MEMORANDUM

To: Kenzie Billings

Date: March 4, 2022

From: Brian Eagle

Project No.: 8006.58.01

RE: PCC Structurals Baghouse Testing Conceptual Plan – Revision 1

PCC Structurals, Inc. (PCC) received a letter dated October 19, 2021 ("the letter") from the Oregon Department of Environmental Quality (DEQ) requesting that PCC perform "representative source testing of baghouses by January 31, 2022 to verify assumed control efficiencies" at the Large Parts Campus (LPC). The letter acknowledges that there are "several" baghouses at the LPC with different levels of filtration (e.g., HEPA or ULPA after-filters), and that some of the LPC baghouses control substantially similar processes. The baghouse selection criteria suggested in the letter included materials processed, unit operations controlled, and exhaust temperatures. PCC submitted a Baghouse Testing Conceptual Plan (Conceptual Plan) to the DEQ on December 3, 2021. The DEQ requested revisions to the Conceptual Plan by letter dated February 11, 2022. Maul Foster & Alongi, Inc (MFA) has revised the Conceptual Plan as shown below, using redline/strikeout to denote changes. These changes were discussed during a conference call on February 28, 2022.

PCC operates 33 baghouses at the LPC and satellite facilities ("the facilities"). The baghouses fall into the following three categories, which represent similar materials processed and unit operations controlled:

- High throughput/low metal content: operations such as sandblasting and knockout, which generate a large amount of material but do not include significant metal removal.
- Grinding: grinding during cleaning and finishing operations, sometimes including sawing
- Cutting/hot work: cutting, burnoff, torch cut, etc.

The materials processed are typically categorized as either titanium alloy or steel super alloy, as reflected in baghouse dust analyses previously conducted at the facilities. All the baghouses at the facilities have exhausts that are near or slightly above ambient temperature. For example, in the June 2016 testing of the LPC steel baghouse 9203, which controls both the Torch Burnoff Booth and the Cheetah Saw, the average stack temperature was 86°F.

Many of the metal-finishing baghouses (e.g., grinding, sawing) have airflows with low particulate loading. In evaluating prior attempts to determine system removal efficiency for the PCC baghouses, Jack Herbert (the former DEQ stack test coordinator) stated "I know of no feasible, economical method to measure 99-percent efficiency unless considerably more expense is justified. This method and all others I know require a sample mass that cannot be collected with one-hour test runs."[1] The 2016 baghouse testing employed single eight-hour runs to attempt to obtain samples above the In Stack Detection Limit, yet none of the test runs had detectable particulate emissions at the outlet.

While the criteria identified in the letter may typically be applicable when categorizing baghouses, the purpose of the proposed testing and the types of activities conducted at PCC require a different approach.

PROPOSED BAGHOUSE SELECTION

To verify the vendor-provided control efficiencies as the letter requests, PCC must consider the amount of particulate typically sent to each baghouse to maximize the chance of getting a detectable sample from both the inlet and the outlet of the baghouse. It would be unreasonable to expect detectable results from an eight-hour sampling duration for a baghouse that may have a total monthly collection of only a few pounds. Therefore, PCC will consider the amount of material collected by the baghouses as a baghouse selection criterion, with an emphasis on choosing baghouses that are known to collect substantially more material than others in a similar category.

Based on the baghouse dust analyses performed by PCC, it is possible to identify those baghouses that typically collect material with elevated concentrations of toxic air contaminant metals that are likely to be the focus in the eventual risk assessment, such as nickel and chromium. The dust analysis results, specifically the nickel content of the dust, are proposed as another baghouse selection criterion.

The third selection criterion is the type of process controlled by the baghouses. This is considered secondary to the metal content of the dust, which addresses the amount of metal dust likely sent to the baghouses. Steel super alloys can have high nickel and/or chromium contents, so the baghouse testing will include baghouses processing these alloys to obtain the data that are most useful to the risk assessment process. The primary underlying assumption is that baghouses controlling similar titanium alloy processes will have a performance similar to that of the steel super alloy baghouses tested.

Using the above criteria and incorporating changes proposed by the DEQ, ~~three~~ four baghouses are identified for testing, as shown in the following table.

[1] DEQ, 2006. Source Test Review Report for LPC-S Baghouses. May 15.

Baghouse ID	Filtration Type	Metal Processed	Category	Notes
8687	Conventional	Titanium (shell removal only)	High Throughput/Low Metal Content	Highest dust collection of all baghouses.
8901	Conventional + HEPA	Steel	Grinding	Highest dust collection of grinding baghouses processing steel super alloy.
9203—WEST	Conventional + HEPA	Steel	Cutting/Hot Work	Highest dust collection of cutting/hot work baghouses processing steel super alloy.
9203—EAST				
9256	Conventional + HEPA	Steel	Air Casting and Hot Top	Low dust collection and infrequent use

With the exception of Baghouse 9256, ~~T~~these baghouses represent units that may collect sufficient dust with measurable metal content to achieve valid results on at least the inlet. There is a conventional baghouse and baghouses with HEPA after-filters, and at least one of each of the three categories identified previously is included. Two of the six stacks of Baghouse 9203 are proposed for testing.

The DEQ requested that the Conceptual Plan be revised to "include a baghouse controlling shotblasting activities of super steel alloy materials". While Baghouse 8687 controls shotblasting activities, the shotblasting is employed to remove the ceramic shell from the cast metal as part of the "cleaning" process. Shotblasting is required when cleaning titanium because the ceramic shell is more difficult to remove from titanium castings than from super steel alloy casting. PCC attempts to produce castings that require minimal processing, and it is not desirable for metal to be removed from the casting during the shell removal process. Although there is some metal content in the dust collected at Baghouse 8687, this is incidental metal loss from the shot and the parts being cleaned. Baghouse 8687 controls ceramic dust emissions from cleaning, and cleaning is not a "finishing" operation designed to remove metal from the casting. A comparable baghouse controlling cleaning of super steel alloy castings is Baghouse 1807, which collects less than 20% of the ceramic dust collected by Baghouse 8687, and the dust collected has comparable nickel and chromium contents. For these reasons, we request that Baghouse 8687 remain in the Conceptual Plan as representative of "high throughput/low metal content" baghouses.

The DEQ requested that Baghouse 9256 be added to the list of baghouses to test because it "collects the most dust of baghouses controlling casting processes". Less than 400 pounds of dust were collected by Baghouse 9256 in 2020. For comparison, only two of the 33 baghouses at the facilities collected less material than Baghouse 9256 in 2020. Much of the material collected is due to emissions from hot top application and not from the casting process itself, as evidenced by the high aluminum content and low nickel content of the dust collected (19 percent and 0.63 percent, respectively).

SAMPLING DURATION

A primary concern of the baghouse testing is whether it is possible to collect a "detectable" amount of particulate on the sampling filters. This is a concern for both the sampling at the inlet of baghouses that have low particulate loading and the sampling at all baghouse outlets. Conventional baghouses have filters with rated removal efficiencies of 99.9 percent (or greater), and some of these baghouses have polishing filtration in the form of HEPA or ULPA after-filters. Based on past experience, PCC expects that at least eight hours will be needed for each baghouse test run. Even an eight-hour sampling duration is unlikely to generate a detectable value at the outlet from any baghouse with after-filters, and potentially even those without. Based on the proposed test run length, only one test run will be performed for each baghouse stack.

The DEQ requested that two eight-hour test runs be conducted for each baghouse "due to potential variation in source test results". Performing an eight-hour test run on the baghouses at PCC will effectively capture potential variation in production given the nature of the processing activities that occur at PCC. It is important to understand that requiring two eight-hour tests will effectively require testing on two separate operational days for each baghouse.

This is most significant for Baghouse 9256, because air casting activities are only performed one shift per week. Requiring two eight-hour test runs for Baghouse 9256 may require two separate mobilizations of the chosen stack testing firm. The air casting process, duration, and schedule are all inflexible due to the scale and nature of the process. If the DEQ will require two eight-hour runs as part of the Conceptual Plan, PCC proposes that an exception be made to only require one eight-hour test run for Baghouse 9256.

PRODUCTION

PCC will take reasonable action to plan production on the day of testing to achieve a representative maximum loading rate to the baghouses being tested. For some of the baghouses, the amount of particulate delivered is highly variable, such as for finishing operations where the facility attempts to minimize the amount of work done to each part and much of the finishing work is done on an as-needed basis. It will not be possible to just grind or cut more metal during testing for the purpose of increasing the loading to the baghouse, as this could irreversibly damage the cast parts. Additionally, it is not feasible to require processing of a specific alloy during testing. PCC personnel will record the alloy(s) being processed during testing so the metal speciation of the alloy being processed is known.

TEST METHODS

In the letter, the DEQ requested that all baghouse source testing be completed using both Method 29 and SW-846 Method 0061. Method 29 is listed as being applicable to all of the metal species requested, with the exception of aluminum and vanadium. However, ~~these metals~~ aluminum and vanadium will be requested as part of the Method 29 analysis. For baghouses with multiple stacks, the exhaust flowrate of each stack will be measured as part of testing.

SW-846 Method 0061 is designed to measure hexavalent chromium (Cr(VI)) emissions from stationary sources of combustion emissions, namely waste incinerators and combustors. It is a complex method in that "to obtain reliable results, testers should be trained and experienced with test procedures" (EPA Method 0061, Section 7.1). A significant known concern with the performance of Method 0061 at a facility such as the LPC is the potential for trivalent chromium (Cr(III)) to be oxidized to Cr(VI). This is of particular concern at PCC, as their emissions have material concentrations of manganese oxides (MnO_2), which are one of the few known oxidants of Cr(III) under environmental conditions.[2, 3] This reaction could occur in the impinger solution, which is basic and aerobic, therefore favoring Cr(VI) formation. Use of the test method under conditions where MnO_2 is present may bias the Cr(VI) result high—potentially by a substantial amount. The California Air Resource Board has also recognized this bias. Therefore, PCC will continue to explore whether there are alternative test methods that would more accurately characterize our chromium emissions.

[2] Apte, A. D.; V. Tare; and P. Bose. 2006. Extent of oxidation of Cr(III) to Cr(VI) under various conditions pertaining to natural environment. J Hazard Mater. 6(128(2-3): 164–74.
[3] Kim, J. G., J. B. Dixon, C. C. Chusuei, and Y. Deng. 2002. Oxidation of Chromium (III) to (VI) by Manganese Oxides. Soil Sci. Soc. Am. J. 66(1):306–315.