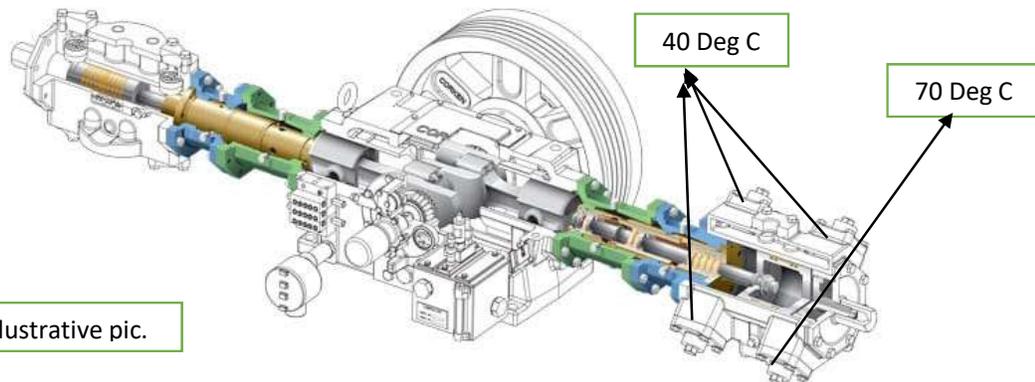


## SAFETY ALERT-COMPRESSOR SAFETY

**INCIDENT:** Continuous Catalytic Reforming (CCR) unit was in steady operation. Around 14:13 hrs, huge dust cloud followed by fire was observed at CCR compressor shed at the CCR Net Gas Compressor. The fire was put off. The unit was shut down in view of the incident.



**OBSERVATIONS:** (1) The net gas compressor comprises of two stage compression and knock out arrangement for each stage. Each stage has two cylinders and each cylinder is equipped with 4 suction & discharge loader valves along with one clearance pocket. (2) Abnormal noise at the 1st stage suction, Cylinder 2 area was observed during the routine field round. (3) Temperature of one of the loader valves was observed to be high at 70 Deg. C (others at 40 Deg. C) (4) Unit load decreased and accordingly compressor loading reduced by 6% but no change in loader valve temperature was observed. (5) It was decided to changeover the compressor. (6) Before the changeover process could be initiated, a huge dust cloud followed by fire was observed at running CCR compressor. After the fire fighting activity was started, isolation of the compressor valves was carried out.

### ROOT CAUSE:

- 1) The ejection of the north east valve assembly of Cylinder 2 of compressor is due to mechanical failure of studs.
- 2) The ejection of the valve assembly resulted in discharge of hydrogen rich gas to atmosphere and subsequent ignition of the same. The possibility of a potential ignition source by spark generation due to metal to metal surface contact during valve ejection exists.
- 3) The failure mechanism of the studs is of fatigue type due to possible loosening of bolts during operation.
- 4) The loosening of the valve during the service may be due to the following reasons or as combination as indicated by the OEM:

- a) Incorrect and/ or inconsistent torque settings
- b) Applying non-recommended anti-seize compound on thread of studs and on nuts will reduce friction factor greatly. This makes nuts in dynamically loaded applications prone for loosening (this also increases risk of fatigue failure)
- c) Non-recommended gaskets (aluminium gasket) may have resulted in gasket being compressed too much. This will result in loss of pretension of the valve cover studs, increasing the risk of fatigue failure.

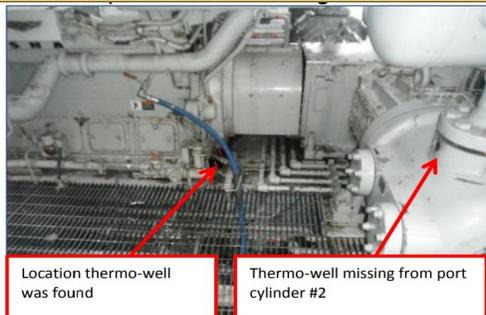
#### RECOMMENDATIONS:

- 1) The best engineering practices as per OEM for applying torque to be complied for the compressor.
- 2) Anti-seize compounds are not to be used for the Net Gas compressors as per OEMs recommendation.
- 3) Usage of OEM recommended valve gasket to be ensured.

**WORTH MENTION:** During an operational test after a repair/ overhaul activity, parts of the air-compressor broke loose. In additions to damage to the compressor, **one of the parts from the compressor hit the attending engineer with fatal consequences.**

**Root cause:** The investigation found that the discharge valve of the compressor was in the closed position. The safety valve of the compressor malfunctioned, no test record of safety valve was found. (<https://officerofthewatch.com/2013/03/22/air-compressor-accident-kills-crewman/>)

### You should Read this incident also.....



#### Gas Compressor Explosion Fire

<http://www.energysafetycanada.com/files/safety-alerts/ENFORM-Compressor-explosion-Alert.pdf>

Industry members are requested to post 'Safety alerts' in above format to Devendra Mahajan, Joint Director, OISD at [mahajandm.oisd@gov.in](mailto:mahajandm.oisd@gov.in) to share across the Industry.