



TURBINE TIPS

Turbine Tips provided by Pond and Lucier, LLC. ®

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Subject: Maintenance of Compressor Recirculation Valves
Applies to: MS5001D, J, K, L & LA General Electric gas turbines

Older GE gas turbines (circa 1961-69) have compressor recirculation valves (a.k.a. compressor bleed valves), whose purpose is to return excessive air flow from the 10th to the 4th stage of the compressor during start-up and shutdown. This was done to minimize an axial-flow compressor phenomenon known as *stall*, which could lead to a *surge* condition; the latter can have violent and destructive consequences. By redirecting some of the air flow (10th to 4th stages in this case) as the turbine is accelerating to operating speed, violent surging condition can be minimized.

Figure 1 below shows a typical recirculation valve. The valve has a small tubing line at the top; this line is connected to the compressor discharge casing. When the compressor discharge pressure (a.k.a. PCD) reaches approximately 50 psig, the valves (quantity: 2) should *close*. This should occur when the turbine reaches approximately 60-70% of rated speed. Also, during the shutdown sequence, the valves should *reopen* when the PCD drops below 50 psig nominal pressure.

Operating on-line at load, when the valves are closed, it will allow the gas turbine to reach its optimal power output. Conversely, should the valves **NOT** close, due to dirt or low PCD pressure, the power output of the gas turbine will suffer. For instance, if the valves are slightly cracked open, the power output could be reduced by as much as 2 megawatts!

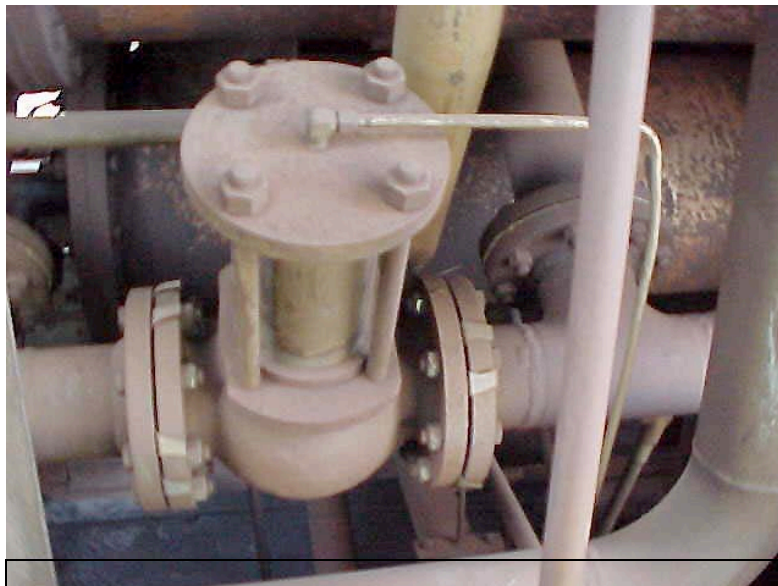


Fig. 1: 10th to 4th Stage Recirculation Valves (Qty 2) for MS5001 Gas Turbines

Air to close the valves comes from a porous stone filter located inside a canister near the valves. There is no shutoff valve for the PCD line. See Figure 2 below. The canister on the **left** supplies the PCD closing air to the two 10th to 4th stage recirculation valves. The canister on the **right** supplies control air to the turbine panel. Both canisters should be cleaned periodically, and the stone filters should be replaced. There is a drip petcock on the bottom to drain out moisture (water). It can be left open slightly.



Fig. 2: Canisters for compressor discharge pressure (PCD)

Knowing the position and operating condition of the 10th to 4th stage recirculation valves is important. **PAL Engineering** has devised a simple “tell tale” valve position indicator. It requires disassembly of the valves for slight modifications. See Figure 3 below.

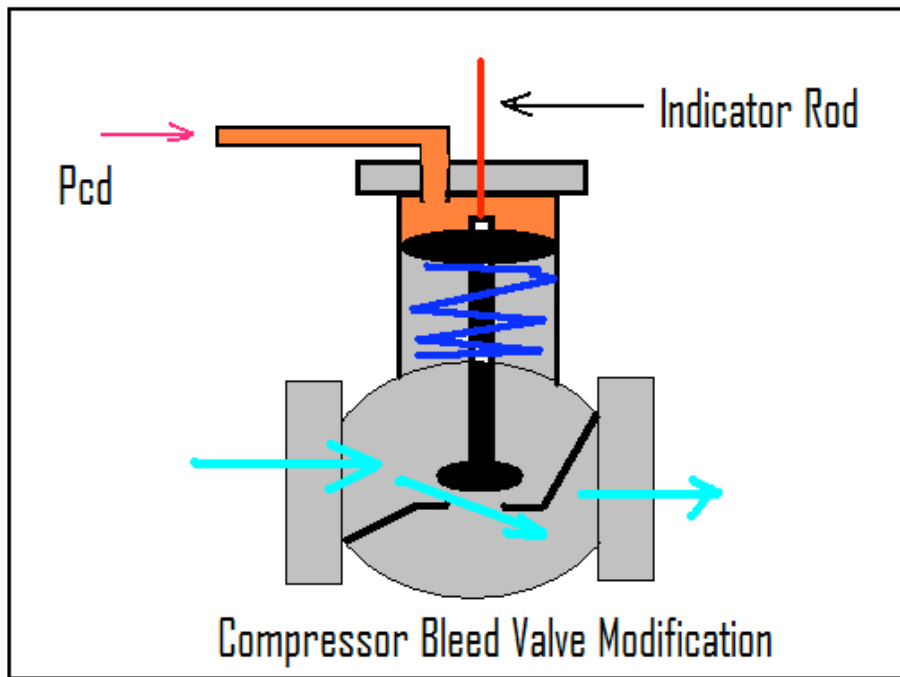


Fig. 3: Schematic of Valve Indicator modification

The modification requires drilling and tapping the center of the valve stem. See Figure 4 below.



Fig. 4: Top of valve stem is drilled and tapped

A metal rod is screwed into the top of the valve. It is then brought out of the top of the valve body as shown in Figure 4 below. Also, another hole needs to be drilled, tapped and a tubing fitting installed, as shown.



Fig. 5: "Tell Tale" Indicator Rod emerging from the top of the Recirculation Valve

The assembled valve is shown on the walkway in Figure 5 ready to reinstall. Both compressor recirculation valves should be modified to allow a **visual indication** of the valve position at all times. Measurement marks should be scribed into the valve indication so that, at a glance, the valve position can become clear to the observer.



Fig. 5: Valve ready for re-installation on compressor

If you want to know more about this minor modification, contact ***Pond and Lucier, LLC*** on this website or call engineer ***Charlie Pond*** on 913-220-5316 or ***Dave Lucier*** on 518-330-4801