

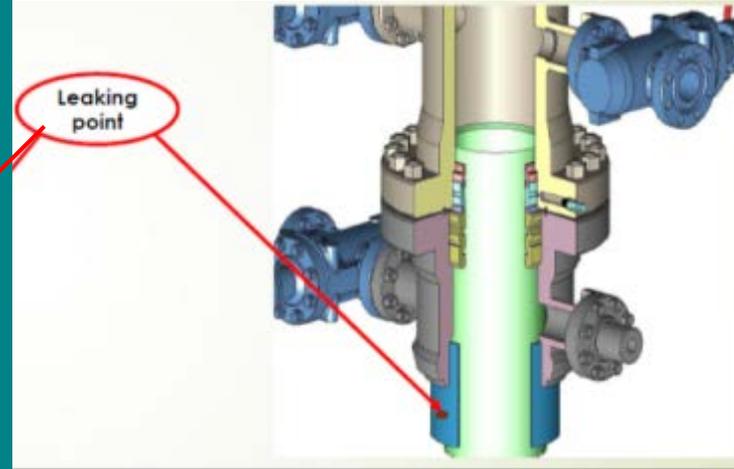
MAINTENANCE OF GEOTHERMAL POWER PLANT MAIN EQUIPMENT

Due to the steam composition a natural production, the possibility of *oxide scale, erosion, corrosion, wearing and damage* on Geothermal Power Plant equipment due to deformation is immense. The steam characteristic (pH, chemical composition, solid particle content, etc) vary from one site to another, so the program may work at one place and not work at another place.

Example of Maintenance in Geothermal Power Plant

No.	Equipment Name
1	Wellhead and master valve
2	Pipeline and Valves
3	Separator vessel
4	Turbine & Auxiliary
5	Cooling Tower
6	Gas Removal System
7	Brine and condensate reinjection

Wellhead maintenance



Repair :
✓ Split collar welding



Master valve leakage



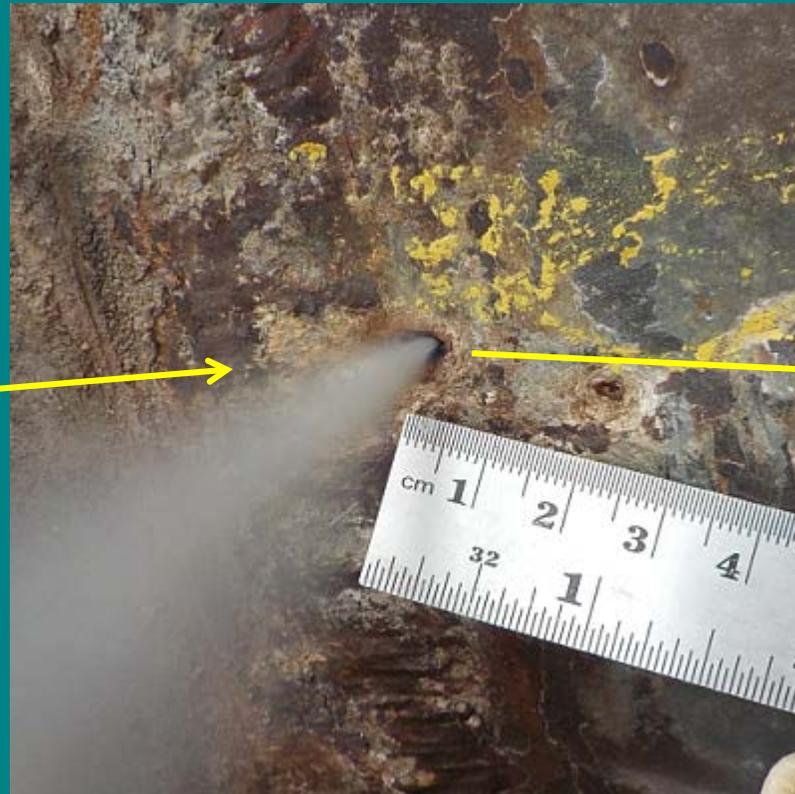
"packer job"



Master valve leakage due to pasing and damage on the RTJ groove, need master valve replacement



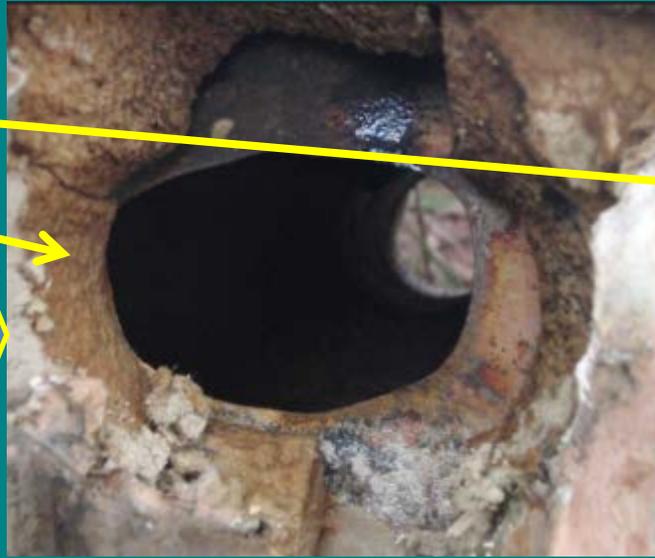
Pipeline and valve leakage



Pinhole leakage in weldment of pipeline

After repair

Pipeline Erosion

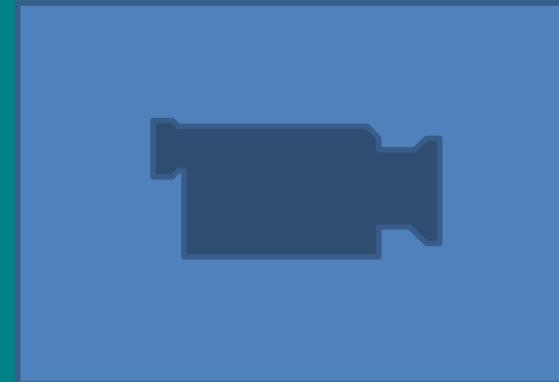


During well discharge, the particle from well imping the 6" bleeding line and create big hole, and penetrate the insulation of 36" steam header line and until the pipe is ripped a little

Temporary repair by patch welding.



Valve Leakage and silica deposition



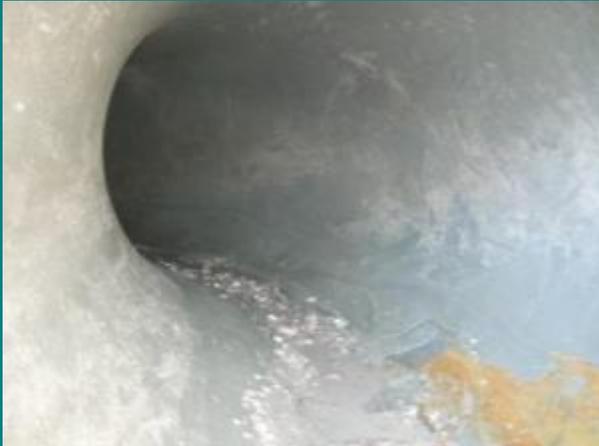
Silica Scaling Problem



Battling again silica scaling :

- Maintain high temperature (good insulation)
- Lower pH (inject acid)
- Lower concentration (dillution with brine from low silica well)
- Redundant pipeline for routine cleaning

Pipeline and Separator Maintenance



Pipeline before separator cleaning

Dirty trap cleaning

Separator Crack Repair by Welding



Steam Turbine Generator Maintenance



Steam turbine



Generator stator

Erosion corrosion on Geothermal Steam Turbine



Erosion on turbine rotor

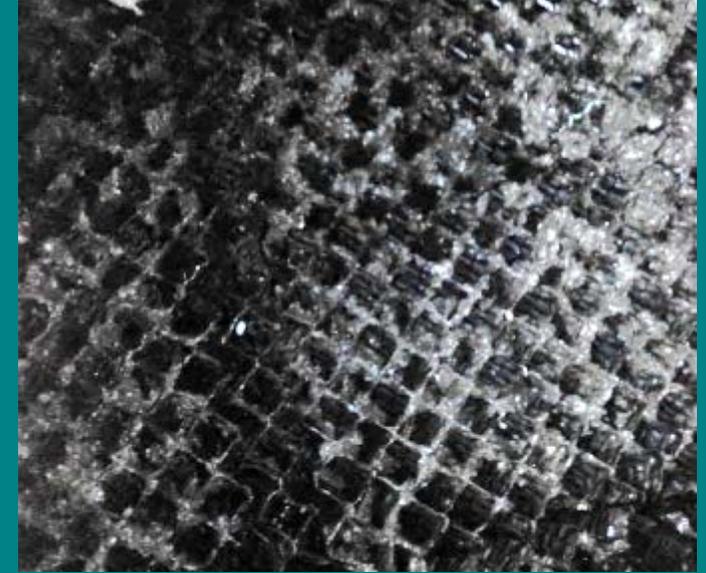


Erosion-corrosion on turbine outer casing

Cooling Tower Water Distribution & Fill Maintenance



Water distribution nozzle spray clogged by sulfur and silica deposit



Fill pack clogged by organic deposit

Solution :

- *Suitable chemical treatment program (sulfur inhibitor)*
- *Routine cleaning*

Gas Removal System Maintenance



After condenser vessel 316L crack from sour service, hydrogen induced crack. Repaired by welding and reinforce pad

Corrosion on condensate injection system



Condensate line severe corrosion : predicted from dissolved oxygen promoted corrosion. A half of the pipeline already replaced with HDPE pipe. Can not replace all to prevent corrosion on the well casing.

Still consider to sacrifice the rest of pipeline rather than oxygen scavenging or filming amine due to high cost

Q & A

