July 5, 2017

Memorandum

To: Elena Guilfoil

From: Alan Newman

SUBJECT: Alternative opacity limitations

The proposed amendments to Chapter 173-400 WAC to address the SSM SIP Call include adding an opacity limitation to several actions that the current rule allows to exceed 20 percent opacity without any limitation. We propose an alternative emission limitation for opacity for these specific actions:

- Soot blowing and grate cleaning
- Startup of a wood fired boiler with a dry particulate emission control
- Initial startup and curing of new refractory materials installed in a boiler or lime kiln
- Startup of orchard heaters

The rule exempts soot blowing and grate cleaning, startup of a hog fuel (wood-fired) boiler, and startup of orchard heaters currently from all emission limitations for a specified period. WAC 173-400-107 covers the curing of boiler and kiln refractory as an unavoidable excess emission.

Under terms of the SIP Call, if we are to allow these activities to have a higher opacity limitation during the defined operations, we need to establish that limitation in our rule. This is not to limit the opportunity for individual new source review permits to contain more restrictive opacity requirements, or allow higher limits, if approved as a source specific limitation contained in the Washington SIP.

We have proposed that the alternative opacity emission limitation that applies to the all of the emission limits listed above (except orchard heating) to be 40% opacity for no more than 3 minutes (cumulative time over the hour) in a one hour period, as determined by a visual emissions reader using Ecology Method 9A.

Ecology is not proposing an alternative emission limitation for particulate matter (aka total suspended particulate or TSP)[1]. The particulate limit during these events would continue to be governed by the standards in WAC 173-400-050: 0.20 grains/dry standard cubic foot (dscf) of flue gas from wood-fired units and 0.10 grains/dscf in flue gas from combusting other fuels. Contemporary BACT decisions on boilers indicate that the particulate standards should be attainable during these four events. Due to the transient nature of an event like soot blowing, or

[1] The particulate standard in the SIP is for particulate matter as measured by EPA Reference Method 5, front half only. This particulate size fraction is also the regulatory basis for particulate matter regulated under essentially all NSPS and NESHAP/MACT regulations.

the rarity and nonstable operation of a boiler startup operation, source testing is rarely or impossible to perform.

Boiler Startup
We arrived at this level of opacity by polling staff at the local agencies on their experience with these operations at sources in their jurisdictions. I acknowledge that the local agency staff can only relate the emissions that they observe during inspections and through evaluating monitoring reports. When representatives from business with wood-fired boilers were polled, their responses ranged from this is not attainable, to this shouldn't be a problem. Several said they would evaluate their opacity monitoring data and submit information to us.

Boise Cascade has submitted information for their Kettle Falls facility indicating that for that plant, the plum opacity during startup (before their dry particulate control is energized) will reach levels of 80 percent opacity, even when using the good combustion practices mandated by EPA's Boiler MACT rules. Other industrial plants with wood-fired boilers have indicated that they have and would supply us data to support a different alternative opacity standard to apply during boiler startup, but have not yet supplied this information.

Soot blowing and grate cleaning
The proposal for soot blowing and grate cleaning follows the longstanding allowance for these activities contained in state rule. This is an activity done while all air pollution controls on a source are operating. As such while we don't expect to see exceedances of the 20 percent emission standard that applies during normal operations, there remain some wood-fired boilers with minimal controls in place where meeting the alternative 40 percent standard would be a challenge. The boilers with minimal controls tend to be smaller units equipped with multiclone particulate collectors only. While a multiclone is quite efficient at removing larger particulates, it is less effective on the fine particulates that cause the most opacity.

Refractory curing
The proposal for refractory curing is based on information supplied by several companies using Wellons Boilers. They supplied a copy of Wellons's refractory curing procedure.
Refractory curing is a process where the new refractory mortar and water absorbed into the refractory material has to be slowly removed from the refractory to prevent it from failing prematurely. Absorbed water in the refractory can turn to steam inside the refractory and cause it to "blow up," causing hot combustion conditions to impinge on the metal shell of the boiler, causing premature failure.

During curing, a small[2] fire is started in the boiler and intentionally kept small for a number of hours, before being slowly enlarged to increase furnace temperature. While the fire is small and during the slow buildup, there will be less than optimum combustion conditions in the furnace that are conducive to making smoke. This smoke plus the water being evaporated from the refractory renders any installed continuous opacity monitor unusable until the flue gas temperature is above its dew point. Currently, excess opacity emissions during refractory curing has been addressed as unavoidable excess emissions under WAC 173-400-107.

[2] Small being in a relative sense to the normal scale of combustion in the unit during normal operations.

The proposal allows a 36 hour period (based on the Wellons curing procedure[3]) when the opacity may exceed 40 percent for up to 3 minutes in an hour. This will allow for this necessary refractory curing prior to the unit resuming normal operation.

The operators of the Kraft pulp mills in the state asked that their lime kilns be offered the same alternative opacity allowance as the boilers, indicating the same issues during curing as their boilers. The representatives did not propose an alternative time period that might be appropriate for their kiln operations. As a result, the proposed rule provides kiln and boilers the same 36 hour curing period.

As part of a 1979 document,[4] EPA evaluated the time it took for various units in various NSPS categories to perform refractory curing. Noting that our proposal only affects boilers and kilns, this document indicates that refractory curing at lime kilns associated with lime manufacturing and Kraft pulp mills would take 3 to 5 days, while for large MSW incinerators curing would take 2 to 3 days, and for petroleum refinery process heaters curing would take "a number of days." I find the range of time presented in this 1979 document could support the proposed 36 hours for the smaller units covered in this rule or a longer period based on specific characteristics of individual units. Data, manufacturer's operational procedures, or other information to support a different duration (other than the EPA document) has not been presented.

Orchard heaters

The rule proposal for orchard heaters is to remove the exemption from meeting the 20 percent opacity standard for the first 30 minutes after ignition. This standard was included in our rule in the 1970's when orchard heating was primarily performed with open pots of fuel oil. Subsequent to that time, and in response to regulation by the Yakima Regional Clean Air Agency and Ecology's Central Regional Office (plus the cost of fuel oil), orchardists have replaced these heaters with a variety of non-combustion methods to protect flowering trees from frost. This has resulted in combustion-based orchard heating to fringe locations of orchards. Currently, orchard heating equipment uses much more efficient combustion techniques when using fuel oil and in many cases, they use enclosed propane combustion units if any heating with fuel is used. Other alternatives include the use of wind machines or the use of water (overhead or undertree). Based on the changes in how orchard heating is done, and the equipment used, the development of an alternative opacity limitation for these units is not required.

[3] The 36 hour period is based on wood fired units of 100 MMBtu/hr heat input or smaller. For comparison, the threshold size for the large MSW units is at least 250 MMBtu/hr, while process heaters and boilers at petroleum refineries are mostly under 100 MMBtu/hr, but may be as large as 800 – 1000 MMBtu/hr. It would be reasonable to expect different size units would require different curing times, but no additional information from the industries has been presented to support a longer time period than the proposed 36 hours.

[4] EPA, *Instructional Manual for Clarification of Startup in Source Categories Affected by New Source Performance Standards*, EPA-68-01-41-13, October 1979.