

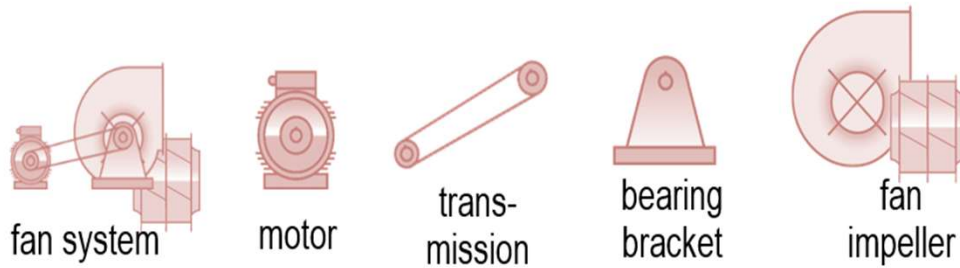
Ascertaining System Efficiency

MEPS Compared to Fan Performance

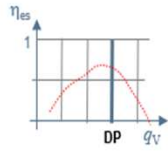
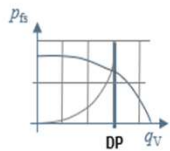
By: Francois Schoombie



Agenda



$$\eta_{es} = \eta_m? \quad ? \quad \eta_T? \quad ? \quad \eta_b? \quad ? \quad \eta_{rs?}$$



+ / ?
- x
DP max. opt
min

- 1 MEPS & Efficiency Landscape
- 2 Pitfalls of Motor-Only Replacement
- 3 Missed Savings vs. EC Fan Retrofits
- 4 The EC Retrofit Value Proposition
- 5 Overcoming Barriers & Case Examples
- 6 Key Takeaways + Q&A

Motors Dominate **Energy Use**



-53% of Global Electricity
is Consumed by **Motor-Driven Systems**



Improving Motor Efficiency = **Huge Savings!**



Reduced Energy
Consumption



Lower Costs



Less Emissions

Cold Chain Impact

Efficiency in Refrigerated Warehousing



24/7 Fan Systems
Running Continuously



Small Efficiency Gains
Scale Up Quickly



Major Cost Savings
Lower Energy Bills

Optimizing Refrigeration Systems = Big Savings!

ENERGY CRUNCH

In SA's context of high electricity tariffs and **load-shedding**, **efficiency** isn't just **green** — it's essential for cost control and reliability.



LOAD-SHEDDING WOES
Frequent Power Cuts & Blackouts

SOARING ELECTRICITY TARIFFS
Rising Costs for Households & Businesses

ENERGY EFFICIENCY
Key to Reducing Costs & Staying Powered Up

SAVE ENERGY

USE RENEWABLES

IMPROVE SYSTEMS

NEW MINIMUM ENERGY PERFORMANCE STANDARDS (MEPS)

Government Mandate: All New Industrial Motors Must Meet **IE3 Efficiency**

Effective June 2025

All Industrial Motors 0.75 – 375 kW Sold Must Be:

IE3 HIGH EFFICIENCY



IE3 High Efficiency

Phasing Out



Old IE1 Motor



Old IE2 Motor

IE1 & IE2 Motors to be Phased Out

Motor Efficiency Classes (IEC 60034-30)



IE1 Standard Efficiency



IE2 High Efficiency



IE3 Premium Efficiency



IE4 Super Premium Efficiency



IE5 Ultra Premium Efficiency

Brief History

— EFF1, EFF2, EFF3 used in Europe —



IE Classes Introduced in 2008

Global MEPS Adoption

IE Efficiency Classes

IE Class	Typical Application
IE1	Older Installations
IE2	Entry-Level Efficient Motor
IE3	Industrial Benchmark
IE4	Advanced Applications
IE5	Ultra High Efficiency

Key Factors Affecting Motor Efficiency

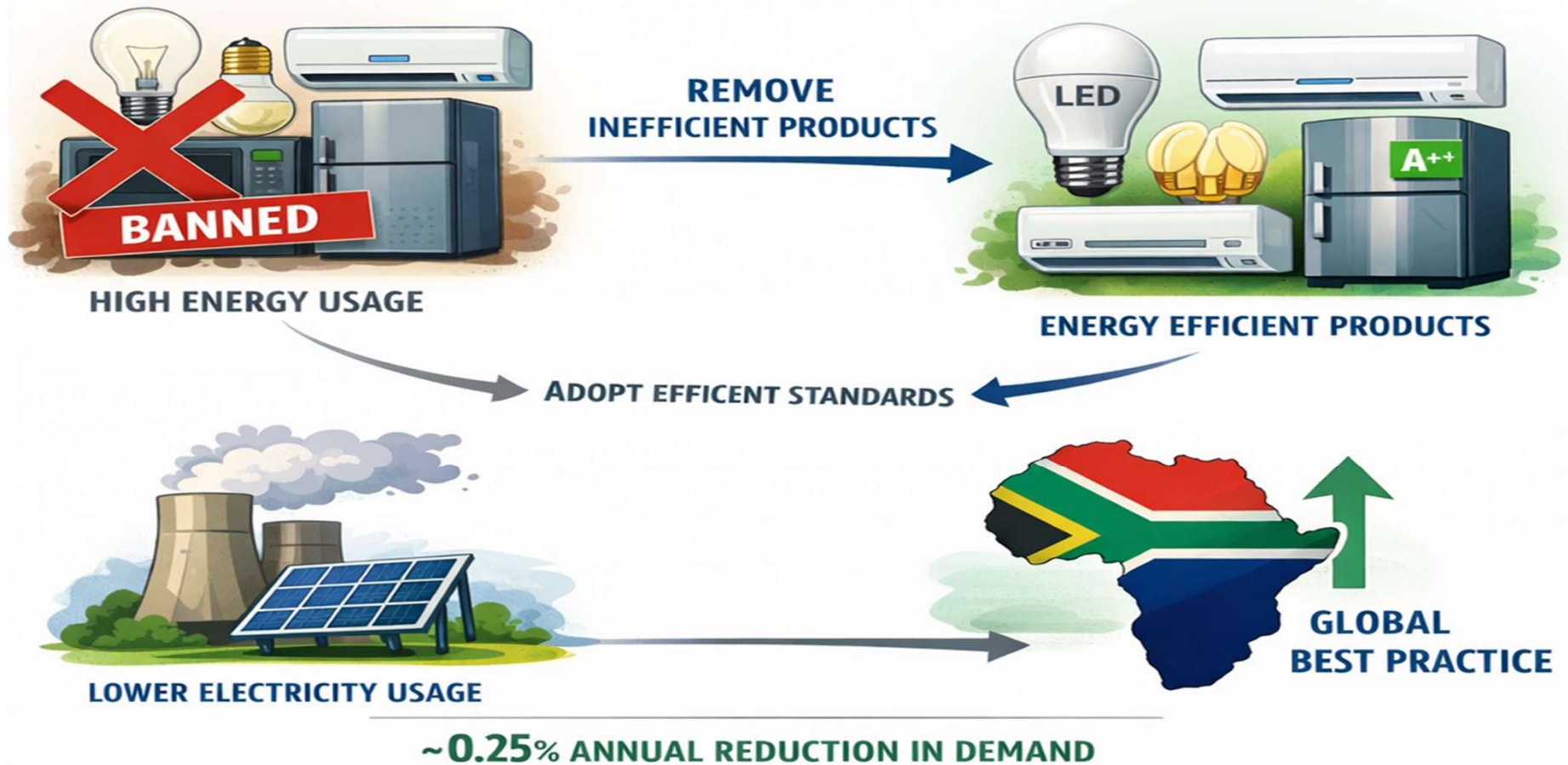
- Copper Losses
- Iron Losses
- Mechanical Losses
- Stray Load Losses
- Motor Loading
- Speed Control



REMOVING INEFFICIENT PRODUCTS FROM THE MARKET

— ALIGNING SA WITH GLOBAL BEST PRACTICE —

REDUCING ELECTRICITY DEMAND BY ~0.25% ANNUALLY



Benefits to Cold Chain Ops



MEPS ensure new compressors, fan motors, etc. are higher-efficiency...



Lower Energy Bills



Less Waste Heat
Improved Reliability



**Future-Proof
Equipment**

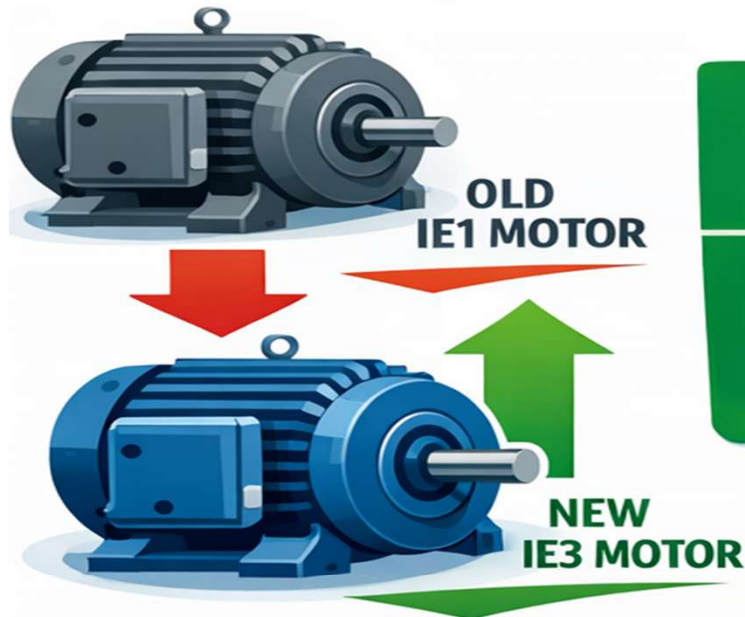
A Baseline for Efficiency...
But Only the Beginning.

MEPS BENEFITS

Energy & Cost Savings

Mandatory IE3 motors are
~4–10% more efficient than old IE1

Each new motor can save
5–10% of its energy use!



**A BIG IMPACT FOR FANS & PUMPS
RUNNING LONG HOURS**



MEPS BENEFITS

- **Equipment Quality & Longevity**

- **Efficient Motors (IE3+) Run Cooler, Reducing Failure Rates and Maintenance Costs.**
- **Cold Store Operators Get More Reliable Uptime – Preventing Costly Product Spoilage Events.**



MEPS **BENEFITS**

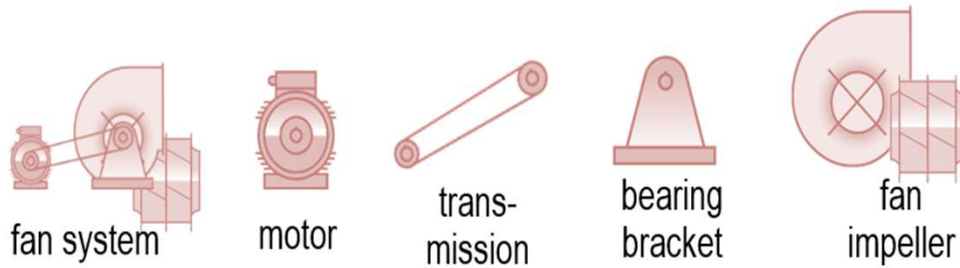
Market Transformation

**MEPS force the industry to innovate, leveling the playing field
(no dumping of cheap inefficient gear).**

This benefits forward-thinking cold chain companies ready to adopt advanced solutions.

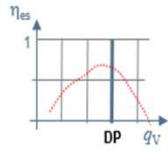
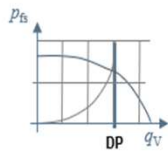


Agenda



2 Pitfalls of Motor-Only Replacement

$$\eta_{es} = \eta_m? \quad ? \quad \eta_T? \quad ? \quad \eta_b? \quad ? \quad \eta_{rs?}$$



+ / ?
- x
DP max. opt
min

Compliance vs.

Optimization

From Basic Compliance to System-Level Efficiency

Compliance:

IE3 Motor Installed



Basic MEPS Compliance

A Good Start!

Compliance Alone $\neq$ Full Optimization



Optimization:

System-Level Efficiency

The Real Prize!



Efficient Fans

Speed Control

Advanced Sensors

Optimized System Integration



The Common Fix: Motor-Only Replacement

Status Quo

Like-for-Like Swap



Old Motor



New IE3 Motor

Why It Persists



Lowest Upfront Cost

Cheaper & Easy Fix



Familiarity

Stick to What They Know



Downtime Concerns

Faster Motor Change

Result

Actual Savings



Slight Improvement



What You Could Achieve

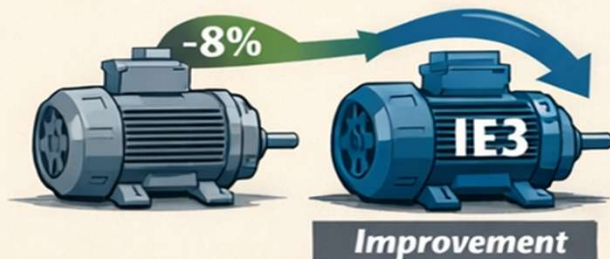


Limited Gains: Meeting IE3 but Missing Bigger Opportunities!

Pitfall: Limited Gains from Motor-Only

Modest Efficiency Gain

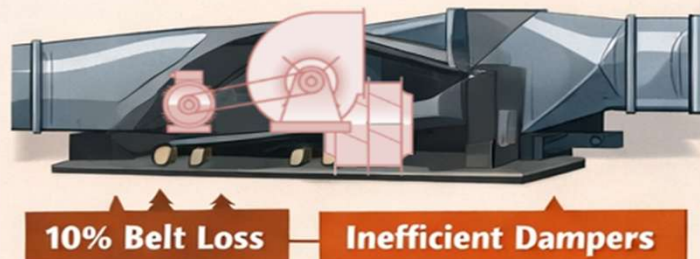
IE1 to IE3 Motor Upgrade:
5–8% Power Reduction for Fan



Marginal Gains, Much Untapped Potential

No System Optimization

Still Inefficient:
Belts, Controls & Old Fan Design



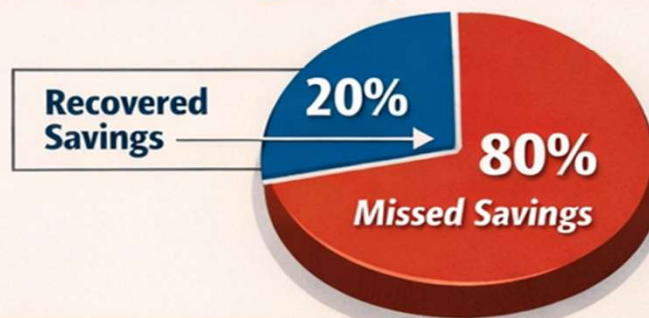
Hybrid Engine in an Old Car

Better Engine, Still Idling at Every Stop



Lost Savings

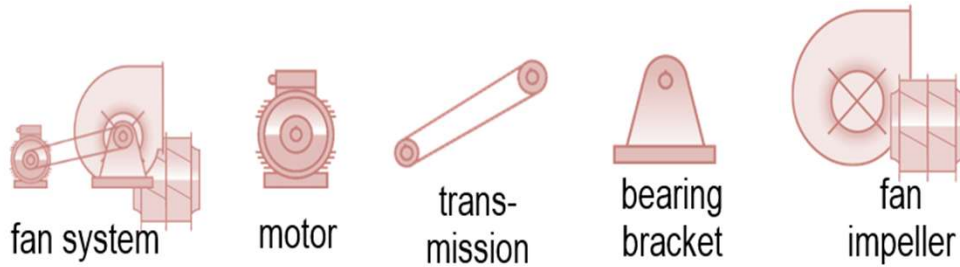
Only **20%** Savings Recouped



80% Potential Savings Left on the Table

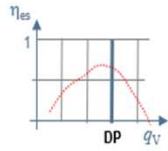
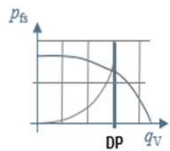
Far Short of Full System Optimization

Agenda



$$\eta_{es} = \eta_m? \quad ? \quad \eta_T? \quad ? \quad \eta_b? \quad ? \quad \eta_{rs?}$$

3 Missed Savings vs. EC Fan Retrofits



+ / ?
- x
DP max. opt
min

EC Fan Retrofit: Complete Fan Upgrade

- Replace old fan assembly with a new EC Fan System
- Direct-drive, high-efficiency unit with integrated speed control
- Plug & Play installation

Before



Old Belt-Driven Fan

After



New EC Fan

Why EC Fans?



High-Efficiency
IE4 / IE5 Motor



No Belts,
All Direct-Drive



Precise
Speed Control

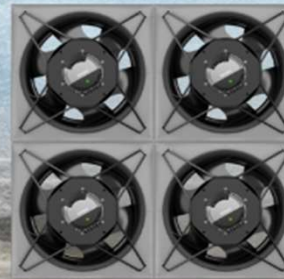
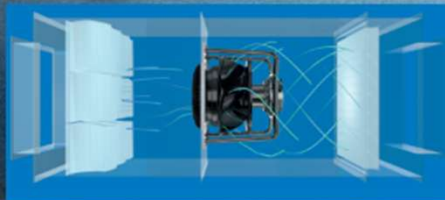
Unlocking Full Potential!



Maximum Energy Savings!



Optimized Airflow, Reduced Losses



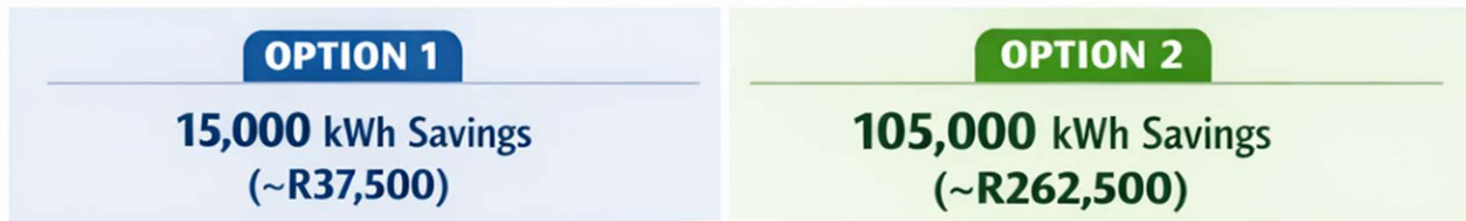
SAIRAC

Quantifying Missed Savings:

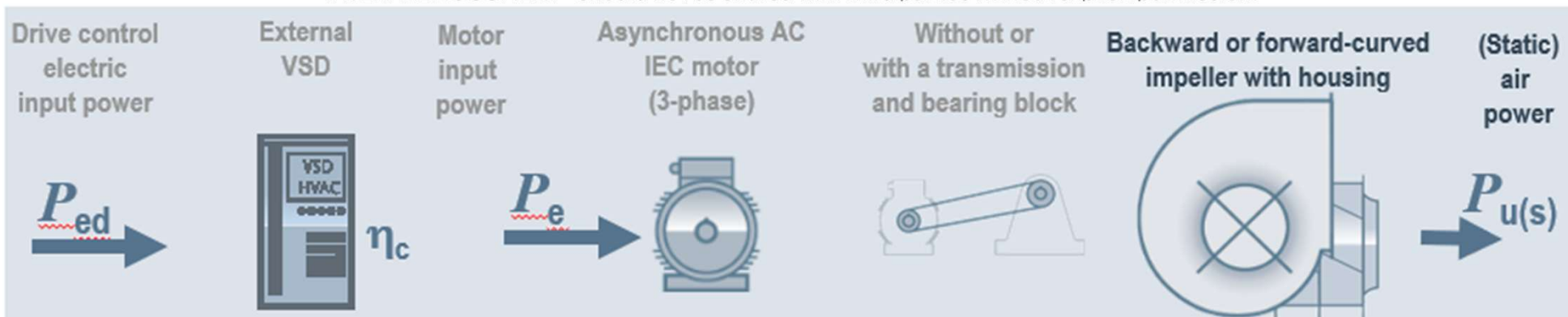
Evaporator Fan Example



5-Year Impact:



Option 2 Saves 90,000 kWh MORE!
(~R225,000 More)



Calculation method to determine efficiency of component parts

Overall (static) efficiency for fans **without** variable speed drive VSD:

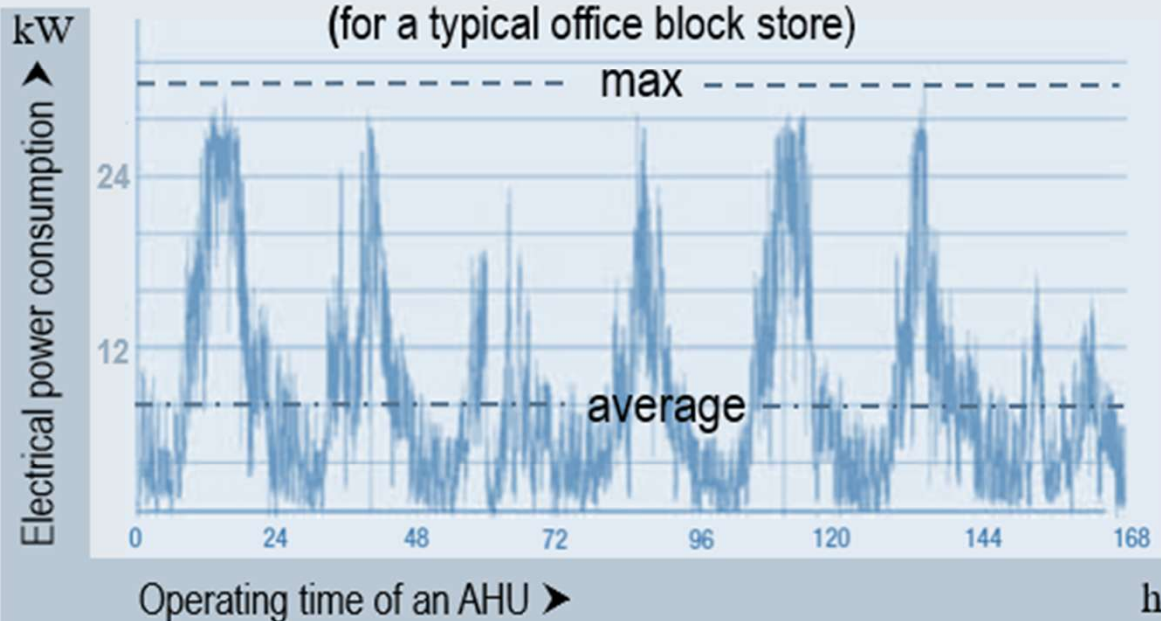
$$\eta_{e(s)} \approx \eta_m \cdot \eta_T \cdot \eta_b \cdot \eta_{r(s)} \cdot C_m$$

Energy saving potential through VSD

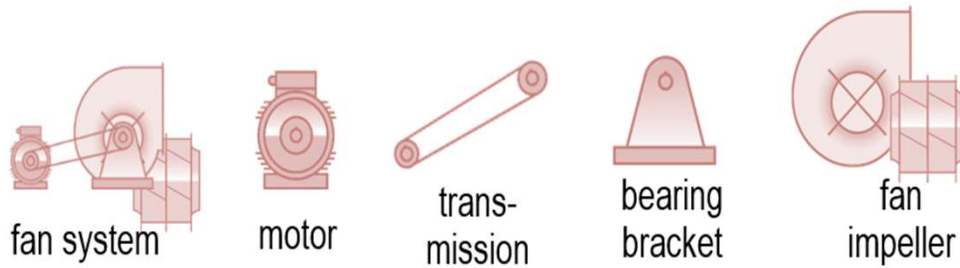
The time of day or weather conditions may cause the operating point to change.

→ Duty points related to real load requirements instead of to maximum load!

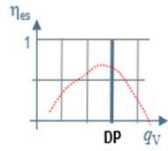
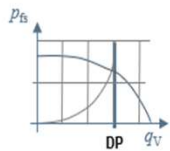
Power requirement of an AHU
(for a typical office block store)



Agenda



$$\eta_{es} = \eta_m? \quad ? \quad \eta_T? \quad ? \quad \eta_b? \quad ? \quad \eta_{rs?}$$



+ / ?
- x
DP max. opt
min

4 The EC Retrofit Value Proposition

Comparative Outcomes (Beyond Energy)

(3 min)

Maintenance

Motor-Only



Belts, Bearings & Couplings to Maintain

EC Retrofit



Beltless, Low Maintenance

VS

VS

Part-Load Performance

Motor-Only



Wasted Energy at Low Load

EC Retrofit



Variable Speed

VS

Reliability & Redundancy

Motor-Only



No Added Redundancy

EC Retrofit



Fan Arrays

VS



Self-Monitoring Sensors



Failure? Others Keep Running

Grid & Generator Load

Motor-Only

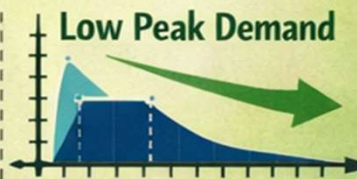


High Power Draw

EC Retrofit



Low Peak Demand



Soft Start Ramp

VS

Case Study: Cold Storage Warehouse Retrofit

Johannesburg - Freezer Evaporator Fan Upgrade



The Retrofit

Old 4 KW Fans



10 Freezer Rooms Upgraded



Upgraded EC Fans



Key Results

- 35% Fan Energy Savings
- Improved Temperature Uniformity
- Reduced Compressor Run-Time

ROI & Incentives

- ~ 3 Year Payback
- Section 12L Tax Incentive: 95c per kWh Saved
- Effective ROI: ~ 2.2 Years



- Pilot to Full Rollout

The EC Fan Retrofit Business Case (4 min)

Energy Cost Savings

30–50%+ Fan Energy Savings!

SA Tariffs: ~R2.00–R2.50/kWh

**Quick Payback
<1–3 Years!**



Life-Cycle Cost Advantage

90–95% of LCC = Energy Costs

Invest More Upfront, Big Long-Term Gains!



Maintenance & Downtime

Lower OPEX & Less Downtime

Ideal for Refrigerated Storage!



Resilience & ESG

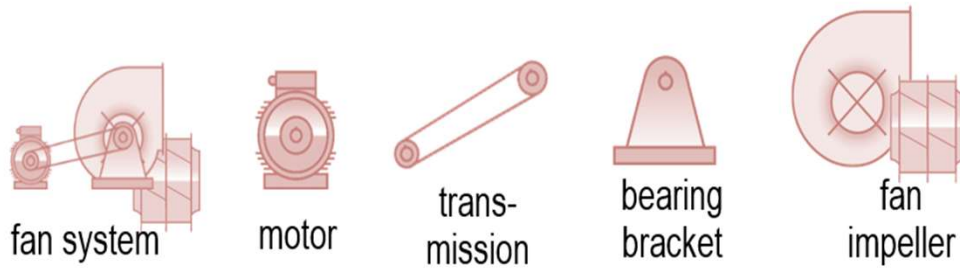
- **Reduced Peak Demand, Load-Shedding Ready**
- **Lower Carbon Footprint, ESG Benefits**



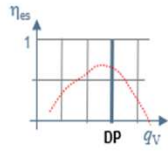
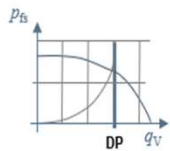
Saving Energy, Boosting Profits!



Agenda



$$\eta_{es} = \eta_m? \quad ? \quad \eta_T? \quad ? \quad \eta_b? \quad ? \quad \eta_{rs?}$$



+ / ?
- x
DP max. opt
min

5 Overcoming Barriers & Case Examples



Upfront Cost?

Yes, an EC retrofit costs more than a motor swap (1.5-3x).

- ✓ **Short paybacks** from operational savings
- ✓ **SA's Section 12L Rebate:** 95c per kWh saved
- ✓ **Eskom & Financing Incentives**
- ✓ **Cash-flow positive** options from Day One



Downtime Concerns?

Worried about taking systems offline for retrofit?

- ✓ **Phase Installations**
- ✓ **Backup Cooling Available**
- ✓ **Planned Maintenance Windows**
- ✓ **Quick, Plug-and-Play Installs** (Few Hours Per Fan)



Compatibility Issues?

Will new fans fit old units?

- ✓ **Retrofit-Friendly EC Modules**
- ✓ **Custom Surveys & Fitting**
- ✓ **Minimal Duct & Mount Rework**

Plan & Retrofit with Confidence!

Handling Objections: Reliability & Skills



Reliability of Electronics

- Proven Globally in Harsh Conditions
- Built-In Protections: Soft Start, Overload Cutout, IP54+
- 100k+ Hour Bearing Life
- Trusted Brands with Local Support

Service & Skills

- Largely Maintenance-Free
- Local Technical Support Available
- Training for Your Staff or Contractors

Spares & Interchangeability

- Modular, Replaceable Components
- One-for-One Fan Swaps Possible
- Stock Spares for Critical Systems

**Not a High-Risk Situation.
Flexible, Serviceable, & Reliable!**



Don't Settle for Minimum Compliance

MEPS compliance (IE3 motors) is good, but major efficiency gains require **holistic upgrades**.

Motor-only replacement is a **half measure** – better than nothing, but leaves money on the table.



EC Fan Retrofits = Big Wins

Upgrading fan systems can cut energy

30~50%+, with paybacks often ~2~3 years or less.



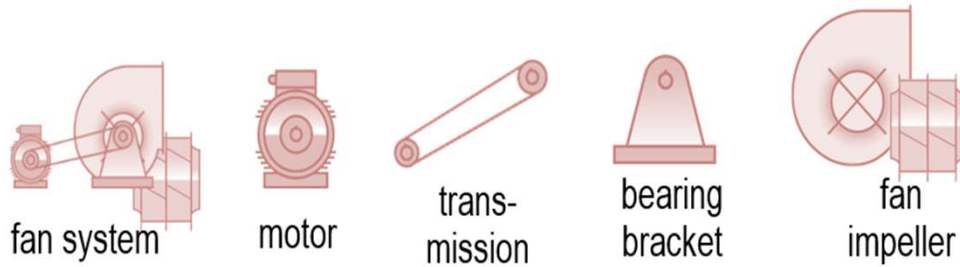
Strategic Move

In an era of high energy costs and grid instability, investing in efficient technology yields **guaranteed returns**.

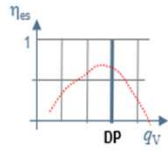
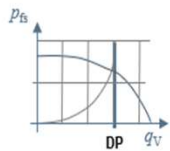
A "Win-Win" of Lower Costs & Boosted Sustainability.



Agenda



$$\eta_{es} = \eta_m? \quad ? \quad \eta_T? \quad ? \quad \eta_b? \quad ? \quad \eta_{rs?}$$



+ / ?
- x
DP max. opt
min

6 Key Takeaways + Q&A

Call to Action for Stakeholders

For Cold Chain Owners/Executives

- Think life-cycle, not just first cost.
- Demand LCC analyses for any equipment replacement.
- Leverage incentives like 12L tax deductions.
- Start with a pilot EC retrofit in one facility - scale up portfolio-wide!

For Engineers & Consultants

- Raise the bar on specs.
- Incorporate fan system upgrades!
- Optimize for part-load efficiency.

For Contractors & Facility Managers

- Partner up & skill up.
- Learn from EC fan suppliers.
- Champion advanced retrofits.



➤➤ Deliver More Value & Future-Proof Your Clients

Conclusion & Discussion

Ascertaining System Efficiency



Built-In Sensors



Edge Pre-Processing



Native Connectivity



**Sustainable
Solutions**



**Pioneer
Spirit**



**Intelligent
Technology**



**Customized
Solutions**
Plug & Play

System efficiency
should be considered
and not only
component level
efficiency

ISO 12759:2010 Fans – Efficiency classification for fans