

Shared Learning

Geothermal Fluid | Steam Hammer leading to LOPC | Rotokawa site

What happened?

During the Rotokawa Upgrade Project in July 2021, a control system failure led to a sequence of events that resulted in a Steam Hammer incident.

The incident damaged pipework and released steam to the surrounding area.

No one was harmed but there was the potential for serious harm had someone been in the vicinity.

Due to low reinjection back pressure, hot brine started to flash and generated large quantities of steam.

Mixing of hot steam with subcooled brine led to ongoing 'Condensation Induced Water Hammer' (CIWH) that ultimately led to pipework damage and loss of containment of steam.

What did we learn?

The HAZOP review had identified the risk of CIWH potentially leading to LoC and Fatality.

We should have been more diligent around the close-out of the HAZOP action items:

- We should have implemented more safeguards as part of the design
- We should not have relied on past experience and procedures to manage the risk of CIWH

We should not have relied on single isolation, but should have used spading or double block and bleed

We should not normalize the occurrence and risk of Steam Hammer in Geothermal operations.

We should have immediately shut down the station when the loss of containment of steam was detected.



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What happened?

A control system switch over causes the re-injection well control valve to close.

Brine flow stops, causing high separator level.

Hot brine bypass opens fully but is not able to pass fluid.

Brine temperature at OEC1 outlet drops.

Opening of off-spec brine control valve to dump pond reestablishes brine flow and causes backpressure to drop. Hot brine starts to flash.

Mixing of hot steam with subcooled brine leads to ongoing 'Condensation Induced Water Hammer' and piping damage and loss of containment of steam.

