

Title PPOOLEX EXPERIMENTS ON STRATIFICATION AND MIXING IN THE WET WELL POOL

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Abstract This report summarizes the results of the thermal stratification and mixing experiments carried out in 2010 with the scaled down, two compartment PPOOLEX test facility designed and constructed at LUT. Steam was blown into the thermally insulated dry well compartment and from there through the DN200 vertical blowdown pipe to the condensation pool filled with sub-cooled water. The main purpose of the experiment series was to generate verification data for evaluating the capability of GOTHIC and APROS codes to predict stratification and mixing phenomena. Another objective was to test the sound velocity measurement system.

Altogether five experiments were carried out. The experiments consisted of a small steam flow rate stratification period and of a mixing period with continuously or stepwise increasing flow rate. The dry well structures were heated up to the level of approximately 90 °C before the actual experiments. The initial water bulk temperature was 20 °C.

When the steam flow rate was low enough (typically ~100–150 g/s) temperatures below the blowdown pipe outlet remained constant while increasing heat-up occurred towards the pool surface layers indicating strong thermal stratification of the wet well pool water. During the stratification period the highest measured temperature difference between pool bottom and surface was approximately 40 °C.

During the mixing period total mixing of the pool volume was not achieved in any of the experiments. The bottom layers heated up significantly but never reached the same temperature as the topmost layers. The lowest measured temperature difference between the pool bottom and surface was 7–8 °C.

According to the test results, it seems that a small void fraction doesn't have an effect on the speed of sound in water and that the acquired sound velocity measurement system cannot be used for the estimation of void fraction in the wet well water pool. However, more tests on this issue have to be executed before a final conclusion can be made.

Key words condensation pool, steam/air blowdown, thermal stratification and mixing