

SCOPE

- I 1.1 This practice covers the design of washing systems for special purpose steam turbines.
- I 1.2 **An asterisk (*)** indicates that additional information is required. If a job is contracted, this additional information is furnished in the Job Specification.

DESIGN

PRELIMINARY CONSIDERATIONS

- I 2.1 **Method of washing.** Washing of a steam turbine is accomplished by gradually desuperheating the inlet steam from the initial temperature down to about 15°F (8°C) of superheat, holding the temperature at this near saturation value for a definite period of time, and then gradually restoring the temperature to its initial value.
- O * 2.2 **Equipment capabilities.** The turbine equipment, steam inlet and exhaust piping, water and condenser facilities, and washing facilities shall be designed to permit washing at normal turbine speed with a reduced load, as determined by a review of expected plant operations.
- O 2.3 **Facility requirements.** A reliable source of high purity water such as high pressure condensate or polished demineralized water is required for desuperheating. If boiler feed water quality is satisfactory, water may be taken directly from the discharge of the boiler feed pumps. If suitable high pressure condensate or boiler feed water is not available, a separate supply system, consisting of an atmospheric condensate storage tank and pumping facilities, will be required.
- C * 2.4 **If "provision for future washing system" is specified,** the system shall be fully designed, and the required connections shall be provided so that washing facilities may be added without interruption of normal operation.

SYSTEM DESIGN

- I 2.5 **A typical washing system** for a multiple turbine installation is shown in [Figure 1](#).
- C 2.6 **Acceptable alternative arrangement.** The desuperheater may be located directly in the steam supply lateral to the turbine, eliminating the bypass. In this case, the desuperheater must be designed for minimum pressure drop and removal under line pressure to facilitate maintenance.
Note: The design is most applicable to single turbine installations.
- R 2.7 A minimum of 70 ft (21.3 m) shall be provided between the desuperheater and the turbine trip or trip and throttle valve.
- R 2.8 **All valves in the steam line** which must be operated during the washing cycle, **and all low points,** shall be equipped with **trapped drains**. **All traps** shall be installed with a **valved bypass**.

DESUPERHEATING WATER PUMPS

- O,R * 2.9 If the temperature difference between normal steam supply and the desuperheated condition is large enough to cause significant thermal shock to the turbine in case of failure of the desuperheating water during the washing cycle, a spare pump is required.
- O,R 2.10 **The restriction orifice in the pump bypass** line shall be sized to permit recirculation of a sufficient quantity of water to allow continuous pump operation before washing is started, and at low flow rates.
- O 2.11 **Pumping capacity.** The pump shall be sized for the flow rate required for 0° superheat operation, plus the design recirculation rate.

DESUPERHEATER

- R 2.12 **A steam atomizing desuperheater shall be used if a source of steam pressure greater than the turbine inlet pressure is available.**
- R 2.13 **A venturi-type desuperheater or multiple mechanical atomizing nozzles** shall be used in installations where a source of steam pressure greater than the turbine inlet pressure is not available.
If mechanical atomizing nozzles are used, a thermal liner inside the pipe shall be **provided** to prevent pipe damage during desuperheating.
- O 2.14 The desuperheater shall be capable of water flow turndown approximately 50:1 for the expected steam flow.

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STEAM SEPARATORS

- R 2.15 **Exhaust and Extraction line separators.** A separator, or alternate arrangement, shall be provided in turbine extraction lines and the exhaust line of each non-condensing turbine sized to remove all water and dirt washed from the turbine during the washing cycle.
- * Final design shall be approved by the Owner's Engineer.
- O 2.16 **A sample connection** shall be provided in the exhaust line.

TEMPERATURE RECORDING

- O,R 2.17 A locally mounted steam inlet temperature recorder visible from the water flow regulating globe or needle valve shall be provided.

Revision Memo

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6/83	Revision 2
12/94	Revision 0 - Original Issue of International Practice
3/98	Revision 1
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