

Common failures in steam and/or brain supply

Major component	Plant type				common failure modes	Failure causes			
	Dry flash	Single flash	Double flash	Binary		Scaling	Corrosion	Erosion	Other
Down hole pump		X*	X*	X	No or reduced output	X	X		Motor failure Seal failure Bearing failure
Wellhead valves & control	X	X	X	X	Steam leakage Seizure Incomplete shutoff			X	Due to moister flashing in valve body
Steam piping	X	X	X		Excessive pressure drop Excessive condensation Leaks		X	X	Epoxy failure Compression fitting failure
Steam cyclone separators		X	X		Excessive moister in steam output Leaks	X	X		
Flesh vessels	X				Leaks	X	X		Internal and external corrosion
Brine piping		X	X	X	Leaks Plugging	X	X		Stress due rapid heating
Brine booster pump		X*	X*	X	No or reduced output	X	X		Motor failure Seal failure Bearing failure
Final moister separator	X	X	X		Excessive moister in steam output leaks	X	X		

Common failures in geothermal plant

Major component	Plant type				common failure modes	Failure causes			
	Dry flash	Singel flash	Dubble flash	Binary		Scaling	Corrosion	Erosion	Other
Common failures in heat exchangers									
Evaporator				X	Organic vapour leakage				Material defects (cracks) Seal failure
Condensor	X	X	X	X	Insufficient cooling Closed heat exchange tubes Leakage	X	X	X	Suspended material in cooling water Material defects in heat exchanger tubes
Common failures in Turbine generator and controls									
Steam turbine	X	X	X		Reduced or no output		X		Stress corrosion cracking Corrosion fatigue
Organic vapour turbine				X	Reduced or no output	X	X		Fatigue
Dual-admission turbine			X		Reduced or no output	X	X		Stress corrosion cracking Corrosion fatigue
Control system	X	X	X	X	Various depending upon system components				Various component failures

Common failure power plant pump

Major component	Plant type				common failure modes	Failure causes
	Dry flash	Singel flash	Dubble flash	Binary		Other
Common failures in plant pump						
Condensate	X	X	X	X	Reduced or no output	Motor failure Seal Failure Bearing failure
Cooling water circulation	X	X	X	X	Reduced or no output	Motor failure Seal Failure Bearing failure
Brine injection		X*	X	X	Reduced or no output	Injection well capacity exceeded Plugged well Motor failure Seal Failure Bearing failure

Common failures Geothermal plant

Major component	Plant type				common failure modes	Failure causes
	Dry flash	Singel flash	Dubble flash	Binary		Other
Common failures in Non condensable gas removal system						
Steam jet injectors	X	X	X		Failure to sustain vacuum	Seal failure Connection failure
Compressor	X*	X*	X*		No output	Broken wire Worn wire installation Bearing failure Piston failure Valve failure
Vacuum pump	X*	X*	X*		Failure to sustain vacuum	Motor failure Seal Failure Bearing failure
Common failures in cooling tower						
Wet type	X	X	X	X*	Structural failure Leaks Insufficient cooling	Wind/atmospheric condition Vibrations Corrosion Scaling
Dry type				X*	Structural failure Leaks Insufficient cooling	Wind/atmospheric condition Vibrations Corrosion Scaling

Common problems and effected components (1)

Problem	Affected Components
Corrosion (all forms)	Turbine blades/nozzles/rotor, pipelines, vessels, expansion bellows, NCG pipelines, wells, fluid collection and disposal systems, all components, valves, condensers, electrical systems
Scaling	Turbine blades, first stage nozzle box, wells, pipelines, reinjection pumps, separators, condenser tubes, valves, let-down valves at well heads, pumps
Stress corrosion cracking	Turbine blades/rotor, stainless steel vessels, piping, pipe elbows, heat exchangers, 316/304 stainless steel rupture disks, security valves, wherever 300 series stainless steel is used, duplex stainless steel, some higher Ni alloys, condensers, valve shafts
Erosion corrosion	Turbine blades/rotor, LP blades' last stage, steam separators, production piping, reinjection piping, process piping, gland seal system, valve seats
Microbiologically influenced corrosion	Cooling towers (including concrete above vapor space), heat exchangers, pipelines, tube and shell main condenser, condenser tubes, valves
Fatigue	Turbine blades/rotor, pipelines, condensers, heat exchangers, rotating equipment
Corrosion fatigue	Turbine blades/rotor, pipelines, condensers, condenser tubes, rotating equipment

Common problems and effected components (2)

Problem	Affected Components
Solid particle erosion	First stage nozzle box, turbine blades/nozzles/seals, well components, pipelines
Wear (all forms)	Turbine blades/rotor, valve stem, steam seals, steam scrubbers, valves, steam equipment exhaust, compressors
Coating failure	Turbine casing, pipelines, well/line valves, silencers, epoxy coating on mild steel condenser, cooling tower fan gearboxes, miscellaneous plant structural material, Teflon linings, circulating water pipes, Sulfatreat pressure vessels
Creep	Teflon linings
Yielding	Wells
Fracture	Well casing, turbine blades, stainless steel vessels, pipelines, welds
Combination	Turbine blades

Source last 5 sheets "A brief overview of geothermal energy and its reliability implications"; The journal of the reliability information centre, august 2012