

Shell Polymers Monaca Totally Enclosed Ground Flares (TEGFs) Monthly Inspection Report

Prepared by: Site Heat Transfer Specialist

Reviewed by: Shell P&T Senior Heat Transfer Engineer

Report Date: April 11, 2024

For Time Period: March 6, 2024, to April 3, 2024

EXECUTIVE SUMMARY

This Monthly Inspection Report was prepared with the goal to demonstrate that both TEGFs are in good operating condition based on examination performed by qualified site personnel as required by section 3.b of the order under the May 24, 2023 COA. Operator inspections were performed nightly from March 6, 2024, to April 3, 2024, by operations personnel. The operator inspections conform of the following activities addressed as questions for the operators:

- Is there presence of flame on all burner tips in stages in service?
- Presence of Coke build up - Check in all stages. (Observe from walkway above staging valves)
- Are burner tips free of damage? (i.e., cracks, bulging)
- Are there any abnormal sounds coming from inside the ground flare?
- Are there any signs of a hot spot on the shell of the ground flare?

If any of the items listed above are observed, the operator reports to their Production Team Lead and subsequently gets reported to the Site's Heat Transfer Specialist / Heat Transfer Engineer to determine the need of any mitigating actions. There was one report to the Heat Transfer Specialist of TEGF A Stage 2 soot formation as a result of the nightly operator inspections. After inspection by the Heat Transfer Specialist, the soot formation is determined to be acceptable and not affecting Destruction Efficiency of the TEGF.

On April 3, 2024, the Heat Transfer Specialist for the site performed a visual and drone footage inspection of the flares. The flares were under the following operating condition:

Flow: 11 TPH

Flare Gas Net Heating Value: 981 Btu/SCF

Stages In Service: stages 2 and 4 for TEGF A and stage 2 for TEGF B.

At the time of the inspection some external residue formation in form of soot was observed in some of the tips in stage 2 and 5 of TEGF A and stage 2 of TEGF B, minor tip damage on one out of 20 tips. The observed external residue has no impact to the destruction efficiency of the TEGFs and aligns with Zeeco's letter in Attachment A. The current condition of the flare complies with the manufacturer's performance guarantee as described in Exhibit D of the Consent Order and Agreement entered on May 24, 2023. Both TEGFs achieve the destruction efficiency to meet Plan Approval Section D, Source 205, Condition 002. See Summary Tables for details.

1. SUMMARY TABLES

TABLE A: TEGF A (A-59011A) – April 3, 2024, Inspection Points

Inspection Point	Acceptable per Performance Guarantee? (Yes/No)	Actions Required? (Yes/No)	Comments/Action Taken
Daily Inspection Completed	Yes	No	N/A
Burner Tip Residual Formation (i.e., Look for Coke or Soot)	Yes	No	Visible external soot formation was observed in stages 2 and 5. Based on previous observation in the month of March. There was no change in the amount of soot formation observed for this April inspection compared to what was observed in the previous month. Flames were observed to be stable with all burners lit not impacting DRE.
Is Burner Tip Mechanical Condition Acceptable? (i.e., Look for Damage Such as Cracks or Bulges)	Yes	No	Observed minor tip damage on one out of 20 tips in stage 5.
Burners within a Stage Ignited	Yes	No	N/A
Is There any Abnormal Sounds to Be Reported	No	No	N/A
Pilots Condition	Yes	No	N/A
As built Floor Location with Respect to the Tips	Yes	No	N/A
Combustion Chamber External Condition	Yes	No	N/A
Combustion Chamber Internal	Yes	No	N/A

Lining Condition (i.e., Look for Refractory Damage).			
Stages Out of Service	Yes	No	Stages 1 and 3 are out of service
Burner Tip Mechanical Condition (i.e., Cracks or Bulges)	Yes	No	N/A

TABLE B: TEGF B (A-59011B) – April 3, 2024, Inspection Points

Inspection Point	Acceptable per Performance Guarantee? (Yes/No)	Actions Required? (Yes/No)	Comments/Action Taken
Daily Inspection Completed	Yes	No	N/A
Burner Tip Residual Formation (i.e., Look for Coke or Soot)	Yes	No	Visible external soot formation was observed in stages 2. Based on previous observation in the month of March. There was no change in the amount of soot formation observed for this April inspection compared to what was observed in the previous month. Flames were observed to be stable with all burners lit not impacting DRE.
Is Burner Tip Mechanical Condition Acceptable? (i.e., Look for Damage Such as Cracks or Bulges)	Yes	No	N/A
Burners Within a Stage Ignited	Yes	No	N/A
Is There any Abnormal Sounds to Be Reported	No	No	N/A
Pilots Condition	Yes	No	N/A
As built Floor Location with Respect to the Tips	Yes	No	N/A
Combustion Chamber External Condition	Yes	No	N/A
Combustion Chamber Internal Lining Condition (i.e., Look for Refractory Damage).	Yes	No	Small Amount of refractory within 10 feet of the top slightly dislodged from the Shell. No performance or

			integrity impact.
Stages Out of Service	Yes	No	Stages 1 and 3 are out of service
Burner Tip Mechanical Condition (i.e., Cracks or Bulges)	Yes	No	N/A

ATTACHMENT A - Zeeco Letter in Response to Observed Soot



- Burners
- Flares
- Incinerators
- Combustion Systems

22151 East 91st Street
Broken Arrow, OK 74014 USA
Phone: 918-258-8551
Fax: 918-251-5519

www.zeeco.com
sales@zeeco.com

August 11, 2023

Shell Pennsylvania Petrochemical Complex
MMC6+JQ5
Industry, PA 15061

Subject: Shell Monaca, PA Facility, Enclosed Ground Flares, Zeeco # 29205

Attention: Shell Heat Transfer Engineer

This letter is in specific reference to the two (2) enclosed ground flares that are currently installed at the Shell Monaca, PA facility, and also in reference to the letter issued by Zeeco to Southwest Regional Office of PADEP in May of this year.

As noted in our prior letter referenced above, based on specific Shell project testing in our Zeeco HQ test facility, and based on prior testing and extensive experience with the burner type that is applied in the Shell Monaca, PA enclosed ground flares, Zeeco are very confident the system installed at Shell can achieve the required smokeless and DRE performance.

Relative to our discussion of this week, we understand the burners are experiencing some minor SOOT formation. Based on photos, this SOOT formation seems to be on the "top" of the burners, beyond the flare gas exit points. This SOOT formation is fully expected, depending on the gases that are being flared. The formation of SOOT is not a failure of the burners to perform per specification and expected requirements. We also understand this is SOOT, and not coke, as coke would typically be forming on the INSIDE of the burner arms, and coke could result in the possible plugging of ports in the burner arms, or damage to the burners. SOOT is soft, and is largely removed from the burner tips during high flare gas velocity conditions. Partial plugging of burner ports was simulated during testing in our Zeeco HQ test facility, with no impact on the burner performance.

We hope the above information is helpful in demonstrating our view that the enclosed ground flares are in good working order at this time. Please let us know if you have any questions.

Sincerely,

Scot K. Smith
Director, Flare Division