Mechanical Overspeed Bolt Replacement
Modern protection system reduces failures

There are significant advantages to the use of an electronic overspeed protection system when compared to mechanical trip bolts. ABB’s automated solution eliminates costly overspeed bolt testing and maintenance.

It wasn’t too long ago that a request to a power engineer to remove the overspeed trip bolt on a gas or steam turbine would have been greeted with a look of stunned disbelief. After all, this mechanical device is the last protection against catastrophic failure caused by excessive turbine speeds.

A failure during a mechanical bolt test is 3 times more likely than during normal operation.

- Resulting in a minimum loss of generation of 6 hours to recover back to reheat soak temperature.
- MW sold at $50 per MWH over the 6 hours equates to 800 MW x $50 MWH = $240,000 of lost generation.
- The $240K lost generation + $100K fuel and manpower costs = $340K of total savings.
- Return-On-Investment is recouped on the first overspeed bolt test.

Modernizing your low-tech mechanical bolt approach with ABB’s electronic overspeed protection system will generate true long-term benefits for operation, maintenance and a more reliable turbine protection.

When asked about the main benefits achieved by replacing the bolt with the state-of-the-art electronic control and protection system, customers have commented:

“We appreciate the current technology, the fact that it’s more reliable and provides substantial cost savings with the reduction of failures.”

“We really benefited from the fact that it is not necessary to ramp to trip and recovery is quick.”

“The new electronic trip provided us with a quick return-on-investment the first time in use.”

At ABB, we understand the risks you face each time the mechanical overspeed bolt test is performed. Reducing the chance of failure of the mechanical bolt is achieved when replacing the bolt with an electronic control and protection system.

ABB’s electronic control and protection system delivers countless advantages:

- Greater reliability and safety
  - Fully redundant power supplied from independent sources
  - Triple redundant speed channels (2 out of 3 voting)
  - Elimination of false trips
- Reduction of failures during testing
- Substantial cost savings
  - Reduced hours for testing by a minimum of 6 hours
  - Test performed at sync speed (ready to sync in 5 min.)
  - Reduced insurance premiums
  - Reduced maintenance of the mechanical components
  - Provide on-line testing
  - Ability to test each channel individually
Why replace the mechanical bolt? When you consider the cost associated with traditional overspeed tests, and the additional stress imposed on the unit to carry out the test, replacing the bolt with the electronic system decreases mechanical failure and provides a quick return-on-investment.

Most utilities experience problems with their mechanical bolt assembly at the worst time:

- Internal bolt spring breaks, turbine suddenly trips at 3600 RPM and several days are lost to identify the problem
- Entire bolt assembly loosens, resulting in excess run out which causes the bolt to operate a trip, several costly runs needed before identifying the cause

By replacing the mechanical bolt protection with an electronic overspeed protection system you will improve reliability and repeatability. The comparisons are outlined in the table below of a mechanical overspeed trip system versus an electronic overspeed protection system.

### Mechanical overspeed trip system

- General trip speed range, +/-50 rpm
- Trip speed will change over time
- Does not interface with anything
- Does not provide any trip indication
- Must have mechanical trip lever interface
- Oil varnish buildup will keep the mechanical trip plunger from functioning
- Not fault tolerant
- Cannot be tested except when uncoupled from the driven equipment, which requires a shutdown
- Requires 110% of speed to trip
- Requires multiple runs of the turbine to adjust the trip set point in the field

### Electronic overspeed protection system

- Precise trip speed, digital set point
- Trip speed will not change over time
- Provides DCS interface
- Provides first out trip indication
- No physical contact with shaft or mechanical trip lever is required
- Oil varnish does not affect the trip function
- Fault tolerant
- On board frequency generator provides an internal overspeed test with no risk to the operation of the turbine
- Can test at sync speed and each individual channel tested on-line
- Does not require any extra runs of the turbine in the field

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