Predictive Model for Entrainment Limitation in Non-Condensable Gas Pressurized Thermosyphon

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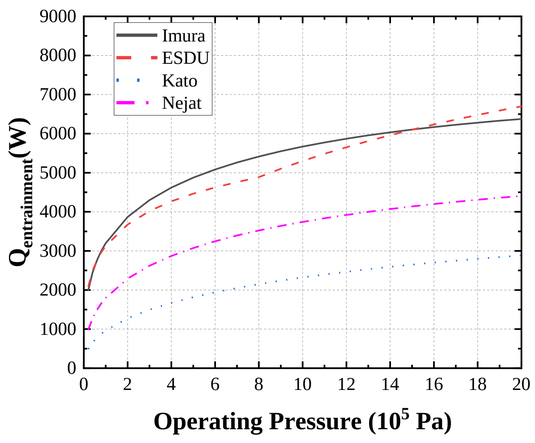
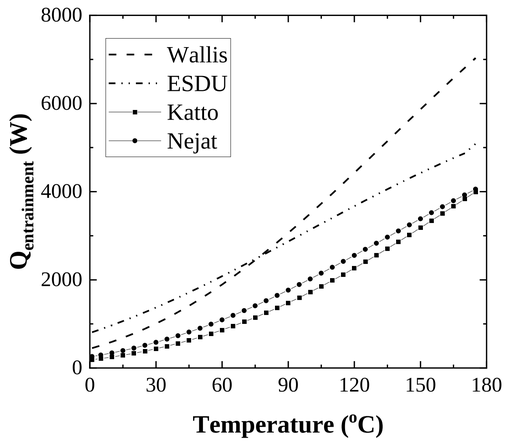
INTRODUCTION

This study aims to optimize the utilization of thermosyphons, particularly non-condensable gas pressurized thermosyphons, in nuclear safety components. The key focus is to propose a predictive method for estimating the entrainment limitation of a thermosyphon based on its initial charging pressure.

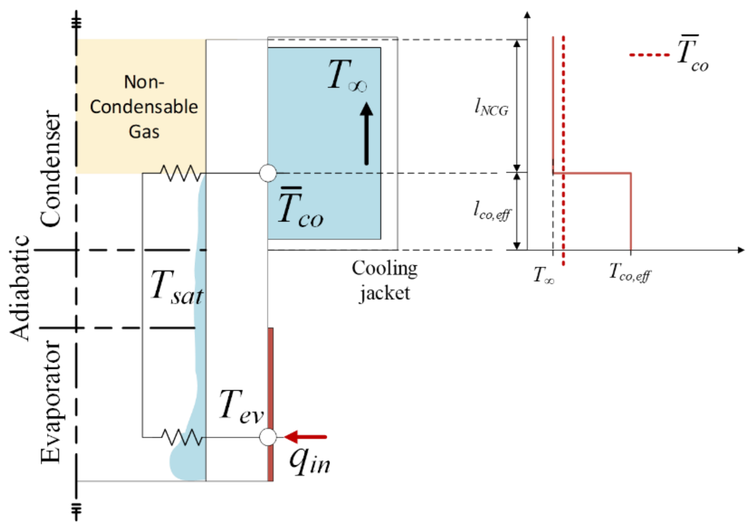
METHOD AND DESIGN

- Current method of predicting entrainment limitation of thermosyphon provide the limitation value based on operating value. (Operating pressure or operating temperature)

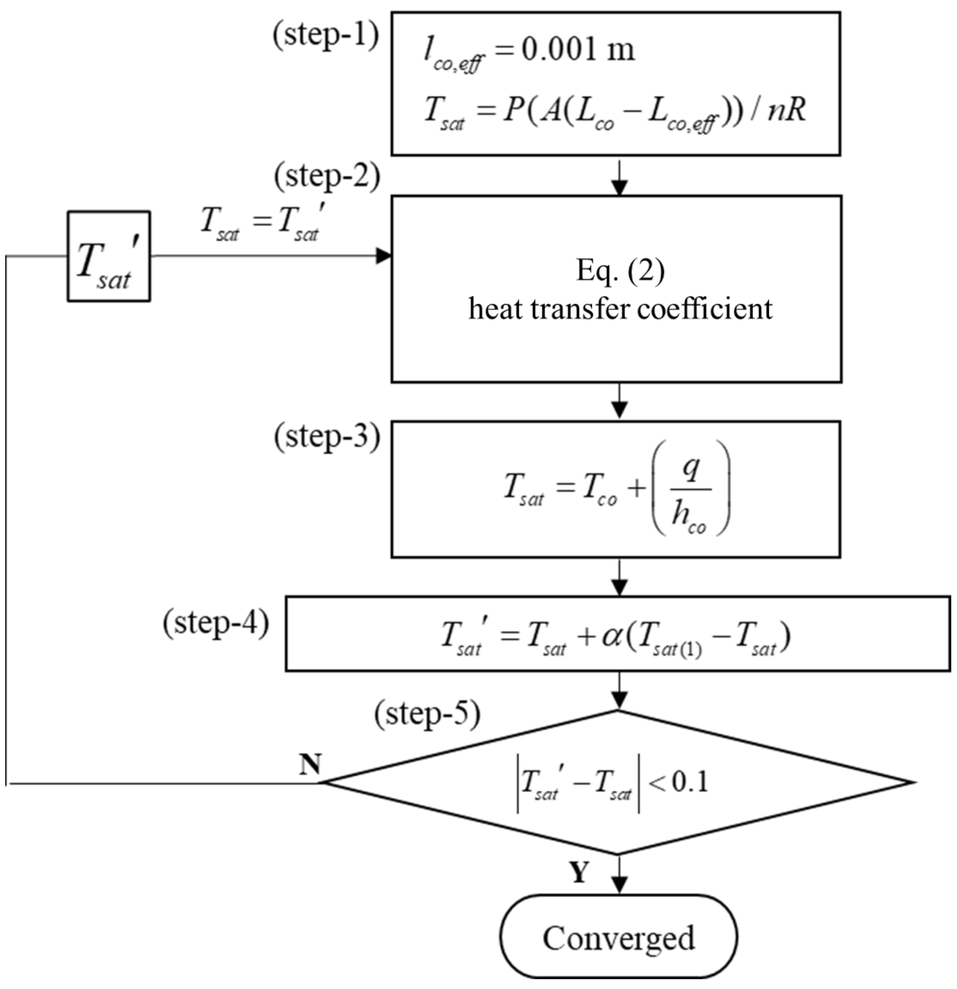




- For the case of thermosyphon with non-condensable gas, a model predicting its thermal hydraulic behavior is proposed by Simamora and Lee [3].

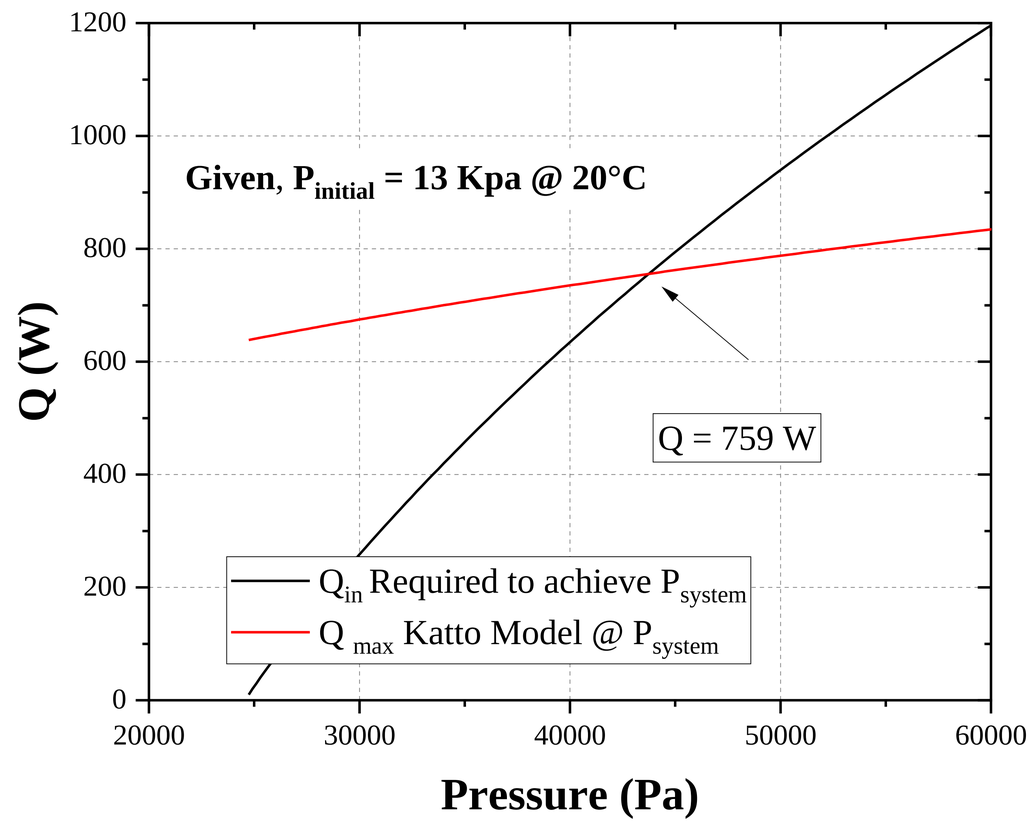


- The prediction of operating condition and entrainment limitation can be combined to give specific limitation based on boundary condition.



RESULT

$$Q_{Katto} = \frac{0.01\pi D_e L_e \rho_v^{0.5} h_{lv} \left[\sigma g (\rho_l - \rho_v)\right]^{0.25}}{\left[1 + 0.0491 L_e / D_e Bo^{0.3}\right]}$$



- The results demonstrate the usage of predictive model by Simamora and Lee combined with equation of Katto can generate predictive value based on initial condition.

CONCLUSION

In this study, a conceptual model is proposed to predict the entrainment limitation for NCG-pressurized thermosyphon based on its initial charging pressure. Experimental validation is necessary to confirm the efficacy of the model.

ACKNOWLEDGEMENT

This work was partially supported by the Korea Institute of Energy Technology Evaluation and Planning (KETEP) grant funded by the Ministry of Trade, Industry & Energy (MOTIE) of the Republic of Korea (No. 20214000000010), and also partially supported by Korean Hydro & Nuclear Power Co. (2021).

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