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PROJECT: 631180

Technical Case Study Report

Offline System Decontamination, Reservoir Decontamination, High-Velocity Chemical Cleaning, High-Velocity Oil Flushing, System Purification, Spec Final Fill

Site Location: Texas, USA

Project Number: #631180

Asset Description: Steam Turbine Generator

Overview

Frontline Global Services performed Off-Line System Decontamination, Reservoir Decontamination, High-Velocity Chemical Cleaning, High-Velocity Oil Flushing, System Purification, and Spec Final Fill on a steam-driven turbine generator package (lube oil and seal oil systems). The comprehensive decontamination addressed severe Black Beauty sandblasting contamination that had spread throughout the system following inadequate foreign material exclusion during internal reservoir sandblasting and had been worsened by a previous remediation attempt.

Project Objectives

- **Ensure Safety:** Protect personnel and equipment throughout the extended 45-day project and maintain rigorous safety protocols during decontamination.
- **Eliminate System Contamination:** Perform multiple reservoir decontaminations, High-Velocity Chemical Cleaning, and High-Velocity Oil Flushing to remove Black Beauty abrasive particles and protect the lube oil and seal oil systems.
- **Verify and Document Performance:** Validate each stage through API 614 screening and ISO 4406:1999 laser particle counting, capturing data for QA records and client review.
- **Meet Cleanliness Standards:** Achieve an ISO 4406 particle count of 16/14/11 or better, progressing from severely contaminated conditions to specifications suitable for safe operation.

Methodology

The restoration required a focused and adaptive approach to severe Black Beauty sandblasting contamination. The reservoir had already been drained after a previous contractor's remediation attempt. Internal sandblasting to repair a chipping liner and inadequate foreign material exclusion allowed abrasive sand to spread throughout the system. A previous oil flush and acid wash caused particles to gel in hard-to-reach crevices.

The process utilized 5,600 gallons of FF2020 hydrocarbon-based chemical cleaning fluid followed by ISO 32 operating oil for High-Velocity Oil Flushing. Initial particle count testing revealed 24/22/17, with an API 614 screen rating of 5.

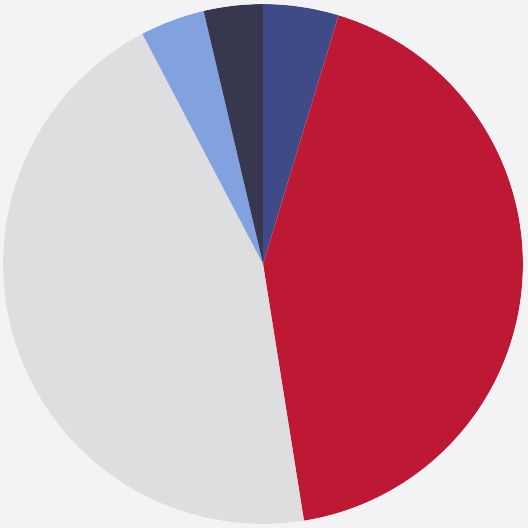
The team implemented daily API 614 screening at every jump location and multiple reservoir decontamination cycles. Single bag filter housings were installed at each jump on deck for a second filtration layer. ISO 4406:1999 laser particle counting documented progressive contamination reduction. The customer's system pump was periodically cycled to move large turbine valves. The bulk storage tank was decontaminated each time oil was transferred to prevent recontamination.

Process

1. **Initial Reservoir Decontamination:** Manually wiped down the drained reservoir to remove contamination before chemical cleaning.
2. **Chemical Cleaning Initiation:** Filled the reservoir with 5,600 gallons of FF2020 fluid and monitored screens at each jump location.
3. **Chemical Clean Cycle:** Circulated FF2020 for approximately one to two weeks through system components, valves and piping.
4. **Post-Chemical Cleaning:** Drained the reservoir and performed two additional manual decontaminations and wipe downs.
5. **High-Velocity Oil Flushing:** Refilled with ISO 32 operating oil and flushed, pausing for additional reservoir decontaminations.
6. **Selector Valve Repair:** A broken valve component was discovered and repaired; the team decontaminated the reservoir again before restarting.
7. **System Integration and Purification:** Reconnected system piping and continued slip-stream purification while the auxiliary pump was being started.
8. **Final Validation:** Continued purification and ISO 4406:1999 particle counting to verify cleanliness for turnover.

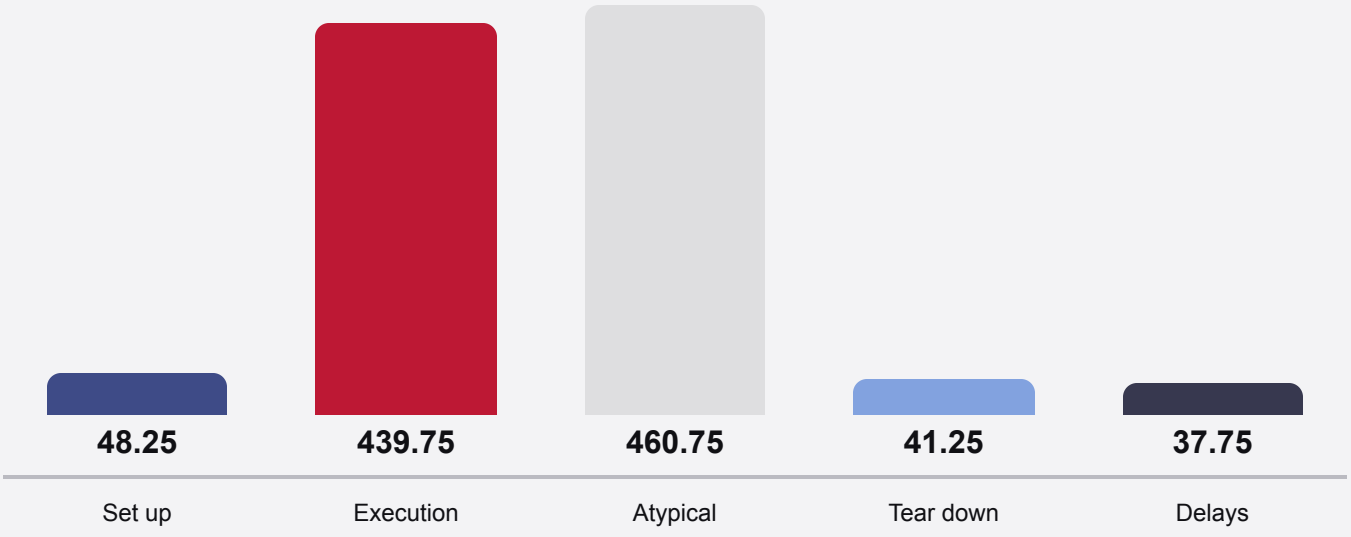
Key Project Metrics

Total Project Hours: 1027.75

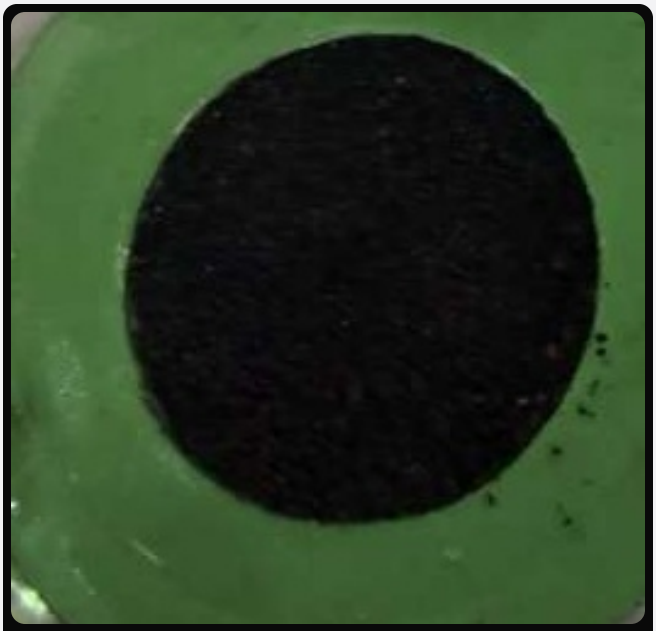


- **Project Set Up**
  48.25 hours · 4.7%
- **Project Execution**
  439.75 hours · 42.8%
- **Atypical Project Execution**
  460.75 hours · 44.8%
- **Project Tear Down**
  41.25 hours · 4.0%
- **Delays**
  37.75 hours · 3.7%

Hours by Category



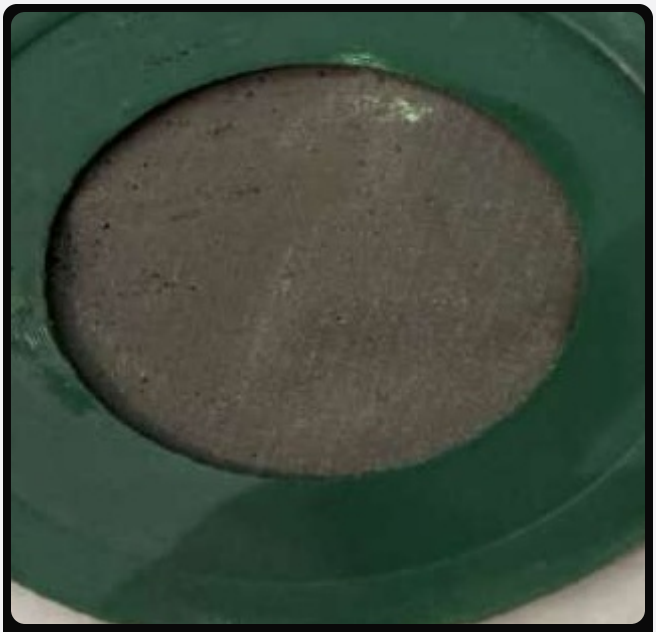
Project Milestones



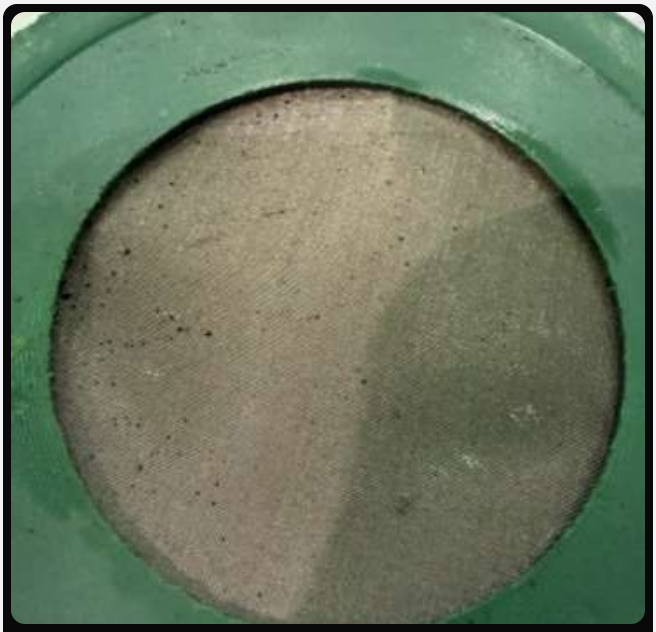
Initial Screen Evaluation



Initial Screen Evaluation



Final Screen Evaluation



Final Screen Evaluation

Project Milestones


Reservoir Before Chemical Flush


Reservoir Before Chemical Flush


Reservoir Before Chemical Flush


Reservoir Before Chemical Flush

Project Milestones



Reservoir After Chemical Flush



Reservoir After Chemical Flush



Reservoir After Chemical Flush

Project Summary

- **Efficient & Safe:**
  System and reservoir decontamination, chemical cleaning, oil flushing, final fill and purification were completed over the 45-day project.
- **Increased Equipment Reliability:**
  Seven reservoir decontaminations addressed sandblasting contamination. A broken selector valve component was repaired and enhanced filtration and bulk tank cleaning helped prevent recontamination.
- **Key Field Impacts:**
  ISO particle count improved from 24/22/17 to 14/12/8 against a 16/14/11 target. API 614 screen rating improved from 5 to 1.

Before



After



Conclusion

The Frontline team restored the steam-driven turbine generator package lube oil and seal oil systems to operational cleanliness standards. Initial particle count of 24/22/17 with API 614 screen rating 5 improved to a final count of 14/12/8 with screen rating 1, supporting protection of turbine bearings and tight-tolerance components.

Contamination was more severe than anticipated, requiring seven reservoir decontaminations versus the proposed three. The team also addressed a broken selector valve and complications following a previous remediation attempt through systematic decontamination, enhanced filtration and bulk tank cleaning.

The methodology used throughout the 45-day project positioned the turbine generator systems for reliable operation.

100%	100%	100%	100%
Project Safety Record	Project Environmental Stewardship Record	Project Results Guaranteed	Project Success



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