Message

From: Walter Koucky [wkoucky@corner-enviro.com]
Sent: 2/7/2017 2:03:22 PM
To: Brahmbhatt, Roshni [brahmbhatt.Roshni@epa.gov]
Subject: RE: Request for Applicability Determination
Attachments: image001.emz

Hi Roshni:

The carbonizing furnace (muffle) is sealed on either end and the material is heated as it is drawn through and outer combustion chamber that surrounds the muffle. There is a stack for the natural gas combustion emissions for the burners in the outer furnace shell. The combustion gas never contacts the inner muffle or the carbonaceous material that is being carbonized in the muffle furnace. So there is a stack for natural gas combustion emission that is separate from the process gases. The muffle is under negative pressure and swept with inert nitrogen gas. The negative pressure and nitrogen sweep the "devolatilized" gases into the oxidizer (see devolatilization as a stage of pyrolysis below). The carbonaceous material is reduced to elemental carbon and the carbon and other inert material (such as glass and metal) goes out of the muffle furnace through an air seal for beneficial reuse.

So, for the process gas – pyrolysis results in removing the volatile components as the carbon compounds approach carbonization. All of these gases are carried hot and direct to the oxidizer.

Q1
When are emissions emitted to the atmosphere? Is it after the gases have passed through the carbonizer, thermal oxidizer, and the heat exchanger?

Yes, this is correct. All the hot off-gas from pyrolysis goes directly from the carbonizer through the thermal oxidizer and then though the heat exchanger.

Q2
Also, what is the primary function and purpose of the thermal oxidizer and the heat exchanger in the process flow?

The thermal oxidizer takes the purge nitrogen and the off-gas from the pyrolysis that is occurring in the carbonizer and the oxidizer fan is an induced draft design so that the fan after the oxidizer at the base of the stack is producing the negative pressure on the system. The negative pressure on the carbonizer shell (muffle furnace) is produced by the oxidizer. The oxidizer is an "afterburner" style design. This means that it is not "recuperative" (RCO) or "regenerative" (RTO) in design and has no heat exchangers and only a combustion chamber.

The heat exchanger is designer to capture the heat for the purposes of beneficial reuse. This is essentially a waste heat boiler design with steam tubes as the heat exchanger media. In this design, the waste heat powers a steam turbine to generate electricity.

Pyrolysis of Biomass

- Thermal decomposition occurring in the absence of oxygen
- Above 300°C polymeric building blocks undergo crosslinking, depolymerization and fragmentation
- Smaller molecules are released as gases and vapors
  - can react with residual solids producing more condensed structures (Pyrosynthesis)
- "Always" produces solid (charcoal), liquid (water and organics), and gaseous (CO, CO_2, CH_4, H_2)
  - Proportions and composition dependent on feedstock and process conditions.

Slow Heating of Biomass

Temperature	*Solid Phase*	*Gas Phase*
<200°C	*Drying*	*H_2O*
230°C-250°C	*Retification*	*Acetic acid, MeOH*
250°C-280°C	*Torrefaction*	*Labile Deoxygenation*
300°C-500°C	*Devolatilization*	*Organics, H_2O, gas*
>500°C	*Carbonization*	*Aromatics, HC's, H_2O, gas*

Please tell me if I can provide any additional clarification on the Aemerge process.

Regards,

Walter F. Koucky, M.S.
Senior Air Project Manager
Cornerstone EH&S
2330 Victory Parkway, Suite 701
Cincinnati, Ohio 45206
(513) 808-4089 Direct/Fax
(513) 225 4216 Mobile

From: Brahmbhatt, Roshni [mailto:brahmbhatt.Roshni@epa.gov]
Sent: Monday, February 06, 2017 8:20 PM
To: Walter Koucky <wkoucky@corner-enviro.com>
Subject: RE: Request for Applicability Determination

Hi Walter,

Thanks for the detailed response. I have a couple of follow-up questions that I want to confirm/

When are emissions emitted to the atmosphere? Is it after the gases have passed through the carbonizer, thermal oxidizer, and the heat exchanger?

Also, what is the primary function and purpose of the thermal oxidizer and the heat exchanger in the process flow?

Thanks,
Roshni

Roshni Brahmbhatt
Environmental Engineer
Air and TRI Section (ENF 2-1)
Enforcement Division
U.S. Environmental Protection Agency, Region 9
Email: Brahmbhatt.Roshni@EPA.gov
Phone: 415-972-3995

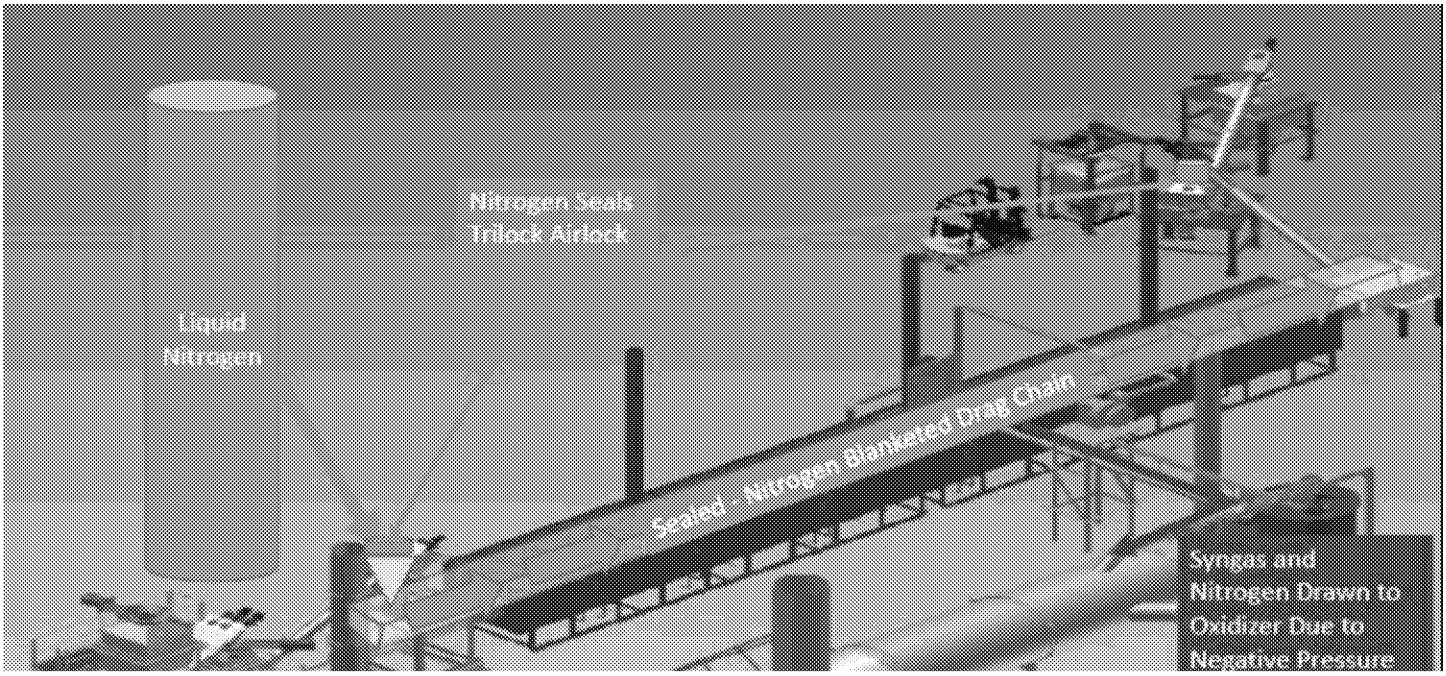
From: Walter Koucky [mailto:wkoucky@corner-enviro.com]
Sent: Wednesday, February 1, 2017 10:50 AM
To: Brahmbhatt, Roshni <brahmbhatt.Roshni@epa.gov>
Subject: RE: Request for Applicability Determination

Hi Roshni:

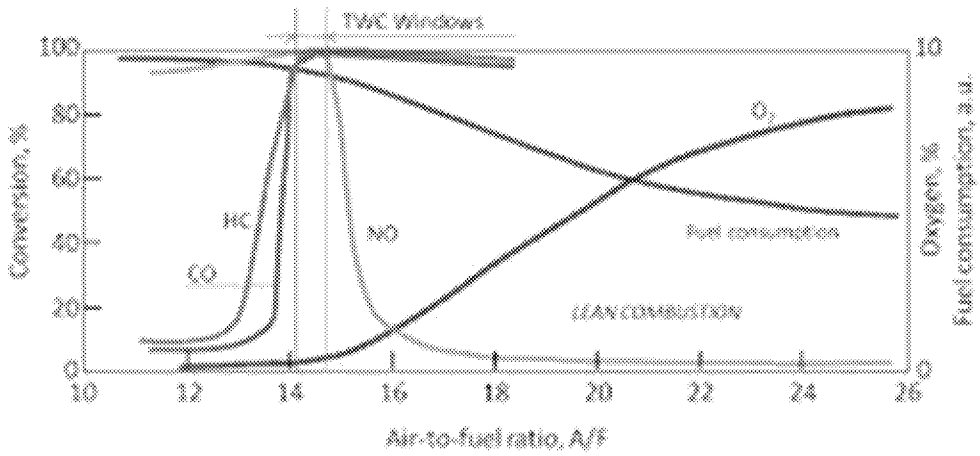
Aemerge did operate a unit in Indiana that was very similar to the one proposed for construction.

It operated on recycled wood shipping pallets, but was tested on sterilized and shredded hospital waste.

Oxygen is designed to be less than one percent in the carbonizer (muffle furnace) where the waste material is pyrolyzed into carbon. The furnace is under negative pressure and nitrogen blanket. The furnace is designed to operate at about -5.0 inches H20 of negative pressure and less than 1.0% oxygen. Air to fuel ratio does not apply to this unit because air and oxygen are excluded from the furnace and the carbonaceous material is not added as a "fuel" as the intent is to reduce the carbonaceous material to elemental carbon through pyrolysis in an oxygen deprived environment. There are multiple air locks on the system to prevent air and oxygen from entering the carbonizer. Both oxygen levels and negative pressure are monitored as this is essential to safe operation.



I said above that air to fuel is a combustion concept and doesn't really fit concept of inert gas carbonization (pyrolysis) – but air to fuel ratios for most fuels are around 15 pounds of air to one pound of fuel. We could do some better estimates based on the amount of nitrogen used to purge air to keep the oxygen levels below 1.0% percent in the furnace, but if you called the carbonaceous feed fuel (which isn't really accurate – since the objective is to make carbon) I would estimate that the air to fuel ratio might be about 0.1 or about one pound of air getting past the air locks for every 10 pounds for carbonaceous material fed into the carbonizer.



Please contact us if you there is anything else we can help with.

Thanks,

Walter

From: Brahmbhatt, Roshni [mailto:brahmbhatt.Roshni@epa.gov]
Sent: Wednesday, February 01, 2017 11:53 AM
To: Walter Koucky <wkoucky@corner-enviro.com>
Subject: RE: Request for Applicability Determination

Ignore my previous email. This is proposed for construction.

Thanks,
Roshni

Roshni Brahmbhatt
Environmental Engineer
Air and TRI Section (ENF 2-1)
Enforcement Division
U.S. Environmental Protection Agency, Region 9
Email: Brahmbhatt.Roshni@EPA.gov
Phone: 415-972-3995

From: Brahmbhatt, Roshni
Sent: Wednesday, February 1, 2017 7:56 AM
To: 'Walter Koucky' <wkoucky@corner-enviro.com>
Subject: RE: Request for Applicability Determination

Hi Walter,

Do you currently monitor and record the following parameters: (1) air-to-fuel ratio; (2) the oxygen level; and (3) the pressure? Do you know what the air-to-fuel ratio is needed to provide an oxygen-free environment?

Thanks,
Roshni

Roshni Brahmbhatt
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Email: Brahmbhatt.Roshni@EPA.gov
Phone: 415-972-3995

From: Walter Koucky [mailto:wkoucky@corner-enviro.com]
Sent: Tuesday, January 31, 2017 1:22 PM
To: Brahmbhatt, Roshni <brahmbhatt.Roshni@epa.gov>
Subject: RE: Request for Applicability Determination

Hi Roshni:

It is good to hear from you. Please let me know if there is any additional information you need or any clarification we can provide that would make your review more complete or easier.

Regards,

Walter F. Koucky, M.S.

Senior Air Project Manager
Cornerstone EH&S
2330 Victory Parkway, Suite 701
Cincinnati, Ohio 45206
(513) 808-4089 Direct/Fax
(513) 225 4216 Mobile

From: Brahmbhatt, Roshni [mailto:brahmbhatt.Roshni@epa.gov]
Sent: Tuesday, January 31, 2017 4:19 PM
Cc: Walter Koucky <wkoucky@corner-enviro.com>
Subject: RE: Request for Applicability Determination

Hi Walter,

I was recently assigned to this ADI, so I will be your point of contact. Seeing as this was requested early 2016, I will try to get back to you as soon as I can.

Thanks,
Roshni

Roshni Brahmbhatt
Environmental Engineer
Air and TRI Section (ENF 2-1)
Enforcement Division
U.S. Environmental Protection Agency, Region 9
Email: Brahmbhatt.Roshni@EPA.gov
Phone: 415-972-3995

From: Salazar, Matt
Sent: Tuesday, January 31, 2017 11:39 AM
To: Brahmbhatt, Roshni <brahmbhatt.Roshni@epa.gov>
Subject: Fwd: Request for Applicability Determination

Hi Roshni,
Can you respond? Please let me know if you have any questions.
Thank you,
Matt

Sent from my iPhone

Begin forwarded message:

> **From:** Walter Koucky <wkoucky@corner-enviro.com>
> **Date:** January 17, 2017 at 12:08:34 PM PST
> **To:** "Salazar, Matt" <Salazar.Matt@epa.gov>
> **Cc:** Guy Smith <gsmith@mdaqmd.ca.gov>
> **Subject: RE: Request for Applicability Determination**
>
> Hi Matt:

Is EPA making any progress on the Aemerge applicability determination? Lacking clarification, the facility is going to need to make a decision about obtaining a Title V permit in the near future. I understand about EPA's limited resources, but some clarification about this technology is important if a permit under Section 129 is to be requested or avoided.

Thanks,

Walter F. Koucky, M.S.
Senior Air Project Manager
Cornerstone EH&S
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From: Salazar, Matt [mailto:Salazar.Matt@epa.gov]
Sent: Wednesday, November 02, 2016 5:59 PM
To: Walter Koucky <wkoucky@corner-enviro.com>
Subject: RE: Request for Applicability Determination

Hi Walter,

Thank you for the message. I apologize for the long wait. As you may know, we have a long backlog for applicability. It is assigned and we are moving as quickly as we can with the diminished federal resources that we have. Please let me know if you have any questions.
Thank you,
Matt

From: Walter Koucky [mailto:wkoucky@corner-enviro.com]
Sent: Tuesday, November 01, 2016 11:16 AM
To: Salazar, Matt <Salazar.Matt@epa.gov>
Subject: FW: Request for Applicability Determination

Hello Matt:

We had submitted an applicability determination request for Aemerge carbonization technology regarding a proposed installation under the Mojave Desert AQMD. It has been several months and I was hoping for an update on the progress of this determination.

Thanks,

Walter F. Koucky, M.S.
Senior Air Project Manager
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Cincinnati, Ohio 45206
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(513) 225 4216 Mobile

From: BECKHAM, LISA [mailto:BECKHAM.LISA@EPA.GOV]
Sent: Tuesday, November 1, 2016 11:22 AM
To: Walter Koucky
Subject: RE: Request for Applicability Determination

Hi Walter,

Your request is being handled by our Enforcement Division (I'm in the Air Division). You may contact Matt Salazar for updates:

Phone: 415-972-3982
Email: Salazar.Matt@epa.gov

Thanks,
Lisa Beckham
Environmental Engineer
Air Permits Office
EPA Region 9
(415) 972-3811

From: Walter Koucky [mailto:wkoucky@corner-enviro.com]
Sent: Monday, October 31, 2016 5:28 AM
To: BECKHAM, LISA <BECKHAM.LISA@EPA.GOV>
Subject: RE: Request for Applicability Determination

Hello Lisa:

I am following up regarding the applicability determination we submitted in February.

Could you give me a status update or tell me who to contact regarding this?

Thanks,

Walter F. Koucky, M.S.
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From: Walter Koucky
Sent: Friday, February 05, 2016 7:42 AM
To: 'BECKHAM, LISA' <BECKHAM.LISA@EPA.GOV>
Subject: RE: Request for Applicability Determination

Hi Lisa:

Thank you for the assistance.

Regards,

Walter F. Koucky, M.S.
Senior Air Project Manager
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2330 Victory Parkway, Suite 701
Cincinnati, Ohio 45206
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(513) 225 4216 Mobile

From: BECKHAM, LISA [mailto:BECKHAM.LISA@EPA.GOV]
Sent: Thursday, February 04, 2016 8:30 PM
To: Walter Koucky <wkoucky@corner-enviro.com>
Subject: Request for Applicability Determination

Hi Walter,

Please submit your request for an applicability determination in writing to:

Matt Salazar, Air & TRI Section Manager
Enforcement Division (ENF-2-1)
75 Hawthorne St
San Francisco, CA 94105

Please also provide an electronic copy to: AEO_R9@epa.gov, Mia.Marcia@epa.gov.

Lisa Beckham
Environmental Engineer
Air Permits Office
EPA Region 9
(415) 972-3811