

Title	PPOOLEX Experiments with a Modified Blowdown Pipe Outlet
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Abstract This report summarizes the results of the experiments with a modified blowdown pipe outlet carried out with the PPOOLEX test facility designed and constructed at Lappeenranta University of Technology. Steam was blown into the dry well compartment and from there through a vertical DN200 blowdown pipe to the condensation pool. Four reference experiments with a straight pipe and ten with the Forsmark type collar were carried out. The main purpose of the experiment series was to study the effect of a blowdown pipe outlet collar design on loads caused by chugging phenomena (rapid condensation) while steam is discharged into the condensation pool.

The PPOOLEX test facility is a closed stainless steel vessel divided into two compartments, dry well and wet well. During the experiments the initial temperature level of the condensation pool water was either 20–25 or 50–55 °C. The steam flow rate varied from 400 to 1200 g/s and the temperature of incoming steam from 142 to 185 °C.

In the experiments with 20–25 °C pool water, even 10 times higher pressure pulses were measured inside the blowdown pipe in the case of the straight pipe than with the collar. In this respect, the collar design worked as planned and removed the high pressure spikes from the blowdown pipe. Meanwhile, there seemed to be no suppressing effect on the loads due to the collar in the pool side in this temperature range. Registered loads in the pool were approximately in the same range (or even a little higher) with the collar as with the straight pipe.

In the experiments with 50–55 °C pool water no high pressure pulses were measured inside the blowdown pipe either with the straight pipe or with the collar. In this case, more of the suppressing effect is probably due to the warmer pool water than due to the modified pipe outlet. It has been observed already in the earlier experiments with a straight pipe in the POOLEX and PPOOLEX facilities that warm pool water has a diminishing effect on water hammers and pressure loads inside the blowdown pipe.

However, warm water seems not to prevent pressure loads in the condensation pool. Even an order of magnitude higher loads were measured with the collar than without it at the blowdown pipe outlet (measurement P5). At least in the 50–55 °C temperature range, the collar doesn't seem to work as planned. Instead, it looks like it can even magnify pressure loads in the condensation pool.

Key words condensation pool, steam/air blowdown, blowdown pipe