DEMOLITION OF A SHALLOW BED AND RECONSTRUCTION OF A DEEP BED SINTERING POT FACILITY AT THE COLERAINE MINERALS RESEARCH LABORATORY JANUARY 2008 THROUGH OCTOBER 2009

October 15, 2009

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CMRL/TR-09-08
NRRI/TR-2009/32

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Demolition of a Shallow Bed and Reconstruction of a Deep Bed Sintering Pot Facility
at the Coleraine Minerals Research Laboratory
January 2008 through October 2009

Objective: To complete the program in two phases, as follows: during the first phase (Jan. 2008 – Mar. 2008) the existing sinter equipment was made operable in order to perform sinter tests for two clients. In the second phase, old equipment was demolished, removed and replaced with new equipment (Jan. 2008 – Oct. 2009).

Background: In 2007, interest was expressed in using the CMRL sintering pot test equipment. The decision to proceed with test programs led to installation of a new ignition burner and Programmable Logic Controller (PLC), both required before sintering tests could be conducted. Two complete sinter test programs were conducted for two major steel producers in 2008.

The original sinter test equipment at Coleraine dates back to the 1960's. It consisted of a sinter pot with maximum depth of 16 inches and a suction fan limited to 40 inches water suction. The equipment was last operated in 1996. Prior to the first test program, extensive cleaning and repair was required to make the system operational. This renovation took place during the first phase of sinter renovation. It included construction of a new burner hood, installation of a new code-compliant gas train, and addition of a PLC-computer data logging system.

The test facility was re-commissioned in early 2008 and was used to perform two sinter programs during the year, the last test being fired in late December. The system operated without problem, but was limited by pot depth (16 inches) and wind box suction (40 inches water). It was not representative of current sinter practice, which utilizes deeper beds (up to 28 inches) and higher suction (up to 70 inches water). Furthermore, the original system used water injection to cool wind box exhaust gases upstream of the suction fan. The water injection system also resulted in corrosion and flow measurement problems.

In May 2008, one client expressed strong interest in re-building the facility to accommodate deep beds (26 inches). This interest resulted in a proposal to replace essentially everything except the burner hood and PLC control panel. In October the client withdrew from funding the rebuild. Subsequent discussion within NRRI/CMRL resulted in a project funded by Permanent University Trust Funds (PUTF) to carry out the second renovation phase.

Demolition began in early 2009, and the new facility was completed by late September 2009. Several test pots were fired to ensure that the equipment would perform as designed.

Description

Phase I: During this phase, a new granulation drum with water spray addition was fabricated. A new burner hood was designed, fabricated and tested. The old burner and gas train were replaced with code-compliant equipment. Approximately 87 sinter tests were fired in 2008 following these modifications. Figure 1 shows the new granulation drum. Figure 2 shows the new burner hood and sinter wind box. Figure 3 shows the exhaust gas piping arrangement with water quench tank. Figure 4 provides a view of the piping leading to the orifice flow meter and suction fan.

Phase II: Noramco Engineering provided design, piping and layout drawings. Coleraine personnel carried out most of the fabrication and installation. Marshall Nelson and Associates provided PLC programming and control. All exhaust piping, the suction fan and non-compliant electrical service equipment were removed and were replaced by new stainless steel piping, a dual chamber Venturi gas scrubber, and variable speed blower. Additional programming, thermocouple inputs and pressure control were added to the PLC. A new Pitot tube flow meter was installed upstream of the gas scrubber for exhaust gas flow measurement.

The new blower has demonstrated capability to maintain at least 65 inches of water vacuum at the wind box. It has the capacity to pull higher suction, but has not yet been fully tested to find the upper limit. Wind box suction is controlled through a variable speed drive. Additional thermocouples were added to monitor three temperature points in the wind box, as well as blower inlet and blower outlet temperatures. All new temperature points are recorded in the data logging system. Figure 5 shows new exhaust piping with the old sinter pot in place. Figure 6 shows the new deep pot. Figure 7 shows the gas scrubbing system, and Figure 8 shows the new exhaust blower.

Commissioning Tests: The equipment has been commissioned and tested, firing six sinter pots. It is ready for a formal test program. One of the clients from 2008 has donated sinter mix samples for this program, since the client has no further need of the materials. The materials have been blended and analyzed for chemistry and structure.

Capital Expenditure Summary: A summary table detailing renovation costs, completed sinter projects, and estimated costs for 2009 is provided below.

Sinter Demolition and Renovation Summary

	FY 07-08	FY 08-09	FY 09-10	Totals
PUTF Transfers	$130,209.00	$179,660.00	$30,000.00	$339,869.00

Description	Expenditures				
Total Salaries and Fringe	$50,804.51	$53,904.19	$50,342.67	$155,051.37	
Total Supplies	$9,067.72	$15,728.01	$9,916.06	$34,711.79	
Professional Services		$12,610.13	$444.00	$13,054.13	
Equipment Leases			$392.00	$392.00	
Total Equipment Acquisitions		$74,416.00	$3,573.74	$77,989.74	
Repairs/Maintenance/Maint. Supplies		$12,381.51	$3,094.03	$15,475.54	
Total Indirect	$15,369.49	$8,741.58	$2,652.02	$26,763.09	
					Balance
Sub-Total	$75,241.72	$177,781.42	$70,414.52	-$323,437.66	$16,431.34

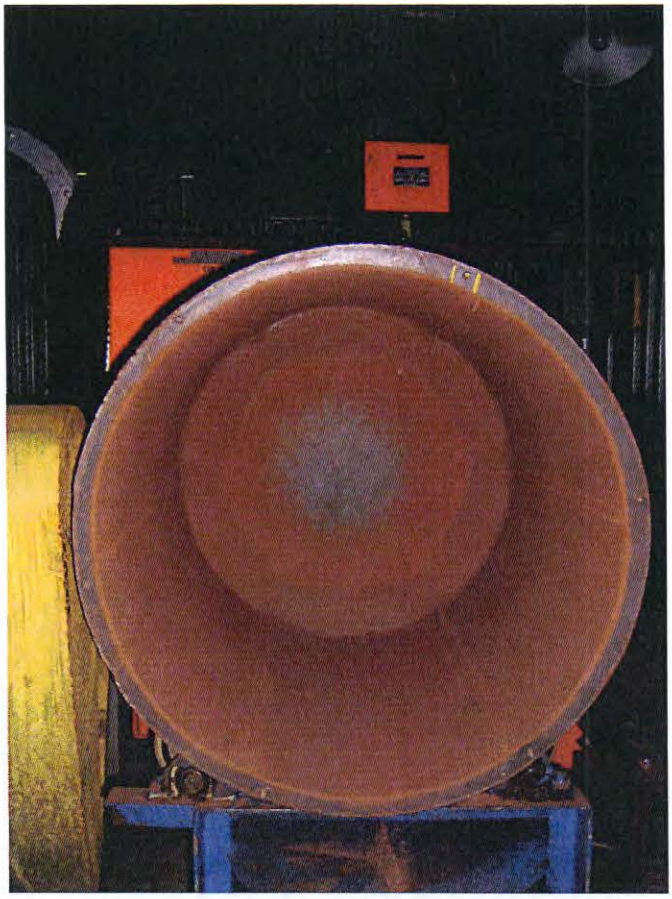

Figure 1 Granulation Drum Fabricated During Phase I Renovation

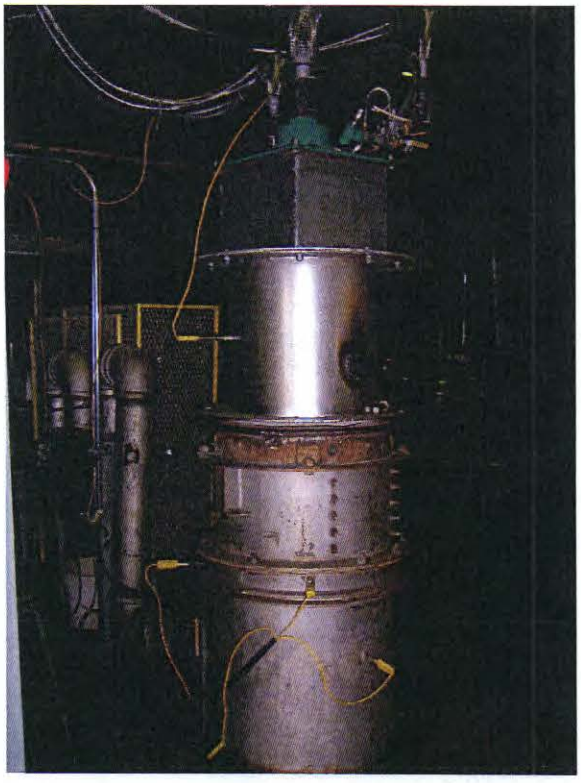

Figure 2 New Burner Hood with Existing Wind Box and Exhaust Piping

Figure 3 Original Exhaust Piping with Water Quench Tank

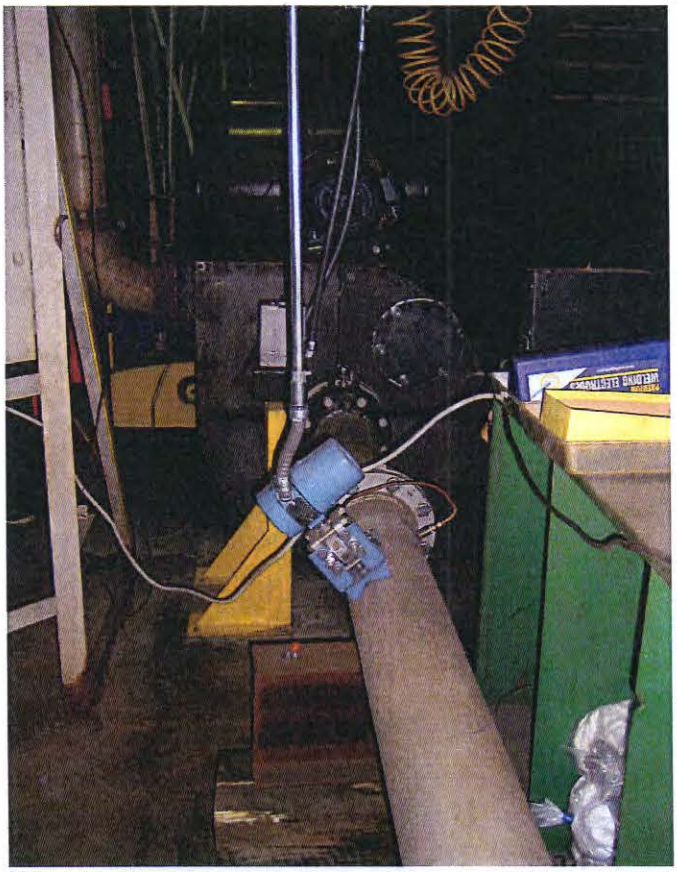

Figure 4 Exhaust Piping and Existing Suction Fan

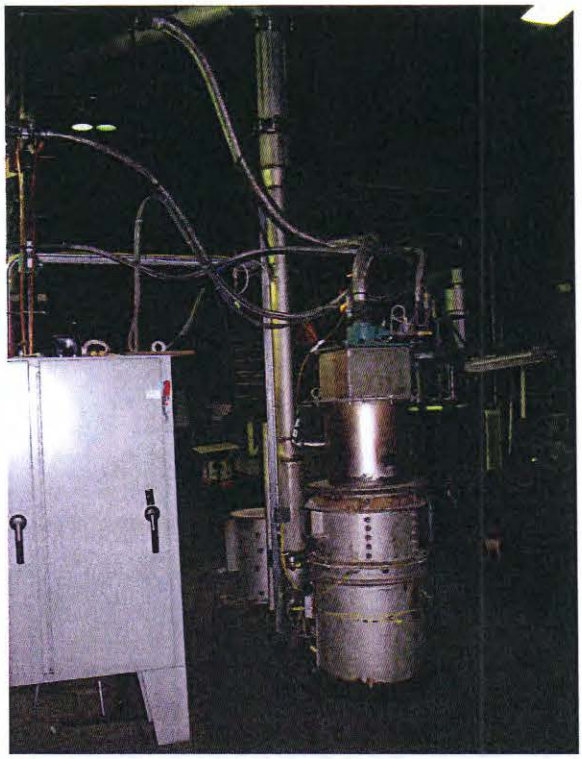

Figure 5 New Exhaust Piping with Old Sinter Pot

Figure 6 New Deep (26 inch) Sinter Pot

Figure 7 Gas Scrubbing and Exhaust Piping

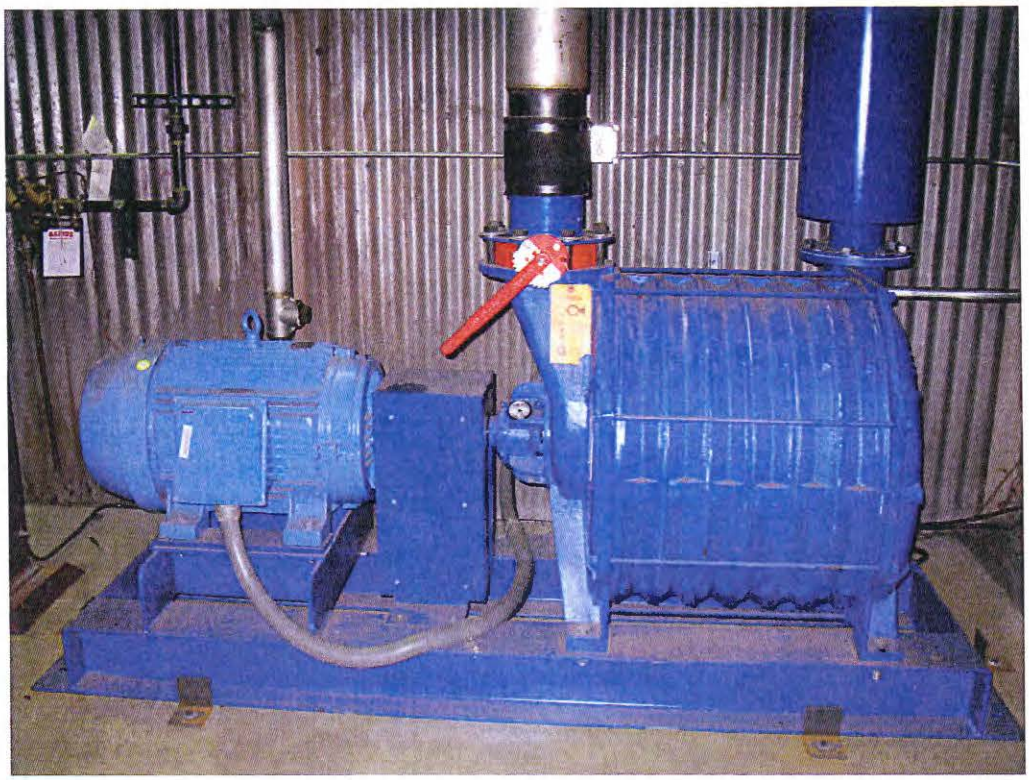

Figure 8 New Exhaust Blower