

TECHNICAL BULLETIN

Prepared By: Mike Macdonald	Pages: 3
Reference: ATWOOD & MORRILL® Trip Throttle Valves	

Subject: Trip Throttle Valves (TTV) Preventative Maintenance **Bulletin No. 5.0** 08/10

APPLICATION Trip Throttle Valves are designed to protect steam turbines from over speed during upset conditions. The valves close quickly upon the loss of turbine lube oil pressure or a mechanical trip of the turbine. If the valve does not respond when required, the result can be a severely damaged turbine.

PURPOSE To alert our customers to proper routine maintenance and give guidance on the minimum preventive maintenance requirements for Trip Throttle Valves.

BACKGROUND WVC has designed, engineered, and manufactured A&M® Trip Throttle Valves for more than fifty years. Because the basic design is very robust, the valves provide many years of trouble free service. Many plants operate these valves “maintenance free”. While this appears ideal, Trip Throttle Valves are intricate mechanical devices that do require periodic preventive maintenance.

Our customers often call us after the valve becomes a problem, or has failed to isolate the steam flow to the turbine. When we arrive at the site or receive the valve at the factory, the lack of proper preventive maintenance becomes apparent.

We often find broken hand wheels, missing operating instruction plates, missing or severely damaged steam strainers, inoperable balancing devices, worn, inoperable, and misadjusted trip linkages, and plugged or broken off grease fittings.

Even more concerning, we sometimes find **NON-OEM parts that DO NOT MEET our engineering or manufacturing specifications**. The combined effect of all of this neglect often renders the valves completely inoperable.

RECOMMENDATION For the valves to remain operable and continue to provide protection, we recommend the owners of Trip Throttle Valves follow these preventative measures. The suggested frequency and inspection points are minimum.

**EVERY
SIX MONTHS**

- Verify the valve is free to stroke by manually closing the valve approximately 10% of the stroke, then reopen the valve fully. The valve should stroke smoothly both open and closed with very little hand wheel resistance.
- For valves equipped with automatic exercising features: Verify that the valve exercises correctly and as predicted when using the exercising features.

- Visually examine the valve, paying particular attention to the area of the valve stem where it passes through the leak off bushings or packing gland. Remove any scale or residue that has accumulated in this area. We have seen cases where residues caused the valves to bind.

EVERY UNIT SHUTDOWN

- Verify that the valve operates correctly on a steam turbine trip. It should close rapidly and completely shut-off the steam flow to the turbine.
- Verify the condition of the grease fittings and lubricate all gearing with any good quality industrial EP grade grease.
- Do a complete functional test, simulating operation, after the unit is shut down and before a start-up. Simulate loss of lube oil pressure, or manually trip the mechanical linkage. At the initial start-up, perform a hot functional test to ensure there is no thermal binding.

EVERY TWO YEARS

- Open and inspect the oil operating cylinder. **If the oil trip cylinder does not function properly, the valve will not close as designed.**
- Replace all soft goods and seals.
- Inspect the cylinder bore for wear and/or gouges.
- Check the fit of any piston rings. **Our experience has shown** repair companies sometimes replace OEM piston rings with alternates. **These alternate designs can cause the valves to become inoperative.**
- Check the operating linkage making sure that it rides freely through all guides, and the pivot points still allow free movement of the parts.
- Check the trip latch point and be sure that the surfaces are not rounded and worn.
- Perform hot functional tests after restoration to ensure the valve still operates smoothly.

Perform the two year maintenance **PLUS** confirm:

EVERY FOUR YEARS

- **Main Seat Seal Weld Integrity:** verify by Seat Hydrotest or Liquid Penetrant test. Pressurize the valve inlet cavity up to the seat to line pressure (+10%) and hold for ten minutes. One should not see leakage around the main seat Outer Diameter. When using the PT test, the seal weld should only be judged acceptable if there are no linear indications, and no rounded indications greater than 1/16" in diameter.
- **Main and Pilot Seat:** Check the main and pilot seat areas for evidence of steam cutting or impact damage. Restore the seat faces to $\sqrt{32}$ RMS finish and verify good seating contact with transfer blue. **Gasket Faces:** Visually inspect the gasket seat areas of the body and covers. You should not see cuts or abrasions, and the serrated finish should still stand out above the flange face. **Always Use New Gaskets** upon reassembly.
- **Valve Stem:** Check the stem for any scoring or pitting, and verify that the stem is straight. Pay particular attention to the area of the stem that passes through the guide bushings. If the pilot seat is integral with the valve stem, it should be true and square to the stem. Replace the stem if necessary.
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**EVERY
FOUR YEARS**



*6" Class 600
Inverted
Hydraulically
Actuated Trip
Throttle Valve*

- **Guide and Leak off Bushings:** Visually inspect the conditions of the bushings, and check that the labyrinth grooves are clear of any foreign material. Make sure that the bushing retainer is still locked in place. Replace the bushings if scored.
- **Poppet Guide Band and Cover Guide Bore:** Visually inspect the condition of the poppet guide band and the mating surface in the cover guide bore. You should not find any scoring. If scored, restore the finishes, being careful not to remove too much material.
- **Balancing Valve(s):** Disassemble and inspect the balancing valve(s) found in the cover. Lap the seats in the cover using the balancing valve stem. Verify that the balancing valve stem(s) is straight, and replace if bent.
- **Steam Strainer:** Check the overall condition of the strainer and make sure it is not plugged and still has its original cylindrical shape. If the strainer shows evidence of impact damage or the screen is torn, replace it.
- **Bevel Gear Set, Bearings, Spindle, Drive Nut and Keys:** Clean and inspect the bevel gear and drive pinion teeth faces. Clean and inspect any thrust bearings. Replace worn bearings. Clean and inspect the drive spindle and drive nut. If the threads or key ways are damaged, restore the damaged area or replace the parts.
- Confirm the grease fittings are still functional and replace broken or damaged fittings. On reassembly **always use new gaskets and keys and lubricate the drive gearing with good quality industrial grade EP grease.**
- **Tests:** After refurbishment is complete, perform seat tightness and functional tests to assure that the valve is operating properly. During the initial start of the turbine, adjust the balancing valves as required for proper operation.

CONCLUSIONS As with any complicated mechanical device, Trip Throttle Valves will protect your turbine reliably only if you do proper preventive maintenance with correctly specified parts. WVC has a proud tradition of supplying the highest quality valves and equipment and continuing support services well after the design life has expired. We have issued this bulletin in the spirit of that tradition, and look forward to supporting your needs in the future.

**SUPPORT
SERVICES
AVAILABLE**

WVC has all the parts, engineering, manufacturing and field technical resources needed to maintain these critical service valves. Some ways we can help include:

- Recommended Spare Parts List
- Repair Parts Kits
- Field Supervisors
- Valve Repair Crews
- Full Engineering Support
- Factory Reconditioning Service
- 24-Hour Emergency Service Assistance

WHERE TO CALL Our service department is available 8 am – 4:30 pm EST, at (978) 744-5690.

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