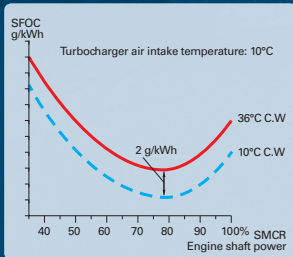


ESS for Cooling Sea Water Pump

ESS (Energy Saving System) is one of the famous VFD system for Cooling Sea water Pump, E/R Fan and Cargo Hold Fan to reduce the fuel consumption of Diesel Generator in Vessel. Recently, We upgrade it for Cooling Sea Water Pump based on the MAN Diesel & Turbo. This reaflet shows the our reference data and payback analysis.



Man Diesel & Turbo Engine informs that Lower F.W Temp. can reduce the Fuel Consumption. Please refer to the Fig1. This graph shows that Max. 2g/KWh will be saved to meet the 10°C F.W Temperature.

Fig1. MAN Diesel & Turbo Guideline

CSW Pump Max. Flow	Decrease the F.W Temp. for Air Cooler
M/E Eff. Up	Fuel Consumption efficiency Up as 2g/1Kwh
No Need ESS	MAN recommend that M/E can save the more fuel consumption compared with ESS installation.
DongHwa Proposal	If There is the ESS, Vessel can save more Fuel consumption from D/G

We calculate the M/E saving from our reference data. We have the average 22°C S.W temp during 1 year. from the 10,000TEU Container vessel during below sailing route.



Considering the performance of the L.T Central cooler, the F.W temperature may be estimated at 26°C We assume the 20,000KW of M/E 80% Load. Then, M/E can save the fuel consumption during 200days sailing condition as below.

MT=315 USD

M/E Power	KW/year	Fuel(Kg)	Fuel Cost(\$)
20,000KWh	96,000,000	73,824	Abt. 23,230

Someone can be satisfied with this saving result. But ESS can give the fuel saving more. We have reference data about installing the ESS to 156K COT Vessel according to the MAN Diesel's Guideline. Please see the Schematic Diagram of L.T Central Cooler as Fig2.

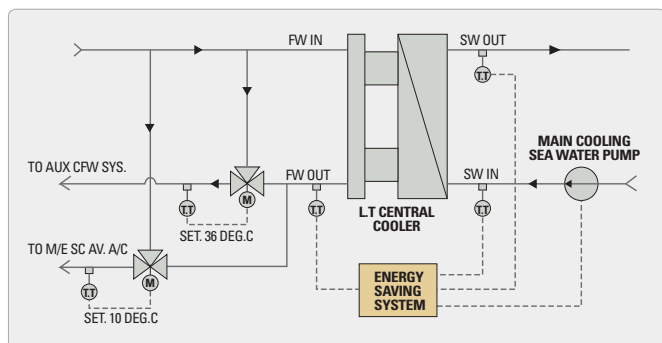


Fig2. Schematic Diagram for the L.T Central Cooler

The Sea-trial for this Vessel was finished. Then Our S/E logged the all status as below information.

Description	Actual Value.	Remark.
S.W. Temp.	27 °C	
F.W. Temp.	31 °C	
M/E Load	76.6%	
Pump KW	9.1 KW	45KW in 60hz
D/G SFOC	181 g/KWh	75% Load/ Best Efficiency

This table shows that the 4°C of ΔT between S.W Temp. and F.W Temp. is maintained. If C.S.W pump is the full load running in above condition, the 4°C of ΔT might be almost same due to the design specification.

Therefore, If vessel didn't have the ESS, It should miss good benefit. We calculate the payback price base on the sea-trial logging data. The 27°C of S.W temp. is near the 32°C of design temp. in L.T Central Cooler. Therefore, We assume that two pumps are running. Then, We get the **(US\$) 31,432** of Fuel Cost saving per one(1) year from only ESS as below.

MT=315 USD

Pump Power	KW/year	Fuel Cost(\$)	Remark
Full capacity (45KW)	788,400	44,903	Two pumps running
Sea-trial (9.1KW)	236,520	13,471	Two pumps running

In Conclude, Your vessel has the ESS and L.T Cooler pipe line from MAN Requirement.

Then, you can save total **(US\$) 54,662 / year.**

We hope that you will not miss good opportunity with your wise choice. If you need more information or specific data for New E.S.S, Don't hesitate contact me anytime.

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