

The report "Concrete Repair Mortar Market by Type (Polymer-Modified Cementitious Mortar and Epoxy-Based Mortar), Application Method (Manual, Spraying, and Pouring), End-use Industry (Building & Car Park, Road & Infrastructure, Utility) - Global Forecast to 2021", forecasts that the market size of concrete repair mortars is estimated to grow from USD 1.69 Billion in 2015 to USD 2.62 Billion by 2021, at a CAGR of 7.67%, in terms of value. However, no such exact data is available for concrete repair industry in India. But as per the report of "Industry Reports, Primary & Secondary Research," the share (% of total value) in construction chemical products in India is as follows: Admixtures: 42%, Waterproofing: 14%, Flooring: 14%, Repair & rehabilitation: 12% and misc. products: 18%. The repair industry is still being managed mostly in an unprofessional way, though the various repair products are available in the market. This is because of poor knowledge in new polymeric repair materials and continuing the old traditional cement-based repair systems rather than using advanced repair materials. Considering this weakness, we have dedicated our next few issues of ReBuild on repair and strengthening of concrete elements for our readers' benefit.

The polymer-modified cementitious (PMC) mortar segment has been witnessing significant demand in recent years due to several advantages of polymer modification, such as high workability, tensile strength, adhesion, and so on. Furthermore, the demand of PMC mortar is fueled by its low cost and environmentally friendly nature. The PMC mortar segment accounted for the largest market share in India, both in terms of volume and value, in 2015. On the other hand, epoxy-based mortars are used in extremely high strength requirements; therefore, it has a limited application in the concrete repair industry.

The repair and rehabilitation is a highly unexplored and underdeveloped market. Retrofitting is basically addition of new technology or features to older systems and improving the structures with energy efficiency. Rehabilitation is reconstruction of the structural components that were damaged. These products include cementitious repair mortars, concrete floor repairing systems, polyester and epoxy-based resin mortars, moisture insensitive epoxies, structural additives, synthetic adhesives, rust removers and corrosion inhibitors. The main rehabilitation methods are concrete jacketing, steel jacketing, and FRP wrapping.

A building constructed with different types of materials ages like the human body and therefore needs repair to strengthen its weaker members and to increase the service life of the deteriorated/ damaged structure. Materials like steel and concrete deteriorate due to gradual ingress of moisture and aggressive chemicals, weakening the structure. A structure, which is poorly constructed, will deteriorate very fast as compared to properly constructed structures. Besides, unplanned structural modifications, in adequate joint treatment, poor waterproofing systems are

other causes of damages that weaken the structure and therefore need repairs and strengthening.

Concrete repair must successfully integrate the new repair materials with old materials forming a composite one capable of enduring the exposure of the environment and time. Concrete structure requires routine repair & maintenance, ranging from simple protective coating to repair of spalled concrete to strengthening the components from time to time.

The various factors that may require repair are:

- Bad quality materials.
- Poor construction practices.
- Settlement of foundation.
- Chemical attack.
- Poor maintenance.
- Structural modifications.
- Fire or natural calamities like earthquakes.
- Lack of repair & maintenance.

With respect to planning of repair, generally it should be distinguished between defects in concrete and defects caused by reinforcement corrosion. The purpose of the main assessment before repair as follows:

- To identify the cause or causes of defects.
- To establish the extent of defects.
- To establish where the defects can be expected to spread to other parts of the structure.
- To assess the effect of defects on structural safety and stability.
- To identify all locations, where protection or repair may be needed.

The following options shall be taken into account in deciding the appropriate action to meet the future requirements for the life of the structures:

- Do nothing for a certain time and monitor the structures for active crack if any.
- Re-analysis of structural capacity, possibly leading to downgrading of the function of the structure.
- Prevention or reduction of further deterioration, without improvement of the concrete structure.
- Improvement, strengthening or refurbishment of all or parts of the concrete structure.
- Reconstruction of part or all of the concrete structure.
- Demolition of all or part of the concrete structure.

"Concrete Repair Guidance Notes 1-11" of Concrete Society UK gives guidance for repair and strengthening of structures conforming to European Standard on protection and repair of concrete structures i.e. "Standard EN 1504". We have referred to those principles and methodologies as outlined in the standard. The detail repair materials and methodologies will be discussed in next few issues of our ReBuild.