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## Heavy Oil

### Controlled Document

Quest CCS Project

# Quest CO2 Capture Ratio Performance

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## Signatures for this revision

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## Summary

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

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Quest, CCS, CO2 capture ratio, CO2 recovery

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## 1. CO<sub>2</sub> CAPTURE RATIO INTRODUCTION

This document provides the annual CO<sub>2</sub> capture ratio performance of the Quest CCS facility. The CO<sub>2</sub> capture ratio is defined as the percentage of CO<sub>2</sub> in the three HMU raw hydrogen streams that is removed in the amine absorbers (V-24118, V-24218, and V-44118), separated in the CO<sub>2</sub> stripper, compressed, and sent to the CO<sub>2</sub> pipeline for injection. The typical CO<sub>2</sub> content in the absorber feed gas (raw hydrogen stream) is typically between 16 and 18% by volume.

## 2. 2016 PERFORMANCE

The CO<sub>2</sub> capture ratio data has been provided on a daily basis, and reported as the combined CO<sub>2</sub> capture ratio for the three HMUs. The data for the reporting period was selected to be from January 1 through December 31, 2016. The average capture ratio for the reporting period was 83.0%. See Figure 1 below for the daily averaged data.

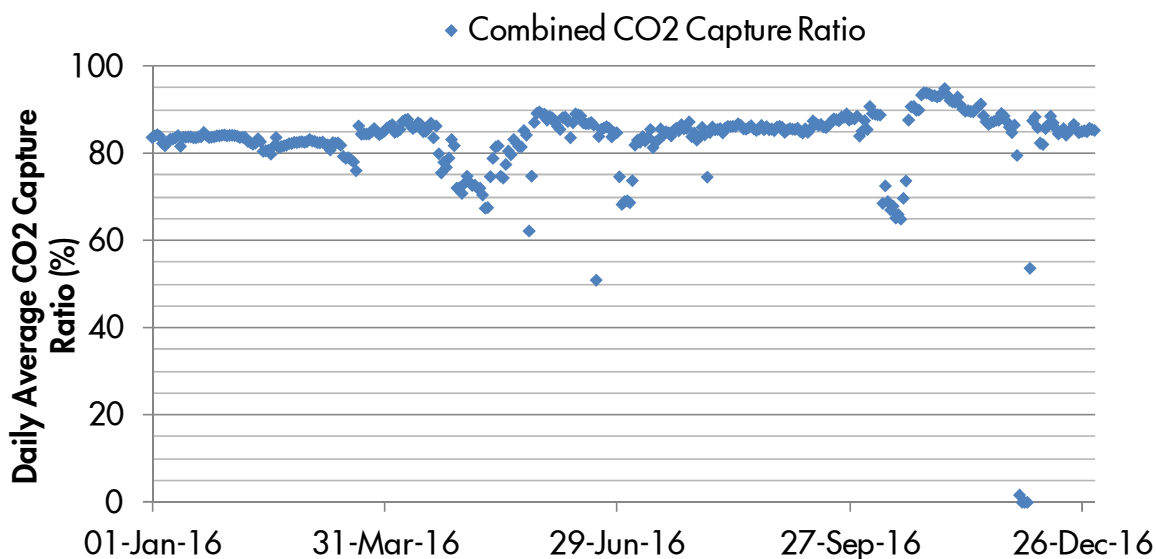


Figure 1: CO<sub>2</sub> Capture Ratio – Daily Averages

The data from Figure 1 shows that there were a few periods where performance on a daily basis was below the typical 80% capture rate expected. The following events in 2016 contributed to low overall CO<sub>2</sub> capture ratio performance:

- April 28 – May 12, 2016: Reduced hydrogen demand at the Upgrader resulted in turndown conditions in the Upgrader HMUs. When the HMUs go into turndown, capture ratios are reduced due to a low fuel gas pressure constraint. This constraint is a result of removing large volumes of CO<sub>2</sub> from the PSA feed streams via the absorbers, resulting in lower tail gas volumetric flowrates, and hence less pressure

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in the fuel gas piping to the reformer burners. Hydrogen plants are equipped with low fuel gas pressure differential trips as part of the safety system, so a minimum fuel gas pressure is maintained for reliability.

- June 21, 2016: Loss of amine circulation due to amine charge pump trip on low suction pressure. Capture suspended for approximately 9 hours. CO<sub>2</sub> compressor also shutdown from no CO<sub>2</sub> feed.
- October 10-19, 2016: Reduced CO<sub>2</sub> capture ratio during a period of low hydrogen demand at the Upgrader/Refinery. Lean amine trim cooler (E-24605B) plate pack repair also completed on as opportunity work.
- December 1-6, 2016: Capture suspended for retrieval of CO<sub>2</sub> pipeline in-line-inspection tool.

Overall, capture ratio performance was very strong for the year, sustaining ratios of 85% for the majority of the summer, and capture ratios reaching 95% in October. This shows that the installed Quest technology/capacity is capable of strong, sustained CO<sub>2</sub> capture ratios with good reliability performance and stable hydrogen demand.

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