



### **Root Cause Analysis**

**Incident Type :** Fire

**Location :** Interchange A Pad

**Date:** 3/12/2022

#### **Incident Summary:**

At 4:36 p.m., drilling operations were preparing to drill through the curve and to do so had switched to the mud/gas separator. The purpose of the mud/gas separator is to separate gas from drilling mud as it returns to the surface. The fluid flows into the mud/gas separator through a side port which hits a plate and allows the gas to rise and the mud and cuttings to flow out the bottom port and back into the mud system. We have now determined that the flow rate through the bottom port had in this instance become restricted and plugged with drill cuttings and as a result, drilling mud accumulated in the mud/gas separator and directed liquids to the combustor. The drilling mud was ignited, resulting in flames within and directly above, and immediately outside the perimeter of the combustor. The fire was quickly controlled and almost completely extinguished by on-site personnel. NMFD arrived onsite and extinguished remaining flames inside the combustor with approximately 5 gallons of non-PFAS foam (Microblaze).

#### **Notifications:**

4:36 p.m.	Drilling rig shut down related to incident, fire occurred, isolated at combustor unit
4:42 p.m.	Civitas EHSR notified
4:44 p.m.	North Metro Fire Department on scene
4:52 p.m.	Attempted contact with Broomfield LGD
4:56 p.m.	Successfully contacted Broomfield Inspector
5:21 p.m.	Civitas EHSR on scene
5:35 p.m.	Broomfield Inspector on scene
5:35 p.m.	North Metro Fire Department left location
6:13 p.m.	Email notification provided to COGCC
6:49 p.m.	Broomfield inspector left location

<b>Location Equipment Inventory</b>	<b>How did this piece of equipment contribute to the incident?</b>	<b>How was this equipment affected by the incident?</b>
Mud/gas separator	Drilling mud from the well enters the vessel and allows any gas to travel to the top port to be sent to the combustor.	Bottom port became plugged with drill cuttings, not allowing any return flow to mud tanks and directing liquid to the combustor.
Combustor	N/A	Combustor overwhelmed, causing visible flames above the walls.

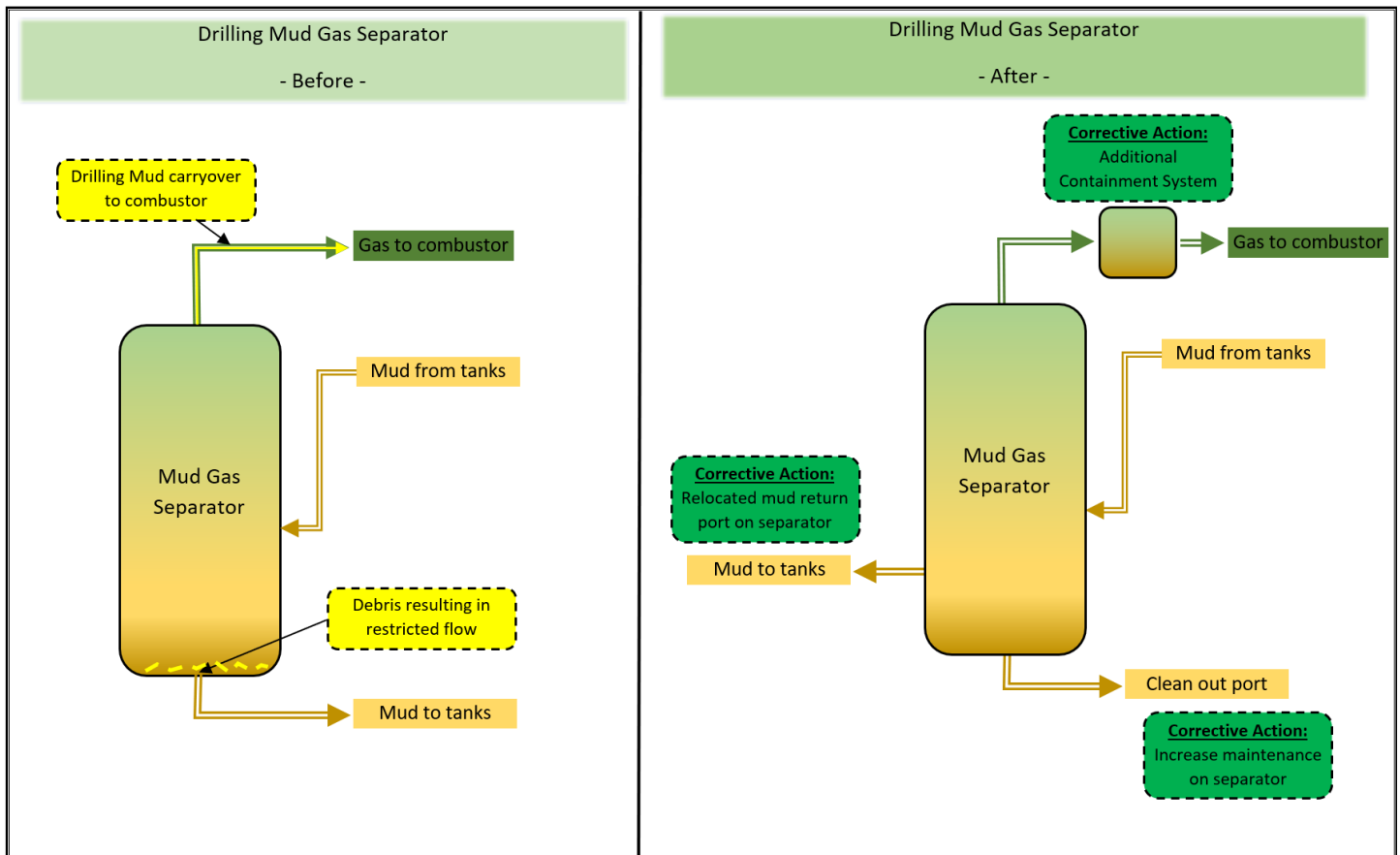
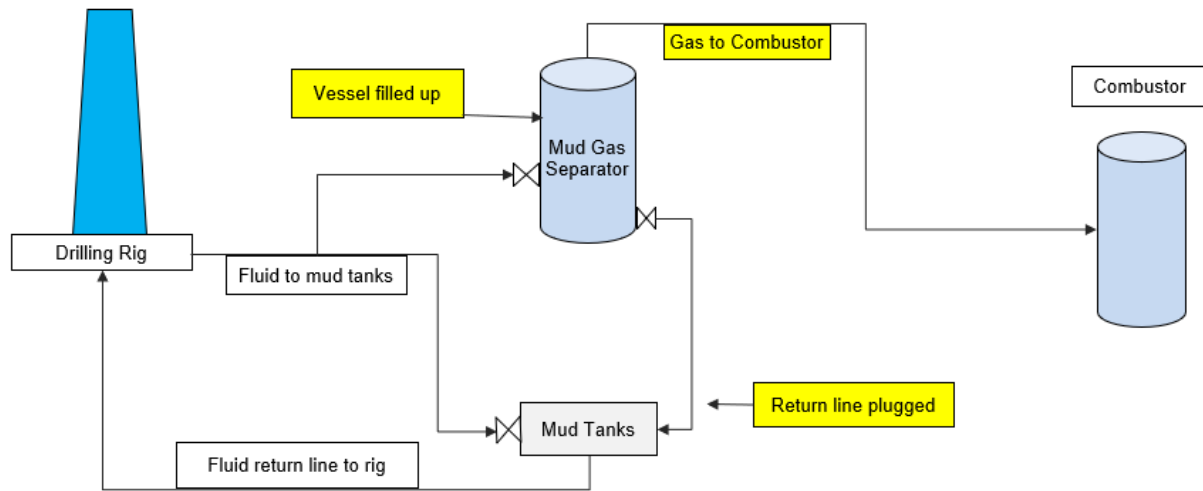
#### **Causal Factors:**

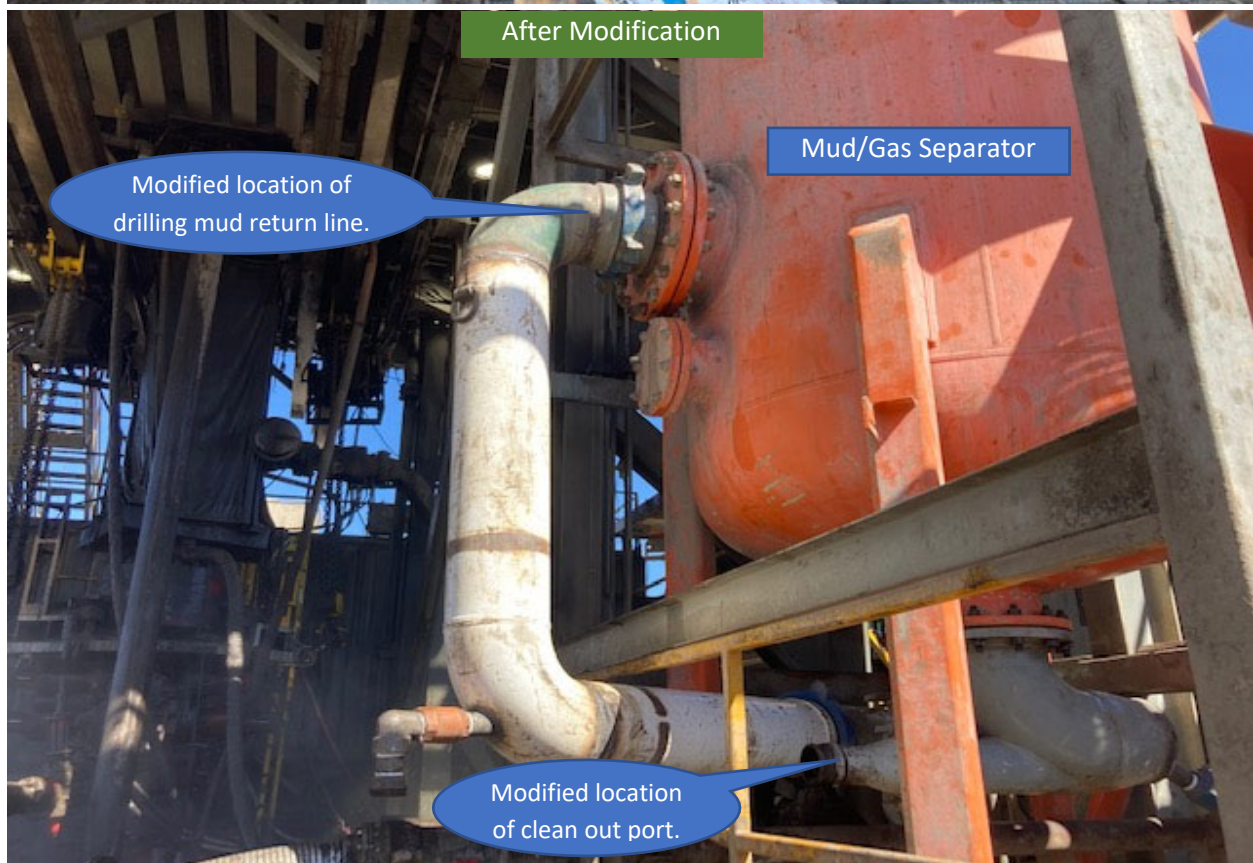
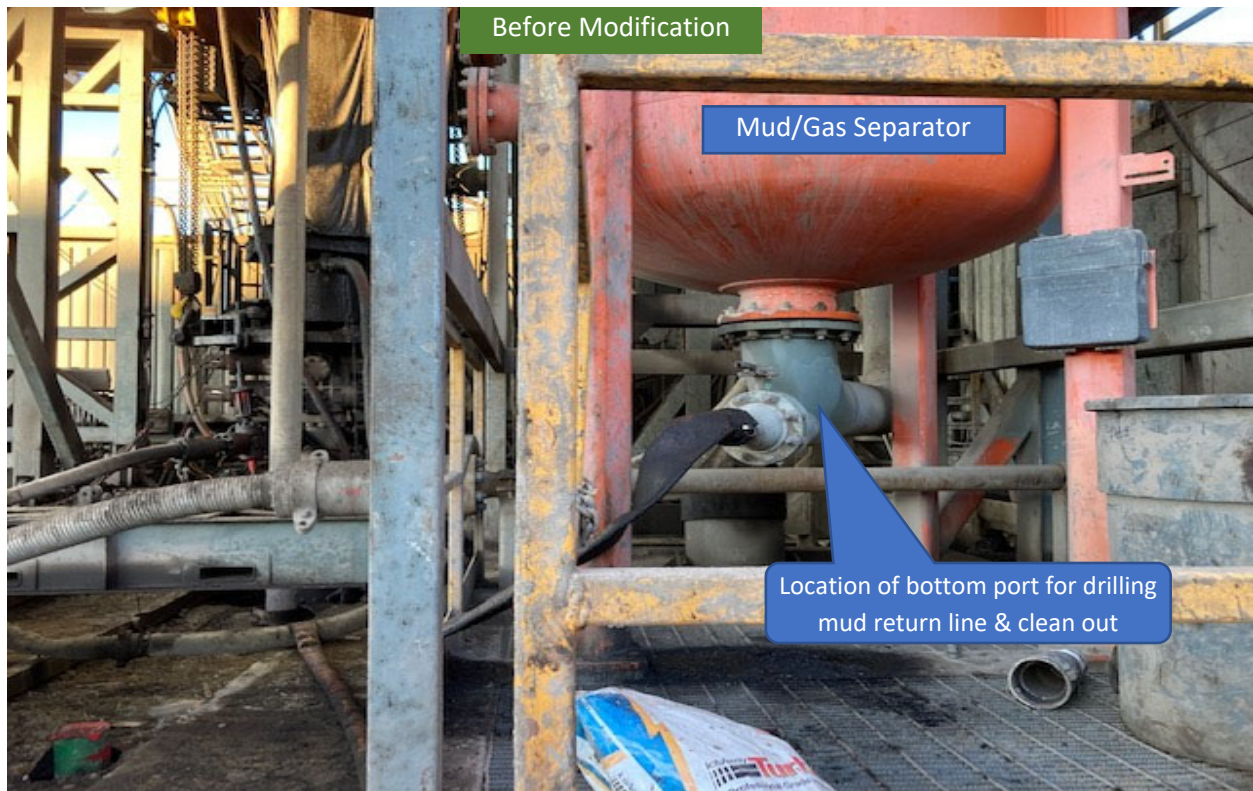
- 1) Bottom port of mud/gas separator became plugged restricting normal returns.
- 2) Estimated one barrel of drilling mud entered combustor.
- 3) Cleanout maintenance frequency of mud/gas separator resulting in the buildup of drill cuttings within the vessel.
- 4) Monitoring of drilling mud return rates when switching to the mud/gas separator.

#### **Immediate Corrective Actions:**

- 1) Drilling rig operations shut down.
- 2) Flow rate to the mud/gas separator halted to prevent flow and control fire.
- 3) Fire isolated at the ground combustor was extinguished by both drilling rig crew and NMFD.
- 4) Drill bit and pipe were moved upward in the vertical wellbore away from the curve during 24-hr shutdown to allow for equipment inspection and modifications.

## Flow Diagram





**Post-Action Items:**

1. Mud/gas separator flowlines modified for optimal flow rate, circulation, and maintenance cleanouts.
2. Completed internal visual inspection of combustor on 3/12/2022 and put back in service.
3. Inspection of equipment with Broomfield inspector and NMFD prior to resumption of drilling. Completed 3/13/2022.
4. Submitted report related to BMP 51 on 3/13/2022.
5. Follow up meeting with COGCC 3/14/2022 discussing event and decision to file Form 22. Submitted 3/14/2022.
6. Area air monitors showed no abnormal spikes during the incident.
7. Initiated company internal root cause investigation.
8. The fire and subsequent black smoke that resulted from the incident was contained to the ground combustor and posed no safety risk to the community.

**Go-Forward Actions:**

1. Increase maintenance to mud/gas separator. Specifically, every time that the mud/gas separator is taken off-line and prior to it being put back on-line, it will be drained and then washed-out using drilling mud introduced into the vessel through a high-pressure line installed during the modification of the clean-out port.
2. Additional monitoring of drilling mud return lines during transition of the mud/gas separator.
3. Inclusion of additional ecological containment system between mud/gas separator and ground combustor
4. Civitas will apply these corrective actions to other drilling locations.