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Current Systems Reports - Outline Comments
Red Hill Fuel Storage Facility

Introduction

This memo summarizes PEMY Consulting's comments on three "current practices" report outlines that Navy transmitted to EPA in the last week of October 2015. The three pertinent paragraphs of the AOC Statement of Work (SoW) are:

- Section 2.2 TIRM Procedures Report
- Section 4.2 Outline of Current Fuel Release Monitoring Systems Report
- Section 5.1 Outline of Corrosion and metal Fatigue Practices Report

The TIRM outline is not a deliverable in the SoW, but we were glad of the opportunity to review it early in the process.

Intent

The reports that will follow from these three outlines are intended to allow an informed reader to adequately understand the current and past practices employed at the Facility. Such an understanding includes elements of:

1. Listing and describing each step of the current practices,
2. Explaining the reason for adopting the current practice,
3. Illuminating how the decision to execute the work using the current practice supports operations while minimizing tank integrity risk,
4. Providing narrative insight into the effectiveness of the current practices, describing that could be encountered when completing the task, and explaining ongoing refinement efforts that are expected to improve the current practice.

Notes and Discussion

The following three sections offer comments and suggestions for the three outlines organized generally the same as the outline.

TIRM Procedures Report Outline

The TIRM report outline mainly consists of a list of topics and questions related to TIRM. The Red Hill tanks are unique and are subject to loading conditions, operating conditions, and site constraints that are extremely uncommon. The industry and government standards listed in the outline are broadly applicable

to conventional storage tanks and generic infrastructure, and it was not clear that either the current TIRM practices (Item 2.a) or the planned changes forward (Items 2.c through 2.f) have fully embraced the unique nature of the facility and its setting. After our review it was not clear that the forthcoming report will have sufficient detail for an informed reader to adequately understand current and past practices related to tank inspection and repair.

The following paragraphs describe a few specific parts of the outline where additional detail in the outline would aid a conversation about how the eventual TIRM Procedures report will satisfy the AOC requirements.

1. NDE Performance Criteria: Item 2.a.1 reads (in part) "Non-destructive testing - LFET, BFET, UT, MT, Dye Penetrant, Pressure Test, Vacuum Test.",

   a. Applicability: It is not clear from the outline what the TIRM Procedures report will offer regarding the applicability of the listed NDE measures to the Red Hill tanks: what misdetection rates are acceptable, what objectives are considered in designing an inspection, how the methods are used to compliment each other, what training, supervision, and quality checks are implemented when an NDE testing program is deployed. In our opinion, such a robust discussion is necessary for the reader to adequately understand current and past practices related to nondestructive testing at Red Hill.

   b. Detection Limits: All of the listed techniques have significant probabilities of both missed detections and false positives. We anticipate that the TIRM Procedures report, specifically sections 2.c and 2.d, will include analysis of necessary inspection performance parameters and evaluation of whether current practices achieve those detection standards. It would be very helpful for the current practices section to describe successes and shortcomings of the present NDE practices relative to the established detection limits.

2. Destructive Testing: Item 2.a.2 reads: "Destructive testing - destructive testing has not been performed". From a minimalist perspective, this "current practices" topic could be completely addressed with that statement: current practices do not include destructive testing to check the effectiveness of scanning NDE. Destructive testing is such a fundamental principle of validating NDE inspection techniques that we encourage the Navy to thoroughly analyze this topic and provide the results in Item d "Options for Improving the TIRM procedures."

3. Quality Control: Item 2.a.3 of the outline states that quality control is performed per P-445. More specifically, "NAVFAC P-445, Construction Quality Management Program." Quoting from the P-445 manual:

   The CQM Program is designed to:
   - Properly assign responsibilities for the management of quality on construction projects.
   - Support construction projects across the entire spectrum of size, complexity, scope and acquisition strategy.
   - Tailor a particular project to ensure appropriate level of monitoring is provided.

   Amplifying on that third bullet, we anticipate that the TIRM Procedures report will describe how the generic P-445 program has been tailored to the unique requirements of the Red Hill Tanks.

Site-specific CQM programs for both inspection and also repair would make excellent appendices to the TIRM Procedures report.

4. Welding Inspections and Integrity: Item 2.a.4 states that welding is inspected according to API 653 and ASME IX and V. The vintage of welding at Red Hill means that calibration is needed to determine whether the NDE techniques are sufficient for purpose (which must also be defined in Item 2.a.1). Detecting weld imperfections through NDE is limited due to the inaccessibility of the back side, which is similar to the problems of inspecting tank bottoms. The probabilities of detection are known to be very poor for the standard tank bottom techniques such as vacuum box, eddy current, magnetic flux exclusions, and the various forms of ultrasonic testing. One-sided inspection of a weld subject to the pressure from over 200 feet of product is an uncommon procedure. It is important that the TIRM Procedures report have sufficient description of current and past weld inspection procedures so that an informed reader can understand how past weld inspection practices varied from the inspection practices for an API 650 tank supporting, typically, less than a third of the pressure in a Red Hill tank.

5. Modified Standards: Item 2.a.5 in the outline states that tank inspections are performed according to a "modified API 653" procedure. The Red Hill tanks are unique, and API Standard 653 "Tank Inspection, Repair, Alteration, and Reconstruction" specifically applies only to "steel storage tanks built to API 650 and its predecessor API 12C." Technically speaking, ad-hoc changes to an industry Standard make the practice non-standard. While there is a great deal of flexibility in applying most storage tank standards, a principal goal of the TIRM report is to adequately describe how the standards have been modified and what measures have been undertaken to verify that the modifications are complete, internally consistent, and technically correct. We anticipate that this part of the TIRM Procedures report will provide a thorough description of current practices that Tank Engineers follow when designing repairs at Red Hill, both as described in API 653 and the modified practices that are unique to Red Hill. A copy of the inspection, repair, and alteration procedure would make an excellent appendix to the report.

6. Pipeline Inspections: For item 2.a.6 we concur that the TIRM Procedures report should describe current pigging and pressure testing procedures. In addition, we suggest that the report also describe how design, fittings and joints, flexibility, and materials for this system combine with the appropriate NDE techniques. Pressure tests are only proof tests for gross errors in design and construction and are a poor indicator of inherent mechanical integrity.

7. Alarm Operation and Testing: Item 2.a.7 states that FLC will provide information about alarms at the Facility. We would be pleased to review FLC's outline for this topic to evaluate how this part of the TIRM Procedures report will allow an informed reader to adequately understand current and past alarm monitoring and testing practices employed at the Facility.

8. Lessons Learned from Tank 5 Release: Item b of the outline states that a list of lessons learned is being prepared, and that primarily the Contractor's QC practices were at fault. To acquire lessons learned in a legitimate and informative way usually requires a formal incident investigation with qualified incident investigator facilitators. Not only is the process a facilitated one but also the team members should be those who are qualified to attend. This is an intensive and time consuming

process. It is not clear in the outline what level of effort is being applied to identifying the incident root cause. It is also not clear which, if not all, incidents will be rigorously investigated.

9. QC/QA: Item 2.c in the outline is a restatement of the problem and does not describe how quality improvements will be accomplished. This topic is also addressed in Comment 3 above. Additional detail is necessary so that an informed reader can adequately understand current and past QA/QC practices employed at the Facility. One area of particular interest pertains to the limits of NDE used in the inspection process, both inspecting the out-of-service tank and then inspecting the repairs. Pertinent lines of inquiry include:
   a. What types of defects or flaws can the particular NDE method deal with best, worst?
   b. How operator-sensitive is the technique and how does the present QA program address operator skill?
   c. Will redundant application of different NDE techniques substantially reduce the potential for missed detections?

10. Improving TIRM Procedures: Item 2.d of the outline describe how global specifications will be developed for tank inspection and tank repair. Considering that the Red Hill Facility is unique, it is unclear how a global standard will apply. This is essentially the same constraint posed by attempting to use a non-standard version of the API approach to tank inspection and repair. While developing global tank integrity standards certainly has merit, these mentioned standards should not be done to serve Red Hill. The options for improving TIRM procedures at Red Hill should focus on the specific needs of the Red Hill Facility.

11. Immediate Actions: Item 2.f of the outline includes 5 practical measures to reduce risk of release that can be implemented independent of tank upgrades. While the 5th action pertains to the annual static tightness test, we suggest that also an evaluation of the existing dynamic leak detection monitoring systems is warranted.

12. Management Systems: Much of the problem of achieving the best possible job in Red Hill tank repair boils down to management system effectiveness. The TIRM Procedures report outline does not address these fundamental issues. We suggest that management systems committed to tank integrity are as important as technical procedures, and encourage the TIRM Procedures report to widen its perspective to address this topic.

Fuel Release Monitoring

Overall, the outline indicates that the forthcoming Current Fuel Release Monitoring Systems report will provide a thorough and comprehensive description of current practices. A few outline items suggest that the report would include summaries of current practices that may not provide sufficient detail so that an informed reader could develop an adequate understanding of the existing fuel release detection systems, how they are operated and maintained, and how the collected data are used in analyses. We offer these suggestions:

1. Section 3-2 commits to providing a summary of tank filling procedures utilized prior to 31 January 2014. An adequate understanding of the past practice would best be developed by supplementing the summary with an appendix that has a complete copy of the past re-filling procedure.

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2. Section 3-4.2 states that the report will include a summary of the current Red Hill-specific re-filling procedure. In addition, it would be very helpful to have a complete copy of the re-filling procedure in an appendix.
3. Section 4-2.1 states that the report will include a summary of FLCPH's current dynamic tank filling procedures.
   a. The use of the plural "procedures" is puzzling. Not to read too much into the wording, but are there multiple procedures for completing one activity? We anticipate that the report will clarify to such an extent that an informed reader can understand the current practice.
   b. A complete copy of the procedure(s) should be provided in an appendix.
4. Section 5-2.1.2 states that the inventory management system at Red Hill is not a certified release detection system. The report should address current inventory control practices that compliment the inventory management system so that an informed reader can understand of how the Facility maintains daily (or other short-duration) release detection capability.
5. Section 5-2.2.2 cites 40 CFR 280.43.c as a tightness testing procedure. The CFR establishes a sensitivity requirement for the tightness test; it is not a procedure. The current tank tightness testing procedure should be provided in an appendix.
6. Section 6 of the report will address detection sensitivity but does not presently appear to address alarm reliability. The procedure for false alarm handling and post-alarm analysis should also be included in the Current Practices report.

Corrosion & Metal Fatigue

Overall, the outline for the forthcoming Corrosion and Metal Fatigue Practices Report provides a satisfactory summary of several current practices including:

1. The use (or impracticality) of cathodic protection,
2. How tank coatings are selected, applied, and inspected,
3. The methods and frequency of NDT and visual corrosion inspection,
4. How data and reports are filed at two or more locations,

The report described in the outline may not offer a complete explanation of the current practices for assessing the condition of the Tanks to the extent that an informed reader can develop an adequate understanding. We offer these suggestions for further developing the issues addressed in the report:

1. Section 2 – Current Corrosion Assessment Practices: In addition to the information indicated in the outline, it would be very helpful to understand what plate thickness is currently deemed acceptable and what amount of corrosion thinning triggers a repair.
2. Section 4 – Historical Records Availability: The outline indicates that the report will provide a comprehensive description of two or more locations where tank data are stored. Corrosion detection and mitigation analyses are often based on longitudinal analyses, typically statistical analyses of collected corrosion data at different times over the Facility service life. A description of the available data including as-built tank drawings updated following repairs, vellum rubbings for corroded areas that were not repaired, coating failure modes, and other site-specific data would constitute a robust description of recordkeeping practices.

3. Section 4 – Historical Records Usage: In addition to where the records are kept, it would be very helpful also to know the current practice for what analyses are completed using the historical records. Specifically:
   a. A description of how inspection and repair data are added to the as-built tank drawings (or functional equivalent),
   b. Where the corrosion rubbings or scan data for areas not repaired are located and how those data are added to the record drawings,
   c. How corrosion rates are computed from the scan data, and
   d. How new data are incorporated in the metal fatigue evaluations.

References

US EPA Region 9, 2015, "Administrative Order on Consent In the Matter of Red Hill Bulk Fuel Storage Facility, EPA Docket No: RCRA 7003-R9-2015-01, DOH Docket No: 15-UST-EA-01, Attachment A - Statement of Work."

US Navy, 25 October 2015, "2. Tank Inspection, Repair, and Maintenance."

US Navy, 26 October 2015, "Outline of Current Fuel Release Monitoring Systems Report."

US Navy, 26 October 2015, "Outline of Corrosion and Metal Fatigue Practices Report."