INTRODUCTION

- Compact multistream plate fin heat exchangers (MPHX) form an important component of onboard liquefaction systems that use Reverse Brayton Cycle (RBC) for liquefying boil-off gas (BOG).
- These ships employ dual fuel diesel engines that use both diesel and BOG as fuels.
- Sudden switching from diesel to BOG is going to change the flow rate of BOG input to the system.
- Fluctuations of mass flow rates and the temperatures affect the vital operating parameters of rotary equipments like turbo expanders and centrifugal compressors may undergo sudden changes unless proper control strategy is adopted.
- System has been analyzed and appropriate modification of configuration and process control scheme are suggested in such a way that the operating parameters remain compatible with sensitive components.
- BOil-off rate is 0.15% of tank capacity per day

OBJECTIVE

- This work, the effect of fluctuation of BOG load on the operation of BOG liquefaction system is analyzed and critical components in system are identified along with their operation limits.
- Purpose of the project to determine the relationships among the system parameters such as component sizes, specifications, operating parameters etc., the allowable fluctuations of BOG flow at the input and the rate of change in mass flow and temperature at the output with different control strategies.

METHODOLOGY

- Sizing of each component
- Liquefaction is designed for a load of 2 kg/s
- Due to diversion of BOG to engine, it is assumed that 50% of BOG is diverted to engine.
- The BOG is diverted by closing of valve. The rate of closing of valve induces brings the system into dynamic mode.
- The rate of closing of valve is selected as parameter.
- The effect of size of heat exchanger for above rate of closing is also studied.
- Designed the UA value of all heat exchanger HX1, HX2, HX3 and HX4

RESULTS AND DISCUSSION

- From the result it is found that perturbation is lower for the reduced value of UA compared to that of designed UA value.
- Though reduced UA decreases the quality of performance during maximum load (steady state performance) but it stabilize the system quickly when load fluctuates.

CONCLUSIONS

- UA comprehensive strategy for analitical treatment of the transient behaviour of the heat exchanger is presented. Emphasis is given on the effects on UA value of heat exchanger.
- This allows to quantifying the effect of reduced UA value and its influence on the temperature at the various location in the cycle.
- The present results are of practical importance not only for the proper design of a heat exchanger to minimise the perturbation but also the proper control strategy for the BOG rate fluctuation.
- The result clearly indicate that reduced UA play a major role in retarding the perturbation in dynamic state.
- The reduction in a UA reduced the quality of performance of a heat exchanger by 11.25% but at the same time it retards the perturbation in the temperature of the existing stream of heat exchanger.

REFERENCES

- Gomez, Garcia and Catoria A D M 2013 Polish Marit. Res. 21(1) 77–88