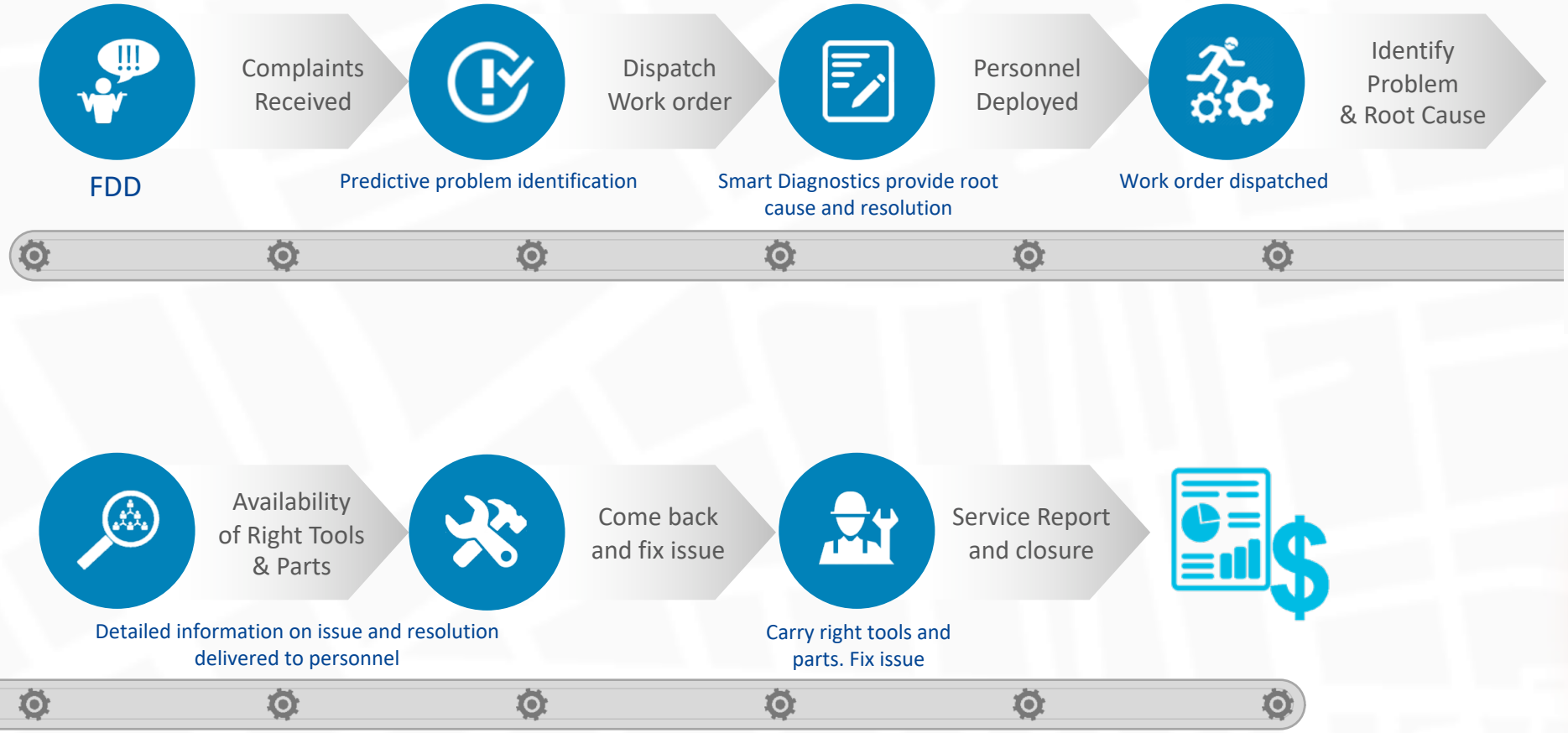
Occupant Wellness

- Monitor indoor comfort index
- Manage building IAQ performance
- Identify space outliers that do not meet wellness criteria
- Analyze comfort complaints
- Building comfort analysis
- Meet compliance and regulatory requirements





- **Analytics helps facility operators automate and optimize their process and offer an integrated & interactive experience**




VERTICAL MARKET
MIXED USE COMMERCIAL
HEADQUARTERS:
Sydney, Australia
LOCATIONS:
1 high-rise building with 37 floors
CUSTOMER MOTIVATION:
Single source partner who can deliver sustainability
6 STARS
6 STAR "GREEN STAR" RATING
5.5 STAR "NABERS ENERGY" RATING
GOLD "WELL BUILDING" RATING
600,000 KWH SAVINGS
600,000 KWH & $13,500 SAVINGS PER MONTH
5 HIGH EFFICIENCY CHILLERS
MONITORS 5 HIGH EFFICIENCY CHILLERS W/ 1,200 KW TRI-GENERATION PLANT
CUSTOM FAULTS DESIGNED TO PREDICT WATER USAGE OF REUSABLE RAIN & SPRINKLER TEST WATER
JOHNSON CONTROLS ENTERPRISE MANAGEMENT MODULES INSTALLED:
Fault Detection & Diagnostics with custom rules
Tenant Management
Work Order Management
Data Visualization Widgets
Equipment Management
Energy Management

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Key Takeaways

1 Big Data-Big Changes

2 Transformational Platform

3 Intelligent Analysis

4 Optimized Performance

5 Safe & Secure

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Thank you!

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Agenda

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Case Studies on Air Conditioning and Refrigeration Retrofits in the Retail Sector

Marco Duarte

Business Development Manager

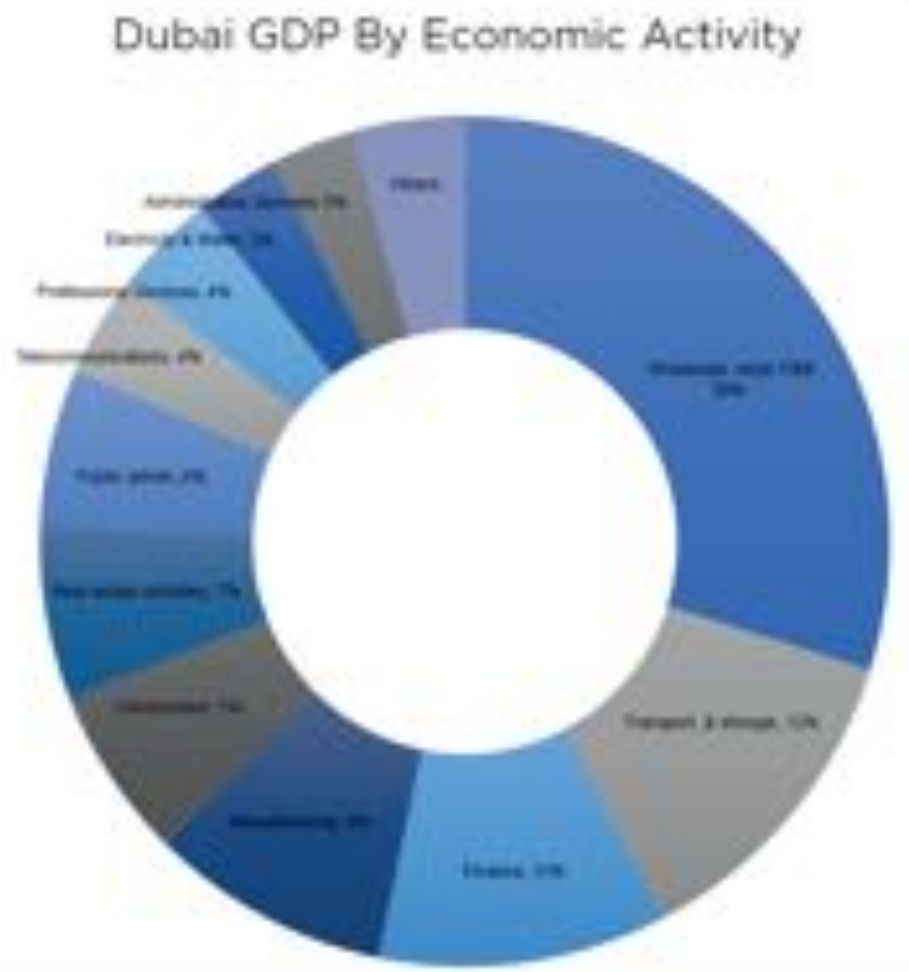
ebm-papst Middle East FZE

Agenda

- Introduction
- Why is it important to consider fans?
- EC fans – Why are they more efficient?
- How can EC technology reduce energy consumption?
- Case Studies: Upgrade Projects – Energy Saving & Payback
- Conclusion

Introduction
Retail Market in Dubai

Dubai's retail sector is one of the largest contributors to the Emirates economy representing almost 27% of real GDP in 2017 (approximately 103.6 billion AED) according to the Dubai Statistics Centre. At least 50% of energy consumed results from HVAC



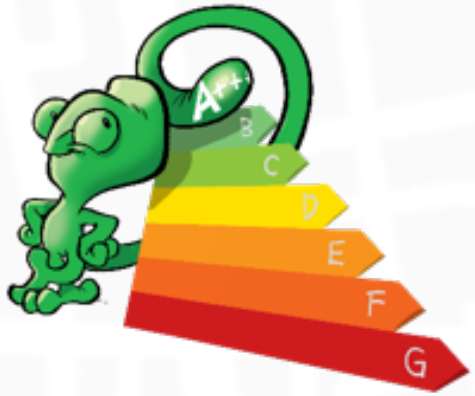
Why is it important to consider fans?

UNITED ARAB EMIRATES
MINISTRY OF ENERGY

- Building sector consumes 70 to 80% of the UAE's energy
- Air conditioning uses 80-85% of the total energy consumption of buildings
- Fans and pumps account for ~ 50% of the energy consumed in HVAC

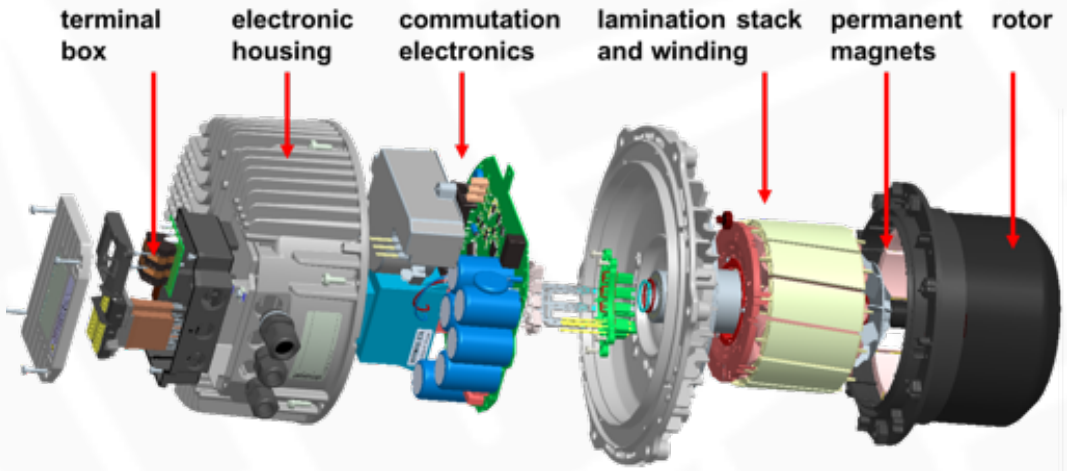
Why is it important to consider fans?

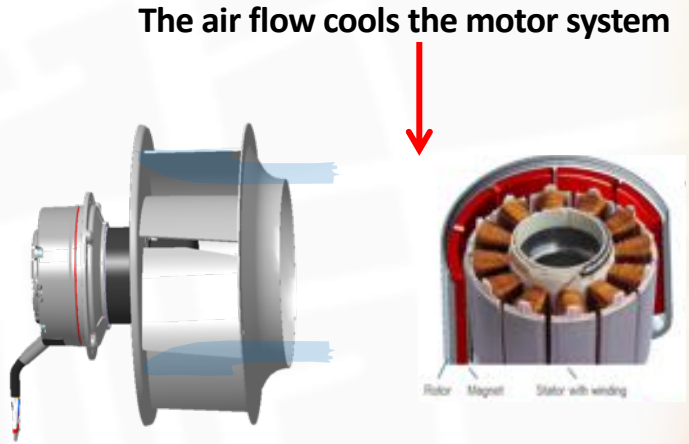
- Fans are in most products and they are the unseen power consumer.
- The key to energy efficiency projects is capital return – making savings to exceed the costs as quickly as possible
- Energy Efficient Products – New equipment
- Upgrade of existing HVAC equipment
- Reduce your energy bill – **SAVE MONEY!**



EC Fans

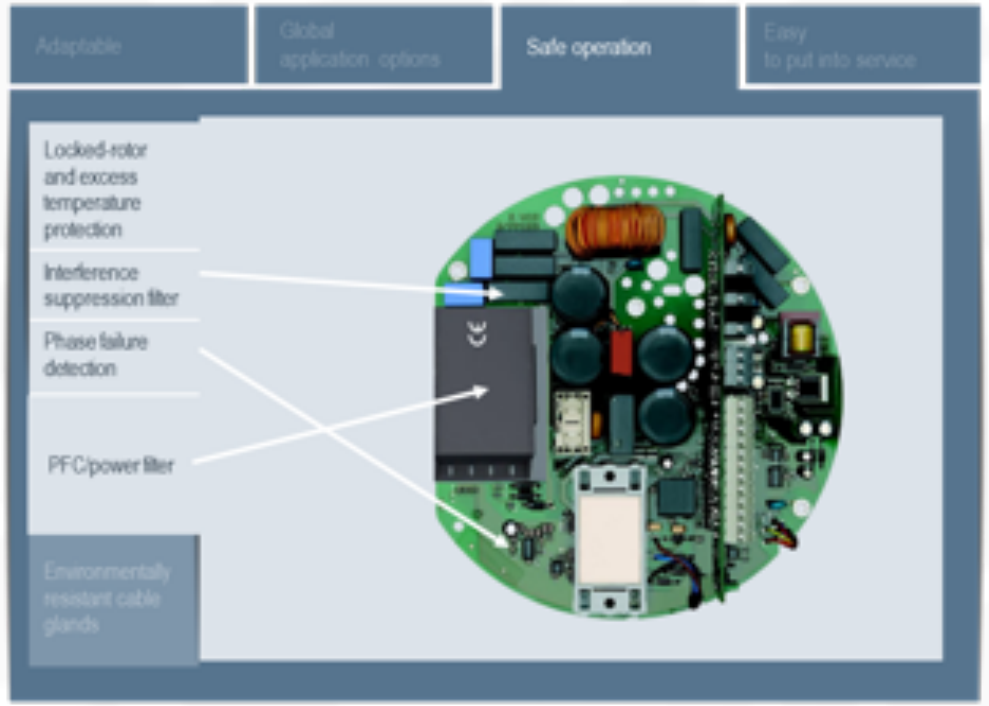
Why are they more efficient?





- **Energy efficiency -** EC motors, also known as PM motors or Brushless DC Motors controlled by an electronic circuit board, are around 30% more efficient than AC motors
- **Controllability** - Integrated speed control - no additional VSD is required.
- **Increased reliability and life expectancy**
- **Reduced maintenance costs**

EC Fans
Why are they more efficient?



Locked-rotor protection:
If the impeller is locked (for example by an object that has fallen in), the hall sensors no longer change from north to south within a given time window. This results in the fan shutting down.

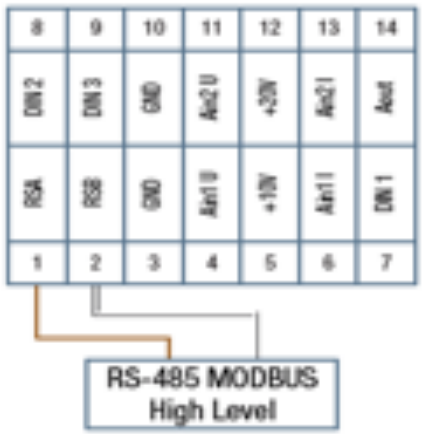
Excess temperature protection:
Integrated sensors are analysed in the motor to protect against excess temperature in the motor. If there is an excess temperature in the motor, these sensors open up and the motor is switched off by the commutation electronics.

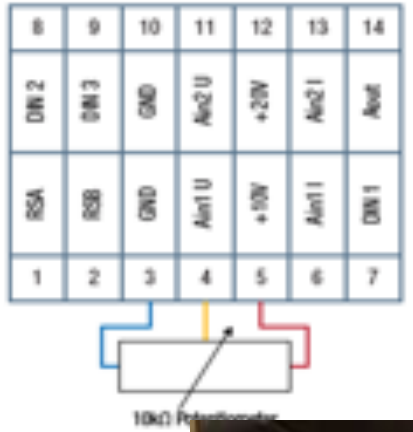
Integrated power and EMC filters

Phase failure detection:
All three phases are monitored with 3-phase-fed GreenTech EC fans. If a phase fails, this is detected and the motor is switched off, thereby effectively preventing the motor from overheating.

PFC - RadiPac product range are equipped, as standard, with active PFC (Power Factor Correction), thereby setting the power factor to approximately 1. This leads to a non-critical behaviour with regard to THD (Total Harmonic Distortion) → current harmonics are reduced to a minimum.

EC Technology
Controllability



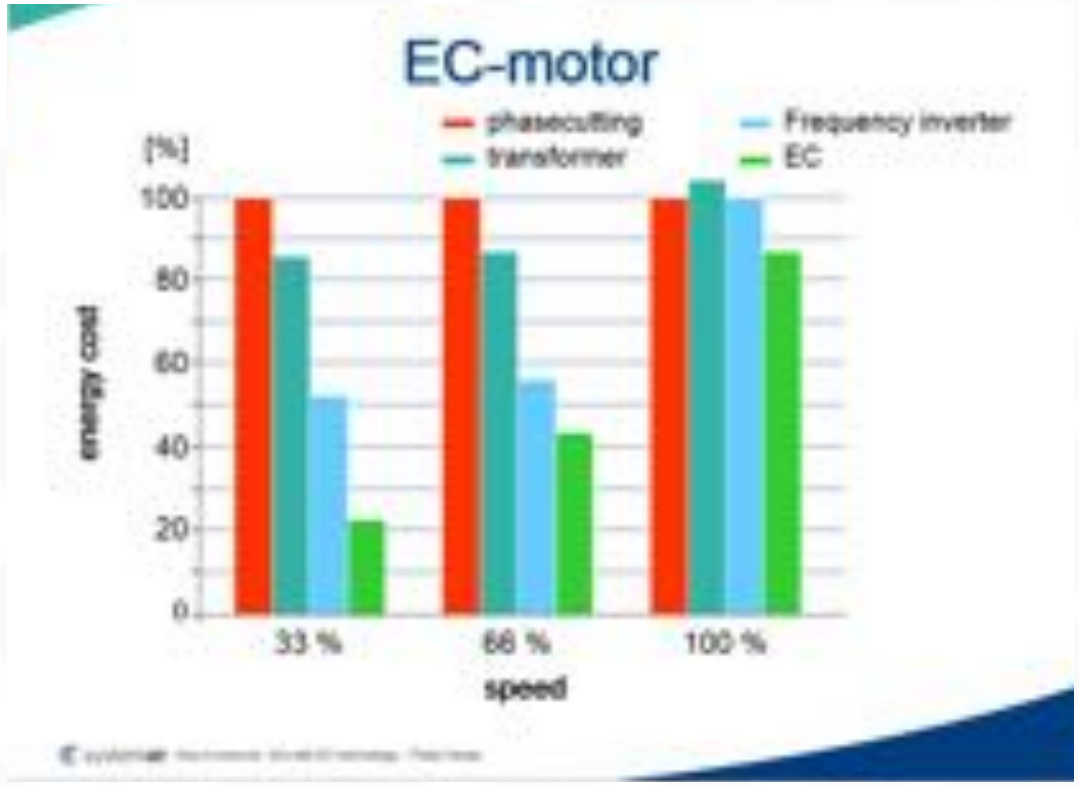


EC Technology
Controllability

The following parameters are monitored real-time and displayed on the LCD screen:

- Warnings
- Actual speed (RPM)
- Real-time power consumption (W)
- Motor temperature (°C)
- Electronics temperature (°C)
- Control input (%)
- Fan serial number
- Total power consumption of the fan array* (kW)

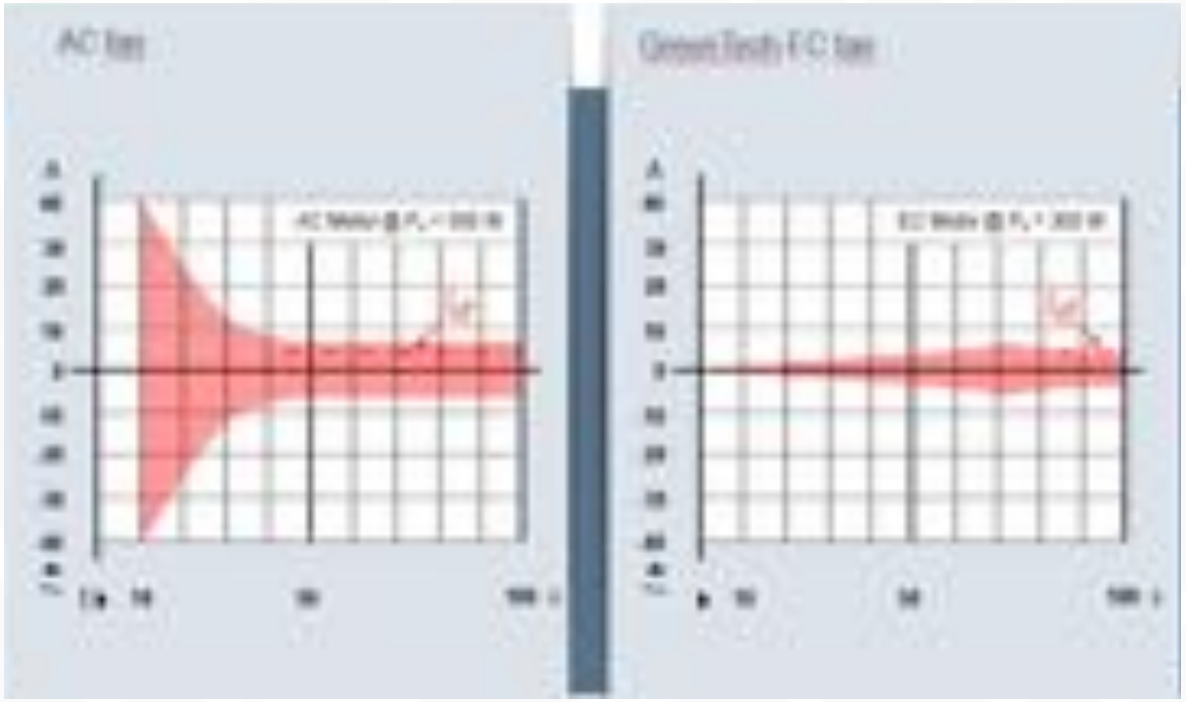
EC Technology or External VFD?



Hidden costs with VFD's:

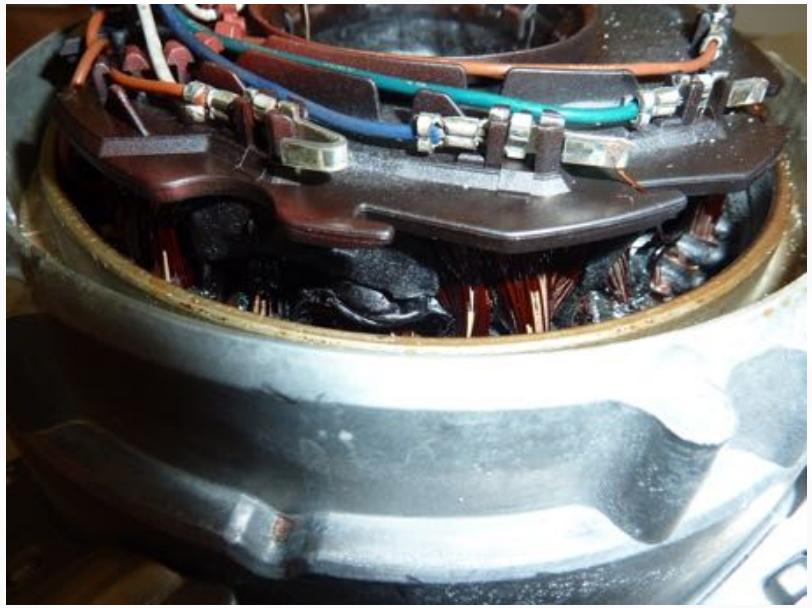
- They increase motor losses
- Use of a VFD increase motor losses by at least 2 to 5%
- AC motors with VFD - adjusts the incoming voltage which alters their sine wave and in turn decreases the motor lifetime and increases noise

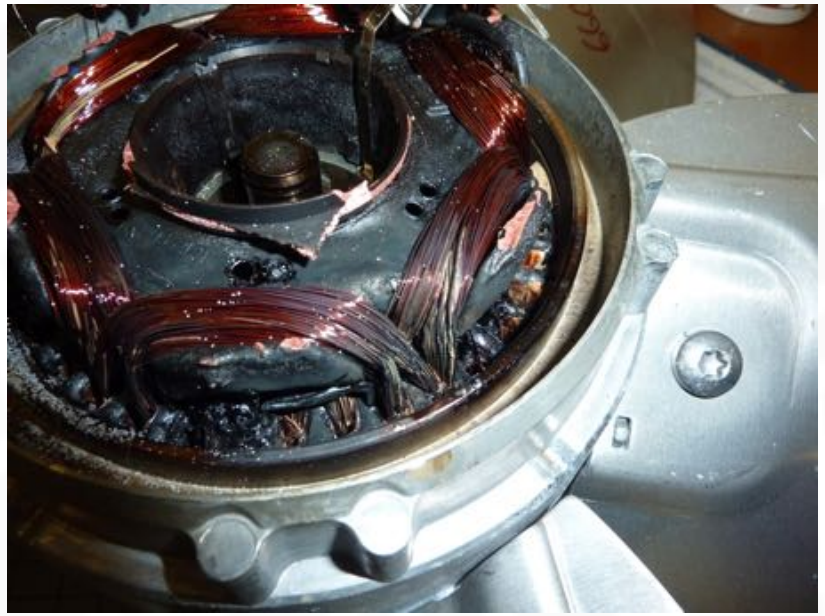
EC Technology or External VFD?



- Very high currents occur when switching on AC motors operated directly from the power grid.
- With EC fans, however, the switching on currents are limited by a defined ramp-up phase.
- Finally an effective value appears that is 10-20% lower than that of an AC motor.

EC Technology or External VFD?

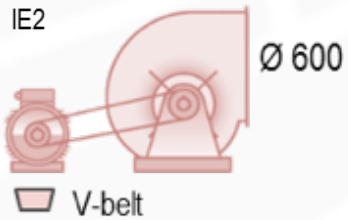




Frequency Inverter without a all pole sine filter (Phase-Phase and Phase-Earth) there is a risk of damaging the bearing system and the winding.

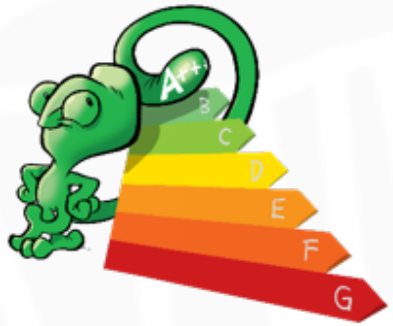
EC Technology – Fan retrofits boost efficiency

AC Centrifugal Belt Driven Fan with IE2 motor

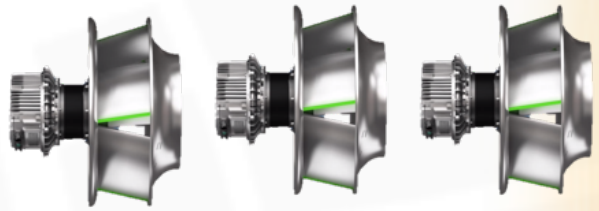


- Fan
- Motor
- VFD
- Spring
- Belt, pulley
- Slide in Rail
- Fan & Motor Rail

More Components
+
More Materials
+
More Labour
+
Additional Installation field cost



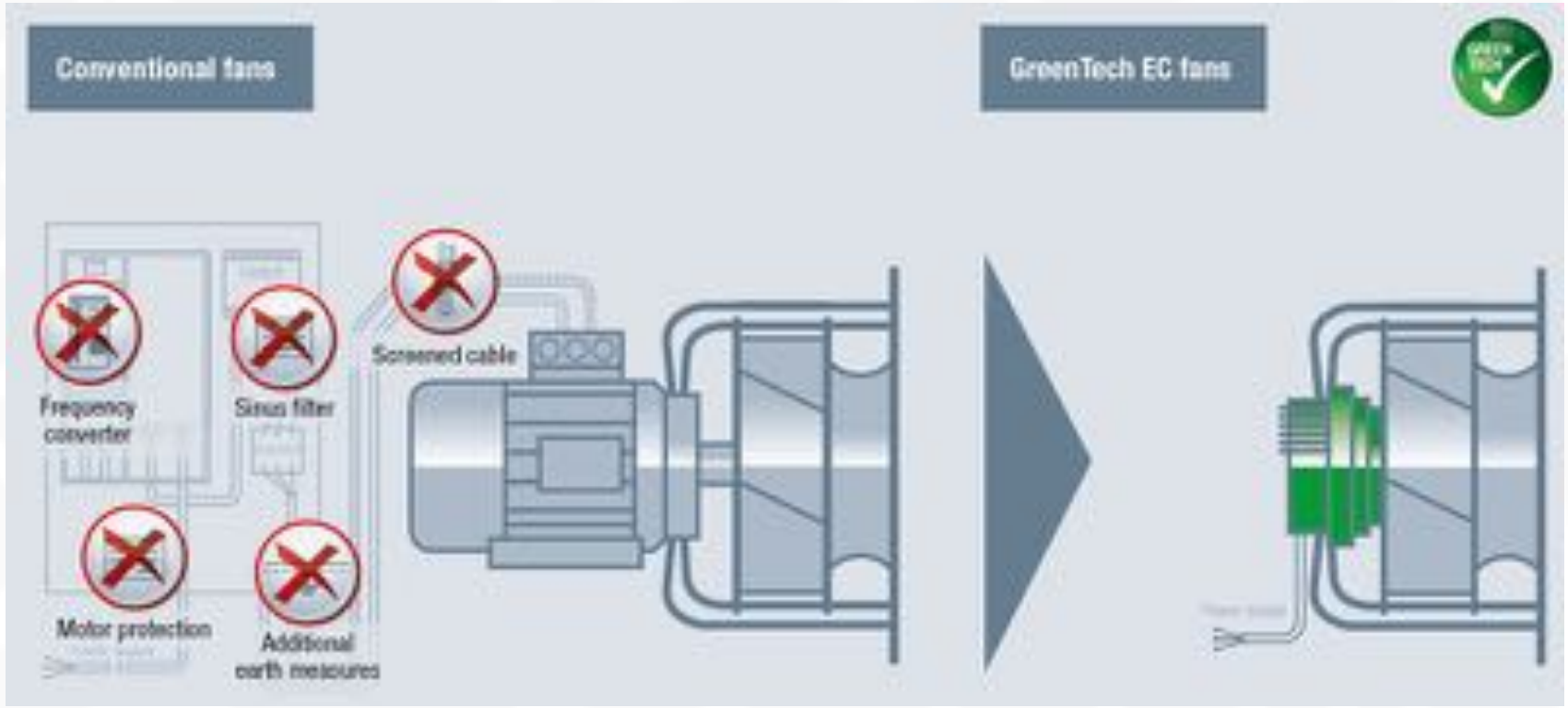
NO MORE BELT MAINTENANCE !
Sorry for Service people...



3 x EC Plug Fans IE4 motor

- High Efficiency
- Low Noise
- Integrated electronics (VSD)
- Low operating costs
- Precisely adjustable to actual air performance demand
- Long service life and high reliability

EC Technology
Fan Retrofits Boost Efficiency



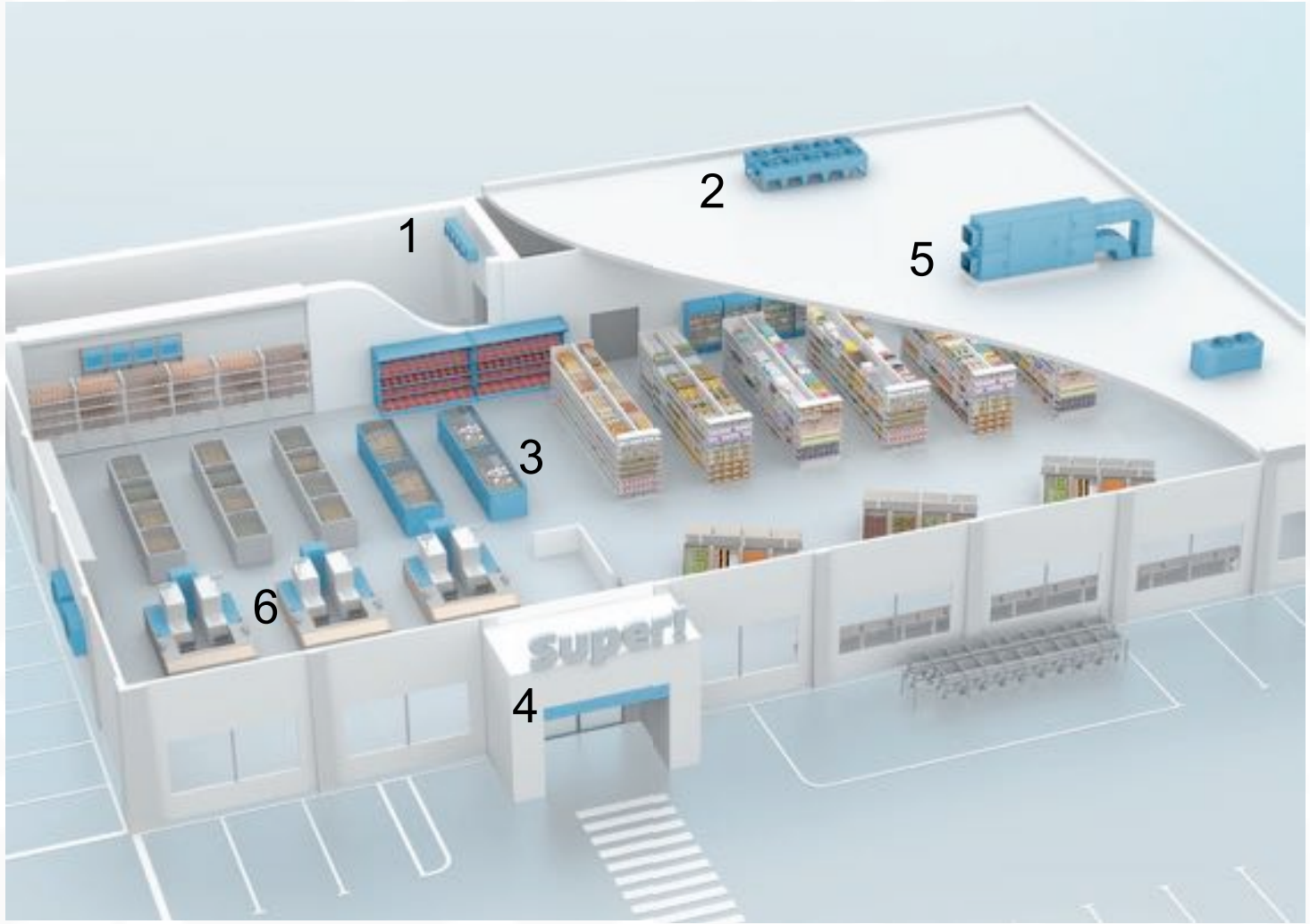
EC Technology
Fan Retrofits Boost Efficiency

Its not a case of less energy less air flow; EC Fans consume less energy for the same air volume.

Case Studies – Upgrade Projects

Energy Savings and Payback through Retrofit

Retail Sector

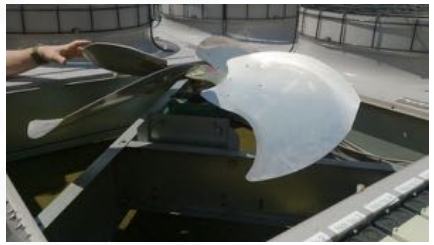


Examples of applications:

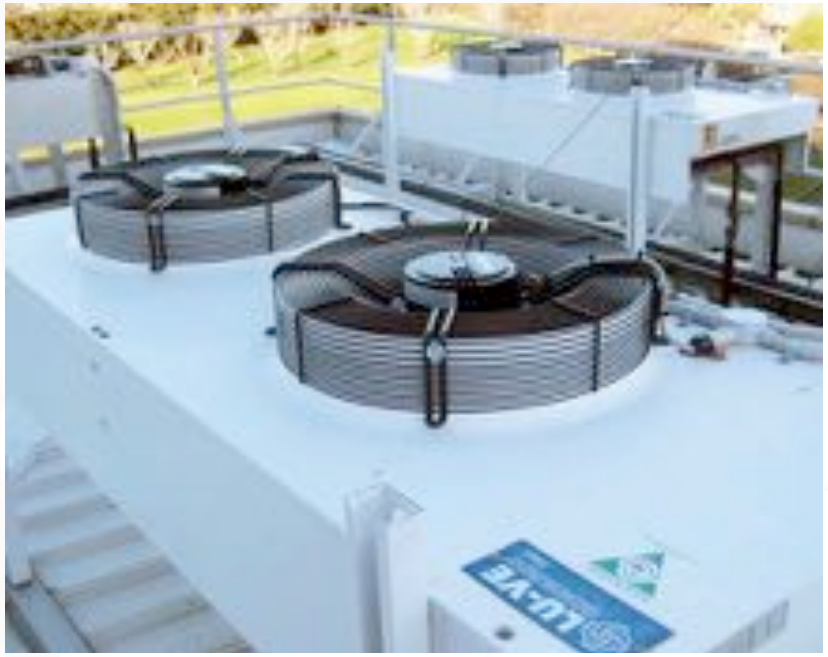
1. Evaporators
2. Condensers
3. Chiller cabinets
4. Air curtains
5. Centralised/decentralised air conditioning
6. Check-out conveyors
7. Ovens

Condenser

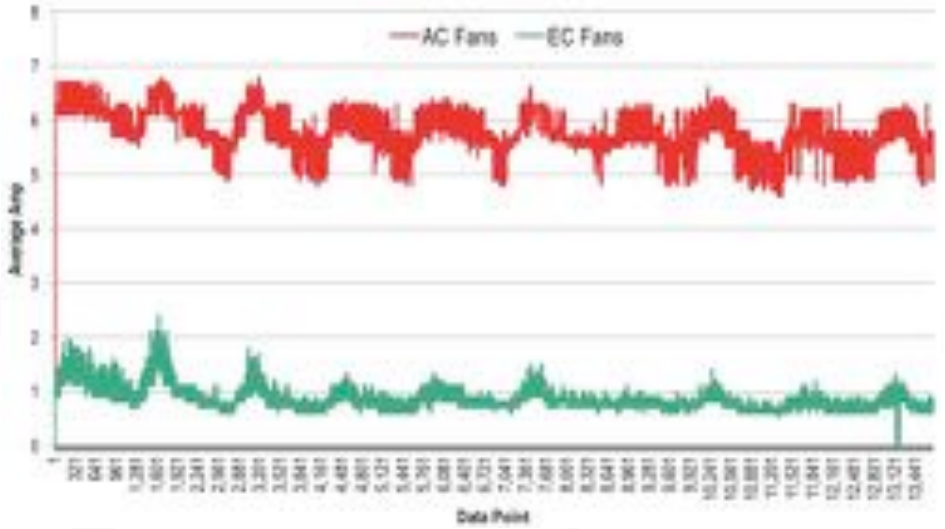
EC fans can be efficiently speed controlled from 0 – 100 %, this allows all fans to operate simultaneously drawing air through the entire condenser while operating efficiently at low speed.

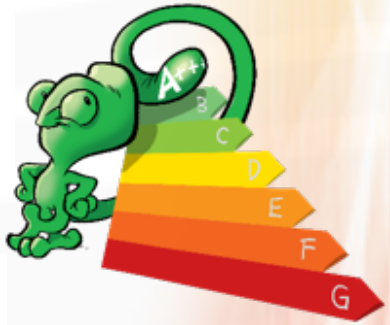


Condenser



Aims: Improve performance, reduce starting current, reduce power consumption





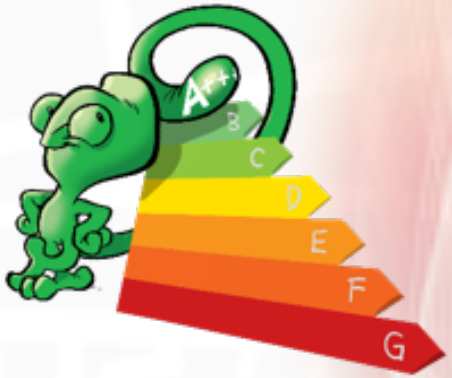
- 85 % reduction in input current. The average input current per fan decreased from 5.79 A to only 0.86 A.
- 30 % reduction in power compared to AC equivalents at full speed

Air Handling Units

- 7 AHUs – York YMS models
- 7 belt driven fans – Yilida SYZ Series with WAT IE2 Motor
- Smallest 3kW up to 11kW

The Results:

- **Power:** Reduced from 37.7 kW to 21.41 kW
- **Percentage:** 43.2 %
- **Saving:** 53726.15 AED ≈ 12557.64 EUR
- **ROI:** 0.8 yr



The aims:

- Replace failing AC fans with high efficiency EC Fans
- Reduced maintenance costs
- Increase flexibility by adding redundancy

Air Handling Units

We remove the old scroll fan and motor, build up a wall in the old fan chamber and install the new EC fans to suit.

The EC fan arrangement has a number of benefits as well as saving energy:

- Do not require maintenance
- Offer redundancy - If one fails the others will continue to run
- Do not require an inverter, so less energy loss and less 'weak points'
- Fans have a MODbus facility pre wired into the back of the motor and can be addressed so a BMS system can locate them.
- Run cooler than an AC motor at around 35 degrees Celsius
- Soft starting, so no spikes in power.
- Improved modulating speed, with a greater efficiency curve, so they are more efficient running at different speeds.

Refrigerated Display Cabinets

The Project:
Upgrade of 2000 fridge fans
Challenge = Reduce Power Consumption
Existing fans are 38W AC motors
Annual kW = 798,912 kWh

The Results:
Upgrade fans are 8W EC fans
New Annual Consumption = 154,176 kWh
Total Energy Reduction = 644,736 kWh (80%)
CO2 savings = 318.50 tonnes

Refrigerated Display Cabinets

The Project:
Upgrade of 30 refrigerated cabinets (fan section)
Existing fans total kWh/day = 4.9 kWh/day
Annual kW = 53655 kW

The Results:
Upgrade EC fans are 1.3 kWh/day
New Annual Consumption = 14235 kWh
Total Energy Reduction = 39429 kWh

Simplicity is the key to energy efficient retrofit project (figure 1)

Fan Coil Units

2 sizes of FCU
- Small (208)
- Large (212)

4 speed settings (manual)

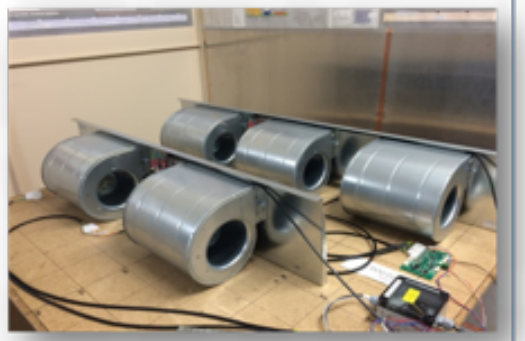
AC motor Twin Fan deck – efficiency of 25% at the OP

EC double fan unit – efficiency of 78% at the OP

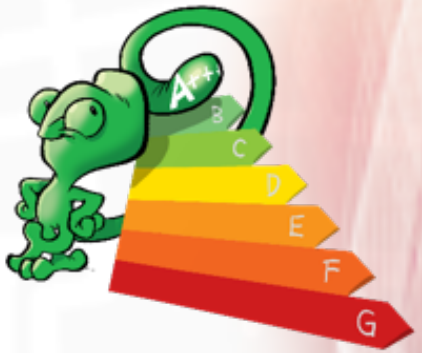
EC Fan Decks

Small unit - (2 x D3G133)
Large unit - (3 x D3G133)

Variable speed control – Via 0 – 10v

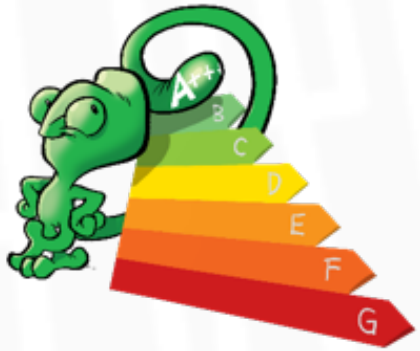


	Large unit	Small Unit
AC fan deck (W)	247	150
EC fan deck (W)	49	54
Saving (W)	198	96
% saving	80%	64%

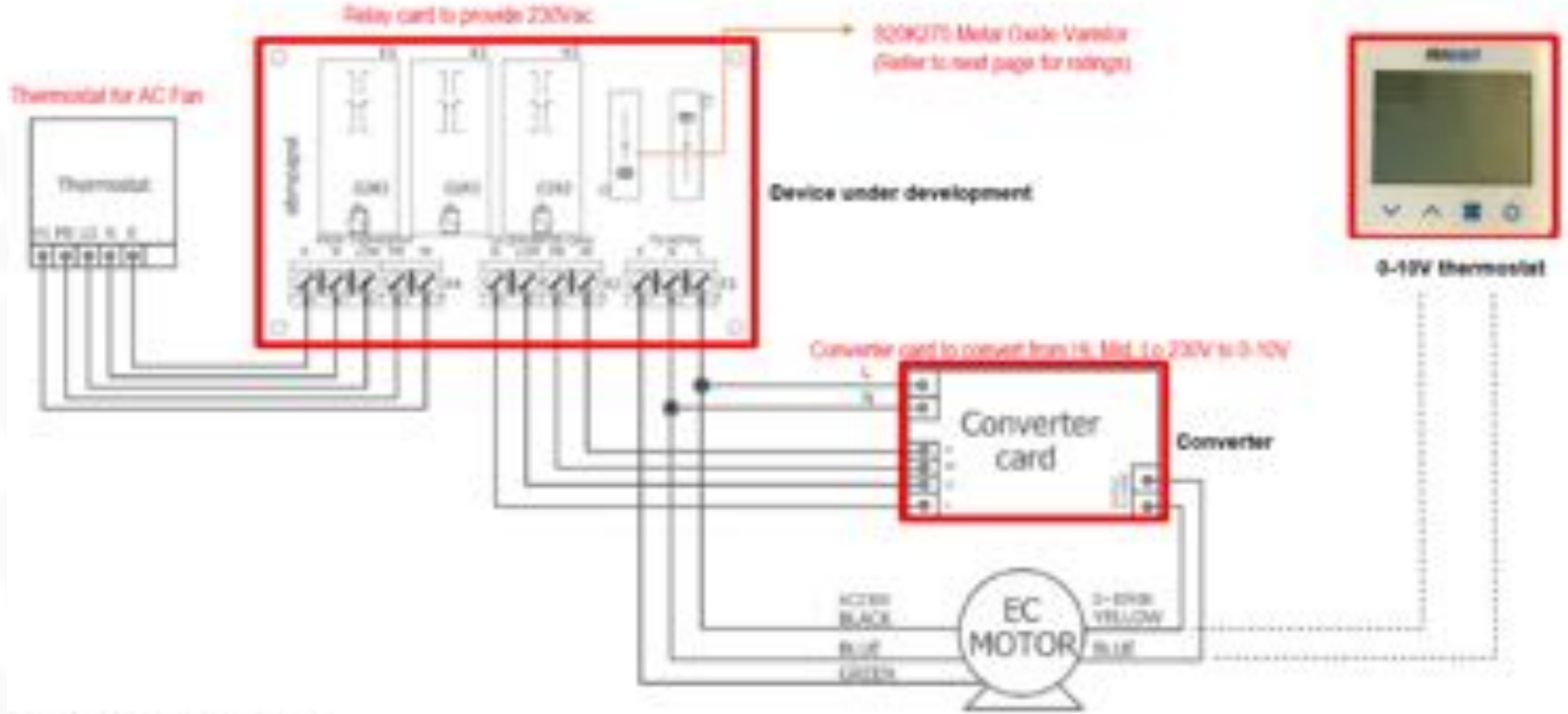


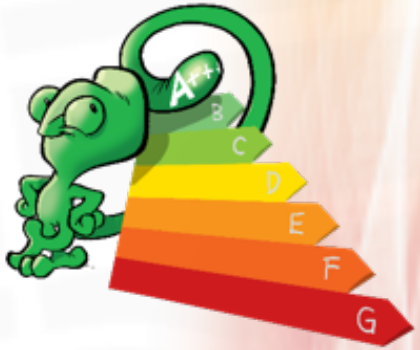
Fan Coil Units

Qty of Units	49
Run time (hrs / year)	3,120
AC fan deck (kW)	10,066
EC fan deck (kW)	2,506



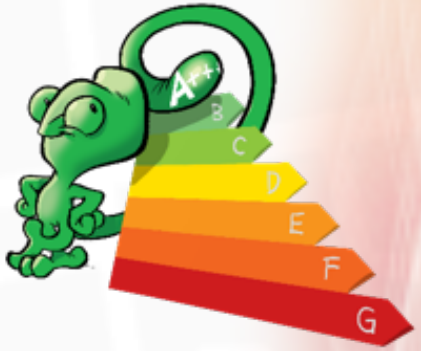
Fan Coil Units





Conclusion
Choose EC Technology

- High Efficiency
- Low Noise
- Extremely easy to install and replace thanks to the plug & play principle
- Integrated electronics (VSD)
- Low operating costs
- Precisely adjustable to actual air performance demand
- Long service life and high reliability



EUROVENT MIDDLE EAST

HVACR Leadership Workshops

Agenda

1. Food Retail Stores - A focus on Energy Efficient Refrigeration
2. How Air Curtains can be used to reduce thermal energy losses in the retail sector
3. Doing More with Less: Smart Stores and Energy Efficiency
4. Energy Savings through the Enterprise Management Platform
5. Case Studies on Air Conditioning and Refrigeration Retrofits in the Retail Sector
6. **Moderated discussion**