RECEIVED

JUL 09 2010

BUREAU OF
AIR REGULATION

KOOGLER & ASSOCIATES, INC.
ENVIRONMENTAL SERVICES
4014 NW 13th STREET
GAINESVILLE, FL 32609-1923
352/377-5822 ▪ FAX/377-7158

KA 624-08-04
July 7, 2010

Ms. Christy Devore
Bureau of Air Regulation
Department of Environmental Protection
2600 Blair Stone Road, MS # 5500
Tallahassee, Florida 32399-2400

SUBJECT: Summary Report and December 7, 2009 RAI, Item 2, Response
Suwannee American Cement – Branford, Suwannee County
DEP File No. 1210465-016-AC (PSD-FL-259G), Permit No. 121-465-017-AC
Alternative Fuel Materials Testing – SAC Cement Kiln

Dear Ms. Devore:

This letter provides the Summary Report required by permit 1210465-016-AC, Specific Condition 10. and response to your Request for Additional Information letter to Tom Messer of Suwannee American Cement dated December 7, 2009 which similarly requested results of the initial short-term operational test. Enclosed are (4) copies of the report. In accordance with Rule 62-4.050(3), I have sealed this letter with enclosure as certification by a professional engineer. On behalf of Suwannee American Cement, I look forward to working with you to continue this project. With additional data collection Suwannee American Cement and Gerdau recognize an opportunity to improve the quality of this material both as fuel source and recognize its potential for environmental benefits. I trust this response addresses the information of your request and appreciate your review.

Please feel free to contact me at (352) 377-5822 or mlee@kooglerassociates.com if you have any questions regarding this submittal.

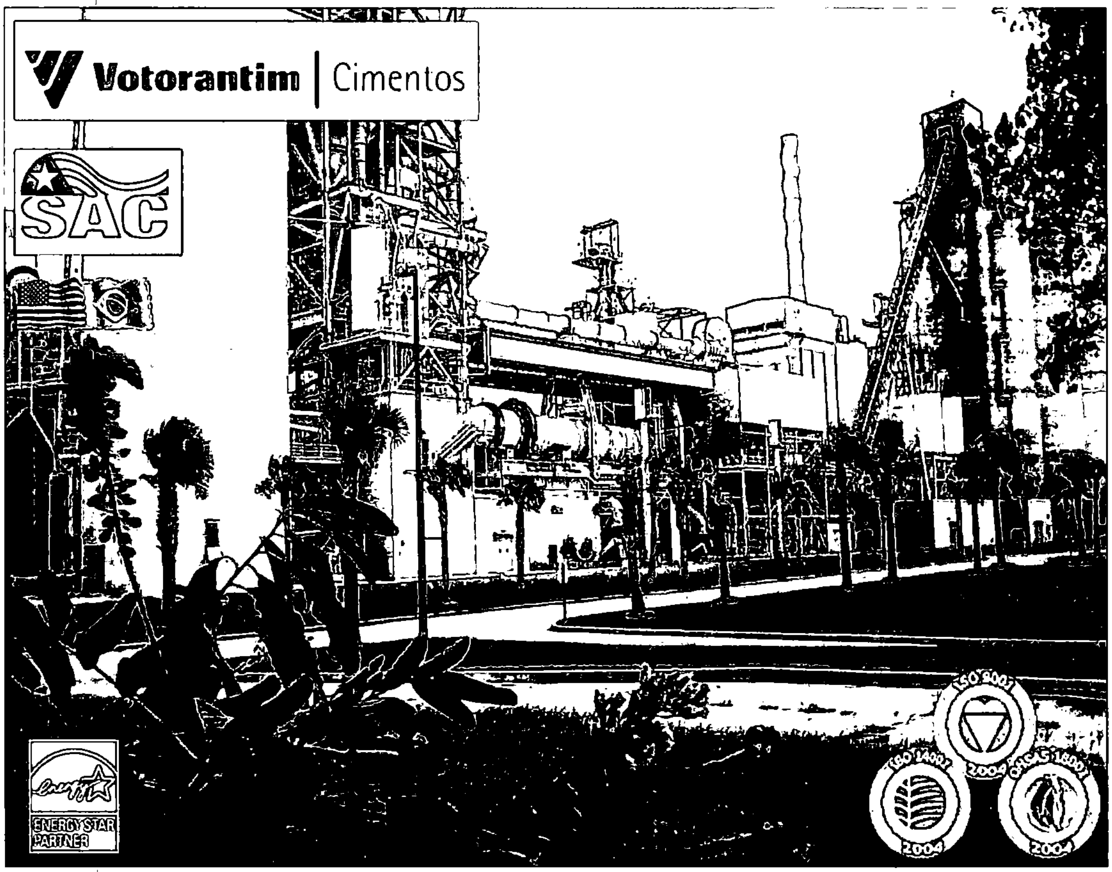
Sincerely,

Mark Lee, Ph.D., P.E.

7/7/10
Date
P.E. Seal 58091

Cc: via email
Trina Vielhauer, FDEP: Trina.Vielhauer@dep.state.fl.us
Jeff Koerner, FDEP: Jeff.Koerner@dep.state.fl.us
A.A. Linero, FDEP: alvaro.linero@dep.state.fl.us
Chris Kirts, FDEP NED: christopher.kirts@dep.state.fl.us
Greg Strong, FDEP NED: greg.strong@dep.state.fl.us
Kathy Forney, EPA Region 4: forney.kathleen@epa.gov
Heather Abrams, EPA Region 4: abrams.heather@epa.gov
Ken Feely, EPA Region 4: feely.ken@epa.gov
Larry Fitchhorn, EPA Region 4: Fitchhorn.Larry@epa.gov
Joe Horton, SAC: jbhorton@vcnainc.com
Celso Martini, SAC: cmartini@suwanneecement.com
Tom Messer, SAC: tomm@suwanneecement.com
Krishna Cole, SAC: krishnac@suwanneecement.com
James Wold, Gerdau Ameristeel : JWold@GerdauAmeriSteel.com

Enclosure: 4 copies-AC Permit Application RAI Response



Trial Burn Summary Report

Suwannee American Cement, LLC

5117 US HWY 27, Branford, FL 32008

Permit No. 1210465-017-AC

Authors: Krishna C. Cole

Max Lee, Koogler & Associates, Inc.

1. Executive Summary

Suwannee American Cement (SAC) performed its phase one test trial of auto shredder residue, also referred to as auto fluff, according to specifications stipulated by permit number 1210465-017-AC beginning on March 10, 2010 and ending on April 9th, 2010. During the trial period SAC consumed a total of 442 short tons of auto fluff; well below the permitted limit of 1,200 short tons. The primary purpose of this temporary trial period, to co-fire auto fluff with coal, was to research whether future use of auto fluff is feasible and practical for further consideration as an alternative fuel for SAC's cement kiln. Based on results from this test trial, SAC has demonstrated that properly prepared and segregated material is feasible for further consideration and research as an alternative fuel for the SAC cement kiln. Overall, the auto fluff fired into SAC's calciner combustion chamber demonstrated the following positive attributes: high volatility, significant energy content, and insignificant changes in combustion emissions. Although, SAC experienced some difficulty in preparing the material for test trial, SAC has identified specific feasible engineering solutions which are described in further detail in this report. SAC urges the Florida Department of Environmental Protection (FDEP) to consider permitting SAC to conduct further research, over a longer time period, and with other suppliers. As noted in recent EPA publications, auto fluff, when properly generated can be a viable alternative fuel to conventional fuel (e.g., coal and oil).

Table of Contents

2. PROJECT BACKGROUND

Facility Description

Suwannee American Cement (SAC) operates an existing Portland cement manufacturing plant, which is categorized under Standard Industrial Classification Code No. 3241. The facility consists of a Portland cement plant, and raw material and cement handling operations. The plant combines raw materials and utilizes a preheater/precalciner kiln with in-line raw mill to produce clinker. The clinker is milled and combined with gypsum to produce Portland Cement. Annual production is limited to 965,425 tons per year of clinker production, and 1,191,360 tons per year of Portland cement production. The existing Branford Facility is located in Suwannee County at 5117 US HWY 27 in Branford, FL. The UTM coordinates of the existing facility are Zone 17, 321.4 km East, and 3315.9 km North. This site is in an area that is in attainment (or designated as unclassifiable) for all air pollutants subject to state and federal Ambient Air Quality Standards (AAQS).

Figure 2.1 Aerial view of Suwannee American Cement's Portland cement plant and associated limestone quarry.

Project History

Suwannee American Cement submitted an application on September 28, 2008 to conduct a six month trial burn of auto fluff. That application was given project number 1210465-016-AC and is currently pending. Because, there is no readily available information regarding use of auto fluff as a coal replacement in cement kilns in Florida, the FDEP agreed to a short-term test trial to determine if autofluff is suitable as an alternative fuel to conventional fuels. SAC applied for a permit to conduct the short term trial which was permitted on October 19, 2009 (Permit No. 1210465-017-AC) after a public comment period. After significant efforts to establish coordinated operations with the single supplier, Gerdau Ameristeel (GA), initial material preparation and efforts to ensure permit compliance, SAC began the test trial on March 10, 2010 and ended the trial on April 9, 2010.

Project Description

For this test trial, the autofluff supply was restricted to a single supplier of autofluff, Gerdau Ameristeel of Jacksonville, FL (Gerdau). Gerdau owns a large rebar manufacturing and automobile recycling facility in Baldwin, FL. Gerdau agreed, for this test trial, to produce auto fluff material to be free of contaminants to meet the restrictions of the permit, and to provide the necessary storage facility, handling equipment, and personnel to assist in the reprocessing of the auto fluff to a suitable consistency for introduction to SAC's pyroprocessing system. SAC arranged for the re-shredding and screening equipment for this process to be delivered to Gerdau and SAC supplied personnel onsite to assist in the re-processing operations and operation of the shredder and screening system. SAC contracted with Peninsula Equipment (a.k.a. Blanchard CAT) to rent a model GRDAK630 Doppstadt diesel powered grinder and model SCRSM 720 Doppstadt diesel powered screen and magnet for the duration of the test trial. Typically this equipment is used for shredding of construction debris or wood waste, but has also been used for shredding solid waste. Based on preliminary batch tests, the expected re-processing rate of auto fluff with the rented equipment was 10 tons per hour.

Figure 2.2 Image of a Doppstadt AK 430 in operation. The AK 630 is similar only larger.

Figure 2.3 Image of a Doppstadt mobile screen in operation.

The re-processed material stored at Gerdau was then sampled and analyzed prior to the first delivery. Once the first sample results were received the results were analyzed and distributed to the FDEP and notice was sent out that SAC would receive the first load of material and would begin the test trial. Subsequently, SAC periodically sampled and analyzed material produced at the Baldwin facility as well as delivered material and daily composite samples of material introduced to the pyroprocessing as required by the short-term AC permit.

SAC received the material by covered truck and stored the material under cover in a portion of its coal storage building. From there the material was carried by front end loader to the Schenck dosing system on an as need basis. The live bottom hopper of the dosing system was capable of holding approximately 2 bucket loads of material.

Figure 2.4 Image of a SAC's temporary covered storage area.

Figure 2.5 Experiment to remove metal (shows metal from one bucket load of material).

SAC rented the Schenck dosing system since it was a compact and simple design specially designed as an alternative fuel feeding system capable of handling many kinds of fuels with varying densities and physical properties. The dosing system consisted of a live bottom hopper feeding a small drag chain conveyor onto a weigh feeder and into a rotary valve and blower. The weigh feeder controls the speed of the hopper and drag chain conveyor based on the desired flow rate of material. The blower and rotary valve were connected to an 8 inch diameter pipe connected to the existing flyash injection pipe. The flyash injection pipe fed the material directly into the calciner combustion chamber where it was mixed with incoming coal.

BALLOON NO.	DESCRIPTION
1	WEIGHBELT FEEDER SYSTEM, MULTIDOS 1440
2	BLOWER-TBS
3	DONS 100 BLOW-THROUGH ROTARY VALVE
4	BRACKET, MOTOR STARTER
5	LIVE BOTTOM, 16 CU METER BIN
6	ALT FUEL CONVEYOR ASSEMBLY
7	LIVE BOTTOM BIN, STATIONARY

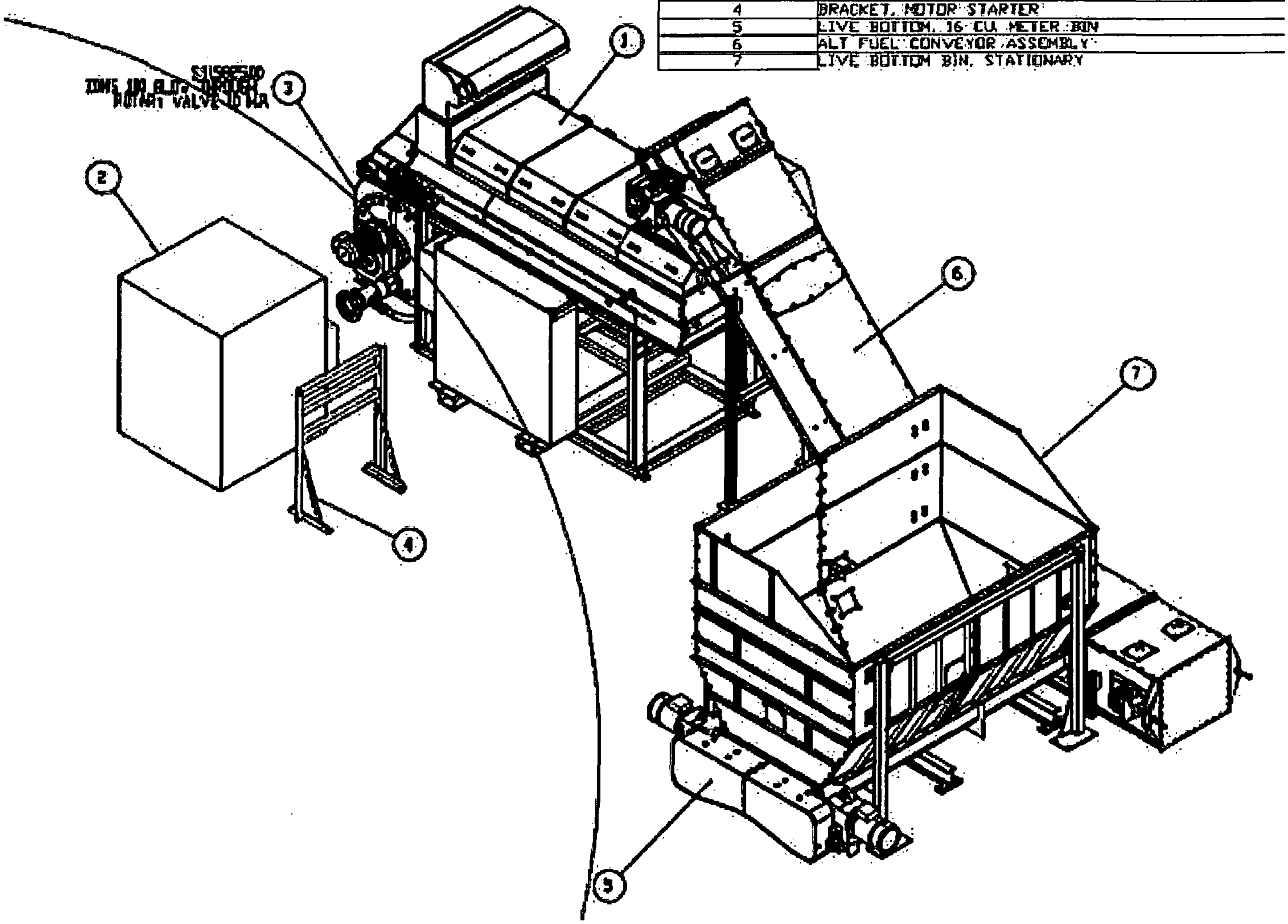


Figure 2.6 Drawing of the Schenck dosing system used during SAC's test trial.

Samples for analyses during feeding operations were gathered from material being loaded into the hopper approximately every 2 hours. These samples were composited into daily samples and sent to an external laboratory for analysis.

All production data (such as: feed rates, temperatures, etc.) was collected and stored by SAC on its process data server. The environmental emissions data for NOX, SO2, and THC were collected by the CEMVIEW data storage system. Emissions of CO were monitored by process monitors and data is stored along with the process data.

3. MATERIAL PROCESSING & HANDLING RESULTS

Prior to this test trial, it was not expected that the material processing and handling portion of this test trial would prove to be the bottle neck. However, from January 29th, 2010 to April 8th, 2010, Gerdau and SAC were able to produce and receive only 525.6 tons of suitable material for the test trial out of its permitted limit of 1,200 tons. Some of the challenges faced, related to processing, are addressed in this section of the report. The challenges experienced can be classified into the following four categories:

- Market, Operations, & Scheduling
- Management & Communication
- Equipment & Material Properties
- Existing Infrastructure

Market, Operations, & Scheduling

Due to poor market conditions for construction products during this test trial period, SAC and Gerdau's production capacity and human resources were significantly limited. This had a significant affect on the number of days of operation and the number and length of time personnel were assigned by Gerdau to assist with the processing efforts. Also, Gerdau's shredder experienced significant down time for maintenance; by rough estimates it appeared to approach 50 percent down time. When the Gerdau shredder was operating, a portion of that time had to be devoted to shredding white goods. In addition, during re-shredding, crew and equipment assigned to assist SAC personnel were frequently called off to other jobs; this only further exacerbated the situation.

In addition, SAC was restricted by schedules tied to product inventories and the significant costs and limitations of available rental equipment contracted for this test trial. These additional factors reduced the time that SAC could wait for a large stock pile of processed auto fluff to be built. SAC began the test trial with far less auto fluff in stock than it would have anticipated (approximately 180 tons) could be supplied by Gerdau. Within 3 days SAC had consumed all of the available stock and did not receive additional material until March 18th; eight days into the limited test trial period. SAC also experienced kiln process instability, unrelated to auto fluff testing, that resulted in 7 stops totaling 29.3 hours (due to Stage 2 blockage) between April 1st and 8th within the 10 day extension period granted by the FDEP. This resulted in approximately 97 tons of unused material being shipped back to Gerdau for landfilling.

Management & Communication

Due to differences in company culture and environment SAC knew this project would require exceptional communication and diligent management. SAC and Gerdau management were in constant contact and communicating. However, communication remained a constant effort through out the project.

Gerdau operates both a steel mill and shredder that prepares source material for the steel mill, but appears to operate them as separate entities. Gerdau's shredder operations, until recently, were contracted out to a third party, and this potentially contributed to require additional communication efforts amongst the shredder personnel. This added some complexity to the communications. However, any communication issues that were brought to the attention of the Gerdau management were effectively addressed.

Prior to the test trial, SAC had expected Gerdau would make special arrangements to have a special supply of source material stockpiled for the trial. However, Gerdau was never able to build a significant stock pile of end of life vehicles (due to market conditions) solely for SAC prior to the test. Gerdau management stated that they had communicated their needs to suppliers and had made every effort to build this supply and to remove contaminants from the supply. Results of early material sample results suggest that this was the case. However, there may have been some breakdown in control as the later grab and composite sample results seem to suggest.

It is important to note that the auto salvage and shredder industry has been operating for a very long time under existing regulatory and economic conditions, and SAC expects that there will be some resistance to change ingrained behavior. Although an exceptionally clean supply (i.e. very low mercury) would have made the case for additional testing easier, this does provide baseline information suitable for comparison to future research.

As demand for auto fluff as a fuel increases, it will provide a lower cost alternative to disposal and will drive behavioral change in the salvage and shredding industry. Partly the contamination problems exist because there is currently no alternative to disposal and the regulations support it (US EPA, Oct. 2008, Draft Document).

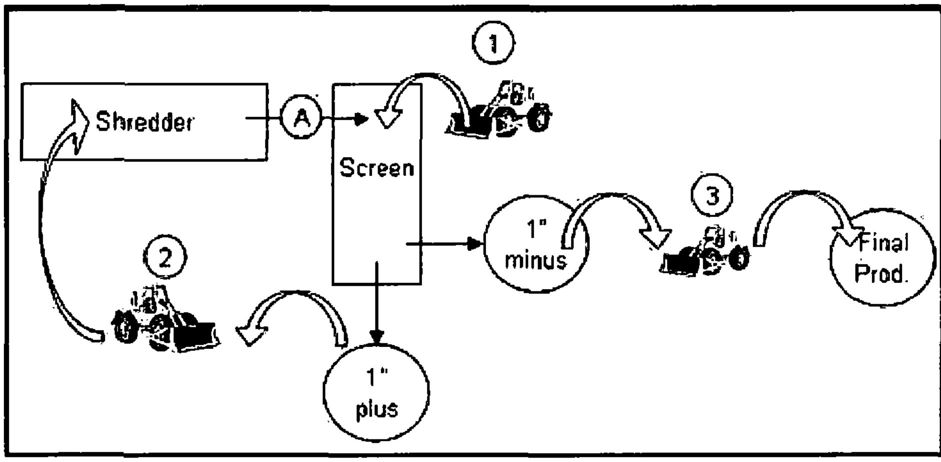
SAC believes that any future research should provide the opportunity for additional suppliers to be involved. This will provide SAC and the FDEP with additional information regarding the status of existing control programs and will provide some additional leverage for SAC to enforce better management and coordination of permit requirements.

Equipment & Material Properties

For this test trial SAC rented a Doppstadt AK630 mobile, diesel powered shredder and a Doppstadt SM720 mobile, diesel powered trommel. SAC had to rely on this off-the-shelf, readily available, mobile equipment since it was a short term test trial. This equipment was not ideal for processing auto fluff.

The Doppstadt AK 630 shredder is a high speed shredder and is capable of shredding many different materials, but it is better suited for harder materials with higher densities such as: wood and construction debris. In comparison a low speed high torque shredder would be more appropriate for this application. Auto fluff consists predominantly of light, soft, and malleable materials such as: seat foam, plastic, rubber, carpet, and fabrics. Therefore, when the shredder hammers strike particles at high velocity the particles do not readily break apart. This results in a large recirculating load on the trommel screen and shredder which significantly reduces processing rates.

SAC experimented with the set up to try and increase production rates. Initially, the Doppstadt AK 630 shredder was set up and ready for operation on January 29th, 2010. However, the trommel screen had not arrived yet. The trommel with a one inch minus screen arrived the following week. The first attempt to run the re-shredding process with the trommel followed the schematic below:



Step 1: Load source material into screen.

Step 2: Load material 1" plus material into shredder.

Step 3: Move 1" minus material to storage as final product.

Note: Due to the high recirculating load this process was very slow and required at least 1 front loader and 1 skid steer to operate. Also metal was only being removed post shredder by magnet A. Also required significant coordination by loader operators.

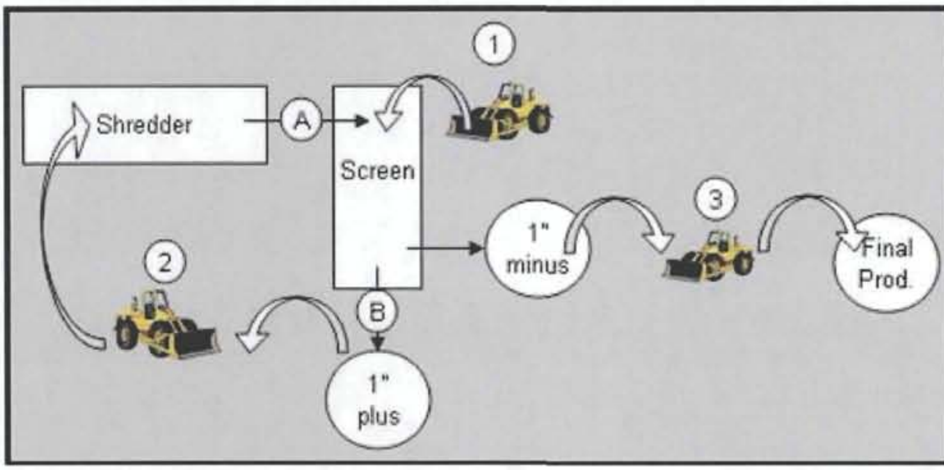
Figure 3.1 Schematic of initial re-shredding process.

Very quickly it became apparent that the amount of metal existing in the auto fluff exceeded expectations. SAC expected approximately six percent metal (base on information from Gerdau), but it became evident that the concentration of metal in the source material was significantly higher. Shredder hammers were repeatedly damaged in the process of this discovery. Therefore it was determined that a magnet on the exit belt of the trommel was necessary to remove some of the metal prior to the shredder and that Gerdau would have to try to remove more metal in their shredding process. SAC decided to run some experiments to demonstrate the amount of metal being wasted in the auto fluff. One non-scientific experiment demonstrated that in one loader bucket of auto fluff there was an estimated 700 to 1000 lbs of metal, by rough estimates this is between 10 and 20 percent metal (see Figure 3.3. below).

Figure 3.2 Examples of metal contamination present in the auto fluff. The shovel head is present for size comparison.

Figure 3.3 Experiment to remove metal (shows metal from one bucket load of material).

For a short time period, SAC also installed a belt magnet, which came from SAC's coal belt system, onto the end of Gerdau's process to demonstrate the quantity of metal which could be removed with a simple belt magnet. This resulted in Gerdau taking efforts to adjust their magnets to try and increase metal removal. Once he additional magnet for the trommel screen arrived, SAC removed its magnet off of Gerdau's process and re-installed it at SAC. In summary, the magnet on the trommel exit made a significant reduction in the amount of metal content in the auto fluff (see Figure 3.4 below). However, occasionally a large piece of non-ferrous metal would still pass through and destroy shredder hammers causing processing down time.



Step 1: Load source material into screen.

Step 2: Load material 1" plus material into shredder.

Step 3: Move 1" minus material to storage as final product.

Note: The B magnet placed at the exit of the trommel screen provided additional metal removal prior to the shredder. This resulted in some reduced shredder down time due to broken hammers.

Figure 3.4 Schematic of re-shredding process after a magnet was installed at the exit to the trommel.

Initial samples were taken from the first material produced (Table 5.1, Sample No. 9). Results of visible observation and internal lab analysis suggested that the material was high in silica possibly from glass, sand, or dirt were high in the processed auto fluff. Therefore, it was decided to run the re-shredding process in such a way as to discard the first pass through the screen. However, this resulted in a very time consuming semi-batch process that involved loading the screen. A batch of material (approximately 2 to 3 bucket loads of material) would be run until it became apparent the process reached a point of diminishing returns. Then the remaining material not passing the screen was discarded.

Therefore, the decision was made to move to a two phase process as depicted below in Figure 3.5. The first phase would be to screen the material; removing and discarding the one inch minus material in an attempt to reduce the amount of glass and dirt present in the auto fluff. Then the second phase was to take the oversize material, from phase one, and feed that to the shredder. This process was still very slow due to the high recirculating load. An attempt to estimate the recirculation load based on the length of time it took to process the material through the shredder was made. Based on these rough estimates, material was passing through the shredder at least 20 times. Clearly, the material processing evolved based on trial and error to improve the material quality.

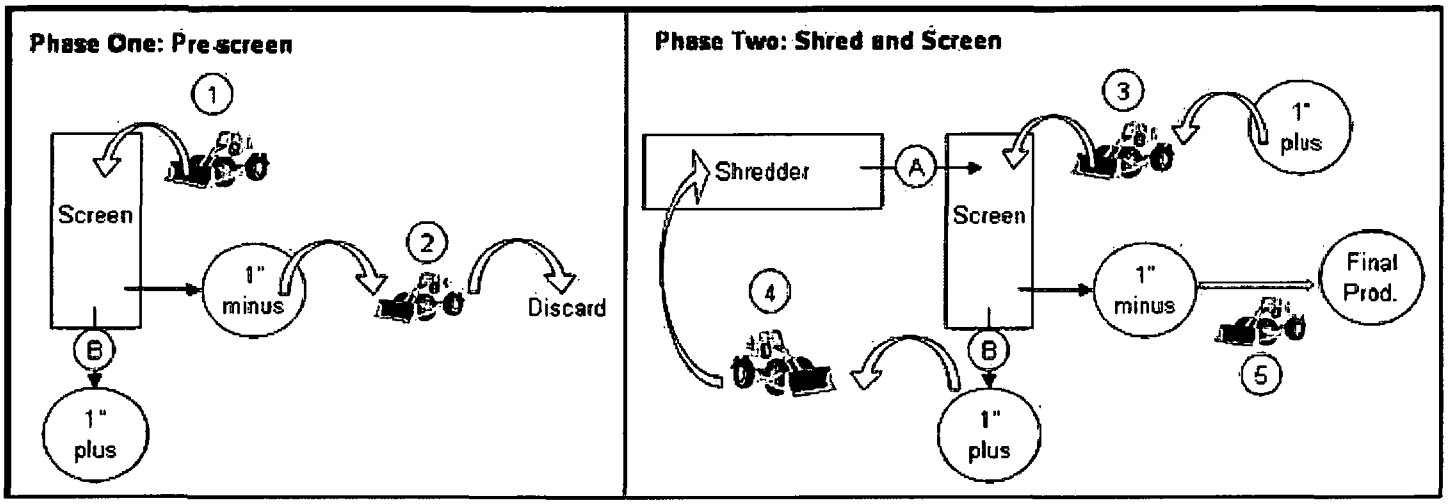


Figure 3.5 Schematic of the two phase re-shredding process.

Although slow, this process worked well; except approximately 20 to 30% of the source material was being discarded through the first pass. The first pass material also was of higher density. Therefore, to produce the same quantity of material it required a greater volume of source material since a portion was being discarded. Furthermore, this process was still heavily dependent on having at least one full time loader and skid steer working to feed and receive material from the system. So SAC decided to rent a mobile, diesel powered, piggy back conveyor to eliminate loader operations on the recirculation load (see Figure 3.6 below).

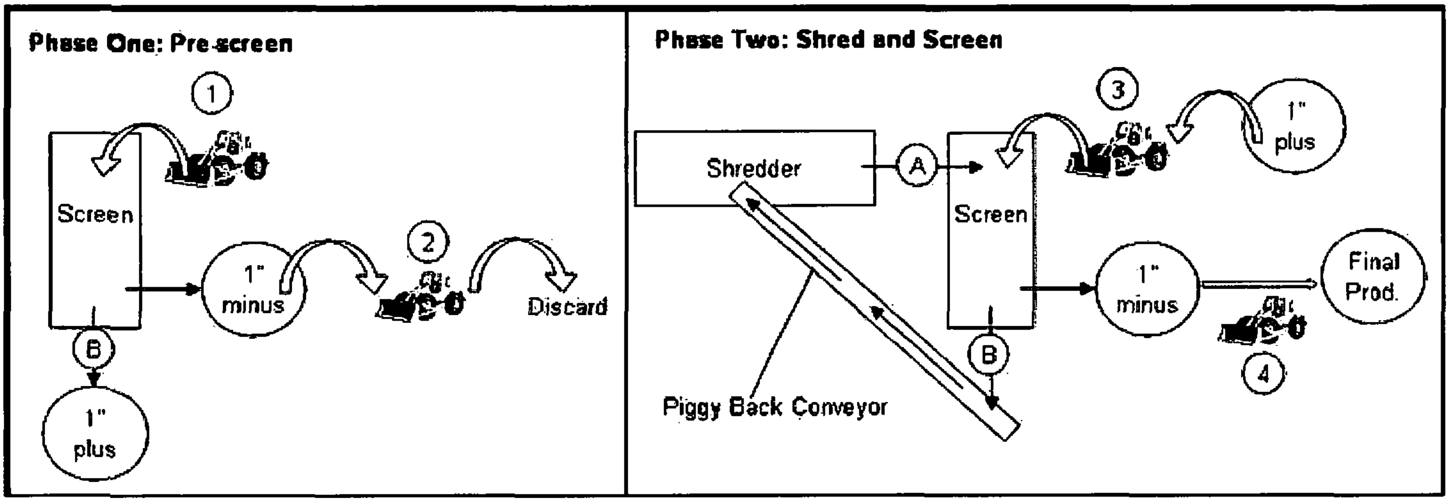


Figure 3.6 Schematic of the two phase re-shredding process with piggy back conveyor installed.

Another change was made near the end of the test trial, based on laboratory particle size analysis results that showed a majority of material being produced was well below the one inch particle size being sought and that a larger screen could improve production rates without negatively impacting material handling in the feeding system. SAC replaced the 1 inch mesh with a 1.5 inch mesh to see how this would affect the production rates. The 1.5 inch mesh had a noticeably positive impact on production rates despite the increased rejection rate during the pre-screening of the material. Also, visually it appeared that the portion remaining after the initial screening contained a greater percentage of components that were of interest from a fuel perspective. However, since this change came late in the test trial, this material was not co-fired until April 8th and 9th.

For future research, SAC has a greater understanding of appropriate processing equipment and will use its knowledge to prevent any problems noted above.

Existing Infrastructure

Due to the short duration of this test trial, the location and infrastructure provided by Gerdau for conducting the re-shredding operations was not engineered or specifically designed for this trial. Therefore, SAC had to make due with amenities provided. The existing infrastructure at Gerdau had a direct effect on the quality and rate of re-processing of the auto fluff. Primarily increased material moisture content, high metal content, contamination of prepared materials, frequent starts and stops, and limited mobility surrounding the preparation site can all be attributed to limitations imposed by existing infrastructure.

The auto fluff SAC received contains absorbent materials; and with no measures to reduce moisture, the moisture content can be quite high (ranging from 5 to 45%, with an average 30% moisture, see Analytical Results section). It is generally higher than necessary for dust control. Some portion of the high material moisture content can be attributed to the fact that the existing shredder uses water sprays to cool the process and prevent dust. However, a further contributor to this issue is the fact that auto fluff is not stored under cover at the Baldwin facility and the area in which the auto fluff is stored has retaining walls that act to contain material and water; and since the area suffers from routine drainage issues, the auto fluff is often stored in a pool of water. For future research auto fluff source material should be stored and transported under cover at all times if possible. This would significantly improve the quality of this material as a fuel.

Figure 3.7 Aerial view of GA shredder operations with diagrams showing the location of SAC's re-shredding operations.

Metal contamination of material processed at Gerdau can be attributed to most of the stops of the SAC fuel feeding system during the test trial (see Figure 3.8 below). Likely sources for this contamination are related to SAC's final product storage area at the Baldwin facility and contamination during transportation. The re-processed auto fluff storage piles, at the Baldwin facility, were located next to a large pile of scrap metal. Since SAC's final product storage area was not in its own individual storage bay it is likely that pieces of metal could have rolled down off the scrap metal pile into SAC's storage area. Also the auto fluff was being handled by front loader and delivery trucks that haul unprocessed auto fluff for Gerdau. It is likely that there could have been some pieces of metal and debris left in the buckets or beds of these transport vehicles.

Figure 3.8 Example of pieces of metal pulled from the tripped feeding equipment. The 12 inch ruler is for reference of scale. It is not likely for any of these materials to have made it through the one inch trommel.

4. KILN PRODUCTION & PROCESS DATA

Initial firing of auto fluff into the calciner combustion chamber began on March 10, 2010 and ended on April 9th, 2010. Below are charts displaying one-minute average autofluff rates for each day that alternate fuel was fired into the pyroprocessing system:

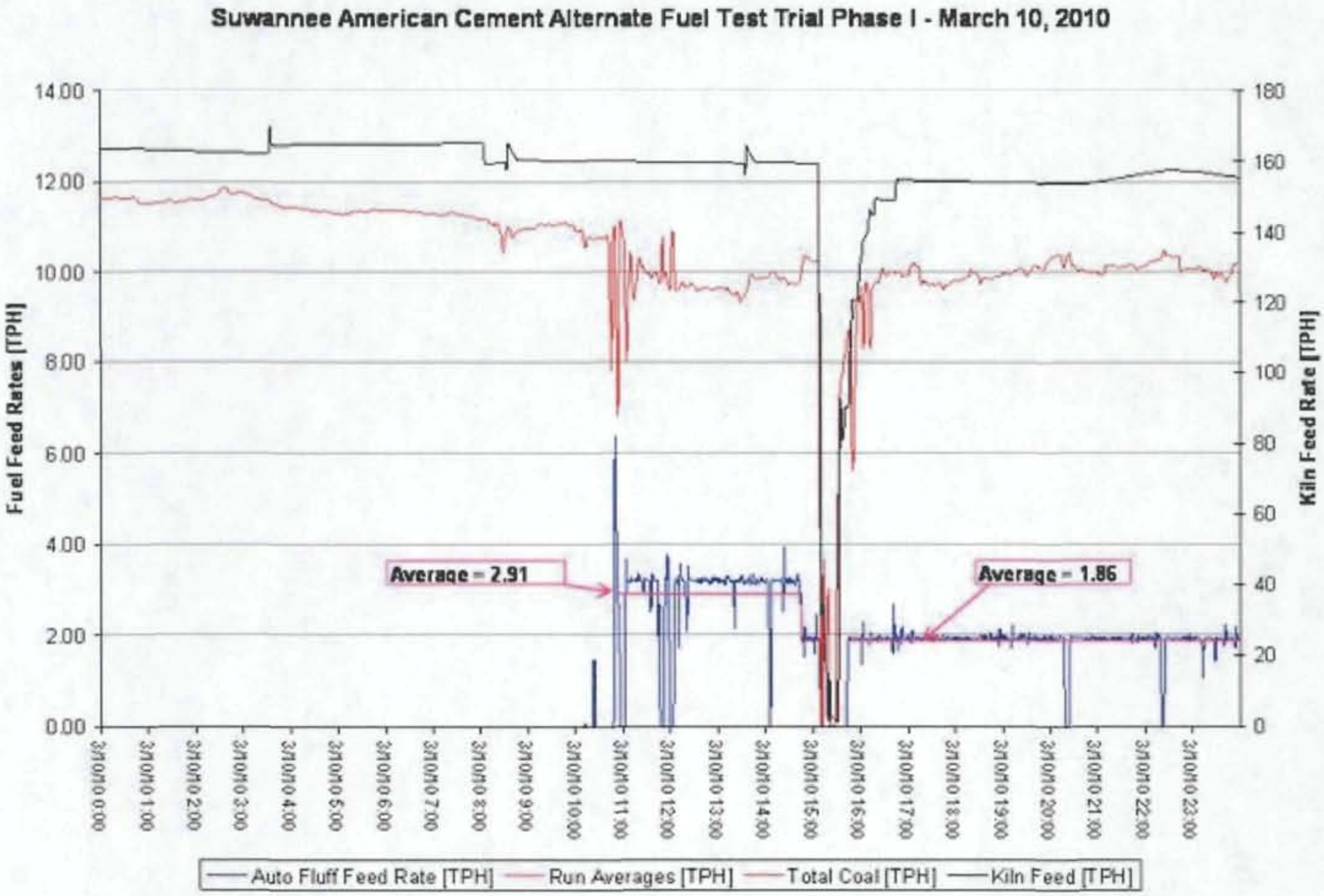


Chart 4.1 March 10, 2010 kiln feed rate, coal feed rate, and auto fluff feed rate.

DATE:Wednesday, March 10, 2010		
	Units	Value
Kiln Run Time:	HH:MM	23.56
Kiln Stops:	#	1
Clinker Production:	stons	2,313
Total Coal Consumed:	stons	296.6
Calorific Value of Coal:	Btu/lb	11,841
Total Alt Fuel Consumed:	stons	27.9
Alt. Fuel Feed System Run Time:	HH:MM	12:11
Alt. Fuel Feed System Stops:	#	7

March 10, 2010:

Start Time = 10:22 AM

Immediately after starting, the feeding system tripped. There were some problems with the electric motors that drive the screws of the auto fluff live bottom feeder. SAC was targeting 1 TPH, but this low tonnage caused too much torque on the motor and it kept overloading. Therefore, a higher feed rate near 2 TPH was targeted for start up.

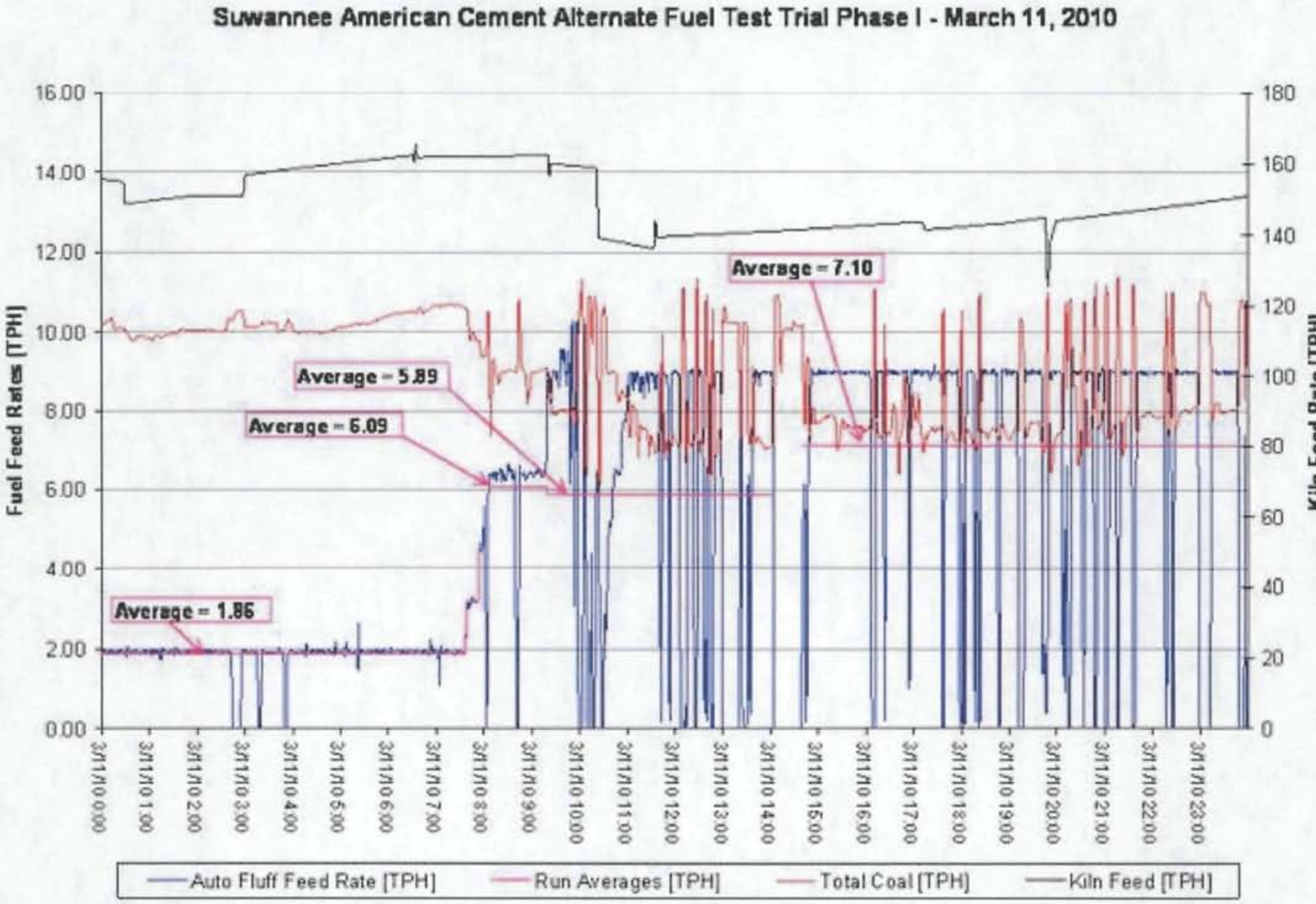


Chart 4.2 March 11, 2010 kiln feed rate, coal feed rate, and auto fluff feed rate.

DATE: Thursday, March 11, 2010		
	Units	**Value**
Kiln Run Time:	HH:MM	24.00
Kiln Stops:	#	0
Clinker Production:	stons	2,235
Total Coal Consumed:	stons	254.5
Calorific Value of Coal:	Btu/lb	11,865
Total Alt Fuel Consumed:	stons	118.7
Alt. Fuel Feed System Run Time:	HH:MM	20:41
Alt. Fuel Feed System Stops:	#	32

March 11, 2010:

After running all night (March 10-11), relatively smoothly, targeting 2 TPH, the decision was made to target higher feed rates. As can be seen by the chart below, at higher feed rates near 7 TPH there were frequent stops and starts of the feeding system. The reasons for these stops and starts were primarily the result of feeding system problems due to material contamination.

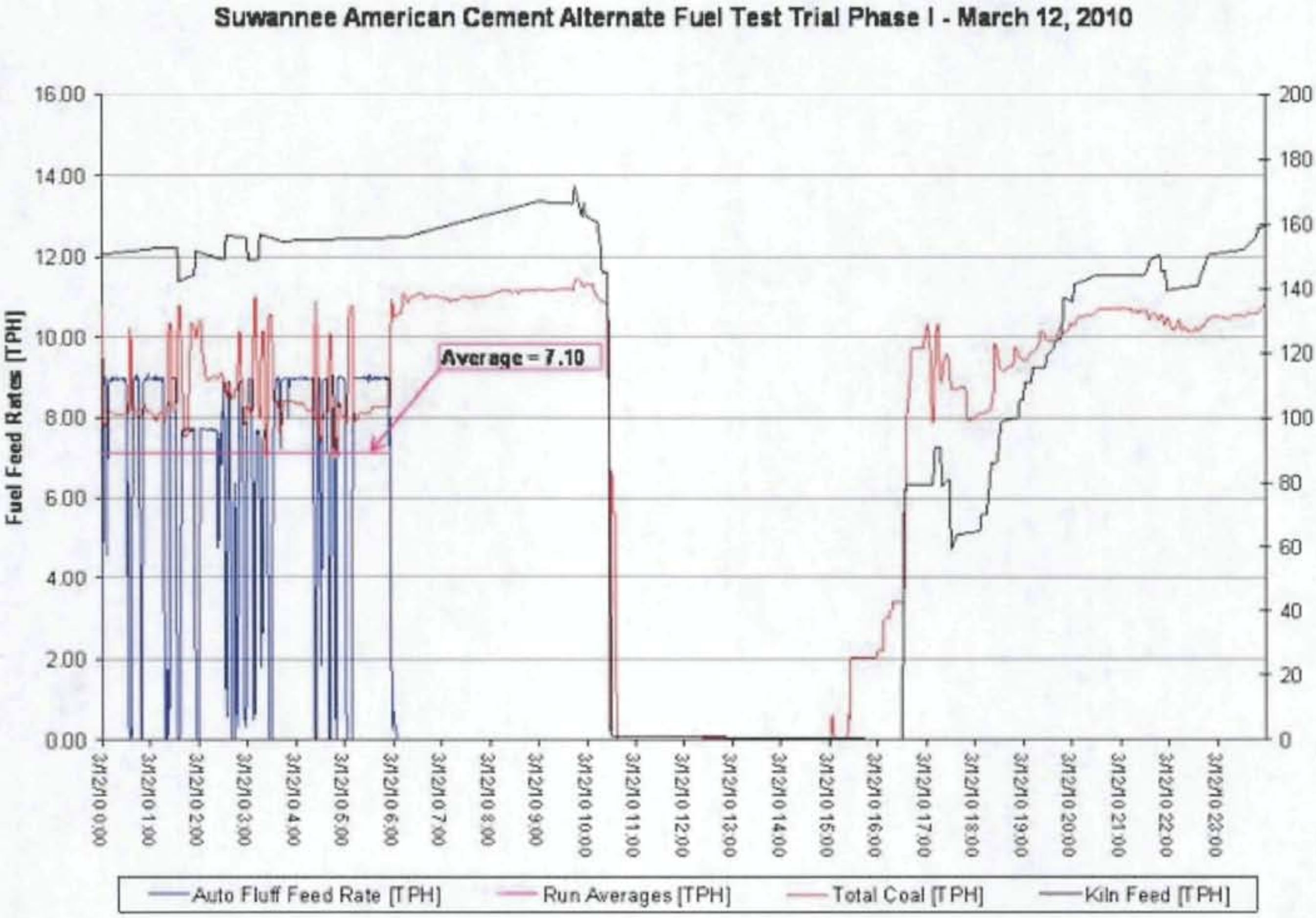


Chart 4.3 March 12, 2010 kiln feed rate, coal feed rate, and auto fluff feed rate.

DATE:Friday, March 12, 2010		
	Units	**Value**
Kiln Run Time:	HH:MM	17.85
Kiln Stops:	#	1
Clinker Production:	stons	1,584
Total Coal Consumed:	stons	211.2
Calorific Value of Coal:	Btu/lb	not tested
Total Alt Fuel Consumed:	stons	40.9
Alt. Fuel Feed System Run Time:	HH:MM	5:19
Alt. Fuel Feed System Stops:	#	11

March 11-12, 2010:

SAC ran at a targeted feed rate of 9 TPH starting on March 11,2010 (averaging 7.10 TPH including all the stops and starts) until SAC ran out of prepared auto fluff on March 12, 2010 at 6:04 AM. At approximately 10:30 AM the kiln was shut down to repair a leak on the main burner pipe. Gerdau required two more weeks to produce a sufficient amount of auto fluff (see Section 2) to restart the test trial on March 29th.

Suwannee American Cement Alternate Fuel Test Trial Phase I - March 29, 2010

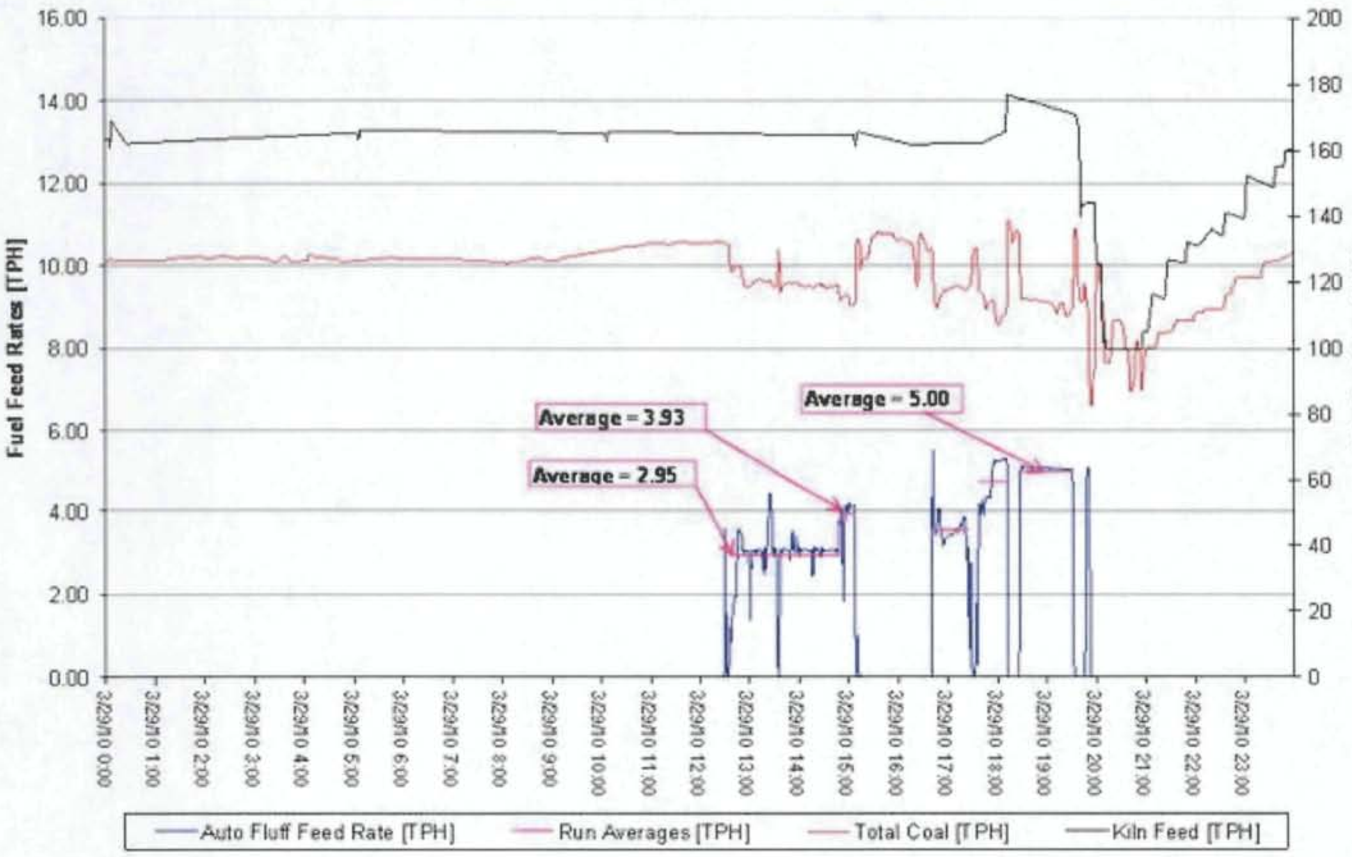


Chart 4.4 March 29, 2010 kiln feed rate, coal feed rate, and auto flu

DATE:Monday, March 29, 2010		
	Units	Value
Kiln Run Time:	HH:MM	24.00
Kiln Stops:	#	0
Clinker Production:	stons	2,917
Total Coal Consumed:	stons	296.4
Calorific Value of Coal:	Btu/lb	12,689
Total Alt Fuel Consumed:	stons	19.4
Alt. Fuel Feed System Run Time:	HH:MM	5:10
Alt. Fuel Feed System Stops:	#	8

March 29, 2010:

SAC started feeding auto fluff again to the pyroprocessing system on March 29th with an initial target feed rate of 3 TPH and then slowly ramped it up to 5 TPH as seen in the above chart. At 1:30 PM the auto fluff feeder rotary valve tripped on overload due to material contamination. At 19:10 the operator called the process attendant to address high levels (blockage) in the discharge end of the stage two cyclone of the preheater tower. This problem is evidenced by the kiln feed instability between 7:00 PM and 12:00 AM. During this period of kiln feed instability alternate fuel feed was suspended.

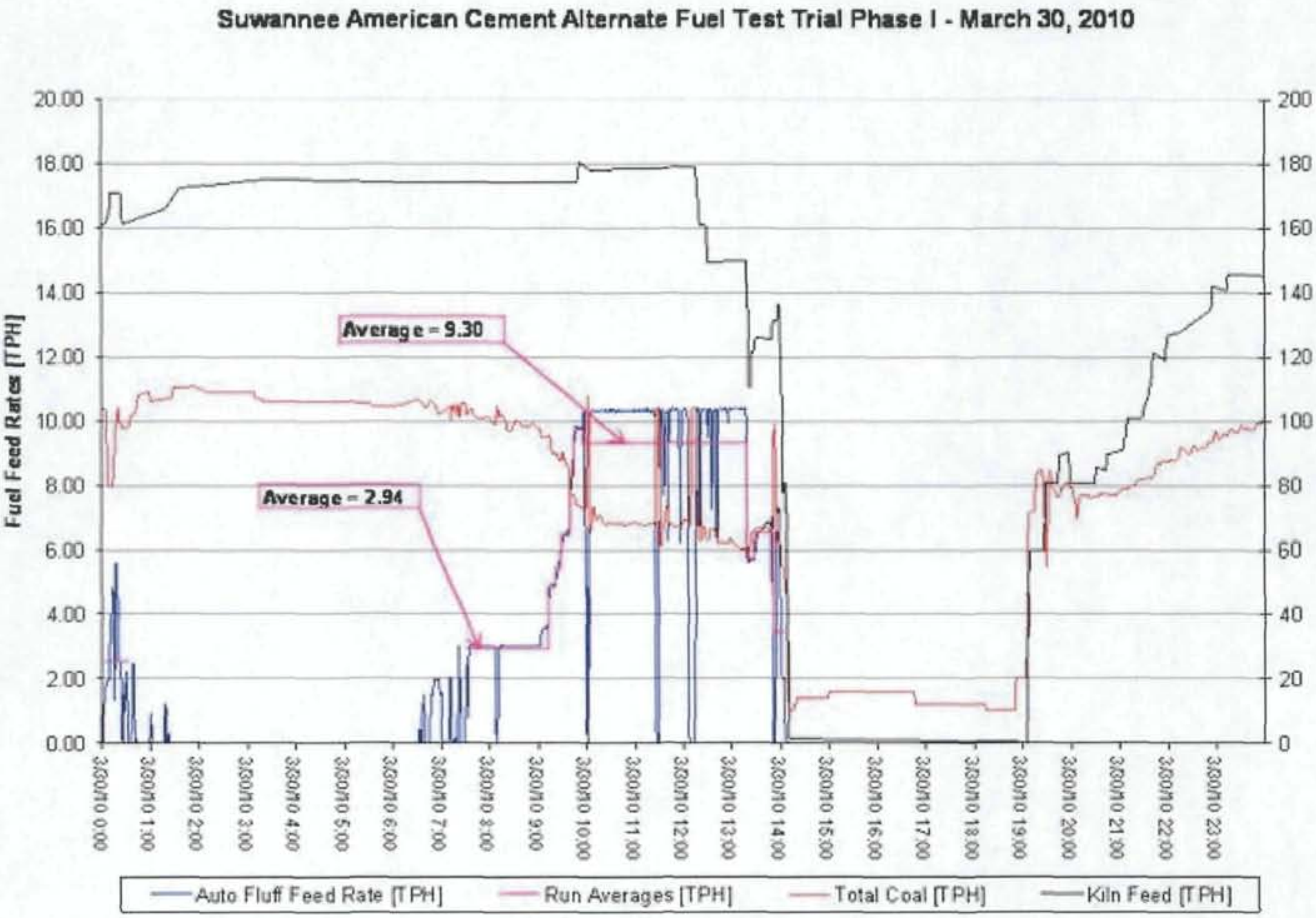


Chart 4.5 March 30, 2010 kiln feed rate, coal feed rate, and auto fluff feed rate.

DATE:Tuesday, March 30, 2010		
	Units	Value
Kiln Run Time:	HH:MM	18.89
Kiln Stops:	#	1
Clinker Production:	stons	2,271
Total Coal Consumed:	stons	221.8
Calorific Value of Coal:	Btu/lb	12,502
Total Alt Fuel Consumed:	stons	47.8
Alt. Fuel Feed System Run Time:	HH:MM	7:26
Alt. Fuel Feed System Stops:	#	13

March 30, 2010:

At 12:01 AM, March 30, 2010 SAC attempted to restart the fuel feeding system. However, the fuel feeding system could not be started due to an auto fluff blockage in the feeder system. At 07:41 AM consistent material flow to the calciner burner was established and operated with some minor upsets until the auto fluff feeder rotary valve tripped on overload. At 7:10 PM the operator called the process attendant to address the blockage at the discharge end of the stage two cyclone of the preheater tower. This problem is evidenced by the kiln feed instability between 7:00 PM and 12:00 AM. During this period of kiln feed instability alternate fuel feed was suspended.

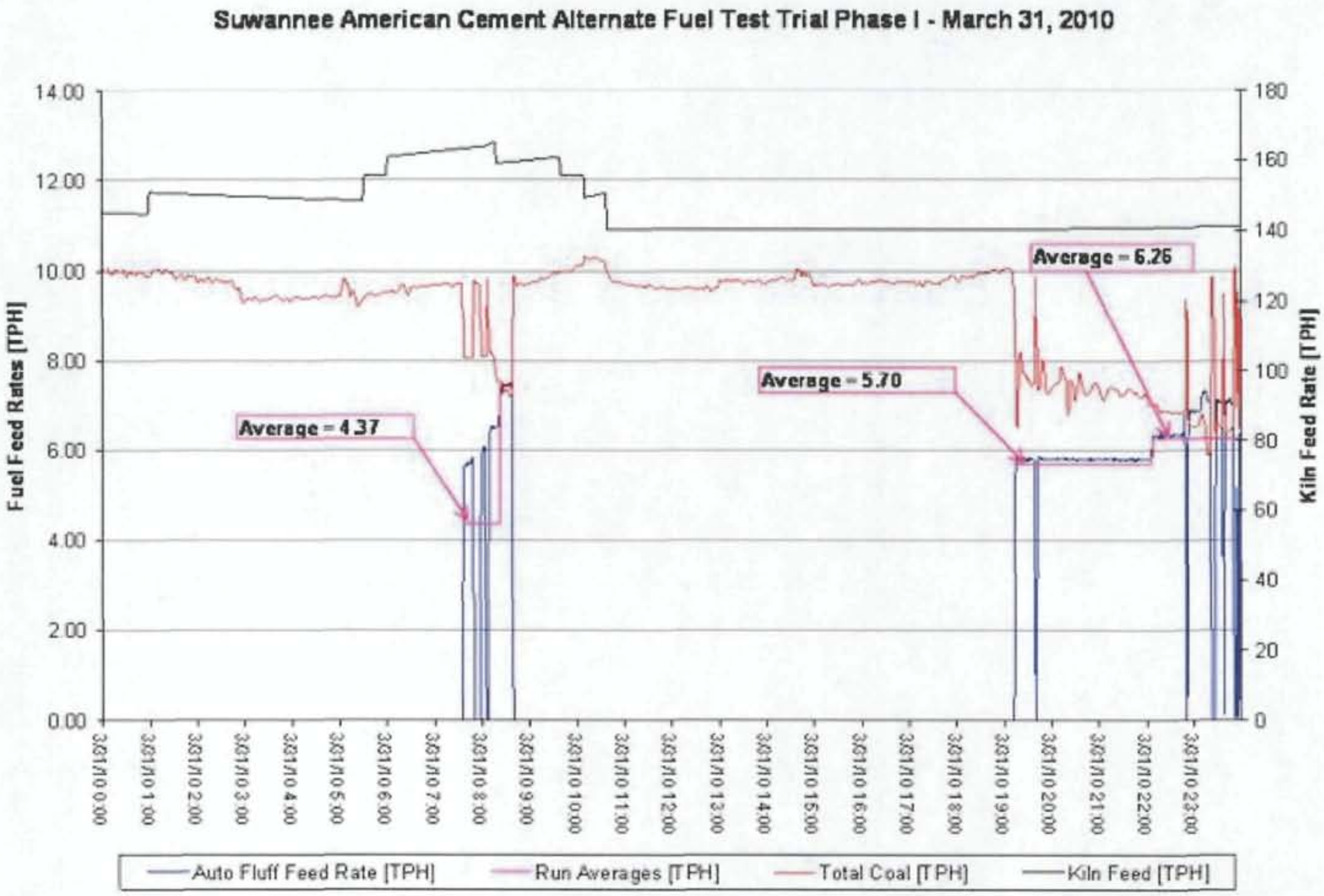


Chart 4.6 March 31, 2010 kiln feed rate, coal feed rate, and auto fluff feed rate.

DATE:Wednesday, March 31, 2010		
	Units	Value
Kiln Run Time:	HH:MM	24.00
Kiln Stops:	#	0
Clinker Production:	stons	2,699
Total Coal Consumed:	stons	275.6
Calorific Value of Coal:	Btu/lb	12,134
Total Alt Fuel Consumed:	stons	32.7
Alt. Fuel Feed System Run Time:	HH:MM	5:24
Alt. Fuel Feed System Stops:	#	8

March 31, 2010:

The alternative fuel test was suspended until 7:36 AM on March 31. The operator tried to establish a steady alternative fuel feed, but the feeding system again tripped at 8:40 AM due to a plugged feed pipe. The feed system was restarted at 9:14 AM at a target rate of 5 TPH. It appears that the auto fluff feed rate was relatively constant until the feed rate was increased at 10:22 AM.

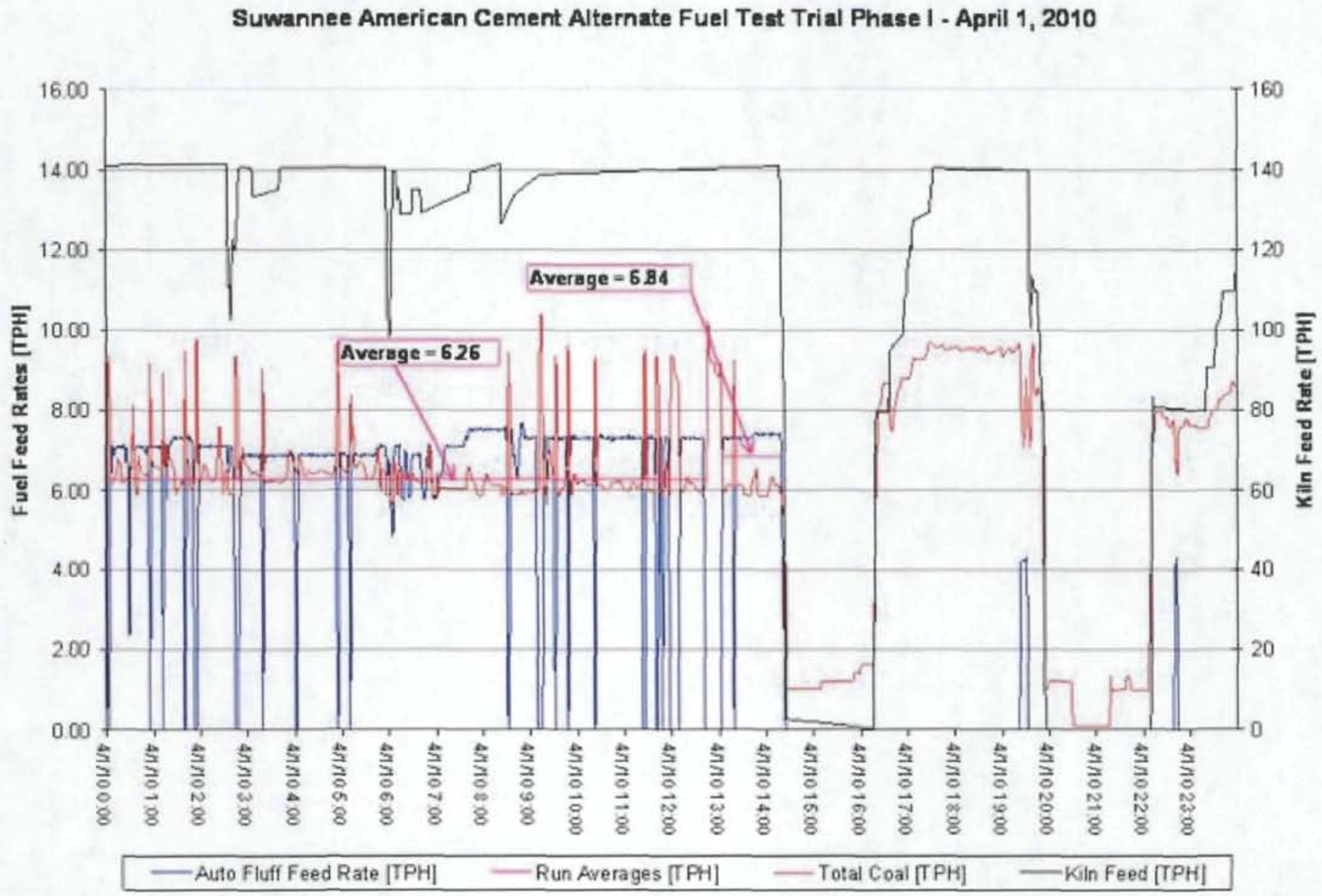


Chart 4.7 April 1, 2010 kiln feed rate, coal feed rate, and auto fluff feed rate.

DATE:Thursday, April 01, 2010		
	Units	Value
Kiln Run Time:	HH:MM	19.55
Kiln Stops:	#	2
Clinker Production:	stons	1,566
Total Coal Consumed:	stons	154.9
Calorific Value of Coal:	Btu/lb	12,010
Total Alt Fuel Consumed:	stons	90.6
Alt. Fuel Feed System Run Time:	HH:MM	13:08
Alt. Fuel Feed System Stops:	#	24

April 1, 2010:

The target feed rate from midnight until the kiln shut down was 7 TPH. The feed system tripped a total of 21 times during this period. The kiln shut down due to an unrelated blockage in the preheater tower causing high levels in the stage 2 cyclone.

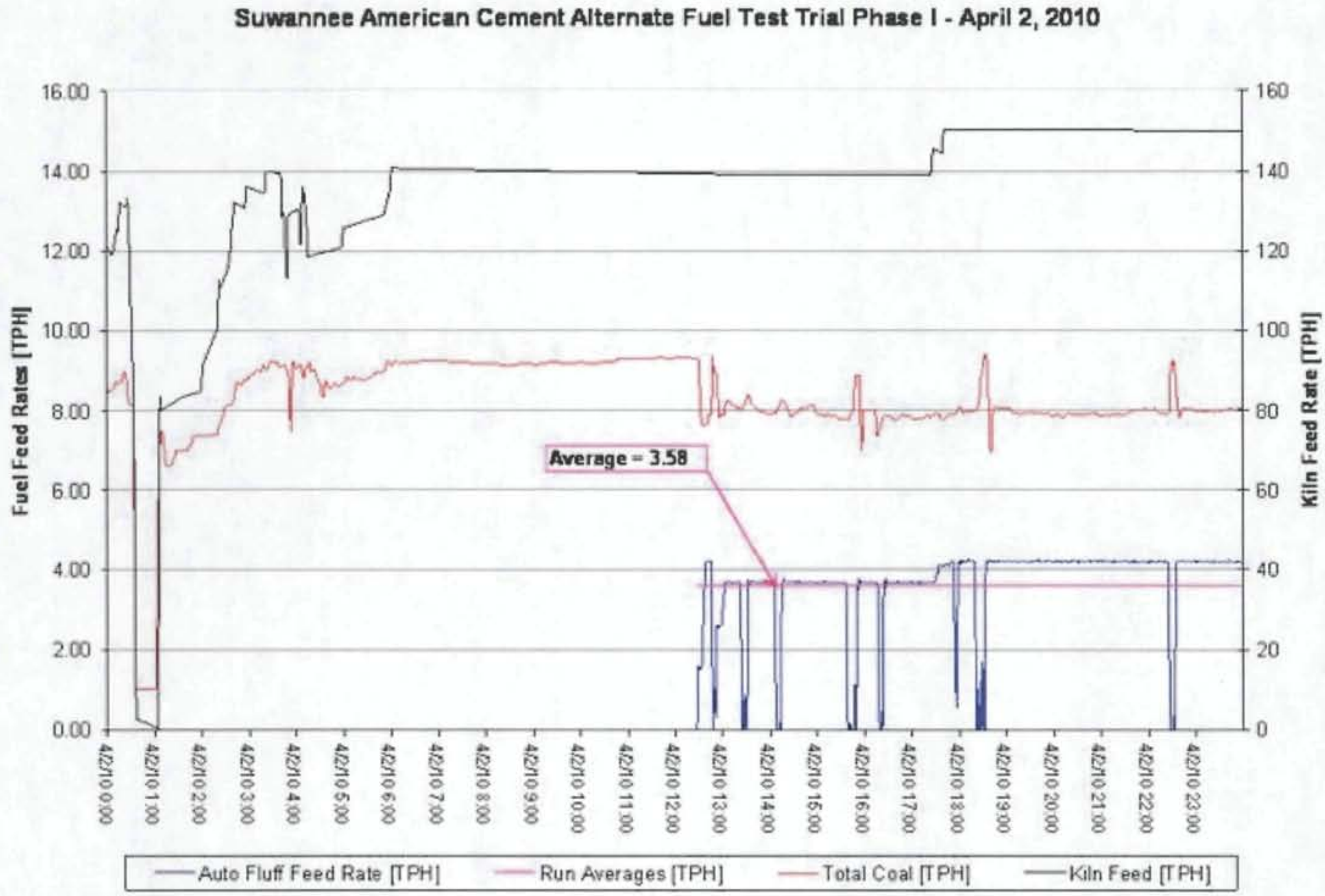


Chart 4.8 April 2, 2010 kiln feed rate, coal feed rate, and auto fluff feed rate.

DATE:Friday, April 02, 2010		
	Units	Value
Kiln Run Time:	HH:MM	23.35
Kiln Stops:	#	1
Clinker Production:	stons	1,954
Total Coal Consumed:	stons	216.1
Calorific Value of Coal:	Btu/lb	12,305
Total Alt Fuel Consumed:	stons	41.4
Alt. Fuel Feed System Run Time:	HH:MM	10:48
Alt. Fuel Feed System Stops:	#	12

April 2, 2010:

After repairs were made to stage 2 and auto fluff was unplugged SAC did not return to the test trial until 12:28 PM due to instabilities in the pyroprocessing system . When alternate fuel feeding resumed the target feed rate was 4 TPH. As displayed in the graph above, the system was relatively stable during this period of testing.

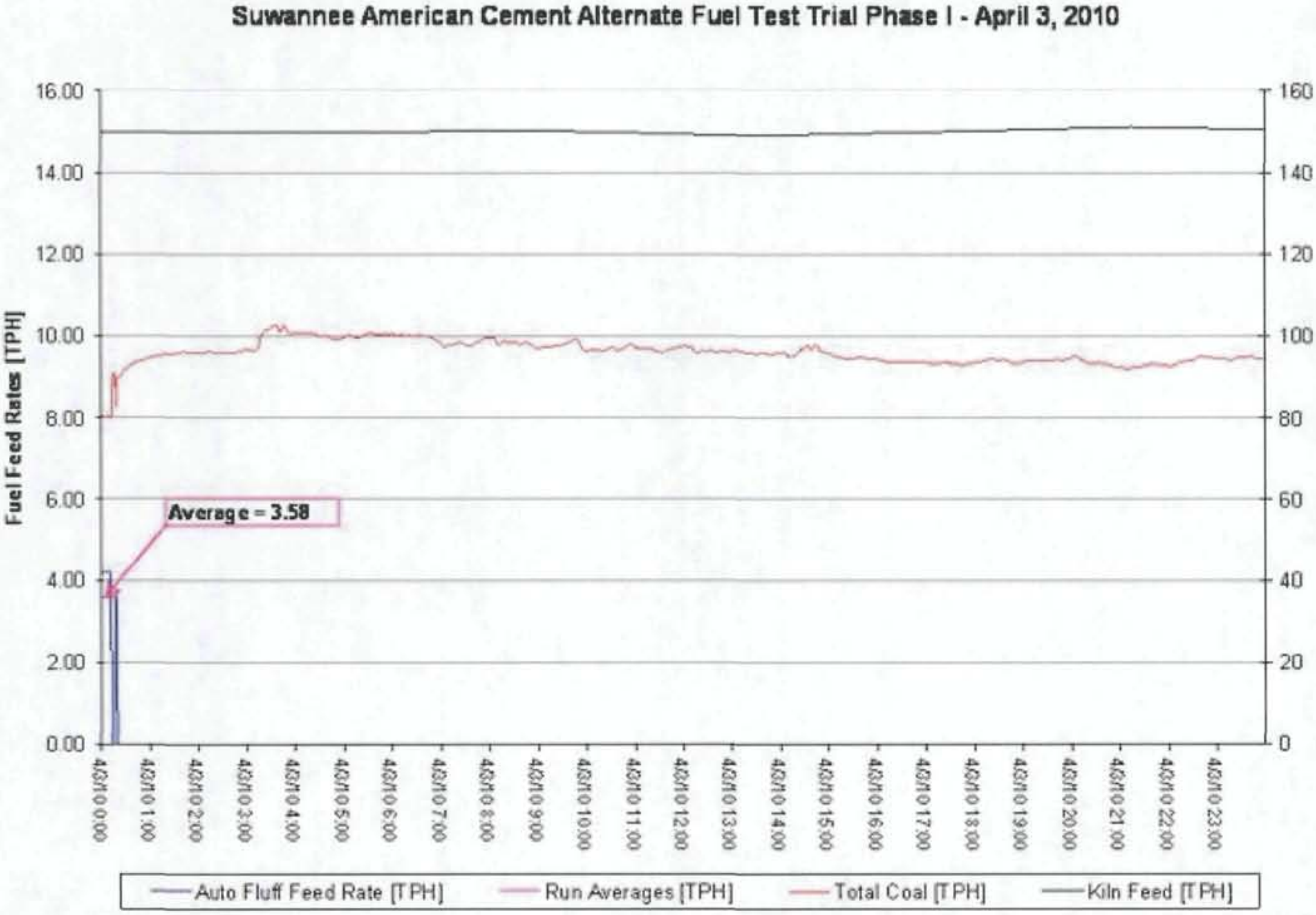


Chart 4.9 April 3, 2010 kiln feed rate, coal feed rate, and auto fluff feed rate.

DATE:Saturday, April 03, 2010		
	Units	Value
Kiln Run Time:	HH:MM	24.00
Kiln Stops:	#	0
Clinker Production:	stons	2,183
Total Coal Consumed:	stons	252.8
Calorific Value of Coal:	Btu/lb	12,463
Total Alt Fuel Consumed:	stons	1.0
Alt. Fuel Feed System Run Time:	HH:MM	0:14
Alt. Fuel Feed System Stops:	#	1

April 3, 2010:

On April 3, 2010 SAC ran out of material for the test trial at 12:19 AM. SAC attempted to get more material prepared and delivered prior to the close of the extended testing period. SAC received more material on April 8th, 2010.

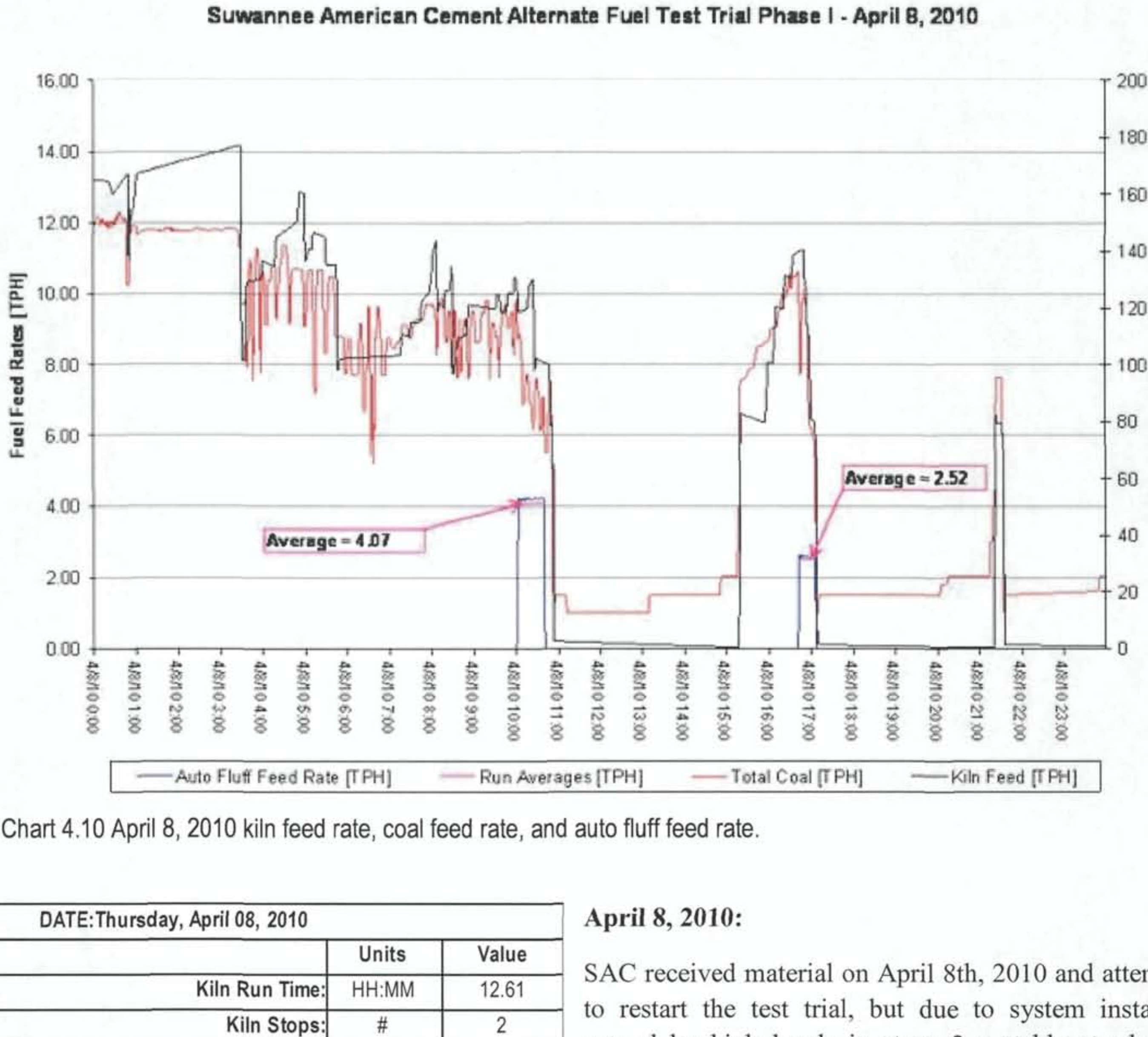


Chart 4.10 April 8, 2010 kiln feed rate, coal feed rate, and auto fluff feed rate.

DATE: Thursday, April 08, 2010		
	Units	Value
Kiln Run Time:	HH:MM	12.61
Kiln Stops:	#	2
Clinker Production:	stons	1,025
Total Coal Consumed:	stons	150.8
Calorific Value of Coal:	Btu/lb	not tested
Total Alt Fuel Consumed:	stons	3.7
Alt. Fuel Feed System Run Time:	HH:MM	1:03
Alt. Fuel Feed System Stops:	#	2

April 8, 2010:

SAC received material on April 8th, 2010 and attempted to restart the test trial, but due to system instability caused by high levels in stage 2 a stable steady feed could not be established for any significant period of time.

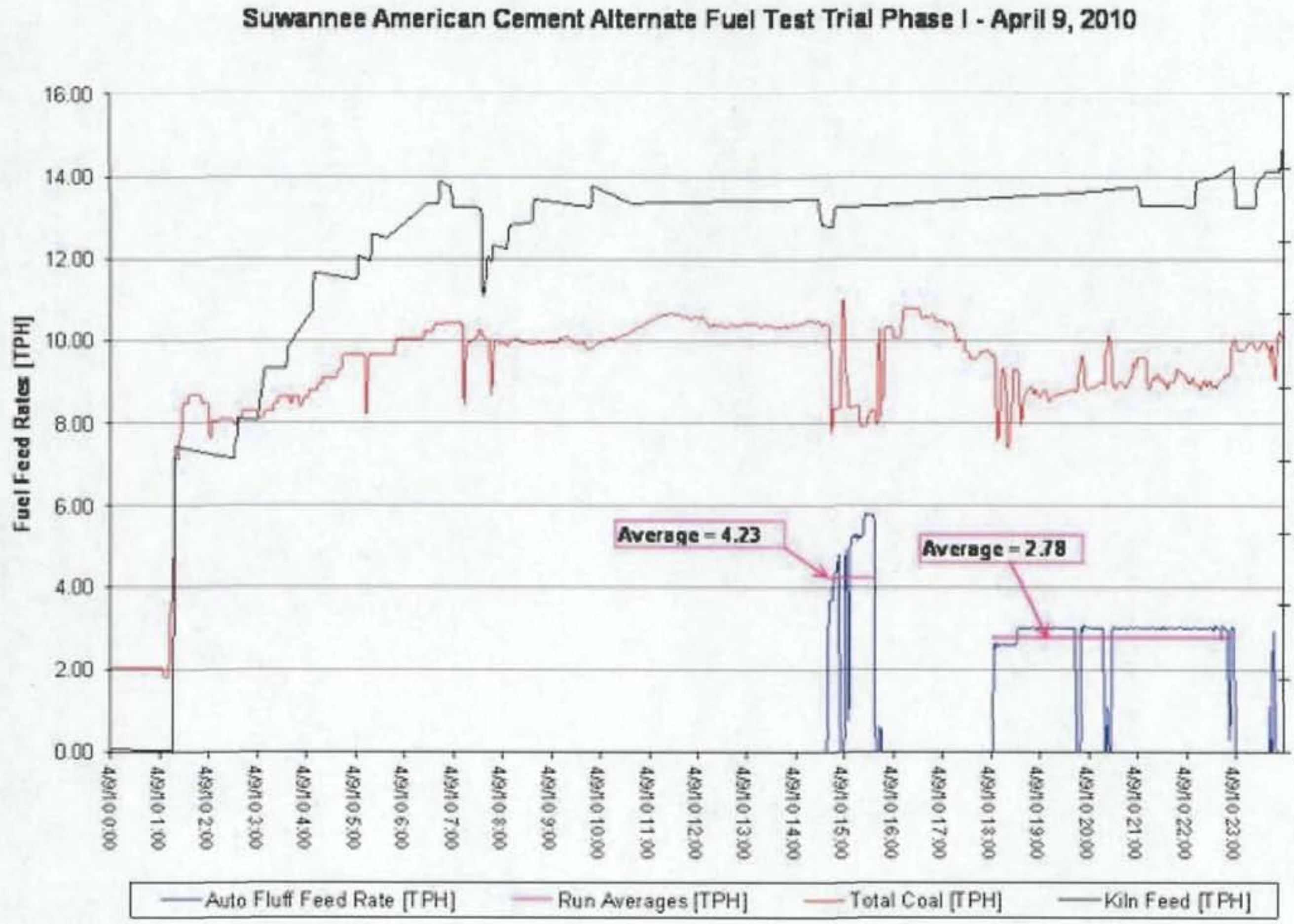


Chart 4.11 April 9, 2010 kiln feed rate, coal feed rate, and auto fluff feed rate.

DATE:Friday, April 09, 2010		
	Units	Value
Kiln Run Time:	HH:MM	22.57
Kiln Stops:	#	0
Clinker Production:	stons	1,941
Total Coal Consumed:	stons	234.0
Calorific Value of Coal:	Btu/lb	12,060
Total Alt Fuel Consumed:	stons	18.0
Alt. Fuel Feed System Run Time:	HH:MM	5:42
Alt. Fuel Feed System Stops:	#	7

April 9, 2010:

April 9th was the last day of the test trial. As soon as SAC could establish stable kiln conditions, SAC began to feed material to the system at 2:40 PM. However, the feed system tripped at 3:45 PM and could not be restarted until 6:03 PM. The feeder ran until it tripped again at 10:59 PM. An attempt to restart the feeding system was made at 11:42 PM to empty out the feeding system, and the test was concluded at 11:50 PM.

5. EXTERNAL LAB RESULTS

During the trial SAC and Gerdau collected and analyzed a total of 24 samples. Ten (10) samples were of daily composites made from sampling every 2 hours while auto fluff was being fed into the pyroprocessing system. The other 14 samples were a variety of samples taken from truck deliveries as well as analysis of the various streams in the preparation process at Gerdau's Facility. The purpose of this analysis was to assist in determining if auto fluff is suitable for use as a fuel in cement kilns. All of the samples in the table below were collected and analyzed for the following constituents using the listed analytical methods:

Sampler @ Location	Sample Description	Sample Date	Sample #
Gerdau @ Gerdau	R-ASR 1	1/28/2010	1
Gerdau @ Gerdau	P-ASR 1	1/29/2010	2
SAC @ Gerdau	GA-Side Sample	1/28/2010	3
SAC @ Gerdau	Screened GA	2/3/2010	4
SAC @ Gerdau	Shredded + Screened GA	2/3/2010	5
SAC @ Gerdau	GA Stock Shredded & Screened	2/12/2010	6
SAC @ Gerdau	GA Shredded Screens	2/10/2010	7
SAC @ Gerdau	1st Pass Waste Material	2/16/2010	8
SAC @ Gerdau	Final Product	2/16/2010	9
SAC @ Gerdau	20100223 GA Side Sample	2/23/2010	10
SAC @ SAC	3-2-10 6A 2 Truck Comp	2/23/2010	11
SAC @ SAC	Auto Fluff Daily Comp 3-10-10	3/10/2010	12
SAC @ SAC	Auto Fluff Daily Comp 3-11-10	3/11/2010	13
SAC @ SAC	Auto Fluff Daily Comp 3-12-10	3/12/2010	14
SAC @ Gerdau	(1.5"-) Final Product	3/24/2010	15
SAC @ Gerdau	(1.5"-) First Pass Waste	3/24/2010	16
SAC @ Gerdau	Source Material	3/24/2010	17
SAC @ SAC	Auto Fluff Daily Comp 3-29-10	3/29/2010	18
SAC @ SAC	Auto Fluff Daily Comp 3-30-10	3/30/2010	19
SAC @ SAC	Auto Fluff Daily Comp 3-31-10	3/31/2010	20
SAC @ SAC	Auto Fluff Daily Comp 4-01-10	4/1/2010	21
SAC @ SAC	Auto Fluff Daily Comp 4-02-10	4/2/2010	22
SAC @ SAC	Auto Fluff Daily Comp 4-08-10	4/8/2010	23
SAC @ SAC	Auto Fluff Daily Comp 4-09-10	4/9/2010	24

1. Calorific Value [Btu/lb] - ASTM Method D240
2. Ash Content [%] - ASTM Method D2974
3. Dry Solids [%] (or % Moisture) - EPA Method SW 846
4. Particle Size [inch] - ASTM Method D422
5. Halides:
   - Chloride [mg/kg dry] - EPA Method SW 846 9056
   - Fluoride [mg/kg dry] - EPA Method SW 846 9056
   - Sulfate [%] - EPA Method SW 846 5050
6. Total Metals [mg/kg dry] - EPA Method 6010 B
   - Beryllium
   - Chromium
   - Cadmium
   - Lead
   - Thallium
7. Total Mercury [mg/kg dry] - EPA Method 7471A
8. PCB [mg/kg dry] - EPA Method 8082
9. Volatile Organic Compounds [mg/kg dry] - EPA Method 8260Bn

Table 5.1 Sample key correlates sample number to sample location, description, and date.

It is important to note that auto fluff is an extremely non-homogenous material and very difficult to prepare for lab analysis; and therefore the lab selected for this analysis had to be capable of handling such a material. After review and confirmation, Gerdau and SAC selected the NELAC-certified Test America laboratory located in Nashville, Tennessee for the analysis. All analysis (except particle size analysis) was conducted there. Particle size analysis was subcontracted to Test America's laboratory in South Burlington, Vermont. Results of this analysis are summarized in the table below, but for complete details see the attached laboratory reports.

Fuel Properties

Fuel Properties	Method	Units	AVERAGE	Std Dev	Minimum	Maximum	%Non Detect	N	# Non Detect
CALORIFIC VALUE	ASTM D240	BTU/lb	2107	1412	243	4380	N/A	24	N/A
ASH CONTENT	ASTM 2974	%	50.5	9.9	26.1	69.2	N/A	21	N/A
% DRY SOLIDS	SW846	%	70.1	9.4	54.3	93.5	N/A	24	N/A
MOISTURE CONTENT (CALCULATED)	---	%	29.9	9.4	6.5	45.7	N/A	24	N/A

Table 5.2 Summary of lab analysis results of the fuel properties for all samples gathered.

The material properties summarized in Table 5.2 above, such as calorific value, ash content, and percent moisture help generally determine if the material is suitable for use as a fuel. Auto fluff consists of a multitude of materials (rubber, plastic, cloth, leather, foam, etc.) some of which are known to have significant fuel value. Therefore, the results of the analyses, showing relatively low heat content and highly variable heat content in comparison to similar analyses, including the samples analyzed for permitting. As well the results are inconsistent with auto fluff testing performed for similar permitted operations (US EPA, Oct. 2008, Draft Document). However, one variable noted during sampling was the difference of sampling location. As stated above, there are two different types of samples included in the table above; grab samples and daily composite samples of received material. Below is a chart demonstrating the difference between the lab analysis of calorific value for the pre-test grab samples and the test trial daily composite samples:

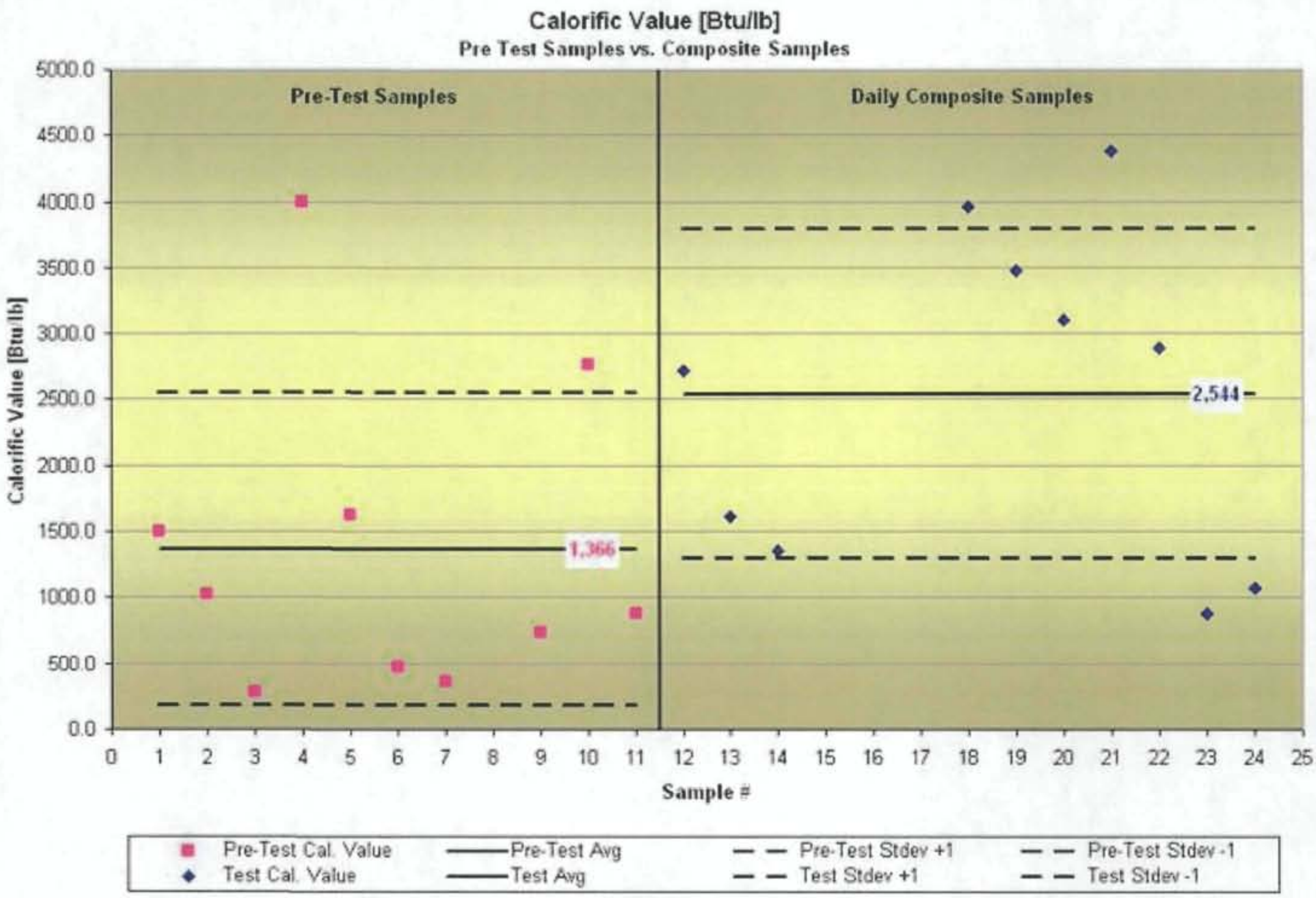


Chart 5.1 Chart of calorific value lab results of pre-test samples and daily composite samples.

As one can see, the average of the composite samples is approximately one standard deviation above the average of the pre-test samples; but the standard deviation of both sample sets is quite large and proportional suggesting, as expected, significant variability between sample sets. One reason for the increased calorific value is that many of the pre-test sampled materials were taken from the separation process at Gerdau prior to delivery, and as explained in the material handling and processing section of this paper; SAC made changes to the process to try and improve the quality of this material such as removing the material that passed through the screen on its first pass. However, an average energy density of approximately 2500 Btu/lb is still not consistent with other studies and clearly suggests the material quality processed at GA was lacking and needs further research. In addition, the variability of results may be impacted by the analytical method, ASTM D240 method. This method may not be suitable for analyzing this material.

Therefore, SAC has also used an analytical approach to estimate the energy density of auto fluff. It is calculated based on auto fluff consumption rates during the trial and the measured reduction of energy input by coal; based on coal consumption rates and a calculated expected process energy demand. The results of this analysis suggest that auto fluff energy density is significantly higher than the lab results suggest. This analytical approach is described below:

ANALYTICAL APPROACH

In order to calculate the heat replacement by auto fluff during the trial the heat demand was first estimated for the pyroprocessing system during periods prior to and during the trial where there was no auto fluff being fed to the calciner combustion chamber as follows:

Equation 1: Energy demand of the pyroprocessing system when the system is stable and no auto fluff is being fed.

$$E_{Demand} = \frac{\dot{M}_{Coal} \times E_{Coal} \times 2000 \times 10^{-6}}{\dot{M}_{KF}}$$

E_{Demand} - Energy Demand [MMBtu / ston kiln feed]

E_{Coal} - Coal Energy Density [Btu/lb] (from internal lab analysis of daily composite samples of milled coal)

$\dot{M}_{KF}$ - Kiln Feed Rate [ston/hour]

$\dot{M}_{Coal}$ - Coal Feed Rate [ston/hour]

The average calculated energy demand for the three test trial periods was calculated to be:

1. 3/10 to 3/12/2010 = 1.624 [MMBtu / ston kiln feed]
2. 3/29 to 4/03/2010 = 1.582 [MMBtu / ston kiln feed]
3. 4/08 to 4/09/2010 = 1.643 [MMBtu / ston kiln feed]

The kiln feed during periods when auto fluff is being fed to the system is then multiplied by the energy demand average to determine a theoretical energy demand for each one minute average during the test trial.

With this information it is possible to estimate the energy contribution from auto fluff as follows:

Equation 2: Energy rate of auto fluff.

$$\dot{E}_{AF} = E_{Demand} \times \dot{M}_{KF} - E_{Coal} \times \dot{M}_{Coal}$$

$\dot{E}_{AF}$ - Auto Fluff Energy Rate [MMBtu/hour]

Equation 3: Energy density of auto fluff.

$$E_{AF} = \frac{\dot{E}_{AF} \times 10^6}{\dot{M}_{AF} \times 2000}$$

E_{AF} - Auto Fluff Energy Density [Btu/lb]

$\dot{M}_{AF}$ - Auto Fluff Feed Rate [ston/hour]

The auto fluff energy densities were analyzed and filtered for periods of auto fluff feed rate transition greater than one ton per hour. This filtering is necessary because the system's actual response lags auto fluff fuel feed rate changes and takes some time to adjust to the correct coal feed rate. During periods of increasing auto fluff feed rate it can appear that auto fluff has a negative energy density and when it is decreasing it can appear that the energy content is impossibly high. The results of this estimation method are displayed in the charts below and indicate that the actual energy input of auto fluff were greater than laboratory results convey:

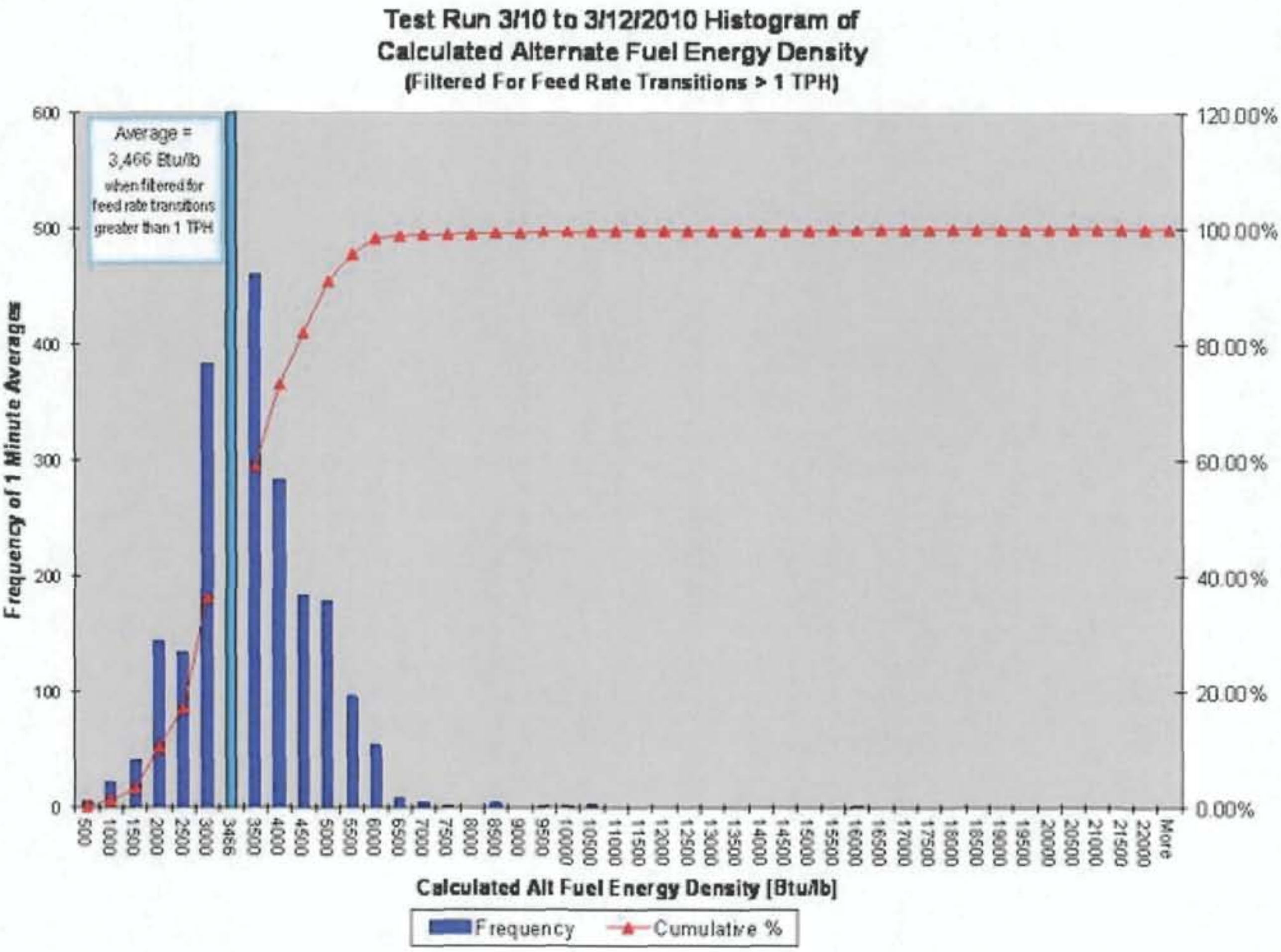


Chart 5.2 Histogram of one minute average calculated auto fluff energy density during the trial period lasting from March 10th to March 12th, 2010. The light blue line represents the arithmetic mean of all the data points as 3,466 [Btu/lb].

This histogram is a good representation of the data set, nicely bell shaped, with the most frequent estimated energy density between 3,000 and 4,000 Btu/lb. Approximately 65% of all data points fall between 2,500 and 5,000 Btu/lb. The composite sample lab results are lower for these three days; between 1,350 and 2,720 Btu/lb. SAC believes that the calculated energy density is a better representation of the experienced coal replacement and is estimated to be approximately 3,500 Btu/lb or 30% of the average energy density of milled coal (11,875 Btu/lb) used during this test period. The same method was applied to the other three test trial periods. The results are similar, suggesting that the ASTM D240 method does not properly report the energy content of auto fluff.

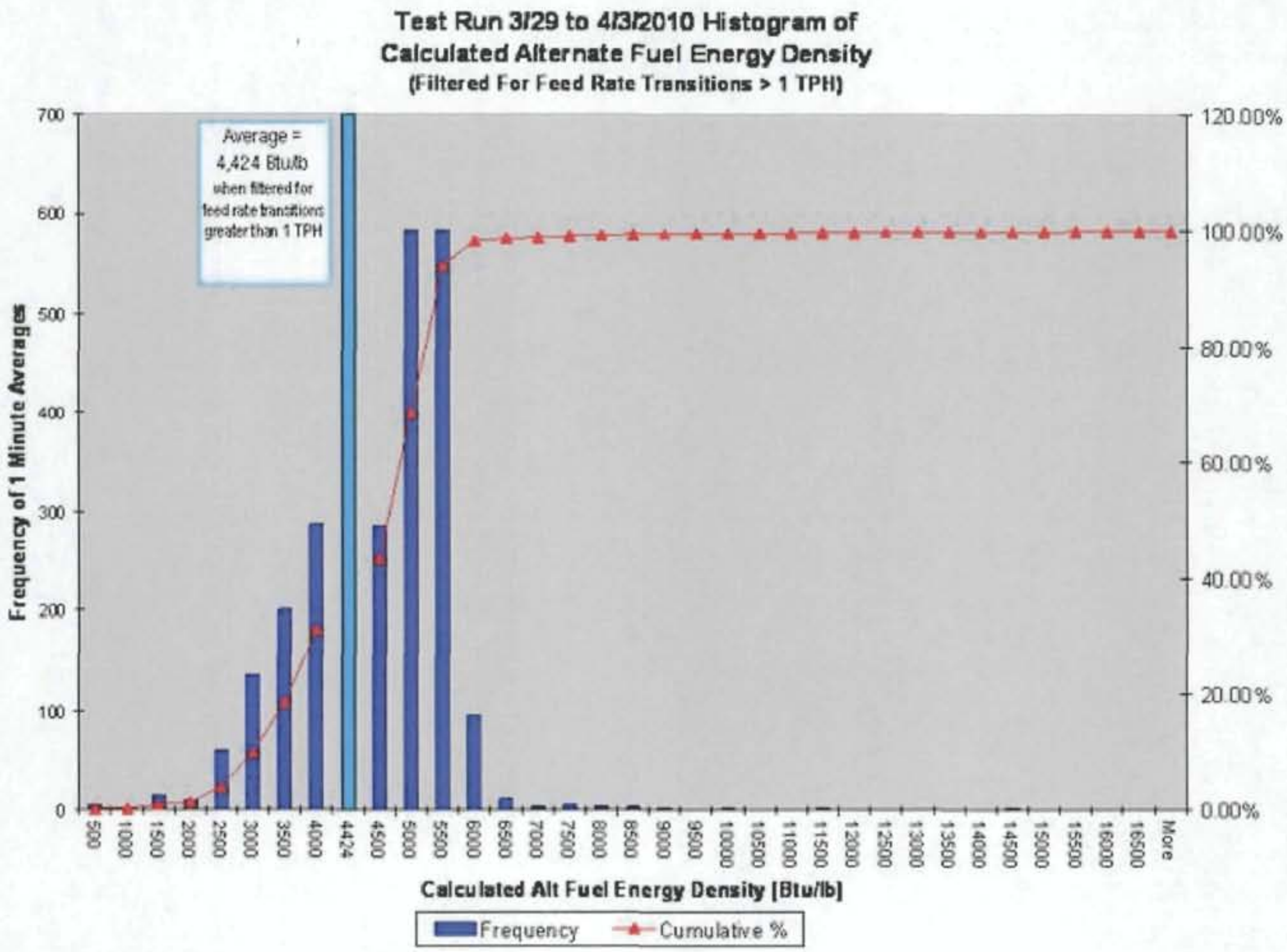


Chart 5.3 Histogram of one minute average calculated auto fluff energy density during the trial period lasting from March 29th to April 3rd, 2010. The light blue line represents the arithmetic mean of all the data points as 4,424 [Btu/lb].

This histogram is right leaning suggesting that the majority of material fed into the system was higher rather than lower. Approximately 55% of all data falls between 4,500 and 6,500 Btu/lb. This is also higher than the composite samples taken during this test period. The lab results of samples taken during this test period ranged from 2,890 to 4,380 Btu/lb. Again, note that the average estimated energy concentration is above the maximum laboratory sample result. Based on this estimate, SAC concludes that the energy density of auto fluff during this test period was approximately 4,500 Btu/lb. This was approximately 36% of the measured heat value of milled coal (12,375 Btu/lb) used during this period of testing.

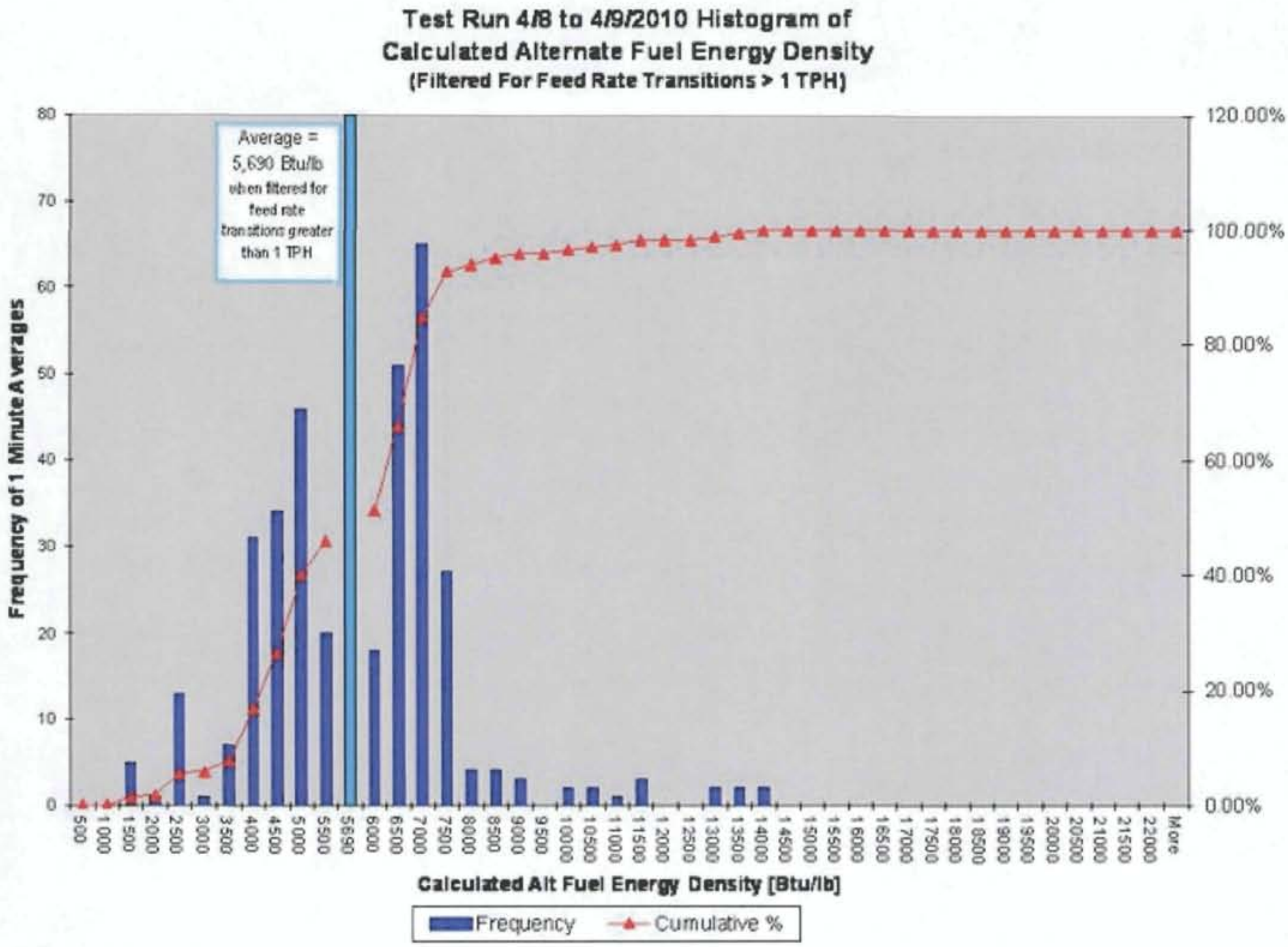


Chart 5.4 Histogram of one minute average calculated auto fluff energy density during the trial period lasting from April 8th to April 9th, 2010. The light blue line represents the arithmetic mean of all the data points as 5,690 [Btu/lb].

This histogram is also slightly right leaning suggesting that the majority of material fed into the system was higher rather than lower. Approximately 76% of all data falls between 4,000 and 7,500 Btu/lb. This is also higher than the composite samples taken during this test period. The results of those samples ranged from 881 to 1,070 Btu/lb. Based on this estimate, SAC concludes that the energy density of auto fluff during this period is 5,500 Btu/lb. This is approximately 46% of the average heat value of milled coal (11,828 Btu/lb) used during this period of testing.

The simple average for all three testing periods is 4,500 Btu/lb. Lab analysis results and other research conducted suggest that this calculated energy density is within the realm of possibility. However, one point of interest, is it has become evident, that with some simple separation techniques (initial screening) SAC was able to increase the fuel value of the material during the trial. SAC also went from a 1 inch to 1.5 inch screen prior to the April 8th to April 9th testing period. This may explain the improved heat value, but there is just not enough data from this short-term trial to draw definitive conclusions. SAC believes the fuel value of this material could be significantly improved by employing separation techniques and simple solutions to reduce moisture. As described in the Material Processing and Handling Results section of this report, other sources are capable of providing drier material since they use newer state of the art shredding systems and store shredded material under cover in a dry location. In further research, additional analytical methods and other sources should be evaluated to determine the most appropriate lab analysis and preparation methods.

Metals Analysis

Metal	Method	Units	AVERAGE	Std Dev	Minimum	Maximum	%Non Detect	N	# Non Detect
BERYLLIUM	SW846 6010B	mg/kg	0.10		0.10	0.10	96%	24	23
CADMIUM	SW846 6010B	mg/kg	19.0	9.1	5.60	37.50	8%	24	2
CHROMIUM	SW846 6010B	mg/kg	286	437	59.6	2270	0%	24	0
LEAD	SW846 6010B	mg/kg	1,448	759	343	2810	0%	24	0
MERCURY	7470A/7471A	mg/kg	1.759	1.124	0.099	4.980	4%	24	1
THALLIUM	SW846 6010B	mg/kg	Non Detect				100%	24	24

Table 5.3 Summary of lab analysis results for metals all samples gathered.

SAC was aware that metal concentrations, primarily mercury, could have the potential to affect the entire future of this program. Therefore, SAC was paying very close attention to these results, but due to the lag time between sample submission and receipt of lab analysis reports; SAC did not anticipate the laboratory findings for mercury depicted in the table above. As displayed in Chart 5.5 below, the average concentration of mercury in the samples analyzed, more than doubled from 0.94 mg/Kg to 2.42 mg/Kg. Composite samples were significantly higher than grab samples. In review of the efforts to ensure quality material from Gerdau and responses from Gerdau, SAC refrains from speculating on this matter because there is not enough data to make definitive statements at this time. With such a short test trial SAC was limited in its ability to research the cause of this increase. The final composite lab sample results were not available for analysis before the trial was even concluded. And since the results that were received are outside of the expected variability of the pre-test samples, they had to be re-tested for confirmation of accuracy; which only added additional time to the analysis. If SAC had more time to conduct this trial, SAC may have been able to determine the cause for the increase and would have worked with Gerdau to make changes to try and reduce future contamination.

Results displayed in the chart below were not anticipated and were surprising to all involved. Further research is necessary to determine the cause for this shift. Any further research should include increased sampling of source material as well as composite sampling of final product from the re-processing operations to determine if this change is a result of the re-processing methods, source material contamination, or laboratory preparation and analysis methodology. Future research should also provide other suppliers the opportunity to provide material for the trial. This could provide information on whether or not such contamination is an isolated issue or if it is endemic to the auto shredder industry.

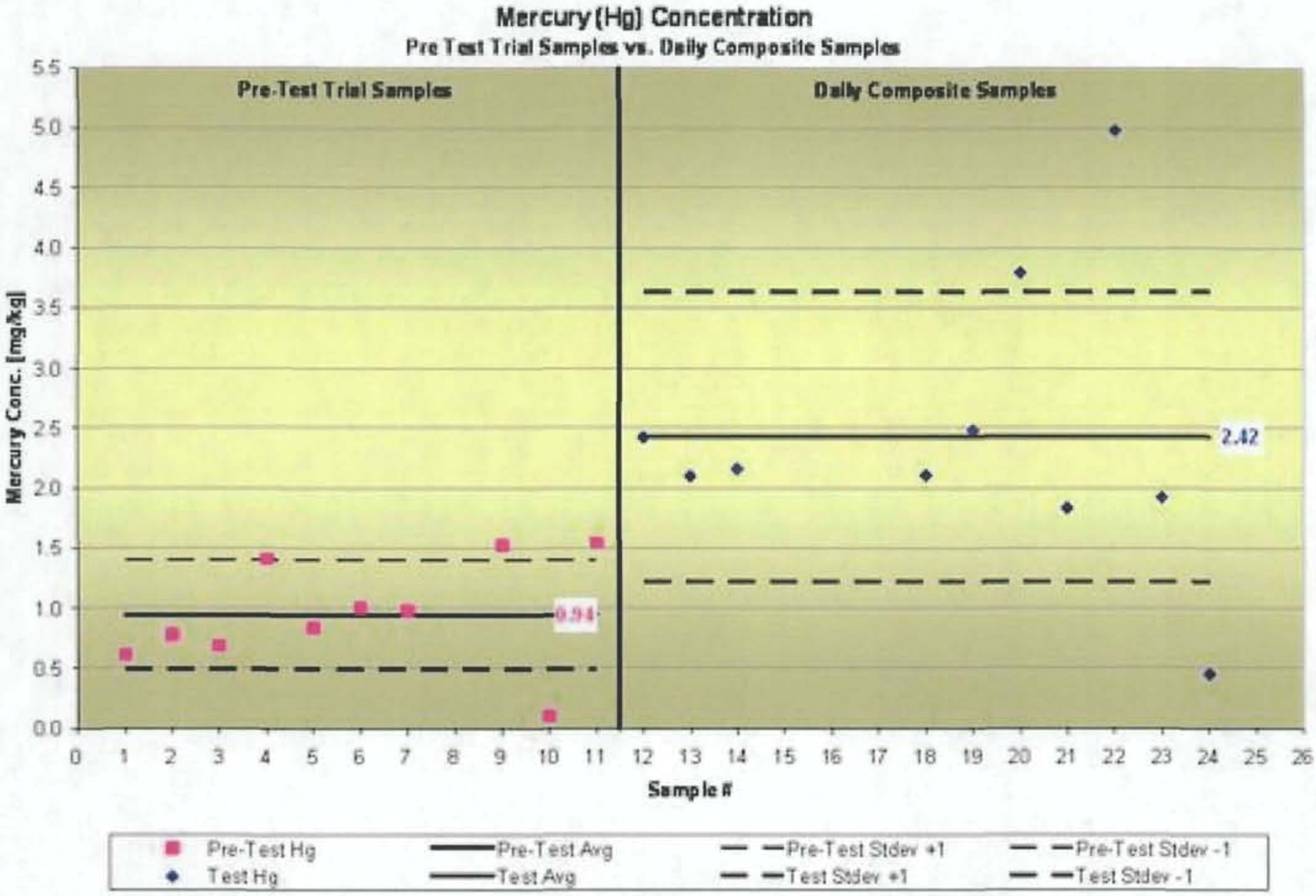


Chart 5.5 Mercury concentrations pre-test versus daily composite sample analysis.

Other metals such as lead, cadmium, and chromium were of less concern, from an air emissions stand point, since it is generally understood that these metals are captured by the pyroprocessing system at system removal efficiencies greater than 99.9 percent. Therefore, although lead was found to be present with an average concentration of 1,448 mg/kg (or 0.15% by mass); it is expected that emissions testing for metals planned during the longer term trial will confirm expected system removal efficiencies. Furthermore, these metals captured by the clinker are diluted to even lower concentrations approximately 0.01% by mass, and then when cement is mixed with aggregate materials to form concrete (concrete is approximately 10 percent cement) it is even further diluted.

Halides Analysis

Halides	Method	Units	AVERAGE	Std Dev	Minimum	Maximum	%Non Detect	N	# Non Detect
CHLORIDE	SW846 9056	mg/kg	352.0	243.55	16.8	1040.0	0%	22	0
FLUORIDE	SW846 9056A	mg/kg	7.75	4.29	1.80	16.10	0%	22	0
SULFATE	SW846 5050	%	0.155125	0.07	0.10	0.32	67%	24	16

Table 5.5 Summary of lab analysis results for halide concentrations of all samples gathered.

Sulfate and fluoride concentrations were consistently low in all samples gathered. Chloride was higher, as expected, due to the presence of plastics containing chlorides. However, the concentrations are still relatively low when comparing them to results of research in other studies (Boughton, 2006). Below is a chart of pre-test and composite sample analysis:

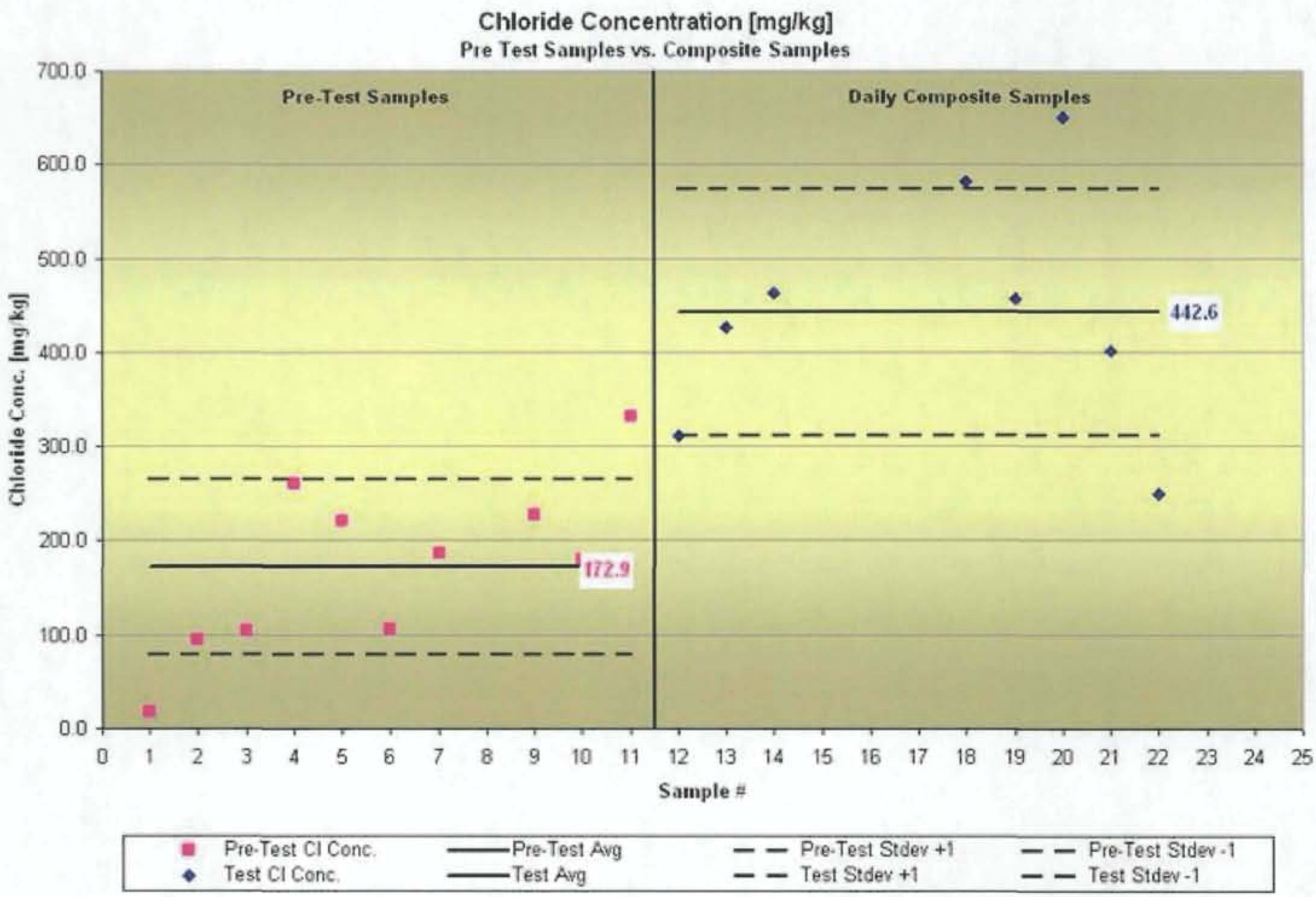


Chart 5.7 Chloride concentrations pre-test versus daily composite sample analysis.

The chart above indicates that the chloride concentration increased from prior to the test till when the test began. One conclusion that may be drawn is that targeting materials to increase the fuel value resulted in a greater concentration of plastics containing chlorides.

Volatile Organic Compounds Analysis

VOC	Method	Units	AVERAGE	Std Dev	Minimum	Maximum	%Non Detect	N	# Non Detect
All VOC	TOTAL	mg/kg	35.55	39.28	0.45	140.22	91%	24	n.a.

Table 5.5 Summary of lab analysis results for Volatile Organic Compound concentrations of all samples gathered.

Concentrations of volatile organic compounds (VOC) appear to be relatively low, and should not impact total hydrocarbon emissions especially since this material is being introduced as a fuel in the high temperature burn zone of the calciner combustion chamber. All VOC are likely to be destroyed. For more detail on which VOC were present review the detailed lab data provided in the Appendix.

6. EMISSIONS MONITORING DATA

As required by permit specific conditions 8 and 9, monitoring data of emissions and processing were collected and stored. The results of the monitoring are discussed in this section. An electronic copy of the hourly process and emissions monitoring data from March 9 through April 9, 2010 are enclosed (included Appendix). Mercury balance information is discussed in Section 5. Continuous Emissions Monitoring (CEM) data for nitrogen oxides (NOx), sulfur dioxide (SO2), total hydrocarbons (THC) are shown in Figures 6.1 through 6.6. These figures show the emissions of each pollutant as pound of pollutant per ton of clinker for six ranges of auto fluff firing conditions based on its tonnage input and heat content. The graphs label the range of auto fluff input and the number of hours of measurements. The data exclude non-normal operation: coal firing less than 4 TPH, clinker production less than 50 TPH. For the graphs based on the heat content of auto fluff, the heat content was based on the analytical model for the three general time test periods, March 9-12 (auto fluff - 3466 Btu/lb), March 28- April 3 (auto fluff – 4,424 Btu/lb), and April 8-9, 2010 (auto fluff – 5,690 Btu/lb) (see Section 5 for discussion). This method is a more accurate measure of heat content than the laboratory analytical method because the needed heat content to produce clinker in this system is well known and predictable in comparison to the highly variable and unexpectedly low heat content laboratory results. Without a more accurate determination of the heat content, these graphs based on heat content represent an approximation of the emissions impact of auto fluff per heat content basis. The carbon monoxide (CO) process monitor data is similarly shown in Figure 6.7 and 6.8.

For future research, it is recommended to further study an accurate method to measure the heat content of auto fluff.

While the data is limited to 14 days of trial burns, the data do not show clear trends in emissions with increasing auto fluff input. Emissions of NOx and THC show a slight increase with concentration yet the trends are not consistent with increased auto fluff input. The limited amount of hourly data makes assessment of the possible trends of emissions questionable. Furthermore, NOx is controlled by SNCR so any potential trend of NOx is a function of the SNCR system. All emissions and opacity were in compliance during the trial burns.

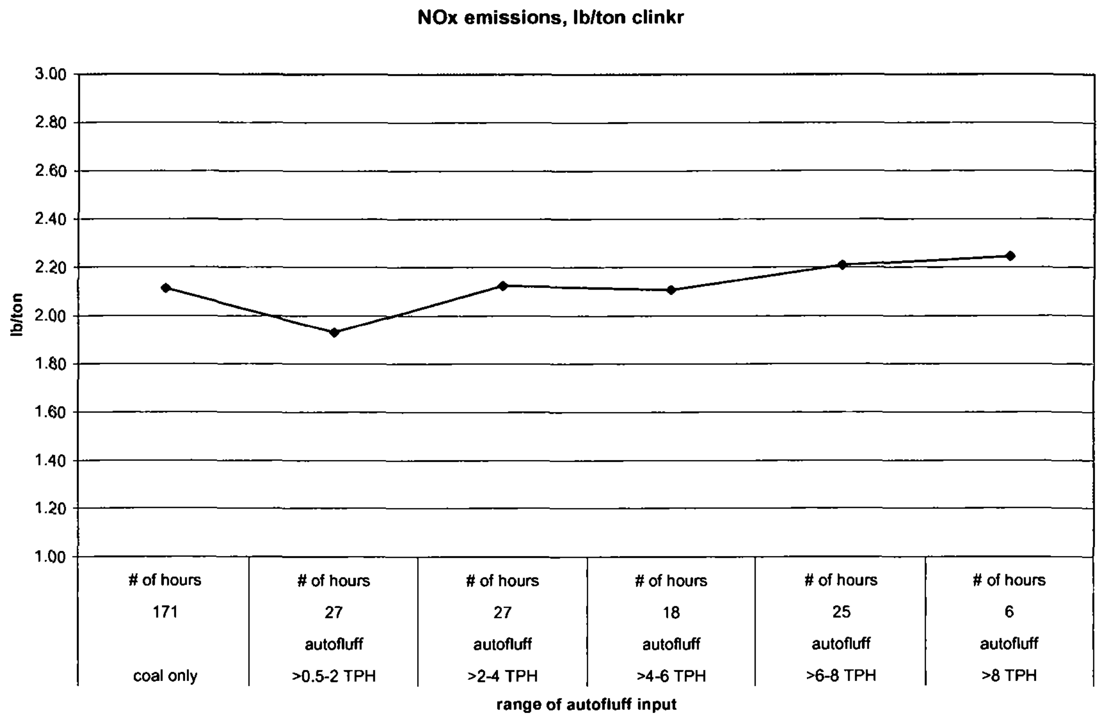


Chart 6.1 NOx emissions versus tonnage of auto fluff input

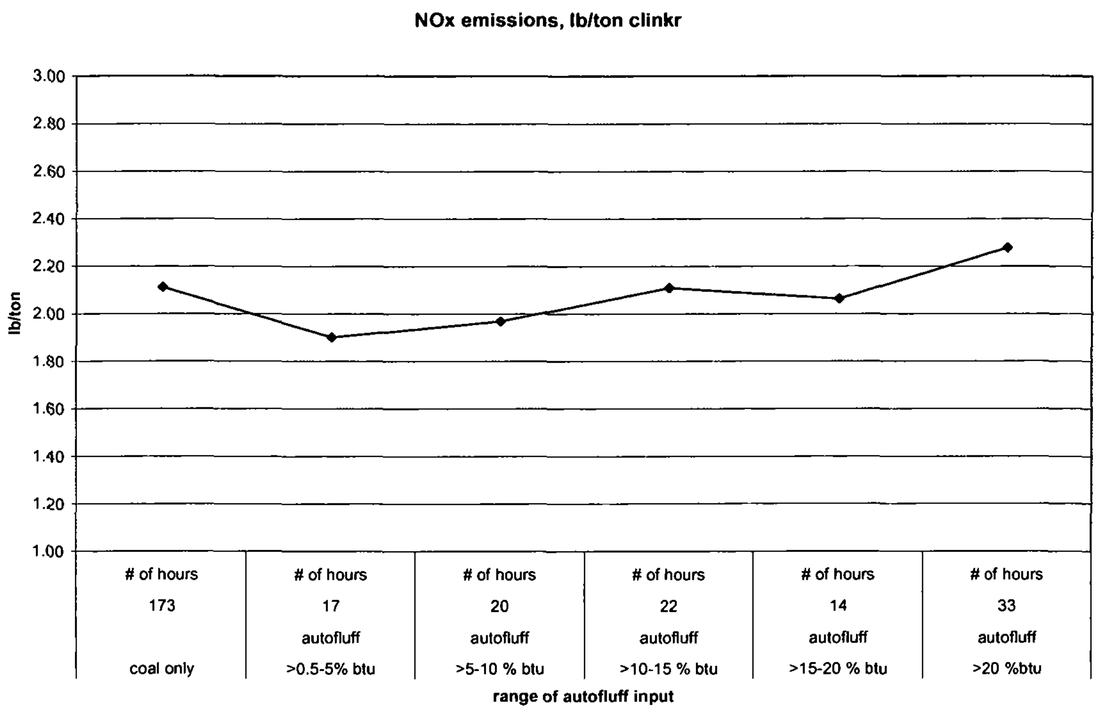


Chart 6.2 NOx emissions versus heat content of auto fluff input.

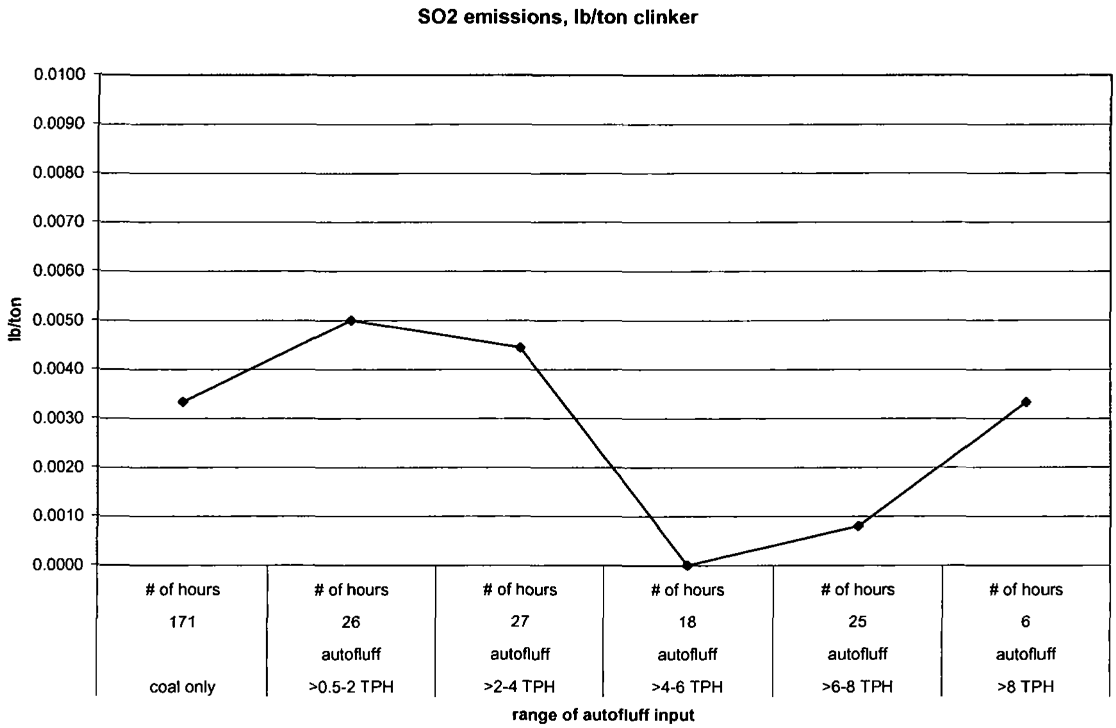


Chart 6.3 SO2 emissions versus tonnage of auto fluff input.

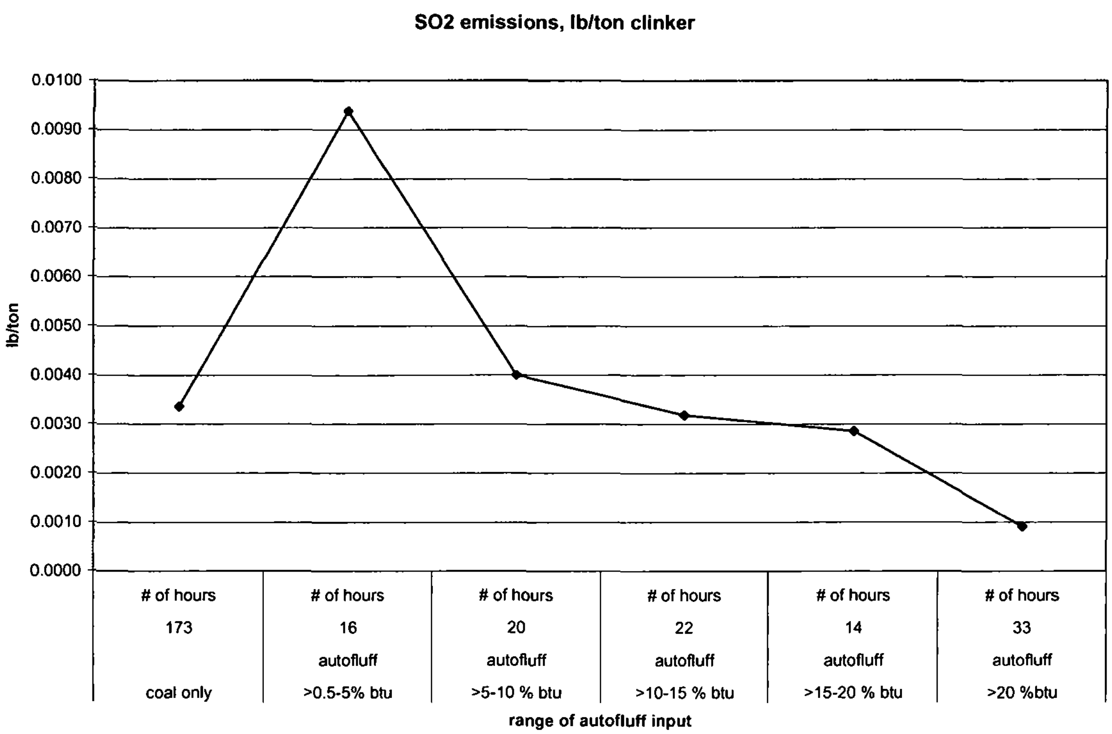


Chart 6.4 SO2 emissions versus heat content of auto fluff input.

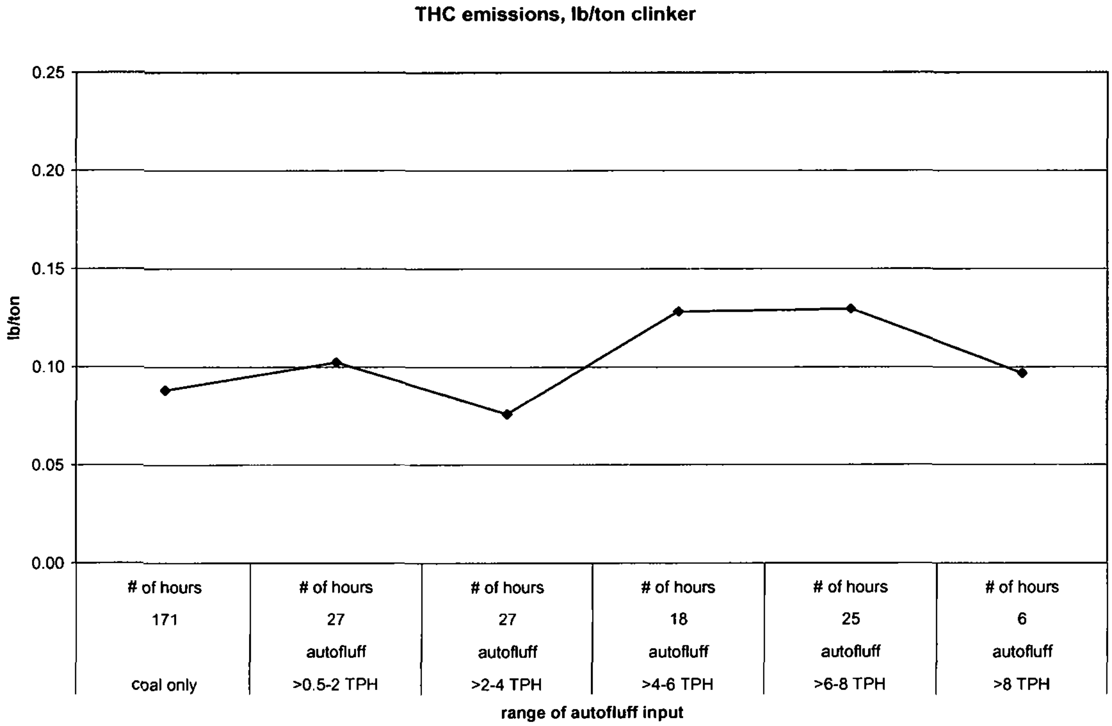


Chart 6.5 THC emissions versus tonnage of autofluff input.

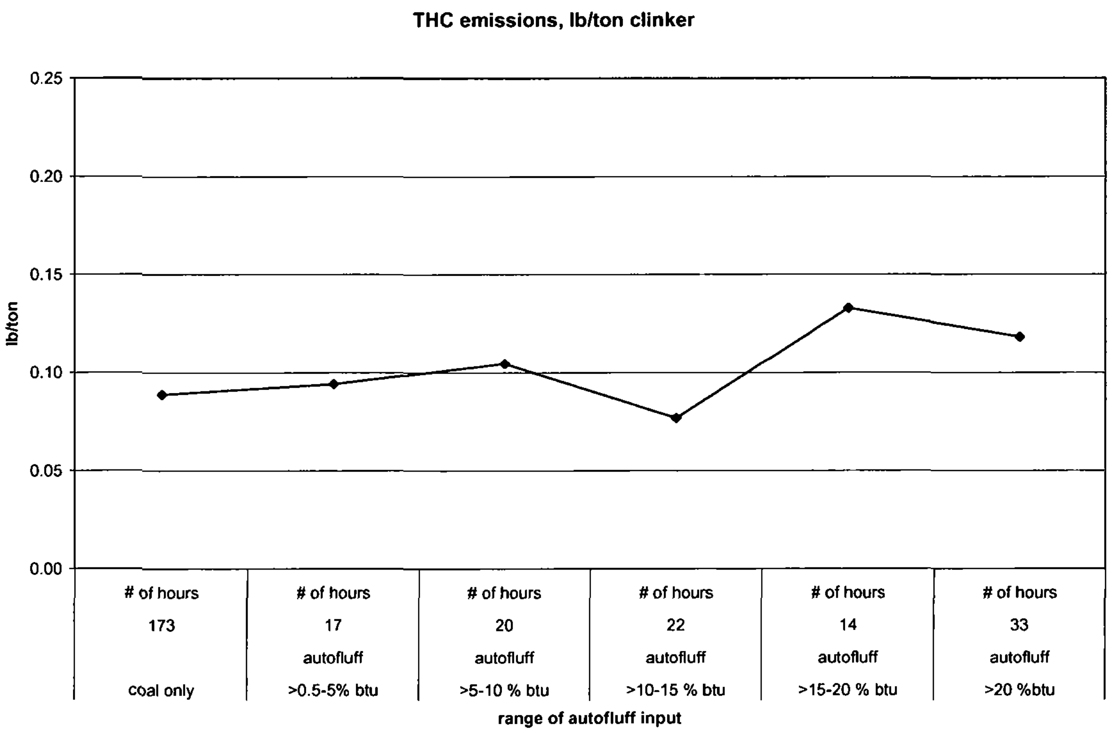


Chart 6.6 THC emissions versus heat input of auto fluff input.

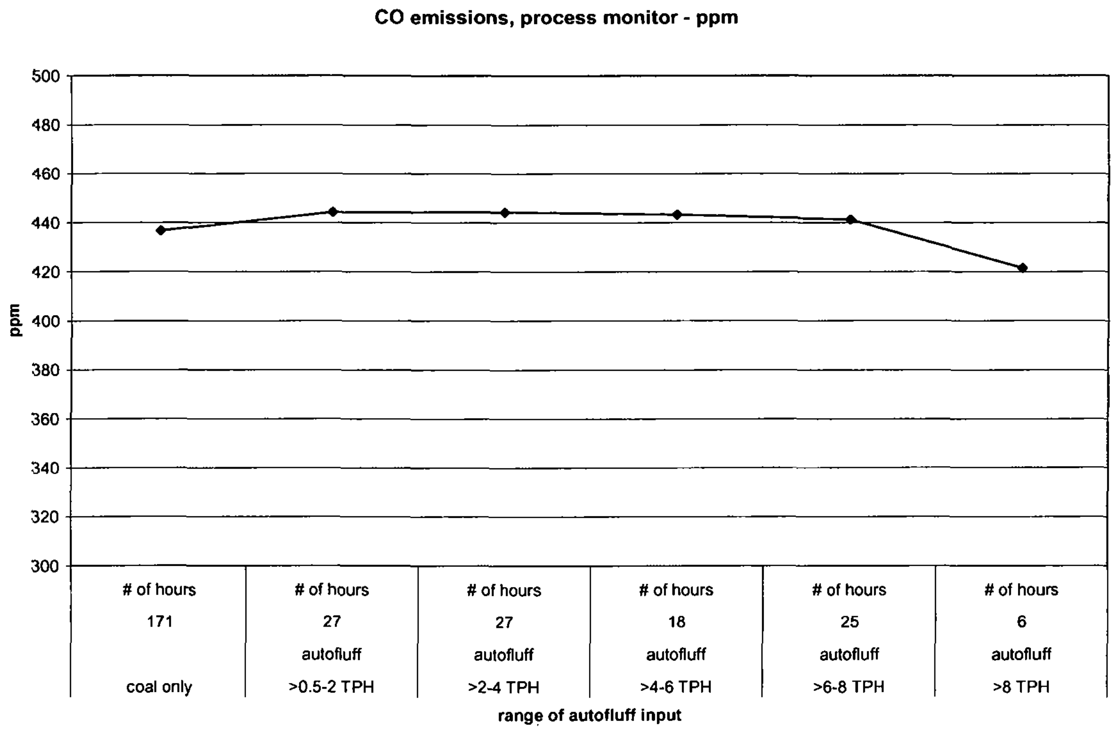


Chart 6.7 CO emissions versus tonnage of auto fluff input.

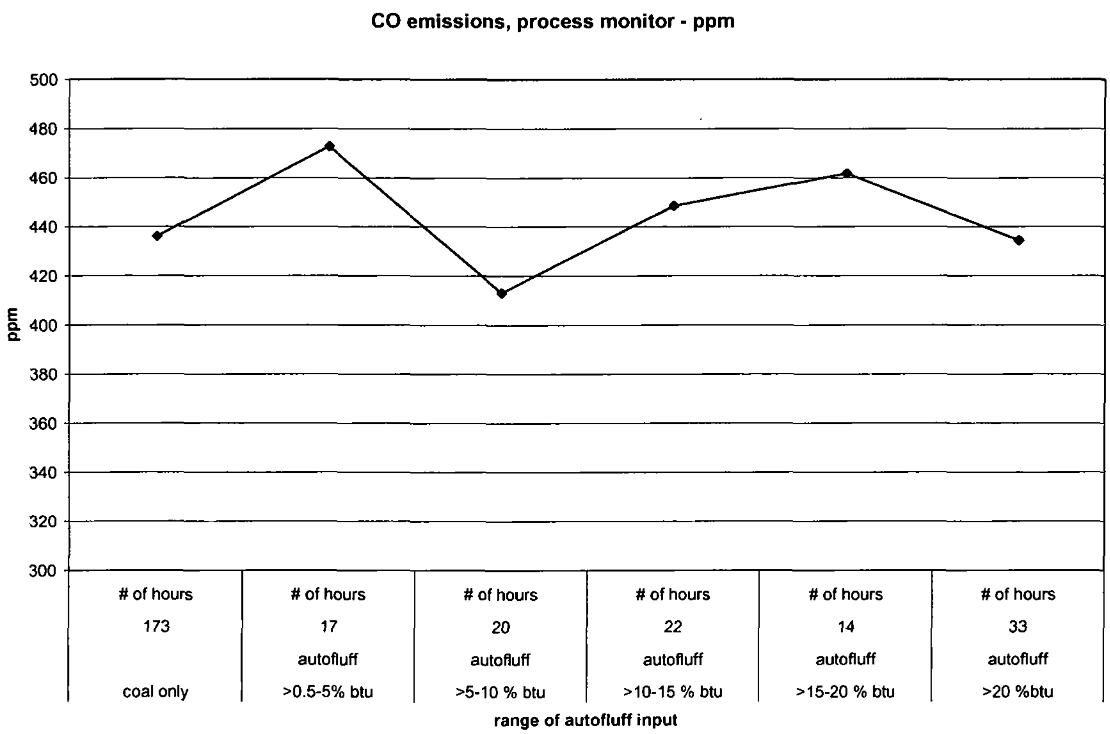


Chart 6.8 CO emissions versus heat input of autofluff input.

7. CONCLUSIONS AND FURTHER RESEARCH

The primary purpose for this trial was to determine if SAC could feasibly prepare, store, and feed this material into the pyroprocessing system before making commitments to the FDEP to install a continuous emissions mercury monitor, conduct stack testing, and test dust shuttling techniques during a long term trial. SAC has demonstrated that it can prepare, store, and feed the material into the kiln. This test trial has provided SAC with valuable information regarding necessities for a long term test trial. For example, a different type of re-shredder will be employed, as discussed in the Material Processing & Handling section of this report. Also material should be kept as dry as possible at all stages and ideally a very large stock pile (400 to 600 tons) should be prepared in advance and composite samples (rather than grab samples). And lower metal sources would be ideal; or improved separation technology should be employed such as: eddy currents, gravity separation, material density separators, and/or additional belt magnets. SAC still believes that this project has merit and that it presents the best option for reuse of this material over land filling.

This short term trial of auto fluff has also provided valuable information to evaluate the potential benefits and detriments of a processed auto fluff provided by a supplier to SAC to use as an alternative calciner fuel. In review of the test trial some significant results are listed below.

1) A single supplier of auto fluff was beneficial to simplify the assessment of source material, the processing methods, and the communications between to corporations. Limiting the supply to a single supplier allowed SAC to evaluate, without any possible complication/interaction of other suppliers. As well, a single supplier provided an accurate assessment of a single suppliers ability to generate, process and transport clean auto fluff.

2) A single supplier limits the ability for SAC to classify and select material for purposes of improving the quality as it relates to heating value and contamination by metals.

3) The results of the laboratory analyses indicate that the method to measure heat content was not reliable and did not match an analytical model of heat content based on kiln process data. The laboratory analysis was also far lower than that of other recent studies of auto fluff conducted by the California EPA. Based on the known coal replacement, the analytical model provides a more accurate estimate of the auto fluff heat content.

4) The mercury content was frequently measured as required by permit condition. While the mercury results were highly variable, the highest values, near 5 mg/kg, are outside of viable fuel supply and clearly point out that further research must reduce the mercury content of processed auto fluff. Paramount to reducing mercury, the supplier of auto fluff must not only have quality assurance procedures, these procedures must be audited and the processed auto fluff must be analyzed to prove the effectiveness of these procedures prior to the use of the auto fluff. Without additional measures taken by the supplier, such high measures of mercury seen in several samples are clearly not reasonable.

5) The method of processing material was a trial and error process with several changes made during the trial to improve material quality. The changes were intended to reduce material dirt and sand, metal content, and reduce the amount of wasted viable fuel materials (e.g., leather, foams, etc.).

6) Emissions data were collected and summarized. The emissions indicate that NOx and THC emissions

were potentially increased by the use of auto fluff. However, the data trends are not consistent due to the limited data set. Furthermore, NOx is controlled by SNCR so any potential trend of NOx is a function of the SNCR system. Additional data are needed to better assess the impact of auto fluff.

SAC believes that the results of this study indicate that further research is needed. Ideally, approval of future testing by the FDEP would permit other suppliers to provide material for the trial, implement improved re-processing procedures, target additional sampling, conduct continuous mercury emissions monitoring, test dust shuttling, and gather additional stack emissions data. Use of multiple suppliers, would provide SAC the opportunity to classify and select materials and attempt to improve the quality as it relates to heating value and contamination by metals. The test trial, summarized in this report, has provided SAC with valuable information regarding some of the challenges it will face in future use of this material. However, SAC intends to pursue this matter further since it firmly believes that the manner in which this material is disposed of now does not eliminate future risk to the environment and wastes valuable energy resources. Any further research should include increased sampling of source material as well as composite sampling of final product from the re-processing operations to determine if this change is a result of the re-processing methods, source material contamination, or laboratory preparation and analysis methodology. SAC proposes, primarily to address the mercury concentrations, for further research to conduct composite sampling (as opposed to grab samples) and mercury analysis of reprocessed material prior to receiving the material. The composite sampling and analysis plan would be similar to the sampling and analysis plan employed during the test trial at SAC (sampling at a minimum every 4 hours from the final product process stream). SAC looks forward to working with the FDEP in determining permit limits on material concentrations based on this research. With the specific measures discussed above SAC believes it can provide reasonable assurance to the FDEP that all consumed auto fluff will meet future specifications.

REFERENCES:

1) Boughton, Robert. 2006. "Evaluation of shredder residue as cement manufacturing feedstock." California Department of Toxic Substances Control.

2) US EPA. Draft document, "Trends in Beneficial Use of Alternative Fuels and Raw Materials", October, 2008. http://www.epa.gov/sectors/pdf/cement-sector-report.pdf

APPENDIX – Submitted as electronic media.

- **Lab Reports**
- **Lab Results Summary Spreadsheet**
- **Emissions Analysis Spreadsheet**

1210465-017-AC

Trial Burn Summary Report Appendices