

## Diverter Valve Incident

### *Description of Incident (Occurred October 5<sup>th</sup>, 2022)*

While completing pressure testing of the High Pressure (HP) manifold following a facility turnaround, a team of operators closed the upper diverter valve on a well flowline when the valve handle / gear box cap, weighing 67.2 lbs, separated and travelled a distance of ~13 feet, making contact with the platform structure. There were no injuries to personnel as the area was restricted at the time of the incident.

At the time of the incident authorized personnel were taking turns operating the valve (300+ turns). Unrelated to the incident, a leak occurred during pressure testing which led to a modification of the pressure test boundary. Following the leak, the team stepped back and discussed the appropriate path forward prior to the change. The leak occurred at a 22 MegaPascal (MPa) hold point; the target pressure was 30 MPa (~90% of PSV set point). Approximately five seconds after the operator (on a ladder adjacent to the valve) fully closed the valve, the valve handle and gearbox cap separated.

The root cause of the incident was an obstruction of the diverter valve vent, which failed to relieve the nitrogen gas that migrated past the valve packing from the body cavity into the bearing assembly (per valve design & API). As a result of the valve's vent being obstructed, the building of pressure was not detectable by the operator(s). The pressure required to fail gearbox cover bolts is 2-3MPa; the gearbox was not designed to retain pressure. See attached photos.

### *Corrective Actions & Recommendations*

As a result of this incident the following corrective actions were identified:

- Add secondary and verifiable over pressure protection to gearbox assembly of like valves
- Share findings and risk potential; limit future purchase of this style of valve
- Complete post start up Forward Looking Infrared (FLIR) checks of diverter valves and add to regular FLIR preventative maintenance
- Complete equipment strategy review for similar single point of failure manual valves
- Develop operations specific leak testing document

The following learning questions have been provided by the operator for the consideration of others working in the basin:

- When operating equipment/tools of trade, how can we check whether there is an overconfidence in experience against understanding of design flaws and failure modes? What should we look for? Consider what is normal vs abnormal.
- When a job covers multiple locations or interfaces, how do we communicate impacts to other teams? Are required barriers in place? Is there an appropriate handover between work crews/shifts? Do other work teams understand the hazards?
- When planning leak testing activities, do we consider the pros and cons of hydro-testing vs. nitrogen gas testing?

*Applicable Lifesaving Rule*

There is no specific IOGP lifesaving rule applicable to this incident. [Read more](#) about IOGP's lifesaving rules.

*Related Photos*



Re-enactment of personnel closing valve



Upper diverter valve following event



Secondary Vent; dust cap to be installed

Additional images included on next pages.

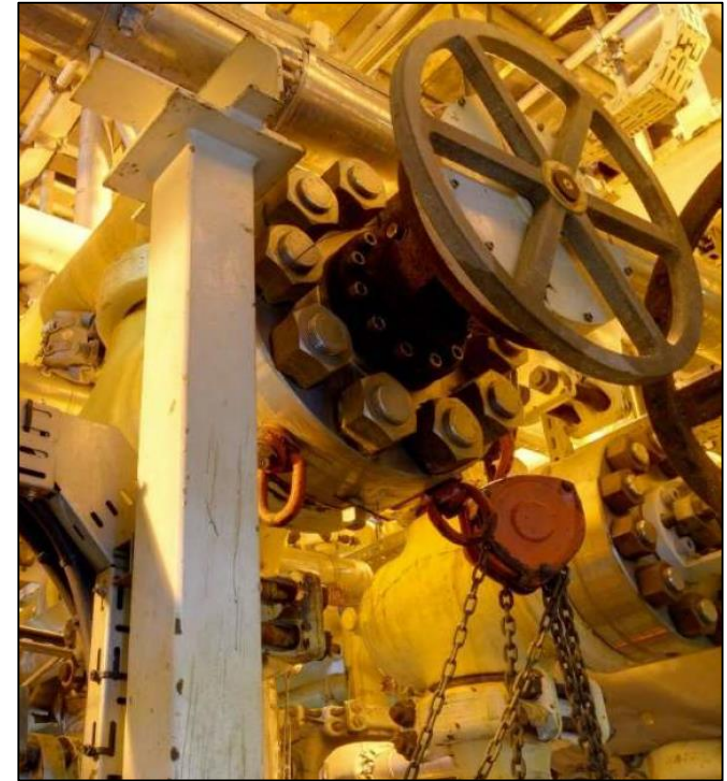
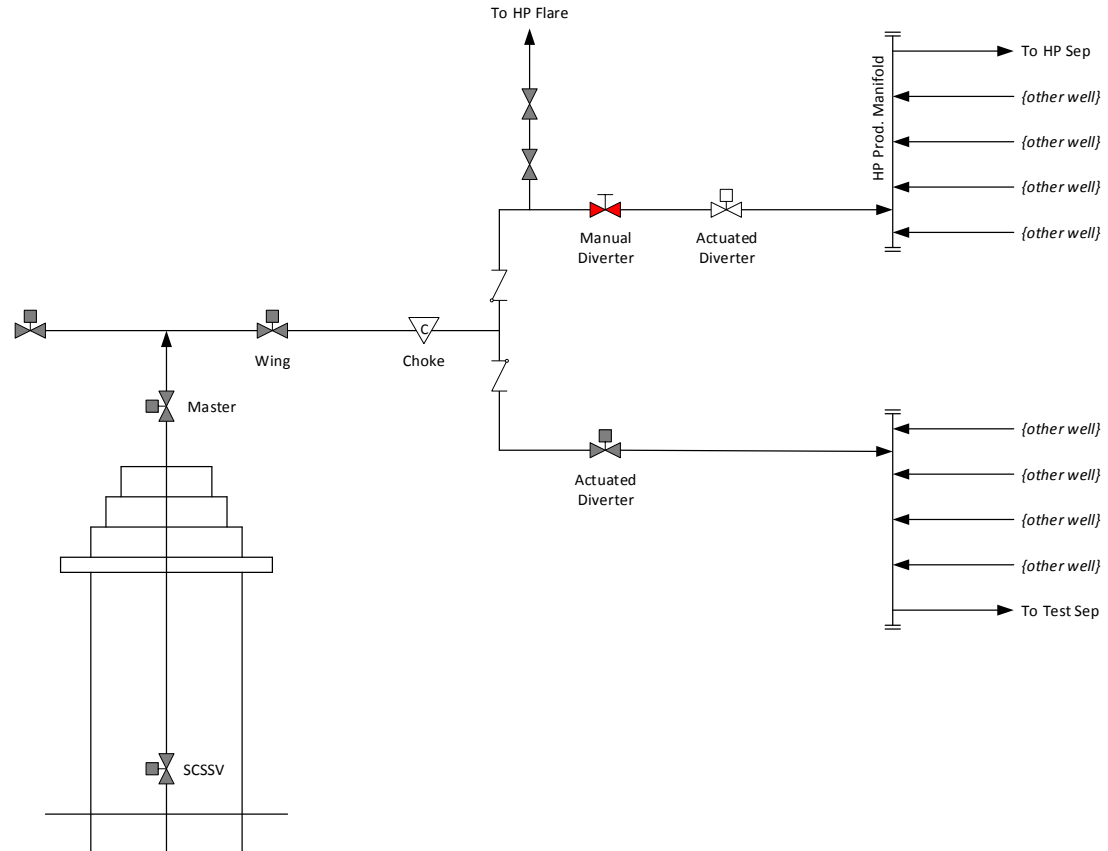
*Posted on December 13, 2022*

[Read more](#) Atlantic Canada Offshore Safety Alerts.

# BACK UP

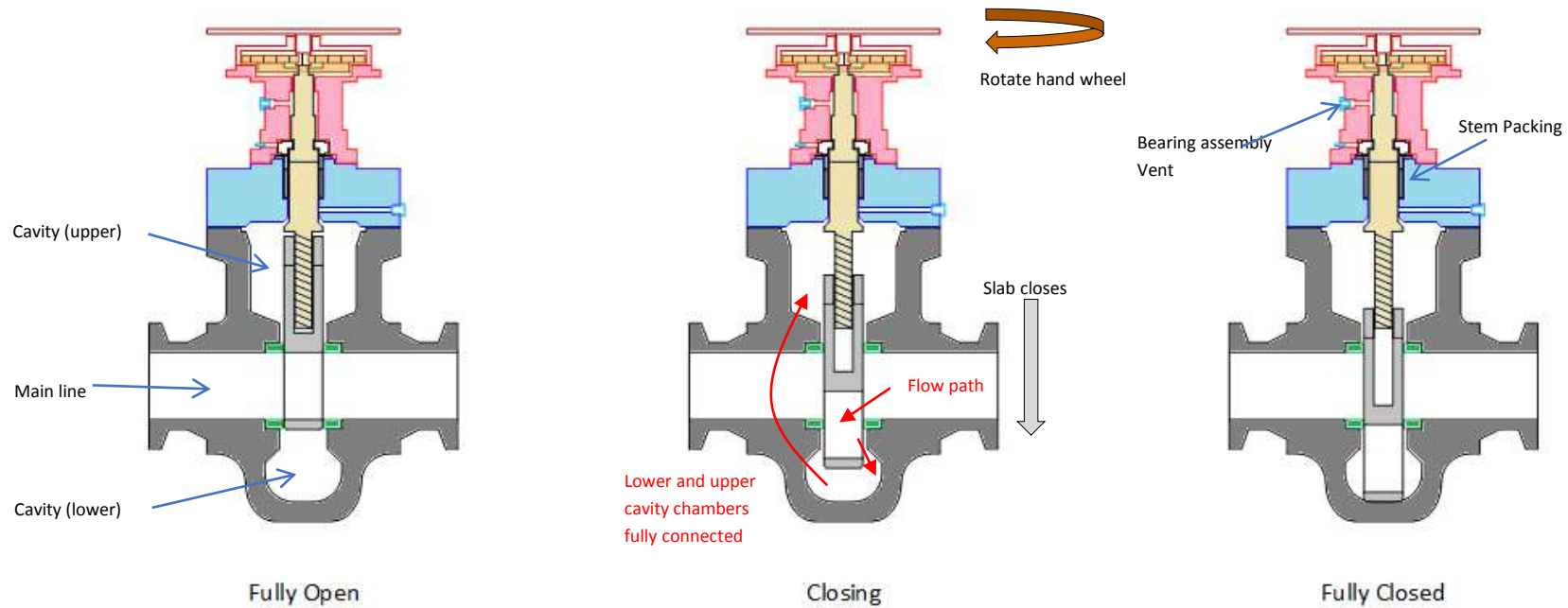
## Valve purpose and location

- Valve in question is upstream diverter valve for flowline to HP production manifold
- Valve is upstream of motor-operated diverter valve and provides double-block isolation for flowline



# BACK UP

## Valve functioning and exposure to pressure



When valve is fully open, cavity is isolated from main line  
→ Possible leakage to cavity past Slab seals

When valve is in partially-open position, cavity is in full communication with main line

When valve is closed, cavity is once again isolated from main line

→ Valve is parallel style (not wedge), so primarily downstream sealing