

# Without compromise: lowering emissions and improving yield in cement production



## Features

- Extensive experience across all kiln types
- Low installation costs
- Proprietary technology for oxygen injection
- Installation across various pyro-processing zones
- Technical and economical assessment in pre contract stage
- Technical assistance from on-site specialists during start-up
- Ongoing post-installation technical support

## Benefits of improved combustion

Oxygen enrichment not only improves combustion regardless of fuel type, but can deliver the following benefits:

- Increased alternative fuel substitution
- Reduce reliance on fossil fuels
- Reduced CO<sub>2</sub> emissions
- Improved kiln stability
- Better burning zone control
- More reliable and consistent product quality and production rates

Cement is the most widely used man-made material as it is a primary constituent in the manufacture of concrete. Rarely used on its own, it acts as a binder for other substances in concrete such as sand, gravel and aggregate. Concrete has an almost limitless number of infrastructure and construction applications - everything from buildings, bridges, roads and sidewalks, to more aesthetic uses such as flooring, staircasing, patios and sculptures – making it a vital material to enable modern day living.

However, cement production accounts for around 9% of the world's carbon dioxide (CO<sub>2</sub>) emissions.

At Air Products, we recognise our customers' need to reduce their greenhouse emissions and attain their sustainability goals.

With decades of atmospheric gas technology experience behind us, we have the knowledge and expertise to deliver carbon capture solutions, optimise energy efficiency and increase alternative fuels utilisation – all to help lower your CO<sub>2</sub> footprint.

Through the use of oxygen enrichment, you can increase kiln performance along with production efficiency, improve safety, clinker quality and lower emissions, while still growing your bottom line.

## Oxygen enrichment: the flexible alternative fuel enabler

Alternative fuels can significantly reduce your operating costs and help meet your sustainability targets. However, they can also present a challenge for kiln operators by impacting on production capacity and quality targets, which might present the bottleneck in further alternative fuel utilization.

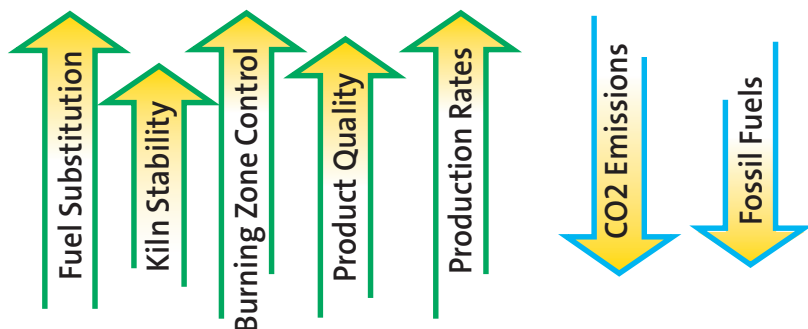
Oxygen enrichment can improve the combustion of these fuels, allowing the kiln operator to increase the level of alternative fuel substitution without negatively impacting on production rate or product excellence.

Oxygen enrichment is an alternative to installing new capital-intensive equipment or having to upgrade existing apparatus. It offers true flexibility and cost effectiveness to cement and lime producers.

At Air Products we really understand oxygen enrichment, as well as the challenges you face. We have successfully enabled numerous customers across the globe to implement oxygen enrichment systems in kilns of various sizes with proven results.

Air Products' expert says: "It is not about the volume of oxygen use in the kiln, but about how efficiently oxygen is used".

## Typical production gains using Air Products' oxygen injection technology



## Proven technology

Oxygen enrichment is a flexible, efficient and cost-effective technology that can help improve your kiln operations.

Since 1997, Air Products' proprietary oxygen enrichment systems have successfully been installed and demonstrated in over 30 kilns around the world.

With minimal capital investment, you can achieve significantly better use of alternative fuels, improved kiln performance, enhanced production rates, and considerably lower greenhouse gas emissions. Our technology is applicable to all types of kilns and its low installation costs make it an attractive alternative to capital intensive equipment modifications.

.....  
 For more information, please contact us so one of our combustion specialists can evaluate your existing process and future needs.

Air Products PLC  
 T 0800 389 0202  
 apukinfo@airproducts.com  
 airproducts.co.uk

.....

## Oxygen enrichment increases alternative fuel utilization

	Plant							
	A	B	C	D	E	F	G	H
% alternative fuel usage without oxygen	45.4	31.1	45.9	44.3	42.8	43.9	60.5	27.0
% alternative fuel usage with oxygen	72.9	52.4	69.3	65.6	77.3	58.3	67.0	40.7
% reduction in fossil fuel	-50.0	-25.9	-40.0	-36.0	-57.5	-25.0	-10.8	-22.0
CO <sub>2</sub> e savings (tons per year)	13,500	8,100	10,800	9,720	34,500	10,800	3,780	11,880

Notes:

1. Production rates were held constant except for Plant G where there was a 4% production increase with oxygen.
2. Carbon dioxide equivalent (CO<sub>2</sub>e) savings at Plant E were greater due to the substitution of biomass fuels for fossil fuel.
3. Results are from recent installations (since 2009).



tell me more  
 airproducts.co.uk