R. SERIES/Initials CON 10-1 / C.A.R.

FACILITY ID 64-01-012

WK ACT/Doc Code CP / GC

Project # / Permit # 07-602 /

12/04/07

Startup Under NSPS

Guidance on Startup Under the New Source Performance Standards (NSPS)

Roling, Chris [DNR]

From: Arnold, Alan [AlanArnold@alliantenergy.com]
Sent: Tuesday, December 04, 2007 2:32 PM
To: Roling, Chris [DNR]; Daniel, Chad
Subject: RE: Startup under NSPS

Thanks much for this Chris. Alan

Alan J. Arnold
Environmental Lead- IPL Baseload Project Alliant Energy Corporate Services P.O. Box 351
200 First Street S.E., GO-13th Floor Cedar Rapids, IA 52406 (52401)

Phone: 319.786.4476
Fax: 319.786.4747

P Please consider the environment before printing my e-mail

-----Original Message-----
From: Roling, Chris [DNR] [mailto:Chris.Roling@dnr.iowa.gov]
Sent: Tuesday, December 04, 2007 6:54 AM
To: Arnold, Alan; Daniel, Chad
Subject: FW: Startup under NSPS

Alan & Chad,

Here is the document and email we got from EPA concerning startup of utility boilers.

Chris

Christopher A. Roling, PE
Environmental Engineer Senior
Air Quality Bureau
ph: 515-242-6002
fax: 515-242-5094
-----Original Message-----
From: <Knodel.Jon@epamail.epa.gov> [mailto:Knodel.Jon@epamail.epa.gov]
Sent: Thursday, August 24, 2006 10:00 AM
To: Roling, Chris [DNR]
Cc: Hutchins, Brian [DNR]; Detter, Corey [DNR]; Phelps, Dave [DNR]; Stone, Mark [DNR]; Bronoski.Michael@epamail.epa.gov; Freeman.Tamara@epamail.epa.gov; Hazziez.Natasha@epamail.epa.gov; Scott.PatriciaA@epamail.epa.gov; Webber.Robert@epamail.epa.gov
Subject: Startup under NSPS

Chris,

Here are some general thoughts on the questions you raise...

1) When does startup begin?
Even though the testing deadlines under the NSPS are firm, there is limited discretion to work within the limitations. In October, 1979, EPA published a document titled "Instructional Manual for Clarification of Startup in Source Categories Affected by New Source Performance Standards" (EPA-68-01-4143). This document analyzed each of the standards in existence at the time and described some of the challenged faced by operators when first beginning operation. While the manual doesn't include any observations for NSPS Subpart Da, the Subpart D summary for utility projects provides some useful insights. I've attached this portion of the manual below. In short, it acknowledges that utility

boilers need a lot of time to work out the bugs, and found that it would be appropriate to define startup, not as first fuel to the boiler, but as first steam to the turbine. That allows extra time to pressure test boiler components as long as the steam is not being put to the grid for commercial purposes. As far as I know, the manual has not been updated but still represents the agency policy when looking at questions about startup of NSPS units.

For the KCPL-Hawthorn project, we took this advice one step further and established dual startup dates for the boiler, each triggered off of distinct fuel types. KCPL said that most of their pressure testing would take place using natural gas. So, we said that first fire of natural gas began a timeline for testing while operating on that fuel. About 6-8 weeks later, KCPL began firing the boiler on coal. This started a separate timeline to demonstrate compliance while operating on coal. If I remember correctly, KCPL certified its CEMS early on, so it was no big deal for SO2 and NOx. Likewise, since we weren't concerned about PM while operating on natural gas, this test was deferred to the coal timeline.

If either of these options provide the relief MidAmerican seeks without having to go to the process outlined below, that is preferrable.

(See attached file: Instructional Manual for Clarification of Startup in Source Categories Affected by NSPS.pdf)

2) Can testing extensions be granted?
We have allowed testing to be performed beyond the 60-180 day testing period required by NSPS, but always in the form of an "Administrative Order". We find the company to be in violation of the testing deadlines and then use the AO to establish a schedule for testing. This approach preserves our ability to take a more formal enforcement action if the order is not followed. Otherwise, NSPS does not make any provision to extend the deadlines and we don't recognize "informal" extensions.

3) Does the state or EPA issue testing extensions?
We have generally said that if a state is willing to follow a formal "Administrative Order" approach similar to that used by EPA, the state may take the lead to issue negotiate the schedule and develop the order. This should be done in consultation with the EPA enforcement state coordinator. If the state is unable to issue an "Order", for whatever reason, then the action should be kicked back to EPA for follow-up.

I hope this helps.

Jon

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United States
Environmental Protection
Agency

Office of Enforcement
Office of General Enforcement
Division of Stationary Source
Enforcement

EPA-68-01-4143
October 1979
Washington, DC 20460

EPA

Instructional Manual for Clarification of Startup in Source Categories Affected by New Source Performance Standards

DISCLAIMER

This Final Report was furnished to the Environmental Protection Agency by GCA Corporation, GCA/Technology Division, Burlington Road, Bedford, Massachusetts 01730, in fulfillment of Contract No. 68-01-4143, Technical Service Area 1, Task Order No. 62. The opinions, findings, and conclusions expressed are those of the authors and not necessarily those of the Environmental Protection Agency. Mention of company or product names is not to be considered as an endorsement by the Environmental Protection Agency.

ABSTRACT

New Source Performance Standards promulgated for 27 source categories specify that performance testing shall be conducted within certain time periods of startup for each affected facility. This manual discusses initial startup for each new facility subject to these regulations and provides the technical basis for uniform application of the regulations pertaining to source testing.

CONTENTS

CONTENTS (continued)

FIGURES

FIGURES (continued)

ACKNOWLEDGMENT

The authors wish to thank Mr. Robert Myers, the EPA Task Manager, for his guidance throughout the program. We acknowledge Mr. Norman Surprenant of GCA/Technology Division, who provided a critical review of this document. Finally we would like to thank Mr. Paul Exner of GCA for his contribution to the manual.

SECTION 1

INTRODUCTION AND SUMMARY

INTRODUCTION

Since 1971, New Source Performance Standards (NSPS) have been promulgated by the U.S. Environmental Protection Agency for twenty-seven (27) industrial categories. Section 60.8 of Title 40 of the Code of Federal Regulations (CFR) specifies conditions for conductance of performance tests for determining compliance with the regulations. Paragraph(a) states in part that performance tests are to be conducted "within 60 days after achieving the maximum production rate at which the affected facility will be operated, but not later than 180 days after initial startup of such facility ..." Startup is defined under Part 60.2, paragraph (o), as "the setting in operation of an affected facility for any purpose." The general nature of this definition could result in a nonuniform interpretation of "startup" by enforcement personnel as applied to various source categories.

The purpose of this manual, therefore, is to provide concise, descriptive summaries of the regulated industries including all operations and procedures related to the startup of a new facility. These industrial "profiles" will provide a common basis upon which decisions can be made with respect to the proper time for performance testing. This is an important decision since testing at less than optimum conditions can yield erroneous and unrepresentative results as well as incurring additional costs upon the source operator.

LIMITATIONS

This manual should not be used as a substitute for meeting NSPS requirements as presented in the Federal Register or Code of Federal Regulations, since the summaries in this manual do not contain all of the requirements a source must meet in performance testing. Additionally, new standards are nearing promulgation and current standards are being revised; this manual represents standards in effect only through March, 1979.

EFFECTIVE DATE

Each source section in this manual contains an effective date. Any source in that category constructed, reconstructed or modified after the effective date is subject to the applicable NSPS.

PROJECT APPROACH

Technical information for this manual has been solicited primarily from process engineers employed at the industries involved. Additional data have been obtained from trade associations, equipment suppliers or contractors, and technical journals and publications.

APPLICATION OF FINDINGS

The startup definitions specified for each industry have been geared towards normal or typical circumstances in which all equipment is delivered and tested on schedule and no major malfunctions occur during initial startup or subsequent process evaluation. This manual points out several source categories where problems might be encountered in meeting the 180 day deadline. In these instances, enforcement personnel will evaluate the situation on a case-by-case basis. It must be stressed that not obtaining maximum production rate within 180 days (as may occur with the kraft pulp mill, nitric acid plant, or primary aluminum industry, for example) is not sufficient reason for delay of performance tests; tests could be required during the 180 day period and again when maximum production is reached.

SUMMARY

Contacts with the various industries involved in each of the NSPS categories have resulted in many similar circumstances regardless of source type, which affect new source startup. Items which generally apply to any source category are:

- The desire to come on-stream as soon as possible so as to minimize extensive startup periods which would result in excessive capital expenditures with no immediate cash flow return.
- Training of operating personnel can be very important if experienced people cannot be obtained from another plant location.
- Most plants initially undergo mechanical acceptance of process equipment which is partially carried out by the contractor or equipment supplier and partially carried out by the source owner or operator.
- Following mechanical acceptance, process performance evaluation is conducted, usually in the form of a demonstration or test run, resulting in the acceptance of the plant from the contractor.

Some specific procedures or operations that may be carried out for particular pieces of equipment are:

- Water batching of liquid vessels for leak detection and instrument calibration,
- Gradual firing and curing of equipment containing refractory material,

- Hydrostatic or pressure testing of fossil fuel-fired vessels according to specific codes, and

- Dry operation of mechanical mixing, granulating, conveying, and transporting systems.

Other aspects of plant startup which regulatory people need to be familiar with pertain to the phenomenon of engineering scale. Scale-up problems are bound to occur since most new plants tend to be larger in capacity than existing ones and also attempt to incorporate innovative designs relative to energy-efficiency. New facilities constructed for a known process of nominal design production rate would likely require much less time than a new plant built for a prototype process or a much larger plant.

The industrial surveys conducted have resulted in several common suggestions for definition of an initial plant startup, irrespective of the industry involved:

1. 24-hours of continuous operation

2. Shipment of on-grade product to the customer

3. Product from process is used to make a profit or is inventoried.

4. First introduction of raw material with potential for emission of regulated pollutant(s)

5. Mechanical acceptance of plant

6. Completion of successful demonstration run

7. Contractual acceptance of plant

The selection of startup for each industry has been based upon a composite of three criteria; the theoretical position of an enforcement agency (No. 4 above), the viewpoint of industrial contacts (all of the above), and the ability of a source category to achieve rated capacity within 180 days of the selected startup point.

GOOD AIR POLLUTION CONTROL PRACTICE DURING STARTUP

After the effective date of an NSPS, an applicable source must meet the standard except during times of startup, shutdown, or malfunction. The source owner or operator must at all times, including startup, maintain and operate any affected facility in a manner consistent with good air pollution control practice (40 CFR 60.11(d)). Hence, atmospheric emissions during the startup period must always be directed through pollution control equipment.

SECTION 2

INDUSTRIAL SUMMARIES

SOURCE LISTING

The twenty-seven (27) source categories currently affected by NSPS which are the subject of this report are listed as follows:

1. Fossil fuel-fired steam generators
2. Incinerators
3. Portland cement plants
4. Nitric acid plants
5. Sulfuric acid plants
6. Asphalt concrete plants
7. Petroleum refineries
8. Storage vessels for petroleum liquids
9. Secondary lead smelters
10. Secondary brass and bronze ingot production plants
11. Iron and steel plants
12. Sewage treatment plants
13. Primary copper smelters
14. Primary zinc smelters
15. Primary lead smelters
16. Primary aluminum reduction plants
17. Wet-process phosphoric acid plants
18. Superphosphoric acid plants
19. Diammonium phosphate plants
20. Triple superphosphate plants
21. Granular triple superphosphate plants
22. Coal preparation plants
23. Ferroalloy production facilities

24. Steel plants: electric arc furnaces

25. Kraft pulp mills

26. Grain elevators

27. Lime manufacturing plants

The detailed summaries that follow are arranged in the same order as the preceding list and as they appear in CFR Part 60. Each summary is self-supporting and contains the following sections:

- Introduction - Brief description of equipment and pollutants regulated and the effective date of the standard.

- Process Description - Discussion of process(es) associated with each industry with a flow diagram if required for equipment/process clarification.

- Prestartup Operations - Discussion of equipment shakedown and debugging procedures, time involved, and types of problems encountered.

- Startup Operations - Definition of best startup points for each category, time and specific procedures involved, and duration of operation prior to achieving maximum (or design) production rate. Also, discussion of any unusual circumstances.

- References - Listing of industrial contacts, equipment suppliers or other technical literature.

FOSSIL FUEL-FIRED STEAM GENERATORS - SUBPART D
§60.40 - 60.46

Introduction

The NSPS for this category encompasses fossil fuel-fired or fossil fuel and wood residue-fired steam generating units capable of operating at greater than 73 MW (250 × 10^6 Btu/hr) heat input. Performance standards were promulgated for nitrogen oxides, particulate matter, sulfur dioxide, and opacity. Sulfur dioxide and nitrogen oxides are regulated according to the type of fuel fired, (i.e., gaseous, liquid, or solid fuels). Particulate matter is limited to 43 ng/J (0.1 lb/10^6 Btu) input. Opacity is limited to 20 percent except for one 6-minute period/hr during which the opacity cannot exceed 27 percent. Continuous monitoring is required for SO_2, NO_x, and opacity. Sources constructed, reconstructed or modified after August 17, 1971, are subject to the standard with one exception; the effective date for the NO_x provisions for lignite-fired units is December 22, 1976; all other provisions apply to lignite-fired units constructed, reconstructed or modified after August 17, 1971.

Process Description

Fossil-fuel is defined in 40 CFR §60.41(b) as natural gas, petroleum, coal, and any form of solid, liquid, or gaseous fuel derived from such materials. These fuels are combusted to create heat in the boilers for the production of steam. The steam, in turn, is used, in the case of an industrial facility, to provide heat and hot water, or to run process equipment, and, in the case of an electrical utility, to drive multi-stage turbines that produce electricity for sale to regional power networks. See Figure 1.

Pre-Startup Operations

Prior to startup, certain operations are undertaken to ready the boiler for service. These "shakedown" procedures are necessary to protect pressure parts against corrosion, overheating, and thermal stresses; prevent furnace explosions; to check for leaks; and insure the on-line availability of the unit.

Some of the operations which are included in the pre-startup category include:

1. Filling the boiler and boilout to test components with respect to temperature, mechanical stresses, corrosion resistance, structural soundness, warping, gasketing, and expansion joints;

2. Curing of refractory material in the boiler and stack and any coatings present on heat exchanger surfaces;

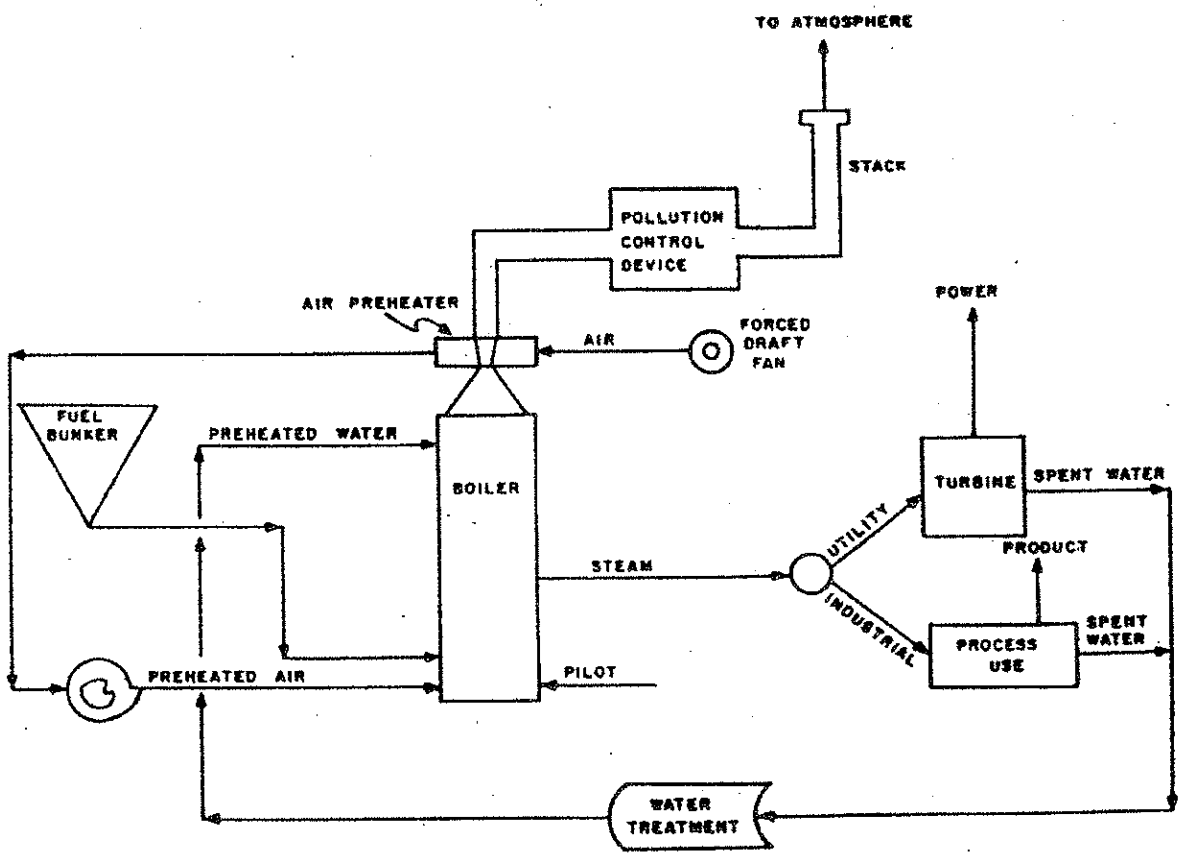

Figure 1. Simplified flow diagram of a fossil fuel-fired steam generator.

3. By-passing of the superheater and turbine until desired steam temperature is reached followed by checking of steam turbine interfacing, controls, sensors, monitors, load switching, and safety interlocks.

Many precautions are taken during filling of the boiler to protect pressure parts. High quality water is used to minimize corrosion and scale deposits. To prevent thermal stresses, the temperature gradient between metal and water is kept less than 100°F. Higher temperature differentials would limit the life of pressure parts and if high enough could cause distortion. Air is completely purged from the system through vents to limit oxygen corrosion and assure that all tubes are filled. On drum-type boilers, the glass gauge level should be about 1 inch of water prior to firing the boiler in order to fill all circulating tubes.

Boilout is necessary to remove all grease and other deposits from interior boiler surfaces. It is usually effected with a caustic solution at reduced temperatures and pressures (as compared to normal operating conditions). Boilout also facilitates the slow curing necessary to condition refractory material.

These operations enable the detection of defects in materials, fittings, and welds which can then be corrected without a loss of on-line availability.

To protect the superheater from overheating, each tube must have sufficient steam flow to operate properly. A by-pass system is used to accomplish this. By-pass systems; (a) protect the superheater against shock from water, (b) provide a means for conditioning water during startup without delaying boiler/turbine warming operations, and (c) reduce temperature and pressure of the steam leaving the boiler during startup to conditions suitable for turbines and condensers.

Complete checkout of the superheater and turbine components is thus effected to ensure that they are completely operational and to detect any defects in installation.

Estimates obtained from several utility companies indicate that these preliminary operations can take from 2 to 12 months depending on such site-specific factors as equipment delivery schedules and the extent of any encountered problems. Industrial facilities would represent the low end of this range while utility plants would require the longer time periods.

Startup Operations

For fossil fuel-fired steam generators, startup is best defined as the first time steam is produced by the boiler and used in the case of an industrial facility, to provide heat and hot water, or to run process equipment, and, in the case of an electrical utility, to drive turbines that produce electricity.

REFERENCES

1. Personal Communication with Mr. Smith, Babcock and Wilcox, February 28, 1979.

2. Personal Communication with Mr. Williams, Stone and Webster, February 28, 1979.

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