

Quick Reference Guide - Troubleshooting of Centrifugal Pumps

Problems / Symptoms	List of possible Causes in Priority#														
No delivery of liquid	S.1	S.2	S.3	HS.9	MS.1	MS.2	HS.1	MS.12	HS.4	HS.12					
Reduced flow	S.3	S.2	HS.2	HS.11	MS.1	HS.1	HS.6	MS.3	MS.2	MS.12	HS.3	HS.4	HS.10		
Discontinuity in flow	S.3	S.2	S.1	HS.2	HS.1										
Reduced discharge pressure	HS.2	MS.1	MS.2	HS.8	HS.3	MS.12	HS.10	MS.9							
Diminished bearing life	MS.4	MS.8.1	MS.17	MS.11	MS.18	MS.6	MS.5								
Diminished mechanical seal life	MS.13	MS.4	MS.8.1	MS.17	MS.3	MS.5	MS.11	MS.18	MS.6	S.3	HS.1	HS.8			
Excessive vibration and noise	S.3	S.2	HS.1	MS.11	MS.4	MS.8.1	MS.16	MS.17	MS.3	MS.5	MS.18	MS.6			
Excessive power consumption	MS.14	HS.3.1	HS.8	HS.3	MS.7	HS.4	MS.2	MS.4	MS.17	MS.9	MS.3	MS.5	MS.6	MS.15	

- please refer the other sheet(s) for possible causes & remedies



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Relevant to Hydraulic System		
HS.1	The required system pressure is higher than expected	- increase operating speed if possible - check impeller size / replace impeller with one of larger diameter - change the pump / increase the number of stages - reduce the system resistance
HS.2	Air / gas enters in the suction line	- check the suction piping sealing areas - modify the layout of suction piping - install air/gas separation chamber
HS.3	Viscosity is higher than expected	- re-establish the characteristics of the liquid as originally expected - heat up liquid to reduce viscosity - increase size of discharge piping to reduce pressure loss - use larger prime mover or change type of pump - in case of high power reduce speed
HS.3.1	Density or speicific weight of liquid are different than expected	- re-establish the characteristics of the liquid as originally expected
HS.4	Impeller is clogged with scale deposit and/or foreign materials	- check for any damage - free the vane passages - soften the pumped liquid
HS.5	There is entrained air in the system	- adjust the packed stuffing box or repair/replace the mechanical seal
HS.6	Piping is clogged	- clean piping and valves - clean the filters
HS.7	Flow velocity is too high	- if possible, decrease the pump rotational speed
HS.8	The required system pressure is lower than expected	- decrease operating speed if possible - check impeller size / reduce the impeller diameter - decrease the number of stages / introduce blind stages - increase the system resistance
HS.9	Supply tank ran dry	- refill supply tank
HS.10	Obstructions in lines / pump housing	- inspect and clear
HS.11	Strainer partially clogged	- inspect and clean
HS.12	Suction and/or Discharge valves closed	- shut down and open valves

Suction problems		
S.1	Pump is not primed	repeat priming procedure - fill pump and suction piping - eliminate high points in suction & piping - check for faulty foot valve / check valve
S.2	Insufficient submergence of suction pipe or bell (Vertical Turbine Pump); creating vortex	- lower suction pipe or raise sump level - increase system resistance
S.3	Pump is cavitating (symptom for liquid vaporizing in suction system)	- check NPSHav to NPSHreq margin - check the sution piping, the foot valve or non return valve, the filter - open completely the isolating valve in the suction piping - decrease the frictional losses - increase suction piping diameter - if the pump is above liquid level, raise liquid level closer to pump - if liquid is above pump, increase liquid level elevation

Relevant to Mechanical System		
MS.1	Rotational speed is not adequate	- consult driver troubleshooting guide - increase the motor speed in relation to the working conditions - replace impeller with one having larger diameter
MS.2	Direction of rotation is wrong	- check rotation with arrow on casing - reverse polarity on motor / change motor direction of rotation
MS.3	The wearing ring and/or impeller neck and/or the impeller and/or the diffusers are worn out or damaged	- inspect parts for defects - overhaul the pump replacing and/or repairing the damaged components
MS.4	Pump/motor coupling is misaligned	- check for angular and parallel alignment between pump and driver
MS.5	Bearings are defective or worn out	- inspect parts for defects - check lubrication procedures - use bearing failure analysis from manufacturer - repair or replace
MS.6	Motor does not operate properly; The power supply voltage is wrong	- consult motor troubleshooting guide - correct the power supply / Change motor
MS.7	The packing is too tight	- loosen the nuts of the packing gland
MS.8	The pump and/or piping are loose	- torque the bolts as required
MS.8.1	Casing distorted from excessive pipe strain	- check for misalignment - check for wear between casing and rotating elements - analyze piping loads
MS.9	Pump is worn out / excessive internal clearances	- check impeller clearances - overhaul the pump
MS.10	The coupling rubber inserts are worn	- replace the coupling inserts
MS.11	The rotor is out of balance due to wear and deposits	- disassmble, clean, balance and/or replace the impeller - soften the liquid - investigate natural frequency
MS.12	Unsuitable pumps in parallel operation	- check design parameters
MS.13	Improper mechanical seal	- check the selection of mechanical seal - contact seal supplier
MS.14	Rotational speed is too high	- check motor voltage - decrease the motor speed
MS.15	Impeller installed reversed (double suction impeller)	- inspect and correct it if necessary
MS.16	Inadequate grouting of base	- check grouting and regrout if required
MS.17	Bent shaft	- check deflection - replace shaft and bearing if necessary
MS.18	Unbalanced driver	- disconnect the driver from pump - run the driver and perform vibration analysis