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Ready-mixed concrete green production matrix

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Abstract: This paper establish a whole concrete production process-based matrix with the whole concrete production process as coordinate and the three principles (maximum utilization of natural resources, minimization of pollution, optimization of plant construction) as abscissa, and put forward the key technologies and management measure to provide reference for the green production in Ready-mixed concrete industry.

Intrduction

Along with the development of modern science and technology, and the requirements to the construction quality become higher and higher, ready-mixed concrete has been widely used in engineering. The commercial production of ready-mixed concrete can speed up the construction progress, reduce environment pollution, improve the quality of engineering and save material costs, and is characterized by batch mixing and social supply of commodities, which is one of the important means to realize Architecture industrialization. However, from the current level of development of the whole industry, as one of the main forces in industry, ready-mixed concrete still has many prominent problems.

（1）Ready-mixed concrete production enterprises do not comply with environmental protection standards, and the emissions of noise, dust and waste water in the manufacturing process exceed standards, affecting the surroundings and the normal life of the residents, damaging the overall image of the city.

（2）Many small concrete businesses has a lower level of production technology, with excessive consumption of non -renewable resources in the production process, not being able to make comprehensive utilization of industrial waste residue, recycled aggregate, tailings and other waste resources.

（3）The waste concrete generated in the process of concrete production failed to be used effectively and timely, becoming a new construction waste , exerting heavy burdens on the environment while increasing resource consumption.

Based on this, the promotion of ready-mixed concrete green production has become the necessary demand for accelerating the construction of resource-conserving and environment-friendly society. Ready-mixed concrete green production means that, in product selection, design, production, supply management activities and product evaluation management, with resource conservation, environmental protection, occupational health as the core, and through the control and optimization of the elements of the whole concrete production process, the maximum utilization of resources and the minimization of environmental pollution is achieved and the plant occupational health environment is improved effectively [4-5].

There are many elements in the whole ready-mixed concrete production process, involving materials, construction technology, machinery, environmental protection, logistics and other industries. To conduct a more comprehensive analysis of the elements in the entire ready-mixed

concrete production process , to systematically solve green production problems, and to articulate the technology integration system, this paper establish a whole concrete production process-based matrix with the whole concrete production process as coordinate and the three principles (maximum utilization of natural resources, minimization of pollution, optimization of plant construction) as abscissa, and put forward the key technologies and management measures.

The whole concrete production process

Ready-mixed concrete production process is a systematic activity, which forms another process product(production factors) after organizing various production factors, unlike the commodities in traditional sense, the entire process go through five steps of "materials selection", "design", "production", "supply", "product" of the five areas, the products are completed within a certain time after the occurrence of supply, rather than the bulk supply of traditional products after they are completed.

Three principles of green production

There are many elements in the whole ready-mixed concrete production process, the three principles of the maximum utilization of resources, the minimization of environmental pollution and the optimization of factory construction should be followed during implementation.

3.1 The maximum utilization of resources

The maximum utilization of resources includes three parts: water saving, land saving, energy saving and materials saving. The main measures are: to promote the application of water-saving production process and equipment, developing the recycling water; to distribute the land rationally and reduce the occupied area in the condition of the normal production of enterprises and meeting the needs of the staff life; to reduce the unilateral power consumption of concrete; to conduct the quota management of raw materials consumption, to put the ecological design of the products into force and encourage the use of recycled materials, and to improve the utilization of raw materials and so on.

3.2 The minimization of environmental pollution

The minimization of environmental pollution include four parts: reducing noise, reducing flying dusts, recycling effluent and making full use of the waste residue. The main measures are: to seal key sources of noise, shielding the noise; to minimize the dust emissions; to reuse waste water, to construct rainwater recycling system; to find a suppliers for comprehensive recovery and utilization of construction waste.

3.3 The optimization of factory construction

The optimization of factory construction includes four parts: production protection, security, human health, plant beauty. The main measures are: the automation of measuring, mixing and unloading process; the fences installed at both sides of belt conveyors; to set warning signs; to be equipped with fire fighting equipment and facilities; regular health examination of employees; the green construction of production base.

Green production matrix

Establish a whole concrete production process-based matrix with the whole concrete production process as coordinate and the three principles of ready-mixed concrete green production as abscissa. According to the diverse content (environmental factors and green measures) of matrix, which is divided into two parts: "Environmental Impact Analysis", and "key technology and management measures integrated system".

4.1 Environmental impact analysis

Environmental impact analysis matrix separately analyze the influence of environment on all elements of the whole process of concrete production respectively from the consumption of resources, environmental pollution and factory environment, the intersection of vertical and horizontal coordinates is "/", representing no environmental impact in the process of that position, the annotations at the intersection indicates the specific impact of that position on the environment.

As can be seen from the figure, "materials selection" and "design" process will create resource consumption; "production" process will create resource consumption, environmental pollution and environmental impact of the plant; "supply" process will result in energy consumption, sewage and waste pollution; while "product" process will create the resource consumption and environmental pollution. The whole ready-mixed concrete production process have an impact on the environment, therefore the appropriate green measures are needed to take.

4.2 Key technology and management measures

Key technology and management measures matrix put forward the key technology and management measures in the whole concrete production process from the maximum utilization of resources, the minimization of environmental pollution and the optimization of factory construction ,respectively.

According to the green production matrix above, single technology or management measure is illustrated from the five processes of the concrete production respectively.

4.2.1 Green materials selection A(1~4)

In green production process, "green materials selection" largely determines the implementation result of the maximum utilization of resources. To achieve the maximum utilization of resources, comprehensive utilization of "fly ash, slag and other industrial residues; construction of the supporting industries of green high performance mineral superfine powder, the research on the application technology of mechanical sand in concrete, research and utilization of tail sand and stone chips as concrete aggregates, research and application technology of recycled aggregate, construction of the supporting industry of green high performance concrete aggregate, development and application of herbal black liquor modified superplasticizer [6],development and production technology of polycarboxylate high performance superplasticizer" and other technical systems are used.

4.2.2 Green design B(1~4)

To ensure the durability of concrete [7-8], in the "green design" of ready-mixed concrete, a series of set technologies are formed, and a series of green concrete, such as high-performance concrete, super high strength concrete, fair-faced concrete, self-compacting concrete , autogenous curing concrete ,and barite radiation shield concrete, are produced

4.2.3 Green production C(3,5~12) F(1~2)

The "green production" of ready-mixed concrete meet the requirements of sustainable development, which not only reduce environmental pollution, but also develop harmoniously with the natural environment. To achieve the "maximum utilization of resources," "minimization of environmental

pollution" and "plant construction optimization" of the green production of ready-mixed concrete, "it is necessary to implement scientific management for plant station construction, production electricity, the recycling, utilization, disposal and other processes of waste through specific means and technical measures, to use resources efficiently.

4.2.4 Green supply D(3,8,10)

After outputting the ready-mix concrete from the production machine, it will be transported by truck to the specified works to be used for construction by pumping and other ways. Although these two steps have little relationship with concrete technology, both are crucial steps to determine the final performance of the concrete. To implement the "green supply" of ready-mixed concrete, and to ensure the performance of concrete to be achieved best in engineering structure, "ready-mixed concrete transportation management system" and "ready-mix concrete pumping management system" are developed, and a new high polymer smooth tube agent is developed to replace the Embellish pipe mortar.

4.2.5 Green product A(11) E(1~8)

"Green products" are achieved by running "Environmental Labeling Product Certification" management system, concrete durability index and ready-mixed concrete environmental labeling product management.

Conclusions

The whole ready-mixed concrete production process-based matrix established in this paper carried out a more comprehensive analysis for the green production process of ready-mixed concrete, which can significantly improve the business environment of ready-mixed concrete, greatly reduce the impact of concrete supply station on the environment, solve the problem of green production systematically, meet the purposes of corporate green production, global low carbon economy and national energy saving and emissions reducing, has multiple social benefits, providing a valuable reference experience for the construction of the green production of ready-mixed concrete business.

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