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Scotford

Quest Carbon Capture and Storage (CCS) Project

Quest CO2 Capture Ratio Performance

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Summary

This document summarizes the CO₂ capture ratio performance of the Quest facility for the reporting period.

Keywords

Quest, CCS, CO₂ capture ratio, CO₂ recovery

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1. CO₂ CAPTURE RATIO INTRODUCTION

This document provides the annual CO₂ capture ratio performance of the Quest CCS facility. The CO₂ capture ratio is defined as the percentage of CO₂ in the three HMU raw hydrogen streams that is removed in the amine absorbers (V-24118, V-24218, and V-44118), separated in the CO₂ stripper, compressed, and sent to the CO₂ pipeline for injection. The typical CO₂ content in the absorber feed gas (raw hydrogen stream) is between 16 and 18% by volume.

2. 2019 PERFORMANCE

The CO₂ capture ratio data has been provided on a daily basis, and reported as the combined CO₂ capture ratio for the three HMUs. The capture ratio is defined as the amount of CO₂ captured over the summed amount of CO₂ available in the three syngas streams. The data for the reporting period was from January 1 through December 31, 2019. The average capture ratio for the reporting period was 78.8%. See Figure 1 below for the daily averaged data.

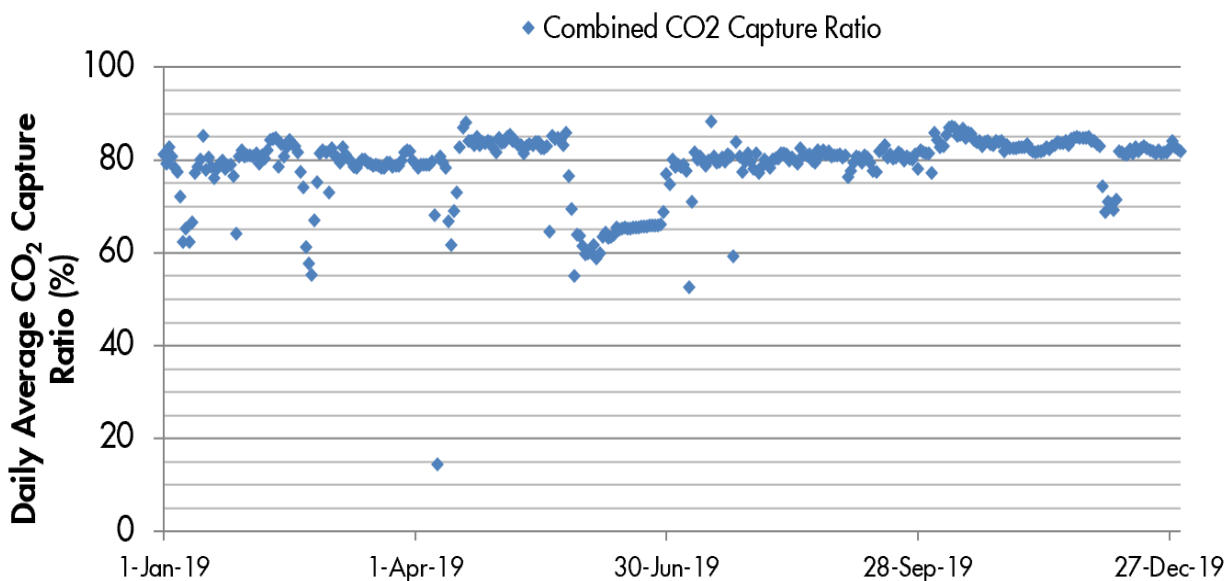


Figure 1: CO₂ Capture Ratio – Daily Averages

The data from Figure 1 shows that there were a few periods where performance on a daily basis was below the objective 80% capture ratio. The following events in 2019 contributed to these periods of reduced CO₂ capture ratio performance:

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- January 2, 2019: Reduced capture % on HMU3 due to reformer flame stability and temperature controllability limits.
- January 5-13, 2019: A&V1 trip causing reduced HMU rates.
- January 16, 2019: Reduced capture % on HMU3 due to reformer flame stability and temperature controllability limits.
- January 18-27, 2019: HMU2 raw gas leak on the common outlet from the E-24206A/D process gas air coolers.
- February 4, 2019: HMU3 capture rate was reduced due to PSA valve work on V-44301 and V-44307.
- February 11, 2019: Reduced capture due to HMU1 amine absorber level SIS transmitter (LT-241154) dropped out, resulting in the closure of XV-241020.
- February 19-25, 2019: Reduced capture rate due to HMU3 trip.
- March 1, 2019: HMU2 LT-242155B was frozen and caused HMU2 absorber to trip. ESD for 8-19 was initiated to control the valve position due to input value and actual valve position deficiency.
- March 5-12, 2019: HMU3 capture rate was reduced due to PSA valve work on V-44303 and V-44309.
- March 15-27, 2019: HMU3 capture rate was reduced due to PSA valve work on V-44301, V-44304, V-44307 and V-44310.
- March 31-April 9, 2019: HMU3 capture rate was reduced due to PSA valve work on V-44305 and V-44311.
- April 9, 2019: Reduced capture rate due to Quest compressor trip due to failed analog card.
- April 11-16, 2019: HMU3 capture was reduced to prepare for unit turnaround activities.
- May 19, 2019: Reduced capture rates due to LP steam inlet valve (FV-246006) positioner failed. This caused the valve to close and loss of steam on E-24603B.
- May 26- July 1, 2019: Capture was reduced due to the extended turnaround scope for the repairs on the RHC3 H-42203 tube rupture. Capture rate on HMU3 started increasing on June 26th to follow the start-up activities on HMU3.
- July 3-7, 2019: Rate reduction due to natural gas restriction.
- July 8-9, 2019: Quest compressor (C-24701) tripped due to 138kV transmission line trip.
- July 13-15, 2019: HMU3 running at reduced capture rate due to reformer flame stability and temperature controllability limits.
- July 18-21, 2019: HMU3 running at reduced capture rate due to reformer flame stability and temperature controllability limits.
- July 24, 2019: The lean amine charge pump, P-24602B was shutdown due to seal flush tubing leak while P-24602A was isolated for motor bearing repair.
- July 27- August 6, 2019: HMU3 running at reduced capture rate due to reformer flame stability and temperature controllability limits.

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- August 13-16, 2019: HMU3 running at reduced capture rate due to reformer flame stability and temperature controllability limits.
- August 21-22, 2019: HMU3 running at reduced capture rate due to reformer flame stability and temperature controllability limits.
- September 3-11, 2019: Reduced capture due to A&V1 de-coke
- September 12-13, 2019: Reduced capture due to wellsite 8-19 was shut-in for Well Integrity Test. High pipeline and TEG pressure was observed during this period, capture reduced on HMU1&2.
- September 28, 2019: Reduced HMU3 capture rate due to PSA trip.
- October 3, 2019: Reduced capture rate due to wellsite 5-35 was shut-in on lower master valve inspection with ice ball observed on the lower master valve.
- December 3-8, 2019: RHC3/4 stabilizer bottom pump seal leak caused RHC3/4 to shutdown and HMU3 to run at reduced rates.

Overall, capture ratio performance was very strong for the year, sustaining ratios near 80% for the majority of the year outside of the periods listed above. The main challenges for 2019 are the numbers of planned, unplanned maintenance work and downtime outside of Quest, and the reformer flame stability and temperature controllability issue for HMU3. As a result, the overall capture ratio for 2019 was slightly below 80%. Although there were operational challenges that were faced in 2019, the installed Quest technology/capacity is capable of strong, sustained CO₂ capture ratios with reliable performance and stable hydrogen demand.

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