Idaho Cleanup Project

Treatment of the Sodium Bearing Waste at the Idaho Nuclear Technology and Engineering Center by Steam Reforming

By

James Law and Bradley Mason

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INTRODUCTION

- There are about 1 million gallons of Sodium Bearing Waste that needs to be processed at INTEC.
- Steam reforming was selected as the preferred technology to treat the waste, the THOR® process was selected.
- The waste will be treated as remote handled TRU waste and will be sent to WIPP pending final waste determination by DOE.
- Steam reforming can also treat waste as high level waste and package for Yuca mountain.

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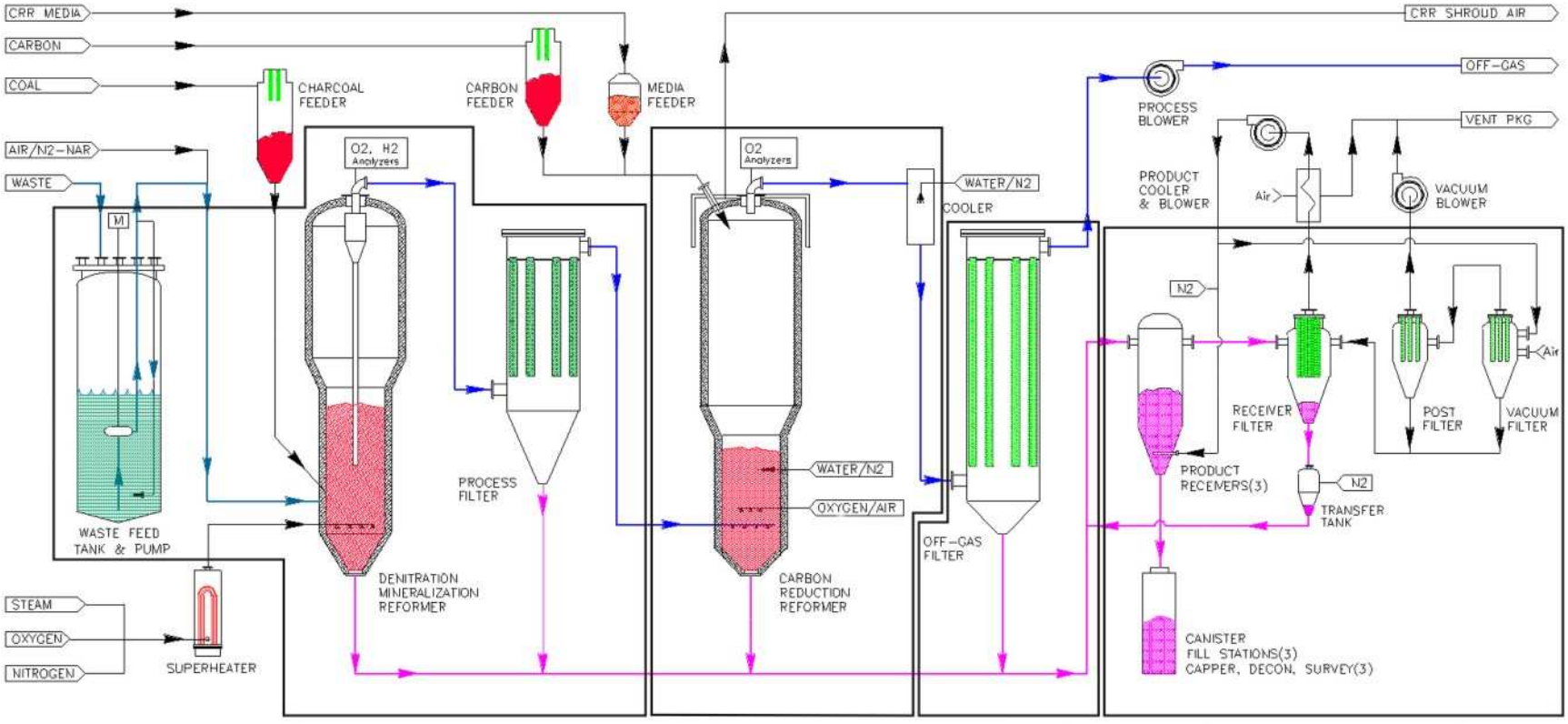
PROCESS DESCRIPTION



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DESIGN STATUS

- Preliminary design is completed.
- Pilot testing was factored into preliminary design.
- Final design will be completed early next year.
- Construction start: early site prep this summer most construction startup in the spring.
- Hot start-up: end of calendar year 2009.

Pilot Plant Testing

- A 1/10th scale pilot facility was built at Hazen Research in Golden Colorado.
- All process units were included in the pilot facility except the packaging system.
- A total of 7500 gallons of simulated sodium bearing waste was processed.
- The testing demonstrated integrated operations of the facility and provided information to the design team.

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SCOPING TEST CONDITIONS

Test Number	Feed	Feed Rate (gal/min)	DMR Additive	DMR Temp (ºC)	CRR Additive	CRR Temp (ºC)
S-1	Water	0.10	None	680	Clay	1050
S-2	SBW	0.10	None	680	Clay	1050
S-3	SBW	0.25	None	680	Clay	1050
S-4	SBW	0.20	Clay	620	Clay	1000
S-5	SBW	0.20	Clay	620	Clay	850
S-6	SBW	0.20	Clay	650	Clay	850
S-7	SBW	0.20	Clay	590	Clay	850
S-8	SBW	0.20	Clay	670	Clay	950

PRODUCTION TEST CONDITIONS

Test Number	Feed	Feed Rate (gal/min)	DMR Additive	DMR Temp (°C)	CRR Additive	CRR Temp (°C)
P-1	SBW[1]	0.25	None	640	Clay	950
P-2A	SBW + 80 g/l UDS[2]	0.25	None	640	Clay	950
P-3B	SBW + 80 g/l UDS + Heavy Metals	0.25	None	640	Clay	950
P-4A-1	SBW + 80 g/l UDS + Heavy Metals + POHC	0.25	None	670	Clay	850
P-4A-2	SBW + 80 g/l UDS + Heavy Metals + POHC	0.25	None	600	Clay	850
P-4A-3	SBW + 80 g/l UDS + Heavy Metals + POHC	0.25	None	600	Clay	1050
P-4A-4	SBW + 80 g/l UDS + Heavy Metals + POHC	0.25	None	670	Clay	1050
P-4A-5	SBW + 80 g/l UDS + Heavy Metals + POHC	0.35	None	670	Clay	1050
P-4A-6	SBW + 80 g/l UDS + Heavy Metals + POHC	0.35	None	600	Clay	850
P-5	SBW + 120 g/l UDS + Heavy Metals	0.25	None	640	Clay	950
P-6	10% SBW + 120 g/l UDS + Heavy Metals	0.25	$Al(NO_3)_3$	600	Clay	950

PRELIMINARY TEST RESULTS

- NO_X reduction in the DMR was 85-95% and the overall NO_X reduction was from 92-99%.
- The CO concentration ranged between 9 – 60% of the Hazardous Waste Combustor (HWC) MACT limit for CO of 100 ppm (dry at 7% O2).
- DMR outlet H_2 levels ranged between about 0.4% to 1.2% (wet basis).
- Mercury removal efficiencies in the GAC beds should comply with MACT requirements, but more testing is needed due to system leakage.

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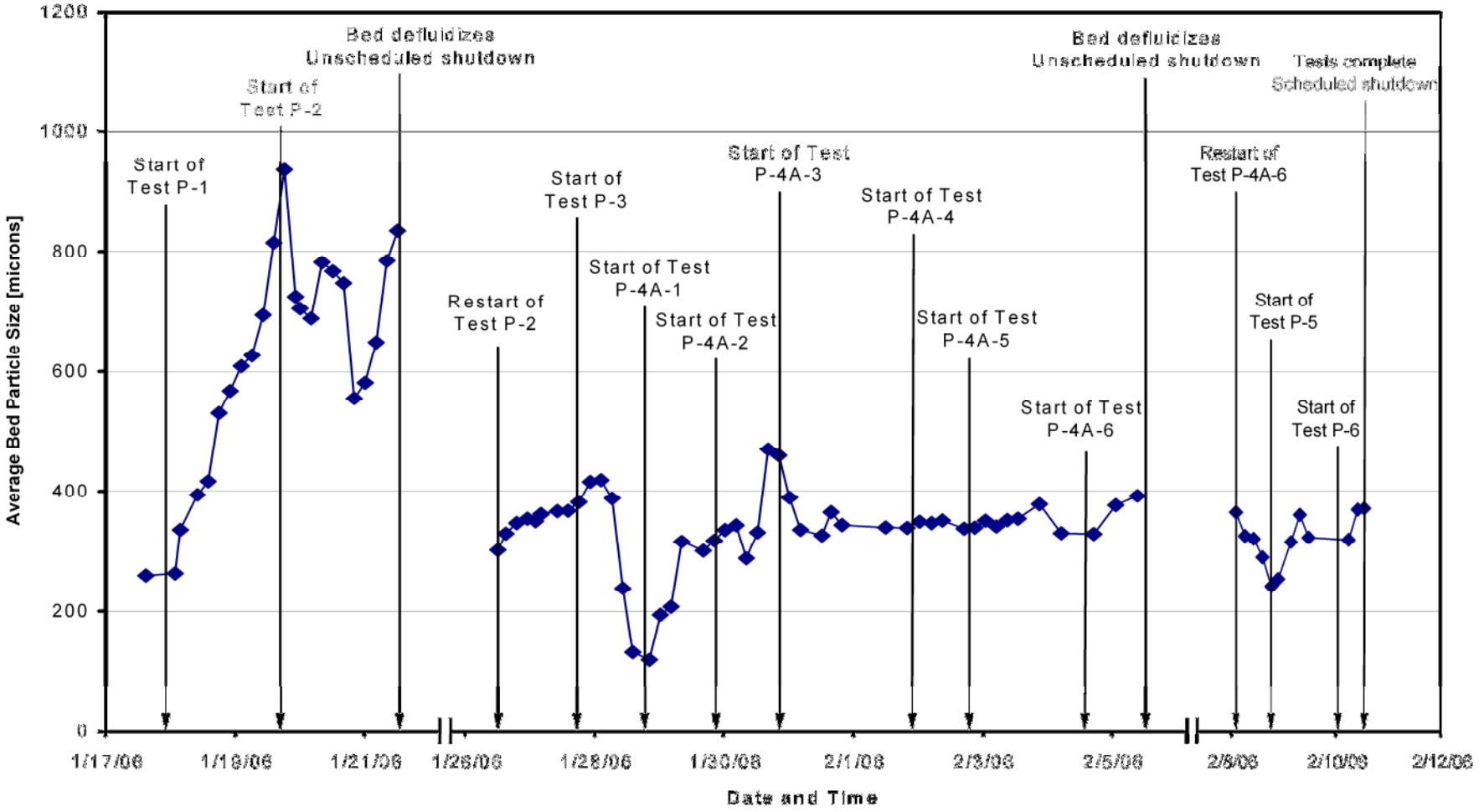
PARTICLE SIZE CONTROL



EQUIPMENT ISSUES

- Feed nozzle plugging was very common and several designs had to be used.
- The sintered metal filters did not maintain there integrity based on inspections after the testing.
- The internal cyclone downcommer had to be redesigned during the scoping tests the final design worked well.

OVERALL CONCLUSIONS

- Demonstrated safe, reliable, predictable series operation of the DMR, CRR, and downstream offgas system during production tests.
- Demonstrated that process gas from the DMR fully fluidized the CRR media at operating temperatures.
- Demonstrated that pressure drops across the process unit operations were within design basis.
- Demonstrated that material flows, pressures, and temperatures from the DMR through the process system matched the mass and energy balance used to design both the Hazen pilot plant and the IWTU.

ADDITONAL TESTING

- Phase two testing will start in mid May.
- Quantify inert particle usage for maintaining particle size control when SBW without UDS is processed.
- Confirm product mass and density when processing SBW without UDS (this provides longer term operations at test conditions similar to production run #1). Utilize data to provide more reliable estimate of canister count when processing SBW without UDS.
- Confirm mercury emissions will meet MACT criteria.
- Test different materials and types of sintered metal filters.