Title	PPOOLEX Experiments with Two Parallel Blowdown Pipes
Author(s)	Jani Laine, Markku Puustinen, Antti Räsänen
Affiliation(s)	Lappeenranta University of Technology, Nuclear Safety Research Unit
ISBN	978-87-7893-306-5
Date	January 2011
Project	NKS-R / POOL
No. of pages	36 p. + app. 13 p.
No. of tables	8 + 14
No. of illustrations	31 + 15
No. of references	13

Abstract

This report summarizes the results of the experiments with two transparent blowdown pipes carried out with the scaled down PPOOLEX test facility designed and constructed at Lappeenranta University of Technology. Steam was blown into the dry well compartment and from there through either one or two vertical transparent blowdown pipes to the condensation pool. Five experiments with one pipe and six with two parallel pipes were carried out. The main purpose of the experiments was to study loads caused by chugging (rapid condensation) while steam is discharged into the condensation pool filled with sub-cooled water.

The PPOOLEX test facility is a closed stainless steel vessel divided into two compartments, dry well and wet well. In the experiments the initial temperature of the condensation pool water varied from 12 ºC to 55 ºC, the steam flow rate from 40 g/s to 1 300 g/s and the temperature of incoming steam from 120 ºC to 185 ºC.

In the experiments with only one transparent blowdown pipe chugging phenomenon didn't occur as intensified as in the preceding experiments carried out with a DN200 stainless steel pipe. With the steel blowdown pipe even 10 times higher pressure pulses were registered inside the pipe. Meanwhile, loads registered in the pool didn't indicate significant differences between the steel and polycarbonate pipe experiments.

In the experiments with two transparent blowdown pipes, the steam-water interface moved almost synchronously up and down inside both pipes. Chugging was stronger than in the one pipe experiments and even two times higher loads were measured inside the pipes. The loads at the blowdown pipe outlet were approximately the same as in the one pipe cases. Other registered loads around the pool were about 50–100 % higher than with one pipe.

The experiments with two parallel blowdown pipes gave contradictory results compared to the earlier studies dealing with chugging loads in case of multiple pipes. Contributing factors to this may be the smaller dry well volume per blowdown pipe ratio and the lack of dry well internal structures in the PPOOLEX facility. Furthermore, the pipe material seemed to have an effect on the condensation process inside the pipe. Polycarbonate has two orders of magnitude smaller thermal conductivity than steel.

Key words condensation pool, steam/air blowdown, chugging, parallel blowdown pipes

Available on request from the NKS Secretariat, P.O.Box 49, DK-4000 Roskilde, Denmark.
Phone (+45) 4677 4045, fax (+45) 4677 4046, e-mail nks@nks.org, www.nks.org