STRETCHING LINING LIFETIMES

Pankaj Gupta, HASLE Refractories, discusses a new precast modular lining helping Ambuja Cement's Maratha Cement Works cut downtime by boosting the lifetime of their equipment.

Nestled between trees outside Chandrapur in Maharashtra state, India, lies Ambuja Cement's Maratha Cement Works Unit. Ambuja Cements Ltd. is a member of Holcim, the global leader in innovative and sustainable building solutions. Among the leading cement companies in India, with a capacity of 29.65 million t, Ambuja Cement has five integrated cement manufacturing plants and eight cement grinding units across the country. Ambuja Cement's plants operate on Indian coal and approximately 11 – 12 % alternative fuels and are continuously seeking ways to operate in a more efficient and sustainable fashion.

The company has focused on environmentally friendly practices since it started operations in 1983, At the start of 2021, Ambuja Cements Limited became the first ever cement company to make it

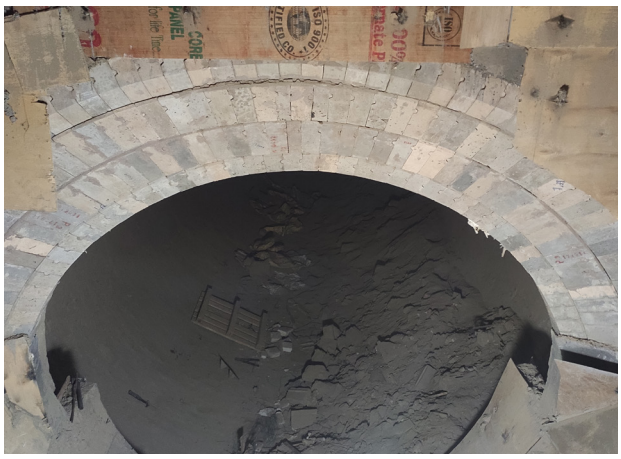
to the 'A' list in global water stewardship by the CDP (formerly the Carbon Disclosure Project) based on its disclosure in 2021. At the core of the company's modus operandi is embracing sustainability one step at a time. Achieving more sustainable production entails lowering the use of natural resources, reducing the use of fossil fuels, and optimising energy use – installing HASLE's precast modular lining has been part of the solution for the Maratha Cement Works Unit.

Solving short lining lifetime in the kiln inlet arch

In early 2015, the cement plant had been experiencing problems with short lining lifetime in the kiln inlet arch. The plant had been using a low cement castable to line the arch, but unfortunately, the lifetime of the lining was always less than one year. The installation required proper form-work and skilled workmen to achieve the desired shape and quality lining, and the time required for both installation and curing was extensive, due to the location and shape of the arch.

Needing a long-lasting and sustainable alternative, Ambuja Cement's Maratha Cement Works Unit turned to HASLE for a suggestion on how to solve the short lining lifetime in this area. After analysing the operating conditions, HASLE's team of engineers suggested lining this critical process area with a unique precast modular lining. The precast modular lining is a hot face refractory lining for the critical areas of high temperature industries; it is durable and resistant to abrasion, chemical attack, and coating, resulting in a significantly longer lifetime than the existing alternatives on the market. Since its creation, it has stood the test of time and will typically last two-to-three times longer (or more) than a traditional cast lining. Soon after, it was decided to install HASLE's precast modular lining in the kiln inlet arch – a decision which has since proved to be very beneficial for the plant. The installation took place in August 2015, and as always, a team of HASLE supervisors participated on site to ensure that the optimal installation technique was used.

Modular Lining in inlet arch during installation.



Completed modular Lining installation in inlet arch.

In August of 2020, the precast modular lining installation had been in operation for five years, with no re-linings or repairs needed to keep it running. With a proven track record of exceptional durability and long-lasting performance, the Ambuja Cement's Maratha Cement Works Unit decided to reline the kiln inlet arch with HASLE's precast modular lining in December of 2020, when the first installation needed to be replaced. According to Mr. K. Subbulakshmanan, VP-Tech., Operation Head, at Ambuja Cement's Maratha Cement Works Unit, the precast lining has been a 'lifesaver' and highly recommends using it in areas with frequent coating formation due to high usage rates of alternative fuels and fuel mix variation.

Designed for longevity. The precast modular lining's low, open porosity and smooth impact surface makes it highly resistant to alkali attack and build-up – even in extremely hostile environments. A traditional in-situ casted solution typically has an open porosity of 18 – 20% or more, whereas the modular lining was designed to have an extraordinarily low open porosity of only 8 – 10%. This quality is achieved by a combination of selecting raw materials with an optimal corn distribution curve and adding only a very small amount of water (as little as 4.5%) when mixing the castable. The result is a refractory lining which has an exceptionally long lifetime, is highly abrasion and alkali resistant, and even when installed in plants operating on 100% RDFs, build-up is practically eliminated.

All modular lining elements are casted and pre-fired under strictly controlled conditions in HASLE's plant in Denmark using specialised equipment such as vibration tables, special moulds, dry-out ovens, and trained workers. The process includes dry mixing for 60 sec., adding water, wet mixing for 4 – 5 min., casting it into moulds and covering the elements in plastic immediately afterwards. The elements are then left to cure for 24 hours and are subsequently pre-fired for five days up to a peak temperature of 500 C. All these steps are carefully monitored to secure a consistently high quality for all pre-cast elements, and each element is both visually inspected and subjected to a strict quality control procedure prior to leaving the production facility.

Fast and easy installation

Installing the modular lining is both fast and easy. Due to a smart element design which combines steel anchors with a tongue-and-groove system, the installation time of the pre-cast modular lining often takes about 50% less time than the installation of a traditional in-situ casted solution. Once preparations are completed, the manhours required for a typical lining is 80 min/m^2, depending on the condition of the area to be lined i.e. number of air blasters, inspection holes, manholes, etc. After welding the rails and steel plates holding the elements, the console elements are easily installed. Upon these, the square modular elements (250 x 250 mm) with a tongue and groove system are installed. The precast elements weigh only about 15 – 16 kg each, so no special lifting equipment is required.

A step towards sustainable production

K. Subbulakshmanan reported that, "Ambuja Cement Limited has been using HASLE's products for many years, due to severe working conditions like frequent coating formation at kiln inlet caused by a high usage of alternative fuels and fuel mix variation. HASLE's product are proven to be beneficial and are a lifesaver for us. The five year plus lifespan of the lining in the Inlet Arch with HASLE Precast Elements is a good example of this."

While choosing to install HASLE's precast modular lining at the Ambuja Cement's Maratha Cement Works Unit helped optimise their production process, it has also contributed to making the production more sustainable. Already at installation, the plant saved manhours, as the easy installation process required ≤ 50% less time than a castable lining would have. The lining lifetime in the kiln inlet has been significantly extended (by at least 500%), which has not only lowered their use of natural resources per produced unit as relining has not been needed, but also resulted in more stable production overall. To ensure the successful completion of each installation project, HASLE Refractories always supply approximately 5% more elements than needed. These have unlimited shelf life which also reduces waste of material.

With precast modular lining, it is also possible to achieve a lining thickness of down to 185 mm. This is often less than the thickness of a traditional casted lining and presents two options: reducing heat loss by applying more back-up lining, or increasing the cross-sectional volume, which will give additional space in any given area. Both factors contribute to lowering the CO_2 emission through optimal use of the energy.

HASLE's precast modular lining offers additional benefits when used in other areas of different industries. It has shown good performance when installed in a variety of applications throughout the world, i.e. feed pipes, coolers, cooler bull noses, smoke chambers, cyclone roofs, as well as cyclone bull noses. The elements can be adapted for curved and cylindrical structures and have even been installed in boilers, incineration plants, and foundries. Companies in all high temperature industries can make a tangible efficiency improvement by installing a modular lining to realise a more sustainable production process. HASLE Refractories is ISO 9001:2015 and serves the cement, power, waste, biomass, steel, glass, and paper industries worldwide. ■

About the author

Pankaj Gupta is Business Head at HASLE Refractories and services the Indian, Middle Eastern, and African cement markets. He holds a Bachelor's Degree in Ceramic Technology a Master's Degree in Business Management. Having rich industrial exposure of around 16 years, he has extensive theoretical and practical experience from on site installation and in-depth understanding of refractory challenges and solution.

Modular Lining after 24 months of operation (taken during shutdown).

Modular Lining after 36 months of operation.