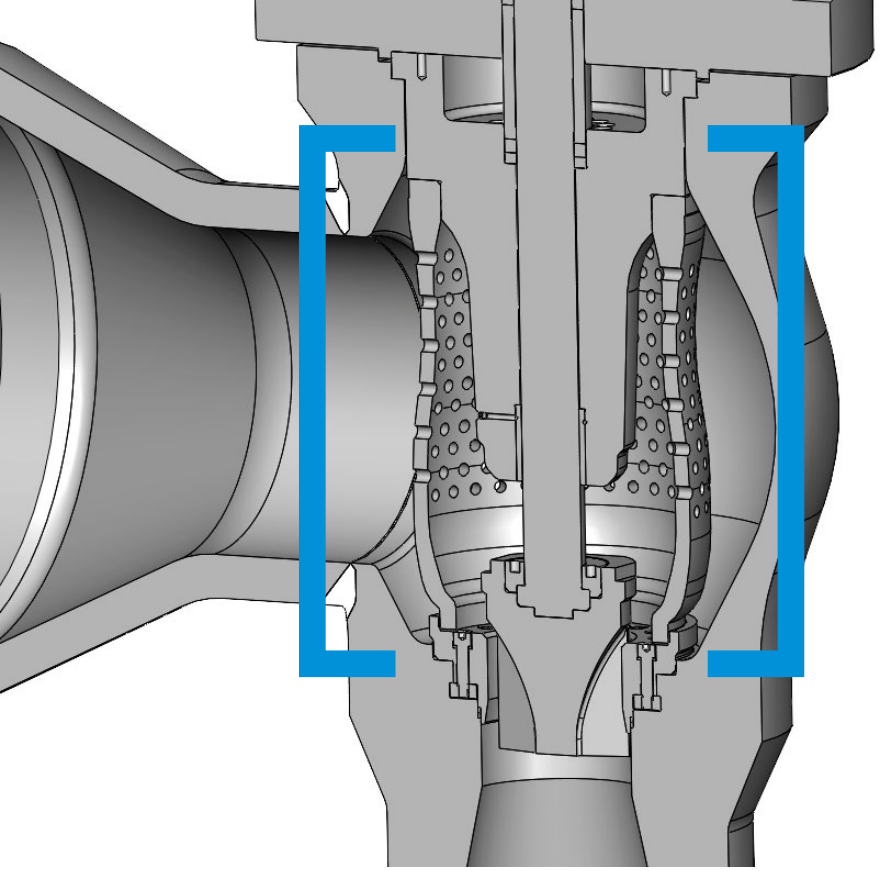


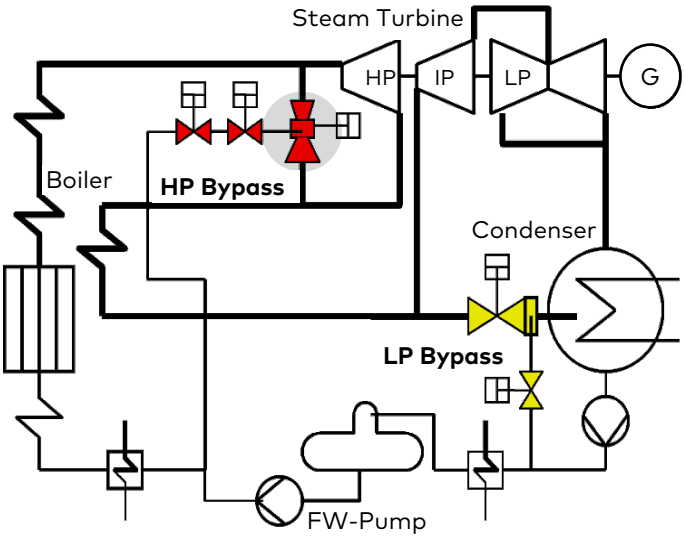
EROSOLVE WET STEAM

EroSolve-Wet Steam

trim upgrade addresses condensate erosion in critical HP bypass valves

DRE is a steam conditioning valve model used in high pressure turbine bypass applications, combining high pressure drops with in-body desuperheating. DRE valves are suitable for fossil-fired power plants with subcritical as well as supercritical steam conditions.

Steam valve passing (leakage) is a widespread problem. The most common cause of steam leaks is the condensate or wet steam erosion of the valve plug and seat sealing surfaces. It happens when the condensate accidentally flows through the valve during cold start-ups. Many of the fossil fuel power plants, especially due to addition of renewable plants, are facing increased number of start-ups and shutdowns and frequent low load operation, exposing the bypass valves to wet steam and condensate.



Continuous steam leakage and unintended opening of steam and spray water valves leads to loss of energy and increased heat rate. Frequent repair or replacement of steam and water trim components are a common consequence. Repair of the welded seat and high strength trim material is complex and risky. Pipe cracking and water hammer can then result in unplanned shutdowns and production losses. All these adversely affect plant safety, the health of the business, and reduces output.

Steam leakage increases the downstream temperature and in order to bring the temperature under control, the spray water valve is forced to open and operate at lower openings, whilst also making it necessary to keep the bypass valve open at minimum openings. The small amount of steam flow may not have sufficient dynamic energy to properly evaporate the spray water. This may eventually lead to thermal shock and cracking of pressure boundary and downstream pipes as well.

IMI Critical Engineering

Breakthrough Engineering

EROSOLVE
WET STEAM

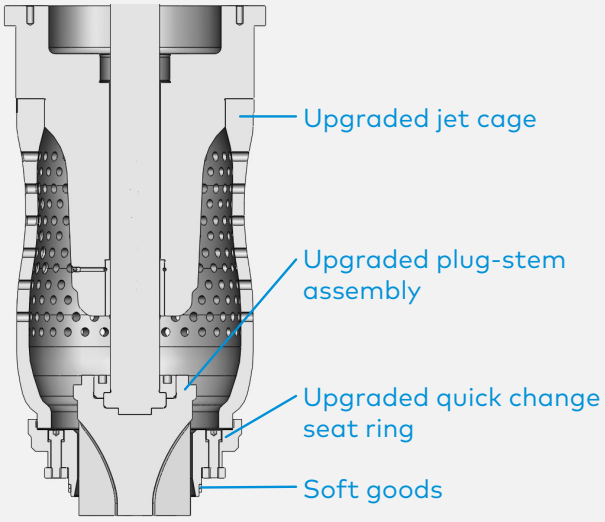
The lengthy operation of spray water valves at a lower opening against high pressure drops can result in the spray water valve trim becoming eroded if the proper technology is not used. All these factors can lead to lost controllability, hunting, over and under spray, downstream pipe cracking, and water hammer.

As condensate flows through the valve and drops pressure, it flashes. Flashed condensate or wet steam flowing at high velocity within the valve can cause droplet impingement on sealing surfaces, leading to trim erosion and steam (valve) leakage.

The upgrade is carried out without changing the actuator and valve body. Special quick change seat design is available which makes maintenance much easier in the long term.

EroSolve is a great solution against:

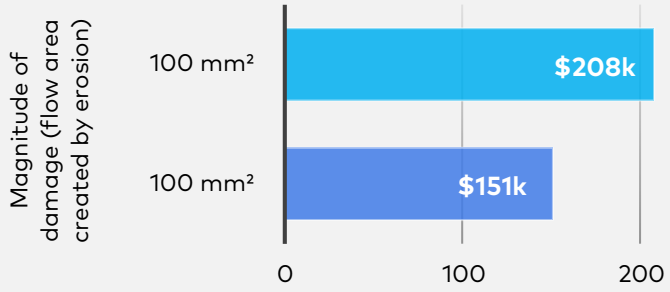
- Severe trim erosion
- Frequent repair and maintenance
- Pressure boundary and pipe cracking, and water hammer
- Downtime due to unplanned shutdowns
- Energy and profit loss



Tremendous value addition using the best engineering expertise

- Specially engineered quick-change seat; no more seat cutting and welding
- Carefully engineered sealing surfaces and flow grooves to harness the flashing condensate impingement to minimise the erosion
- Unique erosion resistant hard facing to enhance the trim life
- Root cause analysis by IMI CCI Valve Doctors® for a customised solution

Magnitude of erosion damage vs typical energy loss



660 MW Super-critical HP bypass

Upstream pressure:	247 bara
Upstream temperature:	565°C
Downstream pressure:	34 bara
Downstream temperature:	340°C

300 MW Sub-critical HP bypass

Upstream pressure: Upstream temperature:	167 bara 538°C
Downstream pressure:	22 bara
Downstream temperature:	320°C

Energy loss per year (example)

Flow area created by erosion damage: 100 mm²
Leakage mass flow rate: 8,390 kg/h (using Kv formula)
Hours a year at normal operation: 365 x 85% x 24 = 7,446 hours
Energy loss: 8,390 x (3,390-3,083) x 7,446 / 3,600 = 5,328,100 kWh
Energy loss per year ($39 per MWh): 5,328,100 x 39 / 1000 = $208k

Steam parameters of bypass valve

Upstream pressure:	247 bara
Upstream temperature:	565°C
Upstream enthalpy:	3,390 kJ/kg
Downstream pressure:	34 bara
Downstream temperature:	340°C
Downstream enthalpy:	3,083 kJ/kg

For more information please visit **www.imi-critical.com/erosolve**, or contact us at **erosolve-wetsteam@imi-critical.com**