Reasonable Available Control Measure (RACM) Determination

Ferro Corporation – Cleveland Frit Plant
OEPA Facility ID: 1318170235

4150 East 56th Street, P.O. Box 6550
Cleveland, Ohio 44101-1550

1.0 Facility Operations and Lead Emission Points

Ferro Corporation operates a frit plant at 4150 East 56th Street, Cleveland, Cuyahoga County, Ohio (Facility ID 1318170235). Frit is a vitreous material made by the carful blending, smelting, and then rapid cooling of various raw materials. The frit production process allows the use of soluble raw materials consisting of metal oxides and carbonates. The majority of production consists of end product powders. These are manufactured from intermediate cullet that is melted and quenched. Production of "cullet" intermediates of non-lead bearing materials is also processed. The cullet is defined by the quench methodology. Frit by definition is a water quenched product yielding a material with a sand-like appearance. Flake is a water cooled roll quenched (splat quenched) material with, as the name implies, a flake or ribbon appearance. A variety of micron particle sized wend products are produced. The median particle sizes of these materials vary from 1 to 30 microns. Production methodology entails in all instances the utilization of ball or pebble mills. The use of dry or medium (water, alcohol) mills is governed by the desired particle size and permissible contaminants. Ferro manufactures glass cullet in two of these principle groups: pure vitreous glass and glass ceramics. Primary lead bearing production includes modified Lead- Boro-Silicates or modified Lead- Alumino-Silicates. The lead raw material is 98% lead oxide.

The Cleveland Frit Plant operates 11 emissions units (EUs) that currently vent or historically vented lead particulate emissions (PE) to 8 control devices. These EU and Control Device combinations are:

1. Emission Units P065 and P064[1], both electrically operated glass melters (Melters 1 and 2 respectively), venting to Control Device FEM8, a fabric filter baghouse

2. Emission Units P066 and P067, both electrically operated glass melters (Melters 3 and 5 respectively), venting to Control Device FEM9, a fabric filter baghouse.

3. Emission Units P068 and P069[2], both electrically operated glass melters (Melters 9 and 10 respectively), venting to Control Device FEM10, a fabric filter baghouse.

[1] This unit is a non-lead unit; however, their Title V permit does have an allowable limit for lead emissions.
[2] This unit is a non-lead unit; however, their Title V permit does have an allowable limit for lead emissions.

4. Emission Unit P071, A group consisting of 10 wet mills, 1 dry mill and 7 friction dryers, venting to Control Device FEM 12, a fabric filter baghouse, and a scrubber.

5. Emission Unit P101, a set of 6 small drop bottom melters, venting to control devices FEM10, FEM11, and FEM14, all fabric filter baghouses. This is a deminimus lead source.

6. Emission Unit P001, a set of 8 ball mills, 2 screeners, 1 cone blender and 2 scales, venting to control device FEM1, a fabric filter baghouse. This is a deminimus lead source.

7. Emission Unit P100, packaging area for shipment, venting to control device FEM5, a fabric filter baghouse. This is a deminimus lead source.

On August 30, 2011, Ohio EPA issued a final air pollution control Title V permit (Permit Number P0095298) to the Ferro Corporation for their activities at the 56th street facility. The permit lists emissions limits for operations at the facility as follows:

1. Emission Units P064, P065, P066, P067, P068 and P069 and their associated control devices FEM8, FEM9, and FEM10 – These units have a shared emission limit of 0.30 ton of lead PE per year. In addition, they each have a 0.01 pounds of particulate per hour emission limit.

2. Emission Unit P071 and associated control device FEM12 – This unit has an emission limit of 0.002 pounds of lead PE per hour and 0.009 tons of lead PE per year.

3. Emission Unit P915 – a permit limitation of 2.81 tons of lead PE per year and 0.64 pounds of lead PE per hour is listed for this emission unit, however, the unit has been converted to a non-lead process and no longer produces any lead emissions.

4. Emission Units P101, P001, and P100 – These are considered de-minimus and do not have an emission limit for lead PE.

2.0 Basis of the RACM Determination

In March, 2012, U.S. EPA issued the document "Implementation of the 2008 Lead National Ambient Air Quality Standards, Guide to Developing Reasonable Available Control Measures (RACM) for Controlling Lead Emissions" (EPA-457/R-12-001). This document provides guidance for determining what constitutes RACM for processes with lead emissions, such as those used at FERRO Corporation, for the implementation of the 2008 Lead national ambient air quality standard (NAAQS).

U.S. EPA's guidance provides that in determining whether a control is RACM, the following factors are considered:

1. The economic feasibility of the control measure,

2. The capital cost, annualized cost, and cost effectiveness of the control measure; and,
3. The extent of adoption of the control measure by state regulations.

The primary manufacturing process employing lead at the facility, as discussed above, is the production of frit. Frits are vitreous compounds, not soluble in water, obtained by melting and then rapidly cooling carefully controlled blends of raw materials. Ferro produces various types of frit including modified Lead- Boro-Silicates or modified Lead- Alumino-Silicates. The lead raw material is 98% lead oxide.

U.S. EPA's March, 2012 guidance does not specifically address frit production, however, a description of the frit process found in U.S. EPA's document "AP-42, Compilation of Air Pollutant Emission Factors" demonstrates that frit production is very similar to, if not identical to, the secondary lead smelting process described in detail in the March, 2012 guidance. In both processes, lead bearing materials are smelted and reprocessed to customer specifications. The difference being that the process described by the Guidance document utilizes recycled materials as a raw material, and frit is typically made from raw materials. Additionally, based on our review of both processes in real world applications, the methods for controlling particulate emissions (PE) is identical for both processes and, therefore, RACM should be identical for both processes.

U.S. EPA's March, 2012 guidance document identifies and considers several control options for particulate emissions from smelting processes, including: a) Dry Electrostatic precipitator, b) Fabric Filter, Reverse air cleaned, c) Fabric Filter (Mechanical shaker type), and d) Electrostatic precipitator (WESP) – Wire plate type. All of these technologies are identified as having a cost effectiveness of between $400 and $800 per ton of PM emission controlled. Ohio EPA's current benchmark for acceptable cost effectiveness is approximately $5,000 per ton of pollutant controlled, therefore, these technologies would all fall into Ohio EPA's acceptable range for Cost effectiveness. These technologies are all capable of control efficiencies greater than 95%, and as high as 99.5% for some of the technologies. Ohio EPA's research also indicates that the use of these technologies, particularly fabric filter baghouses, is ubiquitous in the smelting industry, indicating that it is very likely RACM.

U.S. EPA's guidance also discusses the economic feasibility of adding a secondary PE control downstream of the first control in the form of a WESP or high efficiency particulate air (HEPA) filter. U.S. EPA's analysis indicates that, while making the overall process control extremely efficient, the actual quantity of emissions captured by the secondary control is extremely low, due to the excellent capture efficiency of the primary filter and therefore the cost effectiveness is extremely poor. U.S. EPA gives anecdotal evidence in their guidance that the addition of a HEPA filter or WESP as a secondary control has been shown to have a cost effectiveness of approximately $250,000 per ton of PE controlled and as high as $2,279,500 per ton of lead PE controlled. This exceeds Ohio EPA's current cost effectiveness benchmark and would therefore indicate that the addition of a secondary control after the initial baghouse would be beyond the requirements of RACM.

3.0 Application of RACM to the Ferro Facility

After a complete review of available resources, the OEPA has determined the requirements outlined below as the RACM determination for the Ferro Facility. These requirements will be incorporated into the facilities' Title V Permit to Operate and work in conjunction with the facility's development and implementation of a Preventative Maintenance Plan (PMP). A breakdown of the RACM determination for the Ferro facility is as follows:

Use of Fabric Filters to Control Process Equipment

All of Ferro's lead PE sources are equipped with a fabric filter/baghouse for the control of lead PE. U.S. EPA has identified fabric filtration as an industry standard control method and RACM for the smelting industry. Ohio EPA has included the use of these baghouses in the facility's final Title V permit and established emission limits based on these control devices. The Ferro facility's PMP dated February 22, 2012 incorporates steps and procedures specifically to ensure that the control equipment is maintained and operating properly. Ohio EPA will consider this equipment along with the use of the PMP as RACM for lead emission sources at this facility

Additional Control Measures

On January 23, 2012, Ferro Corporation submitted to Ohio EPA a plan for repair and upgrade of Lead PE controls at their East 56th Street facility. The plan calls for repair and refurbishment of malfunctioning filter baghouses. Included in the plan is the addition of downstream high efficiency particulate air (HEPA) filters as secondary filters on the lead baghouses. Each of the HEPA filters has a rated efficiency of 99.97% capture of particles greater than 0.3 microns.

U.S. EPA specifically discusses secondary controls, such as HEPA filters, in their guidance and specifically states that these would not be required as RACM due to the unfavorable cost effectiveness of the control. Ohio EPA has determined that the planned installation of the HEPA filters is being done voluntarily and will not be required as RACM/RACT at the facility.

4.0 Conclusion for the RACM determination at the Ferro Facility

OEPA considers the establishment and implementation of RACM/RACT at the Ferro Facility to be the most appropriate and effective way to obtain compliance with National Ambient Air Quality Standard (NAAQS) for Lead. Historically, control equipment has always been required at Ferro, and the controls already in operation at the facility and required by the facility's Title V permit would be considered RACM/RACT. It should also be noted in this determination that Ferro is voluntarily adding secondary control to their lead processes going beyond the requirements of RACM/RACT. The Ohio EPA believes that the use of existing control equipment, where a plan is implemented to properly operate and maintain this equipment, will allow the recently lowered Lead NAAQs to be achieved and maintained.