Produced Water Treatment System Predicaments And Outcomes

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Abstract

Objectives/Scope: The design basis for Produced Water Treatment System (PWTS) specifically in the Company is to meet the oil-in-water concentration between 15mg/L - 40mg/L, while regulatory limit is set at 100mg/L and revised internal governance limit of 30mg/L. The quality of PW depends on the production rate, chemical injection, reservoir contaminants (sands) and characteristic of PW, are crucial during PWTS design selection. Since PWTS commissioning, issues encountered then translated into actions for continuous performance improvement.

Methods, Procedures, Process: Three PWTS located at offshore platform A (Oil/Gas), B (Gas) and C (Gas) became the subject of this study. The study involved review of PWTS design, assessing the incoming PW quality data, and performance monitoring for the treatment unit. Following that, operational improvement was undertaken; through chemical injection skid installation, jar testing to determine most effective chemical dosing rate for emulsion breaking, surge vessel cleaning to remove sand accumulation, and PW characterization study led to a long-term solution through Facility Improvement Proposal. Improved practices were documented in operating procedures to provide clear direction for implementation at site.

Results, Observations, Conclusions: Based on comparative analytics (2 variance, 2 sample-T) for platform A, we are 95% confident to conclude that improvement implemented on PWTS has significantly reduced the variation of PW oil-in-water at the average of 36.407mg/L (before) to 20.864mg/L (after), whereby the standard deviation reduced from 30.775mg/L to 6.42mg/L. From process capability analysis, we conclude that platform A oil-in-water discharge against regulatory limit considered optimized (Z Bench 12.23). Based on comparative analytics (2 variance, 2 sample-T) for platform B, we are 95% confident to conclude that improvement implemented has significantly reduced the variation of PW oil-in-water at the average of 112.88mg/L (before) to 13.961mg/L (after), whereby the standard deviation reduced from 204.73mg/L to 12.92mg/L. From process capability analysis, we conclude that platform B discharge reading is optimized against regulatory limit (Z Bench 6.66). While for platform C, oil-in-water reading before improvement had already shown optimized condition against regulatory limit (Z Bench 4.29) as the PW characteristic may varies depending on producing reservoir, as compared to platform A and B. Thus, improvement implemented did not yield as significant result as platform A and B. From the operational improvement, all platforms had obtained promising outcome in complying with the regulatory limit.

Novel/Additive Information: This study presents key information and factors for consideration during the design of new installation of offshore PWTS as to meet the host country requirement on discharge quality limit. In effort to achieve optimized process capability against the internal governance limit of 30mg/L, a long-term solution of pre-treatment skid installation is currently underway at Platform B, which is set to reduce the oil-in-water content in PW before entering the primary treatment system.