ILLINOIS ENVIRONMENTAL PROTECTION AGENCY
BUREAU OF AIR

October 2007

Responsiveness Summary for Comments on a Permit Application from Nucor Steel, Kankakee to Address Emissions of SO2 and VOM from the Existing Electric Arc Furnace

Site Identification No.: 091801AAA
Application No.: 04100024

Comments with Responses by the Illinois EPA

Proposed BACT Limit for SO_2

1. After reviewing USEPA's *RACT/BACT/LAER Clearinghouse* (RLBC) and other available information, I do not agree that 0.60 lb/ton of steel produced represents BACT for SO_2 for EAFs at a steel "mini-mill." For example, Nucor, Darlington, South Carolina is subject to a BACT limit of 0.20 lb/ton; Steel Dynamics Inc. (SDI), Whitley County, (Columbia City) Indiana, 0.25 lb/ton; Nucor, Plymouth, Utah, 0.31 lb/ton: and SMI Steel (now CMC Steel), Cayce, South Carolina, 0.35 lb/ton. All these plants produce similar products. Based on my analysis, BACT for SO_2 for the EAFs at Nucor, Kankakee is closer to 0.20 to 0.25 lb/ton.

The limits cited in this comment cannot be relied upon to set BACT for Nucor, Kankakee. The product of a mini-mill is relevant for emissions of pollutants associated with the scrap as the product type affects or dictates the types of scrap material that can be used at a particular mill. Nucor, Kankakee is a bar mill producing standard reinforcing bar or "rebar" for reinforced concrete and standard grade steel bars in certain basic shapes. The production of rebar and standard grade steel bar can productively use lower quality scrap, which contains higher levels of metals, such as copper, tin or chromium, that are generally undesirable in higher grade steel products. This lower quality scrap also tends to be accompanied by higher levels of the contaminants that can contribute to emissions of SO_2, as well as VOM, from an EAF.

The other mini-mills cited in this comment make products that generally require a better

quality of scrap. Nucor, Darlington, South Carolina is a bar mill with a continuous process furnace and two rolling mills that specializes in producing bars in a variety of shapes and steel grades, as well as rebar,. Similarly, CMC Steel, Cayce makes a diverse range of range of products including higher quality bars and certain structural steel products. Nucor, Plymouth, Utah produces a range of bar products but does not produce rebar. Finally, Steel Dynamics, Whitley County is not even a bar mill and makes structural steel shapes.

In support of the proposed BACT limit for SO_2, Nucor has submitted the results of a study it conducted for USEPA pursuant to a federal consent decree.[1] In this study, continuous SO_2 emissions monitoring was conducted for a year at eight of Nucor's mills, four bar mills, three sheet mills, and one "beam" mill, which produces structural steel shapes. Given the extent of data collected by this study, it is a more appropriate basis to set BACT limits for Nucor, Kankakee that the limits cited by this comment. The emission data for the four bar mills shows an average SO_2 emission rate of 0.265 ± 0.143 lb/ton.[2] This conservatively results in a value for the SO_2 emission rate of a bar mill with a 99 percent confidence level of 0.598 lb/ton[3] or 0.60 lb/ton. It is also significant that the maximum SO_2 emission rate of each mill during the course of the year was substantially higher than this value. The maximum SO_2 emission rate of each of the four mills during a three-hour period was 1.34, 1.35, 2.16 and 5.56 lb/ton. Finally, this study confirmed that product of a mini-mill is a key factor in the SO_2 emission rates of an EAF. The average SO_2 emission rate measured for the four "other mills" examined in the study, which produce higher quality products than bar mills, was 0.130 ± 0.100 lb/ton. This results in a significantly lower SO_2 emission rate for these other mills at a 99% confidence level, i.e., 0.367 lb/ton.

2. Other plants have implemented scrap management programs, including practices such as washing oil from scrap to meet BACT limits. Since degreasing has been employed at other mills (for example, Nucor, Darlington, South Carolina), this practice does not appear to be technical infeasible. Please provide a justification as to why Nucor cannot meet BACT by implementing similar techniques.

Nucor, like other mini-mills, currently implements a scrap management program to minimize the presence of undesirable contaminants in its scrap supply. However, degreasing or washing of scrap metal is not a feature of these programs, including the program of Nucor in Darlington, South Carolina. "Washing" of scrap to remove oil would require addition of either water or solvent. Water carryover into the EAF on scrap would create a substantial danger from a steam explosion, threatening the safety of workers. Solvent carried over would also present an explosion risk and would also likely increase VOM emissions due to the introduction of more VOM into the EAF. In addition, the effectiveness of scrap washing is uncertain as it would only address contamination with oil or grease, but not paint or plastics. Finally, any form of scrap washing would generate its

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[1] United States v. Nucor Corporation, Civil Action No. 4-00:3945-24, United States District Court for the District of South Carolina.

[2] All SO_2 emission data is expressed in terms of three-hour averages.

[3] Conservatively assuming a normal distribution for the SO_2 emission rate from the EAFs, the value for the SO_2 emission rate with a 99 percent confidence value, as appropriate for that rate to be considered achievable, is the average value plus 2.326 times the standard deviation or 0.598 lbs/ton (0.265 + 2.326 x 0.1431 = 0.598).

own waste materials that would then have to be appropriately handled and treated.

It is also important to recognize that the purpose of scrap management programs, such as that of Nucor, Kankakee or Nucor, Darlington, is twofold. Certainly, the purpose of such programs is to minimize the introduction of organic contaminants with the scrap metal charged into EAFs that will contribute to VOM emissions from the EAFs. Degreasing is clearly inconsistent with this purpose. Beyond this, the purpose of scrap management programs is to minimize the introduction of contaminants into the scrap by the people generating the scrap and the suppliers that then handle the scrap. Cleaning of scrap at a mini-mill is also clearly inconsistent with this objective, particularly as waste oil and grease should and can be readily managed so as to minimize any contamination of scrap metal.

3. The permit application contains a statement that degreasing scrap metal prior to charging is "impractical" and "thus technically infeasible". Please explain why a technical or economical analysis on this practice is not included in the Project Summary.

As discussed above, cleaning or degreasing has not been used at mini-mills to clean scrap. There would also be operational and environmental consequences for the operation of a mini-mill from degreasing that make such a practice worthy of at most theoretical consideration. Accordingly, it was not considered necessary to discuss degreasing of scrap in the Project Summary.

<u>Proposed BACT Limit for VOM</u>

4. After reviewing the RBLC and other available information, I do not agree that 0.35 lb/ton of steel produced represents BACT for VOM for the EAFs at Nucor, Kankakee. EAFs at other plants are subject to lower limits, including Nucor in Darlington, South Carolina at 0.13 lb/ton and Steel Dynamics, Hendricks, Steel Dynamics, Whitley, and Nucor, all in Indiana, at 0.09 lb/ton. Based on this information, 0.09 lb/ton appears to be BACT for VOM for the EAFs at Nucor, Kankakee. Furthermore, although emission testing at Nucor, Kankakee demonstrates a VOM emission rate of 0.113 lb/ton, by implementation of a scrap management plan, monitoring oil and other contaminant input, it appears that Nucor should be able to comply with a lower limit.

As already discussed, the plants listed by this comment are not representative of Nucor, Kankakee, which is a bar mill. Steel Dynamics, Hendricks, and Nucor in Indiana are sheet mills. Steel Dynamics, Whitley County, is a structural steel mill. These mills all make products that require a higher quality of steel and accordingly generally use a higher grade of scrap. Based upon information provided by Nucor, the base VOM BACT limit set for Nucor's Darlington, South Carolina plant is actually 0.035 lb/ton, which is identical to the BACT limit that has been set for Nucor, Kankakee.

In addition, Nucor already implements a scrap management program. Accordingly, there is not a technical basis to assume that a requirement to implement such a program as BACT will reduce VOM emissions, much less reduce emissions by 20 percent as presumed by this comment. Moreover, even if a reduction in VOM emissions would occur, it would

be unlikely to affect the average VOM emission rate in a manner that should alter the BACT limit. That is, the obvious result of a more effective scrap management program would be to reduce the extreme or maximum emission rates that occur, which presently accompany batches of "very bad" scrap that would not be present with the more effective scrap management program in the future. This has no effect on current, typical VOM emission rates as they are already representative of the processing of "good scrap."

The numerical BACT limit for VOM must be set at a level that is demonstrated to be consistently achievable given the inherent variability in the scrap supply to the EAF even with proper implementation of a scrap management program and normal variability in proper operation of the EAF. A VOM BACT limit of 0.35 lb/ton limit fulfills these requirements. In the absence of comparable emission data specifically for emissions of VOM, the detailed emission data collected for SO_2 is relevant to address the potential variability in the VOM emission rate for the EAFs. This study demonstrates substantial variability in SO_2 emissions even for EAFs that are operating normally. This is to be expected given the nature of the raw material for an EAF, i.e., scrap material that is being recycled and the volume of material used, approximately 100 tons per hour. In these circumstances, it is appropriate to set a BACT limit that is three times the measured emission rate, i.e., 0.35 lb/ton,[4] to account for normal variation.

5. Why was a Direct Shell Evacuation Control (DEC) system not considered in the BACT analysis? The BACT determination for CO emissions from the EAF states that "the Permittee shall operate a DEC system to promote oxidation...and control CO emissions." However this requirement is not restated in this permit or required as BACT for VOM.

The DEC system was not explicitly considered in the BACT analysis for VOM because this EAF is, and must be, operated with a DEC system and the VOM emission measurements for the EAF reflect operation of this system. In addition, as noted by the comment, the use of the DEC system is required as BACT for emissions of CO.[5] It was an oversight that this was not restated in the draft permit. It is stated in the issued permit, which also requires use of the DEC system for control of VOM emissions.

<u>Practical Enforceability of Proposed BACT Limits</u>

6. The BACT limits proposed in the draft permit do not appear to be practically enforceable. There are no compliance periods associated with the BACT limits (e.g., lbs/ton rolled, monthly) or methodology on how ongoing compliance with these limitations will be maintained. Please explain why ongoing emission testing is not required for these units.

The numeric BACT limits are enforceable with emissions directly measured by periodic

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[4] The BACT limit for VOM, 0.35 lb/ton, is derived as 3 times the average emission rate measured by a single, three run test (3 x 0.113 = 0.339, ≈ 0.35). Use of a factor of 3 is appropriate as the average value and standard deviation were determined from a single emission test with only three test runs, each of about one hour in duration.

[5] Condition 1(d) of the draft permit restated the numeric BACT limit for CO emissions, as well as NOx emissions from the EAF, as established by the original PSD Permit. However, it failed to restate the operational BACT requirements, including use of a DEC system for control of CO emissions.

emission testing. Since Nucor conducted testing in June of 2006 that showed compliance with the BACT limits, it is not necessary for the permit to require an initial "performance test." The permit provides that Nucor must conduct emission testing, which would verify compliance with the numeric BACT limits, upon request by the Illinois EPA (See Condition 5-1). This enables compliance to be verified by testing if the Illinois EPA observes deficiencies in the implementation of the scrap management program. Further provisions addressing the frequency of emission testing are more appropriately addressed in the Clean Air Act Permit Program (CAAPP) permit for the source, which a renewal application is currently pending. This is because the frequency of emission testing for pollutants other than SO_2 and VOM can be addressed in the CAAPP permit.

The numeric BACT limits were not applied over a longer compliance time period because continuous emissions monitoring for SO_2 and VOM is not warranted. In particular, there is not a means to readily quantify, on an ongoing basis, the levels of contaminant in scrap that are relevant to VOM and SO_2 emissions, then quantify the levels of those contaminants in scrap as charged to an EAF, and finally relate those levels to the actual emissions of the EAF. Accordingly, SO_2 and VOM emissions of an EAF must be determined by either periodic emissions testing or continuous emissions monitoring. Except for special studies, common practice has been to determine SO_2 and VOM emissions by periodic emission testing. Key factors supporting this practice are the interest of the operators of mini-mills in maintaining a suitable supply of scrap for their business and the fact that SO_2 and VOM emissions are not being controlled by traditional add-on control devices.

Because of these circumstances, the BACT determination for Nucor, Kankakee also specifies certain work practices that must be implemented to minimize SO_2 and VOM emissions. First, as reflected in the draft permit, Nucor must implement a scrap management program to minimize the presence of contaminants in the scrap supply for the EAF that contribute to SO_2 and VOM emissions, such as oil and paint. The provisions for this scrap management program are adapted from similar requirements in the federal National Emission Standards for Hazardous Air Pollutants (NESHAP) for Iron and Steel Foundries, 40 CFR 63, Subpart EEEEE. While this NESHAP is not applicable to Nucor, Kankakee directly as a matter of rule, the provision of 40 CFR 63.7700 reflect a determination by USEPA as to the appropriate scope and form of a management program for an EAF processing scrap metal. The Illinois EPA considers that this determination is also applicable to the circumstances of Nucor, Kankakee, as it balances the objectives of minimizing contamination in the supply of scrap metal and recycling scrap steel. The requirements for this program in the issued permit have been developed to specifically include all key elements of 40 CFR 63.7700, including punitive consequences for scrap vendors whose shipments repeatedly fail to meet requirements.

The issued permit also includes an additional work practice to minimize SO_2 emissions of the EAF that was not present in the draft permit. This is the use of charge carbon with a low sulfur content. Charge carbon is added to an EAF, along with flux material, to facilitate the melting and refining (purification) of the charged scrap. Sulfur in the charge carbon is another source of sulfur introduced into EAF, along with the sulfur in the scrap,

that contributes to a furnace's emissions of SO_2.