Eagle Materials:

engagement commentary

Federated Hermes SDG Engagement Equity Fund
Q4 2021

Federated Hermes International

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ENGAGEMENT COMMENTARY: Eagle Materials

In a nutshell

Eagle Materials is the largest domestic only producer of cement, aggregates, and wallboard in North America.

$6.66bn market cap

$1.62bn revenue

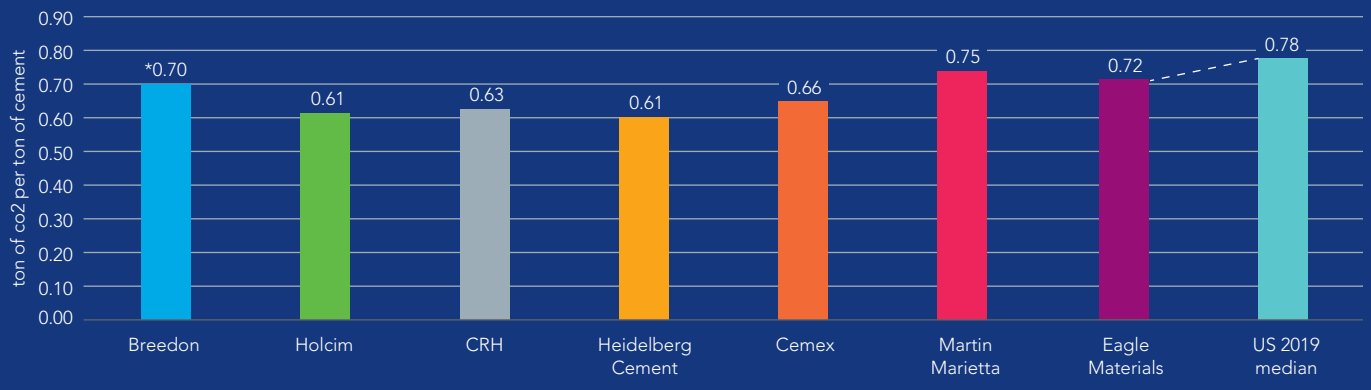
2,400 employees

Headline progress

- The company published its first set of sustainability disclosures for a decade in 2021.
- The carbon intensity of the company's production has declined 13% in the period 2018-20 and its facilities are collectively top quartile for carbon intensity in the US[1].
- In Q4 2021, the company announced a partnership with Chart Industries to pilot their carbon capture and storage (CCS) technology.

Despite the carbon intensive manufacturing process for cement, the coming decade of net-zero infrastructure will be cement and concrete reliant – e.g. foundations for wind farms.

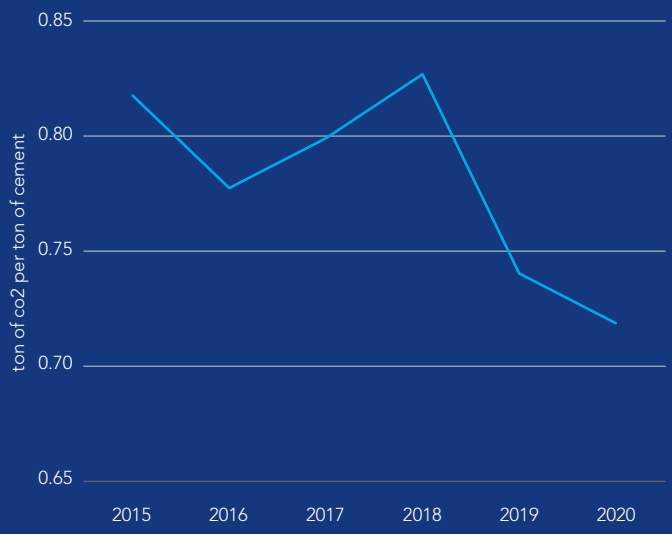
Figure 1. Comparison of construction companies: carbon emitted per unit of production



Source: Federated Hermes, compiled using data gleaned from Bloomberg and company filings *based on estimate that cement plant emissions constitute c90% of total group emissions.

[1] Combination of company filings (e.g. ESG disclosures 2021) and US Environmental Protection Agency (EPA).

Figure 2. Eagle Materials – Carbon emitted per unit of production



Source: Federated Hermes, compiled using data gleaned from Bloomberg and company filings.

Investment case

- Lowest cost producer of in-demand commodity product with significant industry production capacity constraint
- Consistent record of credible management and execution
- Infrastructure improvement in the US provides mid-term certainty over demand
- Despite the carbon intensive manufacturing process for cement, the coming decade of net-zero infrastructure will be cement and concrete reliant – e.g. foundations for wind farms.

Theory of change

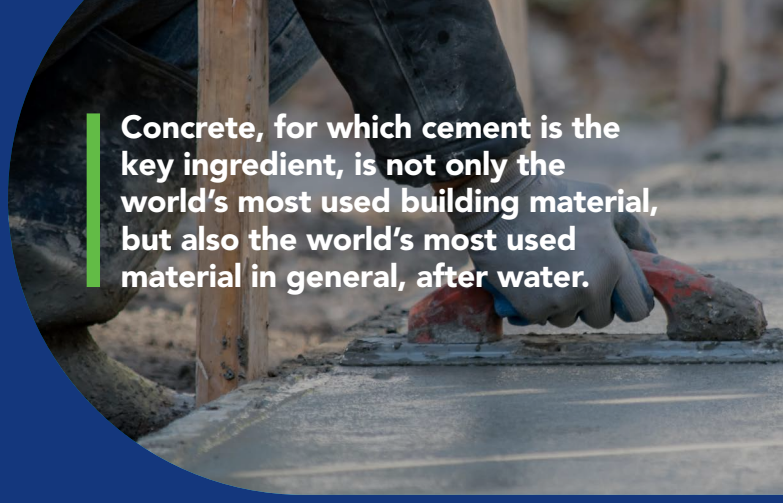
As of Q4 2021, Eagle Materials represented 17% of the SDG Engagement Equity Fund's total carbon footprint. This figure, while high, is perhaps unsurprising given cement manufacturing is estimated to represent c.8% of total global emissions[2].

Currently, based on US Environmental Protection Agency (EPA) carbon emissions data, producing cement accounts for 1.25% of the nation's CO_2 emissions – with demand projected to increase. Eagle's clinker capacity[3] is approximately 6.7m tons, which is approximately 6% of total US clinker capacity.

If Eagle positions itself at the forefront of efforts to manufacture cement sustainably, then it could help transition our economy towards net zero and have a meaningfully positive environmental impact.

Cement context

Concrete, for which cement is the key ingredient, is not only the world's most used building material, but also the world's most used material in general, after water.



According to the IEA,[4] the direct CO_2 intensity of cement production increased 1.8% per year in the period 2015-2020. In contrast, 4% annual declines to 2030 are necessary to get on track with their 'net zero emissions by 2050' scenario.

Cement production – the basics and the opportunities

It is important to acknowledge that cement manufacturing is, at present, unavoidably carbon intensive. The transformation of the calcium carbonate in limestone to calcium oxide – the essential step in cement manufacturing that produces clinker – is responsible for c.60% of total cement manufacturing emissions[5]. Today, there is no viable alternative to mass scale cement manufacturing that does not involve clinker production. Thus, the process emissions (arising when limestone is turned into calcium oxide and then clinker), account for the majority of cement's carbon footprint. The bulk of the remaining emissions relate primarily to fossil-fuel combustion.

Net zero

In the past 18 months, global and regional cement and concrete industry associations have published a series of roadmaps to move the industry to net zero by 2050. This includes both the Global Cement and Concrete Association (GCCA)[6] and the Portland Cement Association[7]. The GCCA net zero roadmap describes the decade 2020-30 as the decade for action. In this key decade, the cement industry must accelerate CO_2 reductions and the GCCA is aiming for a 20% reduction in CO_2 per ton of cement.

The primary levers for attaining this reduction are outlined below:

1. Carbon capture, utilisation and storage (CCUS)
2. Increased clinker substitution
3. Fossil fuel reductions and use of alternative fuels
4. Increased efficiency in concrete production.

The IEA has noted that the increased CO_2 intensity of production in the period 2015-20 means that sharper focus is needed in two particular areas: reducing the clinker-to-cement ratio (including greater uptake of blended cements) and deploying innovative technologies, such as CCUS.

[2] Fast Company, Cement is responsible for 8% of global emissions—but it doesn't have to be, (19 November 2021).
[3] Clinker is a nodular material produced in the kilning stage during the production of cement and is used as the binder in many cement products.
[4] Cement – Analysis – IEA.
[5] National Precast Concrete Association (NPCA), Concrete and CO_2.
[6] GCCA-Concrete-Future-Roadmap-Document-AW.pdf (gccassociation.org).
[7] pca-roadmap-to-carbon-neutrality_10_10_21_final.pdf (cement.org).

Practice of change

Over the period of our investment, we have met with Eagle's management on numerous occasions to discuss issues of interest and have been encouraged by the progress made. We had long contended that their position as the most cost efficient producer in North America was testament to their commitment to do more with less.

While there remains scope for further progress, Eagle has delivered meaningful improvements in practices already. Notably, the company's previously lagging ESG disclosures are now broader and richer. Before this year, the company's last sustainability report was back in 2011 – we are confident that these disclosures will now be annual rather than once a decade. Eagle's disclosures this year evidence their sound practices, aligning them to – or even placing them above – domestic peers in the building materials sector. The company is now catching up with international cement manufacturers.

More pertinently, the company's carbon intensity of production, as of 2020, was 0.72 tons of CO_2 per ton of cement[8]. While higher than international peers for reasons touched upon in this note, it nonetheless suggests that when it comes to efficiency, Eagle's facilities are collectively in the top quartile of cement plants in the US, where the median carbon intensity is 0.78[9]. There is still significant scope for progress, and we are pleased to note that the company is on the case.

Opportunities and Eagle's progress

Alternative fuels

Fossil fuels continue to provide the majority of energy in the cement sector, with bioenergy and biomass-based wastes accounting for only 3% of thermal energy used in 2020[10]. In the US today, the industry's fuel mix includes 60% coal and petroleum coke – the industry wants to cut that amount by a factor of 5 with a goal of no more than 10% use in 2050[11]. While in Europe alternative fuels often exceed 60% of the total fuel mix, in the US, alternative fuel use is just 14% of fuel-related energy[12].

To achieve net zero, the share of energy derived from bioenergy and renewable waste must grow considerably. Meanwhile, the share of fossil-based energy and waste-derived energy (from tyres, waste oil and plastics) must decline. To put this in context, tyres have only a c.11% lower emission factor than coal while waste wood can potentially be carbon neutral (dependent upon sourcing)[13].

The cement industry has taken advantage of opportunities for industrial symbiosis – utilising the waste or by-products from other industrial processes as energy inputs. Greater uptake of alternative fuels can be facilitated by redirecting waste from landfills to the cement industry and by coordinating the supply of sustainably sourced biomass across sectors to enable cost-competitive access to cement production.

- Eagle Materials, like domestic peers, utilises coal, petroleum coke, natural gas and, to a limited extent, alternative fuels in powering their cement plants. While some Eagle plants are utilising over one third alternative fuels, most are near or wholly dependent upon coal and/or natural gas. In 2021, cross-functional improvement teams were established to focus on opportunities in lower carbon fuel mixes at every cement plant. The company cited in its 2021 ESG disclosures the below improvements[14]:
- 4.4% Fuel quality waste
- 2.7% Bio-mass (landfill gas)
- 2.2% Alternative fuels

We hope to see the company set out explicit plans for alternative fuel utilisation across its asset base in the short-term, with associated year-on-year improvement targets.

Clinker substitution

Clinker is the main ingredient in cement, and the amount used is directly proportionate to the CO_2 emissions generated in cement manufacturing.

Clinker can be blended with a range of alternative materials, including waste materials or industrial by-products. The use of other constituents in cement and the reduction of the clinker-to-cement ratio means lower emissions and lower energy use. The clinker-to-cement ratio (the percentage of clinker compared to other non-clinker components) has an impact on the properties of cement; standards determine the type and proportion of alternative main constituents that can be used. These standards vary by region.

The company's carbon intensity of production, as of 2020, was

0.72 tons of CO_2 per ton of cement

In the US, ordinary Portland cement can contain up to 95% clinker (the other 5% being gypsum). In contrast, the average clinker-to-cement ratio over all cement types in Europe (excluding the UK) is currently 73.7%[13]. The ratio is much higher in the US due to less relaxed standards – clinker ratios here are typically over 90%. The US industry is targeting lower clinker-to-cement ratios, with 0.85 by 2030, 0.80 by 2040, and 0.75 by 2050[15].

The availability of alternative materials that can be used as other constituents varies considerably. For example, granulated blast furnace slag availability depends on the location and output of blast-furnaces for pig-iron production equipped with slag granulation facilities, while fly ash use is dependent on the (declining) supply of sufficiently close coal-fired power plants. The availability of natural cementitious materials depends on the local situation and only a limited number of regions have access to this material for cement production. In contrast, limestone is abundant worldwide and is easily accessible for most cement plants.

[8] Eagle's 2021 ESG disclosures.
[9] U.S. Cement Industry Carbon Intensities (2019) (epa.gov).
[10] Cement – Analysis – IEA.
[11] pca-roadmap-to-carbon-neutrality_10_10_21_final.pdf (cement.org).
[12] pca-roadmap-to-carbon-neutrality_10_10_21_final.pdf (cement.org).
[13] The Pembina Institute and Environmental Defence, Alternative Fuel Use in Cement Manufacturing (pembina.org).
[14] Cembureau, Clinker Substitution: In Brief.
[15] pca-roadmap-to-carbon-neutrality_10_10_21_final.pdf (cement.org).

One example of cross-industry tie-ups is with the renewable energy industry, specifically wind power. The increasing number of wind turbines is self-evidently a positive; however, there are also significant challenges with respect to the end-of-life management of turbine blades. About 1,400 blades are set to be removed annually in the US from now until 2025 (the figure is over 6k per annum in Europe[16]). In Germany, the cement kiln process is already being used commercially for glass fiber wind turbine blade disposal. The glass fiber content (roughly 50% of the blade's content) can be used to replace raw material for cement production. The other 50% (the resin that is the organic part) can be used to replace coal or natural gas as a fuel, reducing the CO_2 output of cement manufacturing.

The aforementioned fiberglass challenge (or opportunity) is also pertinent to fiberglass boats – a topic we have discussed before with respect to our ongoing engagement with Brunswick Corporation and their support for the Rhode Island Fiberglass Vessel Recycling Project[17]. This project has verified in the US the applicability of fiberglass boat recyclate material as a valuable alternative input for industrial cement manufacturers. The recyclate offers both thermal and material value that replaces elements such as silica and alumina and reduces emissions that contribute to climate change with no negative impact on the finished product.

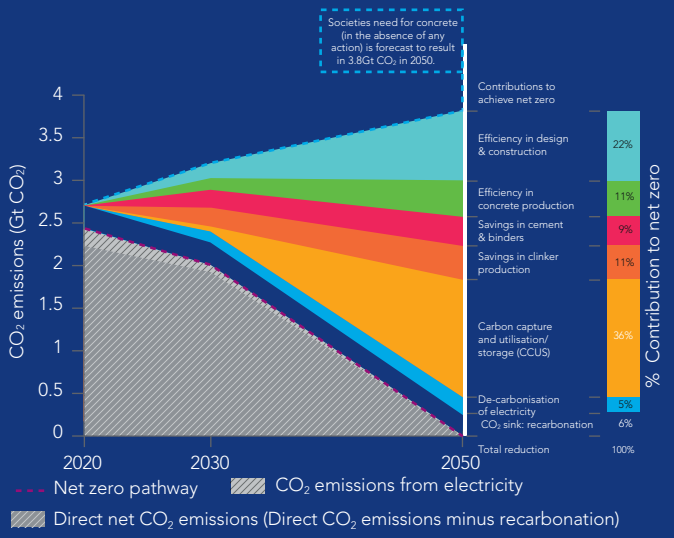
While in the US the clinker content of Portland cement is constrained by stricter performance standards that dictate high clinker ratios, Eagle Materials have been proactive in making the case that there are also less demanding applications (some of which are non-structural) that should be able to use cement with a lower clinker content. To that end, the company is manufacturing Portland limestone cement and looking to, in effect, make the market in many of its jurisdictions of operation.

- The Department of Transport in five US states have, as of November 2021, permitted use of Portland limestone cement, which can have a clinker ratio of 85%. Over the coming 12-24 months, greater willingness in these states to use of lower clinker content cement will result in a notional increase in Eagle's cement production capacity of c.5%, while in turn reducing their CO_2 per ton proportionately.

Thermal efficiency and carbon capture

Thermal process efficiency at US cement plants generally reaches values above 80% of the theoretical maximum. Although incremental thermal energy efficiency gains can be made, they thus have the smallest opportunity for CO_2 reductions[18].

Figure 3. The Net Zero Pathway



Source: GCCA Net Zero Roadmap.

Carbon capture will therefore be crucial to reduce the cement sector's CO_2 emissions, particularly the process emissions released during limestone calcination. Carbon capture is expected, or hoped, to do a lot of the heavy lifting with respect to allowing the industry to get to net zero. In the GCCA's roadmap, they suggest that CCUS will deliver 36% of total emissions reduction. The UK's cement industry's roadmap suggests that CCUS will be responsible for over 60% of the industry's CO_2 reduction.

While dozens of carbon capture technologies are undergoing research and testing in cement plants across the world, there are no commercial scale carbon capture installations at any cement plant within the US. Significant investment in research is still needed.

- Eagle Materials has been in dialogues with the US Department of Energy and others for some time. Pleasingly, the company was able to announce, in Q4 2021, a collaboration with Chart Industries to test their Sustainable Energy Solutions Cryogenic Carbon Capture ("CCC") technology at their Central Plains facility in Sugar Creek.

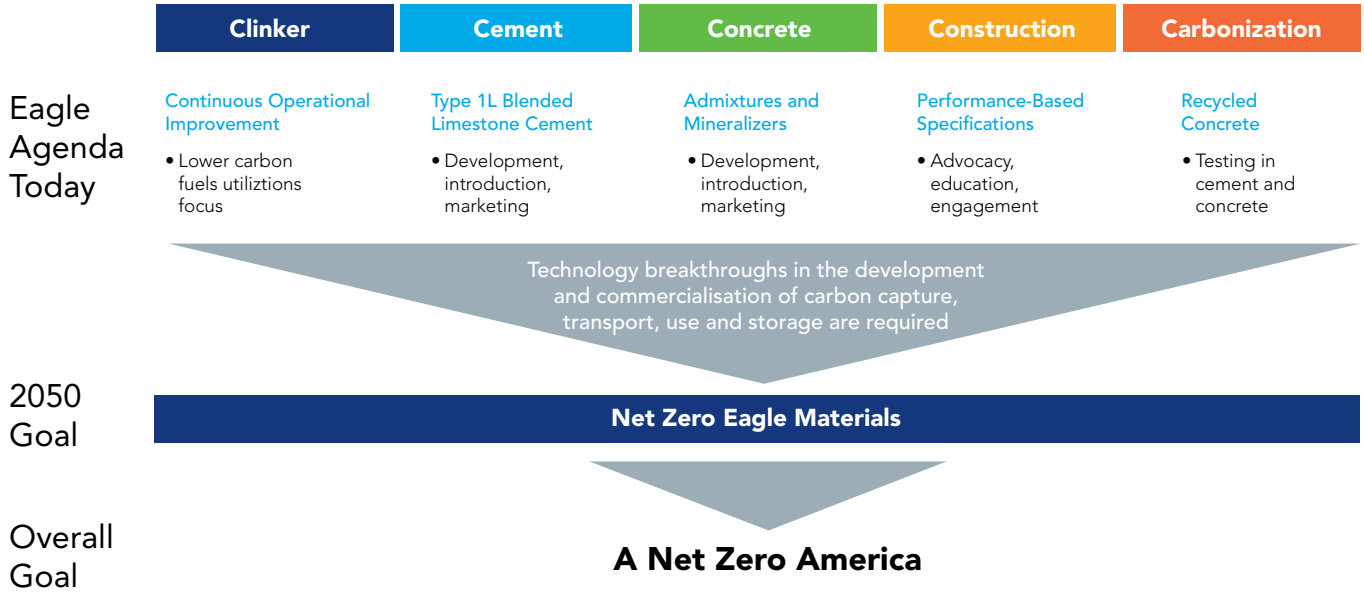
  The project will scale the CCC system to a capacity of nominally 30 tons of CO_2 per day, with the intention of demonstrating that the system captures more than 95% of CO_2 and produces a CO_2 stream that is more than 95% pure. Notably, Chart Industries' CEO and President, Jill Evanko, has suggested that the company's CCC model increases cement production costs by just 24%, compared to 38%-130% for other systems and therefore offers some hope for potential commercial scalability[19].

[16] Bloomberg NEF.
[17] ADV RI Pilot Program 2021 Update.pdf (longwood.edu).
[18] Eagle Materials, ESG disclosures, 2021.
[19] Chart Industries, press release.

Next steps

We will continue to engage with Eagle Materials on the central issue outlined in this note. We hope to see further progress made in the coming year with respect to explicit target setting around, for example, alternative fuel utilisation. Fundamentally, we are hopeful that the company will continue to take a leadership position within the industry, raising collective ambitions and in turn accelerating the progress towards net zero.

Figure 4. Eagle's current agenda and goals



Source: Eagle Materials, ESG disclosures, 2021.

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