

Pay More Attention to Leakage Inside the ASU Cold Box

Most cracking of cold box panels and structures by internal factors are related to plant operation mode changes, such as re-start and cool down and others are design, installation, and maintenance issues

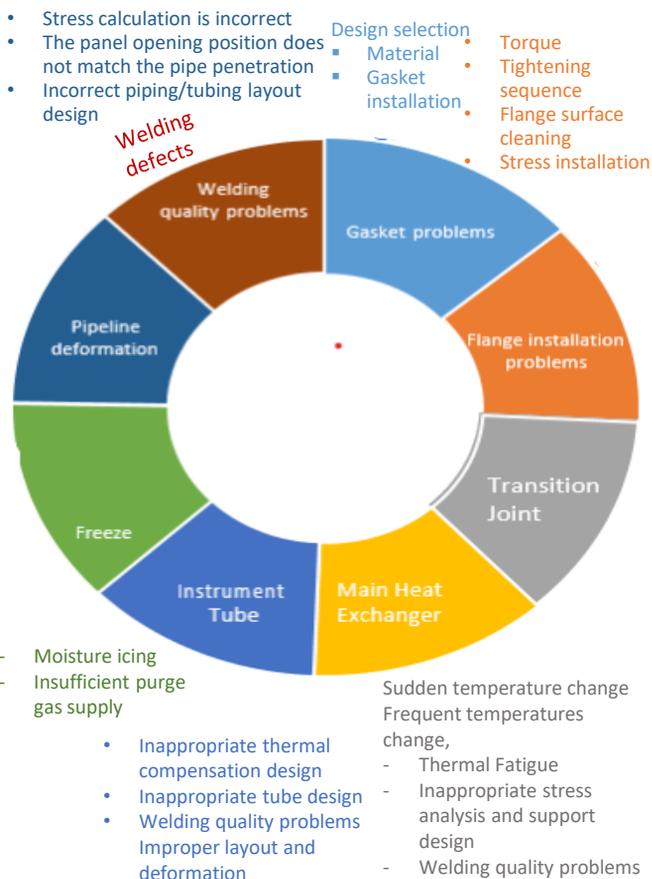


Transition joint separated

Perlite leak

Instrument tube break

Failure mode and key factors:



Do You Know?

- Hazard of cryogenic gas/liquid leakage inside the cold box including collapse, overpressure, perlite eruption, fire, and other catastrophic accidents.
- Reasons cause moisture to enter the cold box and cause internal icing:
 - The paint on cold box panels is not repaired in time, causing corrosion and perforation;
 - Rain water stagnation on roof causing corrosion and perforation;
 - The valve / pipe penetration boot is aging and damaged;
 - Failure of cold box manhole, weighted disc safety valve, cold box breather valve, bolt / gasket damage;
 - Insufficient purgegas.
- Reasons for insufficient purge gas for the cold box:
 - The pressure of the purge gas source is insufficient, and the purge gas flow is low;
 - The cold box is poorly sealed;
 - The purge gas is unevenly distributed and insufficient.
 - The purge gas nozzle is blocked.
- During start-up and shutdown, the cooling or heating rate is too fast, or the local temperature difference is too large, and there is too much thermal stress, which may cause flange leakage, gasket damage, equipment pipeline deformation and cracking, and transition joint separation.
- During the cooling down of the plant, the temperature in the cold box decreases, and the equipment and pipelines will shrink/ move.
- One end of the bimetal transition joint is made of aluminum and the other end is made of stainless steel. Instead of traditional welding, metallurgically diffusion bonding or heat shrink / hot press method is used. Under excessive stress or bending, it gets easily separated.
- Coldbox also can be damaged due to fire or explosion in reboiler or some dead end of oxygen enriched liquid/ liquid oxygen channel.

What Can You Do?

- Implement the Preventive Maintenance tasks on coldbox inspection strictly, conduct regular coldbox anti-corrosion inspections, and complete cold box paint repairs in a timely manner to prevent rust/wear.
- Conduct daily check for the purge gas pressure of the coldbox; if pressure at any part of the coldbox (especially at the upper part of the cold box) reads 0 mbarg or lower than 0, take necessary corrective actions.
- Purge gas used shall be free of moisture and oil. To avoid oxygen condensation on cold equipment and piping, nitrogen as purge gas is preferable, otherwise as specified by manufacturer.
- Check for possible leaks of the coldbox, especially any holes at the bottom of the coldbox, manholes, pipe entry and exit parts, valve boots, coldbox panels, weighted disc safety valves, the back of the tags, flanges, etc.
- Check proper installation of small-bore lines during construction and installation of coldbox to ensure flexibility for thermal contraction.
- Thermal imaging on coldbox enclosure to detect any cold spot of perlite.
- Use welded joint and avoid mechanical joints on piping for reducing possible leaks.
- Pay special attention to the position where the valves and pipelines in the coldbox pass through the coldbox panel and clear any parts that restrict their movement. Check the transmitter lines and sampling lines are well supported during maintenance.
- Add the purge gas pressure of the cold box to the DCS, monitor and analyze the trend regularly.
- Check SOP to ensure that cooling and heating rates are in normal range and temperature difference between the Heating/cooling medium and the exchanger metal is under control.
- Oxygen concentration in the cold box should be low and stable. Any significant increase should be reported.
- Carry out frequent walkdown and inspections at the initial commissioning stage of a plant. Pay attention to any abnormal phenomena such as cryogenic leak, frosting and icing.
- Share Lesson learn and Best Practice related to cold box, communicate, and check regularly.

Cryogenic liquid leak inside the cold box could crack the structural members and lead to cold box collapse !