



Integrated Waste Treatment Unit

Joel Case

Assistant Manager
INTEC Programs

Trent Neville

IWTU Operations Activity Manager

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EM *Environmental Management*

safety ❖ performance ❖ cleanup ❖ closure

Idaho Cleanup Project

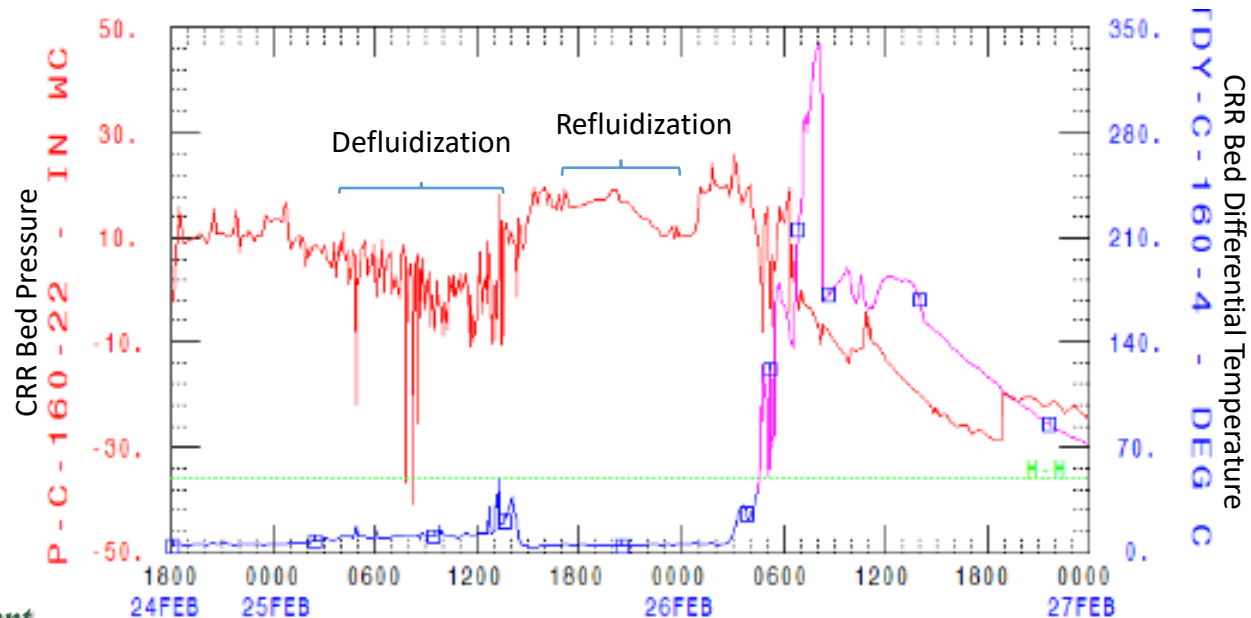
IWTU Update Agenda

- Carbon Reduction Reformer (CRR) de-fluidization event
- Process Gas Filter (PGF) assembly & inspection results
- PGF issue resolution & path forward
- CRR inspection results
- CRR issue resolution & path forward
- Additional unplanned outage scope
- Nitrogen update
- Path to radiological operations



CRR de-fluidization event summary

- Experienced a rapid system shutdown (RSS) on 23 Feb 2022 due to the loss of steam flow indication during maintenance activity
- Restored simulated waste feed ~24 hours later
- Observed CRR bed differential temperature steadily increasing ~ 12 hours later
- Operations secured feed and transitioned to fluidizing nitrogen to stabilize CRR
- Performed series of PGF blowbacks to investigate possible excessive carbonate bypass
- Observed CRR bed differential temperature increase dramatically following blowbacks
- Initiated plant shutdown for vessel inspections
- Suspected cause:
 - Excess carbonate bypass from the PGF formed agglomerations in the CRR
 - Agglomerations caused increasing bed differential temperature and pressure fluctuations
 - Agglomerations ultimately de-fluidized the CRR bed



PGF bundle assembly design

INCONEL® X-750 Wave Springs

Used to provide the force to seal the filter element and fuse gaskets

INCONEL® 718 Clamp Bolts

Provide the force to compress the wave springs

INCONEL® 718 Belleville Washers

Used to live load the joint between the bundle tube-sheet and venturi block

Thermiculite® 867 MRG Gaskets

Responsible for sealing the filter to the bundle tube-sheet and the failsafe fuse to the filter

Modified Filter Bundle Components

Bundle Tube Sheet and Venturi Block

Refractron SF15 SiC Filters

Replacement filters for the existing INCONEL® 625 sintered metal filters

MRG – metal reinforced gaskets
SiC – silicon carbide

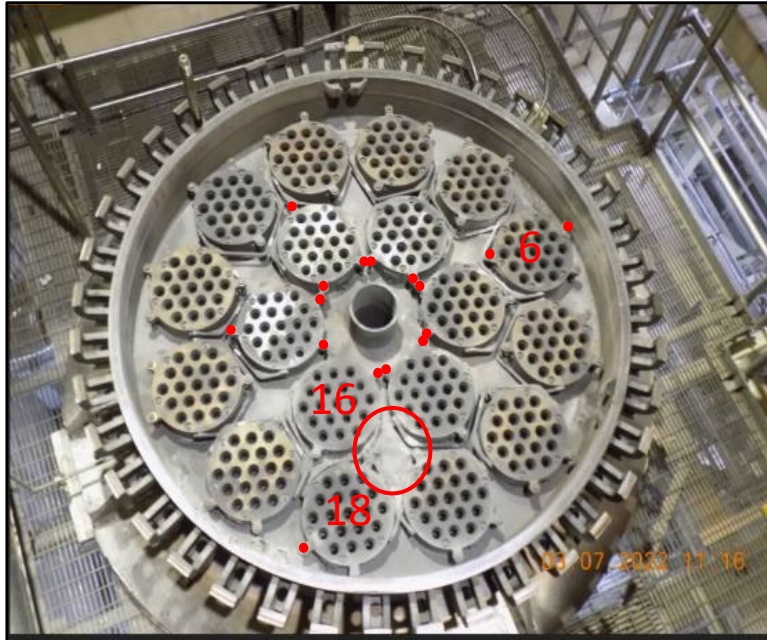


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PGF inspection results



Loose hold down hardware (red dots)
Accumulation of carbonate bypass (circled)



Two broken elements in bundle #16
Sent for failure analysis at Dominion Engineering

Required tie-down hardware preload and/or
surface seal was not developed or maintained
on two bundle assemblies



Closeup of carbonate accumulation
on tube sheet near bundle #18



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PGF inspection results cont'd



PGF bundle main gaskets intact but showed evidence of bypass



New PGF bundle



Potential interference between sub tubesheet and main tubesheet; debris inside tie down lugs



PGF bundles relatively clean with no bridging/excessive material build up indicating effective blowbacks



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PGF issue resolution & path forward

- Conducted joint design review
- Cleaned, inspected and measured all mating surfaces
 - Vessel main tubesheet
 - Hold down lugs
 - Filter bundle sub tubesheets
- Implemented minor design changes
 - New bolting hardware material
 - New positive locking mechanism
 - Revised installation instructions, measurements and inspections
- Re-assembled PGF vessel
- Mockup Testing at Hazen
 - Attempt to induce agglomerations
 - Investigate recovery/mitigation strategies



Prototype locking mechanism



CRR inspection results



Shallow cracks in refractory



Nominal CRR piping penetration



Eroded CRR piping penetration

Sample CRR bed agglomeration;
less than 150 lbs of agglomerate
from nearly 7000 lbs of bed material



Refractory in good shape
overall with minor cracking,
spalling and erosion which
should be correctable with
minor repair work



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CRR issue resolution & path forward

- Refractory inspected and repaired by industry expert
 - JT Thorpe
- Begin fabricating spare piping penetrations
 - Install in a future outage
- Reduce CRR bed high differential temperature alarm
 - Earlier warning of potential bed de-fluidization
- Revise procedures to direct controlled shutdown sooner
 - Reduce impact of potential CRR bed agglomerations

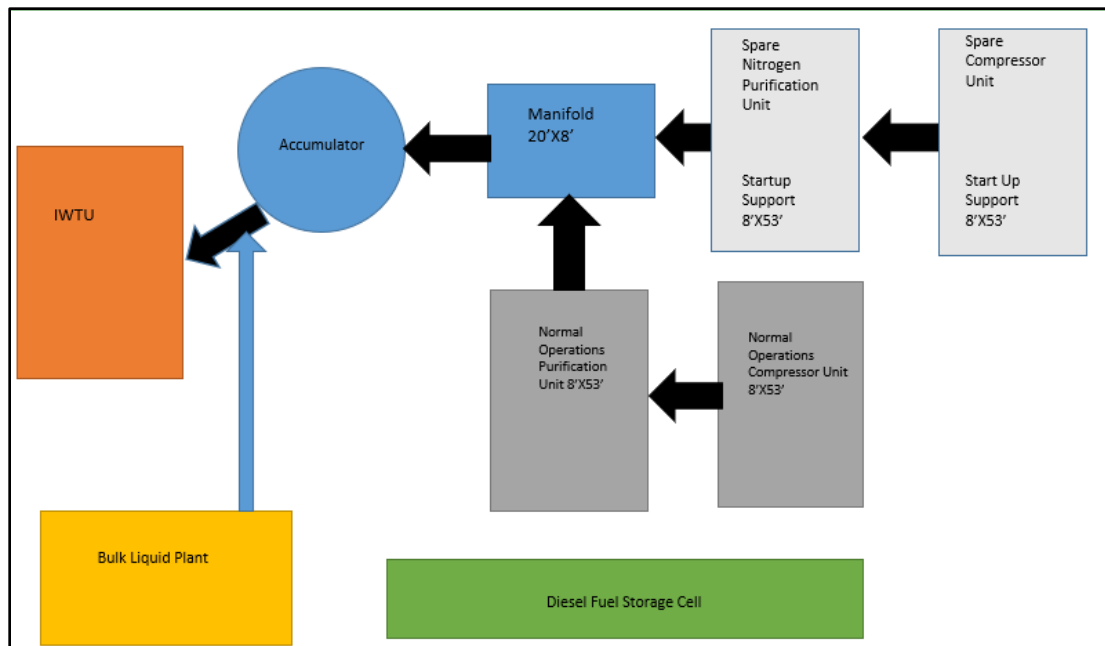


Additional unplanned outage work

- Continuous emissions monitoring system A/C re-wire - complete
- GAC sample & analysis - complete
- Wet Decon component rebuild - in progress
- 250 blower control system tie-in - complete
- PRF vent valve actuator re-build/repair - in progress
- Replace control system UPS batteries - complete
- 240A blower new style seal install - complete
- Other emergent corrective maintenance - as needed



On-site nitrogen generation update



Notional portable nitrogen plant layout



1525/350 Sullair Compressor



Containerized nitrogen equipment (8' x 40')



Accumulator trailer



Generon nitrogen membranes



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IWTU Path to Radiological Operations

✓ Outage J

- implement necessary plant modifications to support sustained operations

✓ Contractor Readiness Assessment

- verification of readiness to safely resume simulant operations

✓ DOE Readiness Assessment

- independent federal verification of readiness to safely resume simulant operations
- **Unplanned vessel inspection outage (completing vessel and plant re-assembly)**
 - Inspect PGF & CRR vessels and implement corrective actions
- **Confirmatory Run (will resume after unplanned vessel inspection outage)**
 - verify modifications, plant, and process meet objective test criteria for sustained operations
- **Radiological Readiness Assessments (during confirmatory run)**
 - additional contractor and federal verification of readiness under simulated radiological plant conditions
- **PGF Inspection Outage (planning well underway)**
 - short duration outage to perform inspections and address emergent equipment issues
- **EM-HQ authorization**
 - EM 3.1 approval required to commence radiological operations
- **System Performance Test**
 - simulant start-up with gradual introduction of SBW followed by regulatory required off-gas sampling
- **Routine waste processing operations**



Q&A

Questions?



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