COMMONWEALTH OF PENNSYLVANIA
Department of Environmental Protection
Southeast Regional Office
October 29, 2025
484.250.5920

Subject: Technical Review Memo
RACT III Significant Modification to Title V Operating Permit No. 09-00006
APS ID 345152, Auth ID 1530475, PF ID 276929
United States Steel Corporation—Fairless Hills
400 Middle Drive
Fairless Hills, PA 19030

To: Jillian A. Gallagher
Environmental Program Manager
Air Quality Program
Southeast Region

From: David S. Smith, E.I.T.
Air Quality Engineering Specialist
Facilities Permitting Section
Air Quality Program

Through: Janine Tulloch-Reid, P.E.
Environmental Engineer Manager
Facilities Permitting Section
Air Quality Program

I. Introduction/Purpose of Authorization

United States Steel Corporation (USS) owns and operates a secondary steel processing (i.e., steel finishing) facility located within the Keystone Trade Center in Fairless Hills, Falls Township, Bucks County (hereinafter referred to as "the facility" or "its Fairless Plant"). The facility is permitted under Title V Operating Permit (TVOP) No. 09-00006[1] due to its status as a <u>major facility</u>[2] for nitrogen oxides (NO_x).[3]

On **June 11, 2025**, the Department of Environmental Protection (DEP) received a significant TVOP modification application package from USS, via DEP's Public Submission Page in Greenport, to address alternative (i.e., case-by-case) RACT III requirements for the galvanizing line furnace at the facility, pursuant to 25 Pa. Code § 129.114. The purpose of this authorization is to modify the TVOP to incorporate appropriate case-by-case RACT III requirements for the galvanizing line furnace into the TVOP.

[1] DEP renewed the TVOP on December 19, 2024, and this is the current TVOP for the facility.

[2] As the term is defined in 25 Pa. Code § 121.1 (i.e., has a potential to emit (PTE) NO_x of equal to or greater than 25 *tons/yr*, pursuant to paragraph (vi)).

[3] The TVOP includes a facility-wide NO_x emission rate restriction of less than 100 *tons/yr*. The facility is not a major facility for any other pollutants.

II. Facility Description/History

Since at least 2003, USS has operated and maintained the following (NO_x emitting) natural gas-fired combustion sources for the steel finishing operations at its Fairless Plant:[4]

- A firetube steam boiler rated at 31.2 *mmBtu/hr* heat input (Source ID 048 in the TVOP).
- The following direct-fired sources:
  - A galvanizing line furnace rated at 68.4 *mmBtu/hr* heat input (Source ID 420 in the TVOP).
  - A galvanneal furnace rated at 16.0 *mmBtu/hr* heat input (Source ID 422 in the TVOP).
  - The following miscellaneous sources (Source ID 426 in the TVOP):
    - A zinc pot preheater rated at 1.0 *mmBtu/hr* heat input.
    - A chemtreat dryer rated at 1.2 *mmBtu/hr* heat input.
    - A space heater rated at 2.50 *mmBtu/hr* heat input.
    - Thirty-seven space heaters rated at 1.25 *mmBtu/hr* heat input each (46.25 *mmBtu/hr* heat input total).

On August 7, 2021, DEP proposed to adopt additional Reasonably Available Control Technology (RACT) requirements and/or emission restrictions at 25 Pa. Code §§ 129.111–129.115, for sources of NO_x emissions at a major NO_x emitting facility[5] that commenced operation on or before August 3, 2018, to address the 2015 8-hour ozone National Ambient Air Quality Standards (NAAQS) (hereinafter referred to as "RACT III"). On November 12, 2022, DEP published the final-form rulemaking in the *Pennsylvania Bulletin*.

At that time, the Southeast Pennsylvania air basin,[2] including Bucks County, was designated as a moderate nonattainment area for ozone by the U.S. Environmental Protection Agency (EPA). Therefore, pursuant to paragraph (vi) of the definition of the term major NO_x emitting facility in 25 Pa. Code § 121.1, the facility was not subject to RACT III requirements at the time of the final-form rulemaking.

However, on July 30, 2024, EPA designated the Southeast Pennsylvania air basin as a serious nonattainment area for ozone. As a result of this reclassification, pursuant to paragraph (iii) of the definition of the term major NO_x emitting facility in 25 Pa. Code § 121.1, the facility was potentially subject to RACT III requirements due to its PTE NO_x being greater than 50 *tons/yr*.

As all the natural gas-fired combustion sources at the facility commenced operation on or before August 3, 2018, they were all potentially subject to RACT III. In accordance with 25 Pa. Code §§ 129.111(a), (c), and (e), and 129.115(a)(1)(ii), (a)(2)(i)–(ii), (a)(4), (a)(5)(i)–(iv), and (a)(7)(i)–(ii), on **January 30, 2025**, DEP received a notification from USS, via DEP's Public Submission Page in Greenport, with a listing of all the sources at the facility and a summary of the applicable RACT III requirements and associated methods of compliance (hereinafter referred to as "the RACT III notification").

In the RACT III notification (*Attachment #1*), USS specified whether each of the sources at its Fairless Plant is exempt from 25 Pa. Code §§ 129.112–129.114, pursuant to 25 Pa. Code § 129.111(c); subject to presumptive RACT III requirements, pursuant to 25 Pa. Code § 129.112; or subject to case-by-case RACT III requirements, pursuant to 25 Pa. Code § 129.114(b). In addition, USS calculated the PTEs NO_x for each of the miscellaneous natural gas-fired combustion sources (i.e., those comprising Source ID 426 in the TVOP) to determine which are subject to presumptive RACT III requirements or exempt from RACT III requirements. USS indicated that it

[4] USS also operates and maintains an immersion cold cleaning machine (parts washer; Source ID 100 in the TVOP) at its Fairless Plant, but it is not a source of NO_x emissions, only volatile organic compound (VOC) emissions.
[5] As the term is defined in 25 Pa. Code § 121.1.

would submit an alternative RACT III proposal (i.e., perform a case-by-case RACT III analysis) for the galvanizing line furnace and submit it to DEP by February 28, 2025.

On **February 28, 2025**, DEP received the case-by-case RACT III analysis for the galvanizing line furnace, performed by Trinity Consultants, on behalf of USS (*Attachment #2*).

On April 22, 2025, DEP sent a letter to USS via e-mail requesting that, on or before June 30, 2025, USS submit a significant TVOP modification application so that DEP may incorporate appropriate case-by-case RACT III requirements for the galvanizing line furnace into the TVOP.

To this end, on **June 11, 2025**, DEP received a significant TVOP modification application package from USS via DEP's Public Submission Page in Greenport. The significant TVOP modification application package included the significant TVOP modification application, alternative RACT III proposal (i.e., case-by-case RACT III analysis), compliance review form [25 Pa. Code § 127.412], and copies of and proof of delivery for the notifications to the municipality and county [71 P.S. § 510-5 (Act 14 of 1984); 25 Pa. Code § 127.413]. On June 12, 2025, DEP received a check (no. 1341078081) in the amount of $4,000 for the significant TVOP modification application fee [25 Pa. Code § 127.704(b)(4)(ii)]. All applicable sections of the significant TVOP modification application were completed. Therefore, DEP considers the significant TVOP modification application administratively complete [25 Pa. Code § 127.421(a)] as of the latter date. Moreover, since DEP received a complete significant TVOP modification application package on or before June 30, 2025, DEP considers the significant TVOP modification application timely [25 Pa. Code § 129.114(d)(1)(i)].

II. NO_x Emissions Analysis

As indicated in the *Introduction/Facility Description* section, above, the facility is subject to a NO_x emission rate restriction of less than 100 *tons/yr*. None of the natural gas-fired combustion sources at the facility are subject to any individual NO_x emission rate restrictions.

The actual NO_x emissions from the facility for calendar years 2020–2024, as previously reported by USS, are as follows:

Source ID	Source Name	NO_x Emissions (*tons/yr*)					
		2020	2021	2022	2023	2024	Average
048	Gal3 Steam Boiler	1.40	1.24	1.23	1.18	1.34	1.28
420	Galvanizing Line Furnace	31.23	26.16	24.34	35.34	26.63	28.74
422	Galvanneal Furnace	1.84	3.70	5.24	1.35	3.46	3.12
426	Miscellaneous Natural Gas Usage	1.01	2.49	1.48	1.55	1.17	1.54
	Totals	35.48	33.59	32.29	39.42	32.60	34.68

III. Regulatory Analysis

The steam boiler is subject to federal New Source Performance Standards (NSPS) for Small Industrial-Commercial-Institutional Steam Generating Units [40 CFR Part 60, Subpart Dc]. None of the other sources at the facility are subject to any NSPS, National Emission Standard for Hazardous Air Pollutants (NESHAP) [40 CFR Part 61], or Maximum Achievable Control Technology (MACT) [40 CFR Part 63] standards or any other federal regulations.

IV. Summary of RACT III Requirements for Natural Gas-Fired Combustion Sources

As discussed in the *Introduction/Facility Description* section, above, USS has specified in the RACT III notification which of the natural gas-fired combustion sources at its Fairless Plant are subject to presumptive

RACT III requirements, subject to case-by-case RACT III requirements, or exempt from these. DEP concurs with USS's classification of the natural gas-fired combustion sources at the facility and, except as discussed in the *Case-by-Case RACT III Analysis for Galvanizing Line Furnace* section, below, its summary of the applicable RACT III requirements and associated methods of compliance. DEP also concurs with the PTE NO_x calculations for the miscellaneous natural gas-fired combustion sources.

As a point of clarification, since the TVOP already includes a requirement to perform an adjustment or tune-up on the steam boiler on an annual basis, this requirement will be maintained in the modified TVOP rather than the less stringent requirement indicated in 25 Pa. Code § 129.112(b)(1)(i) to perform a tune-up on a biennial basis.

V. Case-by-Case RACT III Analysis for Galvanizing Line Furnace

USS operates and maintains the galvanizing line furnace at its Fairless Plant to heat cold-rolled steel prior to coating it with molten zinc for corrosion resistance. The galvanizing line furnace has 242 natural gas-fired burners with a total heat input rating of 68.4 *mmBtu/hr*, with the high-temperature combustion resulting in the formation of thermal NO_x. Due to the following, USS was required to submit a case-by-case RACT III analysis for the galvanizing line furnace, pursuant to 25 Pa. Code § 129.114(b):

- The potential emission rate of NO_x for the galvanizing line furnace is equal to or greater than 5.0 *tons/yr*.
- Based on the results of source testing that USS performed for the galvanizing line furnace in 2014, the galvanizing line furnace is not able to meet the presumptive RACT NO_x emission rate restriction of 0.10 *lbs/mmBtu* heat input indicated in 25 Pa. Code § 129.112(k) without the installation of an air cleaning device.
- The galvanizing line furnace is not a boiler, stationary combustion turbine, or stationary internal combustion engine subject to 25 Pa. Code §§ 129.201–129.205.

In its case-by-case RACT III analysis, USS conducted a "top-down" RACT evaluation, as outlined in EPA's Draft New Source Review Workshop Manual, dated October 1990, for the galvanizing line furnace to satisfy the following five-step RACT analysis process indicated in 25 Pa. Code § 129.92(b):

- <u>Step 1 – Identify all available control options (i.e., air cleaning devices, air pollution control technologies, or techniques)</u>: Based on its review of entries in EPA's RACT/Best Available Control Technology (BACT)/ Lowest Achievable Emissions Rate (LAER) Clearinghouse (RBLC), federal regulations for similar operations; engineering experience with similar control applications; and information provided by air pollution control equipment vendors, USS identified the following potentially applicable NO_x control options for the galvanizing line furnace:
    - Selective catalytic reduction (SCR).
    - Selective non-catalytic reduction (SNCR).
    - Low/ultra-low NO_x burners (LNB/ULNB).
    - Good combustion practices, including the following:
        - Operation and maintenance in accordance with the manufacturer's specifications.
        - Minimizing excess combustion air.
        - Performing annual adjustments/tune-ups.
- <u>Step 2 – Evaluate the technical feasibility of the available control options and eliminate any that are technically infeasible</u>: Based on typical exhaust gas temperature for the galvanizing line furnace, USS indicated that SCR is a technically feasible NO_x control option, but that SNCR is technically infeasible. In

addition, USS indicated that both LNB/ULNB and good combustion practices are technically feasible NO_x control options.

- Step 3 – Rank all technically feasible control options (i.e., those not eliminated in Step 2) by control effectiveness: Based on the outlet NO_x emission rates for the SCR and LNB control options that USS indicated in Appendix C of the case-by-case RACT III analysis, USS ranked the technically feasible control options from Step 2, in order of decreasing control effectiveness, as SCR, LNB, and good combustion practices.

- Step 4 – Evaluate the cost effectiveness of the technically feasible control options and eliminate any that are not cost effective:
  - SCR: Using the cost calculation spreadsheet associated with Section 4, Chapter 2 of EPA's Air Pollution Control Cost Manual, 7th Edition (hereinafter referred as "CCM7"); the results of aforementioned source testing for the galvanizing line furnace (plus a 10% margin); an average typical NO_x reduction efficiency value of 80%; and the maximum potential NO_x emission rate for the galvanizing line furnace, USS calculated a cost effectiveness for the SCR control option of $19,516 per ton of NO_x removed. Based on this cost effectiveness, USS considered this control option economically infeasible.
  - LNB: Using cost estimation procedures consistent with Section 1, Chapter 2 of EPA's CCM7; a 2019 vendor quote and guaranteed NO_x emission rate for LNBs for a similar furnace at a USS facility in Ohio; and the maximum potential NO_x emission rate for the galvanizing line furnace, USS calculated a cost effectiveness for the LNB control option of $142,837 per ton of NO_x removed. Based on this cost effectiveness, USS considered this control option economically infeasible.
  - Good combustion practices: As USS indicated that it already employs good combustion practices for the galvanizing line furnace, USS did not associate an additional cost with this control option. Consequently, USS considered this control option economically feasible.

- Step 5 – Select RACT (i.e., the highest-ranking control option from Step 3 that was not eliminated in Step 4): Based on it being the only remaining economically feasible control option after Step 4, USS selected good combustion practices as RACT for the galvanizing line furnace. To satisfy RACT, USS proposed to continue to operate and maintain the galvanizing line furnace in accordance with the manufacturer's specifications and to perform an adjustment or tune-up on an annual basis. (These requirements are indicated in Condition # 020, Section C, of the previously-renewed TVOP, and Condition # 009, Section D (under Source ID 420), of the previously-renewed TVOP, respectively (same condition numbers in the modified TVOP).)

DEP concurs with USS's RACT evaluation for the galvanizing line furnace and, pursuant to 25 Pa. Code § 129.114(e)(2), "is satisfied that the alternative RACT [III] proposal complies with the requirements of [25 Pa. Code § 129.114](d) and that the proposed alternative requirement[s] … [constitute] RACT." However, DEP considers the requirement to maintain records of each adjustment or tune-up, as indicated in Condition # 006, Section D (under Source ID 420), of the previously-renewed TVOP (same condition number in the modified TVOP), to also constitute RACT.

To highlight the fact that DEP considers these requirements to constitute RACT for the galvanizing line furnace, DEP has added additional authority citations to 25 Pa. Code § 129.114(d)–(f) to the beginning of the associated conditions in the modified TVOP. Moreover, DEP has added the following additional requirement as Condition # 025, Section C, of the modified TVOP: "All [RACT]-related permit conditions under 25 Pa. Code § 129.114 are to be approved by [EPA] as part of the Commonwealth's [SIP], and any future revisions to any such permit conditions will require a co-incident SIP revision."

VI. Additional Information

In addition to the changes specified in the *Case-by-Case RACT III Analysis for Galvanizing Line Furnace* section, above, the permit contact person indicated on the cover page of the previously-renewed TVOP (same location in the modified TVOP), has been changed to Nicole L. Wright, Environmental Engineer, 412.675.7382, nlwright@uss.com.

VII. Comment Period for Proposed Significant TVOP Modification

On October 29–31, 2025, USS will publish a notice in the *Bucks County Courier Times* of DEP's intents to issue the significant TVOP modification, hold a public hearing, and revise the Commonwealth's State Implementation Plan (SIP) to incorporate the case-by-case RACT III requirements specified in the *Case-by-Case RACT III Analysis for Galvanizing Line Furnace* section, above.

On November 1, 2025, DEP will publish a corresponding notice in the *Pennsylvania Bulletin*.

On December 2, 2025, DEP has scheduled a public hearing at its Southeast Regional Office to accept oral and written testimony on the significant TVOP modification application and the proposed revision to the Commonwealth's SIP.

Pursuant to 25 Pa. Code § 127.429(c), "[p]ersons unable to attend the public hearing may submit … a written statement and exhibits to DEP, in the same manner as specified above, within 10 days thereafter to [DEP]." Therefore, the public comment period will open on October 29, 2025, and remain open through December 12, 2025.

VIII. Conclusion

Based on a review of the RACT III notification and significant TVOP modification application with case-by-case RACT III analysis, I recommend that DEP modify TVOP No. 09-00006 for USS for its Fairless Plant.

United States Steel

January 30, 2025

Mr. James Rebarchak
Regional Air Quality Program Manager
Pennsylvania Department of Environmental Protection
Southeast Regional Office
2 E. Main Street
Norristown, PA 19401-4915

Submitted via OnBase

RE: U. S. Steel Fairless Plant
Initial Notification – 25 Pa. Code 129 RACT III

Mr. Rebarchak,

United States Steel Corporation (U. S. Steel) owns and operates a steel finishing facility located in Fairless Hills, Bucks County, Pennsylvania (Fairless Plant). Cold-rolled products are finished into galvanized sheet products at the site. This letter satisfies the initial notification requirements contained in 25 Pa. Code 129.115a and as communicated by the Department via email[1].

The Fairless Plant has historically been considered a minor source of nitrogen oxide (NO_x) emissions as it relates to Reasonably Available Control Technology (RACT) requirements. On July 30, 2024, the US Environmental Protection Agency (EPA) redesignated Bucks, Chester, Delaware, Montgomery and Philadelphia Counties as a serious nonattainment area for the 2015 Ozone NAAQS. This reclassification reduces the major source NO_x RACT threshold from 100 tons per year (tpy) to 50 tpy. The Title V permit for the Fairless Plant (TVOP 09-00006) contains a facility-wide less than 100 tpy NO_x restriction and, therefore, the Fairless Plant would be reclassified as a major source under NO_x RACT. As a major source for NO_x RACT, the Fairless Plant is subject to portions of 25 Pa. Code 129.111 through 129.115:

1. Section 129.111 provides applicability information;
2. Section 129.112 outlines presumptive RACT requirements;
3. Section 129.114 states the requirement and method for case-by-case RACT proposals; and
4. Section 129.115 provides for notifications (including this initial notification due January 31, 2025), compliance demonstrations and recordkeeping and reporting requirements.

This letter is being submitted to meet the initial notification requirements of RACT III per 25 Pa. Code 129.115(a). The attachments to this letter are as follows:

- Attachment A contains the required information for the applicable equipment to satisfy 25 Pa. Code 129.115(a)(2) and 129.115(a)(5) through (7). Attachment A also contains facility information.
- Attachment B summarizes each RACT III citation referenced in Appendix A table of information.

As noted in Attachment A, U. S. Steel will be performing a case-by-case RACT proposal for Source ID 420 – Galvanizing Line Furnace. The case-by-case RACT submissions will be made to the Department by February 28, 2025.

---

[1] Email from Southeast Regional Office to Kaylene Kowalski (U. S. Steel) on November 5, 2024

Should you have any questions pertaining to this matter, please contact Kaylene Kowalski by phone at 412-675-7382 or by email at kkowalski@uss.com.

Based on information and belief formed after reasonable inquiry, the statements and information in the document are true, accurate, and complete.

Respectfully,

Kurt Barshick
Vice President
U. S. Steel – Mon Valley Works

cc: Kaylene Kowalski (USS)
Mike Dzurinko (USS)
Brett Tunno (USS)
Chris Hardin (USS)
Matthew DeLibero (USS)
Mike Benner (USS)

Attachments

ATTACHMENT A –RACT III NO_x Initial Notification Information

Source ID	Source Description	Equipment Make	Equipment Model	NO_x RACT Compliance Option	NO_x RACT Requirement	NO_x RACT Requirement Citation	NO_x RACT Compliance Demonstration	NO_x RACT Compliance Demonstration Citation
048	Gal3 Steam Boiler	Johnston Boiler Co.	PFTAR750-4G150S 31.2 MMBtu/hr Natural-gas fired	Presumptive	Biennial tune-up	129.112(b)(1)	Tune-ups and recordkeeping.	129.115(f), 129.115(i) and 129.115(k)
420	Galvanizing Line Furnace	General Electric Co.	Direct-fired furnace 68.4 MMBtu/hr Natural-gas fired	Case-By-Case	Case-By-Case	129.114	To be determined	To be determined
422	Galvanneal Furnace	Surface Combustion, Inc.	16.0 MMBtu/hr Natural-gas fired	Presumptive	Install, maintain, and operate in accordance with manufacturer's specifications and good operating practices	129.112(c)(4)	Operating practices and recordkeeping.	129.115(f) and 129.115(k)
Part of 426 (Misc. NG Usage)	Thirty-seven (37) Space Heaters	Dravo Corp.	100-I-SGA 1.25 MMBtu/hr, each	Exempt	Potential to emit for each heater (0.55 tpy) is less than 1 tpy NO_x. See attached calculations.	129.111(c)	NA - Exempt	N/A – Records per 129.115(h)
	Space Heater	Cambridge Engineering, Inc.	C2500 2.5 MMBtu/hr	Presumptive	Install, maintain, and operate in accordance with manufacturer's specifications and good operating practices	129.112(c)(4)	Operating practices and recordkeeping.	129.115(f) and 129.115(k)

Source ID	Source Description	Equipment Make	Equipment Model	NO_x RACT Compliance Option	NO_x RACT Requirement	NO_x RACT Requirement Citation	NO_x RACT Compliance Demonstration	NO_x RACT Compliance Demonstration Citation
	Chem Treat Dryer	Eclipse Combustion, Inc.	AH-O 120 1.2 MMBtu/hr	Exempt	Potential to emit (0.44 tpy) is less than 1 tpy NO_x. See attached calculations.	129.111(c)	NA - Exempt	N/A – Records per 129.115(g)
	Zinc Pot Dryer	Eclipse Combustion, Inc.	50 Minimatic 1.0 MMBtu/hr	Exempt	Potential to emit (0.53 tpy) is less than 1 tpy NO_x. See attached calculations.	129.111(c)	NA - Exempt	N/A – Records per 129.115(h)
100	Parts Washer	N/A	N/A	N/A – Not a NO_x Source				
N/A	Storage Tanks	N/A	N/A	N/A – Not a NO_x Source				

ATTACHMENT B – RACT III Citation Summary

RACT Citation	Citation Summary
129.111(c)	Sections 129.112—129.114 do not apply to the owner and operator of a NOx air contamination source that has the potential to emit less than 1 TPY of NOx located at a major NOx emitting facility subject to subsection (a) or (b) or a VOC air contamination source that has the potential to emit less than 1 TPY of VOC located at a major VOC emitting facility subject to subsection (a) or (b). The owner or operator shall identify and list these sources in the written notification required under § 129.115(a).
129.112(b)(1)	Combustion unit or process heater with a rated heat input equal to or greater than 20 million Btu/hour and less than 50 million Btu/hour shall conduct a biennial tune-up in accordance with the procedures in 40 CFR 63.11223 (relating to how do I demonstrate continuous compliance with the work practice and management practice standards?). (A) Each biennial tune-up shall occur not less than 3 months and not more than 24 months after the date of the previous tune-up. (B) The biennial tune-up must include, at a minimum, the following: (I) Inspection and cleaning or replacement of fuel-burning equipment, including the burners and components, as necessary, for proper operation as specified by the manufacturer. (II) Inspection of the flame pattern and adjustment of the burner, as necessary, to optimize the flame pattern to minimize total emissions of NO_x and, to the extent possible, emissions of CO. (III) Inspection and adjustment, as necessary, of the air-to-fuel ratio control system to ensure proper calibration and operation as specified by the manufacturer.
129.112(c)(4)	A boiler or other combustion source with a rated heat input less than 20 million Btu/hr located at a major NOx emitting facility or major VOC emitting facility and is subject to 129.111 shall install, maintain, and operate the source in accordance with the manufacturer's specification with good operating practices.
129.115(g)	Beginning with the compliance date specified in § 129.112(a), the owner or operator of an air contamination source claiming that the air contamination source is exempt from the applicable NO_x emission rate threshold specified in § 129.114(b) and the requirements of § 129.112 based on the air contamination source's potential to emit shall maintain records that demonstrate to the Department or appropriate approved local air pollution control agency that the air contamination source is not subject to the specified emission rate threshold.
129.115(i)	The owner or operator of a combustion unit or process heater subject to 129.112(b) shall record each adjustment conducted under the procedures in § 129.112(b). This record must contain, at a minimum: (1) The date of the tuning procedure. (2) The name of the service company and the technician performing the procedure. (3) The final operating rate or load. (4) The final NO_x and CO emission rates. (5) The final excess oxygen rate. (6) Other information required by the applicable operating permit.

U. S. Steel Corporation Mon Valley Works, Fairless Hills Plant

Source	Furnace Rating, mmbtu/hr	NOx emission factor, lbs/mmbtu[1]	PTE NOx, tons	
Space Heaters - Dravo Corp (each)	1.25	0.100	0.55	(per heater)
Space Heaters - Cambridge	2.5	0.100	1.10	
Zinc Pot Dryer [1]	1.0	0.100	0.44	
Chemtreat Dryer [1]	1.2	0.100	0.53	

[1] Emission factor from AP-42 Section 1.4, small boilers less than 100 MMBtu/hr

United States Steel

February 28, 2025

Mr. James Rebarchak
Regional Air Quality Program Manager
Pennsylvania Department of Environmental Protection
Southeast Regional Office
2 E. Main Street
Norristown, PA 19401-4915

Submitted via OnBase

RE: U. S. Steel Fairless Plant
Case by Case Analysis – 25 Pa. Code 129 RACT III

Mr. Rebarchak,

United States Steel Corporation (U. S. Steel) owns and operates a steel finishing facility located in Fairless Hills, Bucks County, Pennsylvania (Fairless Plant). Cold-rolled products are finished into galvanized sheet products at the site.

On January 30, 2025, U. S. Steel provided the Pennsylvania Department of Environmental Protection (PADEP) an initial notification in accordance with 25 Pa. Code 129.115(a). U. S. Steel committed to performing a case-by-case analysis in accordance with 25 Pa. Code 129.114 for Source ID 420 – Galvanizing Line Furnace. This document serves as that case-by-case analysis, which is required to be provided to PADEP by February 28, 2025.

Should you have any questions pertaining to this matter, please contact Kaylene Kowalski by phone at 412-675-7382 or by email at kkowalski@uss.com.

Based on information and belief formed after reasonable inquiry, the statements and information in the document are true, accurate, and complete.

Respectfully,

Kurt Barshick
Vice President
U. S. Steel – Mon Valley Works

Attachment #2

NO_X REASONABLY AVAILABLE CONTROL TECHNOLOGY STUDY

U. S. Steel Corporation/ Fairless, Pennsylvania

Prepared By:

TRINITY CONSULTANTS
4500 Brooktree Road
Suite 310
Wexford, PA 15090

February 2025

TABLE OF CONTENTS

LIST OF TABLES

1. BACKGROUND

United States Steel Corporation (U. S. Steel) owns and operates a steel finishing facility located in Fairless Hills, Bucks County, Pennsylvania (Fairless Plant). The Fairless Plant has historically been considered a minor source of nitrogen oxide (NO_x) emissions as it relates to Reasonably Available Control Technology (RACT) requirements. On July 30, 2024, the US Environmental Protection Agency (EPA) redesignated Bucks, Chester, Delaware, Montgomery and Philadelphia Counties as a serious nonattainment area for the 2015 Ozone NAAQS. This reclassification reduces the major source NO_x RACT threshold from 100 tons per year (tpy) to 50 tpy. The Title V permit for the Fairless Plant (TVOP 09-00006) contains a facility-wide less than 100 tpy NO_x restriction and, therefore, the Fairless Plant would be reclassified as a major source under NO_x RACT. As a major source for NO_x RACT, the Fairless Plant is subject to portions of 25 Pa. Code 129.111 through 129.115.

On January 30, 2025, U. S. Steel provided the Pennsylvania Department of Environmental Protection (PADEP) an initial notification in accordance with 25 Pa. Code 129.115(a).[1] The notification has been included as Appendix A for reference. The notification, which satisfied the initial notification requirement in the regulation as well as that communicated by PADEP via email[2], provided U. S. Steel's NO_x RACT requirement for each source of NO_x at the Fairless Plant. As outlined in Attachment A to the letter, U. S. Steel committed to performing a case-by-case analysis in accordance with 25 Pa. Code 129.114 for Source ID 420 – Galvanizing Line Furnace. This document serves as that case-by-case analysis, which is required to be provided to PADEP by February 28, 2025.

[1] Submitted via the electronic upload tool by Kaylene Kowalski (U. S. Steel) on January 30, 2025.

[2] Email from Southeast Regional Office to Kaylene Kowalski (U. S. Steel) on November 5, 2024

2. RACT DEFINITION AND METHODOLOGY

RACT, or Reasonably Available Control Technology, is required on existing major sources of NO_X (and VOC for major sources of VOC) in the ozone non-attainment area (NAA). At the federal level, RACT is not defined by statute or rule, rather it is defined in USEPA guidance as "the lowest emission limitation that a particular source is capable of meeting by the application of control technology that is reasonably available considering technological and economic feasibility."[3] Considering this definition, RACT involves identifying implementable control technologies with due consideration given to technological and economic feasibility. Since RACT considers the technological and economic impacts of controls, the analysis and determination may differ from source to source and location to location.

2.1 Top-Down Approach

In this RACT study, U. S. Steel is using USEPA's top-down approach to determining the feasibility of control technologies. The five steps in a top-down RACT evaluation can be summarized as follows:

- Step 1. Identify all possible control technologies
- Step 2. Eliminate technically infeasible options
- Step 3. Rank the technically feasible control technologies based upon emission reduction potential
- Step 4. Evaluate ranked controls based on energy, environmental, and/or economic considerations
- Step 5. Select RACT

The following sections contain a description of the five (5) basic steps of this "top-down" approach.

2.1.1 Step 1 – Identify All Control Options

In this step, available control technologies with the practical potential for application to the emission unit and regulated air pollutant in question are identified. The selected control technologies vary widely depending on the process technology and pollutant being controlled. The application of demonstrated control technologies in other similar source categories to the emission unit in question may also be considered in this step.

The following resources are typically consulted when identifying potential technologies for criteria pollutants:

- USEPA's RACT/BACT/LAER Clearinghouse (RBLC) database;
- NSPS, NESHAP, and RACT regulations for similar operations;
- Engineering experience with similar control applications; and
- Information provided by air pollution control equipment vendors with significant market share in the industry.

2.1.2 Step 2 – Eliminate Technically Infeasible Options

After control technologies are identified under Step 1, an analysis is conducted to eliminate technically infeasible options. A control option is eliminated from consideration if there are process-specific conditions that prohibit the implementation of the control technology or if the highest control efficiency of the option would result in an emission level that is higher than any applicable regulatory limits, such as a New Source Performance Standard (NSPS) or National Emission Standard for Hazardous Air Pollutants (NESHAP). A

[3] 44 Fed. Reg. 53762 (9/17/1979)

control option is "technically feasible" if it has been "demonstrated" or if it is both "available" and "applicable."

2.1.3 Step 3 – Rank Remaining Control Options

All remaining technically feasible control options are ranked based on their overall control effectiveness for the pollutant under review. If there is only one remaining option or if all the remaining technologies could achieve equivalent control efficiencies, ranking based on control efficiency is not required. Collateral impacts are usually not considered until step four of the five step top-down RACT analysis.

2.1.4 Step 4 – Evaluation of Most Effective Control Option

After identifying and ranking available and technically feasible control technologies, the economic, environmental, and energy impacts are evaluated to select the best control option. If collateral impacts do not disqualify the top-ranked option from consideration, it is selected as the basis for the RACT limit. Alternatively, in the judgment of the permitting agency, if economic, environmental, or energy considerations impact the top control option, the next most stringent option is evaluated. This process continues until a control technology is identified. This step validates the suitability of the top control option identified or provides a clear justification as to why the top option should not be selected as RACT.

2.1.5 Step 5 – Select RACT

In the final step, the RACT is determined for each emission unit under review based on evaluations from the previous step.

3. NO_X TOP-DOWN RACT STUDY

As noted in Section 1, a case-by-case RACT study is required for the galvanizing line furnace. The furnace has a total of 242 burners with a total firing capacity of 68.4 MMBtu/hr natural gas. This section provides the analysis for this source in accordance with the procedures outlined in Section 2.

3.1 Step 1 – Identify All Control Options

Step 1 in a top-down analysis is to identify all available control technologies. The evaluation of potential controls for NO_X emissions from furnaces includes both an investigation of end-of-pipe (post-combustion methods) and combustion modifications/optimization that reduce the formation of thermal NO_X. The basic complicating factor in efforts to reduce thermal NO_X from the steel industry is the fundamental need for high temperatures in order to work the materials (i.e., steel). Table 3-1 contains a list of the various technologies that have been identified as potentially applicable for the control of NO_X emissions.

Table 3-1. Potentially Available NO_X Control Technologies for Galvanizing Line Furnace

Potentially Applicable NO_X Control Technologies
Selective Non-Catalytic Reduction (SNCR)
Selective Catalytic Reduction (SCR)
Low NO_X or Ultra Low NO_X Burners (LNB or ULNB)
Good Combustion Practices

3.1.1 Review of Potentially Applicable NO_x Control Technologies

The following section provides a discussion of each potentially applicable technology identified above as it might be applied to the furnace at the Fairless Plant. The technical feasibility of each of the listed control options is discussed in Step 2.

3.1.2 Selective Non-Catalytic Reduction (SNCR)

SNCR uses ammonia (NH_3) or a urea solution [$CO(NH_2)_2$], injected into the gas stream, to chemically reduce NO_X to form N_2 and water. High temperatures, optimally between 1,600 to 2,400°F, promote the reaction via the following equation:

$$CO(NH_2)_2 + 2\ NO + \tfrac{1}{2}\ O_2 \rightarrow 2\ N_2 + CO_2 + 2\ H_2O$$
$$4\ NH_3 + 6NO \rightarrow 5\ N_2 + 6\ H_2O$$

At temperatures below the optimal range, unreacted ammonia can pass through the SNCR and be emitted from the stack (known as "ammonia slip"). At temperatures above the range, ammonia may be combusted, generating additional NO_X. In addition, an effective mixing of gases and entrainment of the reductant into the exhaust gases at the injection point is a critical factor in ensuring an efficient reaction. SNCR is being employed on various types of combustion sources in a wide range of sizes, including industrial boilers, electric utility steam generators, thermal incinerators, cement kilns, and industrial process furnaces in various sectors.[4] SNCR is not suitable for sources where the residence time is too short (reducing conversion of reactants), temperatures or NO_X concentrations are too low (slowing reaction kinetics), the reagent would contaminate the product, or no suitable location exists for installing reagent injection ports. Expected removal efficiencies for SNCR are dependent on many factors, including the reagent type, injection rate, pre-control NO_X concentration as well as CO and O_2 concentrations, temperature, and residence time.[5]

3.1.3 Selective Catalytic Reduction (SCR)

Like SNCR, SCR is also a post-combustion NO_X control technology which removes NO_X from flue gas based on the chemical reaction of a NO_X reducing agent (typically ammonia); however, in the case of SCR this takes place using a metal-based catalyst. An ammonia or urea reagent is injected into the exhaust gas and the reaction of NO_X and oxygen occurs on the surface of a catalyst which lowers the activation energy required for NO_X decomposition into nitrogen gas and water vapor. Reactor design, operating temperature, sulfur content of the fuel, catalyst de-activation due to aging, ammonia slip emissions, and the ammonia injection system design are all important technical factors for effective SCR operation. Generally, SCR can achieve higher control efficiencies and be applied to a broader and lower range of exhaust temperatures relative to SNCR. However, this is accompanied by significantly higher capital and operating costs. Another primary disadvantage of an SCR system is that particles from the catalyst may become entrained in the exhaust stream and contribute to increased particulate matter emissions. In addition, ammonia slip reacts with the sulfur in the fuel creating ammonia bisulfates that become particulate matter.

The primary chemical reactions for an SCR unit can be expressed as follows:

$$4\ NH_3 + 4\ NO + O_2 \rightarrow 4\ N_2 + 6\ H_2O$$
$$4\ NH_3 + 2\ NO_2 + 2\ O_2 \rightarrow 3\ N_2 + 6\ H_2O$$

The general temperature range for the majority of commercial SCR system catalysts is 480 to 800˚F; operation outside the optimum temperature range can result in increased ammonia slip or increased NO_X emissions. The maximum removal efficiency is associated with temperatures between 700 and 750˚F, with efficiency drastically reduced at temperatures below 600˚F.[6]

3.1.4 Low NO_X Burners (LNBs)

The principle of all LNBs is the same: step-wise or staged combustion and localized exhaust gas recirculation at the flame is employed. LNBs are designed to control fuel and air mixing to create larger and more branched flames. Peak flame temperatures are reduced and the flame structure reduces oxygen supply to the hottest part of the flame, resulting in less NO_X formation. LNB retrofits on existing units must carefully consider furnace geometry, as the LNB flame diameters and lengths are typically larger and can impinge on furnace walls which may lead to reduced control efficiencies.

3.1.5 Good Combustion Practices/Proper Furnace Operation/Minimize Excess Air

The formation of NO_X is minimized by proper combustion unit design and operation. Generally, emissions are minimized when the operating temperatures are kept at the lower end of the desired range. The

---

[4] Air Pollution Control Cost Manual, Section 4.2, Chapter 1, Selective Non-Catalytic Reduction, NO_X Control, EPA Form 2220-1.(rev. 4-77), Page 1-1.

[5] Air Pollution Control Cost Manual, Section 4.2, Chapter 1, Selective Non-Catalytic Reduction, NO_X Control, EPA Form 2220-1.(rev. 4-77), Page 1-2.

[6] Air Pollution Control Cost Manual, Section 4.2, Chapter 2, Selective Catalytic Reduction, July 2019, Page 20.

controlled distribution of air at the air and fuel injection zones can also help minimize NO_X formation. Ideally, maintaining a low-oxygen condition near fuel injection points approaches an off-stoichiometric staged combustion process. A certain amount of air is required to provide sufficient oxygen to burn all of the fuel introduced to the furnace. However, excess air contributes to increased NO_X emissions through increasing the amount of air that must be heated (i.e., decreasing fuel efficiency and resulting in higher NO_X emissions) and providing more oxygen in the combustion zone which can in turn lead to greater amounts of thermal NO_X formation. By minimizing the amount of air used in the combustion process while maintaining proper furnace operation, the formation of NO_X can be reduced.

3.2 Step 2 – Eliminate Technically Infeasible Options

3.2.1 SNCR/SCR

As noted in prior sections, efficient SCR systems generally require exhaust temperatures between 480°F to 800°F for NO_X removal. Operation of SCR systems within this temperature range is critical to avoid damage to the catalyst bed. The flue gas exhaust temperatures from the galvanizing line furnace are at approximately 500°F, which is at, or near, the lower bound of the range of the operating temperature for SCR systems. As such, the flue gas temperature would require reheating through the firing of supplemental natural gas which would result in additional fuel cost and generate additional NO_X. While there is a risk of product contamination from contact with the reagent in this direct-fired furnace, SCR technology has been presumed to be technically feasible.

Efficient SNCR systems require exhaust temperatures between 1,600 to 2,400°F for optimal NO_X removal. As noted above, the flue gas temperatures from the galvanizing line furnace are significantly lower than the optimum temperature range for efficient SNCR systems. The flue gases would have to be reheated by using natural gas to raise the gas temperatures in the range of 1,600 to 2,400 °F for effective reaction of NO_X with ammonia. This would require significant fuel cost and generate additional NO_X from the combustion of natural gas. Further, the uncontrolled concentration of NO_X in the exhaust gas from the furnace is approximately 30 ppm, as shown in Appendix B, which is well below the effective SNCR threshold of > 200 ppm. For these reasons, SNCR is deemed technically infeasible for RACT purposes for the galvanizing line furnace.

3.2.2 LNBs

LNB is a potentially feasible control option for the galvanizing line furnace. As part of the RACT study, U. S. Steel evaluated the economic feasibility of replacing the existing burners in the affected furnace with LNBs capable of meeting the presumptive NO_X limit for similarly sized furnaces (i.e., 0.1 lb/MMBtu). The emissions reduction and associated cost-effectiveness are discussed in Step 4.

3.2.3 Good Combustion Practices/Proper Furnace Operation/Minimize Excess Air

Good combustion practices are a feasible option for the galvanizing line furnace. U. S. Steel employs certain practices such as annual adjustments/tune-ups and operating and maintaining the furnace in accordance with manufacturer recommendations.

3.3 Step 3 – Rank Remaining Control Options

The remaining technically feasible NO_X control technologies for the affected source are as follows:

Table 3-2. Remaining Control Options for Galvanizing Line Furnace

Galvanizing Line Furnace
SCR LNBs Good Combustion Practices

The cost effectiveness of the remaining technically feasible NO_X control technologies are discussed in Step 4 below.

3.4 Step 4 – Evaluation of Most Effective Control Option

The capital and operating costs as well as cost-effectiveness of the different control options should be calculated in a manner consistent with the most recent edition of the "United States Environmental Protection Agency Air Pollution Control Cost Manual".

3.4.1 SCR

U. S. Steel evaluated the economic feasibility of retrofitting the galvanizing line furnace with SCR to meet the proposed presumptive NO_X limit (i.e., 0.1 lb/MMBtu). U. S. Steel performed cost calculations (shown in Appendix C) for installing SCR on the furnace using EPA's Air Pollution Control Cost Manual (CCM), Section 4, Chapter 2 (SCR), NO_X Controls. Despite some technical concerns noted in Section 3.1.2, including lower starting point concentrations[7] as well as the exhaust temperature being on the extreme low end of the ideal temperature range for SCR, U. S. Steel assumed an 80 percent control efficiency for this application. The emissions reduction for the furnace is conservatively calculated based on the maximum potential emission rate (emission factor multiplied by maximum capacity).

Table 3-3 below summarizes the cost-effectiveness assessment of retrofitting SCR utilizing USEPA's SCR cost spreadsheet based on the 2019 CCM. The detailed cost calculations are shown in Appendix C C.

Table 3-3. Cost Effectiveness of SCR (Maximum Actuals Basis)

Source Description	Total Capital Investment	Total Annualized Cost	Cost Effectiveness ($/ton)
Galvanizing Line Furnace	$3,697,627	$1,024,347	$19,516

As shown in the above table, retrofit installation of SCR on the galvanizing line furnace is not economically feasible.

3.4.2 LNBs

Similar to the SCR cost effectiveness evaluation, U. S. Steel evaluated the economic feasibility of replacing the existing burners in the galvanizing line furnace with LNBs. The emissions reduction and associated cost-effectiveness assessments are calculated assuming the following:

[7] U.S. EPA, Technology Transfer Network, Clean Air Technology Center. "Air Pollution Control Technology Fact Sheet – Selective Catalytic Reduction." File number EPA-452/F-03-032. https://www3.epa.gov/ttncatc1/dir1/fscr.pdf (Accessed February 11, 2025).

- U. S. Steel utilized LNB vendor quotes for a similar galvanizing line furnace at its Pro-Tec facility in Ohio to perform this cost effectiveness evaluation. The vendor quote for each burner was used to estimate the total burner replacement cost for this furnace.

- The cost analysis utilizes the vendor guaranteed NO_X emission factor of 0.065 lb/MMBtu that was provided to the Pro-Tec facility. U. S. Steel notes that this guarantee was specific to the Pro-Tec facility and there is no assurance that the vendor would guarantee the same emission rate at Fairless. Nevertheless, U. S. Steel used this emission rate as a conservative estimate given that it is lower than the presumptive NO_X RACT limit for similarly sized furnaces (i.e., 0.1 lb/MMBtu).

- The emissions reduction for the furnace is conservatively calculated based on the maximum potential emission rate (emission factor multiplied by maximum capacity).

The emissions reduction and associated cost-effectiveness assessments are shown in Table 3-4 and Table 3-5, respectively. Detailed cost calculations are shown in Appendix C.

Table 3-4. Emission Reductions for the Galvanizing Line Furnace

Emission Unit	Annual Fuel Usage (MMBtu/yr)	Baseline Emission Factor (lb/MMBtu)	LNB Emission Factor (lb/MMBtu)	Emissions Reduction (tpy)
Galvanizing Line Furnace	599,184	0.219	0.065[a]	46.11

a. *As previously noted, a vendor guaranteed NO_X emission factor of 0.065 lb/MMBtu for a similar galvanizing line annealing furnace at U. S. Steel's Pro-Tec facility was used as a conservative approach. U. S. Steel notes that this guarantee was specific to the Pro-Tec facility and there is no assurance that the vendor would guarantee the same emission rate at Fairless.*

Table 3-5. Cost-Effectiveness of Installing LNBs for the Galvanizing Line Furnace

Emission Unit	Total Capital Investment	Total Indirect Annual Costs	NO_X removed (tpy)	Cost Effectiveness ($/ton)
Galvanizing Line Furnace	$22,933,897	$6,585,806	46.11	$142,837

As shown in Table 3-5, it is not economically feasible to replace the existing burners in the galvanizing line furnace with LNBs.

3.4.3 Good Combustion Practices/Proper Furnace Operation/Minimize Excess Air

U. S. Steel employs certain practices such as annual adjustments/tune-ups and operating and maintaining the furnace in accordance with manufacturer recommendations. Since these practices are already in place, there is no additional cost considerations. Therefore, good combustion practices are economically feasible.

3.5 Step 5 – Select RACT

As presented in the above sections, there are no emission reduction add-on control options that are both technically and economically feasible for the galvanizing line furnace. As such, the only remaining technically and economically feasible control technology is good combustion practices. The Fairless Plant proposes to continue to employ good combustion management practices as RACT III for the source listed above. This will continue to be demonstrated through maintaining and operating the source in accordance with manufacturer specifications as well as adhering to the existing permit requirement to conduct an adjustment or tune-up on an annual basis.

APPENDIX A. JANUARY 2025 RACT III NOTIFICATION

United States Steel

January 30, 2025

Mr. James Rebarchak
Regional Air Quality Program Manager
Pennsylvania Department of Environmental Protection
Southeast Regional Office
2 E. Main Street
Norristown, PA 19401-4915

Submitted via OnBase

RE: U. S. Steel Fairless Plant
Initial Notification – 25 Pa. Code 129 RACT III

Mr. Rebarchak,

United States Steel Corporation (U. S. Steel) owns and operates a steel finishing facility located in Fairless Hills, Bucks County, Pennsylvania (Fairless Plant). Cold-rolled products are finished into galvanized sheet products at the site. This letter satisfies the initial notification requirements contained in 25 Pa. Code 129.115a and as communicated by the Department via email[1].

The Fairless Plant has historically been considered a minor source of nitrogen oxide (NO_x) emissions as it relates to Reasonably Available Control Technology (RACT) requirements. On July 30, 2024, the US Environmental Protection Agency (EPA) redesignated Bucks, Chester, Delaware, Montgomery and Philadelphia Counties as a serious nonattainment area for the 2015 Ozone NAAQS. This reclassification reduces the major source NO_x RACT threshold from 100 tons per year (tpy) to 50 tpy. The Title V permit for the Fairless Plant (TVOP 09-00006) contains a facility-wide less than 100 tpy NO_x restriction and, therefore, the Fairless Plant would be reclassified as a major source under NO_x RACT. As a major source for NO_x RACT, the Fairless Plant is subject to portions of 25 Pa. Code 129.111 through 129.115:

1. Section 129.111 provides applicability information;
2. Section 129.112 outlines presumptive RACT requirements;
3. Section 129.114 states the requirement and method for case-by-case RACT proposals; and
4. Section 129.115 provides for notifications (including this initial notification due January 31, 2025), compliance demonstrations and recordkeeping and reporting requirements.

This letter is being submitted to meet the initial notification requirements of RACT III per 25 Pa. Code 129.115(a). The attachments to this letter are as follows:

- Attachment A contains the required information for the applicable equipment to satisfy 25 Pa. Code 129.115(a)(2) and 129.115(a)(5) through (7). Attachment A also contains facility information.
- Attachment B summarizes each RACT III citation referenced in Appendix A table of information.

As noted in Attachment A, U. S. Steel will be performing a case-by-case RACT proposal for Source ID 420 – Galvanizing Line Furnace. The case-by-case RACT submissions will be made to the Department by February 28, 2025.

[1] Email from Southeast Regional Office to Kaylene Kowalski (U. S. Steel) on November 5, 2024

Should you have any questions pertaining to this matter, please contact Kaylene Kowalski by phone at 412-675-7382 or by email at kkowalski@uss.com.

Based on information and belief formed after reasonable inquiry, the statements and information in the document are true, accurate, and complete.

Respectfully,

Kurt Barshick
Vice President
U. S. Steel – Mon Valley Works

cc: Kaylene Kowalski (USS)
Mike Dzurinko (USS)
Brett Tunno (USS)
Chris Hardin (USS)
Matthew DeLibero (USS)
Mike Benner (USS)

Attachments

ATTACHMENT A –RACT III NO_x Initial Notification Information

Source ID	Source Description	Equipment Make	Equipment Model	NO_x RACT Compliance Option	NO_x RACT Requirement	NO_x RACT Requirement Citation	NO_x RACT Compliance Demonstration	NO_x RACT Compliance Demonstration Citation
048	Gal3 Steam Boiler	Johnston Boiler Co.	PFTAR750-4G150S 31.2 MMBtu/hr Natural-gas fired	Presumptive	Biennial tune-up	129.112(b)(1)	Tune-ups and recordkeeping.	129.115(f), 129.115(i) and 129.115(k)
420	Galvanizing Line Furnace	General Electric Co.	Direct-fired furnace 68.4 MMBtu/hr Natural-gas fired	Case-By-Case	Case-By-Case	129.114	To be determined	To be determined
422	Galvanneal Furnace	Surface Combustion, Inc.	16.0 MMBtu/hr Natural-gas fired	Presumptive	Install, maintain, and operate in accordance with manufacturer's specifications and good operating practices	129.112(c)(4)	Operating practices and recordkeeping.	129.115(f) and 129.115(k)
Part of 426 (Misc. NG Usage)	Thirty-seven (37) Space Heaters	Dravo Corp.	100-I-SGA 1.25 MMBtu/hr, each	Exempt	Potential to emit for each heater (0.55 tpy) is less than 1 tpy NO_x. See attached calculations.	129.111(c)	NA - Exempt	N/A – Records per 129.115(h)
	Space Heater	Cambridge Engineering, Inc.	C2500 2.5 MMBtu/hr	Presumptive	Install, maintain, and operate in accordance with manufacturer's specifications and good operating practices	129.112(c)(4)	Operating practices and recordkeeping.	129.115(f) and 129.115(k)

Source ID	Source Description	Equipment Make	Equipment Model	NO_x RACT Compliance Option	NO_x RACT Requirement	NO_x RACT Requirement Citation	NO_x RACT Compliance Demonstration	NO_x RACT Compliance Demonstration Citation
	Chem Treat Dryer	Eclipse Combustion, Inc.	AH-O 120 1.2 MMBtu/hr	Exempt	Potential to emit (0.44 tpy) is less than 1 tpy NO_x. See attached calculations.	129.111(c)	NA - Exempt	N/A – Records per 129.115(g)
	Zinc Pot Dryer	Eclipse Combustion, Inc.	50 Minimatic 1.0 MMBtu/hr	Exempt	Potential to emit (0.53 tpy) is less than 1 tpy NO_x. See attached calculations.	129.111(c)	NA - Exempt	N/A – Records per 129.115(h)
100	Parts Washer	N/A	N/A	N/A – Not a NO_x Source				
N/A	Storage Tanks	N/A	N/A	N/A – Not a NO_x Source				

ATTACHMENT B – RACT III Citation Summary

RACT Citation	Citation Summary
129.111(c)	Sections 129.112—129.114 do not apply to the owner and operator of a NOx air contamination source that has the potential to emit less than 1 TPY of NOx located at a major NOx emitting facility subject to subsection (a) or (b) or a VOC air contamination source that has the potential to emit less than 1 TPY of VOC located at a major VOC emitting facility subject to subsection (a) or (b). The owner or operator shall identify and list these sources in the written notification required under § 129.115(a).
129.112(b)(1)	Combustion unit or process heater with a rated heat input equal to or greater than 20 million Btu/hour and less than 50 million Btu/hour shall conduct a biennial tune-up in accordance with the procedures in 40 CFR 63.11223 (relating to how do I demonstrate continuous compliance with the work practice and management practice standards?). (A) Each biennial tune-up shall occur not less than 3 months and not more than 24 months after the date of the previous tune-up. (B) The biennial tune-up must include, at a minimum, the following: (I) Inspection and cleaning or replacement of fuel-burning equipment, including the burners and components, as necessary, for proper operation as specified by the manufacturer. (II) Inspection of the flame pattern and adjustment of the burner, as necessary, to optimize the flame pattern to minimize total emissions of NO_x and, to the extent possible, emissions of CO. (III) Inspection and adjustment, as necessary, of the air-to-fuel ratio control system to ensure proper calibration and operation as specified by the manufacturer.
129.112(c)(4)	A boiler or other combustion source with a rated heat input less than 20 million Btu/hr located at a major NOx emitting facility or major VOC emitting facility and is subject to 129.111 shall install, maintain, and operate the source in accordance with the manufacturer's specification with good operating practices.
129.115(g)	Beginning with the compliance date specified in § 129.112(a), the owner or operator of an air contamination source claiming that the air contamination source is exempt from the applicable NO_x emission rate threshold specified in § 129.114(b) and the requirements of § 129.112 based on the air contamination source's potential to emit shall maintain records that demonstrate to the Department or appropriate approved local air pollution control agency that the air contamination source is not subject to the specified emission rate threshold.
129.115(i)	The owner or operator of a combustion unit or process heater subject to 129.112(b) shall record each adjustment conducted under the procedures in § 129.112(b). This record must contain, at a minimum: (1) The date of the tuning procedure. (2) The name of the service company and the technician performing the procedure. (3) The final operating rate or load. (4) The final NO_x and CO emission rates. (5) The final excess oxygen rate. (6) Other information required by the applicable operating permit.

U. S. Steel Corporation Mon Valley Works, Fairless Hills Plant

Source	Furnace Rating, mmbtu/hr	NOx emission factor, lbs/mmbtu[1]	PTE NOx, tons	
Space Heaters - Dravo Corp (each)	1.25	0.100	0.55	(per heater)
Space Heaters - Cambridge	2.5	0.100	1.10	
Zinc Pot Dryer [1]	1.0	0.100	0.44	
Chemtreat Dryer [1]	1.2	0.100	0.53	

[1] Emission factor from AP-42 Section 1.4, small boilers less than 100 MMBtu/hr

APPENDIX B. STACK TEST DATA EXCERPT

TABLE 1

SUMMARY OF EMISSION RESULTS
NITROGEN OXIDE EMISSIONS
U.S. STEEL CORPORATION
FAIRLESS PLANT
SEPTEMBER 4-5, 2014
GALVANIZING LINE EXHAUST

Parameter	**Run 1**
Gas Flow (cfm)-rated fan output	90000
Oxygen concentration, %	17.64
Natural Gas F-factor, dscf/mmBtu	8710
Natural Gas usage, mmcf/hr	0.0725
Nitrogen Oxides Emissions	
ppmv	29.90
lb/hr	19.276
lb/mmcf	265.88
lb/mmBtu (based on Method 19)	0.199

APPENDIX C. COST CALCULATIONS

Data Inputs - Fairless Plant Source ID 420

Enter the following data for your combustion unit:

Is the combustion unit a utility or industrial boiler? Industrial

Is the SCR for a new boiler or retrofit of an existing boiler? Retrofit

What type of fuel does the unit burn? Natural Gas

Please enter a retrofit factor between 0.8 and 1.5 based on the level of difficulty. Enter 1 for projects of average retrofit difficulty. 1

Complete all of the highlighted data fields:

What is the maximum heat input rate (QB)? 68.4 MMBtu/hour

What is the higher heating value (HHV) of the fuel? 1,033 Btu/scf

*HHV value of 1033 Btu/scf is a default value. See below for data source. Enter actual HHV for fuel burned, if known.

What is the estimated actual annual fuel consumption? 580,042,594 scf/Year

Enter the net plant heat input rate (NPHR) 8.2 MMBtu/MW

If the NPHR is not known, use the default NPHR value:

Fuel Type	Default NPHR
Coal	10 MMBtu/MW
Fuel Oil	11 MMBtu/MW
Natural Gas	8.2 MMBtu/MW

Plant Elevation 5 Feet above sea level

Not applicable to units burning fuel oil or natural gas

Type of coal burned: Not Applicable

Enter the sulfur content (%S) = percent by weight

Not applicable to units buring fuel oil or natural gas

Note: The table below is pre-populated with default values for HHV and %S. Please enter the actual values for these parameters in the table below. If the actual value for any parameter is not known, you may use the default values provided.

Coal Type	Fraction in Coal Blend	%S	HHV (Btu/lb)
Bituminous	0	1.84	11,841
Sub-Bituminous	0	0.41	8,826
Lignite	0	0.82	6,685

Please click the calculate button to calculate weighted average values based on the data in the table above.

For coal-fired boilers, you may use either Method 1 or Method 2 to calculate the catalyst replacement cost. The equations for both methods are shown on rows 85 and 86 on the ***Cost Estimate*** tab. Please select your preferred method:

- ○ Method 1
- ○ Method 2
- ◉ Not applicable

Enter the following design parameters for the proposed SCR:

Number of days the SCR operates (t_{SCR})	365	days
Number of days the boiler operates (t_{plant})	365	days
Inlet NO_x Emissions (NOx_{in}) to SCR	0.219	lb/MMBtu
Outlet NO_x Emissions (NOx_{out}) from SCR	0.044	lb/MMBtu
Stoichiometric Ratio Factor (SRF)	1.050	

*The SRF value of 1.05 is a default value. User should enter actual value, if known.

Number of SCR reactor chambers (n_{scr})	1	
Number of catalyst layers (R_{layer})	3	
Number of empty catalyst layers (R_{empty})	1	
Ammonia Slip (Slip) provided by vendor	2	ppm
Volume of the catalyst layers ($Vol_{catalyst}$) (Enter "UNK" if value is not known)	UNK	Cubic feet
Flue gas flow rate ($Q_{fluegas}$) (Enter "UNK" if value is not known)	UNK	acfm

Estimated operating life of the catalyst ($H_{catalyst}$)	24,000	hours
Estimated SCR equipment life	25	Years*

* For industrial boilers, the typical equipment life is between 20 and 25 years.

Gas temperature at the SCR inlet (T)	500	^oF
Base case fuel gas volumetric flow rate factor (Q_{fuel})	484	ft^3/min-MMBtu/hour

Concentration of reagent as stored (C_{stored})	29	percent*
Density of reagent as stored (ρ_{stored})	56	lb/cubic feet*
Number of days reagent is stored ($t_{storage}$)	14	days

*The reagent concentration of 29% and density of 56 lbs/cft are default values for ammonia reagent. User should enter actual values for reagent, if different from the default values provided.

Densities of typical SCR reagents:		
50% urea solution	71	lbs/ft^3
29.4% aqueous NH_3	56	lbs/ft^3

Select the reagent used: Ammonia

Enter the cost data for the proposed SCR:

Desired dollar-year	2024		
CEPCI for 2024	791	Enter the CEPCI value for 2024	541.7 2016 CEPCI
Annual Interest Rate (i)	7.5	Percent	(bank prime rate; Jan. 2025)
Reagent ($Cost_{reag}$)	0.293	$/gallon for 29% ammonia*	
Electricity ($Cost_{elect}$)	0.0676	$/kWh	
Catalyst cost ($CC_{replace}$)	227.00	$/cubic foot (includes removal and disposal/regeneration of existing catalyst and installation of new catalyst	
Operator Labor Rate	60.00	$/hour (including benefits)*	
Operator Hours/Day	4.00	hours/day*	

CEPCI = Chemical Engineering Plant Cost Index (Final 9/24 value)

* $0.293/gallon is a default value for 29% ammonia. User should enter actual value, if known.

* $0.0676/kWh is a default value for electrity cost. User should enter actual value, if known.

* $227/cf is a default value for the catalyst cost based on 2016 prices. User should enter actual value, if known.

* $60/hour is a default value for the operator labor rate. User should enter actual value, if known.

* 4 hours/day is a default value for the operator labor. User should enter actual value, if known.

Note: The use of CEPCI in this spreadsheet is not an endorsement of the index, but is there merely to allow for availability of a well-known cost index to spreadsheet users. Use of other well-known cost indexes (e.g., M&S) is acceptable.

Maintenance and Administrative Charges Cost Factors:

Maintenance Cost Factor (MCF) =	0.005
Administrative Charges Factor (ACF) =	0.03

SCR Design Parameters

The following design parameters for the SCR were calculated based on the values entered on the *Data Inputs* tab. These values were used to prepare the costs shown on the *Cost Estimate* tab.

Parameter	Equation	Calculated Value	Units	
Maximum Annual Heat Input Rate (Q_B) =	HHV x Max. Fuel Rate =	68	MMBtu/hour	
Maximum Annual fuel consumption (mfuel) =	(QB x 1.0E6 x 8760)/HHV =	580,042,594	scf/Year	
Actual Annual fuel consumption (Mactual) =		580,042,594	scf/Year	
Heat Rate Factor (HRF) =	NPHR/10 =	0.82		
Total System Capacity Factor (CF_{total}) =	(Mactual/Mfuel) x (tscr/tplant) =	1.000	fraction	
Total operating time for the SCR (t_{op}) =	CF_{total} x 8760 =	8760	hours	
NOx Removal Efficiency (EF) =	(NOx_{in} - NOx_{out})/NOx_{in} =	80.0	percent	
NOx removed per hour =	NOx_{in} x EF x Q_B =	11.98	lb/hour	
Total NO_x removed per year =	(NOx_{in} x EF x Q_B x t_{op})/2000 =	52.49	tons/year	
NO_x removal factor (NRF) =	EF/80 =	1.00		
Volumetric flue gas flow rate ($q_{flue\ gas}$) =	Q_{fuel} x QB x (460 + T)/(460 + 700)n_{scr} =	27,398	acfm	
Space velocity (V_{space}) =	$q_{flue\ gas}$/$Vol_{catalyst}$ =	52.00	/hour	
Residence Time	1/V_{space}	0.02	hour	
Coal Factor (CoalF) =	1 for oil and natural gas; 1 for bituminous; 1.05 for sub-bituminous; 1.07 for lignite (weighted average is used for coal blends)	1.00		
SO_2 Emission rate =	(%S/100)x(64/32)*1x10^6)/HHV =			Not applicable; factor applies only to coal-fired boilers
Elevation Factor (ELEVF) =	14.7 psia/P =			Not applicable; elevation factor does not apply to plants located at elevations below 500 feet.
Atmospheric pressure at sea level (P) =	2116 x [(59-(0.00356xh)+459.7)/518.6]$^{5.256}$ x (1/144)* =	14.7	psia	
Retrofit Factor (RF)	Retrofit to existing boiler	1.00		

* Equation is from the National Aeronautics and Space Administration (NASA), Earth Atmosphere Model. Available at https://spaceflightsystems.grc.nasa.gov/education/rocket/atmos.html.

Catalyst Data:

Parameter	Equation	Calculated Value	Units
Future worth factor (FWF) =	(interest rate)(1/((1+ interest rate)^Y -1) , where Y = $H_{catalyts}$/(t_{SCR} x 24 hours) rounded to the nearest integer	0.3095	Fraction
Catalyst volume ($Vol_{catalyst}$) =	2.81 x Q_B x EF_{adj} x Slipadj x NOx_{adj} x S_{adj} x (T_{adj}/N_{scr})	526.85	Cubic feet
Cross sectional area of the catalyst ($A_{catalyst}$) =	$q_{flue\ gas}$ /(16ft/sec x 60 sec/min)	29	ft^2
Height of each catalyst layer (H_{layer}) =	($Vol_{catalyst}$/(R_{layer} x $A_{catalyst}$)) + 1 (rounded to next highest integer)	7	feet

SCR Reactor Data:

Parameter	Equation	Calculated Value	Units
Cross sectional area of the reactor (A_{SCR}) =	1.15 x $A_{catalyst}$	33	ft^2
Reactor length and width dimensions for a square reactor =	$(A_{SCR})^{0.5}$	5.7	feet
Reactor height =	(R_{layer} + R_{empty}) x (7ft + h_{layer}) + 9ft	66	feet

Reagent Data:

Type of reagent used: Ammonia

Molecular Weight of Reagent (MW) = 17.03 g/mole

Density = 56 lb/ft^3

Parameter	Equation	Calculated Value	Units
Reagent consumption rate ($m_{reagent}$) =	(NOx_{in} x Q_B x EF x SRF x MW_R)/MW_{NOx} =	5	lb/hour
Reagent Usage Rate (m_{sol}) =	$m_{reagent}$/Csol =	16	lb/hour
	(m_{sol} x 7.4805)/Reagent Density	2	gal/hour
Estimated tank volume for reagent storage =	(m_{sol} x 7.4805 x $t_{storage}$ x 24)/Reagent Density =	800	gallons (storage needed to store a 14 day reagent supply rounded to th

Capital Recovery Factor:

Parameter	Equation	Calculated Value
Capital Recovery Factor (CRF) =	i (1+ i)^n/(1+ i)^n - 1 = Where n = Equipment Life and i= Interest Rate	0.0897

Other parameters	Equation	Calculated Value	Units
Electricity Usage:			
Electricity Consumption (P) =	A x 1,000 x 0.0056 x (CoalF x HRF)$^{0.43}$ = where A = (0.1 x QB) for industrial boilers.	35.17	kW

Cost Estimate

Total Capital Investment (TCI)

TCI for Oil and Natural Gas Boilers

For Oil and Natural Gas-Fired Utility Boilers between 25MW and 500 MW:

$$TCI = 86,380 \times (200/B_{MW})^{0.35} \times B_{MW} \times ELEVF \times RF$$

For Oil and Natural Gas-Fired Utility Boilers >500 MW:

$$TCI = 62,680 \times B_{MW} \times ELEVF \times RF$$

For Oil-Fired Industrial Boilers between 275 and 5,500 MMBTU/hour :

$$TCI = 7,850 \times (2,200/Q_B)^{0.35} \times Q_B \times ELEVF \times RF$$

For Natural Gas-Fired Industrial Boilers between 205 and 4,100 MMBTU/hour :

$$TCI = 10,530 \times (1,640/Q_B)^{0.35} \times Q_B \times ELEVF \times RF$$

For Oil-Fired Industrial Boilers >5,500 MMBtu/hour:

$$TCI = 5,700 \times Q_B \times ELEVF \times RF$$

For Natural Gas-Fired Industrial Boilers >4,100 MMBtu/hour:

$$TCI = 7,640 \times Q_B \times ELEVF \times RF$$

Total Capital Investment (TCI) =	$3,697,627	in 2024 dollars

The TCI has been adjusted to include an additional cost of $500,000 for new duct burners and associated equipment needed to reheat the flue gas from the No. 2 Galvanizing Line Annealing Furnace. U. S. Steel estimated the additional capital cost based on cost estimates for a similar project at its Great Lakes, Michigan facility.

Annual Costs

Total Annual Cost (TAC)

TAC = Direct Annual Costs + Indirect Annual Costs

Direct Annual Costs (DAC) =	$689,820	in 2024 dollars
Indirect Annual Costs (IDAC) =	$334,527	in 2024 dollars
Total annual costs (TAC) = DAC + IDAC	$1,024,347	in 2024 dollars

Direct Annual Costs (DAC)

DAC = (Annual Maintenance Cost) + (Annual Reagent Cost) + (Annual Electricity Cost) + (Annual Catalyst Cost)

Annual Maintenance Cost =	0.005 x TCI =	$18,488	in 2024 dollars
Annual Reagent Cost =	$m_{sol} \times Cost_{reag} \times t_{op}$ =	$5,506	in 2024 dollars
Annual Electricity Cost =	$P \times Cost_{elect} \times t_{op}$ =	$20,827	in 2024 dollars
Annual Catalyst Replacement Cost =		$12,338	in 2024 dollars
Annual Natural Gas Cost for Reheat =	NG_{Cost}	$632,660	in 2024 dollars
	$n_{scr} \times Vol_{cat} \times (CC_{replace}/R_{layer}) \times FWF$		
Direct Annual Cost =		$689,820	in 2024 dollars

Indirect Annual Cost (IDAC)

IDAC = Administrative Charges + Capital Recovery Costs

Administrative Charges (AC) =	0.03 x (Operator Cost + 0.4 x Annual Maintenance Cost) =	$2,850	in 2024 dollars
Capital Recovery Costs (CR)=	CRF x TCI =	$331,677	in 2024 dollars
Indirect Annual Cost (IDAC) =	AC + CR =	$334,527	in 2024 dollars

Cost Effectiveness

Cost Effectiveness = Total Annual Cost/ NOx Removed/year

Total Annual Cost (TAC) =	$1,024,347	per year in 2024 dollars
NOx Removed =	52	tons/year
Cost Effectiveness =	$19,516	per ton of NOx removed in 2024 dollars

Low-NOx Burner Cost Effectiveness (PTE Basis)

Galvanizing Line Furnace (Source ID 420)

DIMENSIONAL ANALYSIS

Time Conversion	8,760	hours/year	
Mass Conversion	2,000	lb/ton	

ASSUMPTIONS

Cost Year	2025		
Economic Life	5	yrs	*US EPA OAQPS*
Annual Interest Rate	7.5	%	*https://www.federalreserve.gov/releases/h15/* (bank prime loan rate; January 2025)

BASIC INPUTS

Source 420 Burner Capacity	68.4	MMBtu/hr	*Total Capacity for Burners for Source ID 420 per Title V operating permit.*
Existing NO_X Emission Rate - Source 420	0.219	lb/MMBtu	*2014 Stack Test Result with 10% Additional Margin*
Vendor Guarantee NO_X Emissions	0.065	lb/MMBtu	*Vendor Guarantee for a similar galvanizing line annealing furnace at U. S. Steel's Pro-tec facility in Ohio.*
Potential NO_X Emissions - Before LNBs	65.58	tons/yr	*Burner Capacity for each Stack (MMBtu/hr) x NO_X Emission Factor for Each Stack (lb/MMBtu) x Max Operating Hours (hrs/yr) / 2,000 (lb/ton)*
Potential NO_X Emissions - After LNBs	19.47	tons/yr	*LNBs NO_X Guarantee (lb/MMBtu)] x Heat Input Rating (MMBtu/hr) x 8,760 (hrs/yr) / 2,000 (lb/ton)*
NO_X Removed	46.11	tons/yr	*Potential NO_X Emissions Before LNBs - Potential NO_X Emissions After Controls*
Capital recovery factor, CRF	0.2472		

TOTAL CAPITAL INVESTMENT

1. Replacement Burner Direct Equipment Cost

Burners	Quantity of Burners	*Replacement Burner Cost per Burner*	Total Burner Replacement Cost per Zone
Zones 1 - 2	68	*$ 38,500*	$ 2,618,000
Zone 3	34	*$ 38,500*	$ 1,309,000
Zones 4 - 8	140	*$ 38,500*	$ 5,390,000
Total Burners Replaced	**242**		**$ 9,317,000**

Replacement burner cost for each burner is based on a 2019 vendor quote for a similar galvanizing line annealing furnace at U. S. Steel's Pro-tec facility in Ohio. The vendor quote includes cost estimates for the replacement burners, associated tube, and controller modifications. The per burner rate has been escalated for inflationary factors.

2. Direct Installation Costs

Miscellaneous Materials	$ 1,967,982
Demo	$ 441,417
Natural Gas Piping Modifications	$ 919,618
Burner Installation	$ 3,972,749
Total	**$ 7,301,766**

Facility estimated cost for miscellaneous materials, demo, piping modifications, and burner installation are based on a similar low-NOx burner replacement project at other U.S. Steel facilities. A per burner rate was applied and escalated for inflationary factors.

Low-NOx Burner Cost Effectiveness (PTE Basis)

Galvanizing Line Furnace (Source ID 420)

3. Indirect Installation Cost

Engineering and Project Support	$	2,492,815	*15% of Direct Cost*
Contingency	$	3,822,316	*20% of (Direct Cost + Indirect Cost)*
Total	**$**	**6,315,131**	
Total Capital Investment, TCI	$	22,933,897	*=Direct Equipment Cost + Direct Installation Costs + Indirect Installation Costs*

TOTAL ANNUAL COSTS

Direct Annual Costs			
Annual Maintenance Costs	$	-	
Annual Operator Labor Cost	$	-	
Total direct annual cost, DAC	$	-	
Indirect Annual Costs			
Annual Administrative Cost	$	458,678	*2% of TCI*
Property Tax	$	229,339	*1% of TCI*
Insurance	$	229,339	*1% of TCI*
Capital recovery, CR	$	5,668,450	
Total indirect annual costs, IDAC	$	6,585,806	
Total annual cost, TAC	$	6,585,806	*= DAC + IDAC*

COST EFFECTIVENESS

Annual cost in terms of NO_x removed	$	142,836.80	$/ton	*=TAC / NOx Removed (tpy)*