

Liquid Entrainment and Off-take at the Top of the Pressurizer  
in the case of the actuation of Safety Depressurization System  
of APR1400

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Abstract

In order to determine the bleed capacity of Safety Depressurization System (SDS) of Advanced Power Reactor 1400 (APR1400) in case of Total Loss of Feed Water (TLOFW), we performed an experimental study of liquid entrainment and liquid off-take from the swelled two-phase mixture surface in a vessel. A total of 208 experimental data on the entrainment and off-take are obtained using a test vessel with the height of 2.0m and the inner diameter of 0.3m having a top break with diameter of 0.05m. Two-phase mixture levels are measured by the ultrasonic sensor within  $\pm 1.77\%$  with respect to the visual level data. Droplet entrainments are measured and compared with the existing pool entrainment data. The empirical correlation for the onset of off-take is developed in terms of the Froude number ( $Fr_g$ ) at the break and non-dimensional inception height ( $h_b/d$ ). This correlation shows agreement with the present experimental data within  $\pm 15\%$ . The present off-take quality data is in agreement with Schrock's off-take quality correlation with the r.m.s. error of 15.8%. In the present experiment, droplet entrainment  $E_{fg}$  strongly depends upon  $j_g^*/h^*$  and is proportional to the 7<sup>th</sup> power of  $j_g^*/h^*$  in the same way as the off-take data.