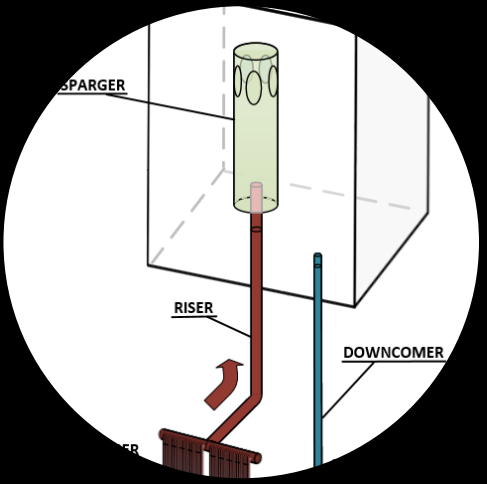
JOINT INTERIM SEMINAR OF SAFIR2022 AND KYT2022

PAHE PROJECT



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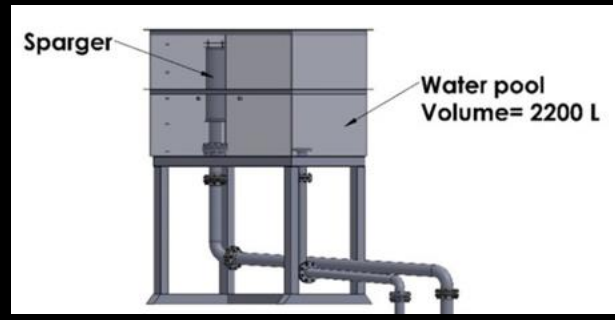
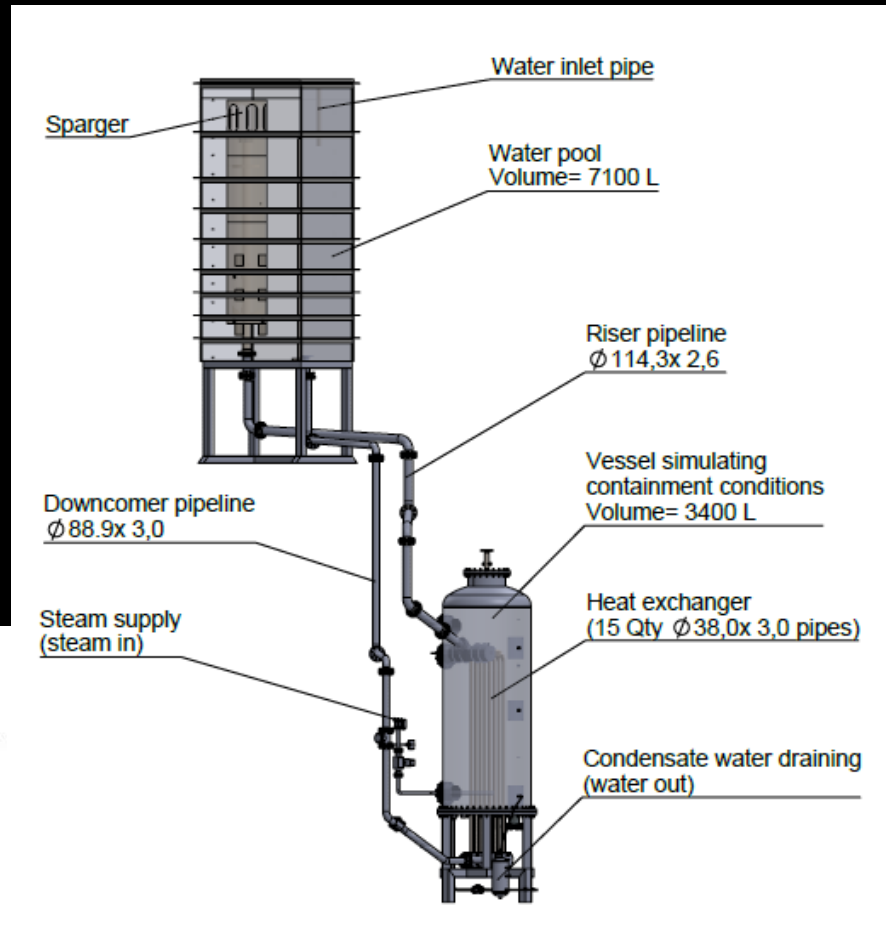
PASI FACILITY

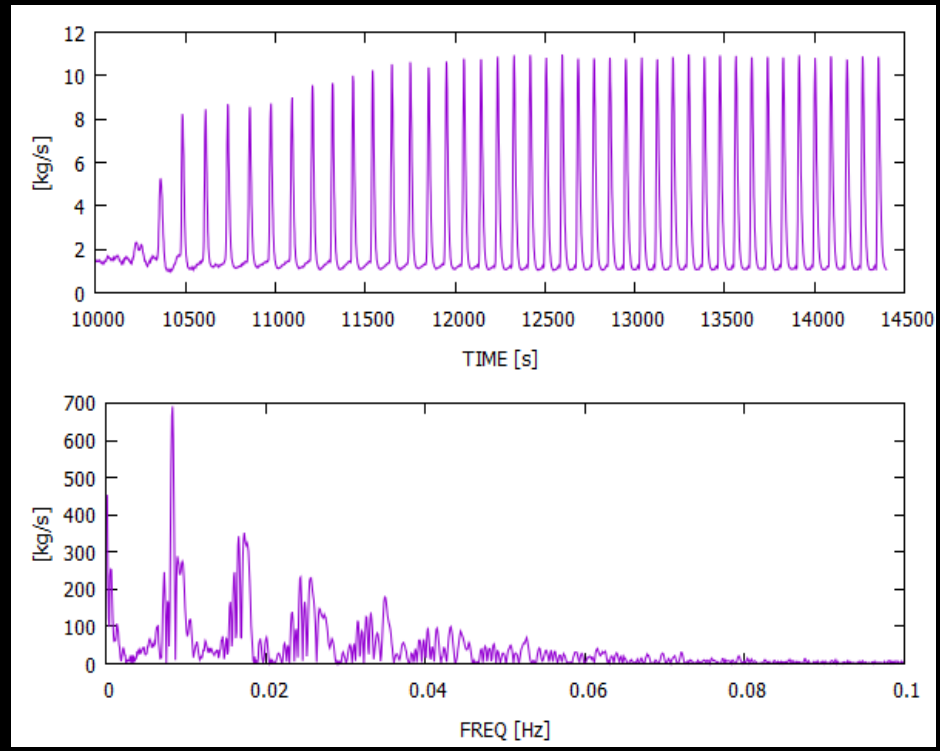
- PASI represents an open passive heat removal loop
- The reference system is the passive heat removal system for containment (PHRS-C) designed for the AES-2006 type PWR
- PASI comprises containment vessel, heat exchanger, riser and downcomer lines, sparger, water pool
  - Height scaling 1:2 → height of the loop 9.9 m
  - Maximum pressure inside containment 5 bar
  - Maximum temperature inside containment 170 °C
  - Higher water pool and sparger





NATURAL CIRCULATION EXPERIMENT

- A natural circulation experiment with the low sparger and water pool to characterize the basic facility operation modes in 2018
  - Flow oscillations were observed in the experiment, which ended before the system reached quasi-steady two-phase flow conditions
  - A new test was done in 2019 to test if the flow oscillations will even out when the temperature in the system increases to the saturation temperature of the water pool
  - Pre-test calculations with APROS were done with the PASI simulation model provided by VTT to find experiment parameters
- In the new experiment, the loop mass flow rate fluctuated strongly (average oscillation frequency about 0.01 Hz)
- Oscillation continued approximately for one hour, until the end of the experiment
- Assumed attenuation of the flow oscillation was not achieved in this experiment



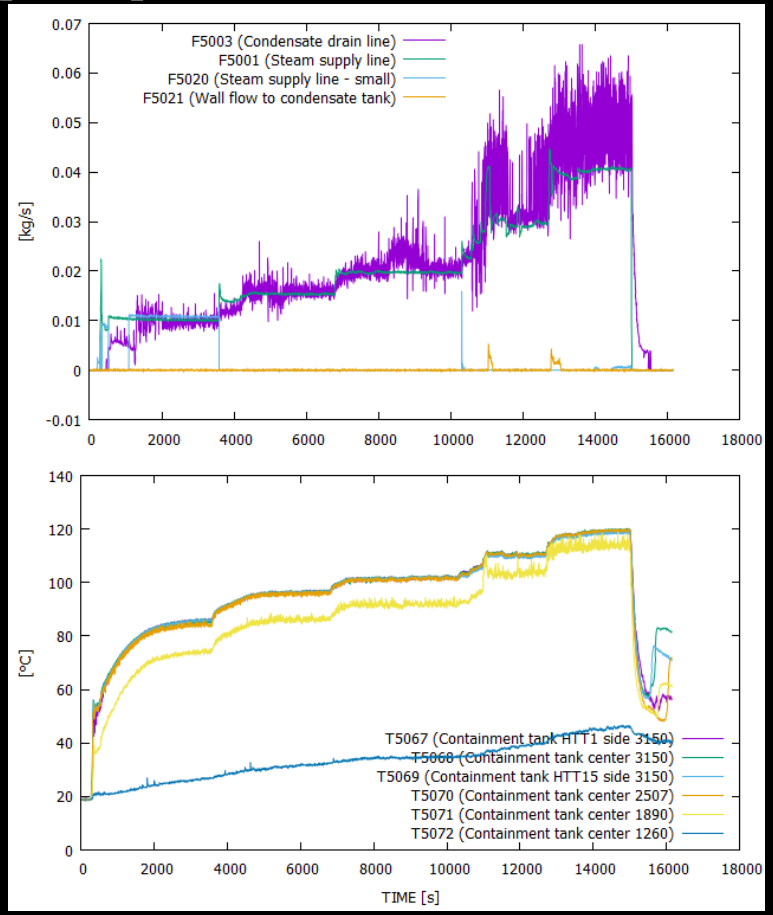
EXPERIMENTS FOR VTT PROJECTS (1/2)

EXPERIMENT WITH STEAM (high sparger and water pool)

- To observe the natural circulation behavior of the PASI facility under different steam mass flow rates to the containment
- How much condensate can be collected from the bottom of the containment vessel and from the walls of the containment vessel

- Experiment began from cold conditions and steam supply flow was increased stepwise starting from a low value
- Experiment contained several steps, between each step the conditions in the facility was let stabilize to get as good steady state conditions as reasonable possible

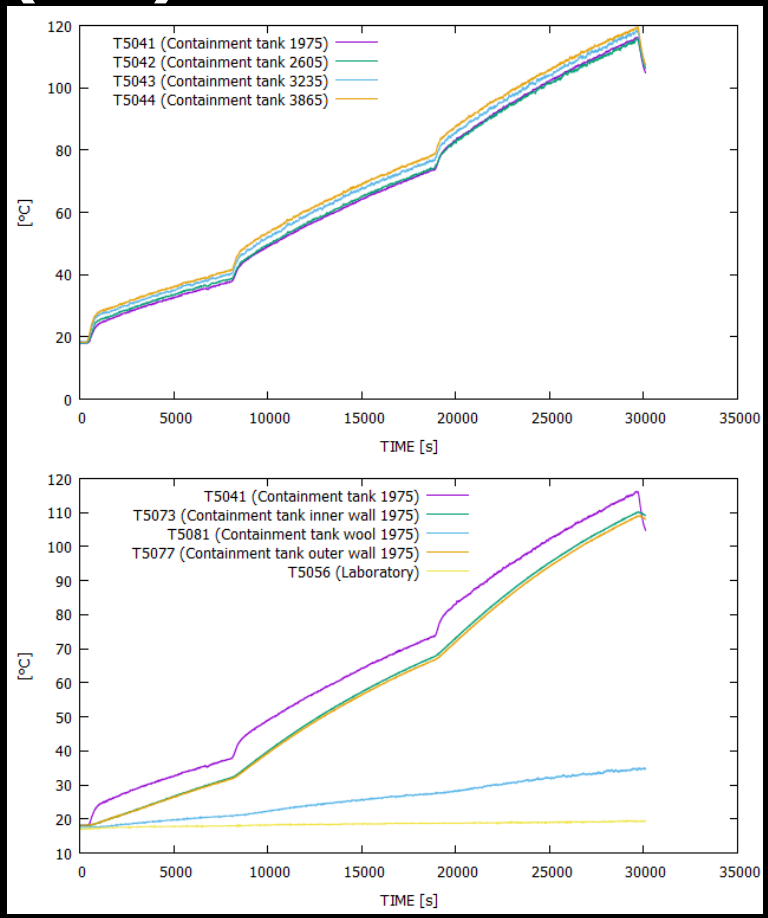
- It was possible to measure the amount of condensate from the heat exchanger, but the wall condensation was minimal (most of the time it was below the measurement range of the smallest available flow measurement device)
- Temperatures in the containment stratified - most likely due to the condensate in the bottom of the containment



EXPERIMENTS FOR VTT PROJECTS (2/2)

HEAT LOSS EXPERIMENT (high sparger and water pool)

- Heat losses from the containment
- Loop was empty, and the vessel was heated up using electrical heaters inside the vessel instead
- Only minor temperature stratification inside the containment vessel was observed
- Inner and outer wall temperatures were clearly higher at the lowest elevation
- The containment tank temperature at the lowest elevation was closer to the wall temperatures



EXPLOITATION OF THE RESULTS AND THE SAFETY SIGNIFICANCE

- Different organizations can use data in the development and validation of system and CFD codes for the safety analyses of nuclear power plants
- Project maintained and extended the research expertise needed for the experimental work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