

Experimental Study on Single-Point Sampling of 2-Phase Fluid in a Nuclear Stack

Hong Seok Kim¹, Jae Hee Jung¹, Sang Bok Kim¹, Sang Soo Kim¹,

¹*Department of Mechanical Engineering, Korea Advanced Institute of Science and Technology, hooo3@kaist.ac.kr*

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Abstract

In many of nuclear power plants in Korea, sampling and detecting of radioactive exhaust particles have been conducted by following ANSI/HPS 13.1-1969. But ANSI/HPS 13.1-1999 (re-leased in 1999) states that a single-point sampling can make representative sampling if some conditions of sampling are satisfied. In this paper, we designed and made the stack that reproduces the aerodynamic characteristics of real stacks. And measuring the velocity of gas and the concentration of particles and comparing the results of concentrations for the cases of multi-point sampling and single-point sampling were performed. The velocities are measured at $z=4D$ and $z=7D$, and the COVs of the velocities are 19.79% and 11.52% respectively. The concentrations are measured by APS (3310A, TSI), and the COVs of concentrations are 29.4% and 16.1% at $z=4D$ and $z=7D$ respectively. Finally the penetration ratios of the case using shrouded probe are measured. Table 1 shows the results fo penetration ratios. So it can be confirm- ed that these results can satisfy the condition of ANSI/HPS 13.1-1999 which states that the penetration ratio of single-point sampling should exceed half of that of multi-point sampling.

According to these results, we can conclude that this modified stack can reproduce the characteristics of real stacks. And single-point sampling using the shrouded nozzle can be a representa- tive sampling of the particles from the stack.

Table 1. Single-Point Sampling by using Shrouded Nozzle

Pos.	Concen. (#/cc)	St. Dev. (#/cc)	Penetration Ratio
$z=4D$	933.9	120.7	68.5 %
$z=7D$	849.9	128.0	72.1 %

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References

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