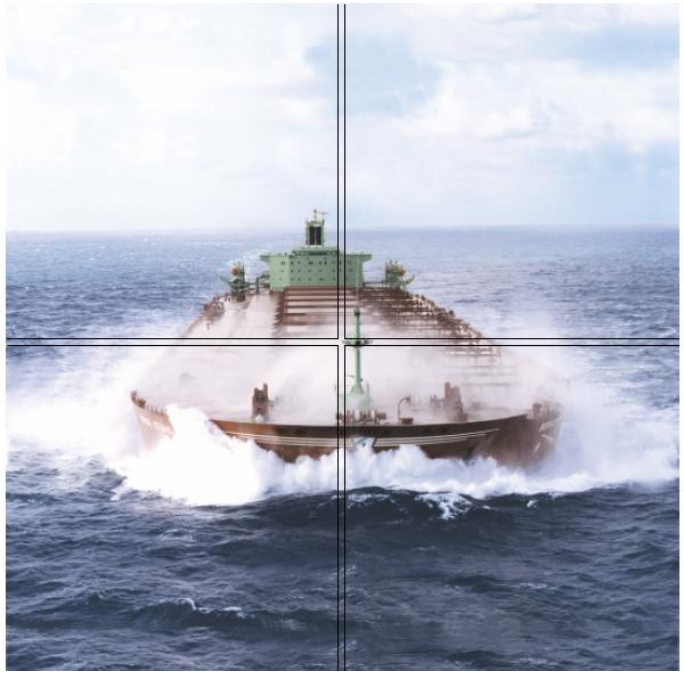
Increase energy savings and minimize maintenance costs.

Electric motors and drives

Presented by Torben Ralph Nielsen

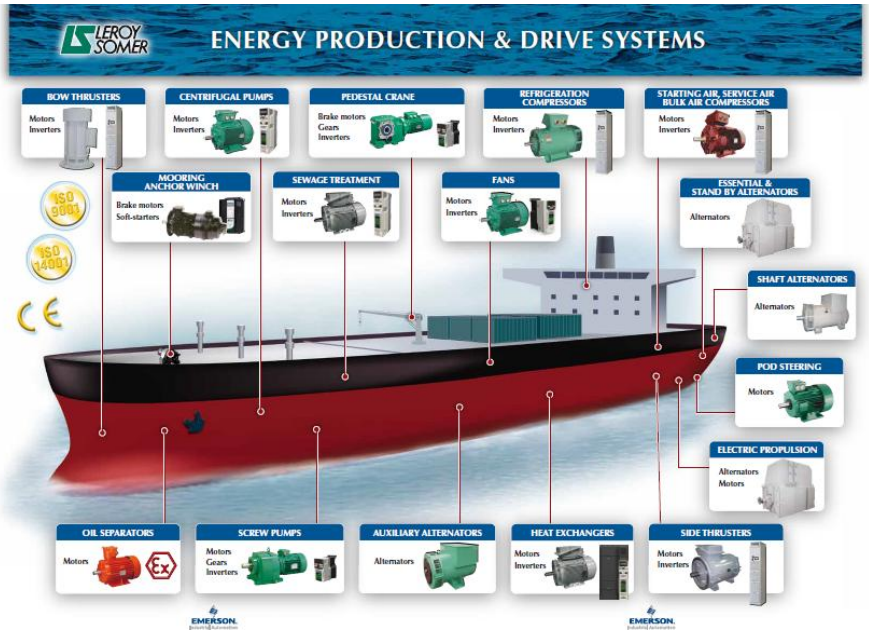


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Emerson Industrial Automation - Marine

Rotating electric machines and power electronics



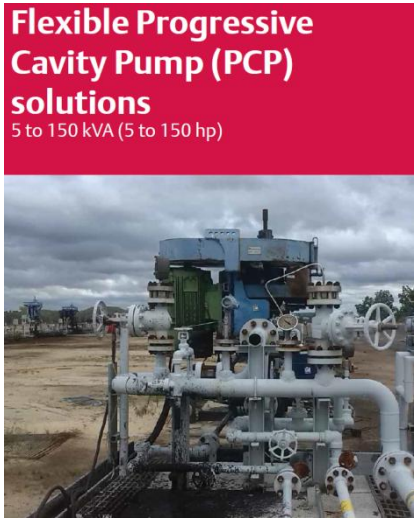




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Emerson Industrial Automation - Artificial Lift







Highly efficient and robust Reciprocating Rod Pumps (RRP) solutions



Recent field tests have confirmed that our RRP package using the Dyneo® Permanent Magnet solutions can save up 20% compared to traditional solutions.





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Fuel Saving Solutions



Fuel Saving Solutions

Optimizing the process

Optimizing the products

Saving maintenance costs

EMERSON™
Industrial Automation

Fuel Saving Solution electrical motors and drives

Main objectives

- Cooling Pumps and fans
- HVAC
- Compressors
- Hydraulic systems

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Fuel Saving Solution electrical motors and drives

Main objectives

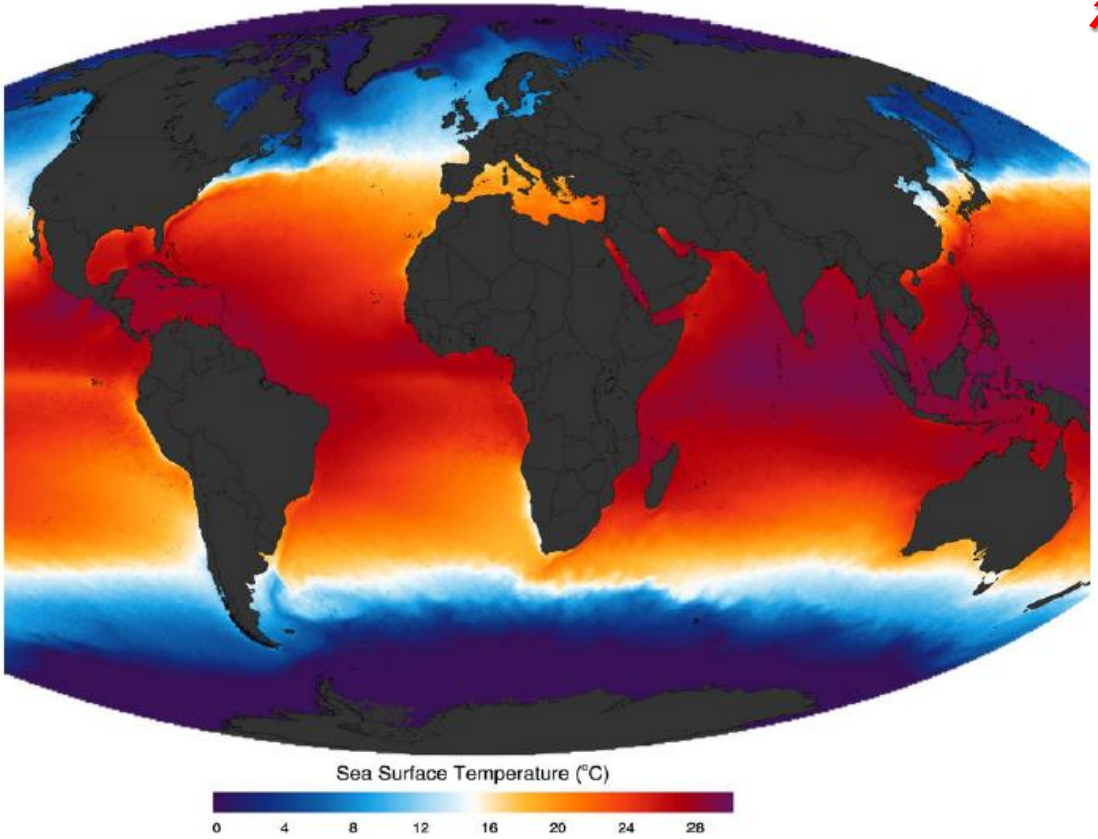
- Cooling Pumps and fans
- HVAC

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Basic points for the fuel save solutions

The cooling system on board of sea going ship is designed for 32°C sea water temperature

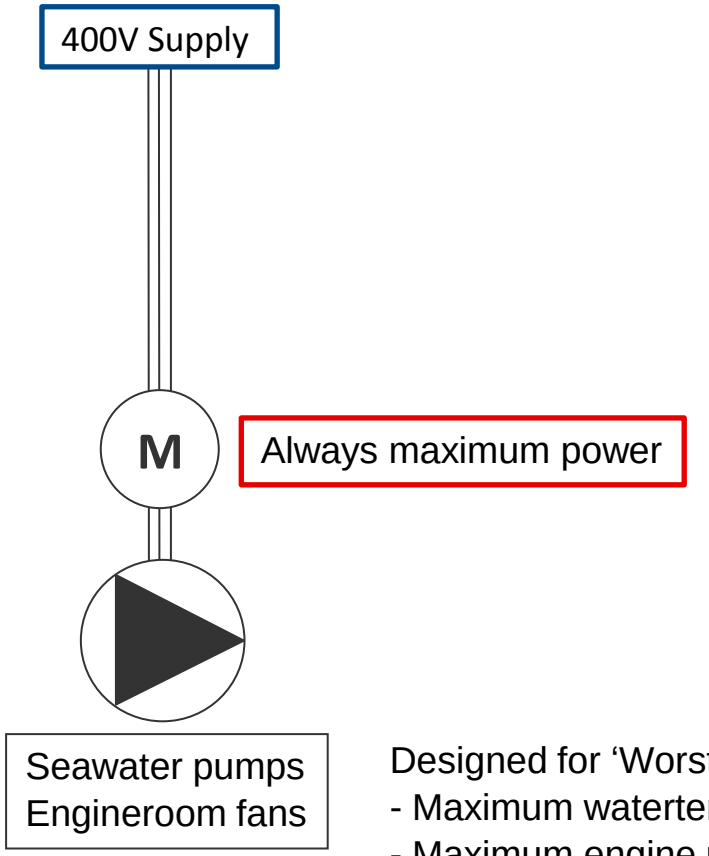
MODIS Aqua sea surface temperature 2003-2011 average.



On board of a ship we need 1kg of fuel to produce 4,2kWe

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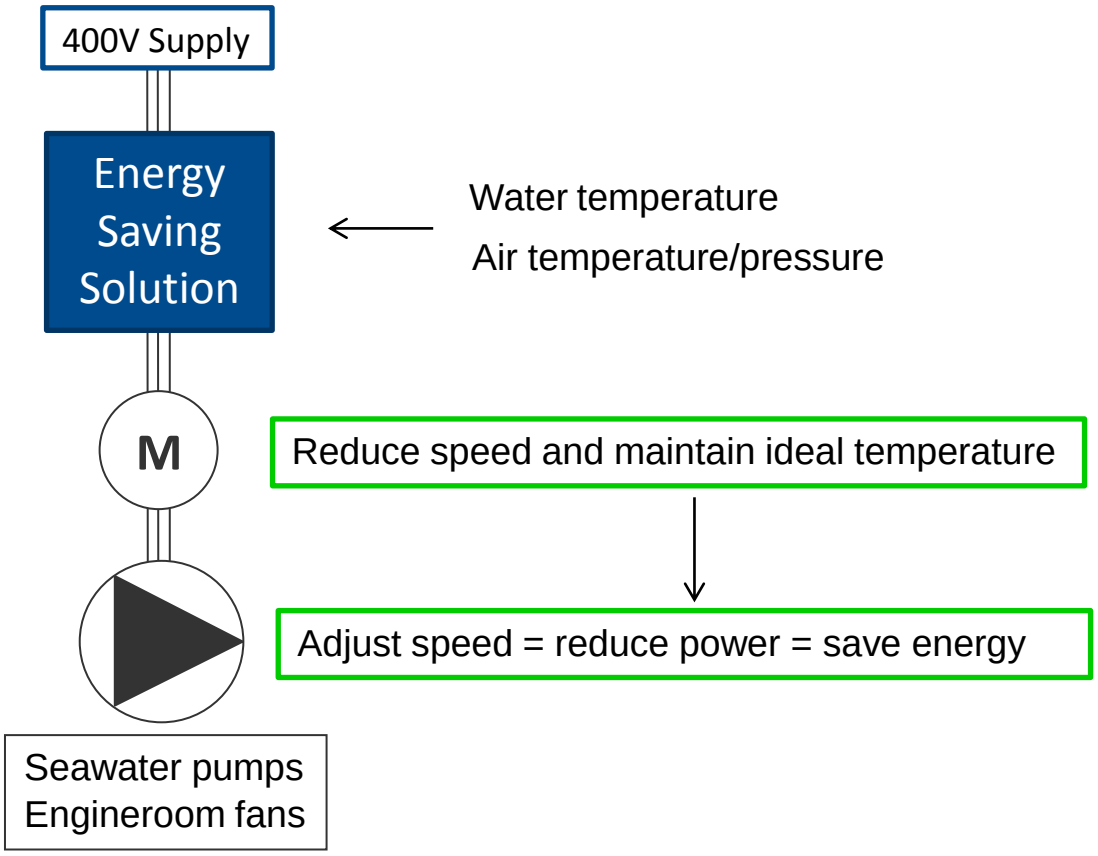
Pumps and fans running DOL



Designed for ‘Worst-Case Scenario’
- Maximum watertemperature
- Maximum engine room temperature

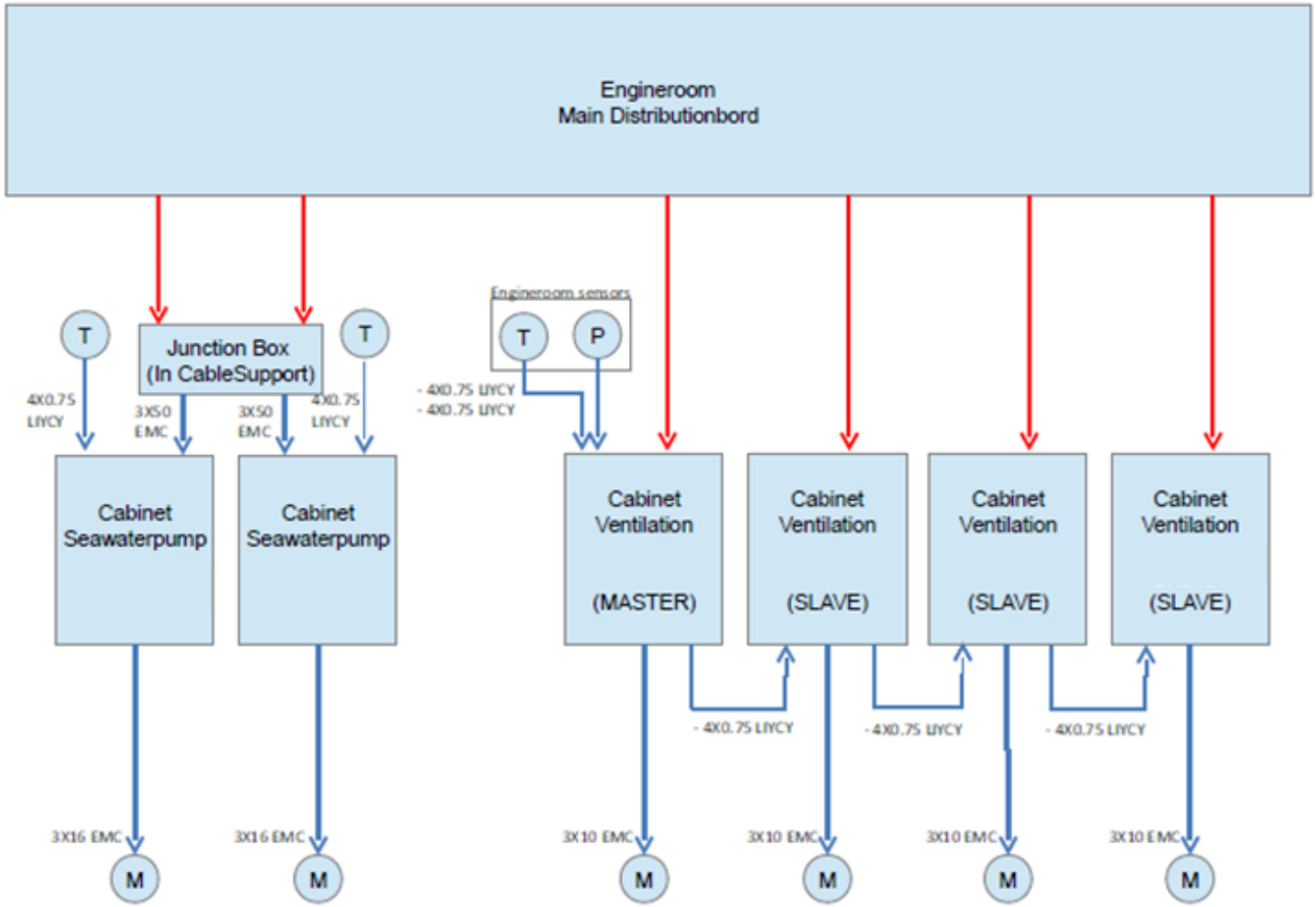
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Introduce the Emerson energy saving solution



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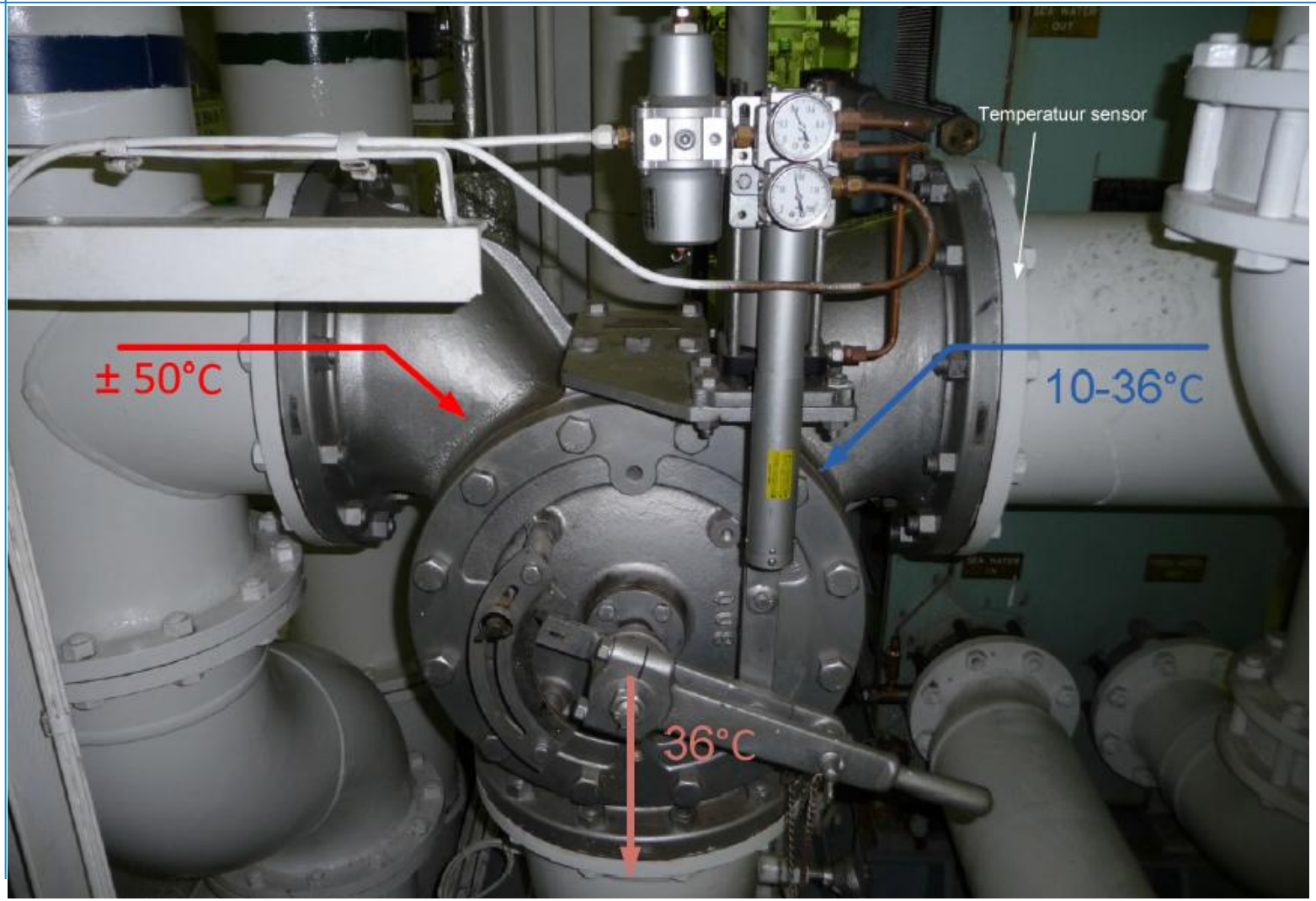
Installation seawater pumps and engine room fans



Wiring Diagram

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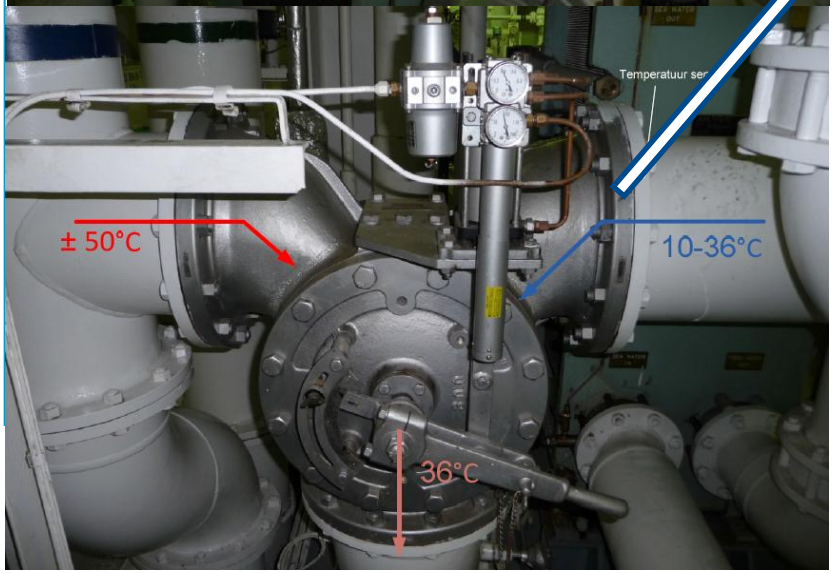
Waste of energy: mixing cold and hot to get 36°C



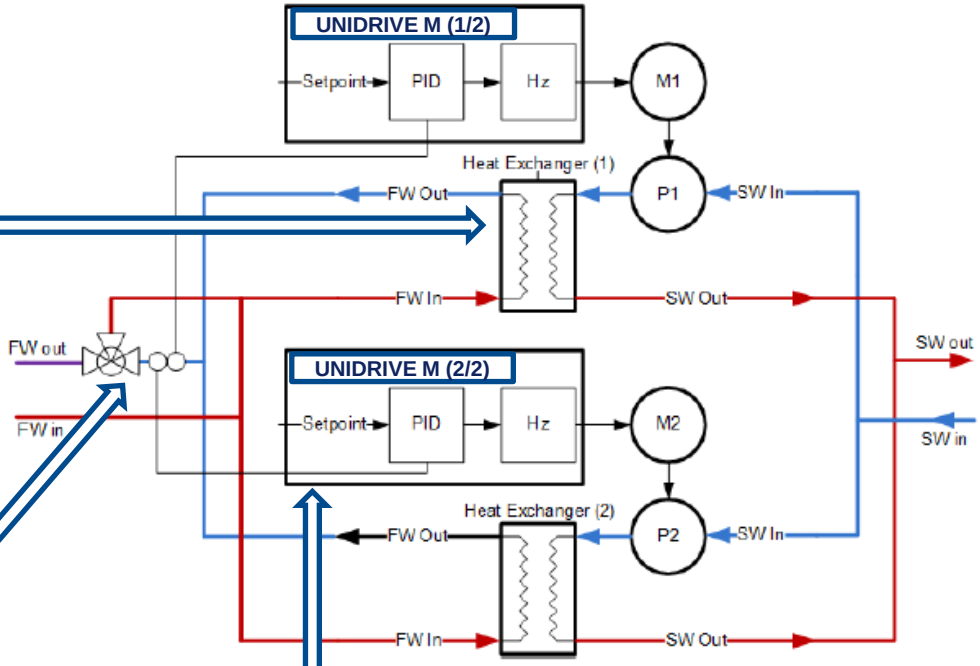
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Principle of the LT cooling water system









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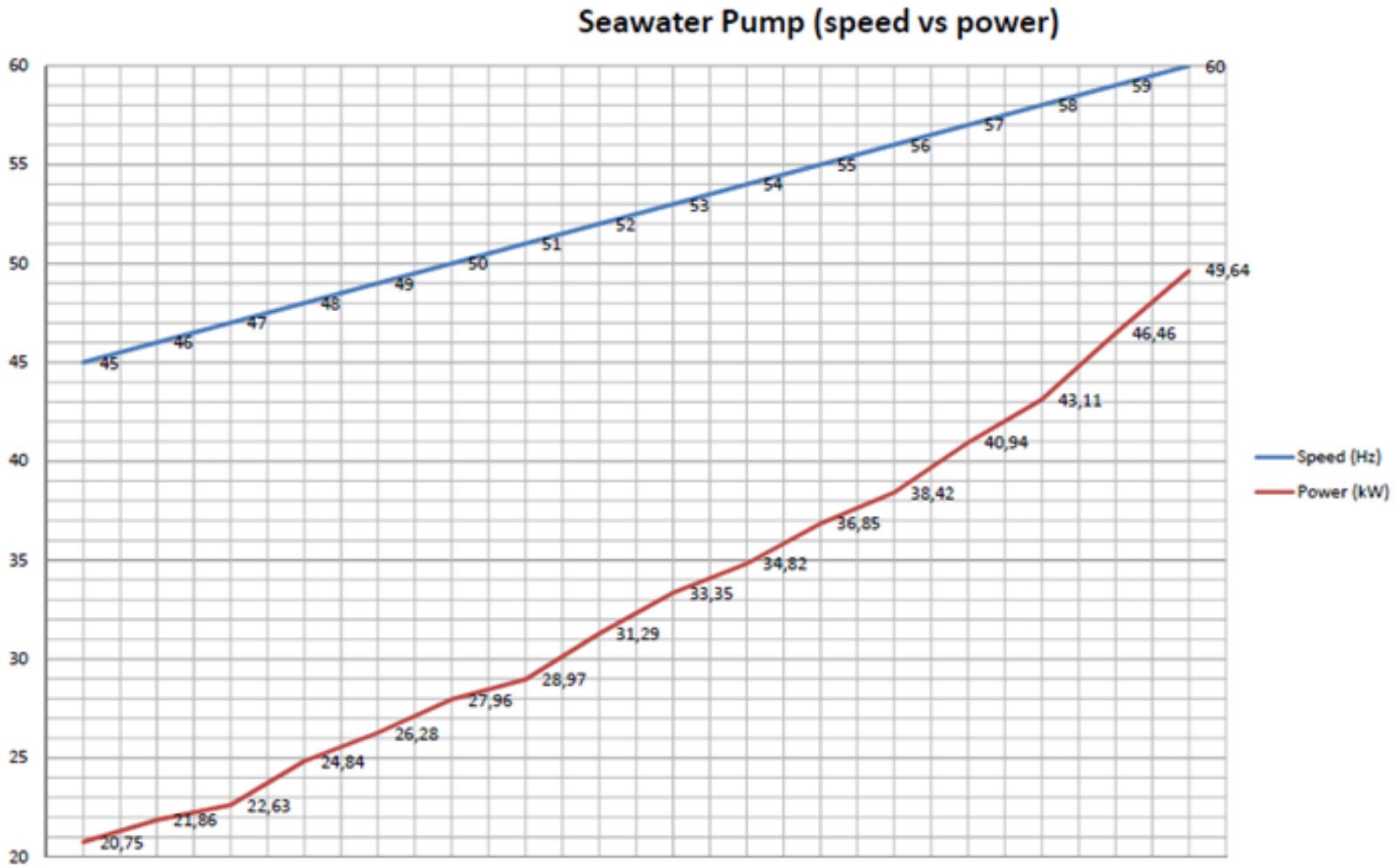
Engine room fan and Unidrive M control box





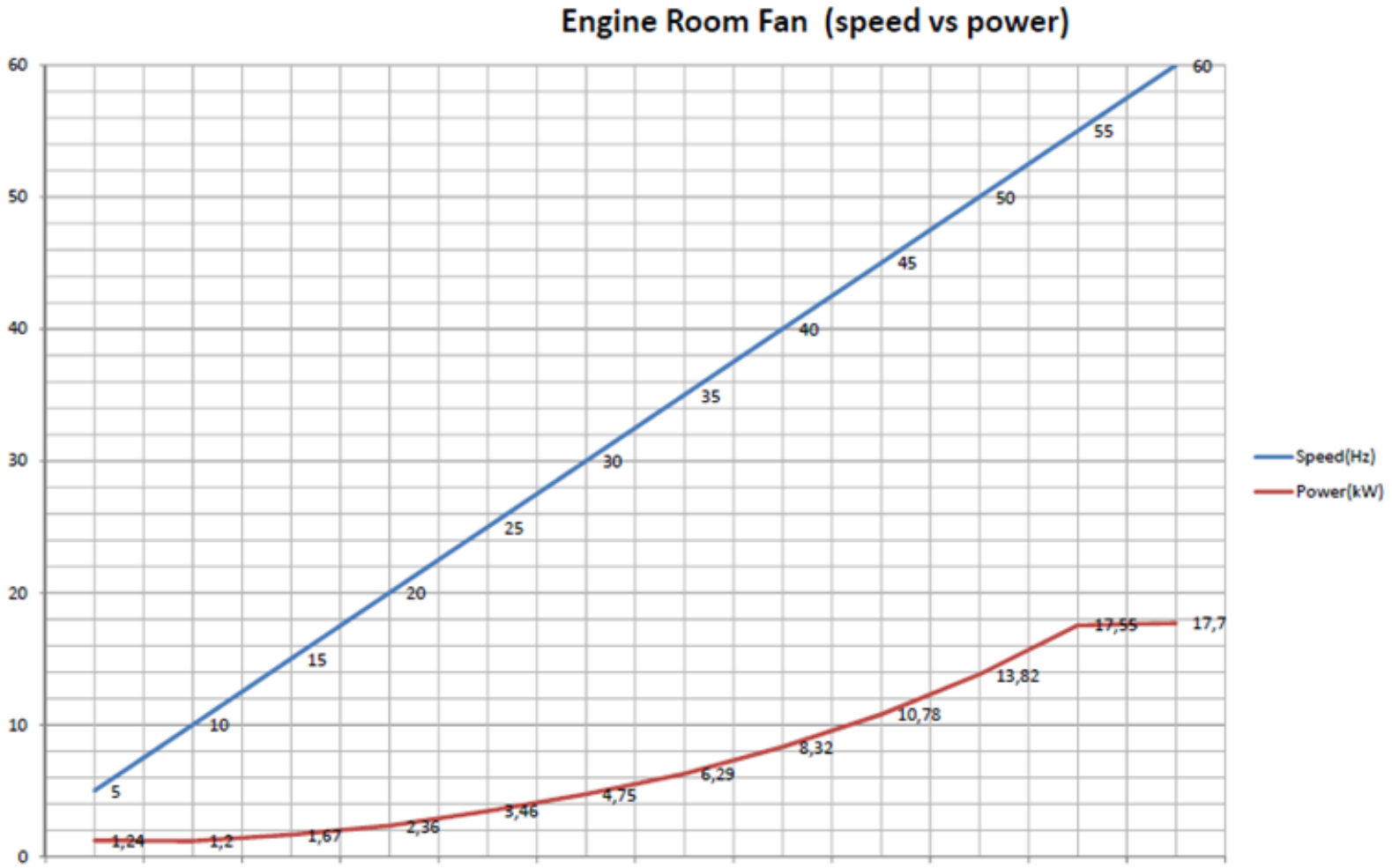
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Seawater pump can be reduced to 45Hz



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Engine Room Fan can be reduced to 30Hz



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Reduce Costs





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Energy Saving Estimator

Customer Information | System Data | Energy Estimation | Energy Graphs | Report

Step 2. System Data

Operation

Hours per Day of operation :	24	Hours
Days per Week of Operation :	7	Days
Weeks per Year of Operation :	52	Weeks
Cost per kWh :	15,00	Cents

AC Motor Data

Motor Power :	22,0	kW
Motor Efficiency :	95,0	%

Company Incentive

(•) One-time Incentive 0,0 €/kW

( ) Yearly Incentive

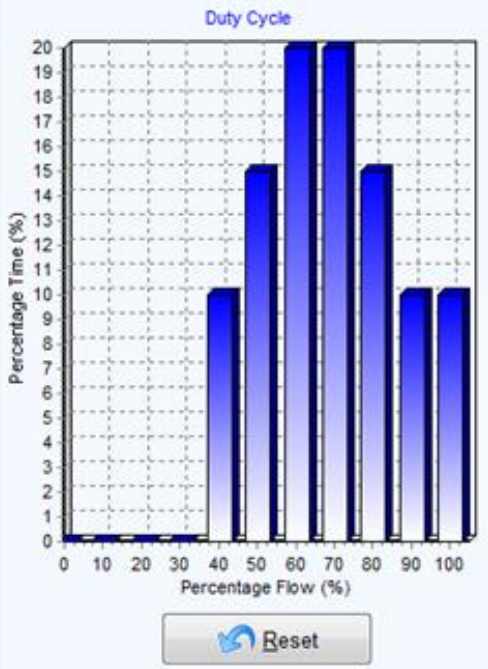
VFD / Inverter Data

VFD Cost : €

Enter operation, motor data and drive data, then continue on to Step 3 to enter the duty cycle.

Step 3. Duty Cycle

Flow (%)	Time (%)
100%	10 %
90%	10 %
80%	15 %
70%	20 %
60%	20 %
50%	15 %
40%	10 %
30%	0 %
20%	0 %
10%	0 %
	+
	100%



Enter duty cycle data. Specify the percentage time that your fan or pump operates at a given flow. (Example: Pump operates 60% of the time at 80% flow, enter 60 in the 80% flow field.)

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Calculate the return on investment

Total Annual Hours of Operation : 8.736 Hours

Operation/AC Motor Data/VFD Data

Cost per kWh :	€ 0,15
Motor Power :	22,0 kW
Motor Efficiency :	95,0 %
Drive Efficiency :	97,0 %
Company Incentive :	0,0 €/kW

Annual Energy Cost:

Variable Speed Drive :	€ 12.124
Inlet Vane Control :	€ 20.840
Outlet Damper Control :	€ 24.962
No Speed Control :	€ 30.429

Duty Cycle

Flow (%)	Time (Hrs)	Time (%)
100%	873,6 Hrs	10 %
90%	873,6 Hrs	10 %
80%	1.310,4 Hrs	15 %
70%	1.747,2 Hrs	20 %
60%	1.747,2 Hrs	20 %
50%	1.310,4 Hrs	15 %
40%	873,6 Hrs	10 %
30%	0,0 Hrs	0 %
20%	0,0 Hrs	0 %
10%	0,0 Hrs	0 %

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Fuel Saving Solution electrical motors and drives

Main objectives

- Cooling Pumps and fans
- HVAC
- Compressors
- Hydraulic systems

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Compressor optimization

Scalable performance of our wide-ranging solutions



*COP = Cooling power produced / Electrical power consumption
(Coefficient of Performance)

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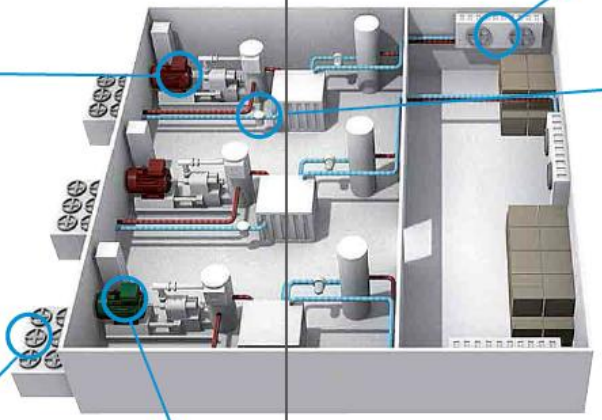
Typical installation



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Drives and motors for industrial refrigeration

Emerson Industrial Automation provides the broadest range of high quality drives and motors on the market, with leading performance and efficiency ratings. Along with our expertise in this field, we are the perfect partner for contractors and system designers in developing bespoke industrial refrigeration solutions that meet and exceed the needs of end users.



Motors for evaporators
0.09 to 2 kW - up to 70°C



Motors IC418 for axial fan mounted on grid, cooled by the air flow

HE 29 / IP55

Drives and motors for compressors
0.75 to 550 kW



Wall mount or free standing variable speed drive

Powerdrive MD2

IP21 - IP54

Sensorless Permanent Magnet Motor Control



Dyneo

Synchronous permanent magnet motors

LSRPM / IP55

PLSRPM / IP23

Drives and motors for pumps
0.75 to 85 kW



Variable speed drive

Powerdrive F300

Sensorless Permanent Magnet Motor Control



Dyneo

Synchronous permanent magnet motors

LSRPM / IP55

PLSRPM / IP23

Drives and motors for condensers
up to 7.5 kW - up to 70°C



Variable speed drive

Powerdrive F300



PAD mounting motors for axial fans

CM29 - CM34 / IP55

Soft-starters and motors for compressors
0.75 to 900 kW



Soft-starter with integrated bypass

Digistart D3



IE2 IE3

IMfinity®

High & Premium Efficiency AC induction motors

PLSES / IP23

LSES - FLSES / IP55

* Must be used with inverter in EU

Drives and motors for cooling towers
up to 75 kW - up to 70°C



Variable speed drive

Powerdrive F300



IE2 IE3

IMfinity®

PAD mounting motors (or foot & flange) non ventilated in air flow IC418

LSES - FLSES / IP55

* Must be used with inverter in EU

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Fuel Saving Solution electrical motors and drives

Main objectives

- Cooling Pumps and fans
- HVAC
- Compressors
- Hydraulic systems

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Deck Equipment









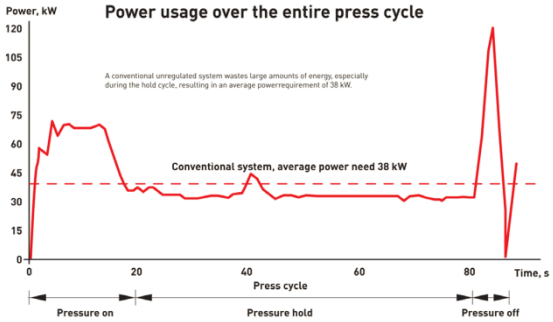
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Emerson Industrial Automation - Marine

Hydraulic systems

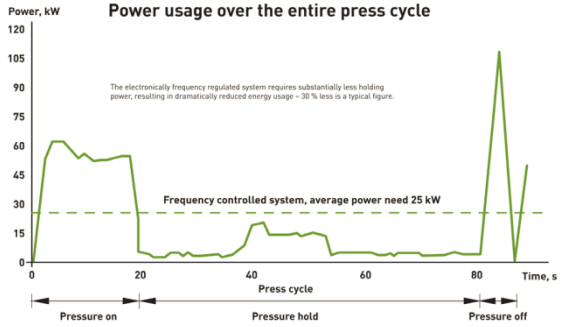


Conventional hydraulic system



38kW x 7200h x $.10/kWh = $27,360/Year

VSD controlled hydraulic system



25kW x 7200h x $.10/kWh = $18,000/Year

Total annual energy saving = $ 9.360/Year

Hydraulic power units are an ideal application for variable speed drives, which can run in setpoint control mode. By receiving inputs representing flow rate or pressure, the drive can maintain just the right pump speed to accurately hold a setpoint. Higher efficiency gained by using the VFD results in less heat to be dissipated. Benefits of noise reduction and energy savings can be achieved on both variable speed pressure compensated and fixed displacement pumps.

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Fuel Saving Solution electrical motors and drives

Optimizing the products

AC asynchroneus Induction motors

AC synchroneus Permanent Magnet motors

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Reduced maintenance costs

Electrical motors and drives

Our new range of IFT AC induction motors have:

- Reduced mechanical, magnetic and electric losses
- New improved materials and lubricants
- 25% thermal reserve
- High η

AC permanent magnet motor Dyneo

- No induction current in the rotor = less heat generated

Lower temperature

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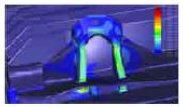
Motors improved

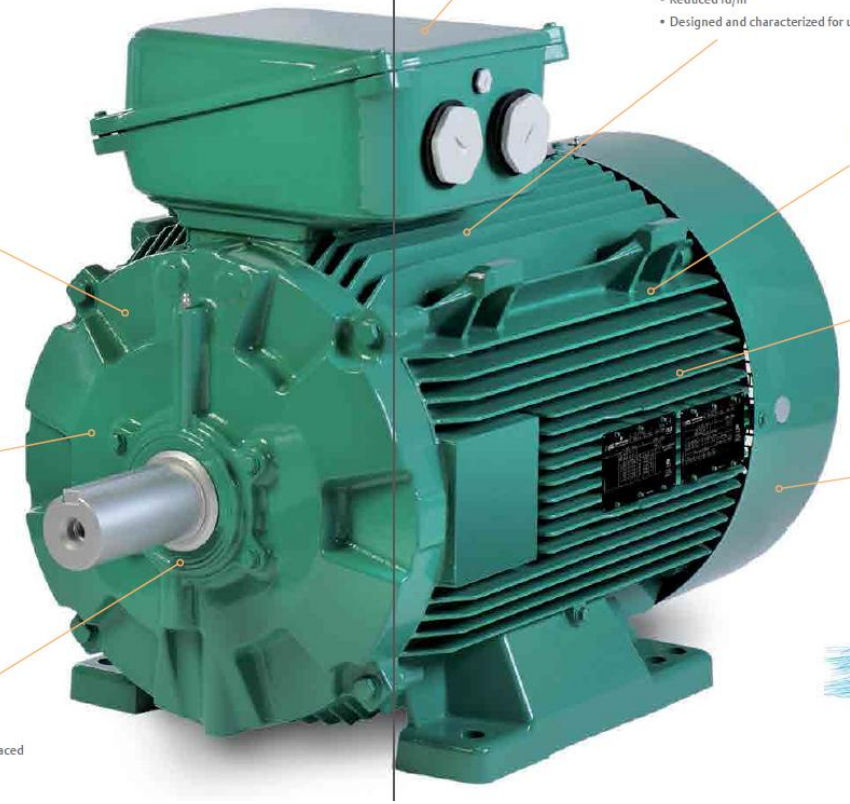
IMfinity®
Designed to last

Electrical safety
- Large terminal box for an easier and safer access to connection

Optimized characteristics
- Magnetic circuit optimized to match IE2 and IE3 classes
- Reduced Id/In
- Designed and characterized for use with inverter or direct-on-line

Mechanically robust
- Robust design based on simulation and test
- Robust cast iron end shields (even for aluminum motors)
- Machining of complete stator on mandrel to ensure perfect concentricity from magnetic axis of the motor
- Rigorous balancing provides a reduced level of vibration



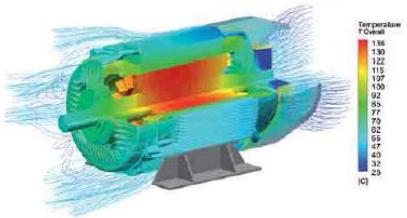


Thermal protection
- PTC sensors included for frames ≥ 160 mm
- Optional types available with short lead time

Electrically robust
- Dedicated options for variable speed use:
  - reinforced insulated winding system
  - insulated bearings
- Impregnation varnish without solvant
- Designed with 25K thermal reserve

Approved sealing
- IP55 Sealing system approved by an independent and qualified laboratory
- Low energy losses shaft sealing

Enhanced cooling
Full optimization of motor cooling:
- to reduce losses
- to prevent hot spots inside winding and bearings
- to keep low noise level



Extended bearing life time
- Properly sized bearing to accept high shaft load
- High quality grease for a long service life and spaced greasing intervals

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Reduced maintenance costs

Electrical motors and drives

Large motors started directly or by a Y/Δ device will cause a high inrush current which is harsh to the windings and has a significant impact on mechanical parts like couplings.

The combination of new motor technology and optimization of the proces by using variable speed, will result in motors with a lower operating temperature (and noise level).

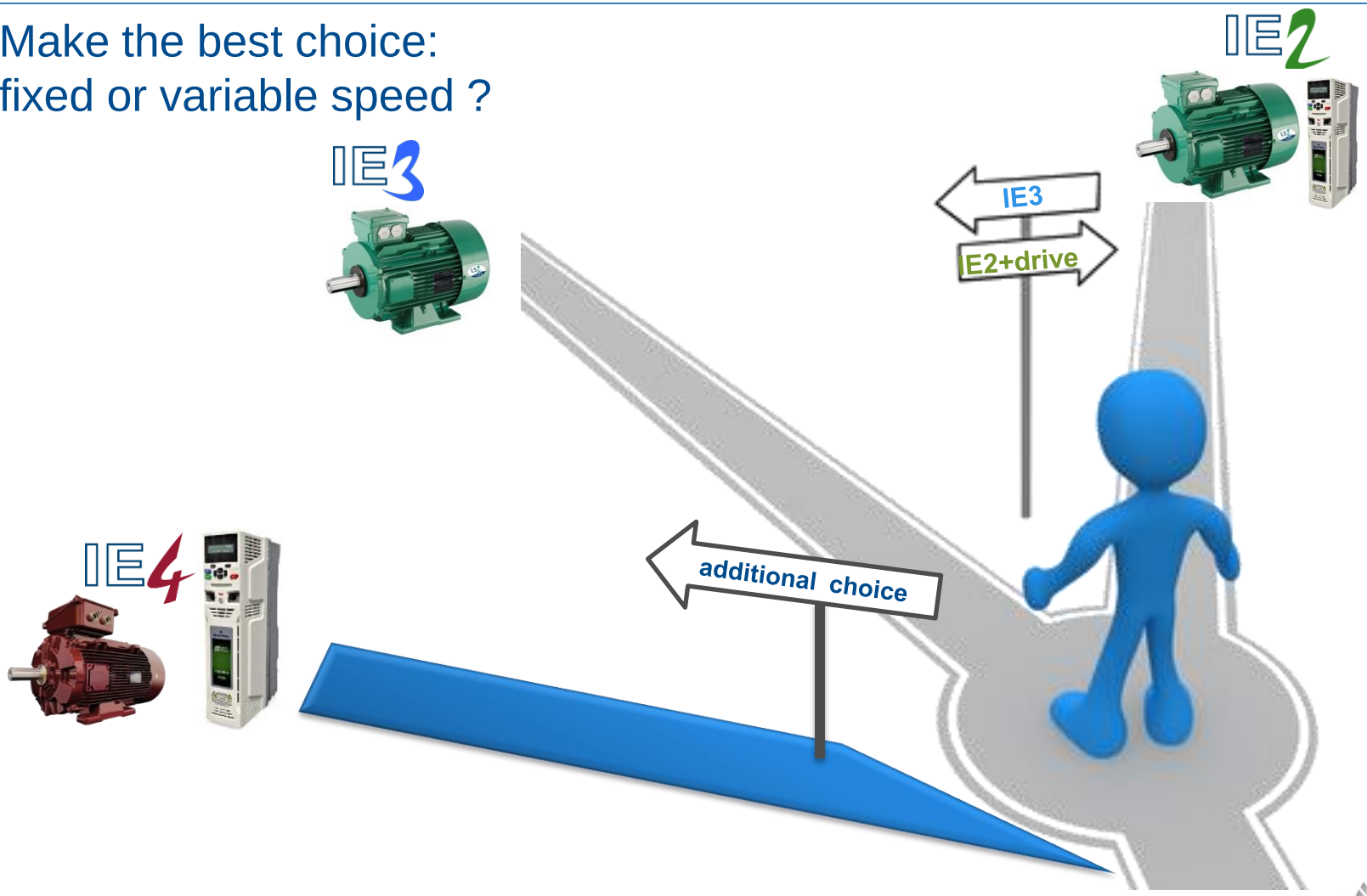


Longer lubrication intervals
Increased bearing life time
Insulation life time extended
Less mechanical wear on e.g. couplings
Less impact on electrical parts like winding heads

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ErP : IE3 or IE2 + drive?

Make the best choice:
fixed or variable speed ?



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Thank you for your attention





Enjoy the rest of the conference.

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