

OCT 04 2011

AIR PROTECTION BRANCH

October 3, 2011

James A. Capp
Branch Chief
Georgia EPD - Air Protection Branch
4244 International Parkway, Suite 120
Atlanta, Georgia 30354

**Subject: CARBO Ceramics Inc. – Millen, Georgia Facility
PSD Application – Response on USEPA Region 4 Comments**

Dear Mr. Capp:

Thank you for forwarding the comments from the United States Environmental Protection Agency's (EPA) Region 4 office pertaining to portions of the sulfur dioxide (SO₂) and nitrogen oxides (NO_x) Best Available Control Technology (BACT) determination for the direct rotary calciners to be installed at CARBO Ceramics Inc.'s (CARBO) proposed proppant manufacturing facility to be located in Millen, Georgia. The purpose of this letter is to discuss the issues raised in EPA's comments concerning the use of selective non-catalytic reduction (SNCR) and the use of a catalytic baghouse to control NO_x emissions from the calciners, the economic analyses for NO_x emissions, and the proposed SO₂ BACT limits for the calciners.

NO_x BACT - SNCR for Calciners

SNCR has been found to be applicable for preheater/precalciner-type cement kilns because the temperature between the process stages is suitable for effective operation of SNCR. The only place in the Millen calciners where the temperature would be suitable for effective SNCR operation is in the middle (lengthwise) of the rotary calciner. As such, CARBO would be forced to inject reagents in the middle of the calciner on a continuous basis. This configuration is addressed in the ACT's discussion of how SNCR is not applicable to long wet/long dry kiln types due to technical infeasibility (see pages 5-15 and 5-22 of the ACT; EPA-453/R-94-004).

Furthermore, even if this difficulty could be overcome, as per ACT page 5-19, use of SNCR in this high-sulfur environment would result in large formation rates of ammonium bisulfite scale, which would substantially interfere with calcining process operation and unacceptably contaminate the finished product (see ACT 5-25). CARBO's 3rd party engineering resources also have concluded that an SNCR system cannot be installed at this time for a rotary calciner due to the above mentioned issues.

NOx BACT – Catalytic Baghouse for Calciners

CARBO has extensively investigated the availability of the catalytic baghouse, a process technology proposed for use by another ceramic proppant manufacturer (PyraMax Ceramics, LLC). Specifically, Tri-Mer Corporation (Tri-Mer) has developed its UltraCat ceramic filter systems to incorporate the NOx SCR catalyst as part of a high-temperature ceramic bag material. However, Tri-Mer Corporation has formed an exclusive commercial arrangement with PyraMax Ceramics, LLC (effective through the first quarter of 2013) and cannot offer this process technology to CARBO or any other party (see attached letter from Tri-Mer Corporation, dated September 8, 2011).

Additionally, Clear Edge Filtration, the manufacturer of the ceramic fiber filter elements used in Tri-Mer's UltraCat system, is not aware of any other US-based manufacturers using their catalytic filter elements as Tri-Mer proposes or that have the expertise necessary to create and integrate such system for this application (per Mike Reichert, Product Manager, Clear Edge Filtration; email of September 9, 2011).

CARBO also has engaged in discussions with Maguin, which is a French company that manufactures catalytic baghouse systems utilizing Clear Edge Filtration's ceramic filter bags (marketed as CERCAT systems). Maguin has not done any business regarding its CERCAT system in the United States to date, and our discussions with Maguin indicate that they are not able to supply a turnkey CERCAT filter system in the US at this time (per email correspondence with Emmanuel Bruniau, Senior Manager Environment, Maguin – 9/21/2011).

Suggested procedures for performing a top-down BACT analysis are set forth in EPA's Draft New Source Review Workshop Manual (Manual), dated October 1990. Step 2 of the five-step process involves the elimination of technically infeasible options. The Manual specifies that one of the key concepts in determining whether a technology is feasible is "availability," per page B.17 of the Manual. A technology is considered "available" if it can be obtained by the applicant through commercial channels or is otherwise available within the common sense meaning of the term.

An example of the application of the concept of "availability" was seen in the case of Knauf Fiber Glass. The EPA's Environmental Appeals Board acknowledged that if the competitor's process was a proprietary trade secret, then such an option might be technically infeasible for BACT purposes.

"In this case, Knauf and SCAQMD investigated the availability of process technology used by other fiberglass manufacturers, learned that it was treated as proprietary and confidential, and concluded that such technology was not available for purposes of BACT. SCAQMD's decision on the non-availability of alternative process technology is adequately justified by the record." [*In re Knauf Fiberglass, GMBH*, 9 EAD 1 (EAB 2000)].

Consistent with the available guidance and previous determinations, CARBO has determined that the catalytic baghouse is not commercially available to the Millen facility. Therefore, the catalytic baghouse may be eliminated in Step 2 as technically infeasible in the top-down

BACT analysis. This letter serves to officially amend the NOx BACT analysis of a catalytic baghouse for all applicable emission units to reflect the elimination of the technology for CARBO's Millen facility.

NOx Cost Analyses for Calciners

We believe that the useful life of a Babcock Power's regenerative selective catalytic reduction (RSCR) system of 10 years is conservative for a high-dust environment such as experience in the calciners used at a CARBO proppant manufacturing facility. Additionally, based on CARBO's extensive evaluation of the RSCR system (as described in a February 2, 2009 letter to Jac Capp – EPA Response to EPA Comments), the RSCR units operate intermittently and cannot be considered a reliable long-term emission control option for the proposed calciners.

CARBO has obtained vendor-specific contingency values for the NOx BACT cost analyses for the calciners. The contingency factor of 30% for SCR systems originates from the TMTS quote which used "RSMeans" Construction Costing Data (see Table A.5-2a, Volume II; CARBO Ceramics Inc. Millen Facility PSD Permit Application). The contingency factor of 40% for the RSCR system originates from the Babcock Power Environmental quote and was based upon comparable experience on other jobs. The EPA Cost Manual default value of 20% should only be used when there are no vendor specific values.

Removing the "Lost Production During Installation" Indirect Cost from RSCR and SCR cost analyses lowers the cost effectiveness for both these systems to \$13,506 per ton NOx reduced and \$8,111 per ton NOx reduced for RSCR and SCR, respectively. The BACT cost effectiveness calculations were originally specified for RSCR and SCR at \$13,908 per ton of NOx reduced and \$8,265 per ton of NOx reduced, respectively. Therefore, the removal of this indirect cost does not substantially alter the premise that these two control technologies are not cost effective for the proposed applications, and the originally proposed BACT calculation remains valid.

SO₂ BACT for Calciners

CARBO's Toombsboro, Georgia facility was designed for – and operates on – low-sulfur clay, and the Millen facility is being designed to allow for operation on high-sulfur clay. To address this limitation, CARBO has decided to restrict the mix of clays that the Toombsboro facility can process so that stack SO₂ controls are not required to comply with permit emission limits. The PSD permit application for Toombsboro facility indicated that the use of a wet scrubber was not cost effective given an uncontrolled SO₂ emissions rate of 34.25 lbs/hr, based on the lower-sulfur clays.

However, at an estimated uncontrolled SO₂ emissions rate of 685 lbs/hr (emissions rate as specified in the Millen PSD Permit Application), the use of a scrubber would be cost effective. The aforementioned uncontrolled SO₂ emissions rate for the Millen facility is based upon an expected in-sulfur clay content of 0.82%, by weight (as identified in Table 2, Note 5, Attachment B, Volume I of the CARBO Ceramics Inc. Millen Facility PSD permit

application). Therefore, the extreme variability of the sulfur content in raw clays combined with the desire for CARBO to diversify its clay sources substantiates the need for a 34.25 lbs/hr SO₂ emissions limit even with the use of a wet scrubber at a control efficiency of 95%.

CARBO is willing to consider parametric compliance surrogates for the wet scrubbers of pressure drop and scrubber reagent flow rate in order to continuously demonstrate compliance with the proposed SO₂ BACT limit for each calciner of 34.25 lbs/hr. This acceptance is provided that the permit terms allow for a broad operating range of such parameters that may be encountered with various clay feedstocks. CARBO believes that compliance with SO₂ stack emission limits should be demonstrated by actual stack measurement when possible, and we request that the methodology proposed for use at our McIntyre, Georgia facility be incorporated as an option to satisfy this requirement.

If you have any questions or need any further information, please do not hesitate to contact me at (281) 921-6472 or via email at Jason.Goodwin@carboceramics.com. Thank you for your consideration, and we look forward to continuing our work toward issuance of this permit.

Sincerely,



Jason M. Goodwin, PE, CSP
Director – Environmental, Health, and Safety
CARBO Ceramics Inc.

c: Susan Jenkins - GAEPD
Eric Cornwell – GAEPD
Hamid Yavari – GAEPD
Curt Churchill – GAEPD
Craig Smith – Smith Aldridge, Inc.
Trish Chappell – CARBO

Encl: Tri-Mer Corporation Letter, dated September 8, 2011.



September 8, 2011

Wes Younger, Project Manager
Smith Aldridge, Inc. - Environmental Consultants
6000 Lake Forrest Drive
Suite 385
Atlanta, GA 30328

Subject: UltraCat Filtration System Technology

Dear Mr. Younger,

I am in receipt of a copy of an email sent to our Business Development Director, Kevin Moss, earlier today.

With respect to our air pollution control technology UltraCat Filtration, we have formed an exclusive business arrangement with the PyraMax organization. This business arrangement is currently effective through the first quarter of 2013. This was a decision based on favorable business and financial aspects.

Best regards,

A handwritten signature in black ink, appearing to read "John M. Pardell", is written over a light blue horizontal line.

John M. Pardell
President, TMC