S-MAN heating systems

Fuel saving methods

S-MAN heating systems

- Based on a dry cargo vessel with a thermal oil system consisting of one 900 kW oil fired heater and one 900 kW exhaust gas heater.
  - Cost for piping, insulation, installation and transportation not included (neither is yard profit)
  - Fuel price (MDO): 600 $ per ton (20091104)
  - Exchange rate €/$: 1,48 (20091104)
  - Electricity cost onboard: 0,12 €/kWh
  - Increased fuel consumption due to extra weight not included.
  - These costs are valid for this example vessel only
  - Pumps used 7700 h per year

S-MAN heating systems

- Reduce the electrical and fuel consumption of the heating system
  - More efficient pumps/pumpmotors
  - Reduce friction
  - Reduce the need of heat
  - Minimise the use of the oil fired boiler
- What to do with the heat?

S-MAN heating systems

- Change the circulation pump motors from EFFII to EFFI
  - € 300 in annual savings (thermal oil)
  - Extra cost € 800 for 2 motors of 17,5 kW.
    - Electricity cost with EFFII: € 13300

S-MAN heating systems

- Reduce the friction losses of the thermal oil or water by bigger valves and pipes (50% speed)
  - € 1 400 in annual savings (thermal oil)
  - Motor size decreases from 17,5 to 14,5 kW
  - Reduces the cost of the pumps but increases the cost of the valves in total about € 3650

S-MAN heating systems

- Reduce the friction losses of the thermal oil or water by increasing the temp jump with 20%
  - € 3 200 in annual savings (thermal oil)
  - Motor size decreases from 17,5 to 13 kW
  - Reduces the cost of the pumps and valves but increases the cost of the exhaust gas heater with in total € 5 850

S-MAN heating systems

- Reduce the friction losses of the thermal oil or water by increasing the temp jump with 20% and having bigger valves and pipes
  - € 5 800 in annual savings (thermal oil)
  - Motor size decreases from 17,5 to 13 kW
  - Increases the system cost with in total about € 8 150

S-MAN heating systems

- Insulate the tanks and hereby reduce the need of heat
  - € 8 000 in annual savings (thermal oil)
    - Losses are normally about 50% of heat need
    - 10 cm insulation reduces the losses with almost 90%
    - i.e. reduces the size of the heating system with more than 40%
    - Saves more than € 40 000 in heating system cost
    - 2 000 m2 insulation costs about € 1 500

S-MAN heating systems

- Aux exhaust gas heater
  - € 16 000 in annual savings (thermal oil)
    - For a Wärtsilä 8L20 engine
    - Output of exhaust gas heater 350 kW (85% MCR)
    - Aux engine used in average 3 h per day
    - Fuel cost to heat 1050 kWh per day: € 16 000 per year (MDO)
  - Cost of Aux exhaust gas heater incl pumps and valves € 28 900 (thermal oil)

S-MAN heating systems

- Conclusion
  - Possible to do improvements
  - Potential savings about € 24 000 per year
    Cost for piping, insulation, installation and transportation not included (neither is yard profit)
  - Saves about € 10 000 in heating system cost including the extra cost for insulation

S-MAN heating systems

- Steam systems
  - 13,5% of boiler output wasted in Condensate cooler
    - Possible to decrease losses with undercooled steam traps
  - Cooling water pump for condensate cooler
    - 0,5 kW
    - Annually € 500
  - Feed water pump
    - 2 kW
    - Annually € 1750
  - Further 10% losses blow down and dearation

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- Hotwater
  - € 7 000 in annual savings
  - Less than half the flow of thermal oil
  - Smaller valves and pipes can be used
  - Exhaust gas heater needs to be in stainless steel
    - Price triples
    - In total € 44 000 more expensive

S-MAN heating systems

- Steam surplus generator
  - Oversized exhaust gas heater where the surplus heat produces electricity
  - About 120 kW electricity
  - Can produce about 10% in kW electricity out of the steam in kg/h
    - i.e. steam production 1000 kg/h
    - Electricity production almost 100 kW

S-MAN heating systems

- ORC unit
  - Oversized exhaust gas heater where the surplus heat together with the engine cooling water produces electricity
  - Can produce about 600 kW electricity