

Energy Saving Systems on board existing Ships

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The Energy Saving System

- **The principle is to utilize only the power necessary at any operative conditions.**
- **The principle can be applicable to many Systems present on Board.**
- **Usually Systems are designed to reach the contractual performances at worst design conditions (I.E. Worst Environmental condition, max Ship's speed).**
- **If we install a System able to: measure conditions (I.E. Temperature , Pression etc) and modulate speed of Fans, Pumps etc to supply only necessary Air or Water we can save Energy.**
- **On board there are many systems for which is reasonable to verify the opportunity to install an Energy Saving System.**
- **HVAC/ER Ventilation (Fans – Pumps – AHUs). Cooling Systems (Pumps) etc.**

The Energy Saving System

- In case of Cruise Ship it was designed, supplied and installed two different Energy Saving Systems:
 - Engine Room and Diesel Generator Room Ventilation System
 - Sea Water Chiller Pumps
- The two Systems are different also in terms of installed power (432 KW for Fans and 105 KW for Pumps) but the principle is the same:

TO EXPLOIT ONLY THE NECESSARY POWER

- First step is to install certified Sensors to control the Process.
- Data from sensors will be elaborated by PLC to control the speed of electric motors of fans or pumps by inverters.
- It is important to know: process of system, international regulations to be respected and operation mode of the ship in order to define in which conditions the system will work.
- In particular is necessary to considerate the different mode of operation of the Ship (Sailing – Berthing) and the different environmental conditions (Manaus Brazil 36°C - Canada less than 0°C).

Pumps and Fans

- ▶ **Reduced energy consumption**
 - drives control the cooling water pumps to match actual cooling demand
 - drives control the engine room fans to match actual air flow demand

- ▶ **Reducing the speed by 10% will reduce the power consumption by 30%**

- ▶ **Reducing the speed by 20% will reduce the power consumption by 50%**

- ▶ **Reducing the speed by 50% will reduce the power consumption by 80%**





The Energy Saving System Engine Rooms Ventilation 1

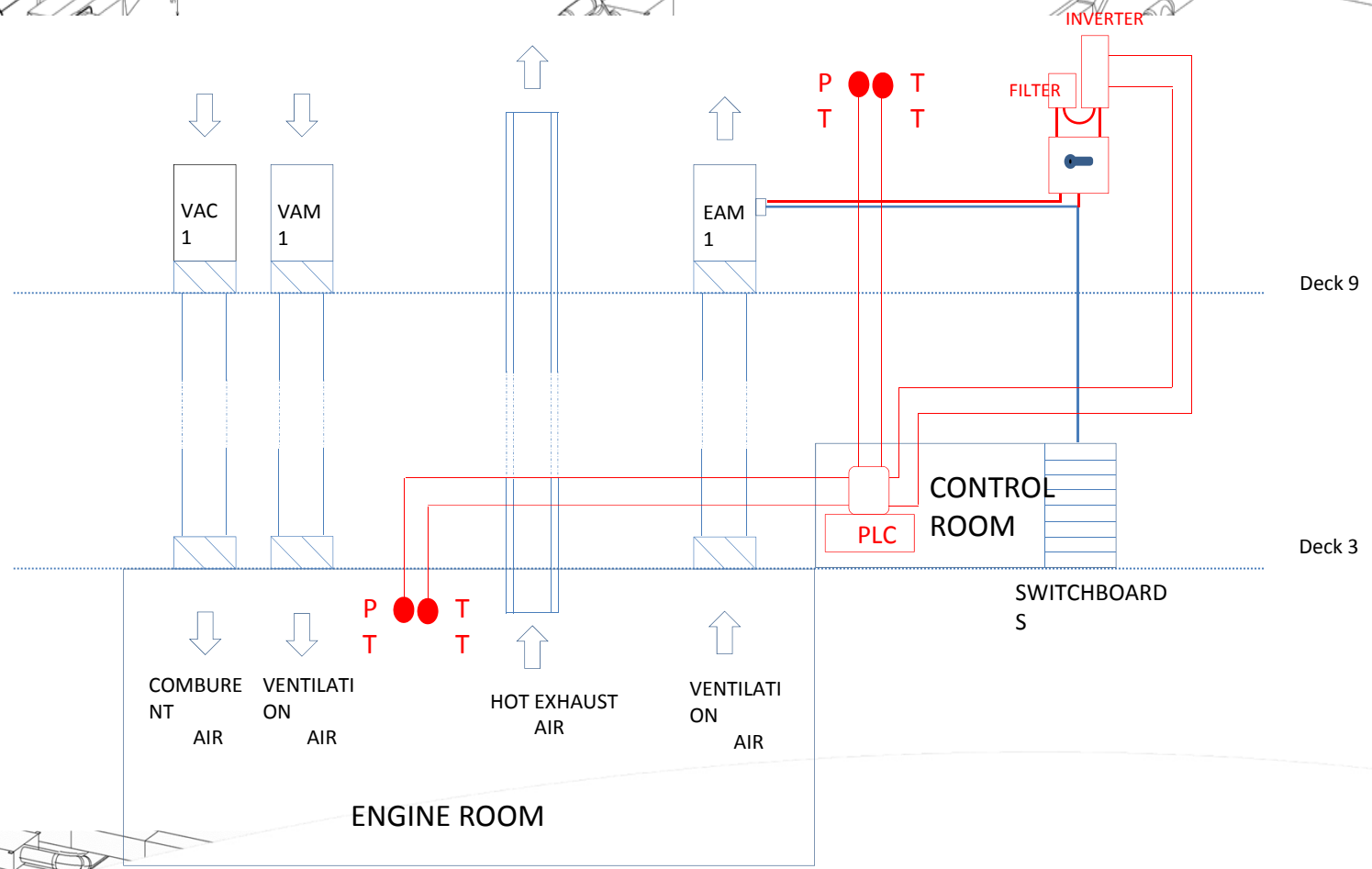
- *The Ventilation of Engine Rooms consists of:*
 - *Diesel Generators Room*
 - *1 Ventilation fan for comburent air;*
 - *4 Ventilation fan/extractors to ventilate the Room;*
 - *Propulsion Diesel Engines Room*
 - *2 Ventilation fans for comburent air;*
 - *4 Ventilation fan/extractors to ventilate the Room.*
- *Total installed Power 432 kW*

The Energy Saving System Engine Rooms Ventilation 2

The System installed on board consists of the following main components:

- **Inverters:** one for each electric motor, correctly dimensioned in terms of protection grade and power;
- **Filters,** one for each electric motor to reduce motor insulation stress;
- **Bypass switchboards,** one for each inverter, to enable electromechanic bypass in compliance with RINa regulations;
- **Air Pressure and Temperature Sensors,** located inside the Rooms and overboard;
- **PLC with our software,** which elaborates data from field and controls Inverters;
- **Network system:** to connect Inverters, Sensors with PLC located in Control Room.

Energy Saving System Supply and Installation



Energy Saving System Data reporting

In order to calculate the amount of the Energy Saving compared to the total amount of installed power (in kW) of the electric Motors the following elements have been considered:

- The total Installed Power of the Ventilation System is 432 kW. And Total installed Power of Sea Water Chiller Pumps are 3 x 35 kW.
- Considering the data available from the System the daily amount of energy saved expressed in KWh is reported in two daily tables and then summarized in monthly table. (Installed Power – Absorbed Power = Saved Power)
- The external temperature and Ship's status (Sailing or Berthing) are the two parameters influencing Energy Saving amount related to Ventilation Rooms.
- External Temperature and Sea Water Temperature are the two parameters influencing Energy Saving amount related to Chiller Pumps.

Energy Saving System Return of Investment 1

The Fuel Cost is depending from International cost and mixing of light and heavy fuel (different geographic Areas)

In order to convert Energy Saving (KWh) in terms of dollar (\$) saved we considered :

- **Average Fuel cost 600\$/Tons, year 2014**
- **Average fuel cost 400\$/Tons, beginning year 2015**

- **0,133 USD per KWh produced on board (if fuel cost is 600\$/Tons)**
- **0,088 USD per KWh produced on board (if fuel cost is 400\$/tons)**

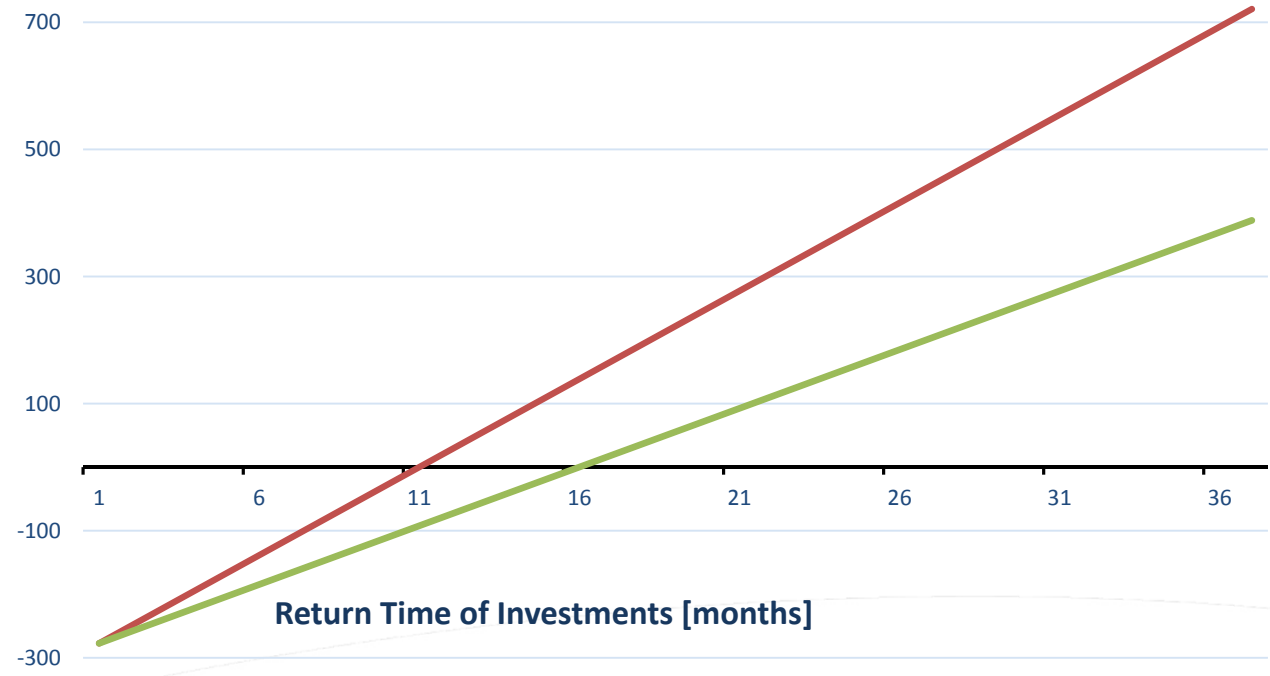
- **The total saving is 269.127 USD year basis (if fuel cost is 600\$/Tons)**
- **The total saving is 178.068 USD year basis (if fuel cost is 400\$/tons)**

The Return time of investment is between 12 to 18 months depending from Fuel Cost.

Energy Saving System Return of Investment 2

Investment [k\$]

Average fuel cost 600\$/tons
Average fuel cost 400\$/tons



Return Time of Investments [months]

grazzi tanan
efcharisto havala
obrigada dekui
dajjem
spasibo paldies
Thank You
blagodarya tack
Merci dekui
gracias dzieki
multumesc
Danke dank
obrigado kiitos
grazie koszi

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