IV. “NONFERROUS FOUNDRY ENVIRONMENTAL ISSUES”
(It’s not all Iron)

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Discussion Items

Most environmental presentations/papers focus on iron and steel foundry issues.

Non-ferrous casting production is increasing due to a demand for lighter castings.

The following PP will focus on environmental regulations affecting non-ferrous foundries as well as typical environmental compliance assessment findings related to these facilities.
US 2011 Non-Ferrous Production

Aluminum – 1,752,680 tons
Copper – 355,620 tons
Zinc – 240,400 tons
Magnesium – 110,680 tons

(Modern Castings Dec. 2013)

Or 18.5% of total casting production. Since most nonferrous production is Al and Al and Mg castings are lighter than ferrous castings, this non-ferrous segment represents ~ 30.4% of castings produced and 38% of sales dollars.
Today’s Talk

Brief overview of common issues affecting non-ferrous casting facilities.

Alloy specific regulations

Common noncompliance issues found during site environmental compliance assessments
Common Issues – Air – EIs

Clean Air Act (CAA) compliance is typically the highest priority issue across all castings facilities.

Title V (Part 70 Major Source)
FESOP (Federally Enforceable State Operating Permit or Synthetic Minor)
State Level Permit (rules vary by state)
NESHAPs ---- National Emission Standards for Hazardous Air Pollutants (HAPs). MACT and GACT (40CFR63)
NSPS ---- New Source Performance Standards (40CFR60)
State Specific Rules --- Air Toxics, Modeling, etc.
Paperwork, Paperwork, Paperwork

The issue is determining your requirements, which are based on emission inventories and your casting processes.
Water Issues

What kind of permitting is required.

Stormwater Permitting (NPDES – National Pollution Discharge Elimination System)--- State specific requirements.

Sanitary (Publically Owned Treatment Works – POTW)

Categorical Discharges (NPDES) by category. Aluminum, Copper, etc.

And a few facilities operate water treatment operations for potable water.
Cats and Dogs

(All the other stuff you do in your spare time!)

Tier II
Tier III Toxic Chemical Release Inventory Reporting, TRI/Form R)
GHG Reporting
Ozone Depleting Chemicals (CFCs)
Spill Prevention, Control, and Countermeasure Plan (SPCC)
Universal waste rule
Used Oil Management
TSCA Chemical Data Reporting
TSCA – PCB
USTs/ASTs
Cold Cleaners/Parts Washers
Company Related Recordkeeping
Customer Related Programs
And lets not forget EMS --- ISO14001 ………………………
AI Issues
Aluminum Casting Facilities -- CAA

Die-Casting – Closed metal mold so emissions are very low.

Permanent Molds – Limited emissions from open pour basin. But emissions still very low.

Semi-Permanent Molds – “Semi” meaning that something else is in the mold? Emissions from chemically bonded sand cores must be accounted for in plant emission inventory. Some level of organic and particulate matter (PM) emissions may be present.
Aluminum Casting Facilities -- CAA

Greensand Molding

Not widely used

Has high particulate emission levels

EFs used are frequently from iron for PM.

VOC, CO and organic HAPs EFs from iron are not appropriate for Al pouring/cooling/shakeout (PCS).
No-Bake Molding (chemically bonded)

Have high emission levels of volatile organic compounds (VOCs)

CERP research testing and supplier data can be used for emissions.

CO levels published for iron are not appropriate.

PM levels for No-Bake are not readily available nor as high as AP-42 or Fire.
Aluminum Casting Facilities -- CAA

Thermal Sand Reclaim (TSR)

Frequently used to recycle No-Bake chemically bonded molds.

Emission factors not readily available.

Will subject the facility to NSPS 40 CFR Part 60 Subpart UUU. This rule has been the subject of many discussions at AFS committee meetings. It was not meant to apply to the metalcasting industry however the current EPA position is that it does apply to thermal sand reclamation units at metalcasting facilities.
Aluminum Casting Facilities -- CAA

Melting Methods

Typically reverberatory furnaces however new facilities use stack melters.

Stack melters theoretically have lower emission levels, energy use, fluxing, dross, and melt losses.

Fluxing is the main source of emissions. Reactive fluxes form HCl and F and levels of fluxing depend on charge materials and metallurgical requirements. (Emission Factors – HCl F)

Dioxin/Furans (D/F) are present at varying emission levels. CAA and Form R (0.1gm/yr)
Aluminum Casting Facilities -- CAA

Melt Material Specifications

Why?
Because scrap selection can affect PSD Major Source threshold. (100 or 250 ton/yr)

Because a combination of the casting and melt processes will affect NESHAPs applicability.

Status as a major or areas source of HAPs will change the requirements. (both covered under Subpart RRR)
Die Castings, Aluminum Foundries, or Aluminum Extruders
Proposed Settlement Agreement as of February 21, 2002

Start

Is your facility used for research & development and not to produce a saleable product?

Yes

No

Are you a manufacturer of Aluminum Die Castings, an Aluminum Foundry, or Aluminum Extruder? (Facilities collocated with Primary Al Production located under this rule.)

Yes

No

Do you use other than Clean Charge, Quenched Scrap (unpainted and uncoated), and Internal Scrap (regardless of contamination level and which remain within the control of company)?

Yes

No

You are not a Secondary Aluminum Production Facility as defined in Subpart RRR.

Yes

No

Subpart RRR does not apply to your facility.

Are you a Major Source of HAPs?

Yes

No

Are you a Major Source of HAPs?

Yes

No

All Requirements of Subpart RRR pertaining to PM, D/F, and associated O&M Plans, Reporting, and Recordkeeping Requirements apply to Each New and Existing: Thermal Chip Dryer, Scrap/Dryer/Delacquering Kiln/Decoating Kiln.

No furnace is subject to Subpart RRR.

The requirements of this Subpart pertaining to PM, D/F, and associated O&M Plans, Reporting, and Recordkeeping Requirements apply to Each New and Existing: Scrap Shredder, Thermal Chip Dryer, Scrap/Dryer/Delacquering Kiln/Decoating Kiln, Group 2 Furnace, Sweater Furnace, Dross-Only Furnace, Rotary Dross Cooler, Secondary Aluminum Processing Unit containing one or more Group 1 furnace emission units processing other than Clean Charge.

AFS 26th Environmental, Health & Safety Conference
August 12-14, 2014 – Atlanta, GA
There will be a test on the diagram at the end of this session!

**Bottom Line**

If you use “clean charge” and are an area source of HAPs you are only subject to the rule if you have a thermal chip dryer. D/F limits apply to chip dryer.

If you use “other than clean charge” and are a major source of HAPs you are subject to the rule for THC, HCl, D/F, PM on melt furnaces………

And lots of monitoring, recordkeeping, periodic stack testing, etc.
What if I am not a diecast facility?

Then

40 CFR 63 Subpart ZZZZZZZ Area Source Standards for Aluminum, Copper, and Other Nonferrous Foundries applies to you if you melt over 600 tons per year and have certain levels of metallic HAPs in metal melted.

The compliance requirements for Al affected sources include scrap management plans, record keeping and work practices. No emission limits apply.

Al Facilities with both diecasting and “other” types of casting processes must comply with both rules.
Aluminum Casting Facilities -- CAA

Other potential air permit issues.

Do you have reciprocating internal combustion engines (RICE)? Then NSPS and/or NESHAPs apply to you. Emergency and Non-Emergency engines treated differently

Do you have boilers or process heaters? Then Boiler MACT or GACT may applies to you.

Do you perform coating/painting. Surface coating MACT/GACT may apply to your.

And many reverbs mean high levels of CO2e. So reporting and, infrequently, NSR/PSD concerns.

Chlorine RMPs (2,500 lbs)?
Al Casting Facilities Water Issues

NPDES Stormwater Regulations apply unless “no-exposure” application is approved for the site.

POTW permit may or may not be required. A local issue.

Categorical discharge limits might apply depending on the processes and air pollution control equipment present.

Typically in Al facilities the most common process with categorical limits is casting quenching (water).
AI Waste Issues

Profile all waste streams such as sludges and baghouse dust.

If “other than clean charge” is used for raw materials, waste streams may be hazardous for metals or classified as TSCA wastes.
Copper Casting Facilities -- CAA

Permit Types Vary
Large facilities are Title V or FESOP
Small may be state level permit.

Our experience is with sand molding operations with electric induction furnace or reverb melting.
Copper Casting Facilities -- CAA

Melt Material Specifications

Why?

There are many alloys of Cu being poured.

Pure Cu is much different than leaded Cu alloys.
(Cu is Form R reportable but not a HAP)

Lead affects the air emissions, waste characteristics and potentially water discharges and ventilation systems.
Copper Casting Facilities -- CAA

Melting Facilities

Most use electric induction melting furnaces. Some reverbs. Leaded Cu alloys may require special exhaust considerations throughout melting/pouring operations.

PM melting emissions are often dependent on cover fluxes and exhaust system design. Can very widely from iron default EFs.

BH dust can contain high Pb or Zn levels and some level of D/F emissions can be present. (D/F Form R at 0.1gm/yr)
Copper Casting Facilities -- CAA

Molding Processes
Greensand Molding – Most common molding process. EFs used are frequently from iron for PM. VOC, CO and organic HAPs from iron are likely appropriate for Cu but not always used. CO is most frequently missed.

We have not worked with other molding processes, however iron process EFs would be the default where Cu EFs not available.
Copper Casting Facilities -- CAA

What NESHAP Applies?

40 CFR 63 Subpart ZZZZZZZZ Area Source Standards for Aluminum, Copper, and Other Nonferrous Foundries applies to you if you melt over 600 tons per year and have certain levels of HAPs. (No major source rules)

The compliance requirements for Cu affected sources includes melting emission limits, scrap management plans, record keeping and work practices. Emission limits apply to large foundries (over 6,000 tons/yr).
Copper Casting Facilities -- CAA

Other potential air permit issues.

Do you have reciprocating internal combustion engines (RICE)? Then NSPS and NESHAPs apply to you. Emergency and Non-Emergency engines treated differently

Do you have boilers or process heaters? Then Boiler MACT or GACT may applies to you.

Do you performing coating/painting. Surface coating MACT/GACT may apply to your.
Copper Casting Facilities Water Issues

NPDES Stormwater Regulations apply unless “no-exposure” application is approved for the site. Difficult to obtain for a sand foundry.

POTW permit may or may not be required. A local issue.

Categorical discharge limits might apply depending on the processes and air pollution control equipment present. Cu limits are different than Al but types of categorical processes are similar.
Copper Waste Issues

Profile all waste streams such as sludges and baghouse dust.

Waste streams are generally non-hazardous unless leaded alloys are produced. This can also cause concerns for spilled sands and other cleanup wastes, which may be hazardous.
Other Alloys (Zn & Mg)
Other Alloys -- CAA

Permit Types Vary
Facilities are not typically large or a part of larger facilities.
FESOP and state level permit.

Our experience is with diecasting and permanent mold.
Other Alloys -- CAA

Melting Facilities

Can be reverberatory, electric, or crucible melting furnaces.
Mg melting is performed under cover a gas or cover flux. Reacts with oxygen in the air. Cover gas typically SF$_6$ or refrigerant gases.
PM melting emissions are very low and difficult to quantify.
Molding Processes
Emissions depend on the specific processes used for forming the castings.

Diecasting and permanent molds have very low emissions.

Other processes need to be evaluated.
Other Alloys -- CAA

What NESHAP Applies?

40 CFR 63 Subpart ZZZZZZ Area Source Standards for Aluminum, Copper, and Other Nonferrous Foundries applies to you if you melt over 600 tons per year and have certain levels of HAPs. (No major source rules)

The compliance requirements for “Other Nonferrus” affected sources includes melting emission limits, scrap management plans, record keeping and work practices. Emission limit only applies to large foundries (over 6,000 tons/yr melt)

Mg and Zn casting facilities and imbedded casting facilities may not exceed 600 ton/yr applicability threshold or be classified as a 6,000 ton/yr large foundry.
Other Alloys -- CAA

Other potential air permit issues.

Do you have reciprocating internal combustion engines (RICE)? Then NSPS and NESHAPs apply to you. Emergency and Non-Emergency engines treated differently

Do you have boilers or process heaters? Then Boiler MACT or GACT may applies to you.

Do you perform coating/painting. Surface coating MACT/GACT may apply to your.

SF$_6$ is a GHG with a GWP or 22,800.
Other Alloys Water Issues

NPDES Stormwater Regulations apply unless “no-exposure” application is approved for the site. Difficult to obtain for a sand foundry.

POTW permit may or may not be required. A local issue.

Categorical discharge limits might apply depending on the processes and air pollution control equipment present. Zn limits are different than Al or Cu but types of categorical discharges are similar. Categorical standards will apply to Zn process water discharges but not Mg process discharges.
Other Alloys Waste Issues

Profile all waste streams such as sludges and baghouse dust.

Most waste streams are likely non-hazardous.

Machining turnings, baghouse and cleanup dust requires special care for Mg due to its oxidation potential. (fire or explosion risk)
Typical Environmental Compliance Assessment Findings
Air Findings

Construction Permits
Operating Permits / Title V
Prevention of Significant Deterioration (PSD) / New Source Review (NSR)
MACT / Air Toxics
Emission Factors
SARA 313 Reporting
Construction permits either have not been obtained for source modifications, or proper documentation of the need for a construction permit not evaluated and/or documented. All emission units are not properly permitted.
Air Operating Permits / Title V

Do all sources at the facility have either:

- An operating permit, or
- Documentation as to why an operating permit is NOT required

Has the facility determined it’s major source status
PTE > 100 TPY for any criteria pollutant

- Including “fugitive emissions”
- 10/25 TPY for Hazardous Air Pollutants (Title V and MACT Applicability)
Air Operating Permits / Title V

Emission Factors?

- Many emission factors were developed during the last 10 years
  - VOCs
  - CO
  - HAPs

Annual Compliance Certification and Reporting Requirements
Determine major source status
PTE > 100 TPY for listed source categories
PTE > 250 TPY for non-listed source categories

- Facilities are considered listed sources if using after-market scrap. AI facilities frequently can use “clean scrap” and qualify for non-listed source.

Modification
PSD/NSR look-backs
PSD Avoidance
Air Findings - MACT

Major source status

- Was the PTE for HAPs from all operations at the facility included when determining whether the source is major for HAPs?
- Do existing permits adequately limit PTE for HAPs?
- Did the facility:
  - Submit Notifications and Required Plans for Approval?
  - Notifications for all MACTs?
Air Findings – SARA 313

Does the facility have a complete and up-to-date chemical inventory?

Is the raw material data accurate?
   ID, wt% reportable components, usage

Is the waste stream data accurate?

Does the facility have test data/analysis for all waste streams potentially containing reportable chemicals?

Have the lower reporting thresholds for PBT chemicals been considered?
   i.e. lower threshold for Pb and Pb compounds
   Dioxins/Furans?
   Mercury?

Are Sara 313 releases shown confirmed by your Emission Inventory?
What about CFCs?

CFC Inventories (or lack of inventories)

Additional recordkeeping and maintenance requirements when equipment exceeds 50 pounds CFC/HCFC

Certifications?

Maintenance activities both equipment and personnel
Water Findings

National Pollutant Discharge Elimination System (NPDES) Permit
Spill Prevention Control and Countermeasure Plan (SPCC)
Stormwater Pollution Prevention Plan (SWPPP)
Stormwater Sampling
NPDES
Do the Categorical Standards/Effluent Guidelines (Pretreatment) apply to the facility? Can be required for processes such as casting quench operations.

Are you’re a direct discharger?

Are you discharging to a POTW?

Are limits calculated correctly?

Are limits based on accurate production data?
NPDES

Are all sources of process water listed in the permit?

Are Discharge Monitoring Reports (DMRs) for process water discharges:
- Consistently submitted, and/or
- Accurately completed

Are proper notifications regarding exceedances in discharges of wastewater being made, including:
- Documentation of the event and actions taken
POTW

Is the plant meeting the requirements of the local sewer ordinance?

Do you have a copy of the local ordinance?

Is required monitoring being performed?

Are there prohibitions of certain types of discharges?

- Noncontact Cooling Water
- Stormwater
- Metals
- Chlorine
SPCC

Has the plan been updated to current operation.

- Include operating equipment hydraulic reservoirs
- Include electrical transformers
- Include piping from operating equipment to centralized pumping systems and storage
- Current management and operating personnel
- Signed off by the Responsible Corporate Officer
- Annual training conducted and confirmed.
- Covers all loading/unloading/dispensing areas
Has the plan been updated to reflect current operations and Best management practices (BMPs)?

- Include all stormwater and contamination sources
- Identify all stormwater discharge points
- Identify and evaluate all current BMPs

Have annual compliance evaluations been completed and documented?
SWPPP (cont’d)

Poor housekeeping with regard to areas that may impact stormwater drainage areas.

Has the facility identified the destination of all drains?

Has a water balance been completed for all flows into and out of the facility?

Is training on the SWPPP up-to-date?
Stormwater Sampling

Has stormwater sampling/analysis been completed correctly?

- Type of sampling (grab versus composite)
- Monitoring parameters adequately reported?
  - i.e. precipitation amount and duration
- Are the correct parameters being reported?
- Do the monitored parameters include categorical requirements

Is the SWPPP signed by the responsible corporate official?
Stormwater
Solid Waste

Solid waste testing
Disposal / Recycle Activities
Hazardous Waste Requirements
Solid Waste Testing

Are wastes properly classified?
- Initial and routine profiles
- Use generator knowledge infrequently

Point of generation
- Are you testing mixed waste streams (haz and non-haz)?

Are you properly reporting hazardous waste treatment?
Disposal and Recycle

Disposal or recycle issues

- Where does it all go? Does $2 + 2 = 4$?
  - Make a waste table listing
    - List all wastes generated
    - List profiles and determination method
    - List recycle or disposal method / facility

If disposed in your landfill, are you permitted to accept the waste streams?

- Limited to certain types of waste
  - Foundry sands
  - Construction waste
  - Dry waste? (Paint filter test)
Hazardous Waste

Satellite areas not properly labeled
Hazardous Waste Storage Area

- Labeling
- Weekly Inspections
- Shipping within 90 days/ or 180 days

Universal Wastes

- Labeling Boxes or Containers
- Shipping within 1 year (unless justified)
Summary

Non-ferrous casting facilities have certain issues specific to the alloy being produced.

Review your environmental compliance. Perform your own internal compliance assessment.

OR Have a qualified third party perform an environmental assessment and rule applicability. Base your improvement plans on the results of the audit. Be prepared to address the issues identified.
Questions?

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