Essar Steel Algoma Inc.

EMISSIONS MANAGEMENT MEASURES

February 11, 2016

F. Post

Manager, Environment Control Services

MEASURES

- **Fugitive Dust Management Areas**
- **Operating Facility Areas**

Fugitive Dust Management

- Trans West – Material Reprocessing
- Trans East – Transportation Services
- Ironmaking
- Cokemaking
- Steelmaking

Operating / Facility Management

- Individual Oven Pressure Control (IOPC)
- Automated Door & Jamb Cleaning No.7 Battery
- Expand Benzene Emission Controls
- Permanent Baghouse on No.6 Blast Furnace
- Improved Capture System on Dekishing Operation
- No.2 Ladle Metallurgy New Baghouse
- Lime Plant

Record of Revision / Review

Date	Details	Approval
June 25, 2009	Annual review	J. Freiman
April 21, 2010	Annual review	J. Freiman
June 25, 2010	Revised to include other emission management measures re: CofA Condition	J. Freiman
January 24, 2012	Annual Review – revised dates	J. Freiman
July 5, 2013	Revised wording and updated to reflect current conditions (i.e. Dekish, Door and Jamb	F. Post

	cleaners, etc)	
February 11, 2016	Revised wording and updated to reflect current conditions (i.e. east Dekish, site specific standard, etc)	F. Post

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Fugitive Dust Management

Trans West – Material Reprocessing

- **Trans West/Lime Plant**

Roadways and Area's – Paved and Unpaved:
Containment method is identified in the Department Environmental Guide under Section 6.1 Road Dust Reduction. When a road dust situation is identified it is to be reported to the FLS/leader by phone (4681) or over the radio. Upon receiving the report, the FLS/leader records the particulars of the incident in the Road Dust Incident Report Log, which is located on the FLS/leader desk at the Material Re-Processing building door #1.
The FLS/leader notifies all equipment and vehicle operators of the dust situation and instructs them to reduce speed on the affected road until further notice.
The FLS/leader has the information verified and determines the best method of response.
There are three types of dust control utilized in the plant.

1) Water, which is applied by a Flusher truck to clean the surface of pavement or to dampen the surface of dirt roads.
2) Petro-Tac and Poly-Trol (or other suppressant), which are applied by a special applicator truck to the surface of dirt roads to help seat the surface and thereby reduce dust.
3) Magnesium Chloride or substitute (i.e. Calcium Chloride), which is applied by a spray truck to the surface of dirt roads to help keep the surface damp longer then just a water spray. This is used in other areas such as inside mills where hot steel may be placed on the ground or during weather conditions when the temperature is near freezing point.

When the incident has been resolved the FLS/leader records the method of suppression used and the date and time completed in the Road Dust Report Log. The FLS/leader then notifies all equipment and vehicle operators to resume normal operations. The information recorded in the Road Dust Incident Report Log is then utilized in assessing the effectiveness of the Road Dust Reduction Program. * Reporting method – Section 5.3.1 in the Department Environmental Guide.

Section 5.3.1 Road Dust

The reporting of excessive road dust conditions is the accountability of all employees. (See Emergency Procedures Section 6.1)

The control of road dust is the accountability of the Transportation Services area. They have various methods of controlling road dust based in location, season and severity to road traffic. These methods are wetting dirt roads with water, flushing of paved roads, apply commercial dust suppressants such Petro Tac, Polytrol, and Magnesium (or Calcium) Chloride. These are applied as a preventative measure but also are applied when emergency situations arise.

Stockpiles such as kish:

Containment methods and procedures are outlined in sections 6.1.1.10, 6.1.10.1, 6.1.1.10.2 & 6.1.1.11 of the Material Re-Processing Loader Procedure Manual which is also outlined below.

Section 6.1.1.10 Kish Cleanup Operations – Loader and trucks

This area located north of the Separator encompasses two skulling pits, two fines pits, an auxiliary fines pit, a skull stockpile, a mixing (cooling) pit with water sprinklers, and a stockpile mix (sand and separator waste fines). The area provides the initial facilities for the recovery of the metallic content of kish by separating kish fines from solid skulls. Dust is controlled by allowing time for cooling and by mixing kish with water (summer) or sand, waste fines and snow (winter).

Section 6.1.1.10.1 Cleaning Kish Fines & Mixing (Cooling) Pits: Winter Operation

- The loader slowly spreads the kish in the mixing pit by gradually tilting the bucket open while travelling in reverse. The bucket is also positioned close to the ground. The reason for this method of unloading keeps dust around the bucket by moving the loader away from the kish. This also shortens the distance the material falls to the ground and reduces the chance of it becoming airborne.

- Mix, in the form of snow, sand or waste fines is spread over the kish fines. This method helps cool the kish and reduce dust in future handling and processing.

- The kish from the mixing pit is trucked to the current kish stockpile at Fritz. The purpose of the kish stockpile area at Fritz is to allow weathering, which reduces dust when processing the material through the Separator.

- The truck and loader operators check for excessive plumes of dust during loading and stop operation when dusty or high wind conditions persist. The purpose for this is to prevent dust exposure for all employees in the loading and dumping areas of operation.

Section 6.1.1.10.2 Cleaning Kish Fines & Mixing (Cooling) Pits: Summer Operation

- The water sprinklers located on the bank above the fines mixing pit are turned on. This is to provide water for mixing with bucket and to water the kish piles against the bank.

- Following the cleaning of the pot hauler kish pit, the loader pushes the water in the mixing pit onto the stocked kish. This process creates steam but little dust and greatly reduces dust during future handling.

- The fines mixing pit material is transferred to the kish stocking area at Fritz when the kish bank is extended beyond the reach of the sprinkler system.

Section 6.1.1.11 Cleaning Skull Pit and Stockpile – Loader and Truck Operator

- Kish is weathered for a minimum of three (3) months to reduce dust before processing through the Separator. The kish stocking area contains a weathering stockpile and a current stockpile for new kish from the pit stockpile.

Material spills from trailer box/truck onto roadway:

Section 5 Department Environmental Guide: Contact supervisor & supervisor will contact truck dispatch who will arrange to remove/clean area within a reasonable timeframe.

Process dust reduction /containment identified in the Department Environmental Guide under section 5.3.2 – Sprinklers/Curing

Section 5.3.2 Excessive Process Dust

Various processes throughout the Material Re-Processing Department create dust when in operation. Where it is practical, water is applied to keep the dust under control. In processes where materials are being handled by equipment, operators are instructed to handle the materials in a way that minimizes the creation of dust.

Located in the shift co-ordinator's office in the main welfare room is an environmental log book, where in all situations are recorded/answered.

Trans East – Transportation Services

Equipment

- Road sweeper x (2); mechanical sweeper x (1); flusher trucks x (2);

On-site traffic:
Emergency Services maintains adherence to posted speeds to reduce the speed effect on road dust.

Paved Roads, Unpaved Roads - & Other Area's (Paved/Unpaved):
Control of road dust is the responsibility of the Mobile Equipment area and is identified in the department's Standard Operating Procedures Manual

ROAD DUST
The reporting of excessive road dust conditions is the responsibility of all employees and is managed by the Mobile Equipment area. There are various methods of controlling road dust based on location, season and intensity of road traffic. Methods are wetting dirt roads with water, flushing of paved roads; apply commercial dust suppressants such as Petro Tac, and Calcium Chloride (salt pellets or salted water). These are routinely applied as a preventative measure but also are applied when emergency situations arise.

ROAD DUST REDUCTION
When a road dust situation is identified it is reported to the Mobile Dispatcher by phone or over the radio. Upon receiving the report, the Dispatcher records the particulars of the incident in the road Dust Incident Report Log located at the Transportation Services Building.
The Dispatcher coordinate's resources to respond to the road dust event or potential and applies one of the dust control methods listed below which is dependent on the location and process use. The Dispatcher also notifies all Mobile's equipment and vehicles operators of the dust situation and instructs them to reduce speed on the affected road until further notice.

These are five types of dust control identified for utilization in the plant: (Others may be substituted as required):

- Petro Tac – unpaved roadways (ie. Trans West)
- Tech Suppressant – steelworks transition areas
- Calcium/Magnesium Chloride – low impact roadways and mill areas
- Dustex – (ligno sulphonate) unpaved roadways (ie. internal to steelworks)
- Water as required in support of foregoing on both unpaved and paved roadways

When the incident has been resolved the Dispatcher records the method of suppression used and the date and time completed in the road Dust incident Report log. The Dispatcher then notifies all Mobile equipment and vehicle operators that it is okay to resume normal operations. The information recorded in the Road Dust Incident report Log is then utilized in assessing the effectiveness of the road dust reduction program.

Ironmaking

Considered Ironmaking Sources with Potential of Fugitive Dust Emissions:

- **a)** On-site Ironmaking traffic
- **b)** Paved roads & other paved areas
- **c)** Unpaved roads & areas
- **d)** Stockpiles of pellets and limestone
- **e)** Pellet and limestone unloading from self unloading lake freighters on the Ironmaking Ore Dock
- **f)** Unloading rail pellets at the Ironmaking Ground Hopper
- **g)** Torpedo Car dekishing operation
- **h)** #6 and #7 BF Casthouses
- **i)** Beaching surplus metal
- **j)** Granulated slag, pellet fines and flue dust spillage
- **k)** Ironmaking conveyor systems
- **l)** Exposed openings in process and storage buildings (i.e. ATH processing without doors closed)

Potential for Fugitive Dust Emissions:

- **a)** On-site traffic – Ironmaking has a number of light trucks and small loaders with limited potential for generating fugitive dust
- **b)** Paved roads & other paved areas – flushed with water and swept as required
- **c)** Unpaved roads & areas – unpaved roads in Ironmaking are treated with dust suppressant by Transportation Services personnel as part of the corporate programme.
- **d)** Stockpiles of pellets and limestone – pellets and limestone that are stored on the Ironmaking Ore Dock typically contain moisture. This moisture, along with the high product density, mass and coarseness, limits the potential to generate fugitive emissions.
- **e)** Pellet and limestone unloading from self unloading lake freighters on the Ironmaking Ore Dock - pellets and limestone offloading conveyors are covered, as well as rubber shrouding at the conveyor discharge, limiting the potential to generate fugitive emissions
- **f)** Unloading rail pellets at the Ironmaking Ground Hopper – there is some potential to generate fugitive dust. Ironmaking personnel are working with the pellet supplier to identify options to minimize fugitive dust emissions.
- **g)** Torpedo Car dekishing operation – this operation has potential to generate fugitive dust. Operating procedures are in place to rotate the cars 180 degrees apart while removing Kish. A containment system with hoods and portable baghouses is installed on the east and west dekishing stations.
- **h)** #6 and #7 BF Casthouses – both casthouses have the potential to generate fugitive dust emissions. Installation of a permanent baghouse for #7 BF is complete and the system is in operation. Design of the permanent #6 BF baghouse is complete, fabrication of the modules is complete and civil work has commenced. The new baghouse must be operational 10 months after start-up of #6 Blast Furnace.
- **i)** Beaching surplus metal – surplus hot metal resulting from downstream process disruption is poured on inclined sand pig beds that are prepared by Material Reprocessing personnel. Fugitive emissions are minimized through bed preparation and controlling the rate of flow onto the bed

j) Granulated slag, pellet fines and flue dust spillage – granulated slag spillage is minimized by use of a truck level control system that allows Material Reprocessing personnel to fill each truck to the optimum level. Any spillage is removed from the roadway by Transportation personnel. Pellet fines are deposited in storage areas at #6 BF and trucked to fines storage by Transportation personnel. Elevated moisture of pellet fines, along with high product density, minimizes the potential for fugitive dust emissions. Flue dust that is removed from the #6 BF process passes through a pug mill that wets the product to avoid fugitive dust emissions. #7 BF utilizes a different technology whereby small quantities of flue dust are periodically removed from the process through a lock hopper system. This dust is collected in an enclosed area with doors and is removed to storage by Transportation personnel.

k) Ironmaking conveyor systems – Ironmaking conveyor systems are enclosed or covered to contain any fugitive dust in the process.

l) Exposed openings in process and storage buildings – operating practice in place to ensure that the ATH torpedo car doors are closed if weather conditions impact baghouse draft.

Cokemaking

Particulate (Dust) emissions from operational sources such as pushing and charging are controlled by approved emission control equipment. Examples are; the PEC on 8&9 Coke batteries, the PEC on 7 Coke battery and the respective battery charging equipment for the coal Larry Car.

The focus on Cokemaking fugitive emissions is based around the site specific standard for particulate. A fugitive emissions management program is in place to control the gas leaks from coke oven doors, lids, off-takes, pushes and charges. By employing an effective maintenance program and strictly adhering to standard operating procedures, fugitive emissions can be effectively controlled.

There is significant potential for fugitive dust emissions from the open-field coal storage pile area located on the west side of the Essar boat slip. Construction of a coal pile wind berm is essentially complete (greening initiatives also completed) and will provide a designed interference to prevent winds from directly striking the surface of the coal piles. This will reduce the opportunity for wind to blow fine coal particulate from the pile surface.

Roads around Surge Piles to Ground Hopper:

The surge pile roads leading up to the ground hopper are required to be graded. Immediately after grading, an appropriate dust suppressant such as Petro Tac or water, is applied to prevent dust emissions as a result of equipment traffic. The frequency and type of application is dependent on weather and may be adjusted as appropriate. Mobile equipment operators working in the area confirm the application has been effective and record the observation in the Mobile shift logs. Weather forecasting of hot, dry and dusty conditions will be considered when scheduling applications of a dust suppressant or levels of activity for equipment operating in the area.

Roads to Pile Cuts:

A pile Cut is the term used when coal scraper equipment drives into the side of the active coal storage pile and “cuts off a slice” of coal to be transported to the conveying system which takes it to the batteries. An appropriate dust suppressant such as Petro Tac or just water, is applied to prevent dust emissions as a result of the coal scraper equipment working in this area. Mobile equipment operators working in the area confirm the application has been effective and record the observation in the Mobile shift logs.

Untraveled Areas between Coal Piles:

The areas between coal piles that are normally untraveled and generally inactive are monitored for potential dust emission conditions largely dependent on weather. The areas are inspected by the Front Line Supervisor generally on a weekly basis and if conditions warrant, an application of dust suppressant is scheduled. The application is recorded in the Mobile operators shift reports along with an evaluation of effectiveness.

Sides of Coal Storage Piles:

The inactive or uncut sides of the storage piles are treated with a dust suppressant such as Petro Tac or water. The application is made at 10 foot elevation intervals and reapplied for every 10 feet of elevation change. This action causes a crust to form on the surface of the pile thereby making it less susceptible to the effects of winds striking the surface. The department also retains the services of a

dedicated water truck that can supplement the Petro Tac on an as-needed basis, such as extreme weather conditions.

Top of Coal Storage Piles:

The coal storage piles are built up dependent on coal delivery and vessel off-loading. The coal delivery spec calls for coal to be delivered at approximately 7% moisture, which limits potential for dust from off-loading. Coal that has been off-loaded from the vessel is transported by large coal scraper equipment to a specific coal storage pile area, dependent on specific grade and type of coal brought in. Weather conditions are closely monitored for potential of fugitive dust emissions during this activity and if warranted, a dust suppressant is applied directly to the tops of the piles. The dedicated water truck has been fitted with water cannon that are also capable of applying water to the top of the piles. Any application in this area is recorded in the Mobile operator's shift log, including effectiveness.

Dust from Belt systems.

The cokemaking process uses a conveyor belt system to feed various parts of the facility with coal and coke material inputs. A rigorous program is followed to routinely clean the accumulations from in and under these beltways and reducing the potential for fugitive dust emissions. The coal conveyors are also enclosed to mitigate dust from the process.

Steelmaking

Following outlines the potential causes of fugitive dust emissions in the BOSP. The potential fugitive emission sources and steps being taken to curtail them are listed by area.

Charge and melt

Fill out emissions. The vessel is not filled until the light indicates that there is sufficient draw from the SEC to process all the fumes coming off iron and scrap when the vessel is filled out. When emissions occur, the responsible area checks into the scrap inputs and inspects it. If the scrap is deemed unacceptable it is sent back to Trans West Material Reprocessing with notification about any cleanliness issues by dirt entrainment. In addition, vendor audits are conducted periodically to ensure supplied scrap meets Essar specifications and in cases where the vendor does not satisfy these, the material is returned to the supplier.

Another cause of a fill out emission is when there is excess water in the scrap charge. These occur mainly in the winter time when snow and ice get mixed into the scrap when it is processed.

The procedure is to flip the scrap charge over onto the tap belly of the vessel to allow the ice to melt and the water to drain out the tap hole. The crane then slowly gives the vessel a small amount to avoid explosions. Furnace crews do not flip the vessel over for iron fill out until the amount of water flowing out the tap hole stops. This can take up to ten minutes in the winter if there is a lot of water to drain.

In-blow Emissions. These are caused when the oxidation process going on during the blow causes the molten bath to overflow the top of the vessel. Shift manager's make out a report of any such incident and investigate the possible causes while at the same time initiating appropriate actions.

The furnace operator will generally reduce the oxygen flow rate, add lime and if need be, will abort the blow to stop the emission. These heats are reviewed by department technical personnel to determine if special action needs to be taken to change the blow inputs to the heat.

Essar Steel has initiated a program to reline the BOSP vessels more often. The major benefit from this is that there is more volume inside the vessel and therefore less chance of the blow slopping over and causing emissions. The frequency of emission rate from this type of event has been greatly reduced since this program was implemented.

Alloy addition emissions. There is some potential for an emission from this activity as a result of alloys and slag trimming material starting to burn off on the top of the ladle. The main cause of this is from high north winds blowing into the shop and blowing the dust into "B" aisle.

To assist in preventing these emissions Essar tries to maintain the BOSP Shop north wall door systems as well as following the practice of keeping the ladle under the floor until the alloys are completely stirred in. The approved SEC emission control system on the south side of the vessel is designed to capture these emissions.

Plans for a new Ladle Metallurgy Furnace (No.2 LMF) also include a new bag house that will handle the emissions from the new LMF and is intended to be state-of-the-art best available technology for efficiency of capture.

Hot MetalTransfer (Iron Reladle) Emissions.

There is potential for emissions when the iron delivered to the BOSP steelmaking shop is poured out of the torpedo into the charge ladle.

BOSP maintenance personnel follow a rigorous maintenance PM program. Essar has completed the process of upgrading the compartments of the bag house in order to increase their effectiveness. Maintenance personnel check the draw on the hot metal kish a minimum of once per shift, ensuring the kish that can be generated from this transfer is going into the kish box.

Pit Cleaning Dust Emissions.

There is potential for an emission to occur during this activity when the pay-loader cleans out under the vessels. The Steelmaking slag material is scooped up and dumped into large slag pots used for this purpose.

Essar is investigating other opportunities to limit the potential for dust from this necessary process activity.

Pigging Pit - Pouring and Removal Issues.

When the shop receives returned metal from the casters it is sometimes pigged in “C” aisle.

In order to reduce the potential for dust emissions from this activity, the molten metal is poured into prepared, clean sand “coffins”. BOSP personnel also follow the practice of keeping the “coffins” (pig beds) small to ensure removal and recovery is easier with a small loader that has less potential of creating dust during the activity. The area is water sprayed when Trans West removes them from the south side of the building.

Dust from Belt systems.

The BOSP Steelmaking process uses a stock conveyor belt system to feed various parts of the facility with raw material inputs. A rigorous program is followed to routinely clean the accumulations from under these beltways and reducing the potential for fugitive dust emissions.

Dirt and dust on roadways.

BOSP personnel monitor road conditions around the facility. If road dust conditions are deemed questionable around the facility, Transportation Services are notified to dispatch sweepers, flushers or apply dust suppressant or water to prevent emissions from dust being stirred up by large vehicle movement in and out of the area.

In addition, when fill is required to maintain level travel surfaces for the unpaved areas, gravel is used in place of the more readily available process fines. The heavier gravel reduces the potential for dust emissions from vehicle traffic around the BOSP facility.

Operating / Facility Management

Individual Oven pressure Control (IOPC)

Individual oven pressure control is considered best available technology for reducing coke oven battery emissions for vertical slot oven batteries. The technology was only available from two vendors in the world and Essar worked very closely with the vendors to evaluate the technology's applicability at the existing coke ovens. This technology has the capability to significantly reduce battery emissions.

Essar Steel Algoma Inc. completed installation of this technology on the current No.9 Coke Battery, and became operational October 31, 2011.

In the longer term, Essar will evaluate the effectiveness of the No.9 battery installation for consideration of installation onto its existing No.8 Coke Battery. Future consideration of a new coke battery will include this technology in the design.

Automated Door & Jamb Cleaning No.7 Coke Oven Battery

While the business case analysis continues to be conducted to assess the ability to finance and construct a replacement new coke battery for the existing older No.7 battery, Essar has procured Door & Jamb cleaning equipment for the existing No.7 battery from a former U.S. facility that was shut down. The equipment has been refurbished to make it suitable for use on the Essar #7 battery.

Automated door & jamb cleaning provides a consistent sealing surface between the oven door and the oven jamb face that is difficult to achieve by manual, hand-operated equipment. A clean, consistent surface seals effectively and repeatably.

In 2012 Essar installed and began operating door & jamb cleaners on the No.7 battery.

Expand Benzene Emission Controls

Essar Steel commissioned and has completed a Technology Benchmarking assessment relative to reducing benzene emissions from Cokemaking. Essar currently meets or exceeds the CSPA/Environment Canada Code of Practices guideline for benzene release reduction and future targets with our existing Benzene Emission Control (BEC) system utilizing a nitrogen inert sweep-gas and collection system.

Essar Steel completed the Technology Benchmarking assessment in 2009 and with the anticipated tightening of benzene release standards, plans to expand the current BEC to capture additional sources not within the current system.

Permanent Baghouse on No.6 Blast Furnace

The No.6 blast furnace was idled in late 2008 following the global market collapse and has not operated since then.

As required by the current Certificate of Approval (Air) for the No.6 furnace, upon restart a new baghouse will be utilized.

While a date for restarting the blast furnace cannot be predicted at this time, Essar Steel will install and operate a new, state-of-the-art, best technology permanent baghouse for the No.6 Blast Furnace within 10-months of restarting. The new baghouse will incorporate baghouse compartmental broken-bag detection and is expected to result in an overall net reduction of particulate release.

Improved Capture System on Dekishing Operation

Essar Steel completed a portable baghouse trial on a portion of the dekish operation in 2009 and in the dekish emission reduction report submitted December 21, 2009, identified the long-term emissions reduction plan for this activity would be to expand the use of the current portable baghouse technology to include both dekishing stations, including separate capture hoods for each station and separate baghouse for each.

In 2012 the existing east station was upgraded to improve capture efficiency. In 2014, an identical system was installed on the west dekish station.

No.2 Ladle Metallurgy New Baghouse

It is the intention of Essar Steel Algoma to grow its market share and improve the quality of its steel product range to meet ever-increasing customer quality requirements. In support of this aim, Essar plans to construct and install a second, efficient Ladle Metallurgy treatment Facility (LMF) at the BOSP Steelmaking operation.

Essar submitted a completed application for Certificate of Approval (Air) for the baghouse for the proposed new No.2 LMF in March 2010. The baghouse proposed for the new LMF facility will be fully dedicated, state-of-the -art technology and incorporating the latest technology in baghouse design and broken bag leak detection. The approval was received in 2010; however, component procurement and construction restart remains on hold due to still stressed global market conditions.

Lime Plant

The lime plant operates a positive pressure baghouse. A thorough inspection and repair program was conducted in 2015 which included significant upgrades to the baghouse, sealing and patching duct work and replacement of all bags in the baghouse and installing chutes to minimize emissions from falling material. Additionally in 2015, all lime plant personnel were trained in revised standard operating procedures to control emissions from the process.