



# EcoMaster ENERGY SAVING SYSTEM

FOR PUMP AND FAN

MADE BY Eco Service



  
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## EcoMaster

- Energy Saving System is drawing ship owner's attention in recent years, as this help to reduce the fuel consumption/ Aux Engine maintenance/ compliance with EEXI target.
- EcoMaster is the advanced ESS from Eco Service.
- After 120,000 Running hours on 20 vessels, EcoMaster reduced FO consumption of 10,100.00Tons, and Co2 emission of 31,500.00Tons in the last 12 months.



# Principle of EcoMaster



Original design for F.W.P & M.C.S.W.P as maximum demanded vessel



E.R Fan was designed as maximum temperature and rated ME load



Actually, the design condition almost never comes up

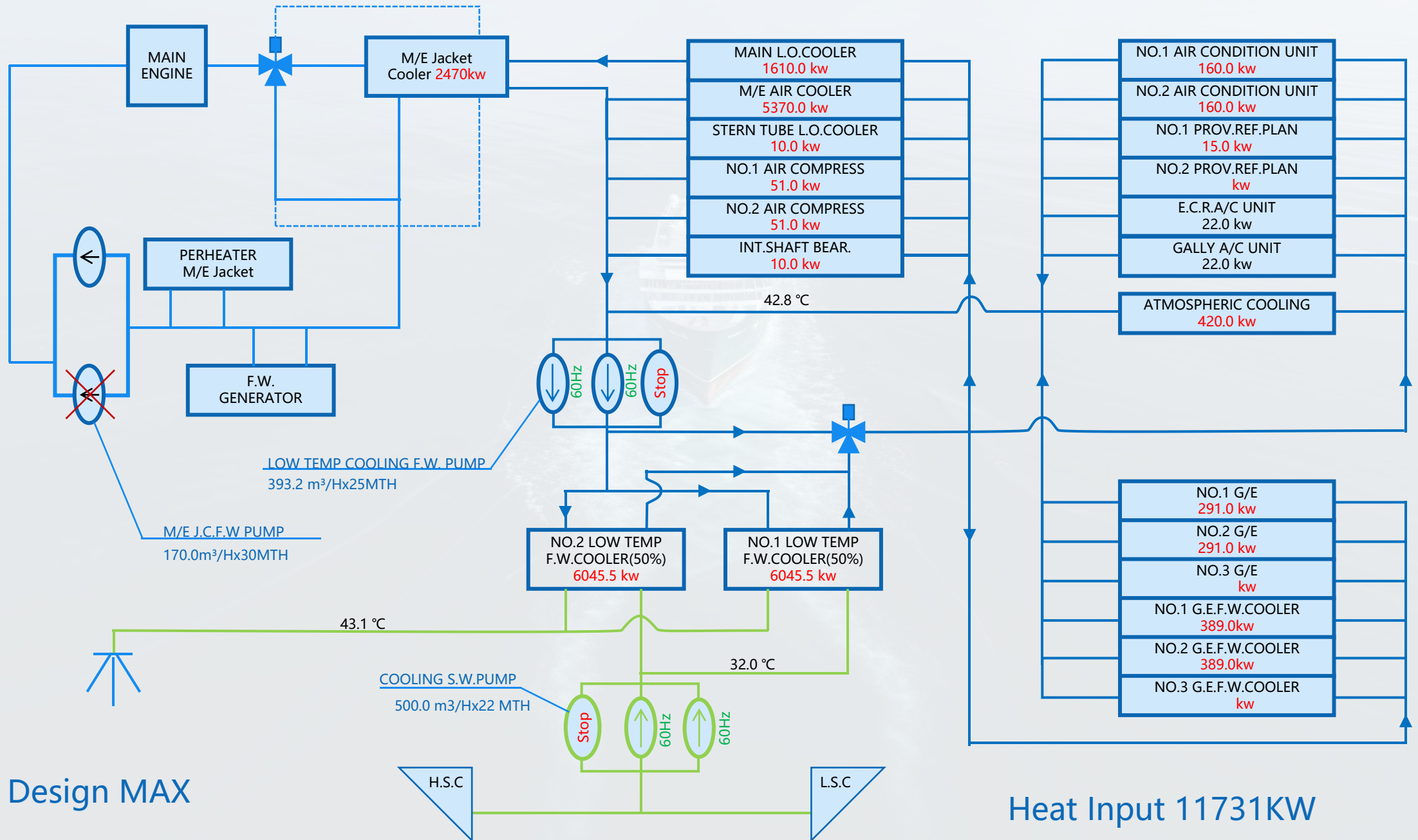


And ME was limited at economic speed with less heat generated

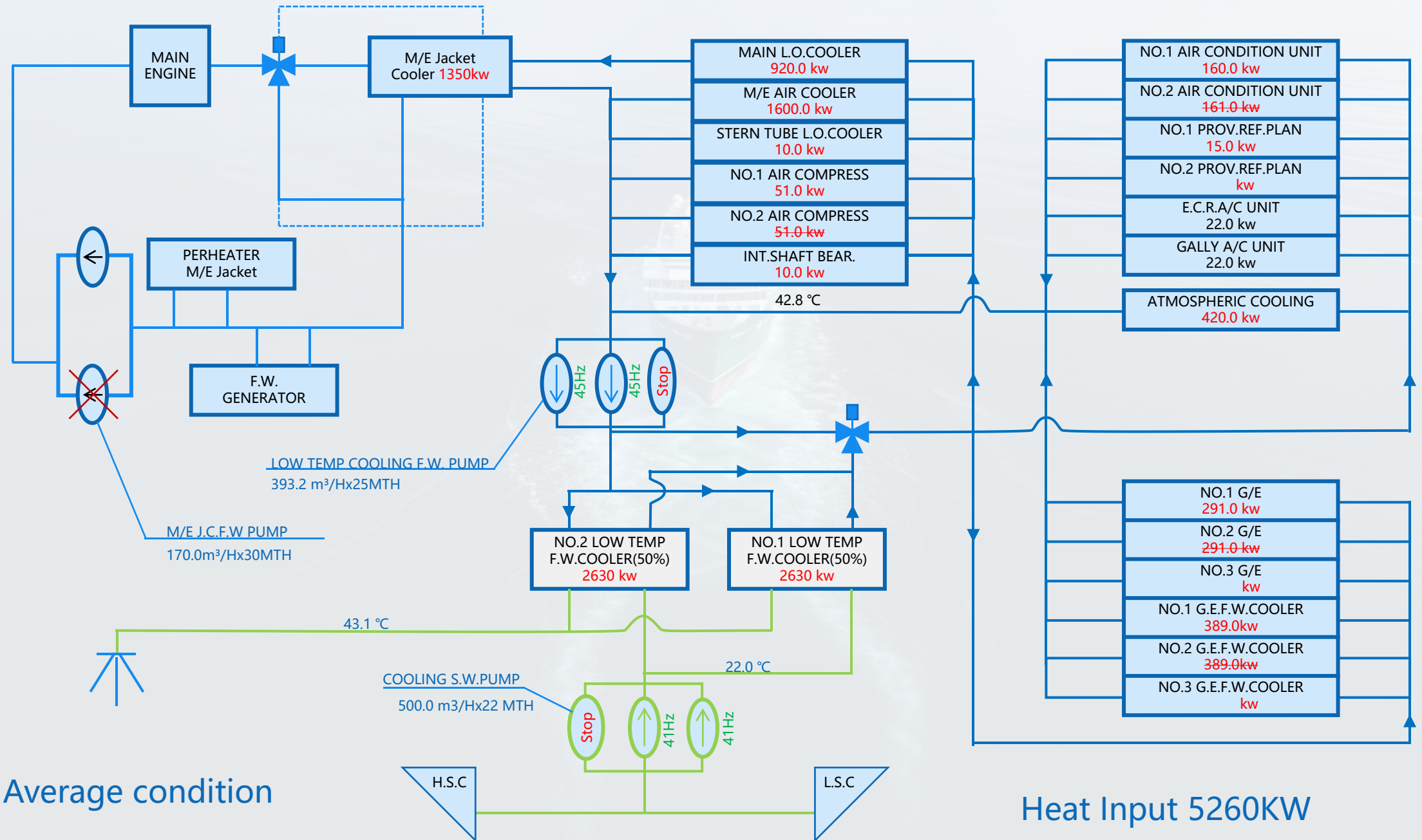


Based on the sailing safety, we improved the energy consumption for above application

# Calculation of Heat Balance



# Calculation of Heat Balance



- Calculation Principle

When VFD was used to regulate the speed of pumps and fans, cubic law will be applied between power consumption and speed, square law will be applied between pressure and speed, Flow and Speed are same percentage of Frequency.

- Best saving @ ME Stop

Sea water pumps and ER Fan mostly running in Pre-set minimum value of 50% speed(30 Hz).

According to the Cubic law, power consumption =  $0.5 \times 0.5 \times 0.5 = 12.5\%$  of maximum motor power.

- Average saving

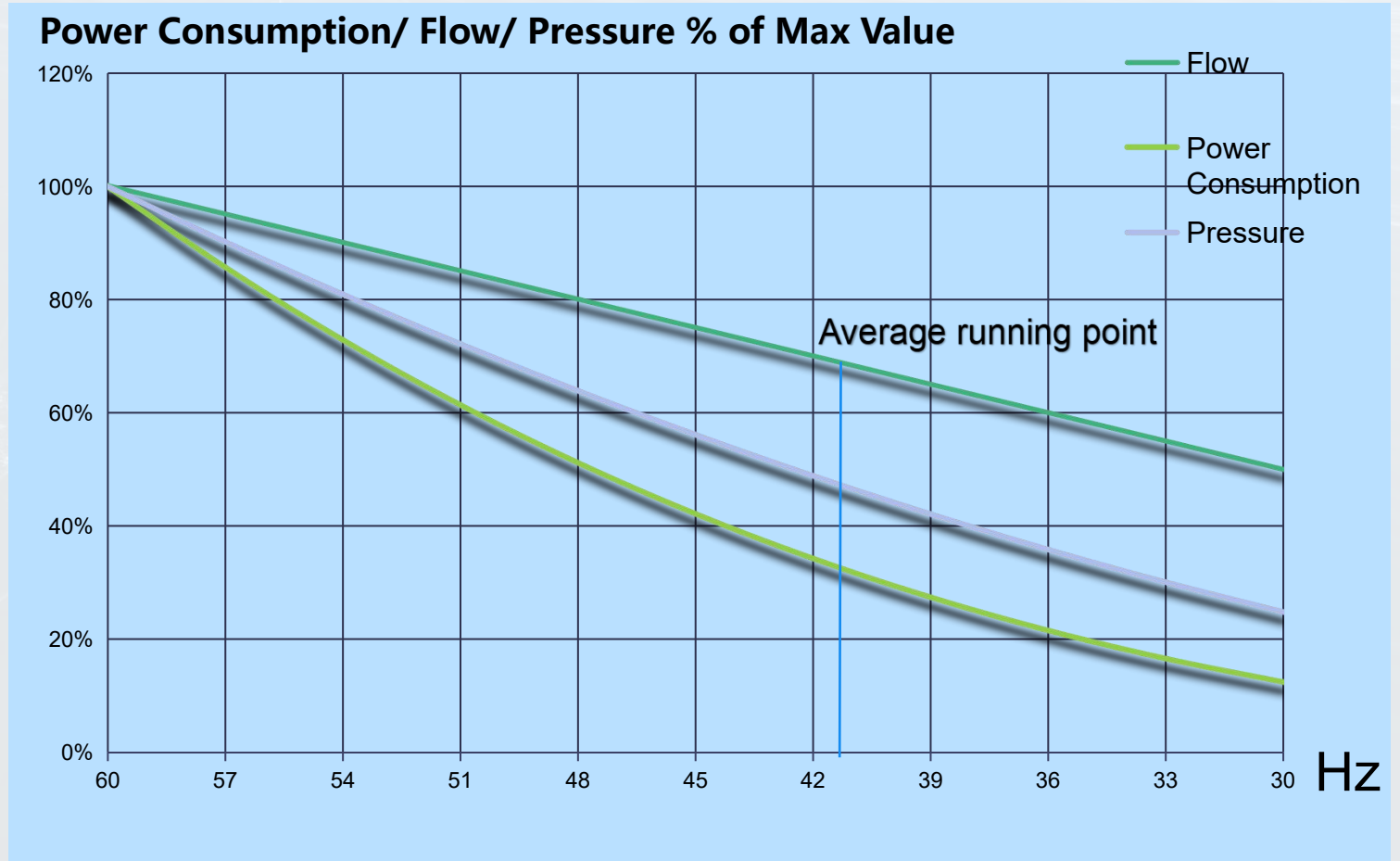
Sea water pumps and ER Fan running in average of 68% speed(41 Hz).

According to the Cubic law, power consumption =  $0.68 \times 0.68 \times 0.68 = 31\%$  of maximum motor power.

$$\text{Power: } \frac{P_1}{P_{Max}} = \left( \frac{n_1}{n_{Max}} \right)^3$$

$$\text{Pressure: } \frac{H_1}{H_{Max}} = \left( \frac{n_1}{n_{Max}} \right)^2$$

$$\text{Flow: } \frac{Q_1}{Q_{Max}} = \frac{n_1}{n_{Max}}$$



General Condition	
SW Temp	22°C
Air Temp	35°C
ME Run period	70% of Year
ME Stop period	30% of Year
Fuel Consumption	210g/KWH
ME load	50%-60% speed
AE max load	70%
LSHFO	643USD/Ton
HSHFO	500USD/Ton

EcoMaster Main Cooling Sea Water Pump ROI											
Pumps	Central cooling	Maker	22K W	30K W	37K W	45K W	55K W	65K W	75K W	90K W	110 KW
2 SW Pumps	Yes	Chinese SY	16M	15M	13M	12M	11M	11M	10M	8M	7M
2 SW Pumps	Yes	Korean SY	16M	15M	13M	12M	11M	11M	10M	8M	7M
2 SW Pumps	Yes	Japan SY	17M	16M	15M	14M	12M	12M	12M	10M	9M
2 SW Pumps	Non	Chinese SY	18M	18M	16M	15M	13M	12M	11M		
2 SW Pumps	Non	Korean SY	18M	18M	16M	15M	13M	12M	11M		
2 SW Pumps	Non	Japan SY	19M	19M	17M	16M	15M	14M	12M		
3 SW Pumps	Yes	Chinese SY		15M	14M	13M	12M	11M			
3 SW Pumps	Yes	Korean SY		15M	14M	13M	13M	12M			
3 SW Pumps	Yes	Japan SY		16M	15M	14M	15M	14M			
3 SW Pumps	Non	Chinese SY		17M	16M	15M	14M				
3 SW Pumps	Non	Korean SY		17M	16M	15M	14M				
3 SW Pumps	Non	Japan SY		18M	17M	16M	15M				

Mark: Vessel with 3 pumps ROI longer than 2 pumps because some time crew in use of 1 pump sometime 2 pumps. Non Central cooling system got longer ROI because system need to keep Minumum pressure.

### EcoMaster ER Fan ROI

Fans	Always running	Maker	7KW	11KW	15KW	18.5 KW	22KW	30KW	37KW	45KW	55KW
2 Sets	Yes	Chinese SY	16M	15M	13M	12M	11M	11M	10M	8M	7M
2 Sets	Yes	Korean SY	16M	15M	13M	12M	11M	11M	10M	8M	7M
2 Sets	Yes	Japan SY	17M	16M	15M	14M	12M	12M	12M	10M	9M
3 Sets	Yes	Chinese SY	13M	12M	11M	11M	10M	9M	8M		
3 Sets	Yes	Korean SY	13M	12M	11M	11M	10M	9M	8M		
3 Sets	Yes	Japan SY	15M	16M	13M	12M	11M	11M	10M		
4 Sets	Not	Chinese SY	13M	12M	11M	11M	10M	9M	8M		
4 Sets	Not	Korean SY	13M	12M	11M	11M	10M	9M	8M		
4 Sets	Not	Japan SY	15M	16M	13M	12M	11M	11M	10M		

Mark: Vessel with 2 Fans ROI better as 2 Fans always running, then the calculated ROI will be continue, if 3-4 sets of ER fan on board, crew may stop some of them, meanwhile, ER fan will be in high speed when temperature is high.



### EcoMaster LTFW ROI

Pumps	With Valve Master	Maker	30KW	37KW	45KW	55KW	65KW	75KW	90KW
2 Sets	Yes	Chinese SY	15M	13M	12M	11M	11M	10M	8M
2 Sets	Yes	Korean SY	15M	13M	12M	11M	11M	10M	8M
2 Sets	Yes	Japan SY	16M	15M	14M	12M	12M	12M	10M
2 Sets	Not	Chinese SY	18M	19M	18M	16M	15M	13M	
2 Sets	Not	Korean SY	18M	19M	18M	16M	15M	13M	
2 Sets	Not	Japan SY	22M	20M	19M	17M	16M	15M	
3 Sets	Yes	Chinese SY	12M	11M	11M	10M	8M		
3 Sets	Yes	Korean SY	12M	11M	11M	10M	8M		
3 Sets	Yes	Japan SY	14M	12M	12M	12M	10M		
3 Sets	Not	Chinese SY	18M	16M	15M	13M	12M		
3 Sets	Not	Korean SY	18M	16M	15M	13M	12M		
3 Sets	Not	Japan SY	19M	17M	16M	15M	13M		

Mark: Vessel with 3 pumps ROI shorter than 2 pumps because always 2 pumps running to keep minmum pressure.ValveMaster system will adjust valve position for reduce LT FW flow to ME & Aux engine when not full load.

### EcoMaster LO PUMP ROI(Under testing)

Pumps	Sailing time %	Maker	45KW	55KW	65KW	75KW	90KW	110KW	132KW
2 Sets	70%	Chinese SY	12M	11M	11M	10M	8M	10M	8M
2 Sets	60%	Korean SY	12M	11M	11M	10M	8M	10M	8M
2 Sets	50%	Japan SY	14M	12M	12M	12M	10M	12M	10M
2 Sets	40%	Chinese SY	18M	16M	15M	13M		13M	
2 Sets	30%	Korean SY	18M	16M	15M	13M		13M	

Mark: Vessel with 3 pumps ROI shorter than 2 pumps because always 2 pumps running to keep minnum pressure.ValveMaster system will adjust valve position for reduce LT FW flow to ME & Aux engine when not full load.

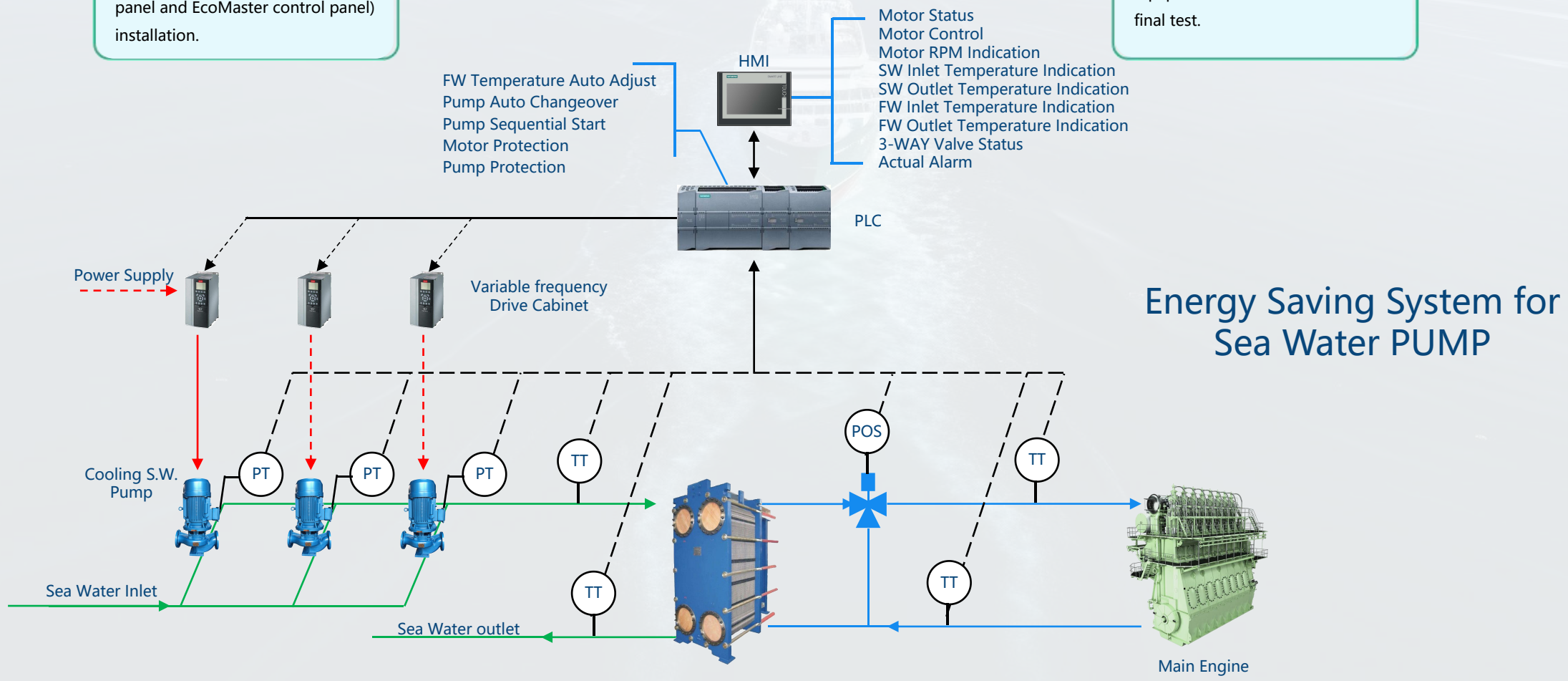
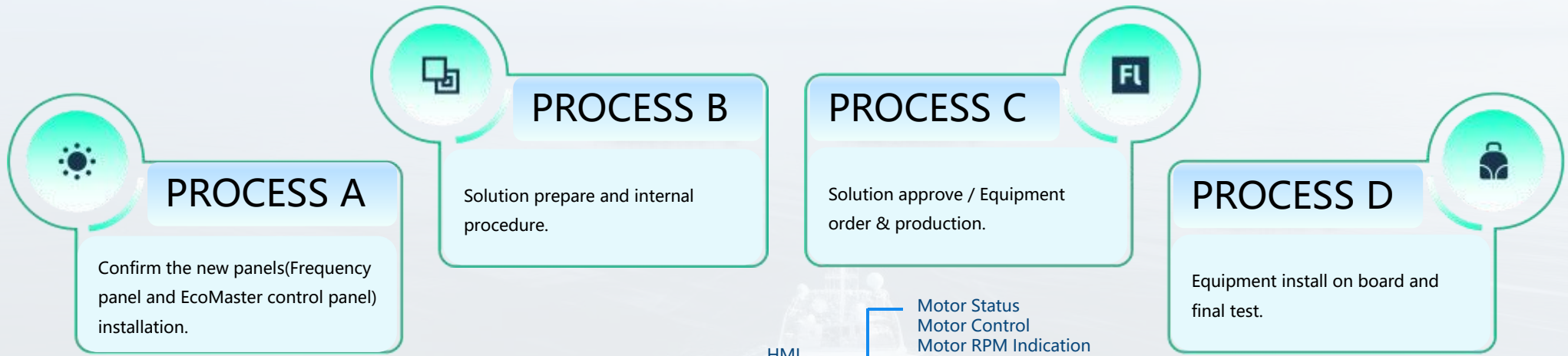
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## EcoMaster of S.W.P



- As proved by the vessels installed with EcoMaster system, around 70% of electric energy saving for owner.
- PLC is playing the important role of energy saving which continue monitoring the system and automatic control the frequency drive output to satisfy the vessels cooling demands.
- Futher more, after EGCS installation on most of the vessels, two sets of Aux engine are running during vessels sailing with EGCS mode, EcoMaster will enable vessel to use only one Aux engine while vessel sailing EGCS PUMPS.





# Energy Saving System for Sea Water PUMP

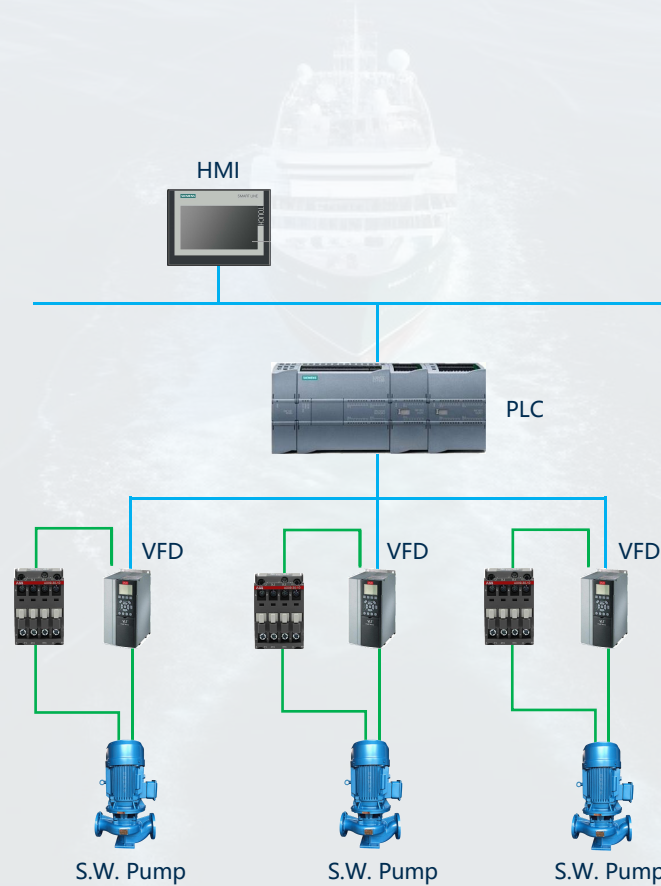
# Main Feature

## Feature A

PID closed loop precise control to meet temperature and pressure requirements.

## Feature B

Bypass contactor was designed to ensure high reliability.



## Feature C

The frequency converter integrates communication function with office for data transmission.

## Feature D

Provide pump group fault auto change over & Blackout sequence start function.



## EcoMaster For ER FAN



- Same as S.W.P system, ER Fan also proved by the vessels installed with EcoMaster, around 70% of electric energy saving for owner.
- PLC is playing the important role of energy saving which continue monitoring the system and automatic control the frequency drive output to satisfy the vessel air supply and cooling demands.
- Although ER Fan motor power is less than S.W.P, but there are more ER Fan running during sailing, by practice, ER Fan saving more energy than S.W.P



# ER Fan System Configuration

- Temperature sensors: T1 & T2.

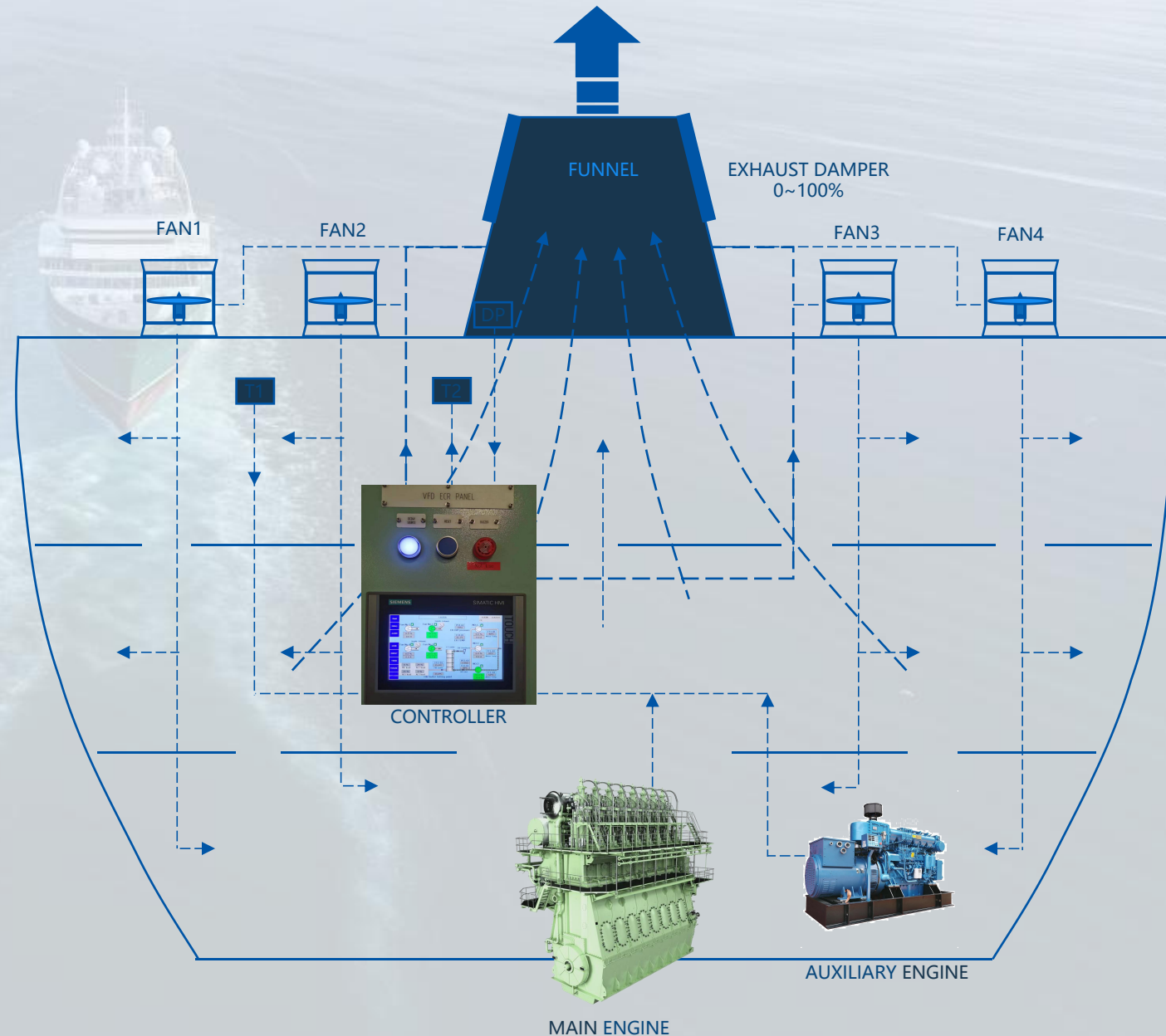
ER temperature sensors will be installed to monitor temperature changes in ER.

- Differential Pressure Transducer: DPT

DPT will be installed to monitor the pressure difference between ER and atmosphere, which will correct indicate the ER air consumption.

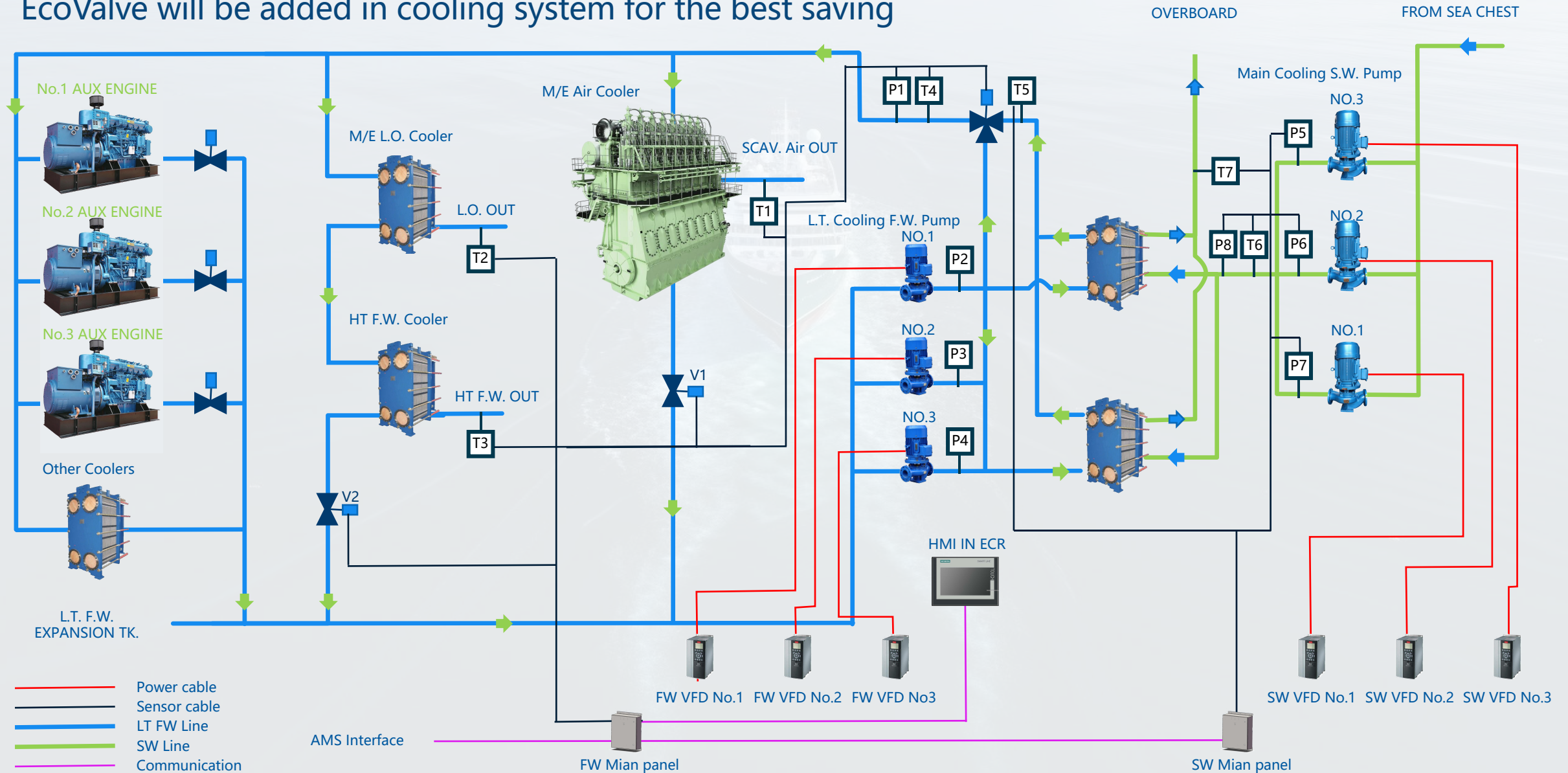
- PLC controller with HMI: Controller.

PLC will be installed to continue monitor all the sensor value and setting point, PID control will be apply to air supply quantity for the engine room.



# EcoMaster unique design for FW and SW

EcoValve will be added in cooling system for the best saving





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## Our Advantages



As the leading feature of EcoMaster, our advantage as following:

1. Flexibility and mobility during installation.
2. Functional completeness with class item.
3. Reliability of the system.
4. Easy operation for crew.
5. Minimum the retrofit work as our special design.
6. By-pass switch in case of emergency operation.
7. Less investment and high rate of return on investment.
8. Maintenance free.
9. Remote access and data logging system.
10. Unique design of EcoValve application for FW and SW system
11. ROI between 0.8 to 1.5 years for different vessels.



# Flexibility and mobility

- As the leading feature of EcoMaster apply in retrofit vessels, EcoMaster was designed as panel by panel, which will be possible to find suitable space to install on board operation vessels.



- Maintenance free

Maintenance free concept is the target for the system design which will allow system running free of trouble as longer as possible.

- By-pass function

By-pass switch was installed in each VFD cabinet to enable starters change back to original DOL/YD start method.

- Less investment and high ROI

We provide turn key solution for each retrofit project, which will be minimize owners investment and got the highest return of investment.

- Functional completeness with Class item

As cooling water pump and ER fan related to class inspection items, after our retrofit, and the class item will be complete tested and hand over to owner with correct system.

- Reliability of the system

Reliability of the system was approved by owners the test as well as 120,000.00 running safety running hours.

- Easy operation for crew

After our EcoMater system retrofit, all the start and stop and change over by original start / stop control.



- **Remote access and data logging system**

Remote access and data logging system was provided for owner to get the energy saving data on line from each vessel, and also provide the remote trouble shooting access in case of VFD issue or other alarm.

The data logging system is our own software with all data store in owner office without third party transfer station.

- **Minimum retrofit work**

According to our special design and the project done, our retrofit work is the minumum in the market, which suitable for all kind of vessels.

- **Real data logging sample of energy saving**

Item NO.	Running Time	Total Consumpt	Total Saving	Proportion	Continue stopped
<b>NO.1 SW</b>	1908H	31018KWH	54842KWH	36.0%	453.3H
<b>NO.2 SW</b>	768H	14787KWH	19773KWH	43.0%	2340.9H
<b>NO.3 SW</b>	548H	9256KWH	15404KWH	37.0%	0.0 H
<b>NO.1 FAN</b>	3065H	22640KWH	90765KWH	19.0%	0.0 H
<b>NO.2 FAN</b>	2887H	26890KWH	80010KWH	25.0%	18.2H
<b>NO.3 FAN</b>	2902H	20828KWH	86546KWH	19.0%	0.0 H
<b>NO.4 FAN</b>	2900H	22121KWH	85179KWH	20.0%	0.0 H
<b>Total Energy saving</b>		<b>SW: 90019 KWH</b>		<b>FAN: 342500 KWH</b>	

# Our reference

ITEM	Vessel	PUMPS	QTY	ER FAN	QTY
1	Star Eleni	45KW	3	37KW	4
2	Laura	37KW	3	18.5KW	4
3	Star Ophelia	90KW	2	17.3KW	4
4	Maharaj	45KW	3	22KW	3
5	Star Ayesha	45KW	3	37KW	4
6	Star Karlie	45KW	3	37KW	4
7	Star Lyra	45KW	3	22KW	4
8	Star Nicole	37KW	3	11KW	3
9	JY Ocean	30KW	3	18.5KW	4
10	Kaley	37KW	3	18.5KW	4
11	Star Claudine	90KW	2	17.3KW	4
12	Star Lydia	37KW	3	11KW	3
13	Eurybia	45KW	3	37KW	4
14	Debbie H	45KW	3	37KW	4
15	Star Libra	45KW	3	37KW	4
16	Katie K	45KW	3	37KW	4
17	Star Jeannette	75KW	2	15KW	4
18	Mackenzie	37KW	3	18.5KW	4
19	Challenger	45KW	2	11KW	3
20	Idee Fixe	37KW	3	18.5KW	4

ITEM	Vessel	PUMPS	QTY	ER FAN	QTY
21	Roberta	37KW	3	18.5KW	4
22	Star Calypso	55KW	2	15KW	3
23	Star Scarlett	45KW	3	30KW	4
24	Honey badger	21.3KW	3	17.3KW	2
25	Kennadi	37KW	3	18.5KW	4
26	Star Genesis	55KW	2	11KW	4
27	Piera	34.5KW	3	12.7KW	4
28	Star Janni	55KW	3	22KW	4
29	Leviathan	65KW	3	15KW	3
30	HAMBURG EAGLE	37KW	3	30KW	4
31	Star Aphrodite	30KW	3	15KW	4
32	Star Apus	37KW	3	18.5KW	4
33	Wolverine	21.3KW	3	17.3KW	2
34	INDIGO HERITAGE	30KW	4	15KW	2
35	Navigator equator	37KW	3		
36	Nord Taurus	55KW	2		

# Global service



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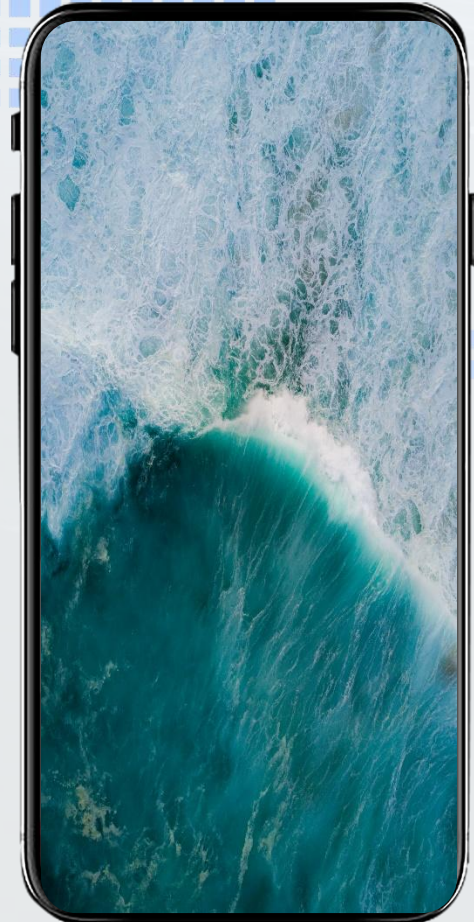
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**Thank you!**

