

2011 Alky Turnaround

Overpressure Failure of 42" Slip Blind at
C-404 Suction Line



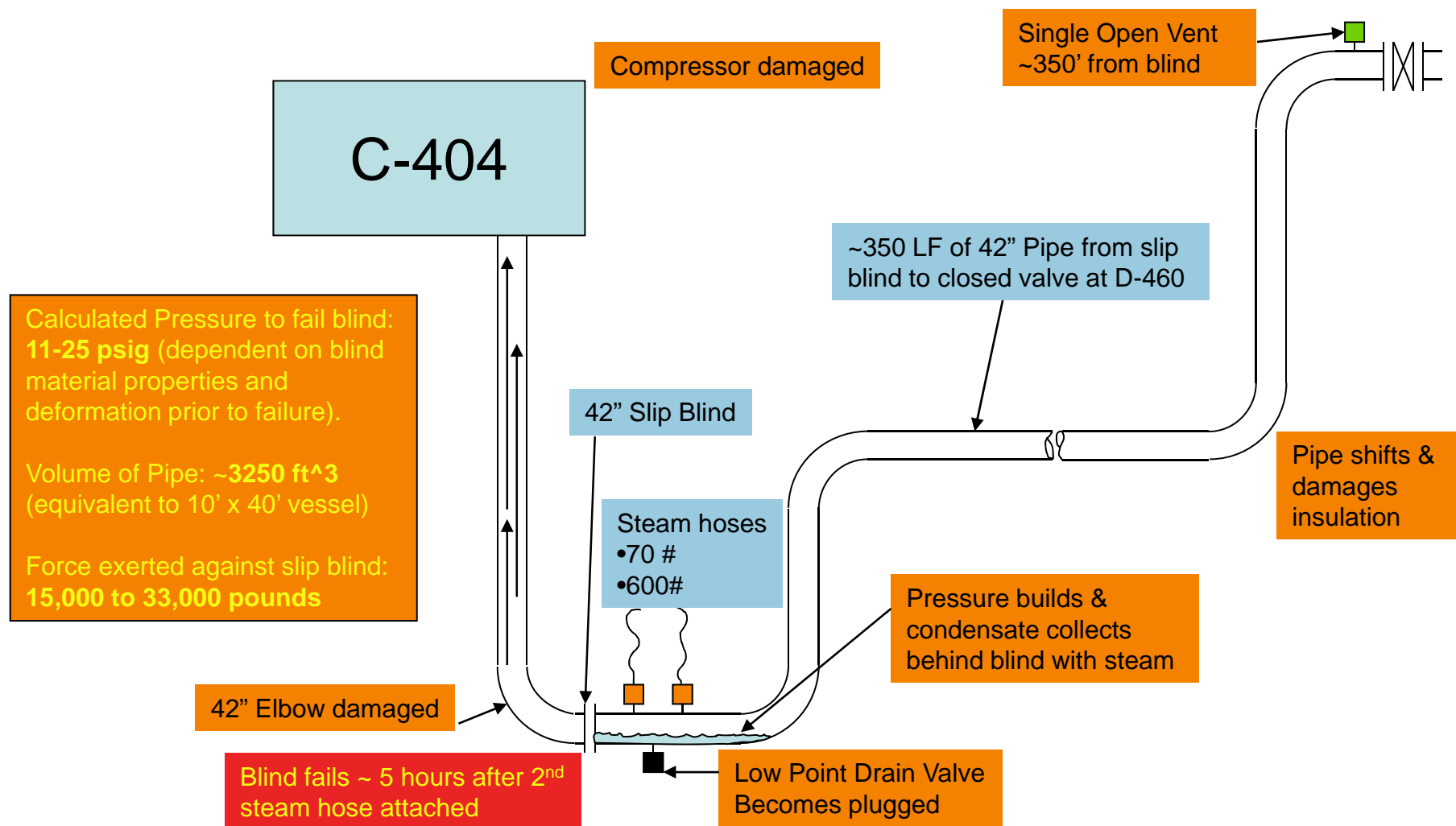
Incident Description

- IMPACT # 84763
- Description
 - While steaming C-404 suction line in order to prepare for CUI maintenance the system was inadvertently steamed with 600 psig header, which ultimately led to pressure build-up in the line and failure of a 42” slip blind and gasket.
- Injuries: none
- Equipment Damage: inspections in progress
 - C-404:
 - Thrust bearing damaged. Checking for seal/bearing/shaft damage
 - Rotor confirmed to have rotated during event. Number of revolutions unknown
 - Compressor lid removed to recover gasket inner ring and other debris
 - Compressor repairs include rotor change-out and seals/bearing replacement.
 - Pipe:
 - Anchor/guide damaged below C-404
 - Pipe shifted in pipe rack. Repositioning pipe supports as needed & repairing insulation
 - 90 Degree elbow immediately downstream from blind location damaged

Sequence of Events (Tim)

- Evening of 2/20: hot work request made to perform weld repairs to small bore pipe connections on C-404 suction piping (CUI findings).
- 7 p.m.: Operations connects steam hose to 42" pipe and opens 70 psig steam supply to start clearing trace VOC from pipe.
- ~8 p.m.: Operations decides that additional steam is required to increase temperature and identifies what is believed to be an additional 70# steam header with associated bleed for connection. A hose was connected to the header which turned out to be a 600 psig steam supply. The steam was being vented through two ¾" bleed valves. It was determined after the incident that one of the low point drains had plugged during the steaming procedure.
- ~1 a.m.: the slip blind in the 42" line fails. Operator is in the area and hears failure. As soon as flange is identified as leaking, steam supply is turned off.
- Operations connects nitrogen supply and starts to cool down piping.

Recreating Incident...



Pictures following slip blind rupture



View of flange where slip blind was installed. Gasket winding material trapped in bolts. Most winding material pulled into pipe with blind & blown downstream to compressor.

Pictures following slip blind rupture



Pipe support and guides for 42" pipe, immediately downstream from slip blind location. Anchor bolts partially pulled out of concrete. Indicates that pipe moved ~2" north and south during incident.

Pictures following slip blind rupture



42" Slip Blind after failure. Blind was torn into two pieces, both of which were found near the flange where installed. Damage to plate from initial failure and impact with pipe and compressor inlet. Gasket outer ring also shown with pieces after removal from pipe.

Pictures following slip blind rupture



42" Elbow was dented/bulged from slip blind failure. Damaged area cut out and replaced.

Pictures following slip blind rupture



Pipe shifted in pipe rack, contacting scaffolds and puncturing jacketing. Support shoes also shifted.



Pictures following slip blind rupture



42" Gasket inner ring stuck in 1st stage impeller

Inactive Thrust Bearing Damage



Key Learnings

**Knowledge gap regarding the use of slip blinds and pressure rating.
When slip blinds are used for energy isolation...**

Stop

- **Slip blinds are not rated to withstand the full pressure of the piping in which they are inserted.**

Think

- **Slip blinds require adequate bleed.** Slip blinds are not intended to be used to isolate energy sources unless there are sufficient bleed points to prevent pressure from building. When introducing a pressure source to an area protected by a slip blind make sure the bleeds are sufficient. If local procedures do not provide the information needed to make an informed decision then check with Process Engineering.
- **Size Matters!** As piping and equipment size increases, the potential to generate large amounts of contained energy increases when any type of compressible gas/vapor is introduced. The bigger the line size the greater the hazard potential.
- **Verify the source.** When using temporary hoses, verify the source. This is especially true when normal utility drop stations are not available.

Go! To GoalZero

Back Up Material

Preliminary Equipment Damage & Inspection Findings

- C-404
 - Thrust bearing damaged on inactive side (significant babbit damage).
 - Seals damaged & contaminated with pipe scale/grit from suction piping.
 - Compressor disassembled for complete overhaul
- Pipe
 - 42" Elbow immediately downstream from slip blind damaged (bulged from displacement or impact). Being repaired.
 - Pipe shifted in pipe rack and damaged guides/supports/insulation.
- Overall TA timeline extended by ~2 weeks.