Investigation of Siphon Breaker Simulation Program through Small Scale Siphon Breaker Experiment

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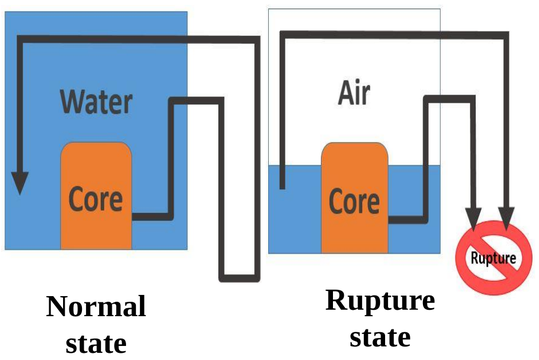
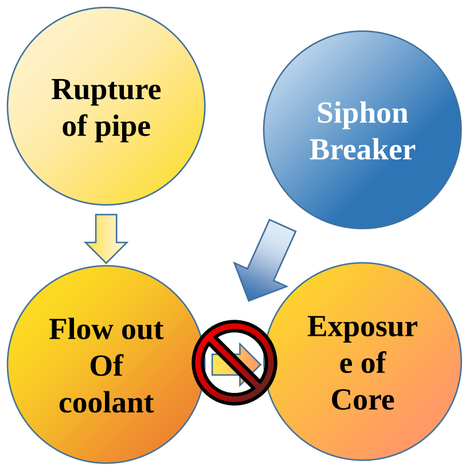
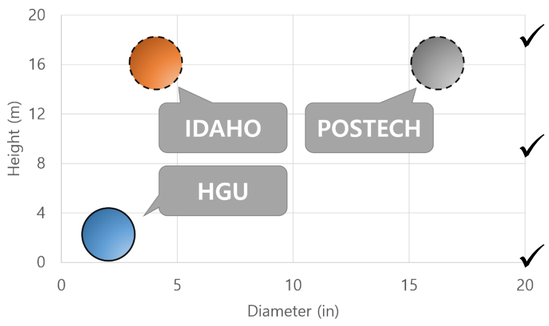
1. Introduction

1.1 Problem





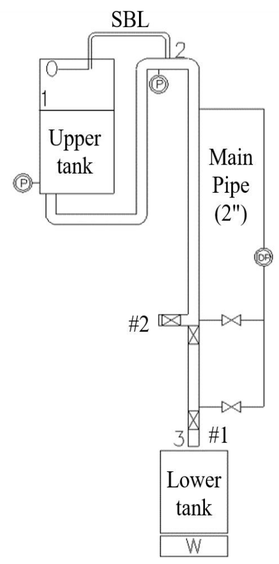
1.2 Research Objective



✓ IDAHO	Main pipe	4inch
	Height	16m
✓ POSTECH	Main pipe	16inch
	Height	16m
✓ HGU	Main pipe	2inch
	Height	2m

2. Experimental Facility

2.1 Schematic Diagram

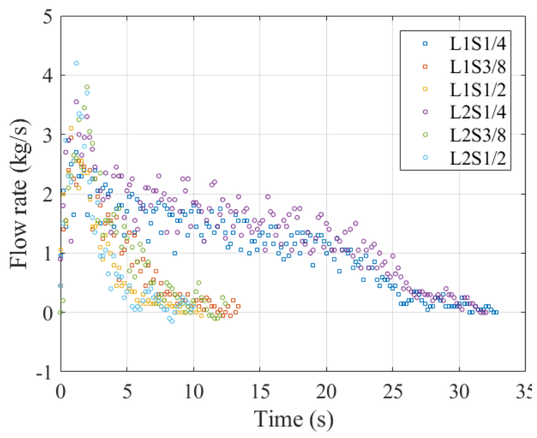


2.2 Experiment Facility

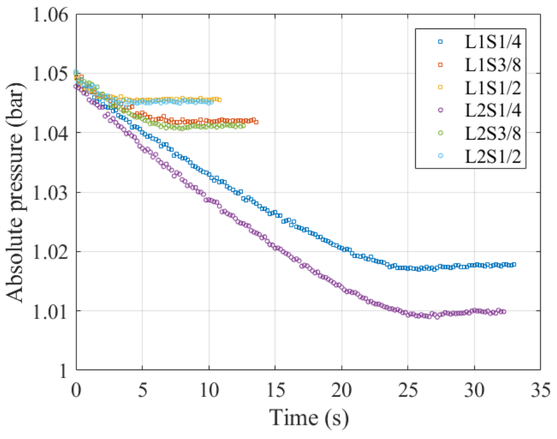
- ✓ **Total Height : 2.5m**
- ✓ **Upper Tank Height : 0.65m**
- ✓ **Main pipe size : 2"**
- ✓ **SBL size : 1/4", 3/8", 1/2"**
- ✓ **LOCA size : 1", 2"**

3. Research Result

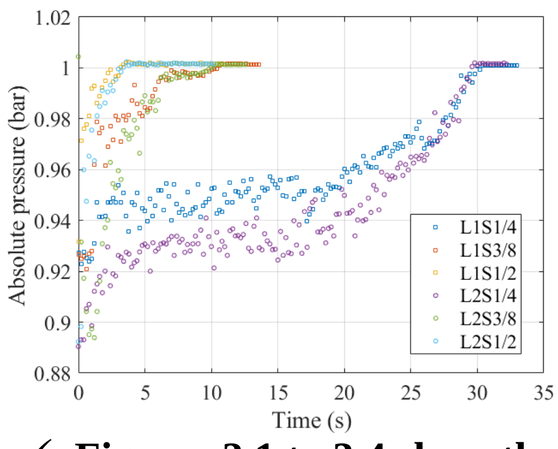
3.1 Flow rate



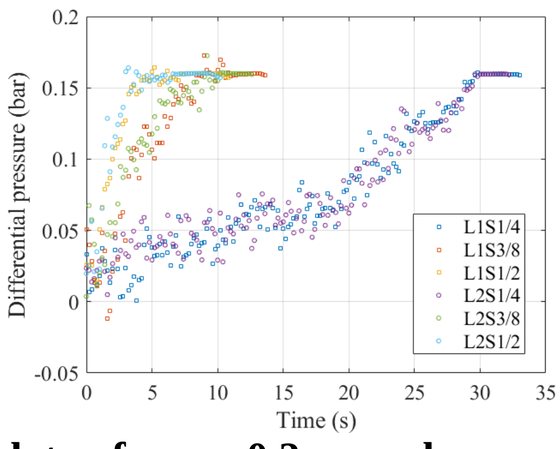
3.2 Absolute pressure of upper tank



3.3 Absolute pressure of point2



3.4 Differential pressure between point2 and point3



- ✓ **Figures 3.1 to 3.4 show the data of every 0.2 seconds.**
- ✓ **Figure 3.1 shows the flow rates over time calculated by measuring the weight of efflux water.**
- ✓ **Figure 3.2 shows the water level changes measured by the absolute pressure transmitter at the bottom of upper tank.**
- ✓ **Figure 3.3 shows the absolute pressures at the point 2 where the SBL meets the apex of the main pipe.**
- ✓ **Figure 3.4 shows the results of the differential pressure between the point 2 and the point 3.**
- ✓ **Results of L1S1/4 and L2S1/4 show full sweep-out.**

Reference

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[4] S. H. Kang, M. H. Kim, K. W. Seo, K. Y. Lee, and D. Y. Chi, Final report of experimental studies on siphon breaker, Korea Atomic Energy Research Institute, 2011.

[5] S. H. Kang, K. C. Lee, M. H. Kim, K. Y. Lee, K. W. Seo, S. H. Kim, and J. H. Yoon, Experimental Study of Siphon breaker, Korea Atomic Energy Research Institute, 2013.

[6] K. Y. Lee and W. S. Kim, Theoretical study on loss of coolant accident of a research reactor, Nuclear Engineering and Design, Volume 309, pp 151-160, 2016.

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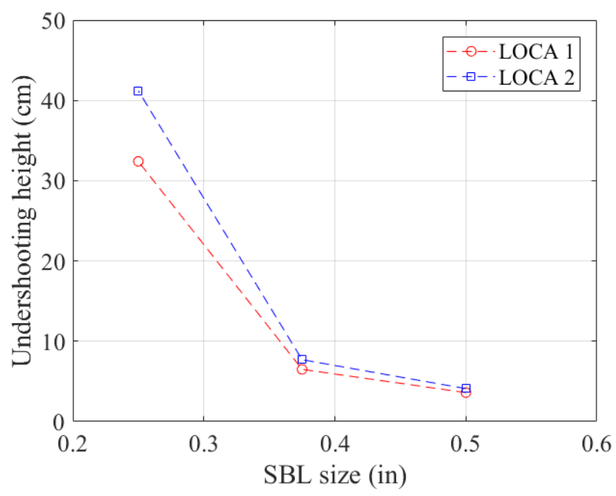
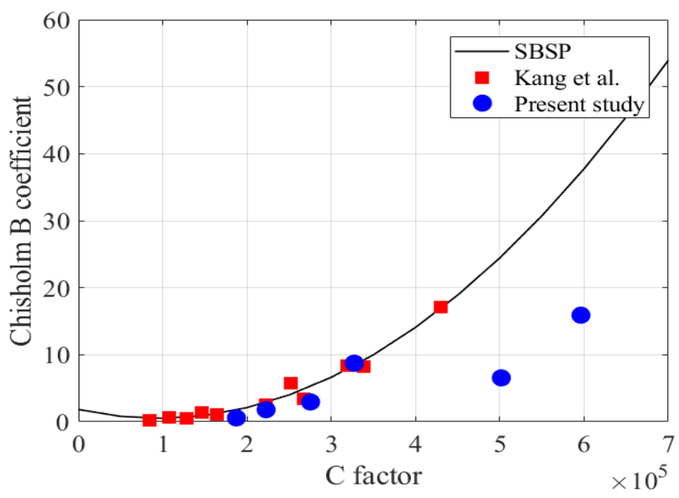
4. Discussion & Conclusion

4.1 Results of undershooting



4.2 Results of C factor & Chisholm B graph



- ✓ **The experiments for the SBL sizes of 1/2 and 3/8 are within the range of Kang *et al.*[4][5] considering C factor and Chisholm B coefficient. However, the SBL size of 1/4 is out of the range.**
- ✓ **In the SBL sizes of 1/2 and 3/8, the undershooting heights were less than 10cm and the SBSP predicted well the data.**
- ✓ **However, the SBL size of 1/4 which had full sweep-out mode during about 5 to 15 seconds showed higher undershooting heights, and the SBSP didn't predict the data. But, the conditions with big undershooting height are not considered in designing the actual research rectors.**
- ✓ **So, the SBSP can be useful to design the siphon breaker of research reactors with various main pipe sizes.**