Covering the US cement deficit

With US cement plants nearing full capacity, domestic producers will need import capability to keep market share. Several lack this capability and will have an interest in new terminal facilities. Moreover, globally, clinker trade is growing faster than cement trade and the trend for building new coastal standalone grinding plants is continuing. A transition by the US towards cements with a lower clinker content will make importing clinker to grind it an attractive economical option in light of the status quo.

■ *by **PEC Consulting Group/PENTA Engineering Corp**, USA*

US cement consumption grew to roughly 103Mt in 2019 and remained stable during 2020 due to the COVID-19 pandemic, with cement prices reaching US$124/t in the same year.[1] This demand was met by cement manufacturing on US soil of approximately 89Mt (86 per cent of total consumption) and imports of approximately 15Mt (14 per cent).

Domestic cement production has not reached peak levels since the mid-2000s. Some plants remain partially idle and others have shut down permanently. Disruptions from plant upgrades and closures, as well as inexpensive imports, have also led to lower levels of local production. The US cement industry has shown no prolonged or widespread negative effect from the pandemic.

Cement is currently produced at 96 plants in 34 states and at two plants in Puerto Rico. It remains possible that some kilns could be shut, idled or used in a reduced capacity to comply with the 2010 National Emissions Standards for Hazardous Air Pollutants (NESHAP), which would restrain US clinker capacity.

In 2020 cement sales were valued at US$12.7bn, most of which was used to make concrete. Approximately 70-75 per cent of sales were to ready-mix concrete producers, 10 per cent to concrete product manufacturers, 8-10 per cent to contractors, and 5-12 per cent to other customer types. Texas, Missouri, California and Florida, in descending order, were the four leading US cement producing states, accounting for nearly 45 per cent of production.[2]

At present, clinker manufacture is one of the largest sources of greenhouse gas emissions from the industrial sector. Improving the sustainability of the cement industry is an important challenge and is mainly focussed on lessening CO_2 emissions in the USA. To reduce CO_2 emissions, cement manufacturers are increasingly developing alternatives to clinker production. These include:

- clinker replacement by ground granulated blastfurnace slag, fly ash and other pozzolanic materials
- importation clinker from foreign countries.[3]

Covering the US cement capacity deficit with imported clinker

Cement and clinker imports into the US

In 2019 the US imported 16.3Mt of cement and clinker comprising 13.5Mt of grey cement, 1.42Mt of white cement

Table 1: key US cement industry statistics, 2015A - 2020E [1]

	2016	2017	2018	2019	2020E
Production ('000t) – Portland and masonry cement[2] – clinker	84,695 75,633	86,356 76,678	86,368 77,112	88,000[e] 79,000	89,000 79,000
Shipments to final customer – including exports ('000t)	95,397	97,935	99,419	103,000	103,000
Imports for consumption ('000t) – hydraulic cement – clinker	11,742 1496	12,288 1209	13,764 967	14,690 1160	15,000 1400
Exports of hydraulic cement and clinker ('000t)	1097	1035	919	1002	1000
Apparent consumption ('000t) [3]	95,150	97,160	98,500	103,000[e]	102,000
Price – average mill value (US$/t)	111	117	121	123[e]	124
Cement stocks at year-end ('000t)	7420	7870	8580	7140[e]	7800
Employment, mine and mill number (units)[E]	12,700	12,500	12,300	12,500	12,500
Net import reliance[4] as a share of apparent consumption (%)	13	13	14	14	15

[E] estimated
[1] Portland plus masonry cement unless otherwise noted, excludes Puerto Rico unless otherwise noted
[2] includes cement made from imported clinker
[3] defined as production of cement (including from imported clinker) + imports (excluding clinker) - exports + adjustments for stock changes
[4] defined as imports (cement and clinker) – exports

and 1.38Mt of clinker. Seaborne imports accounted for 12Mt (75 per cent of total imports). Compared to seaborne imports of 2.85Mt in 2010, the 2019 figure represents growth of 321 per cent.

The overall supply from Asia in 2019 was 2.37Mt, mainly to the US West Coast. The large growth of imports on the US Gulf and East Coast was met from the Europe/Mediterranean region (7.2Mt, of which 3.9Mt were from Turkey) and to a lesser degree, by Canada and Mexico.

In terms of clinker imports, 574,000t arrived from Canada (across the Great Lakes), with the remaining 806,000t imported from Europe. Clinker imports from Canada across the Great Lakes are destined for standalone grinding plants of the same ownership of the clinker exporter. Clinker imports from Europe (with the exception of a small volume of specialty clinker for aluminate cement) are used by integrated US cement plants that are using surplus grinding capacity to increase cement production.

The port facility as an economically efficient solution

The long-term export availability of low-priced cement and (especially) clinker, in combination with low shipping prices, makes it far more economical to import than to build integrated cement plants in coastal areas. Indeed, it is expected that new coastal cement production facilities will be grinding plants with blending capability.[3]

With US cement plants nearing full capacity, all US cement producers will need import capability to keep market share. Several lack this capability and so will have an interest in new terminal facilities.

For those US cement producers with seaborne import capability, most of the terminals have ship unloaders that would be able to unload larger vessels, but the average storage capacity is far too low and needs to be expanded or new larger facilities need to be built.

The cost efficiency of shipping by Supramax (or larger ship) versus that of a smaller-sized ship is significant. The current shipping cost from the

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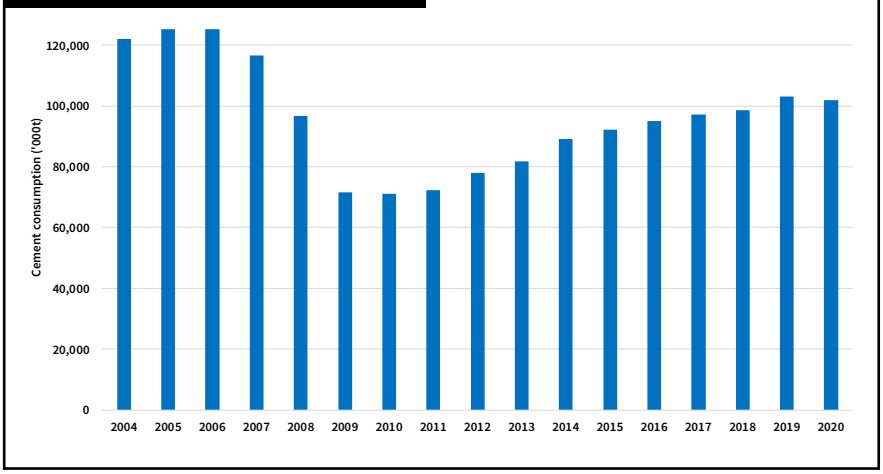
Figure 1: US cement consumption, 2004-20E



"Globally, clinker trade is growing much faster than the cement trade. A large number of new coastal standalone grinding plants have been built over the last decade and this trend is continuing."

Mediterranean to the US East Coast is about US$15-16/t for Supramax vessels, US$18-19 for Handymax vessels and US$27-28 for Handysize vessels of around 25,000dwt. From a historical viewpoint, these shipping costs are very low. Over the lifespan of the terminal's operation they can be expected to fluctuate with the current cost level as the lower value.

Clinker or cement

Because shipping costs vary over time, it makes more sense not to look at absolute shipping costs and their possible variations but at the relative shipping cost differences between importing cement and importing clinker. When the overall cost of importing clinker and grinding is lower than the cost of importing cement, the grinding plants should be profitable for every perceivable shipping cost. The cost difference between the landed cost of cement and the landed cost of clinker consists of three elements:

- There is the FOB price difference of cement and clinker, currently this is US$5-6/t.
- The shipping cost difference between cement and clinker varies mostly due to the use of different ship sizes. Current cement imports into US East Coast terminals are frequently with Handysize vessels that have an average 35,000t shipment size. By utilising vessels with a cargo capacity of 50,000t or larger for clinker imports a current cost difference of US$6-8/t can be realised.
- Terminal costs for cement are significantly higher than for clinker. A difference of US$5-7 is currently achievable.

At present the landed cost of clinker is US$16-21/t, which is lower than the US$19-24/t landed cost of cement. If clinker is imported, then several types of cement can be produced from that clinker, allowing greater flexibility to meet the specific and possibly changing local market demands.

A grinding plant can combine imported clinker with less cost-sourced materials (eg, limestone, coal ash, slag, etc) to make blended/specialty cements at higher profits. The US is quite particular in its use of Type I/II low-alkaline cement. This is a cement with a 95 per cent clinker content and only five per cent limestone and gypsum. It is a high-quality cement, but it has a very high CO_2 output. The global average is a clinker content of about 83 per cent – and there is a big push to reduce this further.

Globally, clinker trade is growing much faster than the cement trade. A large number of new coastal standalone grinding plants have been built over the last decade and this trend is continuing. By comparison, relatively few new cement terminals have been built during this

Figure 2 : US cement and clinker imports 2019 [4]

Table 2: North American cement producers without seaborne import capability

Eagle Materials	Federal White
St Mary's (Votorantim)	Drake
CRH	Colacem
GCC	Armstrong
Martin Marietta	Capital
Giant	Royal
National	Sumter
Continental	Quebec

Source: Cement Distribution Consultants, November 2017

Table 3: required storage capacity, by ship type and annual throughput

Ship type	Cargo capacity	250,000tpa	50,000tpa	75,000tpa	1,000,000tpa
Handysize	30,000	37,705	45,411	53,116	60,822
Handymax	40,000	46,849	53,699	60,548	67,397
Supramax	50,000	55,993	61,986	67,979	73,937
Ultramax	60,000	65,137	70,274	75,411	80,548
Panamax	75,000	78,853	82,705	86,558	90,411

Based on 15 days of buffer capacity and a shipunloading rate of 8000tpd. Source: Cement Distribution Consultants, November 2017

Several factors should be analysed in depth when considering a capex investment

timeframe. That the US has somewhat lagged in this respect can largely be attributed to the very high clinker content of its cement. By contrast, in Africa imported clinker comprises only 70 per cent of the cement, with the remaining 30 per cent applying local materials. This is admittedly a lower quality of cement, but it moves the economic advantage of importing clinker and grinding it decisively over importing cement.

In Europe standalone grinding plants are often combined with blending capability with cementitious materials resulting in high-quality blended cements with a lower clinker content.

A transition by the US towards cements with a lower clinker content will make importing clinker and grinding it even more economical than the present-day situation.

Cement grinding plant considerations

Several factors should be analysed in depth when considering the development of a greenfield grinding plant.

The market

The local market should be evaluated to understand current supply/demand dynamics (including the type of cement in demand), prices, potential medium-term large infrastructure projects.

Marine logistics

An analysis of marine logistics should include the costs to procure clinker and gypsum, the relative cost of these materials versus that of imported and domestically produced cement, shipping and port expenses, port discharge and storage facility costs/requirements.

Land logistics

An analysis of the different land transportation options to and from the grinding plant facility, including both highway and rail freight. In addition, logistic costs need to be analysed from the clients' perspective (distance and convenience of pick-up, etc).

Location

Possible locations should be evaluated for the grinding plant considering both the market and logistics studies. It is necessary to ensure adequate and efficient access to the market as well as to keep the logistics expenses at a minimum. In some cases, it may be optimal to place the grinding plant adjacent to the port (reducing land logistics expenses), while in other cases it may make more sense for it to be located at some inland site closer to the market.

Cost of real estate leases

Need to identify the probable costs of lease and confirm the possibility to obtain options on the land.

Conceptual design and preliminary engineering

At the port

Define the facilities and storage location, the conveying or transport system from ship unloading hopper to storage warehouse, flow diagram and equipment list, preliminary drawings and obtain budgetary pricing from potential equipment suppliers and construction contractors.

At the grinding plant

At the grinding plant, which may or may not be at the same location as the port facility, define all the same points as in the port category, plus the costs associated with rail transport.

Capex, opex and economic analysis

Determine the capital expenditures to build the facilities as well as the expenditures to run the operations. As a final step the economics of the projects must be analysed in depth to confirm the payback timeframe, internal rate of return (IRR) and net present value (NPV) of the project. It is highly recommended that a sensitivity analysis is performed to understand to what degree the different capex, opex and financing variables impact the cash flow and overall profitability.

Determine financing options

Depending on the need for external financing to fund the project, a bankable feasibility report should be prepared, putting all the analysis above into a detailed report preceded by an executive summary. ■

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