Enerwise™

Smart Energy Saving Solutions

UGteck™

Variable Frequency Drive Retrofitting

Fuel saved=
kwhr saved x 0.215kg =165tons

Emission saved=
3.14 x 165=520tons

Effect on Carbon intensity indicator.

Enerwise™ is designed for retrofitting to existing vessels in operation.

To promote the widespread adoption of fuel-reducing technologies like VFDs, it's essential for stakeholders in the maritime industry to collaborate and invest in retrofitting existing ships. Barely few % of the global fleet is currently equipped with VFDs means almost entire fleet is missing an opportunity of fuel savings. Raising awareness about the benefits of such technologies can help accelerate their adoption across the industry.

Enerwise™ is leveraging technology to enhance energy efficiency by optimising shipboard systems and minimize energy consumption thereby play a crucial role in helping the industry in reducing its carbon footprint.

Introduction

Shipboard pumps (& blowers) are designed for max Engine load at extreme conditions, but they rarely operate beyond 75% of Engine power. Hence there is enormous wastage of energy to operate the pumps and blowers at max fixed rpm. Majority of existing ships are fitted with normal motor and starter system thereby causing severe energy losses.

The ship crew adjust the demands by throttling discharge valve or bypass the coolers whereas bypassing is the most common with the use of 3-way temp control valve. So any water which is bypassing the cooler is actually waste of energy which can be saved by employing VFD to operate the pumps to produce required output. In case like sea water pumps the savings are much higher when ship is operating in colder climates.

Benefits

- Soft starting
- Reduction in demand for 2nd generator starting
- Saving in consumptions.
- Increased lifespan of pumps
- Lesser cavitation and hence improvement in pump life.
- Standard equipment’s with Worldwide support
- Environment Compliancy
- Top international brands hardware

Enerwise™

Enerwise is integrated product having multiple VFDs which are either in single panel per VFD mounted with its controls and DOL or seprately.

These VFDs have its own control software provided by the manfacturer of the VFD which controls the speed and torque of the motors enabling precise and efficient operation. These advanced solutions offer a range of feasture such as speed control, fault diagnostics etc.

These software gets input signals from the external PLCs which are designed to interpolate various sensor signal and give processed signal for controlling the VFD further. While most of the OEM's VFDs energy consumption and performance is same, what makes the difference is the PLC logic which controls the signals to the VFD software.

Enerwise™ has PLCs from standard makers like Mitsuibhsi, Schneider or Siemens.

The PLCs are more flexible for ship specific requirements. In case of change in any requirements, the PLC program can be modified with out an issue unlike controllers which would require factory replacement.

Frequency drives

Enerwise™ incorporates popular makes of VFD Drives

- ABB, Schneider or Mitsubishi drives
- Either IP55 wall mounted (with its own inbuilt enclosure+ control panel +DOL) OR
- IP20 (with IP55 Panel will all in single floor mounted cabinet)
- Marine type and approved by all major classification societies like (DNV-GL, RINA, BV, ABS, LR, Class NK, KR)

Enerwise™ Controls & Monitoring

The control system is well-designed, incorporating redundancy for reliability. Here's a breakdown of the key features:

1. Control Panel: All controls are centralized within a dedicated panel.

2. PLCs (Programmable Logic Controllers):
Two PLCs are employed:
- **Primary PLC:** Currently in use, handling real-time control tasks.
- **Backup PLC:** Ready to take over if the primary PLC fails. This setup ensures continuous operation even during PLC failures.

3. Redundancy Concept: The dual-PLC configuration embodies a 100% redundancy concept. In case of any issues with the primary PLC, the

backup seamlessly assumes control, minimizing downtime.

4. Power Meters: These meters directly display critical information:

i. Consumption Readout: Provides real-time data on power consumption.
ii. Load Percentage: Indicates the load as a percentage of the system's capacity.
iii. Frequency Display: Shows the operating frequency.

5. Master HMI is provided in Engine control room and populate the entire real time data like display trends, Carbon emissions, % load, tree saved, savings in USD.

6. 100% redundancy of Drive system- The systems are designed to have additional DOL as part of the system. Any failure in the system, it can be changed to starter system. This is given as included part of the system, the feature no other OEM is providing.

Overall, this setup enhances system reliability and facilitates efficient monitoring.

Enerwise™ variants

Enerwise™ lite: It has everything required for energy saving and monitoring. Touchscreen HMI provides all trends and saving along with daily noon report. The entire information can also be downloaded on USB for review or sharing to the office by email.

Enerwise™ Grande- Everything in lite+ additional feature of online monitoring by our hardware ShipDaaS™ (ship data acquisition as service) for data transmission ashore

If the client is interested any sensor data, it can be provided to Shipdaas without having access to AMS system. The Shipdaas is provided with ship internet. This data can be pushed to either to equipment maker (us) where simplified reports shall be generated for clients or even direct access by client, review of operational settings and performance.

OR

it can be pushed in any format of data as desired by client to his cloud for integrating with the client's existing analytics program.

ShipDaaS™ Bringing ship data to your office takes the game to next level and has the feature if the client wants the integration of numerous data points which could be related with performance monitoring or fuel monitoring (Separate leaflet)

Enerwise architecture

ENGINE ROOM

HMI

BRIDGE

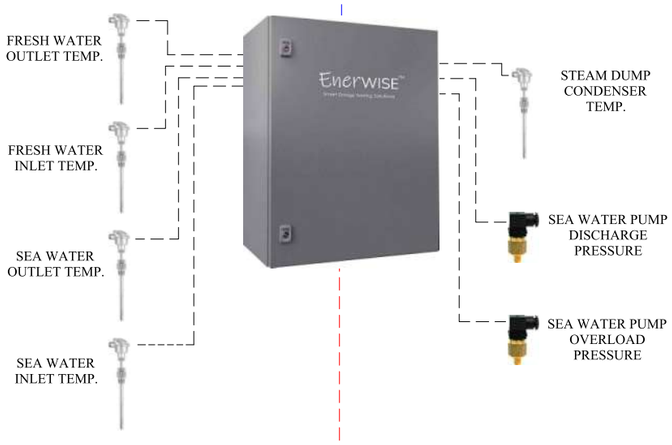
ONLINE MONITORING OPTION

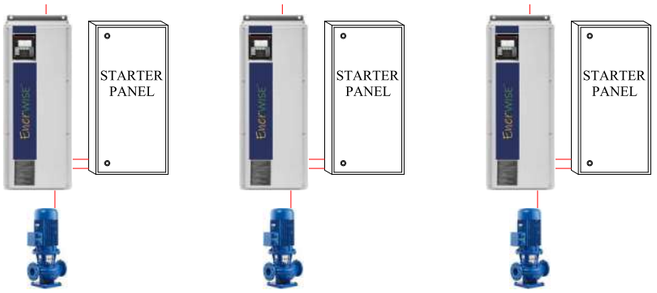
CLOUD SERVER

OWNER OFFICE

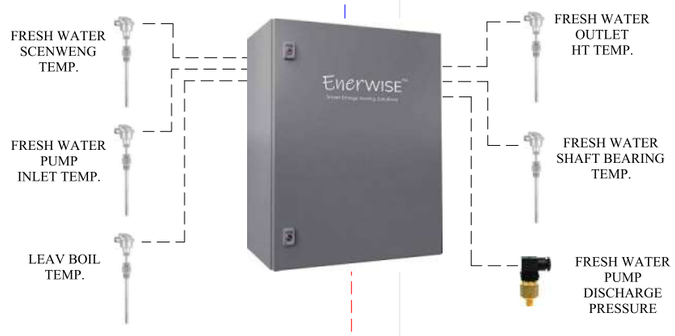
SERVICE SENTER

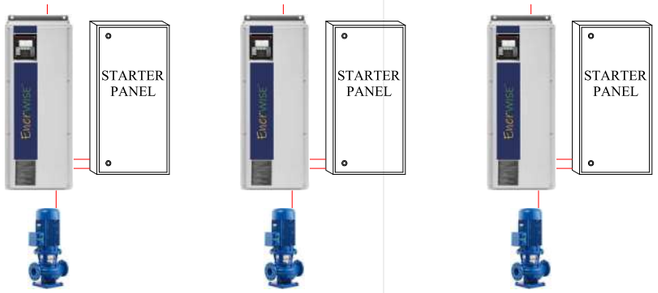
SEA WATER COOLING SYSTEM



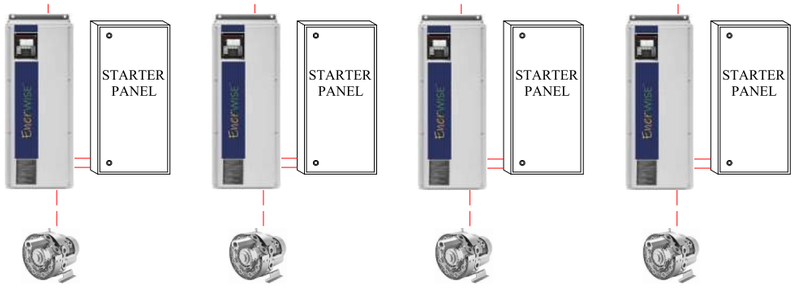


FRESH WATER COOLING SYSTEM





ENGINE ROOM VENTILATION



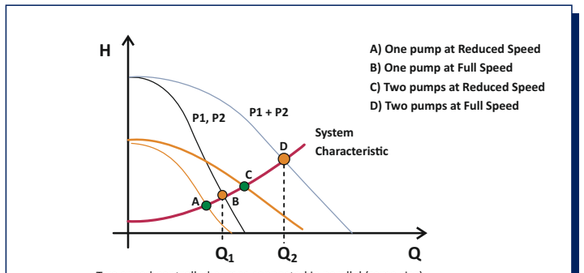
Owner's perspective & guidance for selection

(For LT & SW pumps configuration)

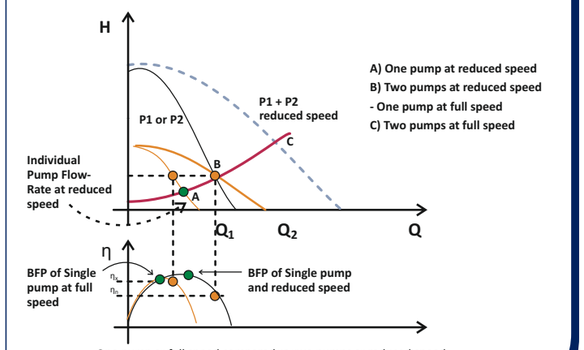
Ships with 2 pumps: Owners constrained by capital budgets opt for a single pump retrofit. In this setup, a pump with a Variable Frequency Drive (VFD) operates continuously (24/7, 365 days), while the other pump remains on standby. Owners typically maintain 100% spare pumps to address any breakdowns promptly.

This approach lacks a unified strategy. The active pump experiences continuous wear, while the standby pump remains relatively untouched. This imbalance can lead to maintenance challenges and potential failures.

Ship with 3 pumps: Two pumps operate at any given time. Pump without VFD runs at full flow while one with VFD shall provide additional needed water. The normal pump operates beyond BEP(best efficiency point)while one with VFD may be running at 60% load. This arrangement may sound good in theory but has internal circulation due to different pressure & not efficient. Not recommended.



Two speed-controlled pumps connected in parallel (same size).
The orange curve shows the perfomance at reduced speed



One pump at full speed compared to two pumps at reduced speed.
In this case the two pumps have the highest total efficiency

We recommend fitting VFD to all 3 pumps while two pumps will operate with VFD with max savings and may be running at BEP range with max efficiency of the pump as well.

Enerwise™ for Sea water cooling system.

Sea water cooling system is used for controlling heat demand which various with load and thereby varies the pump rpm to maintain the desired flow automatically.

Enerwise™ inbuilt intelligence system interpolates the required speeds by various sensor inputs like

- LT System outlet temperature
- Sea water outlet temperature
- Flow to the LT coolers.
- Flow to dump condensers.
- Integration with LT system logic.

Additionally, it monitors following parameters.

- Pressure drop across LT coolers
- Pump pressures
- 3-way valve position which controls the bypass to LT cooler*
- Sensor less flow rate based on model of VFD.
- Motor temperature

The system has numerous features including safeties integrated.

- · Auto starting after black out.
- · Standby pumps start due pump failure.
- · Auto speed synchronization between pumps

Enerwise™ for Fresh water LT system

LT water cooling system is used for controlling Main & Aux heat demand which various with load and thereby varies the pump rpm to maintain the required flow automatically.

The inbuilt intelligence system interpolates the required speeds by various sensor inputs. It consider following parameters

- LT System temperature & Pressure
- Flow to the LT cooler
- ME LO, Jacket water, scavenge air, shaft bearing temperature.

Additionally, it monitors following parameters.

- Pump pressures.
- Sensorless flow calculation based on model of VFD.
- Motor temperature

The system has numerous features including safeties integrated.

- Auto starting after black out.
- Standby pumps start due pump failure.
- Auto parrelling and speed synchronization between pumps
- The entire system complies to class requirements for propulsion equipment's.

Enerwise™ for Engine room ventilation system

Engine room pressure is maintained to provide positive pressure to the Engine. The varying engine load has different pressure requirements and while the Engine is stopped. If the crew stop blowers manually, however if the demand increases the blowers shall start and maintain the engine room pressure.

Features

- Auto synchronising of blower operation.
- Purifier room temperature monitoring.
- Reverse operation as per original design.
- The original safeties are not disturbed like CO2 release, fire safeties, Blower trips etc

Enerwsie ™ Unique features

✓ 3-way control valve -

3 way valve working on temperature controller which take LT cooler outlet temperature and give pneumatic output to 3 way valve to control the position of the valve as per settings. This is modified and Enerwise™ will control the operation of 3-way valve operation allowing max water to LT coolers and reduced pump rpm.

✓ Sensor less flow calculations

(only on specific VFDs)

Inbuilt flow calculations based on pump HQ/PQ curve, Dia and density.

Inbuilt Flow as per Enerwise.

Flow as per flowmeter.

✓ Geotagging -

AIS data/GPS data shall be integrated for Geofencing to calculate the Green tax savings.

Engineering & Feasibility study

Two types of design range are available however our team can give you customised designs of any configuration to match your needs or integrate with any other equipment's.

We provide the turkey packages which includes:

- Feasibility study & Class approval for shipboard installation
- Installation either by UGteck team or by ship crew with commissioning by UGteck engineer with lumpsum rates included in the packages.

There are two types of designs ie Modular design and Integrated panel design.

Modular design

IP55 VFDs which are new generation VFDs and can be installed without any enclosures whereas the control panel and DOL panels are provided as separate standalone panels there by making the installation process easier & ease of handling by crew. Due to IP55 ratings, the VFD enclosures has resilience to water spray and can be fitted in any part of the Engine room.

Other than VFD, each system is also provided with a common control panel per system. Another additional panel is provided with DOL for each VFD (direct online) for providing 100% redundancy to the VFD operation. These are mostly wall mounted.

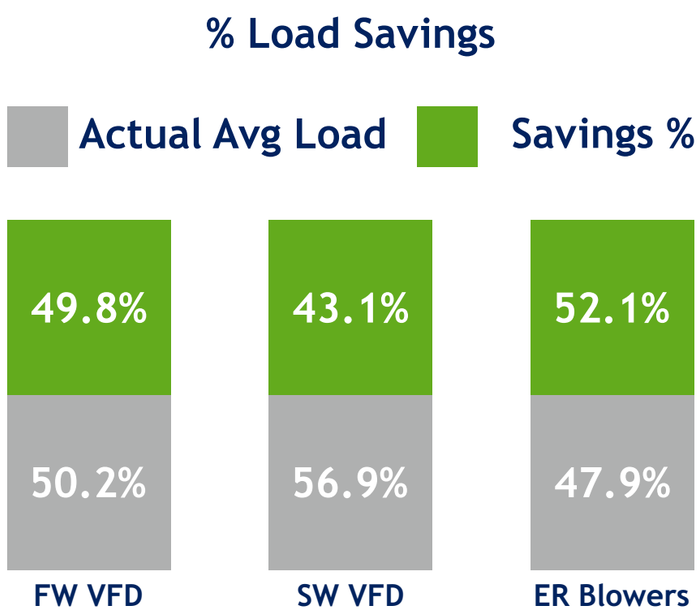
These designs are preferred for retrofitting during sailing however IP55 VFDs have usually more delivery period.

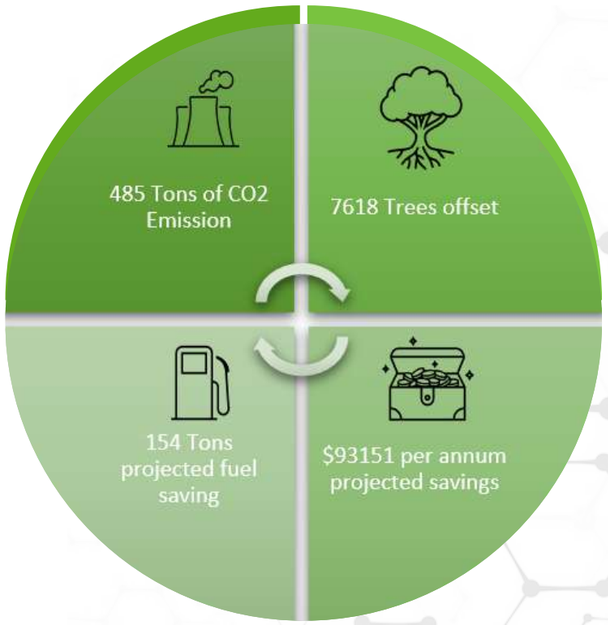
Integrated panel designs

One panel per VFD application. Each panel is IP55 which encloses IP20 VFD, its entire controls and DOL. Such designs are mostly suitable for new building or bigger ship so that panels can be shifted to location for installation. However they are retrofitted also quite often. These are mounted on floor, and we provide prefabricated foundation ready to be fitted as standard supply.

Case Study from Actual Installation

Below is the report summery of one month of operations of a Gas carrier fitted with our system. The ship is trading in Europe with sea water temp of 5 degs maintaining LT temp of 28 deg. She is expected to be trading for entire year in the same region.





Energy Saving Summary

Machinary	Ratings	Actual Avg Load	Energy Saved (KWHr)	Fuel Saved (Tons)	CO2 Saved (Tons)	TREE Saved (nos)	USD Savings
FW LT pump VFDs	3 x 37kw	50.2%	25693	5.144	16.143	273.526	$3,339
CSW Pump VFD	3 x 37kw	56.9%	22356	4.472	14.053	237.793	$2,907
ER Blowers	4 x 18kw	47.9%	18433	4.648	14.64	195.20	$2,394
One Month Summery			66482	14.3	45	707	$8,640
Year Average per day			1902.9	0.411	1.3	20	$247
Yearly Saving expected			694558	150	471	7381	$90,259
European Union Allowance (EUA)							$26,386
TOTAL SAVINGS			694558	150	471	7381	$116,645

Turnkey Project and commissioning services

We undertake the retrofit as turnkey project which includes the feasibility of installation, communication with the ship for location of installation, Assessment of modification required for the retrofit, assist in Class approval of the drawings, making the drydock specifications, supervision, and commissioning by our Engineer in shipyard.

Alternately we are in position to carry out the modification during sailing by our team.

UGteck Marine Singapore Pte Ltd
vfdprojects@ugteck.com.sg | www.ugteck.com
Vijay Arora +91 9920938799

QUALITY SYSTEM CERTIFICATION DNV ISO 9001