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Transmission & Bearing Corp.

Technical Notes by Dr. Mel

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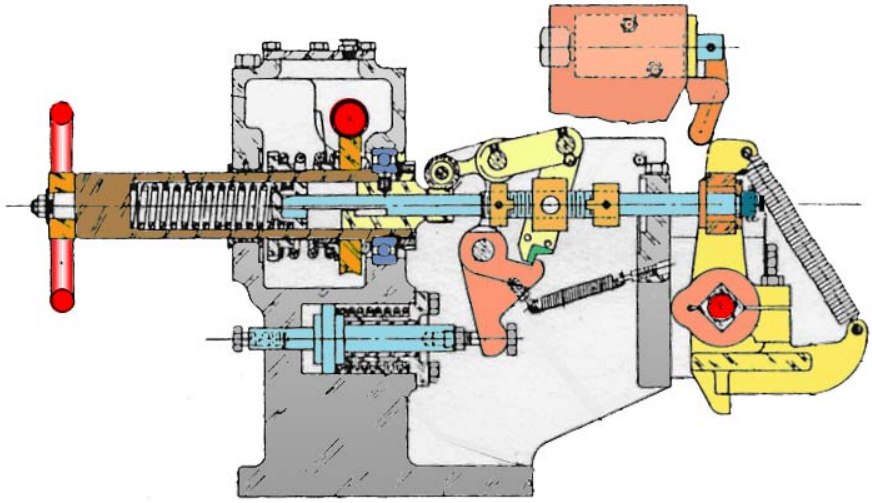
Solutions for Problematic MHC Full Arc Controls of GE Steam Turbine-Generators



MHC full arc control mechanisms have been supplied on GE Large Steam Turbine-Generators as an integral part of new unit control systems and as retrofits to older control systems. The full arc option allows starting, no load, and light load operation of the turbine-generator set with all the control valves fully open. This feature reduces thermal stress cycles in the first stage section of the turbine. Steam throttled by the stop valve by-pass valve flows evenly through the valve chest, through all of the open control valves, and enters the first stage through the full 360 degree arc of the first stage nozzle. This mode of operation provides uniform heating at the first stage nozzle bowl and distributes nozzle wear relatively evenly over the full 360 degree arc versus concentrating this wear at the first and second nozzle openings.

When the full arc controls are operating properly, the unit can be brought up to speed, synchronized, and lightly loaded using the full arc main stop valve. When problems occur, they usually fall into the following categories: (1) non-repetitive operation, (2) poor response, (3) indication problems, and/or (4) system documentation for operators. These problems can force operations personnel to avoid full arc start-ups due to poor turbine speed control which often prohibits synchronization of the unit in the full arc operational mode.

Non-repetitive operation and poor response can usually be traced to insufficient maintenance procedures pertaining to the full arc control mechanism. Several different pilot valve designs were used on the full arc main stop valves and each design has its own idiosyncrasies. Although these pilot valves may be inspected dimensionally during an outage, other problems relating to non-repetitive operation, poor response, and drifting are rarely addressed. Depending on the pilot valve design, some are more prone to problems than others. Mechanical misalignment and lack of clearance in various sliding components can all result in poor response of the full arc device to demand signals.

Various indicating devices have been used successfully on full arc systems. As originally supplied by GE, these systems included:

- Indicating lights for the main stop valve stem position
- A rack driven device to indicate stop valve stem position
- A gear driven indicator for the full arc MHC operating mechanism position

In many cases, these original systems can be evaluated and adjusted to provide reliable and consistent indication for operations personnel.

TRI personnel have successfully resolved operating problems with GE MHC Full Arc Controls during planned outages as well as on an emergency basis. Observation of the system problem during operation is always beneficial, when the situation permits. However, a visual inspection of the full arc controls regardless of the operating state of the unit can also provide useful insights into existing system problems and their resolution.

Written by Anton Chmela

Field Service Engineering Support

Specialty Knowledge of Mechanical Hydraulic Controls (MHC) of GE Large Steam Turbine-Generators.

Mr. Anton Chmela, a former GE Field Service Engineer, recently joined TRI and his consulting services are again available to electric generating stations.

Mr. Chmela will continue to provide service to the utility industry as he has done for many years as a GE representative. As a member of the TRI team of consultants, however, Mr. Chmela may work on equipment provided by any manufacturer. He is not limited to GE.

Some of the field services that Mr. Chmela provides include:

- Disassemble, inspect, develop repair work scope, and reassemble turbine valves including main stop valves, control valves, reheat stop valves and intercept valves for GE turbines of any size and any age.
- MHC control system line-up for GE units and unit start-up support with respect to control system checks, settings, and overspeed testing.
- Troubleshoot and evaluate GE MHC control system problems and auxiliary systems including: lube oil and hydraulic control systems, booster pumps, and MHC steam seal regulators.
- Troubleshoot and evaluate generator hydrogen gas systems, hydrogen seals, seal oil systems, hydrogen coolers, and stator cooling water systems.
- Troubleshoot and evaluate problem conditions and make recommendations for MHC control system adjustments, repairs, and/or equipment upgrades. Review and make recommendations concerning the repair of shell or chest mounted camshaft operated control valves

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This Technical Note was written by Dr. Melbourne F. Giberson, P.E., President of TRI Transmission & Bearing Corp., Turbo Research, Inc. The objectives of Technical Notes are to disseminate information and experience on understanding problems and how to solve them. We attempt to send this Technical Note only to those people for whom the information might be useful. Over the years, many people have asked to be added to the distribution list (see our website). Occasionally, a few individuals inform us that they do not wish to receive the information. Should you desire not to receive future Technical Notes, please advise TRI by info@turboresearch.com or click visit the removal page on the TRI web site MFG 1/2005