TREND REPORT

REPLACING FOSSIL FUELS WITH ALTERNATIVE FUELS TO REDUCE CO_2 EMISSIONS

A new perspective on decarbonising global industries

READING TIME
10 MINUTES

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TRANSITION

FROM FOSSIL FUELS TO ALTERNATIVE FUELS

Burning fossil fuels releases CO_2 gas into the atmosphere, which contributes to global warming. Major energy-consuming industries, including cement, lime, and steel manufacturing, as well as power plants, are minimizing their CO_2 footprint and becoming more aware of their role by adopting alternative fuels in place of fossil fuels.

The 2015 Paris Agreement to limit global warming to below 2.0 degrees Celsius was signed by 196 countries, each pledging to stop using fossil fuels before 2050. To accomplish this goal, individual governments are working towards progressively phasing out coal and other fossil fuels while at the same time accelerating the deployment of alternative sources to meet the ever-growing demand for energy.

For example in the EU, Germany has agreed to phase out coal-fired plants by 2038 at the latest and will require renewable energy sources to supply 65 percent of its gross electricity consumption by 2030[1]. Meanwhile, the state of California in the U.S. has committed to becoming “carbon-neutral” by 2045, which means that all fossil fuels must be replaced with reliable alternative energy sources by that time.[2]

[1] https://www.bmuv.de/en/topics/climate-adaptation/climate-protection/national-climate-policy/translate-to-english-fragen-und-antworten-zum-kohleausstieg-in-deutschland

[2] https://www.law.berkeley.edu/research/clee/research/climate/climate-change-and-business-research-initiative/setting-priorities-for-building decarbonization/

As these deadlines approach in countries all over the world, more and more energy-intensive industries will be pressured – legally, politically, and economically – to minimize their carbon footprint. At the same time, corporations are eager to demonstrate a commitment to sustainability that will enhance their social responsibility.

A transition to alternative fuels, such as a waste-derived fuel that replaces coal, can accomplish both tasks while retaining a good profit margin without subsidy and helping to solve the global waste problem. This transition is growing larger every day as the need for alternative fuels has never been as high as it is now.

KAREL JENNISSEN, FOUNDER AND CEO N+P GROUP

In this report, we take a deep dive into the most important factors that have led to the successful adoption of alternative fuels as a replacement to fossil fuels in various industries. We also explore ways that the benefits of waste-derived fuel can be transferred to new arenas while playing an important role in lowering global carbon levels.

HISTORY OF ALTERNATIVE FUELS

The Paris Agreement was the culmination of a multi-decade process. In 1992, the United Nations Framework Convention on Climate Change agreement was first developed to work towards combating climate change by limiting average global temperature increases.

Starting at about the same time, in the 1990s, the concept of using alternative fuels to replace fossil fuels within major energy-consuming industries began in the EU. This trend has grown steadily as more incentives, both political and economic, have been added to nudge companies towards using alternative fuels. Within the past five to eight years, this transition can now be considered a global trend.

N+P Group is a Dutch based company, with more than 30 years of experience manufacturing alternative fuels. The company discovered a way to turn non-recyclable waste into a high-quality alternative fuel in the form of small pellets engineered to replace coal as a fuel source – named Subcoal®.

Using this type of waste-derived fuel not only helps solve the problem of waste and plastics in the environment, but more importantly, can reduce the carbon footprint of many industrial companies. Over more than a decade, alternative fuels have been successfully burned in the kilns and boilers of factories that produce steel, cement, lime, and electrical power. Remarkably, the cement industry is already substituting over 70% to 75% of its fossil fuel with alternative fuels.

CLEANER FUEL
FROM PLASTICS

Unlike burning a plastic (water) bottle in a campfire, where it would produce black smoke and a terrible odor, the plastic parts in alternative fuels are quickly blasted in kilns at somewhere between 1,000 and 2,200 degrees Celsius, with emissions captured and controlled.

> **Actually, burning plastics, in an industrial process at high temperatures, is much cleaner than coal in terms of emissions. That's because plastics are made from oil that is heavily refined and purified to the point that it is clean enough to make a baby bottle or a container for food out of it.**

The process for producing alternative fuels begins with non-recyclable mixed waste streams (including paper and plastic), which are cleaned and then sorted. In this process, any material that can be recycled again, such as certain metals, and anything that will negatively affect the emissions or quality of the end product are removed.

"For example, we take out any PVC, which contains a large percentage of chlorine, because it disturbs the high temperature processes in kilns and has a negative impact on emissions," said Jennissen.

The result is an alternative fuel based on an ideal mix of plastics and biogenic parts, such as paper and wood, prepared to a specific industry's heating requirements and designed to reduce its carbon footprint and save on costs.

> **Keep in mind that every burning fuel produces CO_2, whether it's gas, wood, coal, or an alternative fuel, but burning alternative fuels produces less CO_2 than coal because of its higher percentage of biogenic content, making it a "greener" fuel.**

NEGATIVE PUBLIC IMAGE

VS INDUSTRY'S GROWING NEED FOR ALTERNATIVES

"To the general public, using recycled waste for fuel still has a negative image," said Jennissen. "But a lot of people are not aware of what's happening in certain industries, where there has been a complete acceptance of these kinds of products."

A great example is the cement industry in Western Europe, which is already substituting a large percentage of its primary fuel resources with alternative fuels.

"In cement manufacturing and related industries, such as the suppliers of their technical equipment, alternative fuels are completely accepted," said Jennissen. "We found that with minor or no adjustments, these plants are able to reach better outcomes with alternative fuels and for a lower price."

Great results like this place a high pressure on similar industries around the world to achieve these same rates in order to be as competitive and as sustainable as their colleagues in Western Europe.

"We now see demand for this fuel coming from cement kilns all over the world, including places like Africa and the U.S.," said Jennissen.

> **"In the future we expect to see many more industries explore the possibilities of using alternative fuels instead of fossil fuels.**

CO_2 EMISSIONS

PRICING PRESSURE

In their push for sustainability, each of the parties signing on to the Paris Agreement is developing financial and regulatory incentives to reduce emissions and increase the overall percentage of renewable energy sources in their total energy budget.

Until now, manufacturing industries had access to the fossil fuel they needed at an acceptable price, so there was little motive to explore alternatives. Developing and testing new technologies and adapting a plant to operate on a new fuel can be expensive and takes time – see the long transition period to electric cars, for example.

However, as the price of fossil fuels rises, along with expected new taxes on CO_2 designed to reduce emissions, the demand for alternative fuels at a lower cost and with fewer emissions will inevitably accelerate.

> **Certain industries in Europe will receive the same discretion as before to keep them on a level playing field internationally, but you can already see many Western countries considering a large CO_2 tax, equal to more than 100 Euros a tonne, and that's in addition to the cost of the carbon credit required for emitting CO_2.**

ENVIRONMENTAL

AUTHORITIES AND POLITICAL PRESSURE

Another important driver to replace fossil fuels with alternative fuels is pressure from politics, as well as regulatory and environmental authorities. The most recent UN report on climate change creates urgency around the topic. This pressure is still building within society and in politics, resulting in higher taxes and stricter regulations, along with heavier reliance on the traditional renewable energy sources, solar and wind.

However, recent years have shown that with unpredictable variations in wind and weather, as well as floods, fires, and other natural disasters, today's electric power grid still requires a significant contribution from fossil fuels and nuclear plants. Service outages for critical industries are unacceptable, but peak electricity use can cost as much as 10 or 20 times more than the base rate.

> **Solar and wind energy, along with today's battery storage technologies, don't yet create enough power for all the industries (and households) that need it, so we must look for more alternatives, we need a third option, and we think that should be waste-derived alternative fuels.**

SUSTAINABILITY

A GLOBAL PUSH FOR CLIMATE ACTION

Along with the economic driver to switch to alternative fuels, there's a sustainability driver. More and more companies are developing a vision of where they want to be in 10 years, in terms of emissions and alternative fuels. Because of the global push for climate action, this trend towards sustainability and social responsibility is developing even in countries that don't yet have a CO_2 emissions tax.

"While utility companies have begun to abandon fossil fuel-powered plants due to impending environmental and political pressures, at the same time, you have companies which see that as an opportunity and they are buying up industrial assets from these distressed sites," said Jennissen.

"We are talking to several businesses who are interested in using alternative fuels, like our Subcoal®, to replace coal and start up these plants again using a more sustainable fuel," he said. "In those industries and others, we expect to see the same pattern that we saw in the cement industry – one company will start using our product, two will follow, then three, and eventually all the companies in that industry will start using alternative fuel."

But industries are not the only ones interested in the latest developments towards alternative fuels. Universities have been studying the question of whether alternative fuels can be used to reduce CO_2 emissions and costs compared with coal for different industries. For example, the University of Leoben in Austria (Montanuniversitat Leoben) independently researched the use of Subcoal in blast furnaces for the steel industry.

“What you see is a trend at universities from all over the world to look into the impact and feasibility of alternative fuels for implementing it into their process to reduce the environmental impact in a cost-efficient way,” said Jennissen.

Sustainability, in the broadest sense of the word, is essential to reduce the global carbon footprint. At the Montanuniversität we research and support ways to achieve a circulair economy to contribute to Europe’s climate goals. We were therefore very pleased to carry out a study with N+P on her Subcoal® as an alternative reducing agent for blast furnaces. The results were exciting and promising and have been turned into real projects in Europe’s steel industry.

JOHANNES SCHENK
PROFESSOR - MONTANUNIVERSITÄT LEOBE AUSTRIA

SOLID WASTE AS A MINE

EVERY COUNTRY HAS ITS OWN SOURCE

Not only does alternative fuel create fewer emissions than coal, but another unique benefit of switching to waste-derived fuels is that every country in the world has a ready-made supply of non-recyclable solid waste. An enormous contribution can be made to reducing the environmental impact of overflowing landfills by processing local municipal waste into valuable new resources.

DID YOU KNOW THAT...

Globally 2 billion tonnes of waste is still going to landfill? This is the equivalent of 1 to 1.5 billion tonnes of coal.

Many governments will subsidize products that use waste, which can provide at least part of a solution to the worldwide plastic and landfill problem. And by taking advantage of their local sources, industrial plants built in each location can avoid the emissions created by international shipping of coal and oil and limit their dependence on third parties to supply their fossil fuels.

A great benefit of using local solid waste is that countries can keep their existing infrastructure for waste management while at the same time creating a new source of energy with it. For example, N+P Group currently has alternative fuel manufacturing facilities in Holland and the U.K. and is planning several additional plants in Holland as well as new factories in Austria, France, and the Czech Republic.

ALTERNATIVE FUELS
VS PRODUCT QUALITY

One of the misconceptions around alternative fuels is that they could have an insurmountable negative impact on the quality of the end-product. To date, the high-quality of the fuel combined with a long-term legacy of knowledge of all different types of production processes and with expertise in waste fractions has proven that potential effects on both the emissions and quality of cement, lime, steel, and other products can be figured out and solved.

“The process of switching to alternative fuels will depend on the experience the clients already have, but if you start a project in a new industry, the impact on quality and emissions will always be a point of discussion,” said Jennissen. “Although some challenges are to be expected, specialists can make sure with testing, analysis, and some adjustments, that the end result will be beneficial.”

According to Jennissen, a new project to supply alternative fuel like Subcoal® to fuel a power plant would definitely raise questions such as, “What is the influence on my emissions?” “What is the influence on my ashes?” “Is the material abrasive?” “Does it have an impact on my boiler?”

“These are quite normal questions, and you would ask similar questions if you wanted to switch from coal to oil, for example,” he said. “But only facts and testing can prove that switching to an alternative fuel can work for your specific industry.”

A HIGHER QUALITY
ALTERNATIVE FUEL

The business of processing non-recyclable waste into an alternative fuel has been pursued by various entities for over 30 years. However, the level of processing and quality standards of different companies and products differ significantly, which makes alternative fuel qualities hard to define. This is also evident from the investments which some industries have already made to utilize alternative fuels in their processes.

“Some industries, like the cement industry, are so flexible that their kilns can take that lower quality of fuel up to a certain amount,” said Jennissen. “What we are doing at N+P is upgrading this lower-quality fuel to a high-quality fuel, where, instead of substitution rates of 60% or 70%, they can substitute up to 100% of coal with our Subcoal®”

In addition to engineering the chemical properties of an alternative fuel, the handling properties of such fuels must also be considered. Typically, a waste-derived fuel handles very differently than milled coal or other fossil fuels.

“We invest significantly in the development of alternative fuels, specifically in upgrading the handling properties of our fuels,” said Jennissen. “By utilizing our proprietary new processing methods, we are able to almost fully replicate the handling properties of fossil fuels, so that users can utilize their existing infrastructure for our alternative fuel.”

THE FARMSUM PRODUCTION LOCATION PRODUCES 150 KTON ALTERNATIVE FUELS PER ANNUM

FUTURE
DEVELOPMENTS

“Producing plastics from oil means that along the way, you can produce methanol, ethanol, and other building blocks for the chemical industry,” said Jennissen. “If you take plastic waste, you can work backward, so to speak, and produce these same building blocks, and even aviation fuel, out of the waste again,” he said.

According to Jennissen, a key factor is understanding all the different “ingredients” in plastic and their specific chemical compounds. It is also both crucial as well as critical to understanding which parts of the waste are most suited for utilization in these processes.

“We are developing technologies which allow us to separate plastics from biogenic materials, so that we can utilize both streams in the most efficient and cost-effective way,” he said.

> **A lot of companies are now looking to build plants that take plastics and process them to generate oil, fuel, and other chemicals, these installations are already in development, with the first being built in 2023 or 2024, and we will be supplying many of them with our knowledge and waste-derived products.**

HELPING
TO MEET SUSTAINABILITY AND PROFIT GOALS

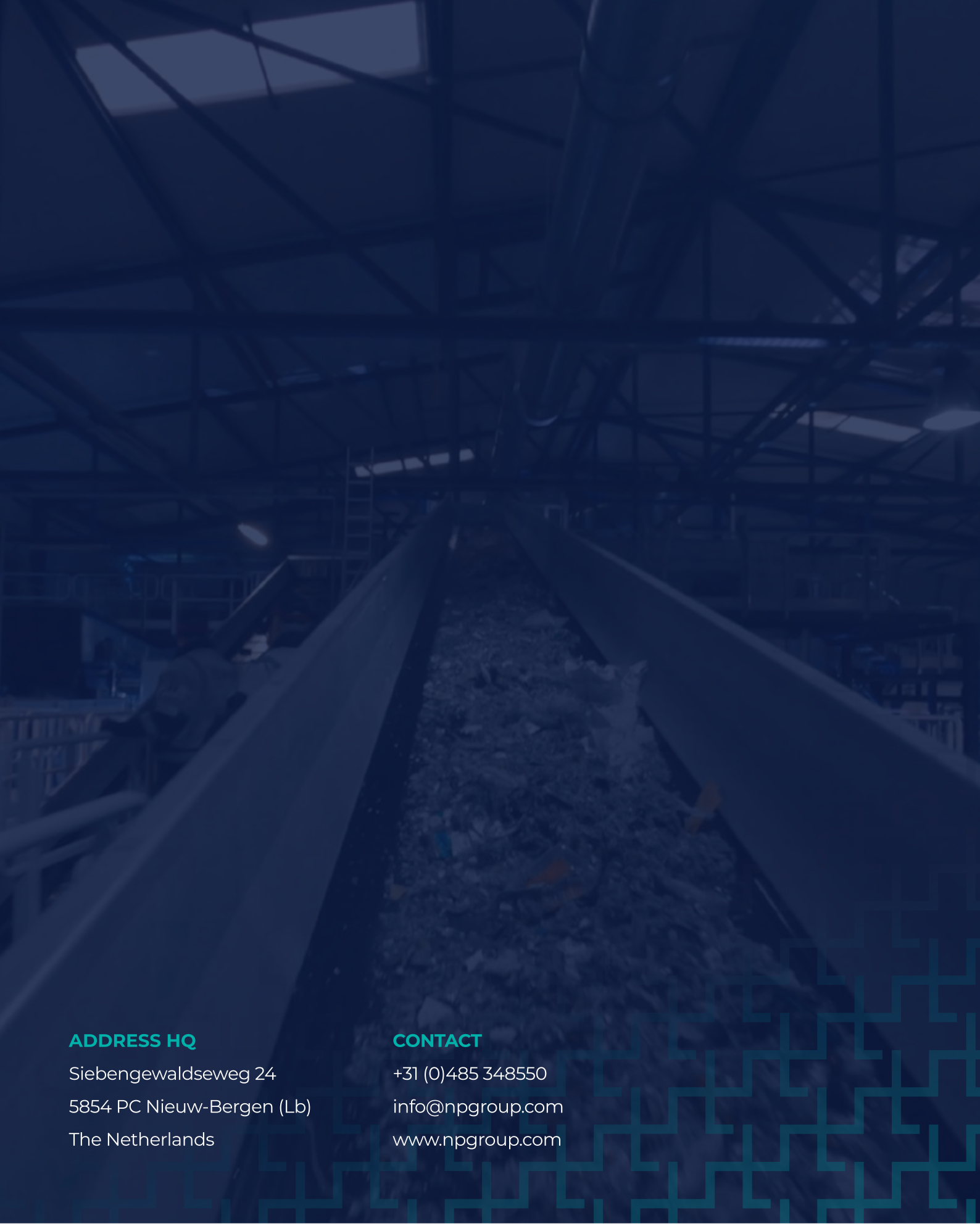
In the next few years, and certainly by 2030, global industries will face a crossroads. With the specter of climate change leading to legally binding commitments that each country has made to reduce CO_2 emissions and radically increase the use of alternative fuel sources, every factory will almost certainly need to make changes to the way they are producing using fossil fuels.

The standard renewable technologies, such as wind and solar generation, have limitations and will likely not be able to meet all the power requirements of industry for some time to come. And meanwhile, the environmental actions taken across the globe mean that the cost of both fossil fuels and CO_2 taxes and credits will continue to rise, with a corresponding negative impact on profits. At the same time, every industry will need to show measurable progress towards sustainability goals, in order to satisfy regulatory requirements and demonstrate socially responsible behavior.

With lower cost and lower emissions, high-quality alternative fuels, such as Subcoal® by N+P Group, have helped dozens of industrial installations around the world improve their emissions, while maintaining their product quality and stability. An alternative fuel like Subcoal® can be designed to fit a specific process, with a consistent level of output and emissions.

To find out if alternative fuels could prove to be the perfect answer to your profit and sustainability goals, talk to our specialist about the possibilities for your transition towards waste-derived alternative fuels.

Talk to a specialist →



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