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Why Greenwashing doesn't Help!

20 years ago the term Alternative Fuel (AF) was much less well known than it is today. I remember a conference of the Arab Union for Cement and Building Materials (AUCBM) where I made a presentation on "processing waste as a sustainable fuel". I think 80% of the participants didn't even understand what the topic was about. After the presentation, a delegate from the Libyan cement industry came to me and said "excellent presentation and topic." However, "a bit too early" but "this will be the future", he stated.

Nowdays, everyone is talking about "Alternative Fuels". I was going through websites of multinational companies from different industries, not only the cement industry. The headlines feature expressions such as "sustainable" and "recyclable" products, "produced with renewable energy", "bio", "organic"; the term sustainability has become a catchphrase. You can't even find normal products in the supermarket. All products are "green" and "organic". Is this reality? Or marketing campaigns of the so called "clever strategists of multinationals"?

It's simple – being seen as ethical drives profitability. A report by McKinsey found that Gen Z (people born roughly between 1996 and 2010) are more likely to spend money on companies and brands seen to be ethical. Another, Nielson's global corporate sustainability report, found that 66% of consumers would spend more on a product if it comes from a sustainable brand, and that jumps to 73% among millennials. Therefore, companies have a financial incentive to be more environmental conscious or at least appear to be.

You buy a product and the producer pays somebody to plant a tree. Great! You fly into vacation and your CO_2 footprint is "offset" by – again planting a tree.

Recently, a German newspaper published an article about those companies that neutralize CO_2 emissions or even make them "positive". Around 90% of these companies could not provide any evidence of the CO_2 neutralization or impact they have contributed to CO_2 neutralization, they could not even provide information about how the plantations have developed, or how many trees they have actually grown. Maybe the unsuspecting consumer doesn't even want to know this? Or it is much easier to fly on holiday and to have a good feeling that the flight emissions are being neutralized, meanwhile, aviation emissions have doubled since the mid-1980s and representing approximately 2% of global CO_2 emissions which also proves that, the majority of actions against CO_2 neutralisation have been a hoax.

In the cement industry, cement manufacturers are publishing ambitious targets to half CO_2 emissions by 2030. The cement is now turning green! Is it that easy?

- The fact is that, global emissions in cement production continue to rise solely as a result of increased production capacities so far approximately 6 - 7% of global CO_2 emissions.
- Also, in the chemical manufacturing industry where half of the world's disposable plastic has been produced in the last 16 years, and 91% of the plastic produced globally is not recycled. This is why companies making claims to manufacture "reusable plastic" can be regarded as being harmful. In the first place we need to produce and consume less plastic.

It's all very well and good to keep on producing recyclable plastic but the above statistics show that this is meaningless if this plastic is still going to end up in a landfill. Many types of plastic are difficult to recycle, either because countries don't have the necessary machinery and infrastructure or because people simply don't have the time or will to recycle their goods.

Unfortunately, there are many examples of organisations engaging in greenwashing.

- In 2018, Nestlé released a statement saying that it had "ambitions" for its packaging to be 100% recyclable or reusable by 2025. However, environmental groups were quick to point out that the company hadn't released clear targets, a timeline to accompany its ambitions or additional efforts to help facilitate recycling by consumers.
- In 2020, Nestlé, along with Coca-Cola and PepsiCo, was named the world's top plastic polluters for the third year in a row.

I can continue this list indefinitely. Unfortunately, I have to say that hardly any of these goals are achieved. Apparently, we consumers have to decide for ourselves what we want and thus also partly renounce cherished habits.

Dirk Lechtenberg
Managing Director
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Biomass in Cement Plants

By Vladimir Dimitrov, MVW Lechtenberg & Partner

Introduction

Biomass is the oldest source of energy after the sun, it is any organic matter that can be used as an energy source. Organic material comes from living organisms such as plants and animals. Most often, biomass consists of wood and waste plants, which are called raw materials for biomass. Energy from these organisms can be transformed and used directly or indirectly by generating electricity, heat and biofuels.

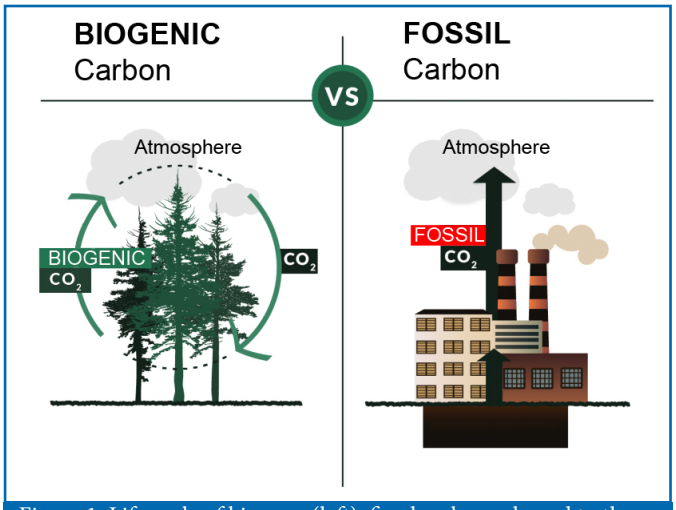

Figure 1: Life cycle of biomass (left), fixed carbon released to the atmosphere (right) [1].

The environmental impact of fossil fuels and biomass in their combustion is significantly different. It is expressed in the fact that plants and organisms have a life cycle related to the atmosphere and when they are used as fuel, the substances they emit do not differ from those when they rot. On the other hand, fossil fuels do not come into contact with the earth's atmosphere before they are removed from the earth. They lack the interconnectedness of plants.

Biomass in Cement Industry

The most consumed material after water is concrete, with billions of tonnes used every year. The production process of cement is highly energy intensive, and one of the major contributors to the world's anthropogenic carbon dioxide emissions. Cement is the source of about 7% [2] of the world's carbon dioxide (CO_2) emissions.

These high releases of CO_2 are a result of the calcination of raw materials and the burning of fossil fuels (Figure 2 and Figure 3), making the production process a sustainability threat to global warming. Moreover, the use of fossil fuel in cement production contributes to the high cost associated with its finished products, along with cost for electrical energy. As the demand for cement is expected to increase, it is paramount to find alternative ways to reduce the embodied energy and carbon of cement by the use of alternative green fuels.

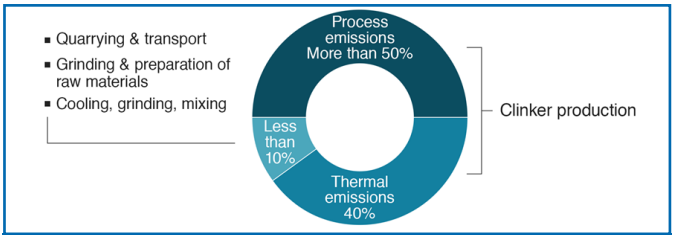

Figure 2: CO_2 contribution areas in the cement production process [3].

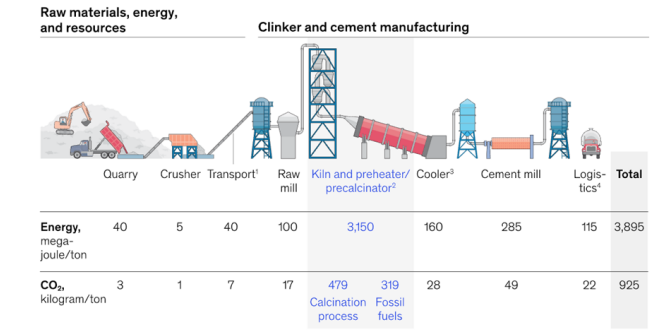

Figure 3: Energy and CO_2 contribution by process in cement manufacturing [4].

Moreover, the global environmental targets for a carbon neutral economy, put enormous pressure on fossil fuel-based industries. The EU is at the forefront

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of tackling the root causes of climate change and strengthening a coherent global response under the Paris Agreement. The Paris Agreement, backed by 181 countries, calls for strong and rapid global action to reduce greenhouse gas emissions in order to keep global temperatures below 2°C and work to reduce them to 1.5°C [5]. It also aims to balance emissions from sources with those absorbed by global greenhouse gas sinks in the second half of this century. The main goals of the European Green Deal are to achieve a climate-neutral economy by 2050.

One of the alternative green initiatives to make the production of cement more sustainable is by replacing fossil fuels with greener options such as biomass. Having a greener and more sustainable cement production is a combination of different factors, part of these factors is the use of biomass as a renewable source of energy, however, posed challenges that can be solved. The sustainable initiative of using biomass energy in cement production will lead to a reduction of the fossil fuel use and the overall carbon emissions, respectively which will also reduce the cement cost.

Processing and Feeding of Biomass in Cement Industry

- **Transportation and Storage**

At the source site, the small grain-sized biomass can be collected in bulk or in big bags, depending on the collection system. Pelletizing and baling are an option for space and transport optimization. Both pellets and bales can reduce fugitive dust emissions. However, pelletizing or baling are expensive.

Transportation is usually carried out by means of trucks from local subcontractors. For transport volumes, the bulk density is an important factor. The type of transport depends on the physical state of the material, bulk, baled or compacted. The trucks should be covered with a tarpaulin in order to prevent cargo losses and material spreading to the environs.

During storage at the cement plant site, biomass should be protected from rain and wind in order to avoid both soaking and fugitive emissions. Biomass should be stored at least on dry ground and covered with plastic film, in a storage hall or silo.

Most of the biomass types generate dust emissions. Dust can create respiratory problems, explosion or to create self-ignition due to its organic origin.

- **Processing of Biomass**

Some biomass types are virtually ready-to-use fuel, depending on their grain size. Grain size less than 10 cm is sufficient for feeding into the calciner burner. Nevertheless, it is advised to screen the biomass, prior to feeding in order to disaggregate lumpy material. Mixing with other alternative fuels such as RDF, small tire chips and others is possible.

Some biomass has to comminuted to a defined size. This can be achieved by wood chippers, mills or shredders, depending on the type of biomass. After comminution, screening is required (e.g. 30 mm) in order to avoid oversized material, which can cause blockages during the feeding.

A small treatment facility, consisting of a hammer crusher or drum screen, represents a reliable technical pre-treatment solution. Direct combustion of biomass is the simplest way to exploit its high energy content.

- **Dosing and Feeding**

Mechanical conveying via screw conveyors and feeding through a screw weigher is also possible. The conveying system can consist of a hopper equipped with a scraper drag out conveyor which conveys the biomass to the metering device, and the feeding point, respectively.

Biomass can be fed gravimetrically by rotary weigh feeders. Some biomass may have very low bulk density; therefore, metering could be inaccurate by accumulating differences between the displayed and actual feed quantities.

- **Quality Influence on Clinker**

Usually, biomass has a very low ash content, so the influence on clinker is quite low, nearly negligible. However, special attention should be paid due to possible contamination with soil, and sand (silica). In case biomass with high silica content is used as fuel, the silica module and lime saturation factor have to be monitored and adjusted.

Types of Biomass

Various types of biomasses can be used directly in the cement kilns. The following are some general types:

- Biomass originating from forestry, such as wood chips and twigs.
- Biomass from C&D activities, such as wood

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chips, saw dust.

- Biomass-derived industrial waste, such as waste paper and paperboard.
- Saw dust originating from different sources.
- Agricultural residues, like sugar cane or beet, cereals, rice stalks, nut shells, sunflower, rice husks, etc.
- Energy crops cultivated for fuel - fast growing trees such as poplars, willows and grasses such as tufts or elephant grass.

Examples of other types of fuels considered as biomass suppose methane collected from landfills, sludge from urban wastewater treatment and animal manure, meat and bone meal. These are fuels, which cannot be used directly, but require prior pre-treatment process.

The biomass can be used in all three physical state solid, liquid and gaseous:

- Solid biomass can be used in cement plants, directly or after minor physical processing, such as chipping or milling.
- Methane gas emitted by landfills can be collected, purify and used as an energy source. Methane, commonly known as natural gas, is an excellent energy source. Most gas furnaces and gas stoves use methane supplied by natural gas utility companies. Very often only a portion of landfill gas is used to provide energy. Most is burned off at the landfill. However, with today's high natural gas prices, this higher-priced "biogas" will become even more competitive.
- Ethanol and methanol can be produced from wheat, corn and other crops, for example, in the form of liquefied biomass.

- Forestry Biomass

After logging, there are different types of residues that are suitable for energy production and other technological processing. These are branches, bark, stumps, roots, firewood, twigs, and leaves are a resource for energy production. The branches and the top are log waste, usually accounting for around 15-20% from each tree. In many countries, only a small part of them is used, as the collection of small wood is considered economically inefficient. Forest residues have low density and low calorific power.

European practice has established that the collection of wood residues and branches with a thickness of not less than 10-12 cm has a high energy application. In order to use wood chips from forestry as an alternative fuel, the local logging companies must be motivated for collection, chipping and transportation of the forest residues. Quality control must be established by the consumer.

On the other hand, forest wood waste bears a good potential to produce pellets and eco-briquettes. Wood waste from the wood processing industry e.g. sawdust and chips are also important for energy production.

Picture 1: Wood biomass – branches in many cases are left in the forest [6].

Picture 2: Wood biomass – branches left in the forest [6].

Picture 3: Wood chips from branches [7].

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Picture 4: Wood pellets and briquettes [8].

Picture 5: Wood pellets and briquettes [8].

- Saw Dust

Saw dust is a by-product in lumber mills, furniture and other wood processing. Saw dust is usually utilized for heating purposes in the lumber mills itself, or used in other industries for different purposes, like absorbent, heating, pellets and briquettes or use as raw material for the production of floor flatness, bricks or roof-tiles and others.

- Agriculture Residues

Solid agricultural waste is generated during the cultivation and processing of crops, their amount depends on the annual harvest and the harvested areas. Such agricultural wastes are, for example straw, corn stalks, sunflower stalks, tobacco sticks, vine sticks, beet, cereals, rice stalks, rice and sunflower husks, nut shells, olive residues, bagasse, and much more. They all have different specifics and qualities, especially important for their subsequent process of use.

Picture 6: Different grain sizes of saw dust [9].

Picture 7: Agricultural waste examples [7].

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Bioenergy production makes it possible to utilize accompanying agricultural products. For example, the stems of corn, rapeseed and others are widely used in bioenergy production. The main agricultural residues for energy production are wheat, straw and corn fodder. Corn feed has a higher caloric content and wheat straw has a lower caloric power. Straw is a solid agricultural waste that is used mainly in crop and livestock production and not a small part of it can be used for energy needs.

Perennial energy crops are also cultivated. Such are sweet sorghum, bamboo and others. They are cost-effective and sustainable for energy production. Herbaceous species, yellow reed and arrow grass belong to the cultivated high-calorific energy crops.

Biomass for energy production also includes manure from livestock. Technologies such as direct combustion, combustion after mixing with solid fuels, pyrolysis, gasification, anaerobic decomposition are used to produce electricity from biomass.

- **Rice Husk**

Rice husks are constituents of rice grains. The hulls are the protective coverings of rice grains during the growing season. Rice husks are typical agricultural residues generated in rice mills as loose material.

Picture 8: Rice husk [10].

- **Sunflower Husk**

Sunflower husk refers to shells of sunflower fruits after the seeds are taken out. As sunflower is planted widely all around the world, every year a large number of sunflower seed is harvested. Its utilization is low, but with the development of biomass pelletizing technique and the invention of biomass pellet machines, sunflower husk has become a promising raw material for biomass pellets processing.

After harvest, the sunflower processors usually perform the following actions separately or in one process:

- Separate the husk from the pip.
- Produce oil cake by pressing the pips.
- Refine and produce oil.

Most of the processors operate boilers or pelletizers and use the sunflower husk for heating or producing pellets. The generated heat is used in the production process or heating in the winter.

Picture 9: Sunflower husk [11].

- **Industrial and C&D Waste Biomass**

Construction and demolition work and certain industries, such as pellet, boards, sleepers, wood from the manufacture of furniture, etc, can serve as a potential supply of fractions of biomass. However, some of these waste woods is consumed within the facilities for heating purposes, or production of pellets or power generation.

Wood is a natural material and therefore from the point of its origin harmless without any hazardous characteristics. But in further processing it is often treated with preservatives that should protect the wood from external influences like fungi. These wood preservatives are harmful. They can contain toxic metal compounds, PCBs, glue and other adhesives. For example, railway sleepers and telephone poles are contaminated wood. Other contaminants in used wood are polymeric materials, paper, board, paint and insulating materials.

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Picture 10: Industrial waste biomass examples [12,13,14].

Biomass Quality and Characteristics

From its origin, the biomass does not contain harmful substances. However, the processing of biomass generates dust, which harms the respiratory tract of the worker's, therefore, using personal protective equipment (PPE) is required. There is also certain danger of anaerobically initiated self-ignition. Table 1 below shows overview and characteristics of biomass.

Conclusion

Switching to biomass fuels is desirable to the cement industry from both environmental and economic aspects. This article highlights the different kinds of biomass that are available or can be produced with support of local stakeholders. Currently, there is a trend in cement plants relying on varieties of biomass available in the market. The key issue is to obtain sustainable long-term supply.

Types / Parameters	Moisture	NCV	Volatiles	Ash	Bulk density
	%	Kcal/kg	%	%	Kg/m^3 (compacted)
Sunflower husk	9.33	4,515	77.13	4.22	127
Rice husk	9.17	3,240	62.80	19.11	96
Saw dusk	24.96	3,663	72.12	0.69	246
Wood chips (air dried)	16.52	3,700	73.54	2.53	300
Wood chips (fresh)	50.00		84.88	0.60	
Industrial biomass	50.07	2,524	77.39	0.23	370
Wood waste	15.00	3,600	71.89	5.0	
Artichoke	12.30	3,656	74.32	9.12	124
Mischanthus	9.36	4,173	75.26	7.70	117
Switchgrass	4.13	3,879	80.55	7.22	105
Begasses	48.80	1,800	79.90	2.20	250
Olive kernels	13.50	4,000	61.10	8.70	558
Straw	10.20	4,200		7.80	130

Table 1: Typical biomass quality [7].

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Processed Engineered Fuels – the New RDF Production Facility of MVW Lechtenberg & Partner

By Dirk Lechtenberg, MVW Lechtenberg & Partner

Summary

For about 40 years, alternative fuels (AF) for the cement industry have been produced from defined wastes, primarily industrial wastes and mixed commercial wastes. With increasing substitution rates, the requirements on the quality of alternative fuels are rising. Due to increasing legal requirements on recycling and more sophisticated sorting technologies, which enable improved separation of recyclable waste materials, the quantities of waste for thermal recycling in the cement industry are decreasing. In addition to this, rising CO_2 certificate prices are forcing the cement and lime industries to increase their efforts in using biogenic waste materials such as biomass, which must be processed accordingly.

MVW Lechtenberg & Partner, Germany, through its associated company, has built a state-of-the-art processing plant for the production of homogeneous substitute fuels, in which defined wastes are processed into alternative fuels that are used as equivalent coal substitute.

Alternative Fuels

In the mid-eighties, after carrying out initial trials utilising household-waste as alternative fuels, so-called “BRAM“ (Brennstoff aus Müll: fuel from waste) at a Westphalian cement plant, employment of alternative fuels has in the meantime evolved into becoming the mainstay in fuel supply. Since the eighties the German Cement Works Association (Verein Deutscher Zementwerke e.V. (VDZ, Düsseldorf)) has been documenting the use of alternative fuels in the Federal German cement industry.

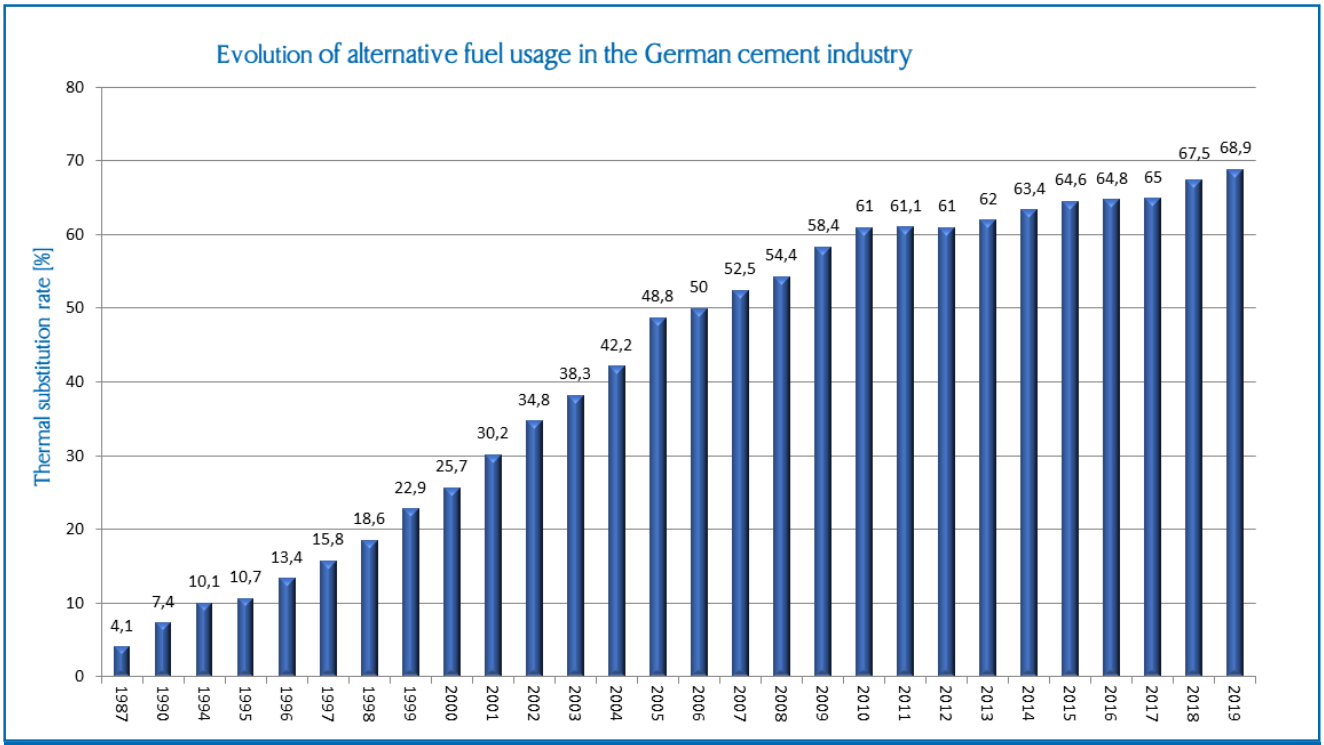

Figure 1: Trend in thermal substitution rates in the German cement industry (source: graph: MVW Lechtenberg; numbers: [2]).

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As from 1987 onwards, the numbers as detailed in Figure 1 show the impressive trend in utilisation of alternative fuels in Germen cement plants. The chart exhibits that usage of alternative fuels has been very advanced over the past 32 years.

It should be pointed out that the chart displays average numbers. The range of AF utilisation spans from nil to nearly 100% in German clinker kilns. On global level the thermal substitution rates in European countries are ahead of the rest of the world. Figure 2 shows the trend in average substitution rates in the European cement industry.

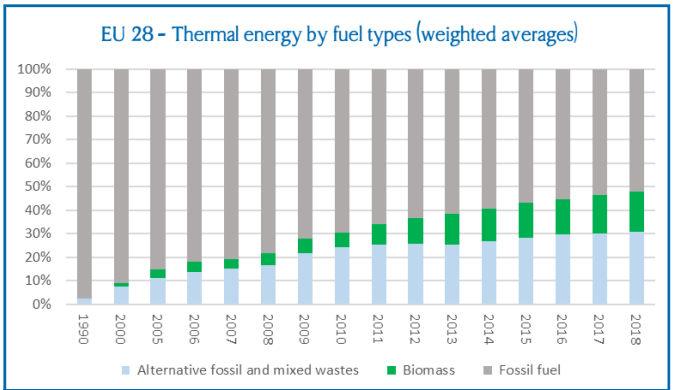

Figure 2: Trend in thermal substitution rates in the European cement industry [1].

Quality Requirements on Alternative Fuels

The quality requirements for the alternative fuels used are based, on the one hand, on emission control regulations and, on the other hand, on requirements for the clinker production process. The lower the thermal substitution rates, the lower the process-related requirements for the alternative fuel; the higher the substitution rates, the higher the requirements.

Table 1 shows the specifications for kiln burner alternative fuels in a German cement plant in 2004 (at 25% substitution rate) and in 2020 (at 60% substitution rate). In addition to a significant adjustment of the chlorine content from <1% to now <0.5%, the permissible moisture contents, ash contents and particle sizes have been adjusted accordingly. These parameters have a significant influence on the clinker production process. The calorific value has been set to a minimum calorific value from 20 MJ/kg to now 22 MJ/kg.

Conventional Refuse-Derived Fuel Production

Conventional alternative fuels for kiln burner firing are primarily made from separately collected high caloric fractions from industrial and commercial waste, such as plastics and products containing plastics. For example, around 2 million tonnes of these fractions, each processed into “fluff”, were used in German cement plants in 2019, i.e. 53,8% of all refuse-derived fuels (Table 1).

Specification 2004			Specification 2020		
	Component	Max. value		Component	Max. value
Mechanical properties - max. grain size <=20mm in one dimension (Film in two dimensions) Dustcontent <0,5 mm = max. 10%		20 mm	Mechanical properties - max. grain size <=15mm in one dimension (Film in two dimensions) Dustcontent <0,5 mm = max. 5%		15 mm
	Chemical Properties			Chemical Properties	
Calorific value, as received Minimum 20 - 40 MJ/kg	H_2O	20%	Calorific value, as received Minimum 22 - 40 MJ/kg	H_2O	10%
	H	--		H	--
	S	1%		S	1%
	O	--		O	--
	N	5%		N	5%
	C	--		C	--
	Cl-	1%		Cl-	0,50%
	F-	0,05%		F-	0,05%
	Ash content	25%		Ash content	15%

Table 1: Specifications of alternative fuel for kiln burner firing in a German cement plant

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Alternative fuels	Tonnes	% by weight
Used tyres	175.000	4,6%
Waste oil	70.000	1,8%
Fractions of industrial and commercial waste	2.042.000	53,8%
thereof pulp, paper and cardboard	79.000	
… plastics	806.000	
… wastes from the textile industry	6.000	
….others	1.151.000	
Meat and bone meal and animal fat	164.000	4,3%
Mixed fractions of municipal waste	370.000	9,8%
Waste wood	1.000	0,0%
Solvents	129.000	3,4%
Sewage sludge	703.000	18,5%
Others (oil sludges, organic distillation residues etc.)	140.000	3,7%
Total	**3.794.000**	

Table 2: Volumes of alternative fuels used in German cement plants in 2019 [3].

Suitable waste is delivered directly from the production sites to the RDF processors and processed using simple, but proven techniques (shredding, screening, sifting, non-ferrous and ferrous separation). At many RDF processors, only the simplest process steps are carried out, i.e. the materials are usually crushed in two stages to the desired particle size, and metals are separated by means of magnets. Such companies are specialised in the processing of pure production waste and already pre-sorted waste fractions.

Such production waste accumulates either discontinuously or continuously in the production process and usually has to be removed and recycled "just in time" by the industrial plants. As a result, there are fluctuations in the quality of the alternative fuel, since the same waste materials are not always available in consistent quantities to create an appropriate "fuel recipe". Furthermore, seasonal fluctuations in the quality of alternative fuel (variations in the moisture content due to the influence of rain, seasonal production fluctuations in the waste-producing companies, etc.) show their influence on the quality of the alternative fuel.

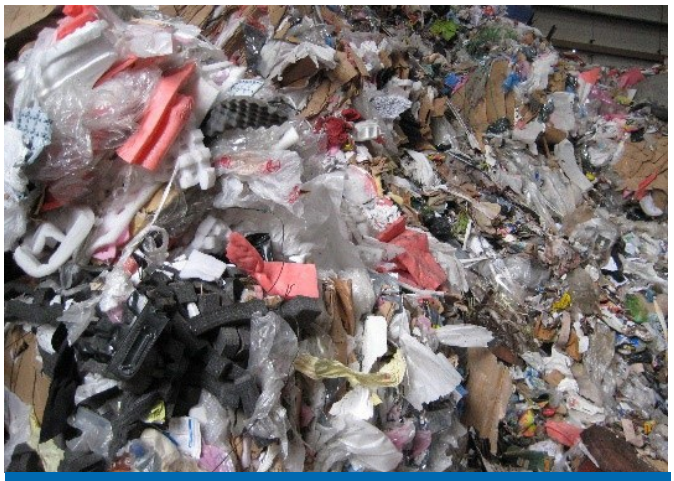

Figure 3: Mixed industrial waste (source: MVW Lechtenberg)

Figure 4: Processed industrial waste as "fluffy" SRF (source: MVW Lechtenberg)

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Looking Ahead: Requirements for the Future

With constantly rising substitution rates the requirements for alternative fuel quality accrue. At the same time, the cement industry is planning a further increase in substitution rates (for instance, HeidelbergCement group from 25,7% in 2020 to 43% by 2030 [4], LafargeHolcim wants to increase its total waste/raw material input from 46 million tonnes in 2020 to 100 million tonnes in 2030 [5]). This is primarily to reduce fuel-related fossil CO_2 emissions.

Typical fluffy alternative fuels, such as those used predominantly in the cement industry, consist largely of plastics or products containing plastics, such as composite packaging. These materials contain only small amounts of "biogenic" substances, such as cardboard, paper, natural fibres, etc.

The biogenic content of fuel is getting increasingly important for the global cement industry in order to reduce fuel-related fossil CO_2 emissions.

At the same time, legislators are requiring increasingly higher demands on recycling, especially of plastic products. For example, the German legislator has increased the quotas for "mechanical recycling" for all packaging waste in the context of the framework of the Packaging Ordinance. By 2022, 63% of plastic packaging must be recycled. This has already resulted in considerable investments in corresponding sorting plants, so that the total available quantities of high caloric waste that are suitable for processing as alternative fuel are reduced.

In order to meet the resulting requirements in alternative fuel production, MVW Lechtenberg & Partner has now built one of the most modern alternative fuel processing plants in the port of Papenburg in Germany. MVW Lechtenberg has been operating a handling facility for high-caloric waste and alternative fuels at the Papenburg site since 2004. Defined alternative fuels are delivered there from processing companies, they are subject to quality control and, after appropriate treatment (baling, packaging), are shipped via sea vessels, mainly to cement plants in the Scandinavian region. Through its own subsidiary "Blue River recycling", this plant was erected in Papenburg in a hall of around 8.000 square metres and with an investment volume of nearly €10 million.

Production Process

Up to 16.000 tonnes of specified raw materials, i.e. sorted, defined mixed plastic fractions, coated papers from the Dual Systems as well as defined sorting fractions from commercial waste sorting plants, can be stored at the site, and independently of seasonal fluctuations. These pre-sorted fractions enable the recipe and production of a consistent alternative fuels. After intensive quality control, the waste materials, most of which are delivered by truck, are bar-coded to ensure traceability, and stored separately. Each truck load is assigned to a dedicated storage area. The operating personnel receive a "recipe" so that precisely defined premixes can be created using the barcodes and stored quality information.

The respective fractions are fed to the processing plant by means of front loaders.

The facility has two separate processing lines to ensure high availability. This makes it possible to maintain individual units (shredder, NIR, hard particle separator, pelletiser, etc.) so that the plant only has to be switched off briefly for maintenance purposes of the CHP. The plant operates three shifts per day, and around 7.000 hours per year.

The energy demand is covered by a captive power plant (i.e. combined heat and power plant (CHP) of 4,6 MWth, which runs on natural gas and an increasing proportion of biogas.

The already pre-sorted waste is shredded to less than 30mm by means of a single-shaft shredder. The infeed volume is around 7-8 tonnes per hour per line. Leaving the shredders, the material passes various separators – ferrous and non-ferrous metal as well as heavy particles separators. After that, the material is temporarily stored in dosing bunkers.

Owing to the two separate processing lines it is possible to mix different materials from these bunkers. By means of several NIR sensors the parameters chlorine, moisture, calorific value, ash contents are determined from the material flow, so that a continuous quality control and, via integrated load cells, also a homogeneous mixture can be carried out.

The homogenised material is fed into two dryers. One of them is a drum dryer that uses the hot exhaust gases from the CHP unit to dry the finely prepared infeed. The other is a belt dryer that uses the hot

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cooling water from the CHP unit as an energy source by means of finned tube coil heat exchangers. This makes it possible to operate the CHP with around 85% energy efficiency.

The entire evaporation capacity is about 1,5 tonnes of water per hour, resulting in a residual moisture content of around 6%. Sensor technology controls the dryers accordingly and precisely in terms of throughput and residence time. Then, the dried and finely processed material can be fed either to the pelletising unit or supplied to local customers as fluffy alternative fuel for kiln burner firing.

The pelleting unit consists of 4 large flat-die pelletisers, each having a capacity of about 3 tonnes per hour. The pellets are further dried by the pelletising process as well as subsequent cooling with ambient air. The fines are removed from the produced pellets by a vibration screen. Having passed the screen, the pellets are stored after a quality control by means of NIR and quantity monitoring of the mass flow. The storage facility has a capacity of around 10.000 tonnes, so that a continuous supply for transport by inland waterway vessel and sea-going ship is guaranteed.

In addition to the directly processed materials, other defined waste materials or biomasses, such as wood shavings, etc., can also be added by means of further dosing devices in order to meet customer requirements.

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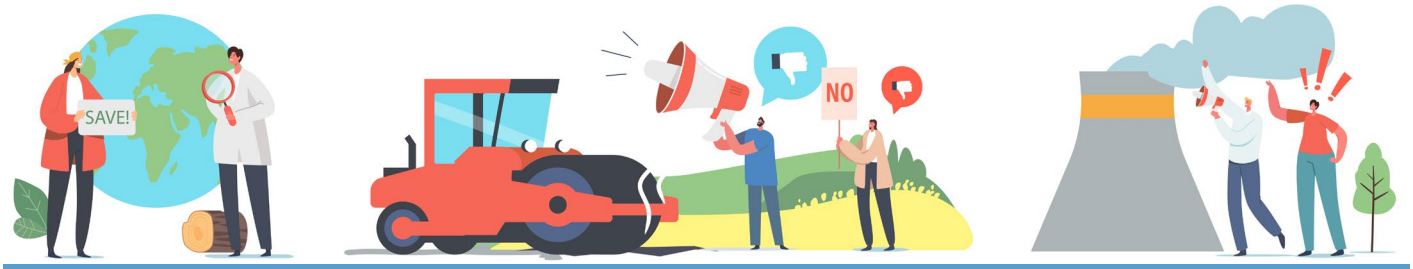

Excuse me for Breathing

By Dr. Hansjörg Diller, MVW Lechtenberg & Partner

The other day I read an article in a German magazine [1] that intrigued me. It started with the question on how much carbon dioxide is being emitted every day by human beings while breathing. And, consequently, what influence do we all have on the climate just because of mere breathing?

Let's assume a human at rest breathes 17 times per minute, which sums up to 4,467 million litres of exhalation air per year. Of this, 3,37% is CO_2 (after deduction of the basic CO_2 level of ambient air), or 150.558 litres per year. In order to determine the weight of CO_2, we need to multiply the gas volume by its specific weight.

Let's do a quick exercise. According to my encyclopedia [2] the normal breathing frequency of adults, at rest, is about 10 to 17 breaths per minute, whilst for children it can be as many as 20 to 25 times. At rest, our bodies exhale around 0,5 litres of air. While inhaled air contains 21% oxygen, and 0,03% CO_2, oxygen goes down to 16%, and CO_2 goes up to 3,4% in exhaled air.

The specific weight of a gas depends on the temperature, the higher the latter, the lower the specific weight. At 37°C (the normal body temperature) CO_2 has a specific weight of 1,74 g/litre [3]. Ultimately, our human fellow will transmit around 262 kg of CO_2 per year. This doesn't sound much until you take into account the fact that the world's population is around 7,7 billion, collectively breathing out around 2 billion tonnes of the stuff each year which

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is around nearly 5,7% of the CO_2 tonnage released by the burning of fossil fuel across the globe in 2020 [4]. Or, around 75% of the CO_2 tonnage coming from India [3].

If all human beings were in a hurry, breathing frequency would go up to about 90, then the CO_2 would go up to around 10,7 billion tonnes, which is equal to China [3].

I know that's merely a back-on-the-envelope calculation, but it shows the order of magnitude. Let's face it, we humans are a significant contributor to global warming, just because we breathe! So, let's all stop breathing and save our climate! – Hang on though, there is something fishy about the considerations so far.

In reality, the CO_2 we're breathing out is part of a natural cycle. Our bodies convert carbohydrates from CO_2 absorbing plants into energy, as well as fats and proteins from animals, which were raised on plant products. When we digest our diet, actually, a combustion of nutritions happens in our bodies, however, at very low temperatures. The combustion products are water and CO_2 which is exhaled. As such, we're not adding any extra CO_2 to the atmosphere.

The CO_2 we exhale has always been present in the biological cycle of nature. When we eat animals or plants, we supply ourselves with chemically bound carbon and later exhale it again as carbon dioxide. Plants draw this CO_2 from the atmosphere again and, with the help of solar energy, create new food for humans or animals - grain, fruit, grass. Our usual diet can be regarded as biogenic fuel, so to speak, and this is renewable. Consequently, the natural carbon cycle is closed. As long as we eat food that is produced in a climate-friendly way, our breath does not harm the climate.

In contrast, burning fossil fuels like coal, oil, or gas releases CO_2 which has been locked up for millions of years, producing a net contribution to global warming.

Clearly then, by living and breathing we are not contributing to global warming through the release of $CO_{2.}$ so breathe easy.

But can we help reduce global warming by dying? Probably. Not by just stopping breathing! When mankind expires, there will be no combustion of fossil resources any longer.

Would the climate be saved then? Not at all, because there would be no one who can participate to this.

To be honest, nature itself will for sure get along also without our presence, eventually. Would this an attractive perspective for mankind? I'm positive you've got the right answer!

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The Surge in the Use of Alternative Fuels in Global Cement Industry

By Ankur Saini, MVW Lechtenberg & Partner

The targets and roadmaps have been set by cement manufacturers all over the world with regard to maximising the utilisation of alternative fuels (AF) that will supplement their goal of global climate target to reach net zero.

The goal of incorporating "alternative fuels" in their fuel mix in the coming years is becoming more and more essential in order to cope with the emissions.

Last year (2021), the so-called "Thermal Substitution Rate" (TSR), i.e. the substitution of conventional fuels by alternative fuels, continued to increase at almost all cement plants across the globe. A roadmap laid by the Global Cement and Concrete Association (GCCA) leading companies across the continents to achieve a net-zero target is in motion. As cement giants quite ambitiously looking to optimise the alternative fuel usage in their fuel mix.

The annual and sustainability reports from the world's largest cement industries have confirmed that almost all companies in this sector continued to increase their TSR. However, the alternative fuel usage in the Asian cement industry is still very low compared to their European counterparts and around the world. Recently there has been a shift in the acceptance of the alternative fuel usage where cement plants in Asia have started to put more efforts into increasing their TSR. Irish CRH is topping the chart across the group global cement industry with 33% of TSR in 2021 followed by the Swiss group Holcim at 21.3%. Figure 1 illustrates the biggest cement manufacturers and their TSR for three consecutive years. Also, this article further entails the alternative fuel usage journey of big global cement companies and their targets.

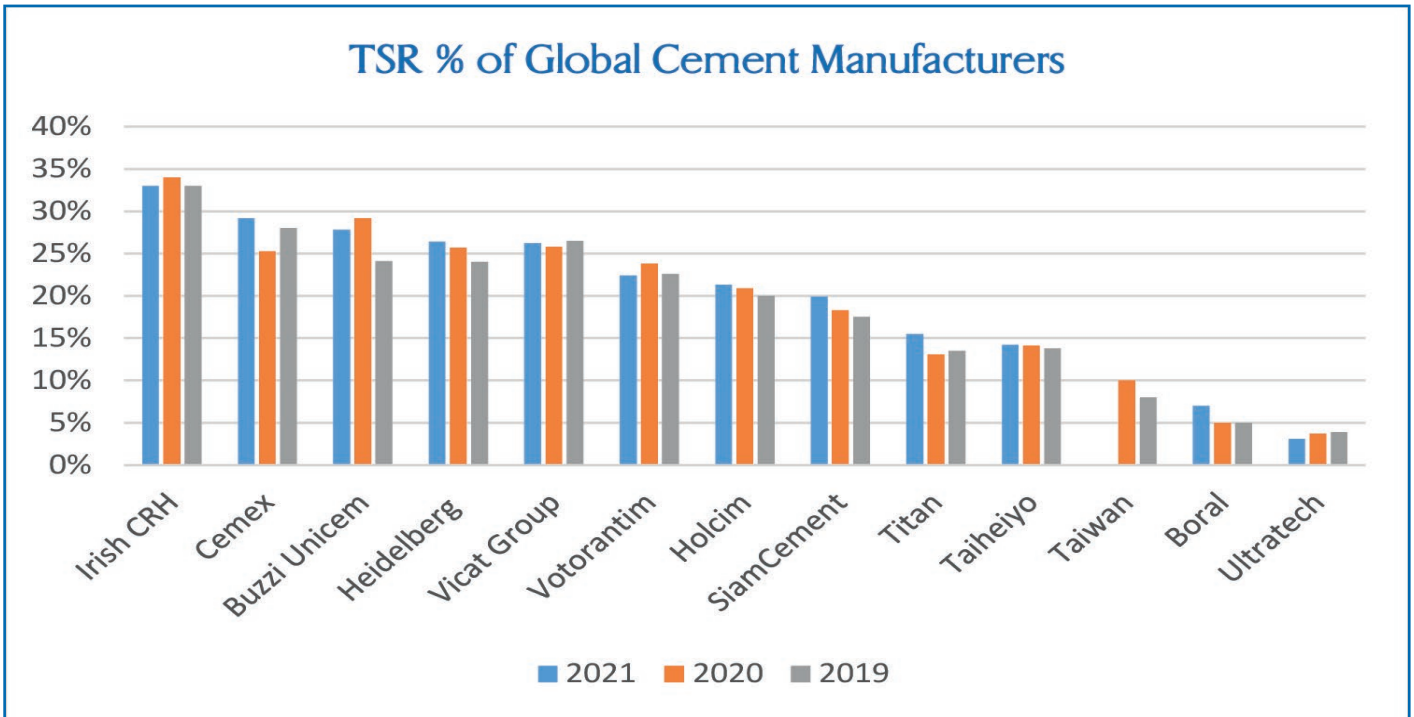

Figure 1: Thermal substitution rate of big players in the global cement industry [2]

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CRH

The Irish conglomerate CRH has maintained the top position in using alternative fuel usage with 33% of TSR equivalent to 2.1 million tonnes (mt) of AF across the group in 2021. The cement plants in the European ground are operating with an average of 50% TSR [1].

In Germany, CRH is operating three cement plants with the group subsidiary Opterra. The largest of the three is the plant Karsdorf near Leipzig. The kilns have been operated with a maximum TSR of 91% in 2021 [2]; on an annual average 56% of substitute fuels covered the thermal energy demand.

From Figure 1, as already said, 2.1 mt of AF have been consumed in all CRH plants across the globe, whereof 68% were Refuse Derived Fuels (RDF), 29% carbon neutral biomass and 3% of solvents and used oil (Figure 2).

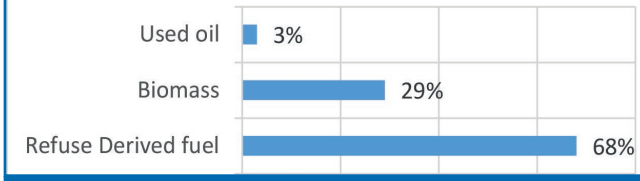

Figure 2: Alternative fuels used in CRH cement plants 2021 (total: 2.1 mt) [1]

Cemex

In 2021, Cemex has reported an almost around 4% increase which is 29.2% TSR, that drove a significant fossil carbon reduction. Cemex is following an aggressive climate action for the 2030 goal to increase its TSR up to 50% and a detailed plant-by-plant roadmap has been laid [3].

Cemex has been using hydrogen injection since 2019 to enhance the use of alternative fuels and maximize thermal efficiency, and by 2021, hydrogen will be utilized in all of its European facilities. Cemex's recent partnership with HiiRoc on a new hydrogen injection technology could expedite this approach, allowing them to further study and rapidly increase the usage of hydrogen in all processes while lowering fossil fuel consumption. This year alone Cemex managed to save 200 million USD while using AF instead of fossil fuels.

HeidelbergCement

The German multinational HeidelbergCement wants to increase its current share of the AF mix from 26.2% to 45% by 2030. The usage of waste-based biomass accounted for around 42% of the AF mix in 2021 [4].

In September 2021, a clinker kiln at HeidelbergCement's subsidiary Hanson UK's British Ribblesdale facility was successfully run on a net zero fuel mix as part of a world-first demonstration. During the trial, the amount of fuels in the kiln's primary burner was gradually increased to a completely net zero mix of tanker-delivered hydrogen, biomass constituents (meat and bone meal), and glycerine produced as by-products of other industries.

HeidelbergCement's goal is to reduce specific net CO_2 emissions to 400 kg per tonne of cementitious material by 2030. This will be done by optimizing the product mix and improving processes such as increasing the usage of alternative fuels.

Vicat Group

The French Vicat Group wants to increase its AF usage from the current 26.2% usage to an average of 40% in 2030. In addition, the usage of fossil fuels in the European cement plants is to be completely discontinued by then. In 2021, the European Vicat plants reported a TSR of 63% [5].

The ultimate goal of Vicat Group is to achieve net-zero carbon emissions across the group's value chain by 2050.

Buzzi Unicem

In 2021, the Italian family-owned cement group Buzzi Unicem stands at 27.8% TSR, which went down slightly compared to 2020, which was 29.2%. TSR levels across the group obtained in Italy (16.8%), the Czech Republic (81.4%), and Poland (68.3%) have improved; Germany stays over 70 % in substituting fossil fuels [6].

In 2021, biomass energy contributed 7.1% of total energy consumption (7.3% in 2020). Because of the certain portions of biogenic carbon in the alternative fuel mix, Buzzi were able to avoid reporting of 574 thousand tonnes of fossil CO_2 emissions.

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Votorantim Cimentos

The Brazilian cement manufacturer Votorantim has replaced 22.4% of the fossil fuels and has committed to reaching 53% by 2030.

Votorantim Cimentos Europe, Asia and Africa plants have 30.1% TSR — an increase of 63% in four years. Whereas the plant in Hasanoglan, Turkey, has achieved the highest yearly TSR of 52.3% in 2021 [7].

The Votorantim Cimentos North America operation has increased the rate of co-processing throughout Canada and the United States. In Bowmanville, Ontario, for example, Votorantim got a new license, allowing them to boost thermal substitution from 5% to 15%. In Charlevoix, Michigan (USA), a license was amended to allow them to increase usage of AF [7].

A bypass project was developed at the Vidal Ramos facility in Santa Catarina in 2021 which enables the extraction of chlorine from the kiln, allowing them to boost alternative fuel co-processing. They expect to reach 70% fuel substitution at this facility. The system will go into operation in 2022, and it will be the first of its kind in Brazil.

Holcim

Holcim a Swiss-based cement flagship division is one of the world's leading companies in the recycling sector. According to their sustainability report in 2021 TSR rate is reported at 21.3%, a slight increase compared to 20.9% 2020. The target is to reach 37% by 2030 and more than half of the European plants will be operating at TSR above 50% [8].

In 2021, the whole group recycled 54 mt with a growth of 17%. By 2025, the figure is expected to reach 75 mt per year and even 100 million tonnes by 2050. By 2023, Holcim plans to restrict the CO2 emissions up to 542 kg per tonne of cement.[8].

CNBM

Chinese conglomerate China National Building Material (CNBM) has stepped up its efforts in utilising waste-derived fuel in recent years. CNBM has not reported any key indicators for TSR only quantitative data for the usage of AF in their fuel mix. According to the sustainability report published in 2020, solid waste fuel consumption was around 178.8 mt compared to 2019 of 149.8 mt which is a tremendous increase and leading in Asia for the usage of AF [9].

CNBM has installed new 27 production lines for co-processing AF at plants across the group, with a total annual capacity of 2.7 mt [9].

Siam Cement Group

Thailand's Siam Cement Group (SCG) is stepping up in the usage of AF. As of 2021, the TSR was 19.90% across the group. The usage of biomass accounted for around 12.2% of the AF mix in 2021.

SCG sought to constantly increase its ability to use alternative energy since its initial move in 2001 when it converted used rubber tires into alternative fuel. These include utilising agricultural waste materials such as oil palm shells, rice husk, straw, and sugarcane leaf as AF. The RDF project was a major accomplishment of SCG's renewables quest in 2012, which was established at the community dumpsite, by installing a waste segregation facility and the material recovery process produced fuel bricks that were used to substitute coal in the cement kilns.

Titan Cement Group

In 2021, Titan Group from Greece increased the TSR to 15.5% compared to 13.1% TSR in the year before. The usage of biomass rose as well, reaching a TSR of 4.8% of the total AF mix.

Dried sewage sludge, refinery sludge, tires, RDF, and agricultural waste were utilised to replace conventional solid fuels in several plants of the Group. TITAN cement plants reported that the alternative fuel processing facilities, as well as the plants' feeding, storage, and combustion infrastructure that is worth approximately €20 million have been installed.

In particular during the first quarter of 2021, a new state-of-the-art production facility for alternative fuels began operations at the Pennsuco cement plant in Florida.
In the cement plants of Zlatna Panega, Bulgaria, Thessaloniki and Usje, North Macedonia, new installations or upgrades to existing infrastructure for the production of alternative fuels were also built, enabling both facilities to achieve record thermal substitution levels.

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Summary

Alternative fuels activities in the global cement industry have taken place in the low-carbon economy and the industry has realized the potential benefits in terms of carbon reduction, energy-saving, cutting cement production costs and, last but not least, for the Global South avoiding waste being disposed of in landfills or by incineration causing greenhouse gas emissions. The next 5-7 years will be crucial for the cement industry as many companies are committed to the climate protection goal of 2030.

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CO_2 Emissions and Growing Biomass for Cement Plants

By Vladimir Dimitrov, MVW Lechtenberg & Partner

Biomass is seen as one of the mechanisms for mitigating climate change. It absorbs carbon dioxide and can replace part of the fossil fuels. Its energy is obtained from the sun through photosynthesis. The use of biomass reduces harmful emissions.

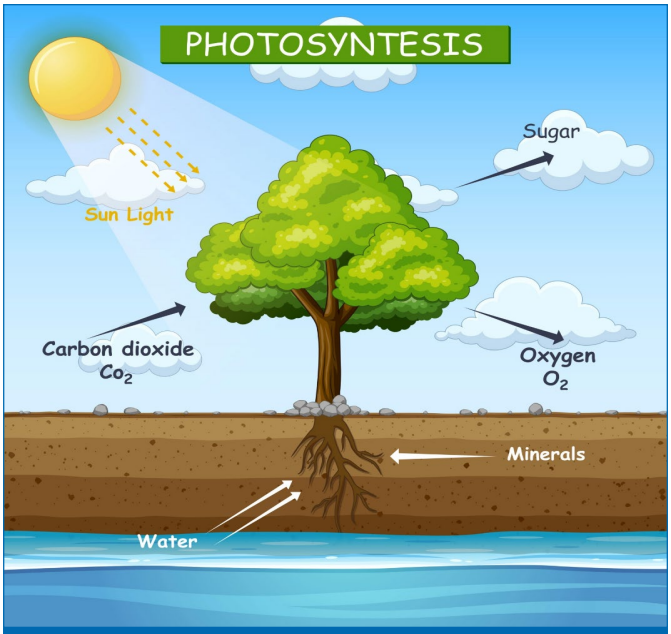

Figure 1: Simple diagram of the photosynthesis [1].

CO_2 Emissions and the Cement Industry

After the European Commission adopted a series of legislative proposals how to achieve climate neutrality of the EU by 2050, including the intermediate target of an at least 55% net reduction in greenhouse gas emissions by 2030 in order to reach EU climate targets under the European Green Deal [2].

As well the shortage of Greenhouse Gas Emissions quotas forces the industries in the European Union to decrease their CO_2 emissions. Of course, the use of biomass as alternative fuels is one of the ways to increase industry competitiveness.

Solid biomass fuels	kcal/kg	kg CO_2 / kcal	kg CO_2 / tonne
Agricultural residues	2,100	0.056	1,029
Peat	2,000	0.056	944
Solid byproducts	2,600	0.041	1,157
Wood residues	4,400	0.021	1,730
Wood waste	3,600	0.027	1,491

Table 1: General CO_2 emission factors of some biomass types [3].

In order to quantify the potential savings of fossil-derived carbon dioxide in cement plants while using biomass as alternative fuel, the following considerations can be made:

- For example, coal has a default emission factor of 96 kg CO_2 per GJ [4], which is equivalent to 2.45 tonnes of CO_2 per tonne of coal (with 6,100 kcal/kg).

As an example, using the appropriate substitution factor (Table 2), 1,69 tonnes of wood waste would substitute 1 tonne of coal, and mitigate 2,45 tonnes of fossil-derived CO_2 from coal.

	Quantity	NCV	t CO_2 equivalent	Coal substitution
	tonnes	kcal/kg	per tonne of fuel	tonne of biomass
Coal	1	6,100	2.45	
Wood waste	1	3,600	1.49	1.69
Rice husk	1	3,400	1.37	1.79
Straw	1	4,200	1.69	1.45
Bagasses	1	1,800	0.72	3.39

Table 2: Quantitative example for CO_2 generation based on the heat value between the different types of fuels [3].

However, for the implementation of biomass projects, the complete supply chain of CO_2 emissions during collection, baling, transportation, processing etc. has to be taken into consideration.

The substantial cost savings due to the decrease of fossil fuels usage and CO_2 emissions will improve considerably the profitability and will strengthen the competitiveness of the industry.

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Figure 2 shows the trend of the CO_2 prices in the last 1 year (May 2021 – May 2022). The increasing price trend effect should speed up the transition to green energy, by using more alternative fuels and renewable energy.

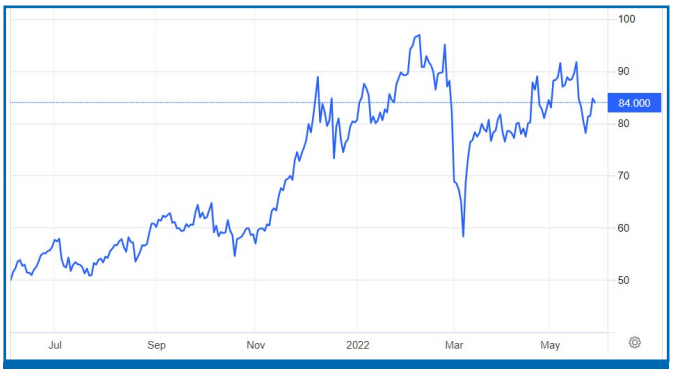

Figure 2 : CO_2 price trend May 2021 to May 2022 [5].

It should be mentioned that some biomass contributes also to an increase of the total kiln flue gas volume. For example, biomass of 50% moisture, and a feeding rate of e.g. 2 t/h contributes to more than 1,245 Nm3/h water vapor.

Grow of Energy Crops for Biomass Fuel

Sources of biomass for energy are also specially grown energy fast-growing crops and trees such as hybrid poplars, hybrid willows, maple, Canadian poplar, ash, oak, and a plane tree, miscanthus, switch grass. After cutting, energy crops regenerate quickly.

Fast Growing Trees

Coppicing trees for a renewable source of wood is an ancient practice, the only thing that is special about modern, hybrid willows and hybrid poplars is that they grow so quickly and so are harvested frequently, hence the plantation is called a Short Rotation Coppice (SRC). Alder, Hazel, Sweet Chestnut and Ash are all suitable for biomass as well, although they aren't as vigorous as the hybrid willows and poplars. Wood from fast growing plants is commonly used to heat homes and power generators.

Picture 1: Hybrid willows [6]

Energy Crops

Energy crops, such as miscanthus, switch grass, sorghum, artichoke and others are characterized by:

- High yielding
- Environmentally neutral (CO_2)
- Easy to grow
- Low maintenance
- Annual growing cycle
- No pesticides or fertilizers
- Increases wildlife biodiversity
- Positive social effect
- Long lifespan
- Soil preservation

Miscanthus also known as Elephant grass is the preferred choice as a biofuel. It grows over 3 meters in height and resembles bamboo. It yields every year without the need to transplant and outperforms corn. Its fast growth, low mineral content and high yield make it a preferred choice as a biofuel.

Miscanthus and switch grass are used for feedstock production for both energy and non-energy end uses. It is a valuable crop, offering major benefits to many sectors, both inside and outside of agriculture.

Picture 2: Miscanthus [7]

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Picture 3: Switch grass [8]

Availability of Biomass

- **Wood Chips from Forestry**

The generation of natural wood chips from forest residues is determined from the logging period. For example, from April to November in some countries, due to the winter. In some regions, due to the wintertime logging stops, because of the bad conditions of the infrastructure and the limited access in the forest.

- **Industrial Biomass**

Industrial wood chips or saw dust arise during the whole year. The origin of that wood comes from demolition works, waste wood, streets and park maintenance, etc. Then, the waste wood is chipped and delivered.

The saw dust generation is determined by the market conditions, but in general, the producers process wood for the whole year, so the saw dust is generated all the time. Finding dry saw dust (less than 20% moisture) is a challenge.

- **Energy Crops**

The availability of the energy crops is determined by the harvest period. For example, the artichoke harvest period usually is in September. In February or March, miscanthus and switchgrass are harvested, because the moisture of these crops is lowest in that period.

Regarding tree species, a good practice is to cut them down before the winter time and left to dry itself till the spring. While storing lumber, wood loses plenty of its moisture.

- **Industrial Waste Biomass**

The industrial waste biomass is not influent by any season. It is biomass from production processes, so it will be available at any time of the year.

- **Rice Husk**

The availability of rice husk is determined by the market conditions in general. Only in August, the rice processors do not work, because of two reasons. Firstly, there is the annual maintenance, and secondly, the weevil (kind of insect) appears. It can infect and jeopardise the whole production.

- **Sunflower Husk**

The availability of sunflower husk is determined by the market conditions in general. Between June and August, the sunflower husk processors do not work, because of annual maintenance and the absence of sunflowers. Securing the supply of sunflower husk in the winter period is a challenge, because most of the processors use the husk for their own need like heating and process energy.

Matrix of Availabilities

Cement companies willing to use different types of biomasses as an alternative fuel on a steady base, will meet challenges in the availability and respectively logistics. A quantitative matrix could be helpful in such cases.

Conclusion

With the current and future CO_2 price projections, obtaining sustainable long-term supply will become more difficult, due to the growing competition from the affected industries. In these conditions, trying to explore sources of waste wood and/or growing own biomass could be good options.

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	January	February	March	April	May	June	July	August	September	October	November	December
Forestry biomass												
Wood chips				•	•	•	•	•	•	•	•	
Saw dust				•	•	•	•	•	•	•	•	
Industrial biomass												
Wood chips & saw dust	•	•	•	•	•	•	•	•	•	•	•	•
Waste biomass	•	•	•	•	•	•	•	•	•	•	•	•
Agricultural												
Rice husk	•	•	•	•	•	•	•		•	•	•	•
Sunflower husk	•	•	•	•	•				•	•	•	•
Energy crops												
Mischanthus		•	•									
Switchgrass		•	•									
Poplar			•	•								
Artichok							•		•			

Table 5: Example for biomass availability matrix. The "•" symbol indicates when a certain biomass is available [3].

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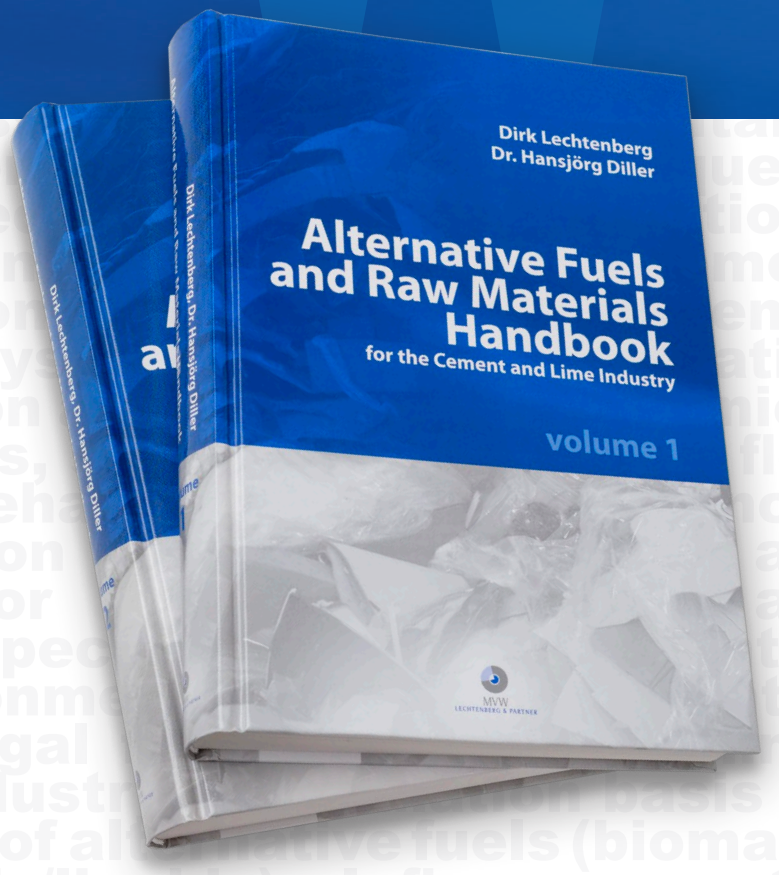

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- Emission limits

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- Information about origin, composition and availability
- Chemical and physical parameters
- Specific influences on the clinker production process
- Environmental aspects

Country Report: Alternative Fuels in The United States

By Ankur Saini, MVW Lechtenberg & Partner

Whilst writing this article I am recollecting my memories of attending the 5th Alternative Fuel Symposium, 2018 in Duisburg organized by MVW Lechtenberg & Partner [1]. Rick Bohan, the Senior Vice President, Sustainability at Portland Cement Association (PCA), U.S. gave a presentation on "Development of Alternative Fuels in the U.S." [2]. He gave a brief overview of where the U.S. cement industry stands in terms of using alternative fuels when compared to the others around the globe, especially in Europe. He reported that the U.S. cement industry currently stands at a 16% thermal substitution rate (TSR) which is far behind in comparison to Europe's 50% TSR in 2019 as reported by CEMBUREAU, however, U.S. cement industries are trying to catch up with the European cement industries in alternative fuel usage.

PCA has developed a roadmap to achieve the goal of carbon neutrality by 2050. Strategies, targets, and timelines are being laid down currently with the support of new technologies, which would need the right policies in place in order to accomplish and expedite the goal of carbon neutrality by 2050 across the value chain. While there has been a significant push to use alternative fuels in the U.S. cement industry, the progress is slow as it only makes up of a small proportion in the current fuel mix, as there is a huge potential for rapid adoption to substitute conventional fossil fuels. Before going more deeply into alternative fuel usage in the States, it's important to understand the current efforts by regulators and stakeholders of current regulatory efforts to curb carbon emissions, energy use and alternative fuels principles in the U.S. as well as the key drivers of energy usage in the U.S. economy

Status Quo On US Economy and Cement Market

The United states GDP per capita was in a sharp increase from 2010 but it fell to 63,200 US$ in 2020 due to unexpected events which hindered activity, including COVID-19 breakouts, escalating supply shortages, and rising energy prices, as well as a diminishing boost to income from pandemic-related fiscal support[3]. In 2021, GDP expanded by 5.7 %, and activity grew at a faster-than-expected rate in the second half of 2021, with significant addition of 6 million jobs and manufacturing activity. The new infrastructure and a roadmap towards carbon neutrality is in place and PCA could start new chapter for the U.S. cement industry.

Demographic (2020)	
Population	331 million
Share of urban population	83%
Economic (2020)	
Per capita GDP	US$ 63,200
GDP growth	- 3.4 %
Environmental (2018)	
Per capita CO_2 emission	15.2 tonnes
Per capita waste generation	2.2 kg
Cement market (2020)	
Production capacity	119.2 Mmt*
Production	89 Mmt
Consumption	103 Mmt
Imports	17 Mmt
Per capita consumption	314 kg

Table 1: Overview of the demographic, economic and environmental status of the States [4,5,7–11].
*Mmt: Million metric tonnes

The cement industry in the States has a production capacity of over 119.2 million metric tonnes. Ce-

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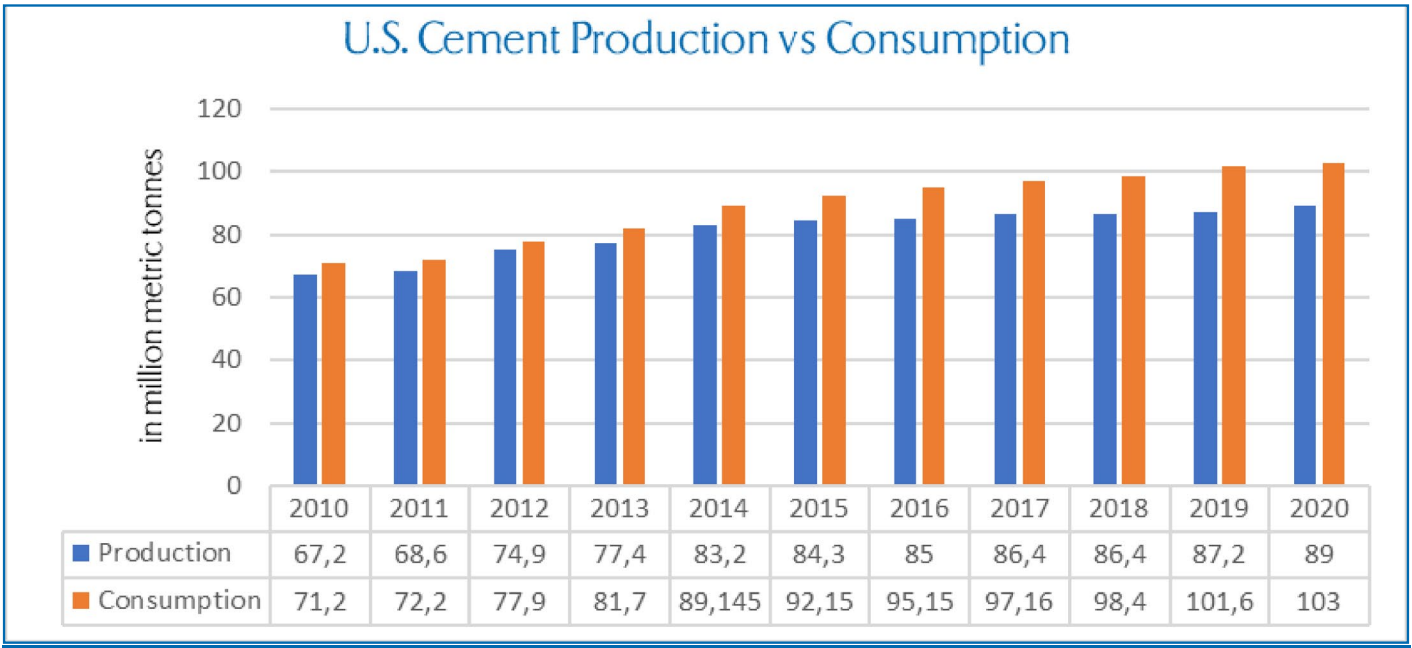
ment consumption is often tied to the construction industry's demand. Strong performance in the construction industry as a whole stimulates cement consumption; but, specific sector growth, such as highway construction, has a greater impact. Since the 2008 recession, cement consumption in the U.S. has gradually climbed.

As depicted in Figure 1, consumption rose quickly reaching about 103 million metric tonnes in 2020 [7]. The total global cement consumption in comparison is 4.3 billion metric tonnes [10]. On the other end, cement production in the States hit 89 million metric tonnes in 2020, the highest level in more than a decade. Since 2010, the country's cement production has been steadily increasing [8].

There are 91 cement plants in the United States as shown in Figure 2. among them 84 dry process plants and 9 wet process plants. Those 91 cement plants represent 128 kilns, with 118 dry process kilns (long dry, preheater/pre-calciner) and 10 wet processes kilns [2].

By far the world's greatest cement importer is the United States. Cement imports to the United States reached more than 17 million metric tons in 2020. The estimated value of imports according to [11] is 1.43 billion US dollars. Also per capita, cement consumption is at its highest levels in 2020 it was estimated at around 314 kg per person in States [10].



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Production	67,2	68,6	74,9	77,4	83,2	84,3	85	86,4	86,4	87,2	89
Consumption	71,2	72,2	77,9	81,7	89,145	92,15	95,15	97,16	98,4	101,6	103

Figure 1: U.S. cement production vs consumption comparison (2010-2020) [5,7].

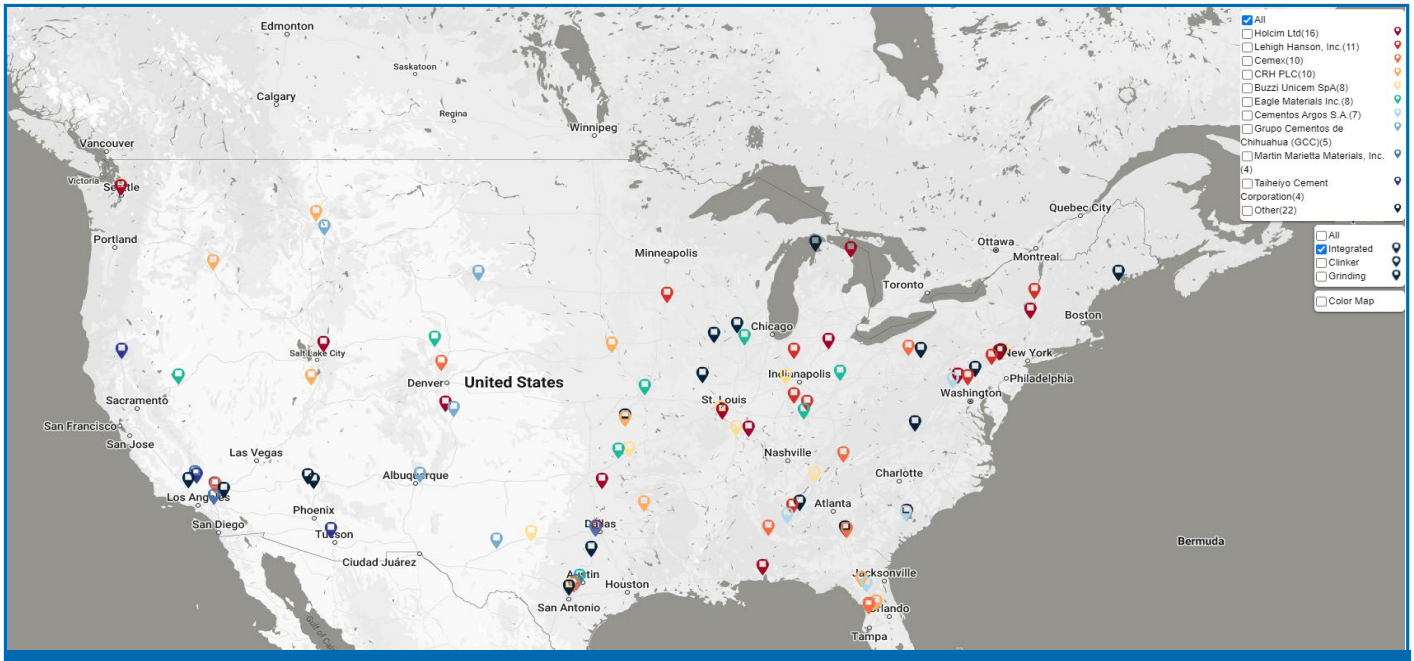


Figure 2: Integrated cement plants located in the United States [11]. *Source: Cement plant database: International Cement Review / CemNet.com.*

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U.S. Cement Industry's CO_2 Emissions Profile

In 2019, 92 cement plants of U.S. reported 67 million tonnes of CO2 emitted to the U.S. Environmental Protection Agency (EPA) [12]. The cement production from the States currently accounts for 1.25% of total national CO_2 emissions.

In 2019, EPA calculated the carbon intensities for the intermediate and final products of cement plants: clinker and cement, to assist the U.S. cement industry in evaluating its efforts for decarbonizing [12]. These intensities serve as reference points for the industry's carbon performance, as measured in tonnes of carbon emitted per tonne of clinker and tonnes of carbon emitted per tonne of cement. The intensities are derived from cement plant data reported to the U.S. EPA Greenhouse Gas Reporting Program (GHGRP) and reflect direct emissions (Scope 1) from on-site fuel use and process emissions, which account for the majority of GHG emissions from cement plants.

Table 1 below shows the quartile carbon emissions intensities for clinker and cement for the cement plants that reported. The 75th percentile represents plants with lower carbon intensities, while the 25th percentile represents plants with higher carbon intensities. The midpoint for carbon intensities is the 50th percentile.

ular decline as energy extensive industries are shifting to lower-emitting power sources.

Figure 3 illustrates the major coal producers in the world compared to the production of coal in the U.S. The U.S. coal production almost declined to half to 6.7% of total global coal production in 2020 compared to 2010 [14]. The decline in U.S. coal production in 2020 was mostly due to lower international coal demand and lower coal consumption in the U.S. electric power industry. Coal became less competitive in 2020 for electricity generation as natural gas costs fell. Coal-fired power generation in the United States declined by 20% in comparison to the prior year.

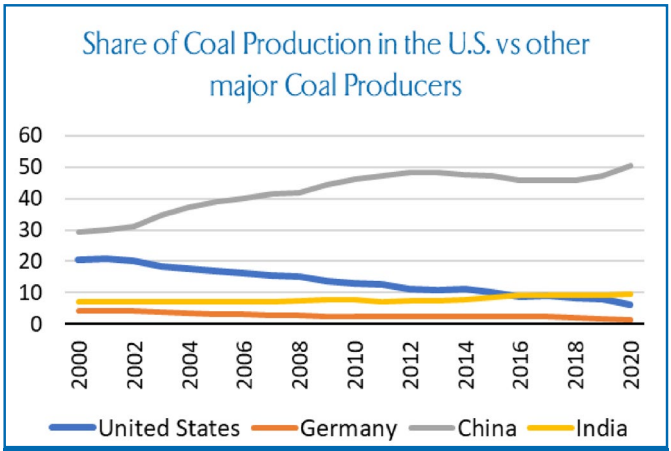

Figure 3: Share of coal production in States compared to other major coal producers (2010 to 2020) [3].

Quartile	Metric Tonne CO_2 / Metric Tonne of Clinker	Metric Tonne CO_2 / Metric Tonne of Cement	Carbon Intensity
75th percentile	0.787	0.722	Low
50th percentile (median)	0.838	0.776	Midpoint
25th percentile	0.934	0.886	High

Table 1: Carbon intensities evaluated by EPA for clinker and carbon production [12].

Energy Matrix and Alternative Fuel Usage in the U.S. Cement Industry

War in Ukraine has rattled the energy markets and disrupted supplies, causing oil and natural gas prices to skyrocket. In the States, the energy index rose to around 30.3% over the last 12 months [13]. On the other hand, coal generation and usage are on the sec-

From 1996 to 2016, the proportion of energy consumption in the cement industry in the United States has shifted dramatically. Coal and coke's share of the fuel market has fallen from 74% to a little over 57% reported by PCA [2]. The cement industry aims to reduce it by a factor of five, with a goal of using no more than 10% coal and petcoke by 2050. According to PCA alternative fuels such as refuse derived

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fuels, agriwaste, ashes, biofuels, biomass, carpet, charcoal, cherry pits, coal pond fines, coke breeze, filter fluff, waste oil, flexicoke, glycerin, landfill gas, nylon fluff, pecan shells, plastics, rice hulls, sawdust, shingles, spent activated carbon, spent pot liner, textile waste, wood and tire derived fuel fuels usage being just doubled in two decades in the U.S. cement industry.

Presently, alternative fuels are used in 73% of all cement plants in the States.

would be increasing the use of alternative raw materials, switching from the conventional fuel to alternative fuels and ultimately transformational fuels like hydrogen. In the long-term incorporating carbon capture and sequestration methods into the plants. Also on the policy side, PCA is trying to push with Congress and federal agencies to make changes in the current Environmental Protection Agency's - Non-Hazardous Secondary Materials (NHSM) Rule to allow the usage of certain materials as alternative fuels.

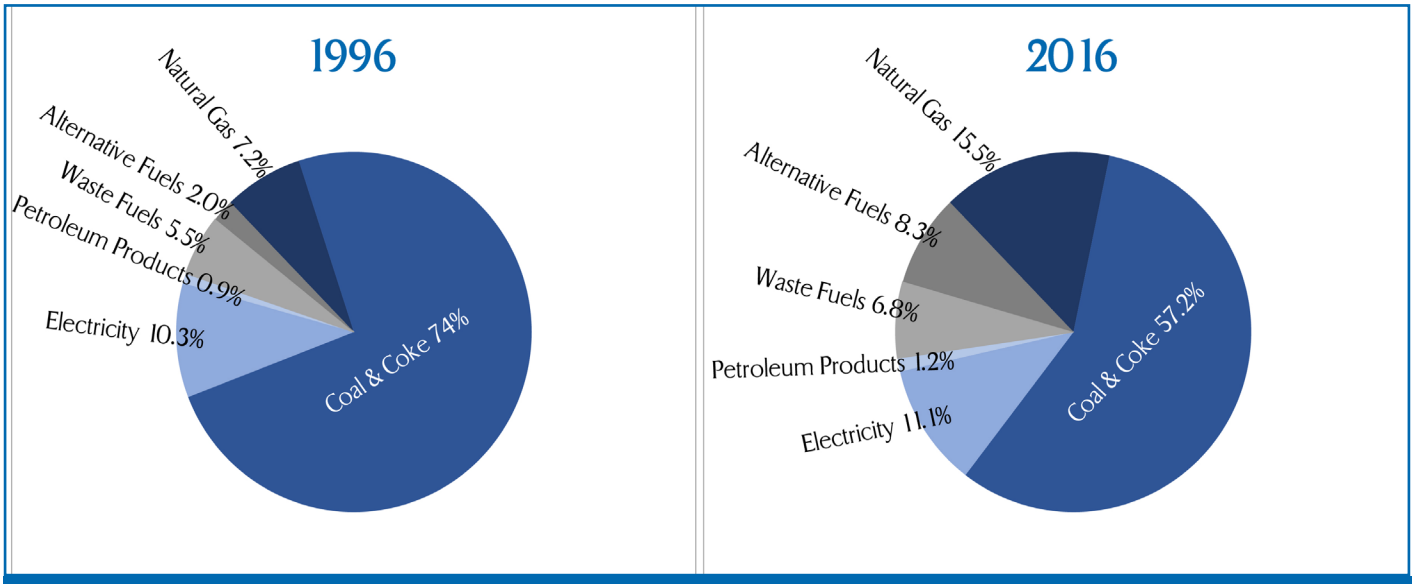

Figure 4: Composition of energy consumption in the U.S. cement industry [2].

Tyre-derived fuel is used in 40 facilities, waste oil is used in 15 different plants, solvents are used in 11 facilities and other alternative fuels are used in 62 plants [2].

The demand for alternative fuel is taking the faster lane in the U.S., several drivers are:

- To cut emissions from the cement industry to achieve the carbon neutrality goal of 2050 since coal/coke is the single largest source emitting energy-related CO_2 emissions.
- Cost-cutting in the cement manufacturing as natural gas price is soaring currently.

U.S. cement plants are already equipped to utilise alternative fuels, provided the continuous supply is available. Alternative fuels might make up half of the industry's fuel mix with the right rules and regulations implemented.

PCA is quite persistent to cut CO_2 emissions and plans to adapt solutions at every step of the cement production stage of the value chain and its energy. The most energy intensive step for the short term

In the mid-term, the best-case scenario for the U.S. cement industry would be to use alternative and waste-derived fuel. As still, carbon capture technology is in the early developing stages and they have to scale up the TSR rate to 60% to 70% without carbon capture.

Way Forward for U.S. Cement Industry

The path forward for the U.S. cement industry to reduce CO_2 emission or achieve carbon neutrality lies in utilising the available waste sitting as a duck in its landfills. U.S. citizens generate around 2.2 kg of municipal solid waste. They are one of the highest per capita waste generators in the world and waste management plants can't deal with this amount of waste. In fact, it is estimated that the average American resident generates roughly 130 kg of plastic waste per year and obviously, the United States is the highest plastic waste producer in the world [16].

According to a Statista report in 2016, U.S. generated around 42 million metric tonnes of plastic waste which is almost double compared to China [16], not to mention that, the U.S. is one of the biggest export-

ers of plastic waste.

My intention is to give these figures and facts on the waste generated and exported by the U.S. They have more than enough quantity of waste available which can be further sustainably processed to produce alternative fuel and increasing the TSR% in the cement plants which could serve as a support to the local waste management problems. This will lead to a significant reduction in of CO_2 emission in the short term and slowly moving towards the 2030 emission reduction goal.

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Water Mist Turbines from EmiControls: Efficient and Innovative Extinguishing Technology for the Waste Management Industry

By EmiControls

This article talks about the basicis of water mist turbine technology and it's advantages. The efficiency of water mist in fighting fires has been known and valued in specialist circles for years. So far, water mist was emitted using nozzle technology, which, however, limited the range to around 10 to 15 meters for technical reasons. As a result, the range of applications in companies remained limited. Firefighting turbines from EmiControls, on the other hand, offer an innovative solution to this problem with their turbine technology that enables ranges of up to 35 meters, which of course also significantly increases the range of applications. Combined with the integrated monitor, ranges of up to 70m are possible. The combination with automatic detection enables early and targeted extinguishing of incipient fires, as well as intensive exposure and cooling of hazardous areas if necessary.

Firefighting turbines basically work with water, foam or a water-foam mixture. Compared to the conventional water jet, water mist has the main advantage that it can envelop objects and therefore can cool and extinguish very efficiently even in usually hard to reach places. The principle works as follows: the turbine atomizes the water into a fine mist. Compared to conventional monitors (nozzle technology), firefighting turbines produce drops of smaller size that are sprayed by means of a propeller. The advantage of such smaller droplets is that they form a larger water surface and thus a larger heat transport surface. The fine mist has a lower sedimentation speed and can also reach hidden areas of the fire that are otherwise inaccessible to a jet of extinguishing agent. An optimal cooling effect can be achieved either through the formation of a barrier or through direct exposure and even distribution on the surface of the object to be cooled. An excellent extinguishing effect is also achieved thanks to the high cooling effect of the water aerosol brought directly into the flames by applying the extinguishing agent directly to the burning surface. The fine droplets also combine better with the smoke and soot particles and bring them to the ground. At the same time, the need for water is significantly lower than for other systems such as sprinkler systems. In sum, with this system, a larger water surface is generated from a smaller amount of water, which combats fire, heat and smoke more efficiently.

A test carried out by the MPA Dresden (an independent fire protection competence centre) in Hungary on the training grounds of the MOL refinery clearly shows the difference between the turbine and the conventional extinguishing method (foam pipe see Fig. 1). The test was carried out on an area of 160 m² with 2,400 liters of gasoline that was set on fire (heat release rate of 350 MV HHR). The fire was extinguished with a mixture of water mist and 1% AFF foam. The test is the largest documented fire test with water mist in Europe.

Picture 1: Water mist has a high cooling capacity with low water consumption

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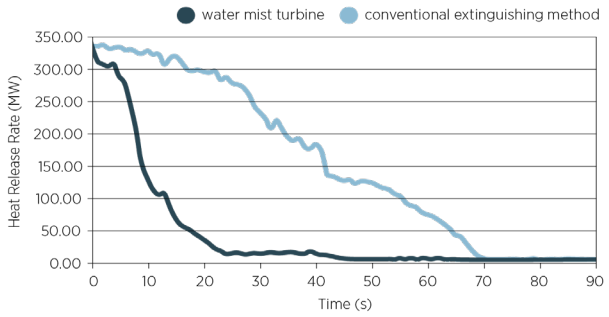


Figure 1: The graph shows how quickly the turbine extracted the heat from the fire compared to conventional extinguishing methods

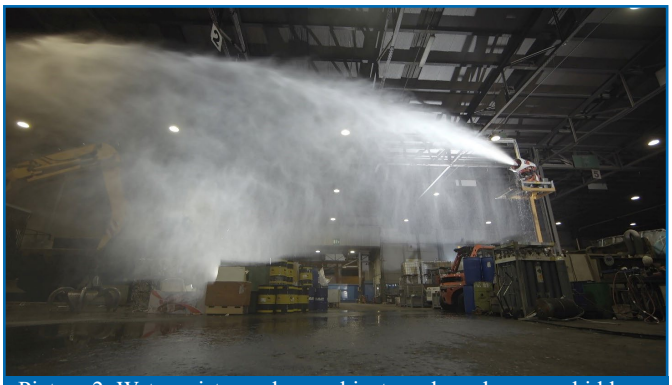
Practical Experience in the Use of Water Mist Turbines in the Waste Management Industry

In the waste management process, materials with high fire loads are often stored in halls and open spaces, where a small ignition source such as a thumb-sized lithium-ion battery or a spray can is sufficient to turn an undetected smoldering fire into a full fire in a short time that even a fire brigade can hardly get under control. Many recycling companies have great difficulties in maintaining their purchase and delivery obligations towards end customers and other waste processing companies after a major fire incident. Such situations lead to considerable financial losses and often to the bankruptcy of the company. Many wastes management companies have therefore already taken precautions to protect the endangered storage and production areas against fire incidents. In the past, the waste management industry also relied heavily on the use of sprinkler technology, because the technology was known to operators, state authorities and insurance companies and has already been used many times.

In the last few years, the use of automatic early fire detection by infrared cameras and extinguishing monitors in storage areas has repeatedly proven its efficiency. Therefore, operators of waste platns, authorities and insurance companies are increasingly relying on this technology. Advantages of these applications compared to traditional sprinkler technology are the earlier detection of a fire source by the surface temperature detection of the infrared cameras and the precise exposure of a hotspot by the extinguisher. As a rule, a sprinkler system will always trigger later than the infrared cameras, which monitor the temperature development on the surface of the stored goods, due to the sprinkler vessels hanging on the ceiling of the warehouse. Using the information from the infrared detection, an extinguisher can act on a hotspot with precise coordinates, in contrast to the area wetting of a sprinkler system.

The firefighting turbine FT10e from EmiControls is a new and important development in the stationary firefighting section. The FT10e covers all the requirements and functions of an extinguisher according to the applicable guidelines and also throws water mist over a separate nozzle ring up to 35m

The water mist turbine can be activated automatically via conventional fire detection. Using intelligent detection systems, the hotspot can also be precisely exposed to different spray patterns (only water mist, only monitor jet, combination of water mist & monitor jet).



Picture 2: Water mist envelopes objects and reaches even hidden fire sources

Picture 3: Spray Pattern: Fine water mist

Picture 4: Spray Pattern: Full jet

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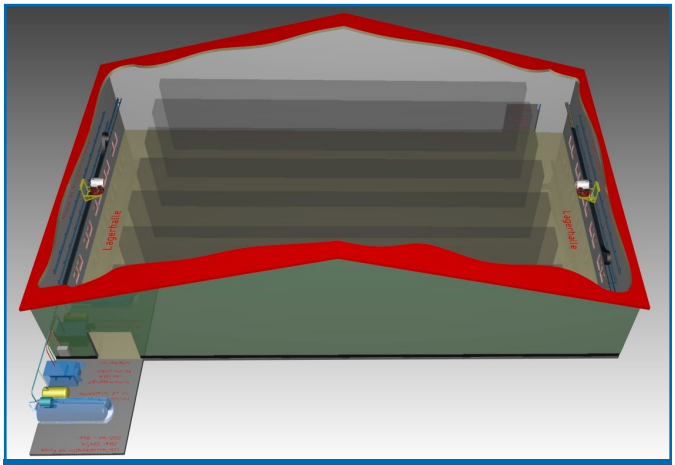
Picture 5: Spray Pattern: Closed spray jet

Control of Several Firefighting Turbines via a Single Infrared Camera is Possible.

The individual configuration of the required customer application is designed and implemented by the experienced EmiControls project team together with the customer's fire protection planner and the other project partners. Of course, the firefighting turbine from EmiControls can also be controlled manually via a radio remote control or a control panel. A separate feed from the fire brigade is also possible.

The use of water mist for firefighting enables the reduction the amount of used water in the event of an incident due to the proven better extinguishing and cooling result compared to a conventional monitor. It may also be possible to reduce the number of extinguishing equipment because the water mist also reaches better shaded areas than traditional fire extinguishing systems. In fire protection project solutions for storage and production halls for substitute fuels, automatic water mist turbine systems in combination with high-quality infrared detection have already been planned and implemented with the customer's fire protection planner, which, according to experts, offers higher-quality protection against fire hazards than a traditional sprinkler system. Depending on the fire load and the requirements of the fire protection planner, the exposure quantities can be configured flexibly in different ways and are generally between 100 and 2,700 l / min in the waste management industry.

For large storage areas with many box areas, the innovative concept illustration of an automatic firefighting turbines on rails is also a very interesting option. After a fire is detected in an area, the water mist turbine automatically moves into the corresponding zone and automatically steams up the corresponding hotspot. A corresponding demo system for this application is located in Dresden and can be visited by appointment.



Picture 6: Illustration of an automatic firefighting turbine on rails

If a company is considering the use of water mist turbines, the planning always starts with the company's existing fire protection concept or fire protection planning. The possible range of applications for such turbines in practice is large and ranges from the chemical sector (where the focus is not only on firefighting, but also primarily on the suppression of gas) through recycling companies to companies with storage areas with high fire loads (such as aircraft hangars, tank farms in refineries wood processing industry, etc.) or high-voltage plants. Installations, even with customer-specific adaptations, are carried out in the usual times of 4-12 months. Completely new technical developments have a longer lead time, as they are carefully checked and tested for their specific suitability.

FACTBOX
Fire Fighting Turbines:

1. Cooling: Very good cooling effect with low water consumption at the same time. The reasons for this are the finest nebulization and application over large areas.

2. Gas precipitation: High proven efficiency in the precipitation of gas after incidents in industrial plants, on the road or rail.

3. Firefighting: Excellent extinguishing results thanks to the high cooling effect of the water aerosol by applying the extinguishing agent directly to the burning surface. In addition, the water aerosol can envelop objects and reach places that are otherwise inaccessible to an extinguishing agent jet.

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MVW Company News

MVW Lechtenberg Opens Branch in India

In 2005 MVW started to work in India, advising a cement plant in Rajasthan to build the first RDF production facility in India. At that time almost nobody was thinking about fossil CO_2 reduction or sustainability.

India had only climbed up cement production capacity of around 200 million tonnes per year at 110 locations. MVW together with Mr. KS Dilip had visited nearly all cement plants in India within five years, travelling all across the country through different means of transportation such as; the plane, railway and car, through deserts and rainforests. Mr. Dilip gave us an insight into "the incredible India" its culture, religion and history. Business-wise it was not really successful, as at that time we were too early!.

Now, the cement production capacity has more than doubled to over 500 million tonnes per year, with 330 million tonnes produced in 2020/21. At the same time, environmental awareness fuelled up and all cement manufacturers are now committed to the reduction of fossil CO_2 emissions.

Presentation by Mr. Lechtenberg at the Conference "Conserve Green & Sustainable Resources" organised by the Cement Manufacturers Association of India at the end of 2019, just before the pandemic.

Beginning of 2019, our managing director Dirk Lechtenberg was honoured by an invitation from the Cement Manufacturers Association of India to speak about alternative fuels where he met his good friend (Mr. Dilip) again.

K.S Dilip

It was certain, that this would be the right time, so MWV began advising some prominent cement players in India, and now in 2022, MVW is starting a local branch headed by Mr. KS Dilip. You can reach our country manager in India at **ks.dilip@lechtenberg-partner.de,** for business enquiries and our support in India.

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Co-Processing Magazine for Alternative Fuels & Raw Materials

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Global News

Plastic Recycling Industry Continues Fast-paced Efforts Towards EU Targets

In 2020, the total installed capacity of plastics processing plants in EU27 + 3 countries increased by 1.1 million tonnes compared to the previous year. The new figures show that the plastics recycling industry will remain resilient in making plastics truly circular. Despite the challenges posed by the pandemic, the extraordinary growth of the sector was made possible, in part, by strong growth in demand, driven by the new legislatives objectives

Source. Peter von Bechen, pixelio.de

The data set shows that PET, flexible PO and rigid HDPE and PP have the majority of the total plastic recycling capacity, representing almost 80%. In addition, Germany, Italy, Spain, the United Kingdom and France have the highest capacity to recycle plastic waste.

Rigid HDPE and PP saw the largest increase in recycling capacity by over 20%, while flexible PO increased by about 10%. Rapid technological advances in collection, sorting and processing were one of the factors that made these advances possible.

Source: *https://www.recycling-magazine.com/2022/05/11/plastic-recycling-industry-continues-fast-paced-efforts-towards-eu-targets/*

Possible Impact of the Delegated Acts on Import of Hydrogen in the EU

The European Commission has announced the REPowerEU's plans to reduce Russia's natural gas demand by the end of 2022 and to take further steps to make Europe independent of Russian fossil fuels by 2030.

One of REPowerEU's key roles is to supply hydrogen and replace the use of fossil fuels in industry and transportation sector. To achieve this, REPowerEU aims to import 10 million renewable hydrogen by 2030 and produce the same amount of hydrogen in the EU. However, achieving this ambition will only be possible through adequate regulation of renewable hydrogen for domestic and import production.

There are currently no defined requirements for renewable hydrogen production in the EU, to address this issue, the European Commission has issued a new Renewable Fuel Production Act of 20 May 2022 ("Delegated Act for Hydrogen Production") and an Act to assess the reduction of greenhouse gas emissions for certain fuels ("Delegated Act for GHG emission savings").

Source:*https://energypost.eu/possible-impact-of-the-delegated-acts-on-import-of-hydrogen-in-the-eu/*

Africa

Ghana - First Hybrid Waste to Energy Plant Inaugurated

The first hybrid waste to energy treatment plants with 400 kilowatts capacity have been inaugurated at Gyankobaa in the Atwima Nwabiagya South Municipal of the Ashanti Region in Ghana. The plant was built with aim to assist in the management of solid waste in Ghana. The facility was executed through the collaborative efforts of the German government though its ministry of education and research and the west Africa science services centre on climate change and adapted land use

Source: Ghanaweb

In his represented speech, the president of Ghana,. President Nana Akufo Addo reiterated the impor-

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tance of the projects and how it will help to clean the environment and generate energy which includes , solar, biogas, and pyrolysis gas as well as help the communal carbon cycle through developing the process of value chain in the production and utilisation of compost to be sold to farmers for agricultural purposes while cutting down mineral fertilizers and in general contribute to Ghana's climate change strategy and inclusions in areas of renewable energy.

Source: *https://www.ghanaweb.com/GhanaHomePage/NewsArchive/Ghana-s-first-hybrid-waste-to-energy-power-plant-inaugurated-1527353?gallery=1*

Nigeria - Dangote Cement Begins Conversion of Waste to Energy

As part of measures to reduce environmental degradation and ensure a clean, green and safe environment, Dangote cement plc is committed to converting waste into energy by converting biomass, tire debris, ash, waste oils and fats into alternative fuels to power all of its factories all over the country. Last year, the waste conversion process was tested and about 89,000 tons of waste, including biomass, tire debris, ash, used oil and grease, were compressed and converted into alternative fuels to power parts of Dangote cement factories.

Source: Dangote Cement

Dangote Cement reiterates its commitment to protect the planet and reduce environmental degradation on World Mother Earth Day, which is celebrated annually on April 22nd. Michelle Pucherkos, Director of Dangote cement plc, mentioned that one of the safest ways to solve environmental problems is to recycle and co-process waste into alternative fuels.

Source: *https://businessday.ng/news/article/dangote-cement-begins-conversion-of-waste-to-energy/*

Nigeria - Dangote Cement to Empower Local Communities in its Alternative Fuel Project Value Chain

As a company that continues to drive values for its stakeholders, Dangote cement will be supporting Palm Kernel Shell (PKS) supply chain stakeholders as part of its strategy to increase the availability as a waste to be co-processed in the cement kilns to restore energy.

Source: Nairametrics

According to the cement producer, this is a contribution to global efforts to protect the environment and the circular economy. To this end, the company can conduct fixed value chain analyses and enter into partnership agreements with community waste collectors of PKS and palm oil processors in Nigeria to improve production that will lead to the sustainable creation of the PKS to be co-processed in cement kilns which will ultimately leads to no waste.

A team from Dangote cement, headed by Engineer Anagbe, the head of Alternative Fuels project visited a farm where PKS are sourced and ascertained that, Dangote cement wants the sustainable collection of PKS waste as a means to improve the environment and also make it as an additional source of living for people in the community. He encouraged people to follow the PKS model and to look for alternatives that could add value to their waste.

Source: *https://nairametrics.com/2022/05/05/dangote-cement-to-empower-local-communities-in-its-alternative-fuel-project-value-chain/*

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America

Canada - Cement Association of Canada Discusses Government of Canada's Emissions Reduction Plan

The emission reduction plan of Canada's government aims to reduce the greenhouse gas emissions of all heavy industries by 25 megatons between 2019 and 2030. The Canadian cement and concrete industry has partnered with the Canadian Industrial, Scientific and Economic Development (ISED) to get clean concrete by 2050. This partnership will be expected to accumulate more than 15 megatons of greenhouse gases by 2030 and continue to reduce greenhouse gases by more than 4 megatons per year.

In October 2021, the Global Cement and Concrete Association (GCCA) published the Net-Zero Global Roadmap. The Canadian cement and industry 2022 net-zero concrete roadmap is unique to Canada's economic and political landscape, as well as its collaboration with international counterparts. The aim is to reduce CO_2 emissions by 40% by 2030 and achieve zero concrete by 2050.

Canada's cement and concrete industry provides approximately 158,000 direct and indirect jobs nationwide and contributes $ 76 billion in direct, indirect and inductive economic impact on the Canadian economy. The Canadian cement association is the voice of the Canadian cement industry, representing five vertically integrated cement companies that provide reliable local cement supplies to help build Canadian society and critical infrastructure.

Source: *https://www.worldcement.com/the-americas/06042022/cement-association-of-canada-discusses-government-of-canadas-emissions-reduction-plan/*

Panama - Cemex Signs Alternative Fuel Agreement with 3M

Cemex has expanded its use of alternative fuels in Panama with 3M for the treatment of industrial waste. This collaboration is in line with Cemex's "Future in Action" strategy to reduce its carbon footprint and contribute to the circular economy.

The agreement expands Cemex's public waste recycling operations, reducing the carbon footprint of its production processes and the amount of waste sent to landfill. Decomposition in landfills releases methane, a greenhouse gas 25 times stronger than carbon dioxide, while maintaining atmospheric heat.

3M will supply Cemex with high thermal waste, such as foam and wool of around 30 tons of waste per year for use as alternative fuel to produce high-quality cement for Panama.

Source: *https://www.cemnet.com/News/stry/172499/cemex-signs-alternative-fuel-agreement-with-3m html*

Asia

India - Dalmia Cement Plant to Process Organic Rejects from Marten

The Shillong Municipal Board (SMB) has reached an arrangement with Dalmia Cement Bharat Limited (DCBL) to dispose of organic waste from the Marten compost unit in its Lumshnong, East Jaintia Hills cement factory.

Source: The landfill site at Mawlai Marten. (ST)

Marten's organic rejects will be transferred to the cement factory for co-processing. According to FB Chyne (SMB's Executive Engineer), the city's waste will be treated, with biodegradable waste being turned into compost and organic rejects or waste being removed. He also stated that they have installed two leachate treatment units, both of which are completely operational.

Source: *https://theshillongtimes.com/2022/03/29 dalmia-cement-plant-to-process-organic-rejects-from-marten/*

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India - JK Lakshmi Partners with TARA for Carbon Neutrality

JK Group reported that, JK Lakshmi Cement will partner with the Society for Technology and Action for Rural Advancement (TARA) in India to sign a long-term memorandum of understanding (MOU) to introduce the method of decarbonisation in cement production. The alliance aims to help the cement company achieve carbon neutrality by 2047 by producing Limestone Calcined Clay Cement (LC3) and other innovations.

In their statement, the JK Group states that "This alliance will be a game-changer for the cement industry, providing momentum to its efforts to reduce emissions, battle climate change, and bring a holistic shift in the surrounding communities to establish sustainable livelihoods in huge numbers," .

Source: *https://www.cemnet.com/News/story/172626/jk-lakshmi-partners-with-tara-for-carbon-neutrality.html*

Philippine - Government Urges Cement Producers to Use Plastics Waste

According to the Manila Times, the Philippine Department of Environment and Natural Resources (DENR) urged cement producers to find ways to use plastic waste as a raw material to reduce the country's solid waste production by at least 40%.

When all cement plants are involved, said William Cunado, director of DENR-EMB, referring to several cement plants using plastic waste as raw material, it can dramatically reduce the amount of plastic waste. Local companies are starting to turn plastic waste into energy. In addition, Jonas Leons, DENR's under secretary and spokesman for politics, public relations and international affairs, said the plastic campaign materials used in the May 2022 elections in Philippines could also be recycled at cement plants.

Source: *https://www.cemnet.com/News/story/172378/philippine-government-urges-cement-producers-to-use-plastic-waste.html*

Europe

Belarus - Prime Minister Want More Solid Municipal Waste Recycled

The use of solid waste should be significantly increased. Belarussian Prime Minister Roman Golovchenko made the following statement at a ministerial meeting. "At the presidiun we will discuss more efficient management of solid waste and secondary material resources. Unfortunately, we still can't learn how to use these resources effectively The government has approved the necessary policy documents, but I don't think they have taken proper account of what they are doing at the real estate and local level".

According to him, the situation has recently changed for the better. Solid waste management and recycling indicators are on the rise. From 2010 to 2021, the amount of secondary material resources collected has increased about 2.5 times, and the amount of solid waste used has tripled from 9% to 29%. "At the same time, the use of solid waste is expected to reach 64% by 2025. This is possible, but requires a precise alignment of all links in the chain, from waste collection and recycling to recovery.

Source:*https://eng.belta.by/economics/view/belarus-prime-minister-wants-more-solid-municipal-waste-recycled-149782-2022/*

France - Setting the Pace for PET Chemical Recycling in Europe

France continues to lead the way in the development of polyethylene terephthalate chemical processing industry in Europe with a series of announcements set to be made about new facilities to expand production capacity in the country.

France plans to open three polyethylene terephthalate (PET) chemical processing plants by 2025, which aims to become a leader in new processing technologies in Europe. Announcements from Eastman, Loop Industries and Carbios highlights the opportunities as well as the challenges that the processing industry still faces. Especially raw materials

While the announcements indicate positive developments in the PET processing industry, it raises ques-

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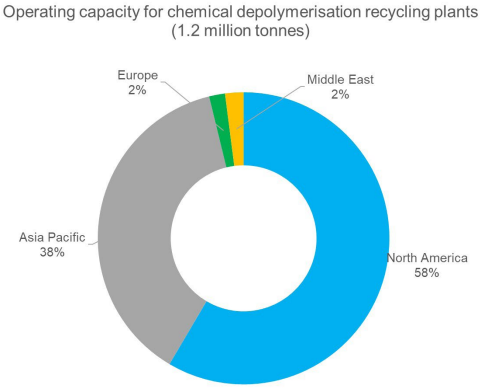
tions about the ability of Europe and the world to supply the materials needed for these new plants. All new businesses that need plastic waste as a raw material are concerned about the established but limited supply of the processing industry, especially if they see new opportunities as competition for raw materials.

At present, the production capacity of chemical plants is lower than that of mechanical recycling, and Europe is smaller in capacity than in some regions such as Asia Pacific and North America at less than 100,000 tons per year. Given the announced projects and the availability of sufficient quantity and quality of raw materials supply the plants, the capacity is expected to increase rapidly.



Source: ICIS Chemical Recycling Supply Tracker, 2022

Source: *https://www.recycling-magazine.com/2022/05/24/france-setting-the-pace-for-pet-chemical-recycling-in-europe/*

Germany - Holcim, Thyssenkrupp and Berlin University Participate in Amine Scrubbing Project

Thyssenkrupp Uhde, Holcim and Technische Universität Berlin have partnered in a joint project to study the use of a new amine purification technology to capture carbon.

The aim is to significantly reduce the CO_2 emitted by existing cement plants and to use the CO_2 obtained for other purposes. In particular, it involves the development of new public transport equipment that is more efficient and more resistant to pollutants. This project is funded by the German Federal Ministry of Economy and Climate Action under Fund no. 03EE5103A.

The performance and efficiency of the equipment are tested with real exhaust at the Beckum cement plant in Germany. Various options for the use of the CO_2 obtained, such as methanol or stable fuels, are also being explored. Through this process, the partners want to help reduce greenhouse gases, especially in existing cement plants. It can then be adapted to produce CO_2 from the process gas without further changes in the production process.

Source: *https://www.cemnet.com/News/story/172455/holcim-thyssenkrupp-and-berlin-university-participate-in-amine-scrubbing-project.html*

Germany - Heidelberg Cement Tightens Specific $C0_2$ Emissions Reduction Target to 2030

Heidelberg Cement has accelerated its current target of reducing CO_2 emissions to 400 kg CO_2 /t CEM by 2030 compared to 1990 levels. This is 30% lower than in 2021 and 47% lower than in 1990. The previous target was 33% since 1990. According to the company, by 2030, CO_2 emissions in the next eight years will be reduced by one percentage point compared to the last 30 years.

The building materials manufacturer has announced this as part of a new medium-term financial and stability objective called “Concrete Promises”, at the Capital Markets Day event hosted in May 2022. The group intends to raise half of its revenues from its sustainable products by 2030. Carbon capture, utilisation and storage (CCUS) projects that have already started will reduce total CO_2 emissions by 10 million tonnes by 2030. By 2025, more than 70% of its debt will be covered by sustainable financial instruments.

Source: *https://www.globalcement.com/news/item/14161-heidelbergcement-tightens-specific-co2-emissions-reduction-target-to-2030;?utm_source=newsletter&utm_medium=email&utm_content=563809&utm_campaign=gcw558*

Germany - Cemex Inaugurates Carbon Neutral Alliance at Rüdersdorf Cement Plant

Cemex has launched the Carbon Neutral Alliance at its Rudersdorf integrated cement plant. The initiative aims to quickly transform the site into the world’s first neutral cement plant by 2030. The event was

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attended by Brandenburg Economy Minister Jörg Steinbach, Cemex CEO Fernando A. Gonzalez, the Mexican Ambassador to Germany and representatives from Sasol.

Carbon Neutral Alliance is a network of over 20 private and public organizations targeting the decarbonization industry. Some of the technologies introduced in Rudersdorf include a residual heat recovery project planned for the summer of 2022 and the development of renewable energy planned to jointly produce aircraft fuel with Sasol and Enertrag.

Source: *https://www.globalcement.com/news/item/14184-cemex-inaugurates-carbon-neutral-alliance-at-ruedersdorf-cement-plant;?utm_source=newsletter&utm_medium=email&utm_content=563809&utm_campaign=gcw559*

Switzerland - Intergovernmental Panel on Climate Change Report Calls on Cement Industry to Promote Use of Secondary Cementitious Materials and Encourage Carbon Capture

A recent report by the Intergovernmental Panel on Climate Change (IPCC) told decision-makers that the best way to reduce carbon emissions from cement production is to use more of secondary cement materials and to develop and stimulate carbon capture. Also, although new developments in building materials chemistry may help the situation, it is not expected in the short to medium term.

The report notes that in 2019, 12 Gt of CO_2 equivalent were emitted directly and indirectly from buildings and from the use of cement and steel for the construction and repair of buildings. These emissions include indirect emissions from external electricity and heat generation, direct emissions from factories and emissions of cement and steel used in the construction and repair of buildings. In some sections of the pre-approve IPCC report, the authors said; "Cement and concrete are currently overused because they are inexpensive, durable, and ubiquitous, and consumption decisions typically do not give weight to their production emissions."

Source: *https://www.globalcement.com/news/item/13939-intergovernmental-panel-on-climate-change-report-calls-on-cement-industry-to-promote-use-of-secondary-cementitous-materials-and-encourage-carbon-capture*

Middle East

UAE - Dulsco Commisions a New Refuse Derived Fuel (RDF) Plant, A First in the Region

With the successful implementation of its Refuse Derived Fuel (RDF) plant, located within the Expo 2020 premises, Dulsco, an integrated solutions provider and the Official Waste Management Partner of Expo 2020 Dubai, continues to advance environmental sustainability. The waste-to-energy facility can process over 70,000 tons of waste each year, which is the equivalent of 7,000 garbage trucks diverted from landfills.

The RDF factory uses a cutting-edge processing approach to handle waste and produce a refuse-derived fuel. The factory is the region's first of its sort. The waste is pre-treated before it is processed, and the end product can be used as a fuel source for the plant itself or by cement plants and other industries.

Source: MENAFN - Mid-East.info

Source: *https://menafn.com/1103996115/Dulsco-commissions-a-new-Refuse-Derived-Fuel-RDF-Plant-a-first-in-the-region&source=138*

UAE - First Waste-To-Energy Plant Is Ready in Sharjah, Testing to Start Soon

The first waste-to-energy plant in the UAE has been completed, and the project is now in the testing and commissioning phase. The Sharjah Waste-to-Energy facility is the first to be built by the Emirates Waste-to-Energy, a joint venture between Beeah Energy and Masdar, the renewable energy business based in Abu Dhabi

The facility will enable Sharjah to become the Middle East's "first zero-waste city" converting non-recyclable waste into clean energy and raising the existing landfill diversion rate from 76% to 100% once it is fully operational.

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It will contribute to the UAE's clean energy resources while helping to reduce garbage transported to landfill. The Sharjah plant, when fully operational, will assist to divert up to 300,000 tonnes of non-recyclable waste from landfills each year while also producing 30 MW of low carbon electricity.

Source: Golf News

Source: *https://gulfnews.com/business/uaes-first-waste-to-energy-plant-is-ready-in-sharjah-testing-to-start-soon-1.87446318*

Turkey - Cimsa's Afyon Cement Plants Opens WDF Facilities

Çimsa's new investment, the "Opium Waste Derived Fuel Feeding Facility" has began operation at the company's plant in Afyon. The facility is designed to reduce the use of fossil fuels in cement production and to stabilize the production process by using alternative fuels. It is expected to apply the principle of the circular economy using waste from various fields.

Completed in nine months with an investment of 52 million TRY (USD 3.65 million), the plant will initially reduce the use of fossil fuels at the Afyon plant in Chimsa by 35%. For example, waste is converted into heat, and energy recovery minimizes the impact on the environment.

This investment is to prevent the release of 46,200 tonnes of CO_2 into the atmosphere. This amount corresponds to the annual CO_2 capacity of 23,000 hectares of forest.

Source: *https://www.cemnet.com/News/story/172328/-imsa-s-afyon-cement-plant-opens-wdf-facility.html*

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