Martinsburg: Essroc’s flagship facility

Building materials have been produced on the site of the current Essroc Cement plant in Martinsburg, West Virginia, USA since the late 1800s. Today the site is owned by Essroc’s parent company Italcementi Group, which is celebrating 150 years of business in 2014. In 2010, the plant underwent a massive overhaul under Essroc, when it was switched from three wet-process kilns to a single FLSmidth dry-process line. The upgrade increased the plant’s clinker production capacity from around 0.6Mt/yr to 1.6Mt/yr. Global Cement’s Peter Edwards visited the plant and spoke to key members of staff ahead of the field trip by delegates of the 56th IEEE-IAS/PCA Cement Industry Conference.

Introduction and site history

Global Cement (GC): Can you briefly summarise the history of the Martinsburg site?

Keith Crowley (KC): Lime manufacturing began in the late 1800s and Portland cement production began in the 1920s. Lime production ceased in the 1950s and the site has been used exclusively for cement since then. Previous owners included Standard Lime and Cement, which was a division of Standard Oil, as well as Martin Marietta Cement and Capitol Cement. In 2002 Italcementi, through Essroc, purchased Riverton Corporation, which was the owner of this plant immediately prior to Italcementi.

Prior to the construction of the new line at Martinsburg, which was completed in 2010, the facility consisted of three wet process kilns capable of about 2000t/day of clinker. Two of the three were built in around 1950 and the third was added in the 1960s. The annual capacity stood at about 0.6Mt/yr of clinker or 0.65Mt/yr of cement in the final years of operation.

GC: What was on the site of the new line prior to its construction?

KC: The new line is on the edge of the quarry but part of it is on the ruins of an even older cement plant that was on site before. This current plant is the third or fourth plant at the site, depending on how you count them.

Since 2010 - The FLSmidth line

GC: Can you please provide a brief run-down of the plant as built in 2010?

KC: The new line consists of a Hazemag crusher, a Bedeschi stacker-reclaimer circular blend pile in a circular storage dome, a Loesche LM 60.6 raw mill, an FLSmidth five-stage in-line calciner single-string preheater, an FLSmidth two-pier kiln with a friction drive and an FLSmidth cross-bar cooler.

We actually make two types of clinker here, low-alkali clinker and normal-alkali clinker. There are separate silos for each of these with a higher capacity for normal-alkali clinker. Two LM 53.3+3 Loesche finish mills are fed from the clinker storage. We therefore have a total of four Loesche mills on site.

There was a new cement storage silo added but for the most part we have re-used the general infrastructure of the old cement storage facilities such as the rail loading facilities.

GC: What were the main reasons behind the decision to proceed with the project?

“We make low-alkali clinker and normal-alkali clinker. There are separate silos for each, with a higher capacity for the normal-alkali clinker.”
KC: The wet process kilns in operation at the time prior to the upgrade at Essroc’s Bessemer (Pennsylvania) facility, its Frederick (Maryland) facility and this facility were nearing the end of their viability due to economic and environmental pressures. At the time the stronger pressures were the economic ones, with environmental pressures on the horizon.

However, since that time the environmental pressures have become quite real. Because of this, it’s very good that the upgrade was undertaken.

Nicola Farina (NF) - Maintenance Manager: When you look at the operating costs of the wet plants compared to the dry plant, you have three lines to maintain versus one line. The decision drives itself.

GC: What were the reasons behind developing the Martinsburg site as opposed to one of the other sites you mentioned or starting afresh somewhere else?

KC: The plant location was capable of economically servicing a large market through an enlarged rail network. It also has adequate reserves that could support the cement demands of the area covered by the seven kilns that were shut down at Martinsburg and the two other locations.

GC: What was the largest construction challenge when building the new plant?

Fred Cerimele (FC): I was actually employed by FLSmidth and working on the Holcim Ste. Genevieve facility in Missouri at the same time as this plant was being constructed so I don’t have direct experience of dealing with its construction. However, a common problem that plagued both projects was the price of steel. Steel was in high demand when these projects came out of the ground and prices escalated quickly.
Global Cement: Plant Visit

So that was an economic challenge rather than a physical challenge.

I would imagine that it was a combination of the two. The economic burden is a direct impact by itself but there is also the challenge of having to scour the country trying to find steel fabricators capable of delivering steel in the desired quantity and time required so that schedules could be maintained.

Some of the on-site issues Essroc had were due to the existence of the wet process kilns, which were producing clinker at the same time as the project was being carried out. Because there were three kilns there was some gradual phase-down of production but by the time the last wet kiln was shut down it was only around a month or two before the new line was started up.

The construction began to some degree in 2006 so for those four years there was a construction project, peaking out at 1200 people working on site. They were trying to build a plant alongside those that were operating a plant that was already tricky to operate because of its age.

Another physical challenge was that once the plant layout was ‘set’, it had to change due to instability in the soil. That affected the location of one of our main process buildings.

Does the soil instability cause give rise to ongoing costs?

No, there were no delays related to the economy. We were actually trying to get the plant online as quickly as possible because it was intended to eventually replace Essroc’s wet-process capacity from elsewhere. There were no pressing reasons to shut down the other plants so if the economy hadn’t tailed off some of the other capacity might have stayed online. As it turned out, however, this plant quite nicely be a challenge to future development and it would have to be considered very carefully if other major buildings are to be installed. There would have to be a lot of geotechnical work. It’s a very geologically-active area. We certainly wouldn’t rely on the old geotechnical surveys from the 1950s!

The economic conditions have changed since the decision to upgrade the plant at Martinsburg. Were there any delays associated with the state of the economy?

No, there are no on-going costs. However, it could be a challenge to future development and it would have to be considered very carefully if other major buildings are to be installed. There would have to be a lot of geotechnical work. It’s a very geologically-active area. We certainly wouldn’t rely on the old geotechnical surveys from the 1950s!

“The plant was originally designed for pet coke but there is currently no incentive for us to use this from a cost perspective.”
replaced the capacity of the other facilities. We put quite some internal pressure on ourselves to have the plant finished as soon as possible.

**GC:** I guess it’s important to remember that in 2009 and early 2010, when this plant was coming up to commissioning, that the recovery was said to be ‘just around the corner’.

**KC:** Yes. We wanted to be ready in case the market picked up, which it hasn’t so far. It was a good thing that there were not extreme market pressures on the start-up because it makes a start-up more difficult.

**FC:** We are ready for the ramp-up in the market now and we are thankful that the project was completed when it was.

**Road and rail**

**KC:** With the ramp-up in mind the rail tracks have all been upgraded, with an upgraded rail yard. There is a new rail link out the back of the plant, which gives us access to CSX and Norfolk Southern rail lines. Because the plant grew, the market stretched out and we rely a lot more on rail now than in the past. We also have facilities to dispatch cement by truck.

**GC:** Has the split between road and rail changed much since commissioning the new line?

**KC:** The rail shipping area was not finalised until after the plant was commissioned but since 2010 there has not been much change in that split.

**Markets served**

**GC:** What is the extent of the plant’s coverage?

**KC:** Martinsburg cement is distributed to an area from central Ohio eastwards to western Pennsylvania and south to southern Virginia. We also have a terminal in Charlotte, North Carolina.
GLOBAL CEMENT: PLANT VISIT

GC: Does your proximity to so many different states cause distribution issues?

KC: Only when dealing with the different Departments of Transport in each state. There are slightly different rules in each state for cement that is used to build road. Martinsburg is certified to sell in nearly every surrounding state. However, each customer is different.

GC: Talking of customers, which types of customers are the most important to Martinsburg?

KC: Ready-mix concrete producers are the bulk of our customers with some customers that make pre-cast and pre-stressed concrete. There are some customers involved in soil stabilisation too.

We have to weigh up the costs of mercury removal from the stack and the cost of being more selective with our raw materials and fuels...

Fuels

GC: What fuels are used in the plant?

KC: We use three types of fuel; two types of coal and fuel oil. The two types of coal are ground in a Loesche vertical coal mill on the back of the kiln. We also have fuel oil, which is used mainly for pre-heating.

The plant was originally designed for petcoke but there is currently no incentive for us to use this from a cost perspective. It's actually more expensive than coal at the minute. Even if it was marginally cheaper than coal, we would consider using it. There is less and less refining capacity in the US and that is actually the main driver behind the high price of petcoke.

GC: The original plant plans show a tyre-handling system. That's not yet been installed. Are there any plans to develop that?

KC: I don't think that we are headed in that direction at the moment. As of now, tyres are not really on the horizon, at least for the next couple of years. When we first implement alternative fuels, we will use engineered fuels.

FC: We started work on some elements of our alternative fuel projects at the onset of 2014 but unfortunately delegates on the tour won’t be able to see much construction when they come.
GC: Can you provide more information about the ‘engineered fuel’?

BB: It’s a locally-sourced engineered fuel. The fuel will have a certain size-distribution, density and composition and will be supplied ready for use by our supplier.

FC: We will start by replacing up to 10% of the fuel in our calciner. If all goes to plan, we will be at that substitution rate by spring 2015. That schedule is weather dependent from a construction perspective.

Emissions and regulations

GC: As the plant currently only burns conventional fuels, does this mean that PC MACT rules apply?

BB: Indeed, we fall under PC MACT.

GC: Will the plant need to undergo any further changes prior to September 2015?

BB: We have some work to do prior to September 2015. We have several of the new NESHAP regulations that will require some upgrades.

GC: What are the main sources of mercury here?

BB: The limestone is not a major problem although it is a bit variable in terms of its mercury content. Some of our alternative raw materials have a bit more of a problem with mercury, the bottom ash in particular. Of course the coal is somewhat variable too.

GC: Do you worry about the potential for mercury contamination from the engineered fuel?

BB: Personally, I think that that will be an important aspect of production which will have to be managed. I think that part of our future control will weigh heavily on what our alternative fuel pilot tests show us. That could decisively swing the economics of selecting between mercury recovery or preventing mercury entering the system in the first place...
The launch of i.Nova

**GC:** How has the North East US cement market received the launch of Italcementi's recent i.Nova branded product ranges?

**KC:** There is huge value in our brands. i.Nova allows us to leverage those brands to facilitate customer choice and promote product performance. The i.Nova branding system is the capitalisation of a communication process started over 10 years ago promoting Italcementi as an innovative company. i.Nova will now allow us to benefit from this experience and transfer the value from innovative products to our traditional products.

Italcementi launched i.Nova on 19 September 2013. We are still in transition, but initial roll-out was well-received. All subsidiaries of the group including Essroc have begun adopting i.Nova on all marketing and communication tools and most importantly our product packaging.

**FC:** Locally, our colleagues in the Bath, Pennsylvania office have done a superb job in marketing this change over to the i.Nova branding for the customer base that we have. You are always going to find customers who are a little bit resistant to change but I think the marketing department has done an excellent job in terms of getting the word out. The Italcementi product hasn't changed, it's just the branding on the bag.

**GC:** Which i.Nova products are manufactured at Martinsburg?

**KC:** We produce ASTM C150 cements such as CEMI and CEMII, with low alkali versions of both of those. We also produce CEMIII products.

Low-alkali clinker

**GC:** Can you explain the low-alkali products?

**KC:** We have a fairly high alkaline raw material here that we can’t change. A section of our market requires a low-alkalinity cement, which means low sodium and potassium levels. This is because of reactions between those alkali components and silica in the aggregates in their concrete mixtures.

There are two ways of tackling this phenomenon in concrete. One is to ensure that the cement has a low alkalinity, in our case the specification states less than 0.6% equivalent alkalis in the cement. That limit is calculated as 60% of the potassium plus the sodium. The other way is to manipulate the aggregates so that they do not contain the types of silica that react with the potassium and sodium. Although I am not an expert in this field, it is probably far easier to change the cement than to make changes to the aggregate.

In some cases low-alkali is specified by architects but in other cases we have to work to see whether or not the customer really requires low-alkali cement.

**GC:** Can you comment on the relative amounts produced relative to normal-alkali clinker?
KC: About 30-40% of our total volume is low-alkali cement. Obviously it gets separated into separate storage areas but production is a continuous stream. We analyse the alkalinity of the clinker as it exits the kiln as part of our production chemistry monitoring.

We make the low-alkali clinker in a slightly artificial way. We don’t change our raw materials but instead we add chlorine to the system and we have an alkali bypass to bring the clinker down to specification. We actually manage the storage location to ensure that only the on-spec low-alkali clinker reaches the low-alkali silo. From the separate silos, the two grades of clinker remain separate throughout the entire remainder of the production process.

GC: Is there a transition time required between making the two types of cement in terms of cross-contamination?

KC: We employ Loesche vertical mills here, which are very forgiving in terms of transition time between different products. You can imagine that, if you had a ball mill, there might be some residual material in the mill but the Loesche vertical mills are very quick.

Nevertheless, we do not switch to a designated low-alkali silo until we have a positive identification of the low-alkali material. Until that point, we can run the cement into our normal alkali cement silo.

**Production and maintenance**

GC: There is a very variable climate here. That presumably makes production quite seasonal. When do you usually shut the plant for maintenance?

Radoslav Slavov (RS) - Production Manager: Generally we will do that between February and April, when the weather is just starting to pick up a bit. It’s a bit warmer but you really notice in the quality of the work.

BB: This most recent shutdown saw a relatively large amount of work. It was the first month-long outage since the plant was built.

KC: It’s now three to four years since the plant was commissioned and we are now at a steady-state in terms of maintenance. In the past it was slightly shorter.

NF: For me the main projects carried out during the shutdown was the installation of the kiln bypass damper and the installation of a clinker cooler transport system upgrade. These were the two bottle-necks in respect to the pace of the shutdown. The rest of the jobs were routine maintenance, including preventative maintenance activities for the first time. It was also the most comprehensive refractory replacement job undertaken so far.

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Left: Detail under the kiln showing an FLSmidth drive.

Left: 10 levels of limestone extraction.
GC: Are there other major developments or changes planned?

FC: During the next shutdown we will install an FLSmidth Air Blast Controlled (ABC) inlet in the front end of the clinker cooler. It will be operational by the time the IEEE delegates come to visit. It will gain us the benefits associated with reducing the build-up of snowmen in the cooler.

KC: The FLSmidth ABC inlet is actually a fairly standard-issue component in the modern FLSmidth coolers. The cooler at this plant was originally slated for a different facility and so was designed in the early 2000s. This means that it did not include this latest development. It's still a fairly modestly sized project.

GC: PCA forecasts can change of course as we saw in 2013. In your experience does the PCA show any bias towards any geographical region of the US?

FC: PCA breaks down its forecast by region then reports on a US level and also a global level. At the time of the interview the PCA was forecasting an 8.1% increase across the US for 2014 but that is not reflective of our market. Maybe markets that include states like Arizona or Texas will see that level of growth but the North East is more likely to see maybe 2-3% growth in terms of cement production. That is the reality for us.

PCA forecasts appear slightly overstated for both the downturn and the upturn, especially pertaining to our region. The downturn was bad but not as bad as the PCA indicated. I anticipate that we will see an upturn in our region in 2014. We saw a 1.5-2.0% increase in 2012 and then it levelled off. In 2014 we will hopefully see the growth that I mentioned above.

KC: Essroc has three regions though, here in the North East, our Indiana plants in the Mid-West and our Canadian facility. Even over that area the growth
is uneven. Growth in the region surrounding our Picton, Ontario plant in Canada, is zero.

It’s important to remember that we serve the mature North East market, which has not been a particular ‘boom-town’ in the past 20 years. Now if you look at some of the sunbelt states, Florida, Texas, Nevada, California, they have seen faster population growth, faster development and so they had more to lose in the downturn.

**GC:** How has Martinsburg been affected by the poor US economy since it was completed?

**KC:** The plant has had a positive effect on Essroc, despite the relative slump in the economy. Using long-distance rail as its primary mode of transportation enables Essroc to get Martinsburg product to multiple terminals. This has allowed us to utilise our most efficient plant to the optimum capacity. In other words, there’s a general push to sell out product from this plant when economically feasible to use our lowest cost facility.

In my years here at Martinsburg, I have not personally seen the downturn because Essroc has constantly been trying to maximise the throughput of this plant because of the cost benefits. Meanwhile around the industry there have been a lot of drastic changes with some plants closing and capacity reductions elsewhere. Being on site, we have been inside a very local bubble. As soon as the plant has been capable of supplying cement, Essroc has sold it.

**FC:** Martinsburg is the flagship plant of Essroc!

**GC:** What are your thoughts on the US cement industry in the coming five to 10 years?

**KC:** According to the PCA the US will show major improvements over the next five to 10 years. Essroc is optimistic for future growth, however the industry is faced with many challenges in the next few years centred on sustainability and environmental regulation.

The cement industry will need to focus on being part of the climate-change solution rather than being part of the problem. This will have to come from the development of new and innovative products, technologies and manufacturing processes. In addition, we feel that lifecycle cost assessment (LCA) will have a larger role in product choice, as concrete continues to yield positive results compared to alternative building products.

**GC:** What is the single most critical factor that you would like to see changed in the US that would make you sleep easier with respect to the cement industry?

**KC:** We need the government’s approval of a long-term infrastructure spending initiative. Here on the news we often see the decaying infrastructure and we have had a couple of huge bridge collapses. There is a lot of discussion about and problems with our decaying infrastructure in the US. The government needs to let cement plants help with rebuilding.

**GC:** Gentlemen - Thank you for your time.