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*Comment Received From: Kolodji Corp/Black Swan, LLC
Submitted On: 9/24/2020
Docket Number: 19-ERDD-01*

Advanced Combustion - Request for Information

Additional submitted attachment is included below.

From: [Brian Kolodji](#)
To: [Energy - Docket Optical System](#)
Subject: 19-ERDD-01 and "Advanced Combustion – Request for Information"
Date: Thursday, September 24, 2020 3:11:44 PM

CAUTION: This email originated from outside of the organization. Do not click links or open attachments unless you recognize the sender and know the content is safe.

John,

Thought I'd share with the California Energy Commission your comments below as they provide a leading major membrane manufacturers with extensive use of manufacturing oxygen using your Prism Hollow Fiber membranes and a perspective of oxy combustion based on actual industrial experience.

Just wanted to let you know that Black Swan has developed, prototyped, and demonstrated a patent pending membrane (Black Swan WIG) and process Black Swan Membrane Air Enrichment Process that indeed does not need high pressurization of the air feed, but instead uses very low pressure, with essentially a fan, to feed the membranes, and thus enhancing the performance, and saving substantially on energy costs in operation of the membranes. Further, the design of the membrane does not use a shell and only has a single tube sheet, and thus cuts manufacturing costs by almost half.

Thank you again very much for your thoughtful response!

Regards,
Brian Kolodji, PE

Kolodji Corp/Black Swan, LLC

Energy Carbon Management

5612 Segovia Way, Bakersfield, CA 93306

2019/2020 Chair Carbon Mgt and Sustainability,

AIChE National Meetings

"...Peace be with you..."

On Wednesday, September 23, 2020, 05:42:11 AM PDT, Hoffmann, John E. <hoffmaje@airproducts.com> wrote:

Hello Brian,

Congratulations on your patents and recent successes. Very impressive.

The current membrane technology that Air Products PRISM Membranes offers for oxygen enrichment requires significant volumes of compressed air. The oxygen-enriched streams are the permeated oxygen molecules (and CO₂, H₂O) that are liberated from compressed air to make nitrogen streams. In the application that you are describing, a PSA may be more efficient since the required compression is much less than what membranes require. For your reference, I have attached a copy of our oxygen generation technical document. There are abbreviated performance tables that will provide you a reference point for the air compression required.

Air Products and Chemicals, Inc has significant experience with enhanced combustion techniques. The applications are typically centered around heavy industries, like steel making, but there are parallels that may apply to these applications. One of the interesting technologies uses a CO₂ and O₂ combination along with the associated fuels, to perform the needed combustion. By eliminating the nitrogen in the air, the NO_x is removed from the process, the CO₂ can be recovered and reused, and the O₂+fuel burns completely. You can find more information on our corporate website: <http://www.airproducts.com/industries/Energy/Power/Power-Technologies/product-list/oxyfuel-carbon-capture-power-technologies.aspx?itemid=73B1EE7098E8493A92B873E77872AC01>

Here's a press release describing CO₂ emissions goals: <http://www.airproducts.com/Company/news-center/2020/09/0915-air-products-third-by-30-co2-emissions-reduction-goal.aspx>

Finally, I am moving into a marketing position at the end of this month that will remove me from customer-facing and business development activities. I have copied Danica O'Neill on this e-mail. Ms. O'Neill will be assuming responsibilities for commercial activities in the Americas and Oceania. As discussed previously, if your applications require additional product modifications, I will put you on contact with our product development team. They will be able to help guide the product modifications based upon your system's specific requirements.

Best regards,

John Eric Hoffmann
Marketing/Business Development Manager
Air Products PRISM Membranes
314-995-3361 (office)

From: Brian Kolodji <bkolodji@sbcglobal.net>
Sent: Tuesday, September 22, 2020 3:50 PM
To: Hoffmann, John E. <HOFFMAJE@airproducts.com>
Subject: [External] Fw: NATURALGAS-LIST: Advanced Combustion Technologies - Request for Information

This email is from an external source. Please exercise caution in opening attachments or links.

John,

It's been awhile, hope all is well at Air Products!

As you may know, I have patented and patent pending Black Swan, LLC devices, methods, and processes, including membrane designs and processes. This technology has been prototyped and piloted with membranes fabricated and supplied by major membrane manufacturers. The fifth Black Swan, LLC technology pilot plant is planned for later this year, with a funded demonstration plant, and with plans for 2021 demonstration/ industrial scale plants at a refinery cogen unit (5 MW), two biogas power plants (up to 2 MW), and three other industrial scale plant boiler operations (up to 50MMBTU/Hr.) The membranes are used for separating oxygen (and CO2) from air, without pressurizing the feed air, that saves up 50% in natural gas firing rates, with only 15% of the savings used on parasitic, but green, energy use.

Thought Air Products might want to weigh in on this recently received email below regarding a request for comment solicitation on oxygen enrichment technology from the California Energy Commission- membranes are mentioned. Please let me know.

Regards,

Brian Kolodji, PE
Kolodji Corp/Black Swan, LLC
Energy Carbon Management

5612 Segovia Way, Bakersfield, CA 93306

2019/2020 Chair Carbon Mgt and Sustainability,
AIChE National Meetings

"...Peace be with you..."

----- Forwarded Message -----

From: California Energy Commission <listennergia@listserver.energy.ca.gov>
Sent: Friday, September 4, 2020 4:26 PM
To: NATURALGAS@LISTSERVER.ENERGY.CA.GOV
Subject: [EXTERNAL] NATURALGAS-LIST: Advanced Combustion Technologies - Request for Information



September 04, 2020

The California Energy Commission (CEC) is gathering information to inform a solicitation for a future solicitation on oxygen-enriched combustion and would appreciate your responses to the following:

1. The following will help us target our specific research:

- a. What are major barriers (technical, economical, and other) for wide adoption of oxygen-enriched combustion?
- b. What are examples of research that could eliminate barriers to wide adoption of oxygen-enriched combustion?
- c. What are examples of current or past projects involving oxygen-enriched combustion? What are important lessons learned from these projects?
- d. What California industries could benefit most from oxygen-enriched combustion?
- e. What are technical challenges that could result from higher oxygen content and higher combustion temperature (e.g., increased NOx emissions; accelerated degradation of materials in burners, furnaces, kilns)?
- f. Provide examples of existing projects using centralized oxygen generation, distribution via pipeline networks or other approaches that could benefit from R&D.

2. The following will help us establish performance metrics and technology status in California:

- a. Besides cryogenic separation, pressure/temperature swing absorption, ion transport membranes, are there any other promising technologies that should be considered?
- b. For the technologies listed in item 2a:
 - i. What is the estimated energy requirement to produce oxygen at the following capacities: 1 metric ton of oxygen per day, 25 metric tons per day, 100 metric tons per day
 - ii. What is the estimated capital and operational costs for 1 metric ton per day of oxygen production capacity?
- c. Identify California research teams working on oxygen-enriched combustion.
- d. Identify California companies who develop and sell equipment for oxygen production and oxygen-enriched combustion.

Written comments must be submitted to the Docket Unit by **5:00 p.m. September 24, 2020**.

Written comments, attachments, and associated contact information (e.g., address, phone number, email address) become part of the viewable public record. This information may also become available via any internet search engine.

The CEC encourages use of its electronic commenting system. Please [submit your comments to the Docket Unit](https://efiling.energy.ca.gov/Ecomment/Ecomment.aspx?docketnumber=19-ERDD-01) at <https://efiling.energy.ca.gov/Ecomment/Ecomment.aspx?docketnumber=19-ERDD-01>. Select or enter a proceeding to be taken to the "Add Comment" page. Enter your contact information and a comment title describing the subject of your comment(s). Comments may be included in the "Comment Text" box or attached in a downloadable, searchable Microsoft® Word (.doc, .docx) or Adobe® Acrobat® (.pdf) file. Maximum file size is 10 MB.

Written comments may also be submitted by email. Include docket number 19-ERDD-01 and "**Advanced Combustion – Request for Information**" in the subject line and send to docket@energy.ca.gov.

For more information:

<https://www.energy.ca.gov/publications/displayOneReport cms.php?pubNum=CEC-500-2019-035>
(If link above doesn't work, please copy entire link into your web browser's URL)

DO NOT REPLY DIRECTLY TO THIS EMAIL

[Email us](mailto:docket@energy.ca.gov) your questions or comments.