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Manufacturing precast walls made of exposed aggregate concrete in an environmentally-friendly way

Throughout Europe, approximately 3% of the amount of concrete manufactured each year in ready-mix plants and approximately 1% in precast production facilities is not processed. This residual mass of concrete finds its origins in various sources like, for example, the residue after cleaning mixers and other transport or processing machines, left-overs from processing plus unused concrete. The costs for dumping residual concrete are high. In the light of limited absorption capacities, prices are continually increasing as are also the distances travelled to waste sites.

For the concrete industry, this development means a successive transition from a simple question of substance disposal to closed cycle material management. One good example of this is the design of a modern precast factory in Belgium where approximately 265,000 m² wall elements will be manufactured on a yearly basis. This newly built production facility is trimmed down for the highest efficiency. Experienced suppliers with well-known, reliable technology were selected for setting it up.
ecofrog GmbH was entrusted with the task of erecting the plant for processing residual concrete and washing water.
Based on production data, whilst taking any wishes on the part of the customer into account, the plant design described in the following was made into reality.
Due to the production flow, there is a distance of more than 100 m between the mixing plant and the panel washing point. For this reason, the recycling plant was also divided into two main groups: on the one side, reutilisation of aggregate and residual water in the manufacturing of concrete and on the other, the washing water cycle.
The RE_X reclaimer heads up the process and separates raw materials from cement and water. The latter is collected in a tank; solids are regularly kept in suspension by means of an agitator and added in batches to the mixer when necessary.

Its extreme flexibility allowed the machine to be adapted to cope with residues from cleaning two mixers, two bucket rails, concrete spreaders and ready-mix trucks. Advantages of the ground-level set-up are the saving on expense for foundations and permanent, user-friendly operations.
Residual water density is continually monitored in order to ensure specific internal quality standards. In contrast to old, widely-used measurement procedures, which are either very involved or very susceptible to contamination through the cement, a cost-effective high-tech method was utilised. The underlying principle is based on the specific light absorption behaviour of defined media. The composition of the mixture and solids content are ascertained by a highly accurate electronic system that evaluates the amount of measuring light passing through the residual water between sender and receiver. The intensive infrared light is conducted through fibre optics into the medium. The optics at entry and exit are nano-coated. These properties all make the measuring process very reliable and practically non-susceptible to caking and scratches. The PLC control unit calculates the density by using these values and the calibration curve obtained and sends them on as an analogue signal to the mixing plant's batching calculator.

The centre piece of the second recycling plant group is the AQUARE_X water clarifying silo. This has been so proportioned that water from the panel production – having been freed of solids – can feed the washing unit in a closed loop circuit at an hourly rate of 30 m³. Adding polymer is unavoidable as colouring additives are used in the concrete. This leads to an agglomeration of fine particles and pigments and thus to an increase in the settling rate. The sludge concentrated in the cone is regularly drawn off and pumped into the RE_XRESS chamber filter press system, where it is dewatered intensively. Handling is facilitated by the high content of approximately 65% dry substances in the ejected sludge cake, reducing waste disposal costs considerably. A pH correction by means of CO_2 takes place afterwards in the clarified water storage basin. The advantages of this procedure are the non-hazardous handling and the elimination of the possibility of overdosage.

A self-sustaining pumping station acts as a link between the mixing plant and water processing areas. This connection creates the optional possibility of clarifying even surplus residual water in order to employ it subsequently in processing the exposed aggregate concrete.

Fig. 1: Waste concrete reclaimer RE_X 16Z

Fig. 2: AQUARE_X & RE_XPRESS water processing systems

Fig. 3: PS Pumping station with counter-current agitator

The recycling plant described here makes a reutilisation of residual water according to EN 1008 and of aggregates possible. At the same time, it is an important element in fulfilling the specifications of the ISO 14001 standard.

Against a background of raw material reserves that are shrinking or else can no longer be viably exploited plus, at the same time, a shortage of waste disposal sites, both the economic and ecological necessities of recycling for all areas of production becomes unquestionable. Added to this, producers are increasingly obliged by legislation to reutilise incidental residual masses.

FURTHER INFORMATION

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