



INSTRUCTION MANUAL

TROUBLESHOOTING

STEAM TURBINE

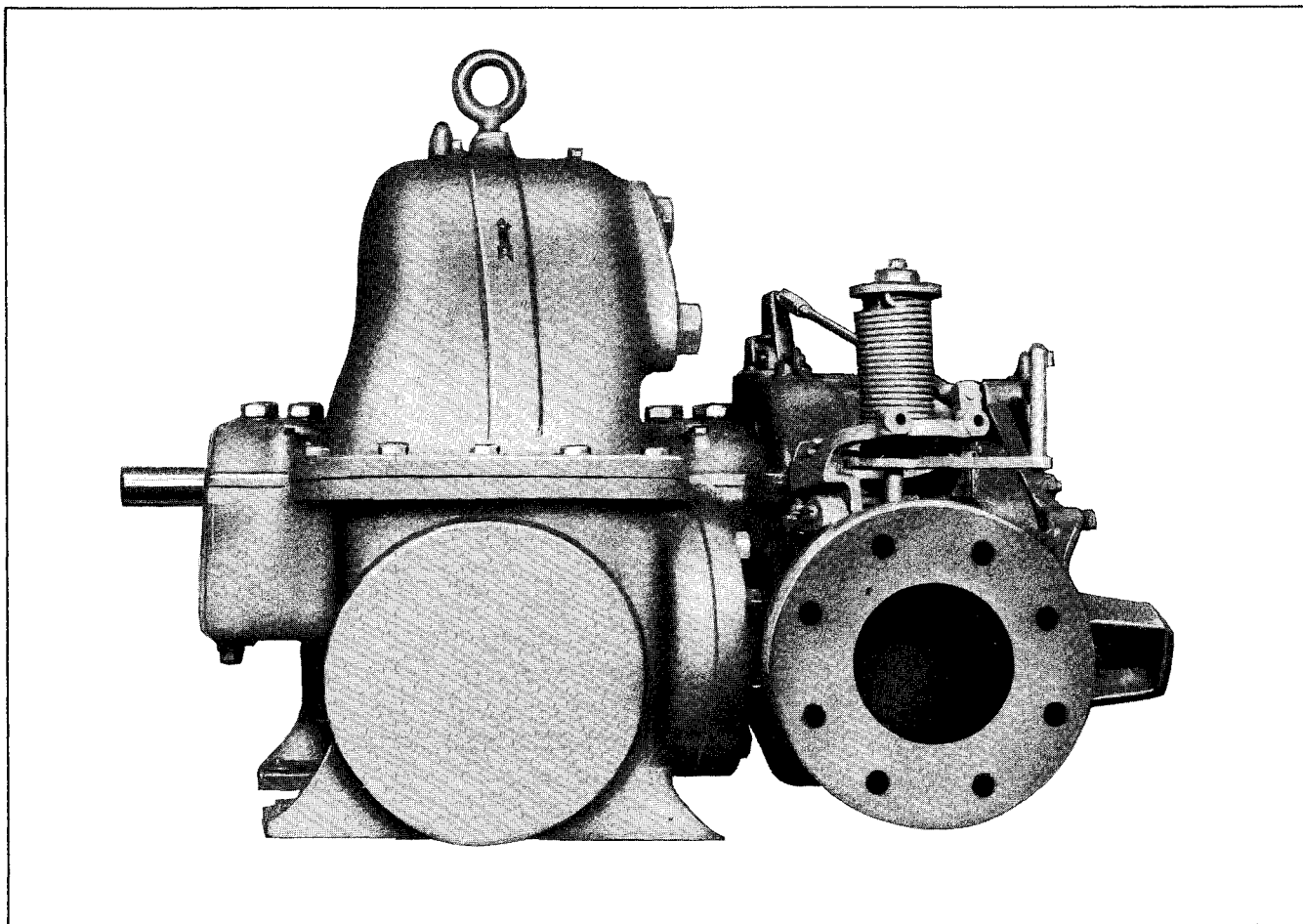
The following troubleshooting chart is furnished to you as part of Aurora Pump's continuing efforts to provide total service to their customers.

The troubles, probable causes, and remedies contained in the troubleshooting chart will aid you in quickly determining and correcting most steam turbine problems. However, it is not the intent of Aurora Pump to supersede the steam turbine manufacturer's operation and maintenance recommenda-

tions, but rather to supplement such data. Any specific questions or problems regarding your turbine should be directed to the turbine manufacturer.

Because of the diversity of problems encountered with steam turbines, the troubleshooting chart is divided into two sections.

- SECTION A. VIBRATION
- B. GENERAL



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A. VIBRATION

CONDITION	IDENTIFIABLE BY	PROBABLE CAUSE	REMEDY
1. Unbalance	1. Uniform vibration throughout turbine, decreasing slightly under load	a. Sprung shaft b. Incorrectly located balance weights c. Displacement of balance weights d. Corroded or eroded blades or buckets. e. Broken blades or buckets f. Sediment in blades or buckets g. Rotor unequally heated	a. Replace shaft. b. Relocate weights and balance rotor. c. Balance rotor. d. Replace worn blades and/or buckets. e. Replace broken blades or buckets. f. Clean blades and/or buckets. g. Consult manufacturer.
2. Poor alignment with driven equipment	2. Variable vibration least noticeable at no load; becoming worse under load	a. Eccentric flexible coupling b. Driver and driven equipment not aligned properly at installation c. Piping strain on driver or driven equipment d. Foundation has settled unequally	a. Replace flexible coupling. b. Realign driver with driven equipment per manufacturer's instructions. c. Provide support for piping to relieve strain. d. Solidify foundation; regrout if necessary.
3. Poor or inadequate foundation	3. Vibration of surrounding structure; constant vibration of turbine under all load conditions	a. Improper grouting b. Bed-plate not securely fastened to foundation	a. Regrout bed-plate. b. Tighten foundation bolts.
4. Loose parts	4. Localized vibration with noise at start-up and shut-down.	a. Excessive bearing clearance b. Ball joint of bearing is loose c. Loose coupling or coupling bolts	a. Machine off joint between bearing halves; replace bearing if necessary. b. Add shims as required to tighten bearing; replace worn parts as required. c. Tighten setscrews securing coupling to shaft; tighten coupling bolts.
5. Internal rubbing	5. Localized vibration with noise varying with turbine speed	a. Rotating buckets coming in contact with stationary buckets b. Inadequate casing clearance c. Thrust bearing is worn	a. Check clearance; adjust as required. b. Check for chemical deposits; adjust bearings. c. Replace thrust bearing.
6. Steam troubles	6. Unusual noise at the intake; failure of strainer	a. Water coming in with steam b. Sediment in steam	a. Re-evaluate piping; install a separator ahead of the throttle valve. b. Test steam for sediment, acid, or salt. Take corrective action.

B. GENERAL

CONDITION	IDENTIFIABLE BY	PROBABLE CAUSE	REMEDY
1. Loss of efficiency	1. Decreased power output with increased steam consumption	a. Failure of interstage packing, gland seals, or sealing strips b. Failure of nozzles or buckets c. Accumulation of chemical deposits on buckets and/or nozzles	a. Replace packing, gland seals or sealing strips as required. b. Repair or replace nozzles or buckets. c. Clean turbine internally; change feedwater treatment method.

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CONDITION	IDENTIFIABLE BY	PROBABLE CAUSE	REMEDY
2. Over speed operation	2. Rapid increase in turbine R.P.M.'s	a. Loss of load b. Faulty governor or governor linkage	a. Shut down turbine; check overspeed control. b. Check governor and governor linkage for malfunction; repair as required.
3. Bearing failure	3. Noisy operation; overheating of bearing	a. Lack of lubrication b. Poor grade of oil c. Dirt and other extraneous material in bearing	a. Check oil supply; increase flow of oil to bearings; replace bearing if worn. b. Drain oil and replace with good grade of oil as recommended by the turbine manufacturer. c. Clean bearing housing to remove dirt; replace bearing if worn. Provide filter on lubrication system.