

Pipe Wall Thinning Phenomena Test Apparatus

Purpose:

Pipe Wall thinning phenomena is an important issue for plant management and operation. Flow accelerated corrosion (FAC) and liquid droplet impingement erosion (LDI) are known to be the main phenomena. In previous research, we developed an evaluation method for FAC at single-phase water piping and LDI at low-wetness and high-speed steam piping. However, FAC and LDI are also observed in high-wetness two phase piping at actual power plants. Therefore, we began research on this wall thinning phenomena and developed 2 test loops, “Water Chemistry Controlled Steam-Water Two-Phase Flow Loop” and “Multi-Purpose Steam Test Apparatus”. The first is for FAC in two-phase flow conditions, and the other is for LDI in wider steam conditions such as high-wetness two phase flow and negative pressure.

Outline:

“Water Chemistry Controlled Steam-Water Two-Phase Flow Loop” is composed of two lines; low-temp./pressure line for control of pH and dissolved oxygen level and high-temp/pressure line for control of flow conditions such as flow rate and wetness. It is possible to conduct two-phase flow FAC tests with simulating the flow and water chemistry conditions in LWR (Light Water Reactor). “Multi-Purpose Steam Test Apparatus” has high-pressure steam boiler, high-pressure and temperature water tank and vacuum tank, and it is possible to conduct wet-steam tests, LDI wear tests and flashing tests with these components.

Specifications:

(1) Water Chemistry Controlled Steam-Water Two-Phase Flow Loop (for FAC, picture 1)

- Conditions Temp: ~200deg. C, Pressure: ~2.5MPa, Flow Rate: ~2.0L/min, Wetness: 50%
- Main Components
 - Low Temperature Pressure Line

Water Tank (200L), Chemical Feed Tank (80L*2), Water Chemistry Measurement Devices

- High Temperature Pressure Line: Pressurizing Pump, Reheater/Preheater/Heater/Condenser

(2) Multipurpose Steam Test Apparatus (for LDI, picture 2)

- Conditions
 - Steam Tests: Temp: ~250deg. C, Pressure: 0.01~1.2MPa, Flow Rate: ~800kg/h, Wetness: ~20%
 - Flushing Tests: Temp: ~Saturated Temp., Pressure: 0.01~0.9MPa
- Main Components: Boiler, Water Tank/Vacuum Tank (3m³), Cooling Piping Line

Location and Date of Installation:

Komae Area, March 2010

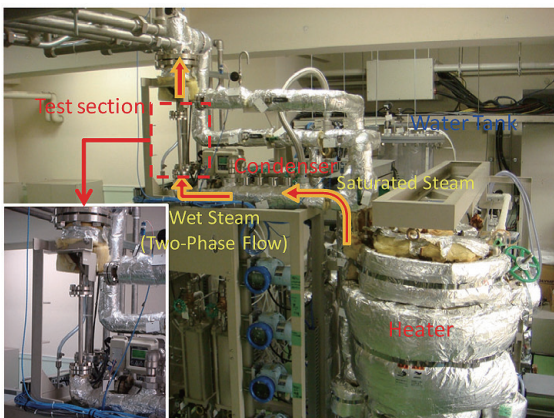


Photo 1 Water chemistry controlled steam-water two-phase flow loop

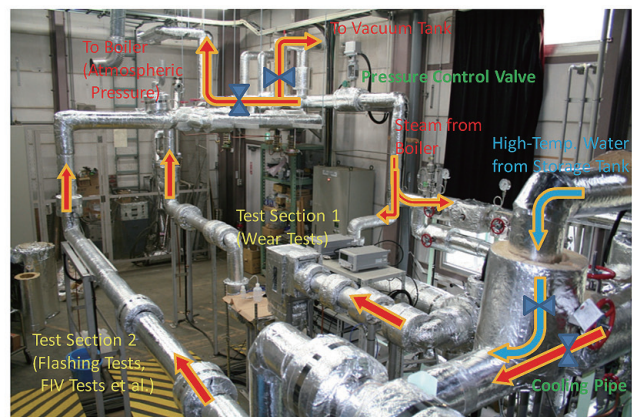


Photo 2 Multi-purpose steam test apparatus