

Energy Savings in Motor Systems is a huge Opportunity in every Business.

Approximately 50% of Global Electrical Supply is consumed in Electric Motors systems.

In nearly every business Electric Motors are the NUMBER ONE asset class on your Electric Bill.

Two Strategies are proven to make a significant difference:

1. Purchase Motors that are Magnetically Balanced: That means implementing an Acceptance Test at the point of sale. Magnetically Balanced motors are more efficient (A phase balance test is quick and easy)

THE PROFILE OF ENERGY USE IN INDUSTRIAL MOTOR SYSTEMS

- Electric motors are used in industry in various systems such as pumping, fan, compressed air, material handling, material processing, and other systems.
- Motor systems account for around **47%** of global electricity consumption.
- Motor systems in China, U.S., EU, India and Japan account for around **70%** of global electricity use of motor systems.
- Around **30%** of global electricity is consumed in electric motor systems in industry.
- The industry sector accounts for over **60%** of electricity consumption by motors worldwide, with the rest consumed in buildings, agriculture and transport sector.
- Industrial motor systems often account for around **70%** of manufacturing electricity consumption in different countries.
- Around **40%** of world electricity consumption in industrial motors is consumed in China.
- In the U.S., **PUMP SYSTEMS** account for around **40%** of the total industrial motor systems electricity consumption.
- In the U.S., **FAN SYSTEMS** account for around **20%** of the total industrial motor systems electricity consumption.
- In the U.S., **COMPRESSED AIR SYSTEMS** account for around **22%** of the total industrial motor systems electricity consumption.
- Globally, total demand for energy use in industrial motors **MORE THAN DOUBLES BY 2040**, almost half of this increase is in China and India.
- The major electricity saving potential in motor systems often exists not in the motor itself but elsewhere in the system.
- There is limited understanding on energy saving potential and cost of motor system efficiency improvement at the country or state level.
- GLOBAL EFFICIENCY INTELLIGENCE, LLC** is working on Global Motor Systems Efficiency Initiative (covers over 50 countries) and the U.S. Motor Systems Efficiency Initiative (covers 30 states in the U.S.)
- FOR MORE INFORMATION VISIT OUR PROJECTS PAGE AT www.globalefficiencyinfo.com
- REFERENCES:
 - IEA 2009 2009
 - IEA 2010 Energy efficiency policy opportunities for electric motor systems
 - IEA 2010 Motor Systems Energy 2008 Policy guidelines for motor efficiency
 - US DOE Energy Programs 2005
 - US DOE Manufacturing Energy Consumption Survey 2000
- Global Efficiency Intelligence, LLC

Best Practice Motor Management

Remote Coaching of Motor Acceptance Testing between Ireland Pharma Site and 3Phi Reliability France

	T1-T2	T1-T3	T2-T3	Conclusion
Resistance:	0.05725-0.05704	0.05729	0.05729	OK
Impedance:	6.21	6.59	7.21	OK
IPF:	38	39	39	OK
Phase Angle:	53	54	55	OK
Phase Balance:	14	14	9	14%
Insulation:	550			
Test Volt:	200			
Test Freq:	200			
Motor Comp:	No			
Direct Test:	Yes			

Findings: - Phase unbalance

Phase Balance correlates to Motor Efficiency in this case 14% loss.

2. Ensure terminations are the lowest they can be. Every resistance lowers the voltage seen by the Motor Windings, imbalances mean even good motors run inefficient.

These resistances are easily quantifiable and gains through good termination practice turned into Money saved on your bill. Most Motors (>90%) can return savings, but obviously you begin with the largest first.

In the example below: The “As Found” measurements were taken, rectifications made and the “As Left” measurements made. The difference **3500 GBP (4,200 USD)** in resistance elimination.

The reduction in resistance is used to calculate the gain, combined with an accurate reading of the running current (Amps).

Loss across a connection $Watts = I^2R$ (R is the difference As found As left, I Running Amps)

This is the Direct Current Formulae, for an Alternating Current eg 50Hz this must be reduced to the RMS value, then using your sites Power Cost per kWhr, and the estimated Running Hours a saving can be calculated.

In this example it took 2 hours to complete the remedial work, and returned 3500 GBP pa.

Example: Centrifuge Motor

As Found: Resistance Imbalance 3.08%

ALL-TEST PRO MOTOR GENIE® Condition Calculator™ - Report Jul 6, 2022, 02:21 PM

Motor ID: CENTRIFUGE
Test Date: Jul 6, 2022, 02:21 PM

	T1	T2	T1-T3	T2-T3	Conclusion
Resistance:	21	22	22		3.08
Impedance:	8.89	9.72	10.7		5.92
IP:	-39	-39	-39		0.0
Phase Angle:	58	57	58		1.0
Phase Balance:					
Insulation:	NO INSULATION				
Test Volt:	500				
Test Freq:	200				
Rotor Comp:	No				
Direct Test:	No				

Findings: - Check for loose connections
- Recommend check at motor if tested from MCC

As Left: Resistance Imbalance Zero
Absolute Resistance dropped by 0.21 Ohms.

ALL-TEST PRO MOTOR GENIE® Condition Calculator™ - Report Jul 6, 2022, 05:31 PM

Motor ID: CENTRIFUGE
Test Date: Jul 6, 2022, 05:31 PM

	T1	T2	T1-T3	T2-T3	Conclusion
Resistance:	0.00	0.00	0.00		0.0
Impedance:	9.97	9.92	10.8		5.92
IP:	-39	-39	-39		0.0
Phase Angle:	58	57	58		1.0
Phase Balance:					
Insulation:	NO INSULATION				
Test Volt:	500				
Test Freq:	200				
Rotor Comp:	Yes				
Direct Test:	Yes				

Findings: - Possible winding fault. See manual

I^2R 75 Rated Amps 0.22 Resistance 3712 Watts
estimate 60% Loss 2227 Watts

3563 Pounds Loss per Annum in I^2R losses.

Defects Fixed: Lug size incorrect, Loose Connection at Motor, Loose connection at Drive (Burnt Cable), Lug extruded, Crimping High Resistance and Lug arrangement incorrect.

