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PROJECT: 631200

Technical Case Study Report

Off-Line System Decontamination and Slip-Stream Purification Process

Site Location: Wyoming, USA

Project Number: #631200

Asset ID: Two Hydraulic Systems

Asset Description: EHC System

Overview

Frontline Global Services performed Off-Line System Decontamination and Slip-Stream Purification on two hydraulic systems, each with a 35 USG capacity. Purification was required to remove system contaminants before commissioning, supporting reliable performance and protecting critical hydraulic components. The report states the project was completed in 3.5 days.

Project Objectives

- **Prioritize Safety:** Conduct all operations safely, protecting personnel and equipment while minimizing equipment downtime.
- **Eliminate System Contamination:** Perform Slip-Stream Purification to remove contaminants and support the long-term integrity of the hydraulic systems.
- **Verify and Document Performance:** Validate each stage through real-time ISO 4406:1999 laser particle counting, capturing data and observations for QA records and client review.
- **Meet Cleanliness Standards:** Achieve ISO 16/14/11 or better per project specifications.

Methodology

The restoration of the two hydraulic systems required a focused Slip-Stream Purification approach to address fluid contamination. Initial access was delayed one day due to closure of the site badging office; service commenced the following day.

The process utilized the existing hydraulic oil per the customer's direction and slip-stream purification equipment. Once purification operations began, the team cycled each system to return fluid from the system back to the reservoir for processing.

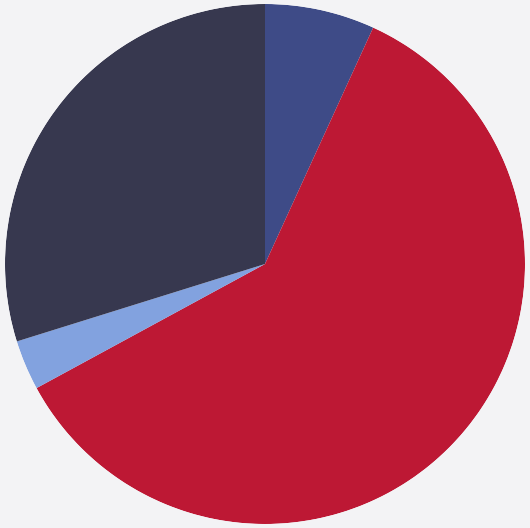
The team implemented multiple purification cycles on both systems. Real-time ISO 4406:1999 laser particle counting documented progressive contamination reduction; the project report records final on-site counts below the ISO 16/14/11 target.

Process

1. **Site Access and Setup:** Mobilized equipment; initial site access was delayed one day.
2. **System 1 Initiation:** Started slip-stream purification and cycled the hydraulic system to return fluid to the reservoir.
3. **Initial Inspection:** Recorded the initial on-site particle count for System 1.
4. **Purification Cycles:** Repeated purification and monitored particle counts in real time.
5. **System 2 Processing:** Repeated the purification and monitoring process on the second hydraulic system.
6. **Final Testing:** Recorded final on-site particle counts for both systems.
7. **Validation and Turnover:** The systems were released for client commissioning, according to the project report.

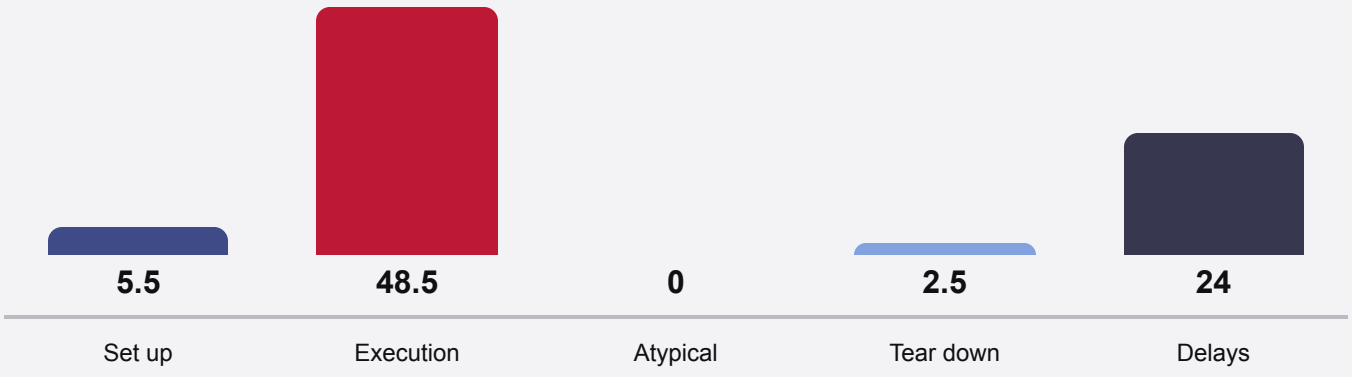
Key Project Metrics

Total Project Hours: 80.5



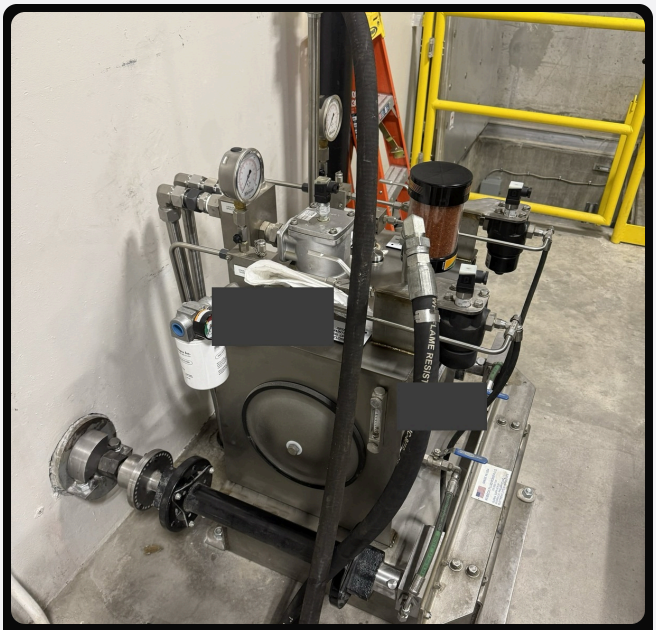
- **Project Set Up**
  5.5 hours · 6.8%
- **Project Execution**
  48.5 hours · 60.2%
- **Atypical Project Execution**
  0 hours · 0.0%
- **Project Tear Down**
  2.5 hours · 3.1%
- **Delays**
  24 hours · 29.8%

Hours by Category

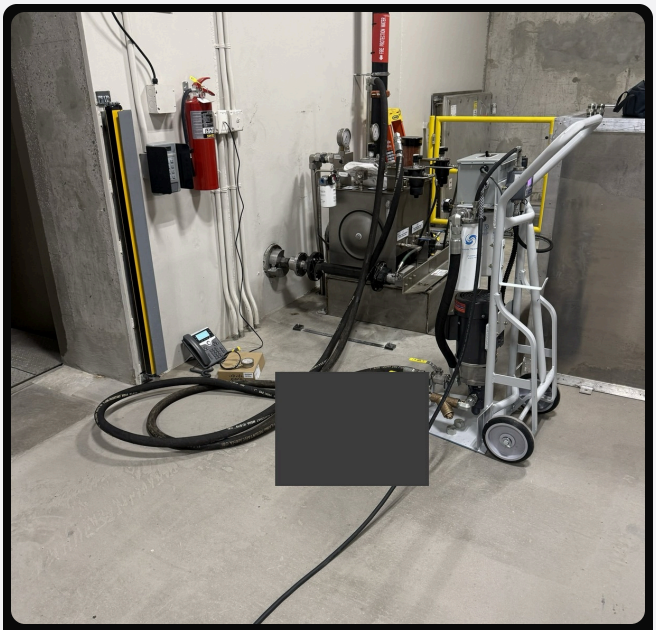


Project Milestones

System Purification Equipment



Purification Equipment



Purification Equipment Setup

Project Milestones

Hydraulic System 1



Initial On-Site Particle Count: 18/17/9



Final On-Site Particle Count: 12/8/0


Final Samples - System 1

Project Milestones

Hydraulic System 2



Initial On-Site Particle Count: 18/15/11



Final On-Site Particle Count: 12/11/10

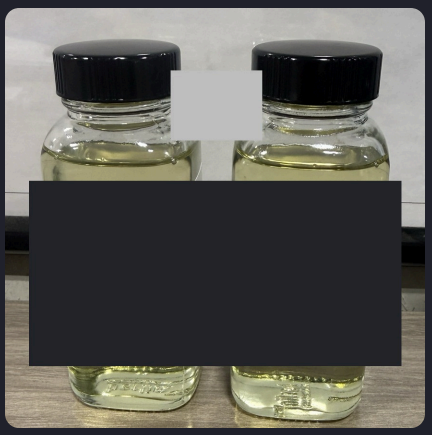

Final Samples - System 2

Project Summary

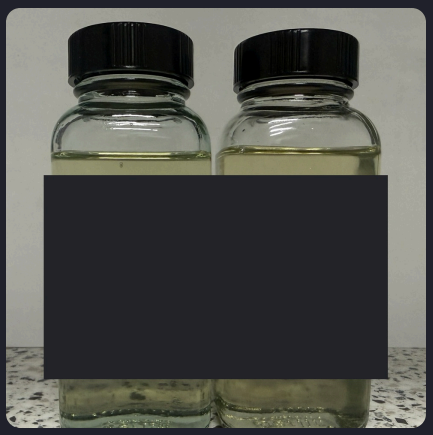
- **Efficient & Safe:**
  The report describes a one-day access delay and completion over 3.5 days, using systematic Slip-Stream Purification before commissioning.

- **Increased Equipment Reliability:**
  Removing built-up contaminants through systematic purification positioned both hydraulic systems to operate with reduced risk of downstream component damage or failure.

- **Target Cleanliness Achieved:**
  Final on-site counts were 12/8/0 for System 1 and 12/11/10 for System 2 against the ISO 16/14/11 target. Independent laboratory samples reported 17/15/12 and 15/13/09, respectively; their timing relative to final on-site readings is not established.



System 1 Samples



System 2 Samples

Conclusion

The Frontline team performed Slip-Stream Purification on both hydraulic systems. The project report records System 1 changing from ISO 18/17/9 to 12/8/0 and System 2 from 18/15/11 to 12/11/10. Contamination removal supports protection of sensitive hydraulic components and reduction of premature wear.

After a one-day access delay, the team adapted the schedule and used systematic cycling and purification to support the systems' commissioning. Independent laboratory samples are reported separately in the appendix.

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



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Appendix

Independent Laboratory Results — System 1

The laboratory assessed the sample as **normal**. ISO cleanliness code: **17/15/12**. The laboratory noted a moderately higher particle level than System 2 and repeated the particle analysis for verification. This result is above the project target.

The laboratory's assessment is separate from the project target of 16/14/11 and from the on-site readings reported on pages 7–8. Sample timing relative to those readings is not established.

Equipment Condition										Normal		Fluid Condition							Normal
Ferrous Debris	Wear Metals (ppm)											Fluid Properties		Additive Metals (ppm)						
Ferrous ppm	Iron (Fe)	Copper (Cu)	Tin (Sn)	Lead (Pb)	Chromium (Cr)	Nickel (Ni)	Aluminum (Al)	Titanium (Ti)	Silver (Ag)			Viscosity 40°C cSt	Acid Number (mg KOH/g)	Calcium (Ca)	Magnesium (Mg)	Zinc (Zn)	Phosphorus (P)	Barium (Ba)	Molybdenum (Mo)	Antimony (Sb)
0	0	0	1	0	0	0	0	0	0			16.1	0.42	16	63	355	300	0	0	0
20	20	20	10	10	5	5	15	5	5			14 - 17	0.8	-	-	-	-	-	-	-
30	25	25	20	20	10	10	20	10	10			13 - 17	0.9	-	-	-	-	-	-	-
-												-	-							

Sample Contamination												Normal
Fluid	Contaminant Metals (ppm)					Particle Count (particles / mL)						
H2O ppm	Silicon (Si)	Sodium (Na)	Boron (B)	Potassium (K)	Vanadium (V)	ISO Cleanliness Code Based On 4/6/14	> 4 µm	> 6 µm	> 14 µm	> 21 µm	> 38 µm	Test Technique
51	6	0	0	0	0	17/15/12	1160	277	26	7	1	Laser
200	10	40	10	15	10	19/17/14	-	-	-	-	-	-
300	20	40	20	30	20	20/18/15	-	-	-	-	-	-
-												

Results apply only to the sample tested as received and are subject to the laboratory's methods, measurement uncertainty and stated limitations.

Appendix

Independent Laboratory Results — System 2

The laboratory assessed the sample as **normal**. ISO cleanliness code: **15/13/09**. The laboratory stated that particle count results indicated good cleanliness.

The laboratory's assessment is separate from the project target of 16/14/11 and from the on-site readings reported on pages 7–8. Sample timing relative to those readings is not established.

Equipment Condition										Normal								
Ferrous Debris	Wear Metals (ppm)									Fluid Properties		Additive Metals (ppm)						
Ferrous ppm	Iron (Fe)	Copper (Cu)	Tin (Sn)	Lead (Pb)	Chromium (Cr)	Nickel (Ni)	Aluminum (Al)	Titanium (Ti)	Silver (Ag)	Viscosity 40°C cSt	Acid Number (mg KOH/g)	Calcium (Ca)	Magnesium (Mg)	Zinc (Zn)	Phosphorus (P)	Barium (Ba)	Molybdenum (Mo)	Antimony (Sb)
0	0	0	0	0	0	0	0	0	0	16.0	0.48	17	68	372	316	0	0	0
20	20	20	10	10	5	5	15	5	5	14 - 17	0.8	-	-	-	-	-	-	-
30	25	25	20	20	10	10	20	10	10	13 - 17	0.9	-	-	-	-	-	-	-
-										-	-							

Fluid Condition	Normal

Sample Contamination												Normal
Fluid	Contaminant Metals (ppm)					Particle Count (particles / mL)						
H2O ppm	Silicon (Si)	Sodium (Na)	Boron (B)	Potassium (K)	Vanadium (V)	ISO Cleanliness Code Based On 4/6/14	> 4 µm	> 6 µm	> 14 µm	> 21 µm	> 38 µm	Test Technique
51	4	0	0	0	0	15/13/09	228	55	4	1	0	Laser
200	10	40	10	15	10	19/17/14	-	-	-	-	-	-
300	20	40	20	30	20	20/18/15	-	-	-	-	-	-
-												

Results apply only to the sample tested as received and are subject to the laboratory's methods, measurement uncertainty and stated limitations.