

Secondary Aluminum NESHAP
40CFR Part 63 Subpart RRR

Operation, Maintenance, and Monitoring Plan for

MI Metals, Inc. – Oldsmar
Air Permit Facility ID 1030114
301 Commerce Blvd.
Oldsmar, FL 34677
Phone 813 855-5695

revised 10/31/08

1. INTRODUCTION

This Operation, Maintenance, and Monitoring (OM&M) plan has been prepared for MI Metals, Inc. (MI) in accordance with the requirements of 40 CFR 63 subpart RRR – National Emission Standards for Hazardous Air Pollutants (NESHAPs) for Secondary Aluminum Production (MACT). This plan is being submitted to the following regulatory agencies for review and approval:

- Florida Department of Environmental Protection
Division of Air Resource Management
13051 North Telecom Parkway
Temple Terrace, Florida 33637-0926
- Pinellas Department of Environmental Management
Air Quality Division
300 South Garden Avenue
Clearwater, FL 34616
- United States Environmental Protection Agency Region 4
Sam Nunn Atlanta Federal Center
Air, Pesticides & Toxics Management Division
Air & EPCRA Enforcement Branch
61 Forsyth Street, SW
Atlanta, GA 30303-89060

MI's Facility ID 130114 (Emission Unit ID 001) is located at 301 Commerce Blvd., Oldsmar, Florida 34677. The facility latitude is 28° 2' 39" and longitude 82° 39' 42".

This facility is classified as a Secondary Aluminum Production Facility with a primary Standard Industrial Classification Code (SIC) 3354 Aluminum Extruded Products, and secondary SIC 3365 Aluminum Foundries.

It is a non major area source facility, since the potential emissions are less than 10 tons per year of any hazardous air pollutant (HAP), less than 25 tons per year of any combination of HAPs, and less than 100-tons per year of any regulated air pollutant. As an area source, MI is required to comply with the USEPA MACT emission limit for dioxins/furans (DF) only. This facility is not subject to the USEPA MACT emission limits for particulate matter (PM) and hydrogen chloride (HCL). PM and visible emissions (VE) limits are FDEP requirements by F.A.C. Rule 62-296.320(4)(a) and Rule 62-296.320(4)(b).

This facility operates a furnace with a dimensional capacity of 25 tons of aluminum and an actual holding capacity of 22.5 tons. The furnace processes scrap aluminum containing painted or unpainted material from any Grades or ISRI Codes listed in Description of Scrap Aluminum (Appendix A) up to a combined maximum of 60% by weight Tutu plus Toto, up to a maximum *charge feed amount* based on *operating cycle* of 21.6 tons Al, up to a maximum *process rate* based on *operating cycle* of 2.2 tons aluminum/hour, and up to a maximum reactive flux rate based on *operating cycle* of 0.885 pounds chlorine/ton aluminum charged. The furnace is never emptied during casting since there is always a heel left for the next charge. This heel accounts for the difference between the actual holding capacity and the *charge feed amount*. Essentially, the furnace is continually alternating between being charged and tapped and is never emptied. The furnace also experiences holding phases during which the level of molten aluminum is simply being maintained and aluminum is neither being added nor removed. Typical *Operating Cycles* for *Charges* are summarized in Appendix B. *Operating cycle* is defined in accordance with 40CFR63.1503 as the period beginning when the feed material is first charged and ending when the casting process is completed.

This melting/holding furnace has no charging side wells and is classified as a Group 1 furnace because it processes coated and non-coated aluminum. The furnace is equipped with a baghouse air pollution control device that includes lime coated fabric filters with an intermittent lime injection feeder.

The only fuel is natural gas that is fired through a set of two 10 mmBTU/hr burners for a total of 20 mmBTU/hr. Process and combustion emissions from the furnace are vented through a single flue stack. The furnace processes coated and uncoated scrap aluminum alloy listed in Description of Scrap Aluminum (Appendix A).

The furnace operates as a continuous batch process, with aluminum scrap being placed on the deck of the charge table by means of forklifts. There is a maximum of three *charges* during the course of the day. An alloying metal may be added to the molten aluminum depending upon the type of product being manufactured. The front door of the furnace is opened immediately before placing the charging table into position and is closed as soon as the charging is finished.

Reactive chlorine flux is injected into the furnace molten metal bath with a degassing wand during a 15 minute period just prior to casting. The furnace bath is fluxed as needed with a maximum of 30 pounds Amlox 72F or equivalent/21.6 tons aluminum or maximum of 60 pounds Amlox 72F or equivalent/day. This equates to a maximum of 0.885 pounds chlorine/ton aluminum charge based on *operating cycle*. The maximum potential stoichiometric amounts of Hazardous Air Pollutants (HAPS) produced from these fluxes are 7.17 tons HCl/year and 7.17 tons total HAPS/year.

A typical day of normal operation would consist of one to three shorter and/or longer *charges* per day. Typical *Operating Cycles for Charges* (Addendum B) provides details of typical shorter and longer *charges*. Hours and total tons of scrap aluminum are approximate and may vary due to production demands but will not exceed permitted limits established during the Performance Test. *Operating cycle* is defined in accordance with 40CFR63.1503 as the period beginning when the feed material is first charged and ending when the casting process is completed.

A casting machine and homogenizing oven produce 8 to 9 inch aluminum logs. The logs are cut into billets to be heated and then extruded into different shapes. The extruded products are placed in an aging furnace to relieve the metal stress. Some of the extrusions are cleaned, etched, anodized, and sealed.

2. SUMMARY OF EMISSION & OPERATION LIMITS

| <u>Parameter</u> | <u>Maximum Limit</u> |
|---------------------------|--|
| Particulate Matter (PM) | 5.85 pounds/hour, 25.6 tons/year based on <i>operating cycle</i> |
| HCL | 7.17 tons/year |
| Total HAPS | 7.17 tons/year |
| Dioxins/Furans (DF) | 3.00 x 10 ⁻⁸ pounds DF/ton aluminum, 2.89 x 10 ⁻⁷ tons DF/year, 2.1 x 10 ⁻⁴ grains DF/ton aluminum based on <i>operating cycle</i> |
| <i>Process Rate</i> | 19,272 tons aluminum/year, 2.2 tons aluminum/hour based on <i>operating cycle</i> |
| Reactive Flux Rate | 0.885 pounds chlorine/ton aluminum charge based on <i>operating cycle</i> |
| Amlox 72F or equivalent | 30 pounds/21.6 tons aluminum, 60 pounds/day, 15 minute period based on <i>operating cycle</i> |
| <i>Charge Feed Amount</i> | 21.6 tons aluminum based on <i>operating cycle</i> |
| Baghouse Temperature | 25°F above allowable limits established during Performance Test |
| Lime Feed | 10.4 pounds/hour, 5 x 50 pound bag/day, 250 pounds/day |
| Charge | 3 charges/day |
| Furnace Burner | 20 MMBTU/hour |
| Hours of Operation | 24 hours/day, 365 days/year, 8760 hours/year |
| Type of Scrap Material | scrap aluminum containing painted material or unpainted material from any Grades or ISRI (Institute of Scrap and Recycling Industries) Codes listed in Description of Scrap Aluminum (refer to Appendix A) and up to a combined maximum of 60% by weight Tutu plus Toto. |

Operating cycle is defined in accordance with 40CFR63.1503 as the period beginning when the feed material is first charged and ending when the casting process is completed.

3. OPERATION

The allowable operating parameters for this source will be pending the operation/construction permit conditions; the operating limits established during the compliance tests; requirements of 40CFR Part 63 Subpart RRR, National Emission Standards for Hazardous Air Pollutants for Secondary Aluminum Production; and the comments/approval by the FDEP, PDEM, and USEPA.

The USEPA MACT performance test for DF will be conducted during the longer *operating cycle* while operating at the highest *charge feed amount* of 21.6 tons aluminum based on *operating cycle*, using 60% by weight of ISRI Code Tutu (highest potential emission), and the greatest reactive flux rate of 0.885 pounds chlorine/ton aluminum charge based on *operating cycle*. The FDEP performance test for PM and VE will be conducted during the shorter *operating cycle* while operating within 10% of the highest *process rate* of 2.2 tons aluminum/hour based on *operating cycle*, using 60% by weight of ISRI Code Tutu (highest potential emission), and within 10% of the greatest reactive flux rate of 0.885 pounds chlorine/ton aluminum charge based on *operating cycle*. Daily operation at equal or lower operational levels will ensure ongoing compliance with emission limits since the performance test will have passed regulatory standards. Refer to Performance Test Protocol for DF Group 1 Aluminum Furnace and Performance Test Protocol for PM/VE Group 1 Aluminum Furnace for details of test procedures. *Operating cycle* is defined in accordance with 40CFR63.1503 as the period beginning when the feed material is first charged and ending when the casting process is completed.

A. ADD-ON CONTROL EQUIPMENT

A shaker-type baghouse with a design capacity of 40,000 acfm and a bag leak detection system has been installed to control the emissions from this SAPU in accordance with EPA Office of Air Quality Planning and Standards Fabric Filter Bag Leak Detection Guidance EPA-454/R-98-015. The baghouse consists of three (3) isolated filter compartments, an exhaust fan located on the clean suction side, lime coated fabric filters with an intermittent lime injection feeder, and an equipment monitor/control system. A Programmable Logic Controller (PLC) is used to control, monitor, or log: the temperature, pressure drop, and automated shaker cleaner of each baghouse compartment; the operation of the lime feed equipment; the condition of the bag leak detection system; and the activation of emergency relief overheat valve during a malfunction event. Refer to MI Metals Baghouse User's Manual for details of control equipment operation.

B. LIME ADDITION

The lime addition to the fabric filter baghouse improves the removal efficiency of the bags for such parameters as PM, HCL, and DF. The lime addition provides a buildup of filter cake on the bags that reduces these emissions. After the lime is spent, it must be removed by shaking the bags before new lime is added. The lime to be added is a hydrated mix of calcium and magnesium hydroxide. Lime is injected for a fraction of a minute intermittently each hour into the baghouse by means of a hopper equipped with a vibrator and screw feeder. The lime feed rate control will be set at a feed rate of 10.4 lbs/hour. The hopper will be filled daily with 5 x 50 pound bags = 250 pounds of hydrated lime and checked each shift to ensure lime is free flowing.

C. BAGHOUSE PRESSURE DROP

The pressure drop measures the difference in static pressure across the filter bags. Baghouse pressure drop determines when a baghouse needs to be cleaned. The PLC will initiate the cleaning cycle once the pressure drop reaches 5 to 7 inches of water column by sequentially separating and cleaning one compartment at a time. There is an activation switch on the control panel that allows the operator to manually start the cleaning cycle.

D. BAGHOUSE INLET TEMPERATURE

Monitoring the baghouse inlet temperature is a regulatory requirement for controlling proper operation of secondary aluminum production. Maintaining temperatures equal to or below maximum allowable temperature established during the performance test will ensure that emissions have not exceeded permitted limits. Also, extremely elevated temperatures could potentially damage the bags and significantly reduce baghouse efficiency.

Under 40 CFR 63.1510 (h) (2) (i) temperature-monitoring device must record the average temperatures for every fifteen minutes block, and every three-hour block period. The baghouse inlet temperature 3-hour block average must not exceed 25°F above the maximum 3-hour block temperature average determined during the DF performance test.

E. BAGHOUSE LEAK DETECTOR

A Goyen EMP5 Baghouse Leak Detector has been installed in the baghouse stack according to 40 CFR 63.63.1510 (f) "Monitoring requirements". This leak detection system provides for continuous monitoring of emissions by indicating when baghouse integrity (rupture bag, loose connections, leaks) has been compromised. Alarm is to be tested semi-annually in accordance with manufacturer's specification (normal running signal level = 25%, alarm level with 1 bag removed = 75% - relay output on alarm). Calibration adjustments and repairs are to be indicated on Equipment Calibration Certification by service representative

F. CHARGE FEED AMOUNT BASED ON OPERATING CYCLE

The amount of scrap aluminum charged into the furnace during an *operating cycle* will not exceed the average of the 3 runs during the Dioxin/Furans performance test. The maximum allowable *charge feed amount* based on *operating cycle* will be 21.6 tons aluminum/charge. *Operating cycle* is defined in accordance with 40CFR63.1503 as the period beginning when the feed material is first charged and ending when the casting process is completed.

G. PROCESS RATE BASED ON OPERATING CYCLE

The *process rate* based on *operating cycle* is the total amount of aluminum processed in the furnace during *operation cycle* divided by the total hours of *operation cycle*. *Operating cycle* is defined in accordance with 40CFR63.1503 as the period beginning when the feed material is first charged and ending when the casting process is completed. The maximum *process rate* based on *operating cycle* is 2.2 tons/hour = 8.8 tons ÷ 4 hour. The annual process weight amount will not exceed 19,272 tons = 2.2 tons/hour x 8760 hour/year for any 12 consecutive months.

H. TYPE OF SCRAP

Scrap aluminum containing painted or unpainted material from any Grades or ISRI Codes listed in Description of Scrap Aluminum (Appendix A) and up to a combined maximum of 60% by weight Tutu plus Toto can be charged into furnace since the performance test was conducted with 60% of scrap aluminum from Code Tutu (contains material with highest potential emissions).

I. REACTIVE FLUX RATE

A maximum of 30 pounds Amlox 72 F or equivalent flux can be added to 21.6 tons aluminum. The reactive flux rate cannot exceed 0.885 pounds chlorine/ton aluminum charge = 30 pounds Amlox 72F x 0.637 pounds chlorine/pound Amlox 72F ÷ 21.6 tons aluminum based on *operating cycle*. The amount of reactive flux cannot exceed 60 pounds Amlox 72F or equivalent/day = typical 20 pounds Amlox 72F or equivalent/charge x maximum 3 charges/day. The flux is injected into the furnace bath with a degassing wand during a 15 minute period just prior to casting. The potential stoichiometric amount of 7.17 tons HCl/year = 60 pounds Amlox 72F or equivalent/day x 0.655 pounds HCl/pound Amlox 72 F x 365 days/year ÷ 2000 pounds/ton or 7.17 tons HAPS/year produced from these fluxes are below the threshold of 10 tons/year that would classify the facility as a major source.

J. HOURS OF OPERATION

The operating hours for this SAPU is set at 8,760 hours per year, which is based on 24 hours per day and seven days per week. MI will record the total *operating cycle* hours of this source on the Daily Operation Log – *Operating Cycle Process Rate*. The actual reported PM emission is calculated by multiplying the hours of operation times the pounds/hour emission rate measured during the performance test.

K. STARTUP, SHUTDOWN, & MALFUNCTION

In the event of startup, shutdown, or malfunction of equipment, refer to Startup, Shutdown, & Malfunction Plan for proper procedures.

4. MAINTENANCE & INSPECTION

MI has an on-site maintenance department to perform routine maintenance. The maintenance team will contact the manufacturer or representative to provide assistance for major maintenance projects.

A. Baghouse Scheduled Maintenance

Daily Maintenance

- Check pressure readings. If the baghouse pressure is greater than 8 inches of water column, maintenance personnel will manually activate the bag cleaning cycle and check the PLC equipment.
- Check temperature readings. If temperature exceed high limit, inspect baghouse and furnace operation for cause of problem.
- Visually check for loose parts or evidence of improper cleaning.
- Check exhaust fan and stack output for problems.
- Inspect lime feeder system each shift
- Complete Baghouse Inspection/Maintenance Completion Log

Monthly Maintenance

- Inspect & clean baghouse compartments/ductwork for buildup & leaks.
- Inspect shaker mechanism.
- Grease fan bearings & drive coupling.
- Check oil level of fan and bearings.
- Check the bag leak detection response and alarm level.

Annual Maintenance

- Inspect bags for signs of break or wear.
- Grease shaker motors & cams
- Clean fan impeller & housing

Safety Caution: The baghouse is considered a confined space. Only MI employees who are trained and certified for confined space entry are permitted to enter. Lock out/tag out of the power for the baghouse and its components will be enforced prior to entry.

Three Year Maintenance

- Replace worn filter bags

Spare Parts

- 6 each stored at facility – nomex bags PN 11, NX092, 5X168, 14SPSB or equivalent (National Filter Media 514516).
- 2 each stored at facility –thermocouple Cleveland Electric Lab #MGO-J-1-8-U-012-0-000-0-00-05-0 iron constantan, 304 s.s., 0.375” diameter ungrounded junction, 0.012” quick disconnect plugs & jack or equivalent (Pyrotek 863 293-0615).

Motors, fans, drives, controls, and other replacement parts will be ordered from manufacturer as needed.

B. MAINTENANCE SCHEDULE FOR PROCESS (SOURCE) DEVICE

- Daily Refill water tower with water.
 Check water leaks.
 Check aluminum leaks.
 Check gas leaks.
 Check visible emissions.
 Make necessary repairs.
 Complete Process Inspection/Maintenance Completion Log

- Weekly Add algacide & scale treatment to cooling tower.
 Check loose refractory.
 Clean furnace air filters.
 Cleanup area.

- Monthly Remove sludge.
 Remove dross.
 Grease motors & pumps.

- Annual Perform annual preventive maintenance.
 Conduct Visible Emissions test per EPA Method 9.
 Complete Emission Capture/Collection & Closed Vent Systems Inspection Form

C. CALIBRATION AND CERTIFICATION OF ACCURACY OF PARAMETER DEVICES

The following table shows the calibration and replacement schedule for all parameter-monitoring devices at MI

| Parameter Monitoring Device | Period Between Calibration | Period Between Replacement |
|---|------------------------------------|----------------------------|
| Baghouse thermocouples & temperature controller | Semiannual | As needed |
| Manometers for baghouse pressure drop | Semiannual | As needed |
| Scales to weigh aluminum ± 1% | Semiannual | As needed |
| Weight of Fluxes | Vendor pre weighed sealed packages | NA |
| Bag leak detection/alarm system (EPA454/R-98-015) | Semiannual | As needed |

D. CORRECTIVE ACTIONS FOR PARAMETER DEVIATION

MI will respond to correct or repair the problem in a safe, efficient, and timely manner as soon as practicable before the next charge cycle. No additional charge cycle may begin until repair is completed.

If the baghouse pressure is greater than 8 inches of water column, then maintenance personnel will manually activate the bag cleaning cycle and check the PLC equipment.

If the temperature in the baghouse exceeds the maximum allowable limit, then actions that will safely reduce the baghouse temperature without causing excessive emissions will be taken.

The baghouse will be inspected immediately if leak detection system alarm is triggered or if any problems are experienced during normal operations that are attributed to the baghouse.

MI will initiate corrective action within one (1) hour. If no action is required, the incident will not be counted towards the 5% of the operating time over a 6-month block-reporting period.

Whenever a deviation occurs a written report will be completed to document the event. All incident reports will be submitted to FDEP and PDEM as attachments to the semiannual reports. The internal deviation reports will contain the following information:

- Determination of the cause of the deviation,
- The time the deviation began and ended,
- Corrective action taken for the deviation,
- The initiation and completion times of the corrective action.
- Baghouse Inlet Temperature Deviations

E. PROCEDURES FOR QUALITY CONTROL AND QUALITY ASSURANCE

MI will perform calibration in accordance with manufacturer's manual. Refer to Appendix D.

5. MONITORING & RECORDKEEPING

A. CHARGE FEED AMOUNT BASED ON OPERATING CYCLE

The amount of aluminum charged into the furnace is calculated by summing the weights of all baled, ingot, and tote bin/bag of scrap aluminum. Weights are measured to 1% accuracy on a calibrated scale. Each bale, ingot, and bin/bag net weight is recorded on the Furnace Charge Log. The maximum allowable *charge feed amount* based on *operating cycle* is 21.6 tons aluminum and up to a combined maximum of 60% by weight Tutu plus Toto. *Operating cycle* is defined in accordance with 40CFR63.1503 as the period beginning when the feed material is first charged and ending when the casting process is completed.

B. PROCESS RATE BASED ON OPERATING CYCLE

The *process rate* based on *operating cycle* is calculated by dividing the total amount of aluminum processed during *operation cycle* by the total hours of *operation cycle*. Daily Operation Log– *Operating Cycle Process Rate* will be completed to record tons aluminum process, total hours of *operation cycle*, and tons aluminum/hour *process rate* based on *operating cycle*. Monthly and 12 consecutive month totals for tons aluminum process and hours will be calculated and recorded on the Daily Operation Log – *Operating Cycle Process Rate*. The maximum *process rate* based on *operating cycle* is 2.2 tons aluminum/hour and the annual process weight will not exceed 19,272 tons for any 12 consecutive months. *Operating cycle* is defined in accordance with 40CFR63.1503 as the period beginning when the feed material is first charged and ending when the casting process is completed.

C. REACTIVE FLUX RATE

A maximum of 30 pounds of Amlox 72 F or equivalent flux can be added to 21.6 ton aluminum. The reactive flux rate cannot exceed 0.885 pounds chlorine/ton aluminum charge. The amount of reactive flux cannot exceed 60 pounds of Amlox 72F or equivalent/day. The flux is injected into the furnace bath with a degassing wand during a 15 minute period just prior to casting. The potential stoichiometric amounts of 7.17 tons/year HCL or 7.17 tons/year total HAPS produced from these fluxes are below the threshold of 10 tons/year that would classify the facility as a major source. Daily Operation Log – Reactive Flux Feed Rate will be completed for each *charge period* to record time charge begin, flux begin, and flux end; pounds of Amlox 72F or equivalent added during 15 minute period; equivalent pounds chlorine; amount of aluminum charged into furnace; calculated pounds chlorine/ton aluminum charged.

D. LIME ADDITION

The amount of daily lime addition, the feed rate, visual observation, and the use of low-level hopper indicator are means used to ensure that adequate lime is used on a regular basis. The hopper will be inspected each shift to check for free flowing of lime and that the PLC control is set at 10.4 pounds lime/hour. At the beginning of each day shift, the operator will fill the hopper counting five (5) -50 pound bags or equivalent total weight to verify 250 pounds of lime will be used each day. Observations for free flow, total pounds of lime used/day, number of 50 pound bags of lime used/day, pounds/hour setting, and corrective actions will be reported on the Lime Feed Inspection/Maintenance Completion Log to verify that lime is free flowing.

E. BAGHOUSE INLET TEMPERATURE

The MACT regulations require monitoring and recording of the baghouse inlet temperature for every 15-minute block average, and the average temperature for each 3-hour block period. A data acquisition system has been installed which continuously records the temperatures of inlet gases to each compartment of the baghouse. The data is stored by the PLC and transferred to an external program that calculates the 15-minute averages and the 3-hours block average for each day. A daily report is printed and stored with Monthly Operation Reports for compliance review. According to the MACT regulation, the 3-hour block average can't exceed 25^oF above highest 3-hour block average temperature established during the Dioxins/Furans performance test.

F. BAGHOUSE PRESSURE DROP

The pressure drop of each compartment is monitored by the PLC continuously and displayed on the PLC monitor. The PLC maintains a log of the baghouse cleaning cycle. Pressure drop readings are recorded during the work shift on the Baghouse Inspection/Maintenance Completion Log. Pressure readings < 8" of water indicate proper cleaning cycle has occurred.

G. HOURS OF OPERATION

The operating hours for this SAPU is set at 8,760 hours per year, which is based on 24 hours per day and seven days per week. MI will record the *operating cycle* hours of this source on the Daily Operation Log – *Operating Cycle Process Rate*. The actual reported emission is calculated by multiplying the hours of operation times the pounds/hour emission rate measured during the performance test.

H. RECORDKEEPING

The production staff responsible for the daily operation of the furnace will maintain production records. Reports will include Daily Operation Logs to record *Operating Cycle Process Rate*, and Reactive Flux Feed Rate; Inspection/Maintenance Completion Logs for Baghouse, Process, and Lime Feed; Furnace Charge Log; Startup/Shutdown and Malfunction Report Forms; and Emission Capture/Collection & Closed Vent Systems Annual Inspection Form. Refer to Appendix C.

The operation and inspection records will be kept on file for a minimum of 5 years and made available to FDEP, PDEM, or USEPA upon request to demonstrate compliance with permit conditions.

Appendix A

Description of Scrap Aluminum

MI METALS – OLDSMAR
DESCRIPTION OF SCRAP ALUMINUM
revised 7/18/08

Grades

Aluminum Extrusions (includes bales, bin, bag, shreds and butt ends) – shall consist of clean aluminum extrusions including window & door frames. Must be free of iron inserts, screw, plastic, rubber or other foreign materials.

Low Copper Aluminum – shall consist of clean, uncoated aluminum plate, may include clips or punching. ISRI grade Taboo may be included in this grade.

New Beverage Can Stock – shall consist of new clean pre-consumer aluminum can stock (printed or unprinted) and may include clips or punching skeletons, & cans in various states of production but may not include whole cans from packaging lines. Equivalent to ISRI code Take.

Remelt Aluminum Ingot – shall consist of remelted aluminum scrap from a sweat furnace operation & poured into a uniform pigs or ingot blocks with a minimum weight of 25 pounds, and a maximum weight of 75 pounds. Must be free of slag or dross materials and prepared in a uniform material handleable form. Similar to ISRI code Throb.

Remelt Aluminum Sows – shall consist of remelted aluminum scrap from a sweat furnace operation & poured into a uniform slabs or sow blocks with a minimum weight of 500 pounds, and a maximum weight of 2200 pounds. Must be free of slag or dross materials and prepared in a uniform material handleable form. Similar to ISRI code Throb.

Bare Aluminum Wire – shall consist of clean aluminum wire free of iron or insulation. ISRI code Tassel, Taste, Talon, and Tann may be included in this grade.

Aluminum Nodules – shall consist of clean aluminum wire recovered from a chopping operation and must be free of iron, copper, & brass wire, aluminum hair wires and free of dirt, oil, and foreign materials. Equivalent to ISRI code Tall.

ISRI (Institute of Scrap and Recycling Industries) Codes

Taint/Tabor - Clean Mixed Old Alloy Sheet Aluminum - shall consist of clean old alloy aluminum sheet of two or more alloys, free of foil, venetian blinds, castings, hair wire, screen wire, food, or beverage containers, radiator shells, airplane sheet, bottle caps, plastic, dirt, and other non-metallic items. Oil and grease not to total more than 1%. Up to 10% Tale permitted.

Take - New Aluminum Can Stock – shall consist of new low copper aluminum can stock and clippings, clean, lithographed or not lithographed, and coated with clear lacquer but free of lids with sealers, iron, dirt and other foreign contamination. Oil not to exceed 1%.

Tall - E. C. Aluminum Nodules – shall consist of clean E. C. aluminum, chopped or shredded, free of screening, hair-wire, iron, copper, insulation, and other non-metallic items. Must be free of minus 20 mesh material. Must contain 99.45% aluminum content.

Talon - New Pure Aluminum Wire & Cable – shall consist of new, clean, unalloyed aluminum wire or cable free from hair wire, ACSR, wire screen, iron, insulation and other non-metallic items.

Tann - New Mixed Aluminum Wire & Cable – shall consist of new, clean, unalloyed aluminum wire or cable which may contain up to 10% 6000 series wire and cable free from hair wire, wire screen, iron, insulation and other non-metallic items.

Tata - New Production Aluminum Extrusions – shall consist of one alloy (typically 6063). Material (includes bales, bin, bag, and shreds) may contain “butt ends” from the extrusion process but must be free of any foreign contamination. Anodized material is acceptable. Painted material or alloys other than 6063 must be agreed upon by buyer and seller.

Toto – Aluminum Extrusions “10/10” – shall consist of new production and old/used 6063 extrusions (includes bales, bin, bag, and shreds) that may contain up to (but not exceed) 10 % painted extrusions and 10% 6061 alloy extrusions. Must not contain other alloys of aluminum. Material should be free of zinc corners, iron attachments, felt, plastic, paper, cardboard, thermo break, and dirt and other contaminants.

Tutu – Aluminum Extrusion Dealer Grade – shall consist of old extruded aluminum of typically alloy 6063, 6061, or 7075 that contain more than 10 % painted extrusions (includes bales, bin, bag, and shreds). Material must be free of iron, thermo break, saw chips, zinc corners, dirt, paper, cardboard, and other foreign contamination.

Appendix B

Typical Operating Cycles for Charges

MI METALS – OLDSMAR
TYPICAL OPERATING CYCLES for CHARGES revised 10/31/08

Shorter Operating Cycle:

1. *Operating cycle* begins when aluminum scrap is initially added into the furnace.
2. A maximum of 8.8 tons *charge feed amount* of scrap aluminum is added into the furnace.
3. Charge feed consists of approximately 40-60% by weight of baled, bin, bag, and shredded extrusion from ISRI Codes Toto/Tutu (includes painted material).
4. Balance of charge material is mill finished, primary ingot, and billet butt (unpainted materials) from Grades and ISRI Codes listed in the Description of Scrap Aluminum.
5. A maximum of ten pounds of Amlox 72F or equivalent flux is added during the 15 minutes before the casting. This is equivalent to 6.37 pounds of chlorine or approximate flux rate of 0.724 pounds of chlorine /ton charge.
6. Casting begins at approximately 2 ½ hours after operating cycle begins.
7. *Operating cycle* ends when casting ends at approximately 4 hours after *operating cycle* begins.

Longer Operating Cycle with/without Hold Mode:

1. *Operating cycle* begins when scrap aluminum is initially added into the furnace.
2. A maximum of 21.6 tons *charge feed amount* of scrap aluminum is added into the furnace.
3. Charge feed consists of approximately 40-60% by weight of baled, bin, bag, and shredded extrusion from ISRI Codes Toto/Tutu (includes painted material).
4. Balance of charge material is mill finished, primary ingot, and billet butt (unpainted material) from Grades and ISRI Codes listed in the Description of Scrap Aluminum.
5. A maximum of twenty pounds of Amlox 72F or equivalent flux is added during the 15 minutes before the casting begins. This is equivalent to 12.74 pounds of chlorine or approximate flux rate of 0.590 pounds of chlorine/ton charge.
6. Total aluminum melting time is approximately 8 hours.
7. The furnace is placed on hold mode for approximately 0 to 12 hours before casting. No charge or flux is added during this hold period.
9. Casting begins at approximately 8-20 hours after operating cycle begins.
10. *Operating cycle* ends when casting ends at approximately 12-24 hours after *operating cycle* begins.

MI METALS – OLDSMAR
OPERATING CYCLE COMPARISON for DIOXINS/FURANS TESTING revised 10/31/08

| | Typical Shorter Operating Cycle ≤ 8.8 | Typical Longer Operating Cycle ≤ 21.6 | Performance Test Operating Cycle *~21.6 |
|---|---|--|---|
| Total tons scrap aluminum charge feed amount | | | |
| Charge type | ~ 40-60% by weight of baled, bin, bag, and shredded extrusion material from ISRI Codes Toto/Tutu. Remainder material is mill finished, ingot, and butt (unpainted material) from Grades and ISRI Codes listed in the Description of Scrap Aluminum. | ~40-60% by weight of baled, bin, bag, and shredded extrusion material from ISRI Codes Toto/Tutu. Remainder material is mill finished, ingot, and butt (unpainted material) from Grades and ISRI Codes listed in the Description of Scrap Aluminum. | **60 % by weight of baled, bin, bag, and shredded extrusion material from ISRI Code Tutu. Remainder material is mill finished, ingot, and butt (unpainted material) from Grades and ISRI Codes listed in the Description of Scrap Aluminum. |
| Pounds Amlox Flux or equivalent | ≤ 10 | ≤ 20 | 30 |
| Equivalent pounds Chlorine | 6.37 = 10 x 0.637 | 12.74 = 20 = 0.637 | 19.11 = 30 x 0.637 |
| Flux rate = Pounds Cl/ton charge | 0.724 = 6.37 ÷ 8.8 | 0.590 = 12.74 ÷ 21.6 | ***~0.885 = 19.11 ÷ 21.6 |
| Flux addition | during 15 minutes before casting begins | during 15 minutes before casting begins | during 15 minutes before casting begins |
| Hours Melt Process | ~ 2 ½ | ~ 8 | ~ 8 |
| Hours Holding Mode | 0 | ~0 to 12 hours | 0 |
| Hours Operating Cycle | ~4 | ~12-24 | ~12 |

Comments: * highest charge feed amount
**highest potential emission
***highest flux rate

Operating cycle is defined in accordance with 40CFR63.1503 as the period beginning when the feed material is first charged and ending when the casting process is completed.

No charge or flux is added during the holding period.

Potential dioxins and furans emissions occur from paint on extrusions and chlorine flux.

Permitted limits will be established during Performance Test.

Daily operation will not exceed permitted limits.

MI METALS – OLDSMAR
OPERATING CYCLE COMPARISON for PARTICULATE MATTER/VISIBLE EMISSION TESTING revised 10/31/08

| | Typical Shorter Operating Cycle ≤ 8.8 | Typical Longer Operating Cycle ≤ 21.6 | Performance Test Operating Cycle ~8.6 |
|--|---|---|---|
| Total tons scrap aluminum charge feed amount | | | |
| Charge type | ~ 40-60% by weight of baled, bin, bag, and shredded extrusion material from ISRI Codes Toto/Tutu. Remainder material is mill finished, ingot, and butt (unpainted material) from Grades and ISRI Codes listed in the Description of Scrap Aluminum. | ~ 40-60% by weight of baled, bin, bag, and shredded extrusion material from ISRI Codes Toto/Tutu. Remainder material is mill finished, ingot, and butt (unpainted material) from Grades and ISRI Codes listed in the Description of Scrap Aluminum. | **60 % by weight of baled, bin, bag, and shredded extrusion material from ISRI Code Tutu. Remainder material is mill finished, ingot, and butt (unpainted material) from Grades and ISRI Codes listed in the Description of Scrap Aluminum. |
| Pounds Amlox Flux or equivalent | ≤ 10 | ≤ 20 | 11 |
| Equivalent pounds Chlorine | 6.37 = 10 x 0.637 | 12.74 = 20 x 0.637 | 7.01 = 11 x 0.637 |
| Flux rate = Pounds Cl/ton charge | 0.724 = 6.37 ÷ 8.8 | 0.590 = 12.74 ÷ 21.6 | 0.815 = 7.01 ÷ 8.6 within 10% of ***0.885 |
| Flux addition | during 15 minutes before casting begins ~ 2 ½ | during 15 minutes before casting begins ~ 8 | during 15 minutes before casting begins ~ 2 ½ |
| Hours Melt Process | 0 | ~0 to 12 | 0 |
| Hours Holding Mode | ~4 | ~12-24 | ~4 |
| Hours Operating Cycle | ~2.2 | ~0.9-1.8 | 2.15 |
| Tons Al/Hour Process Rate | | | within 10% of *2.2 = 8.8 ÷ 4 |

Comments: * highest process rate
**highest potential emission
***highest flux rate

Operating cycle is defined in accordance with 40CFR63.1503 as the period beginning when the feed material is first charged and ending when the casting process is completed.

Tons Al/Hour Process Rate = Tons Al Charge Feed Amount ÷ Hours Operating Cycle.

No charge or flux is added during the holding period.

Potential particulate matter emissions occur from paint on extrusions.

Permitted limits will be established during Performance Test.

Daily operation will not exceed permitted limits.

MI METALS – OLDSMAR
 PERMIT 1030114 revised 10/31/08
 AIR EMISSION CALCULATIONS

Refer to Material Safety Data Sheet: Amlox 72F is maximum 60% Magnesium Chloride + 40% Potassium Chloride

| Chemistry: | Magnesium Chloride | MgCl ₂ | atomic weight |
|------------|--------------------|--|-----------------|
| | Magnesium | 1 x 24.305 | = 24.305 |
| | 2 x Chloride | 2 x 35.453 | = <u>70.906</u> |
| | Total | | 95.211 |
| | | Weight Fraction {Clm}= 70.906 ÷ 95.211 = 0.7447 | |
| | Potassium Chloride | KCl | atomic weight |
| | Potassium | 1 x 39.0983 | = 39.0983 |
| | Chloride | 1 x 35.453 | = <u>35.453</u> |
| | Total | | 74.5513 |
| | | Weight Fraction {Clp}= 35.453 ÷ 74.5513 = 0.4756 | |

Conversion Factor Ratio:
 $\frac{\text{pounds Cl}}{\text{pound Amlox 72F}} = \% \text{ MgCl}_2 \times \text{Weight Fraction \{Clm\}} + \% \text{ KCl} \times \text{Weight Fraction \{Clp\}} = 0.6 \times 0.7447 + 0.4 \times 0.4756 = 0.637$

maximum pounds chlorine = 30 pounds Amlox 72F x 0.637 pounds Cl/pound Amlox72F ÷ 21.6 tons Al = 0.885
 ton Al

Appendix C

Daily Operation/Inspection/ Maintenance Log Forms

MI METALS - OLDSMAR
 PERMIT 1030114 EU ID 001
 FURNACE CHARGE LOG revised 10/31/08

Date Charged 1st/2nd/3rd Alloy Batch #

| Weight Pounds Al | Bale | | | Ingot | | Tote Bin/Bag | | |
|---------------------|--------------|--------------|-------------|---------------|-------------|--------------|--------------|-------------|
| | Painted Tutu | Painted Toto | Mill Finish | Primary Ingot | Billet Butt | Painted Tutu | Painted Toto | Mill Finish |
| 1 | | | | | | | | |
| 2 | | | | | | | | |
| 3 | | | | | | | | |
| 4 | | | | | | | | |
| 5 | | | | | | | | |
| 6 | | | | | | | | |
| 7 | | | | | | | | |
| 8 | | | | | | | | |
| 9 | | | | | | | | |
| 10 | | | | | | | | |
| 11 | | | | | | | | |
| 12 | | | | | | | | |
| 13 | | | | | | | | |
| 14 | | | | | | | | |
| 15 | | | | | | | | |
| 16 | | | | | | | | |
| 17 | | | | | | | | |
| 18 | | | | | | | | |
| 19 | | | | | | | | |
| 20 | | | | | | | | |
| 21 | | | | | | | | |
| 22 | | | | | | | | |
| 23 | | | | | | | | |
| 24 | | | | | | | | |
| 25 | | | | | | | | |

Total Tons Al

Tons Al Charge Feed Amount Based on Operating Cycle

Max Allowed Charge Feed Amount Based on Operating Cycle = 21.6 tons Al

% Tutu %Toto

% Tutu + Toto Max Allowed Tutu + Toto = 60%

Total Hours Operating Cycle

Tons Al/Hour Process Rate Based on Operating Cycle

Max Allowed Process Rate Based on Operating Cycle = 2.2 Tons Al/Hour

Sign _____

MI METALS - OLDSMAR
 PERMIT 1030114 EU ID 001
 DAILY OPERATION LOG – OPERATING CYCLE PROCESS RATE revised 1/30/09

month/year _____

max allowed 2.2 tons Al processed/hour based on operating cycle

| day | first charge | | | | second charge | | | | | optional third charge | | | | total/day | | sign | |
|-----|-----------------|-------------------|-----------------|-------------|---------------|-----------------|-------------------|-----------------|-------------|-----------------------|-----------------|-------------------|-----------------|-------------|------------|------|-----------------|
| | tons Al process | cycle begin am pm | cycle end am pm | cycle hours | tons Al hr | tons Al process | cycle begin am pm | cycle end am pm | cycle hours | tons Al hr | tons Al process | cycle begin am pm | cycle end am pm | cycle hours | tons Al hr | | Amlox max 60 lb |
| 1 | | | | | | | | | | | | | | | | | |
| 2 | | | | | | | | | | | | | | | | | |
| 3 | | | | | | | | | | | | | | | | | |
| 4 | | | | | | | | | | | | | | | | | |
| 5 | | | | | | | | | | | | | | | | | |
| 6 | | | | | | | | | | | | | | | | | |
| 7 | | | | | | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | | | | | | |
| 9 | | | | | | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | | | | | |
| 11 | | | | | | | | | | | | | | | | | |
| 12 | | | | | | | | | | | | | | | | | |
| 13 | | | | | | | | | | | | | | | | | |
| 14 | | | | | | | | | | | | | | | | | |
| 15 | | | | | | | | | | | | | | | | | |
| 16 | | | | | | | | | | | | | | | | | |
| 17 | | | | | | | | | | | | | | | | | |
| 18 | | | | | | | | | | | | | | | | | |
| 19 | | | | | | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | | | | | | |
| 21 | | | | | | | | | | | | | | | | | |
| 22 | | | | | | | | | | | | | | | | | |
| 23 | | | | | | | | | | | | | | | | | |
| 24 | | | | | | | | | | | | | | | | | |
| 25 | | | | | | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | | | | | | |
| 27 | | | | | | | | | | | | | | | | | |
| 28 | | | | | | | | | | | | | | | | | |
| 29 | | | | | | | | | | | | | | | | | |
| 30 | | | | | | | | | | | | | | | | | |
| 31 | | | | | | | | | | | | | | | | | |

Conversion factor: 1 lb Amlox 72F = 0.655 lbs HCl

| | hours | tons Al | lbs Amlox 72F | tons HCl | tons HAPS | tons PM | tons D/F |
|-----------|-------|---------|---------------|----------|-----------|---------|-----------------------|
| month | | | | NA | NA | NA | NA |
| 12 month | | | | | | | |
| max limit | 8760 | 19,272 | NA | 7.17 | 7.17 | 25.6 | 2.89×10^{-7} |

MI Metals – Oldsmar

Startup/Shutdown Report Form revised 4/16/08

Startup or Shutdown: _____

Date occurred: _____

Equipment involved: _____

Time startup/shutdown began: _____

Time startup/shutdown ended: _____

Record Maximum Baghouse Temperature _____

Record Baghouse Pressure _____

Was baghouse in operation before startup and after shutdown of furnace?

Yes _____

No _____

Was burner flue gate & furnace front door opened before automatic purging/relighting of furnace?

Yes _____

No _____

Was charging of the furnace discontinued during startup/shutdown?

Yes _____

No _____

Were visible emissions and monitored parameters within permitted limits during startup/shutdown?

Yes _____

No _____

Were actions taken consistent with procedures in the Plan during startup/shutdown?

Yes _____

No _____

If any answers to above questions were no, explain discrepancies?

Comments: _____

Print Supervisor Name: _____

Supervisor Signature: _____

Print Director Name: _____

Director Signature: _____

Appendix D
PROCEDURES FOR
QUALITY CONTROL AND
QUALITY ASSURANCE

7.1 Probe Overload

If the Probe Overload LED (3) illuminates during operation, reduce the probe's sensitivity by using a thinner and/or shorter probe, and repeat the setup procedure.

7.2 Setting the Gain

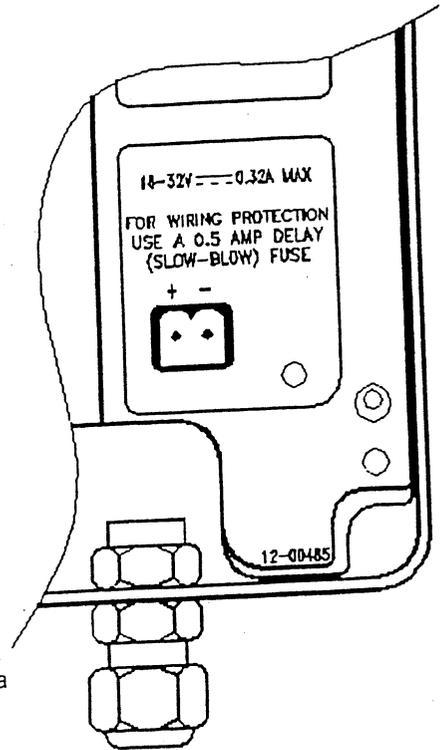
With the plant operating normally, set the fine sensitivity (5) to MAX, adjust the coarse sensitivity switch (6) so the display reads 15-20% for BBD5 or if the bargraph is used alone in EMP5, or 5-10% if the 0-10V, 4-20mA or Numeric Display is used (EMP5). Note that clockwise rotation will increase range and DECREASE sensitivity. If after a period it is found that some emission peaks reach 100%, reduce the sensitivity further (and therefore the normal signal level).

7.3 Setting the Alarm

Hold Button (7) down to show the alarm level (2), then use control (8) to adjust that level. If the alarm level is below the current emission level, the LED (9) will illuminate immediately, then the relay LED (12) and the output relay contacts (13) will trip after a time delay. Set the alarm level either to a simulated alarm condition (eg, run the plant with one filter bag removed), else about 4 times the normal operating emission level. Set the time delay switch (10) so that the brief peaks (eg during bag cleaning) do not trip the relay (12 and 13), eg 10 to 16 seconds.

7.4 Calibration

If the 0-10V or 4-20mA outputs are used to drive a PLC, SCADA or Numeric Display, then those devices will normally allow for fine calibration. Otherwise, EMP5 (not BBD5) includes a fine control. For further detail, see [Appendix C: Emission Monitor Calibration](#).



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GOYEN mecair



CALIBRATION OF THE *EMP5*

CALIBRATION PROCEDURE (When Using The Alarm Relay Output)

The following references using a number enclosed in brackets, eg. (5), refer to a detailed diagram on Page 4 of this manual.

TO SETUP ALARM RELAY OUTPUT

1. With the *EMP5* emission monitoring system properly installed, operate the dust collector/process and simulate the emission level that is required to activate the alarm and/or sequence of operations. This level of emission is identified as the alarm threshold.

Suggestion

In fabric filter type dust collectors, this is usually achieved by running the dust collector with one filter bag removed. The alarm is therefore set to activate whenever emission levels exceed the equivalent of operation with one filter bag removed - this normally occurs when one filter bag is broken.

2. With the emission levels running at the desired maximum level, turn the Sensitivity Switch (6) on the *EMP5* main panel, until the Bargraph is reaching around 75%. Note: Fine adjustment between each position on Switch (6) can be achieved by rotating Potentiometer (5).
3. Hold Button (7) pressed, a stationary Horizontal Bar will appear on the Bargraph. Rotate Potentiometer (8) while still holding Button (7). move the Horizontal Bar to around 70%, then release Button (7). Whenever the Bargraph exceeds the 70% in future the TRIP LED (9) will illuminate.

TIME DELAY

4. After TRIP LED (9) is illuminated, RELAY LED (12) will illuminate after the time period set on DELAY Switch (10) has expired. 0 to 18 seconds can be selected in two second increments. (Normally 10 to 16 seconds)

Note

When setting up the *EMP5* for relay operation in a reverse pulse type dust collector, emission levels are usually higher during pulsing. Therefore LED (12) should remain extinguished during the periods between pulses. (The Time Delay should be set to allow for this activity)

CALIBRATION OF THE *EMP5* Cont.

CALIBRATION PROCEDURE (When Using 0 - 10V or 4 - 20mA Output for Continuous Monitoring)

The following references using a number enclosed in brackets, eg. (9), refer to a detailed diagram on Page-4 of this manual.

The *Goyen EMP5* is designed for Continuous Emission Monitoring by connecting the unit to one or a combination of the following electronic data acquisition devices.

Chart Recorder
Data Logger
Central Control System

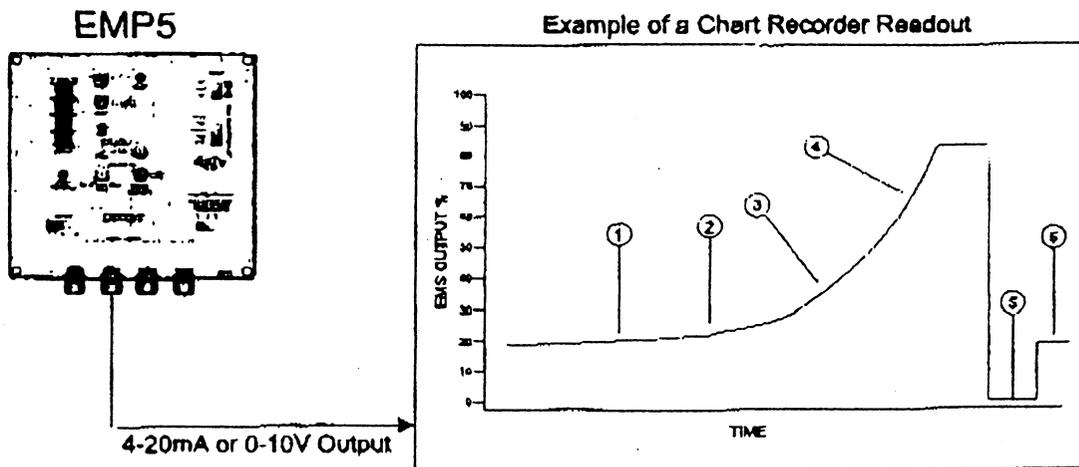
Set up the *EMP5* to carry out this function as follows:

TREND ANALYSIS

The *EMP5* can be set up for trend analysis by connecting the unit to suitable electronic data acquisition device. Trend analysis facilitates early detection of excessive emission levels and/or monitoring of the general condition of the dust collector/process in regard to emission levels.

The *EMP5* is set-up for this function as follows:

1. With the *EMP5* properly installed and connected to data acquisition equipment eg. chart recorder data logger.
2. With the dust collector/process operating normally, adjust the **Sensitivity Switch (6)** on the *EMP5* until the reading on the data acquisition equipment permits measurement of the required range to be recorded eg. if the requirement is to monitor emission levels up to 3 times the existing level, adjust the sensitivity on the *EMP5* until the reading on the data acquisition equipment lies somewhere between 20% and 30% markings on the scale as shown below.

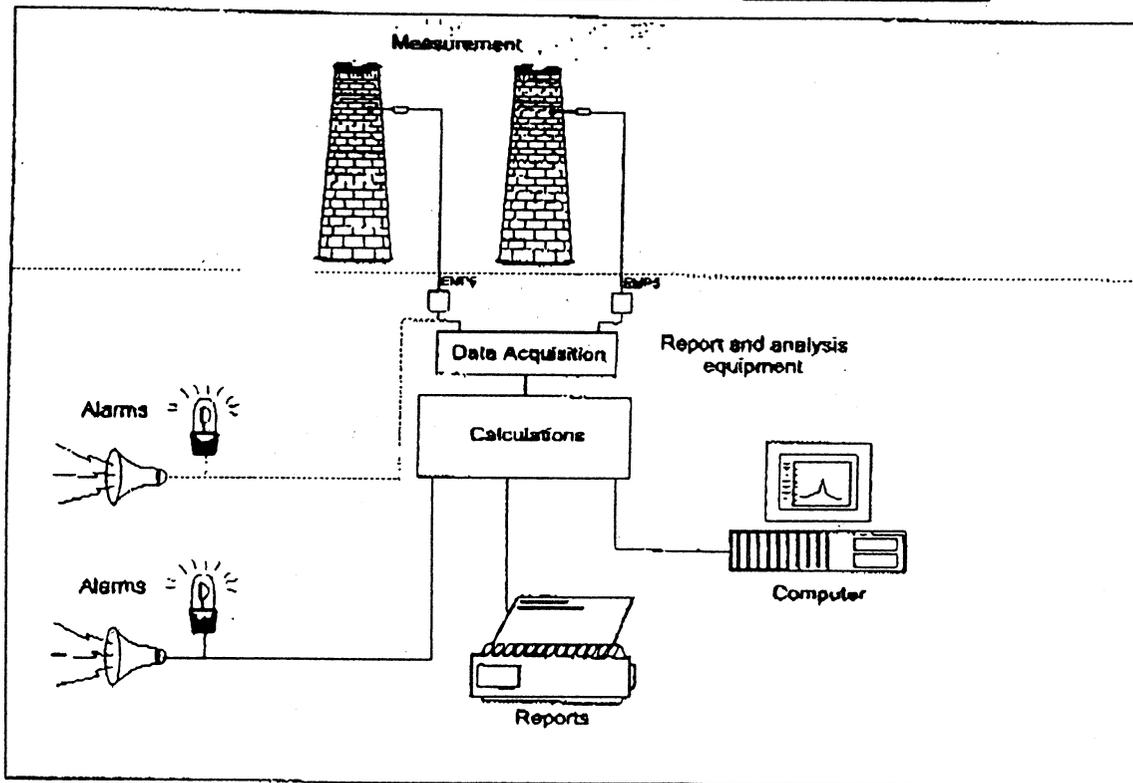
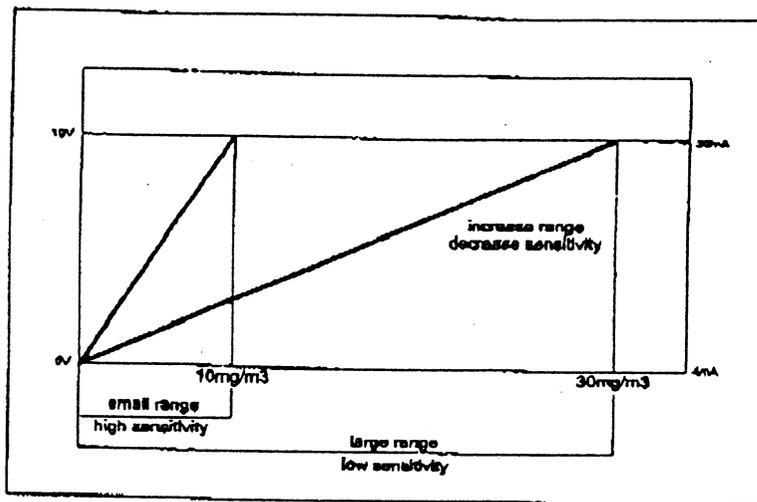


1. Normal
2. Emission level increasing eg: bag beginning to fall
3. Alarm point to signify increase emission level (Set on Chart Recorder)
4. Bag falls, emission levels rise setting off high alarm point (Set on Chart Recorder)
5. Process being repaired
6. Normal operation returned

CALIBRATION OF THE EMP5 Cont.

CALIBRATION PROCEDURE (When Using 0 - 10V or 4 - 20mA Output for Continuous Monitoring)

- Rotating the 10 Position Switch (6) will alter the sensitivity range of the EMP5. Toward the 0 direction will decrease the range (increase the sensitivity), while toward the 9 direction will increase the range (decrease the sensitivity). Note: Potentiometer (5) is used for FINE adjustment, between each selected position on Switch (6)



CALIBRATION OF THE EMP5 Cont.

CALCULATION OF PARTICULATE EMISSION LEVELS IN mg/m^3

1. INTRODUCTION.

The EMP5 can be setup to give a direct read-out in mg/m^3 if the calibration is carried out in conjunction with isokinetic sampling. It may not be possible to calibrate the EMP5 at the same time the isokinetic sampling test is done if the insertion of the isokinetic sampling instruments effects the flow of particulate in the vicinity of the probe.

This can be determined by observing if the EMP5 indicators (bargraph or 4 - 20mA output) fluctuate noticeably while the isokinetic sampling instruments are inserted into the duct.

The SENSITIVITY Controls [5] and [6] on page 4, should be adjusted so the bargraph displays somewhere in the range 10% to 25%. The actual figure should be chosen so that the bargraph indication does not exceed 100% at the highest specified alarm level. Note that 0% corresponds to 4mA and 100% corresponds to 20mA.

In a typical installation there are often three dust levels of interest. These are the normal operating level, the alarm level (corresponds to a tear in a filter) and the factory shutdown level (brought about by a major failure in the filtering system). These three levels are made to fit within the range of the bargraph or the 4 - 20mA output by adjusting the SENSITIVITY Controls and once set, these controls should not be altered.

A conversion factor (K factor) is found from the isokinetic sampling test which is then used to calculate the emissions at other levels of dust since in a fixed installation there is a linear relationship between the dust level and the EMP5 output.

Three methods of determining a K factor are shown below. The first two are based on the bargraph reading and are not as accurate as the third method but would probably be adequate in most situations. The third method requires a DC milliammeter be inserted in series with the 4 - 20mA output of the EMP5 which must be terminated with the correct value resistor, usually 250 ohms.

2. K FACTOR DETERMINATION.

a) Bargraph.

The bargraph comprises 20 segments and is scaled from 0% to 100% which is equal to 5% per segment. The first segment of the bargraph is equal to 5%.

Note that the first segment is always dimly illuminated since it also functions as a 'power on' indicator.

Assume the isokinetic sampling test gives a figure of $10\text{mg}/\text{m}^3$ and the SENSITIVITY Controls have been set to give a reading of 25% or the 5th segment illuminated.

the K factor from the % reading is $\frac{10}{25} = 0.4 \text{ mg}/\text{m}^3\%$

or by counting segments is $\frac{10}{5} = 2 \text{ mg}/\text{m}^3 \text{ segment}$

The emission level and any other reading of the bargraph can now be calculated.

CALIBRATION OF THE EMP5 Cont.

If the bargraph displayed 75% (15th segment illuminated) then from the % method K factor the emission would be

$$0.4 \times 75 = 30 \text{ mg/m}^3$$

and from the segment method K factor the emission would be

$$2 \times 15 = 30 \text{ mg/m}^3$$

b) Milliammeter.

This is a little more complicated because it is necessary to subtract the 4mA offset from the meter reading before making the calculations.

In the above example the milliammeter would have a reading of 8mA. Subtracting the 4mA offset gives an adjusted result of 4mA.

The K factor from the mA reading is $\frac{10}{4} = 2.5 \text{ mg/m}^3/\text{mA}$

In the above example when the bargraph displays 75% the 4 - 20mA output would give a reading of 16mA. Subtracting the 4mA offset gives an adjusted result of 12mA and using the K factor calculated the emission would be

$$2.5 \times 12 = 30 \text{ mg/m}^3$$

3. COMPUTER DISPLAY.

With suitable software and signal processing equipment (Analog to Digital Converter or ADC), the 4 - 20mA output can be fed to a computer and displayed graphically in mg/m^3 versus time.

It may be necessary to vary the value of the terminating resistor connected to the 4 - 20mA output to suit the signal processing equipment used. For example if a standard 250 ohm terminating resistor is used this will result in an input voltage range to the ADC of 1 to 5 volts which may exceed the input range of the ADC. Changing the resistor to 100 ohms will give an input voltage range of 0.4 to 2 volts.

The relationship between voltage, current and resistance is known as Ohms law and is...

$$\text{Voltage} = \text{Current} \times \text{Resistance}$$

where the current is in amps. If the current is measured in mA it must be divided by 1000 to convert it to amps. The resistance is in ohms.

How the data can be further manipulated will depend on the capability of the software used to display the data.