

A Message from Bloom about Low Carbon Combustion

Throughout the past 87 years, Bloom Engineering has helped our clients burn a vast array of gaseous and liquid fuels. With this experience to draw on, Bloom can help your company reach its decarbonization goals and transition to any of a variety of low carbon alternative fuels including hydrogen.

Bloom is also a leading designer and manufacturer of high efficiency burner technology for high temperature applications.

Regardless of the fuel you are using, properly applied Ultra-Low NOx regenerative burners can be used to minimize your fuel usage.

Whether you are looking to reduce your carbon emission by increasing heating efficiency or planning to switch to a potentially expensive low carbon fuel, regenerative burner technology should be considered for direct fired applications.

Your current Bloom sales representative should be the first point of contact for any additional questions.

If you have not worked with Bloom before or do not know who your sales representative is, please let us know through info@bloomeng.com or locate a rep at <https://www.bloomeng.com/contact-bloom>.

Decarbonization & Hydrogen fuel

FAQs

What are low net carbon alternative fuels?

When a hydrocarbon such as natural gas (methane) is burned in air carbon in the form of carbon dioxide (CO₂) along with water (H₂O) and nitrogen (N₂) are given off as waste products. Low net carbon alternative fuels are combustible fuels that contribute little or no net carbon (CO₂) to the atmosphere. Hydrogen depending on its generation method or fuels derived from biomass, which has recently absorbed carbon from the atmosphere during growth, can be considered to contribute little of no new net carbon to the atmosphere.

Fossil fuels are derived from biomass. How are they different?

The carbon contained in fossil fuels was removed, largely by plants, from the earth's atmosphere over very long periods of time and in great quantities. Now this carbon is being stored mostly underground and in a form that it is not available to the atmosphere. Extracting and combusting these fossil fuels releases huge amounts of carbon dioxide into the atmosphere far exceeding what plants can quickly reabsorb. The result is an increased concentration of Carbon Dioxide in the earth's atmosphere that many people attribute to global climate change.

I thought carbon emissions from natural gas were already lower than many other fossil fuels, what is this all about?

Yes, when compared to other fossil fuels such as oil or coal, natural gas produces fewer carbon emissions. In fact, natural gas (methane) generates about 28% less CO₂ than oil and 44% less CO₂ than coal.

Does burning low carbon fuels always reduce CO₂ emissions?

No! For example, hydrogen contains no carbon so at the point of combustion no CO₂ is released. However, depending on how hydrogen is produced, large amounts of CO₂ can be emitted. One common way of generating hydrogen at an industrial scale today is through a process called steam methane reforming. This production method uses steam to separate carbon atoms in methane (CH₄) molecules from hydrogen atoms. Once the energy needed to separate carbon from hydrogen is accounted for hydrogen produced through steam methane reforming can result in 40% more carbon dioxide emissions per unit of energy than the direct combustion of natural gas. If CO₂ emissions resulting from steam methane reforming are emitted into the atmosphere the hydrogen produced is sometimes referred to as grey hydrogen.

While not as common today, methods for producing hydrogen are available that do not add significant carbon dioxide emissions to the atmosphere.

One method is to couple steam methane reforming with carbon capture and store to produce what is often called blue hydrogen.

Others such as electrolysis, which uses electricity to separate water into hydrogen and oxygen, can be done using renewable energy eliminating carbon from the equation.

The term green hydrogen is used when hydrogen is generated using renewable electricity.

What are some low net carbon fuels that Bloom has experience with?

Hydrogen, Biodiesel, Methanol, Ethanol, and Ammonia

How would a switch to hydrogen or hydrogen enriched fuel affect my NO_x emissions?

In our experience NO_x tends to increase when fuels with high levels of hydrogen are burned. If fired on pure hydrogen many common burner types will see NO_x levels increase 40% to 100% over natural gas. Fortunately, properly designed Ultra-Low NO_x burners can help to reduce any NO_x penalty associated with burning hydrogen.

Can Bloom burners operate on hydrogen?

Yes and no. All Bloom burners can operate with natural gas enriched to 8% hydrogen by volume without design modifications. Note that even low levels of hydrogen enrichment can increase NOx emissions, so we recommend talking to your Bloom Sales representative before using any hydrogen enriched fuels with Bloom burners. Many Bloom burners can be designed or modified to operate on fuels containing more than 8% hydrogen by volume. In fact, many appropriately designed Bloom burners will safely operate on pure hydrogen. Keep in mind that Bloom specializes in multifuel applications. This means that Bloom can likely engineer a burner for you that can be operated using both your current fuel, say natural gas today, and be fully functional using hydrogen with little or no modification should you desire to do so in the future.

Does Bloom have actual experience with using hydrogen as a fuel in its burners?

In addition to testing several of our burners at our R&D lab using pure hydrogen, Bloom also has a long history of designing burners for use with coke oven gas (COG) that often contains 50% – 60% hydrogen by volume.

Is it safe to use hydrogen as a fuel?

Hydrogen can be safely used for industrial combustion if the burners and systems handling it are properly designed. One common concern is the fact that hydrogen flames have very low luminosity so visual detection can be difficult. Because of this Bloom has developed and applied for a patent on a “luminosity lance”. The concept behind these lances is to inject a small amount of hydrocarbon fuel into the hydrogen flame envelope to create sufficient luminosity for flame detection while causing an insignificant amount of carbon emissions.

**I am being forced to burn hydrogen but it is quite expensive.
Can Bloom help?**

Yes, while the direct cost of hydrogen can be more than other fuels such as natural gas per unit of energy a reduction in total energy used could partially offset added fuel costs. If you are currently running on cold or even recuperated air, now might be a good time to consider regenerative burners. With regenerative burners combustion air is preheated using heat recovered from the furnace's exhaust gasses. Air preheats to within 300°F (150°C) of the exhaust gas temperature are possible. This translates into exceptional efficiencies on the order of 80% (LHV) for processes that run between 2,000°F and 2,400°F.

I do not believe that carbon dioxide from human activity contributes to global warming. Why should I consider low net carbon alternative fuels?

One thing to keep in mind is that fossil fuels are a limited and in time spans that we are accustomed to “nonrenewable” resources. If alternative fuels are not found this means that someday the earth's fossil fuels will be depleted and no longer available to supply the energy needs of humans. While running out of fossil fuels will likely not occur in our lifetimes, many forward-looking governments will push for a transition away from them before they are depleted. Another factor that might drive the use of alternative fuels would be for a particular country or region to do so hoping to reduce their dependence on others to satisfy their energy needs. Finally, many people with influence in the world today do believe that carbon emissions drive global climate change and they are likely to continue to push for a decrease in net global carbon emissions.

How do I get more information about decarbonization and the ways that Bloom can help?

Your current Bloom sales representative should be the first point of contact for any additional questions. If you have not worked with Bloom before or do not know who your sales representative is, please email info@bloomeng.com or locate a rep at <https://www.bloomeng.com/contact-bloom>.