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Suggestions for introducing treated sea water in construction industry

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ABSTRACT

Day by day the water scarcity is getting increased and that too in developing countries like "India", facing water problems frequently. The need for conservation of fresh water has become mandatory. Here the world's water content is about 71%, and in that the ocean and sea water holds about 96.5%. As indicated by the report of the "World Metrological Organization" (WMO), the greater part of the total populace won't have enough drinking water by 2025. In order to reduce the usage of fresh water, an alternate recourse (Treated Sea Water) is introduced in the construction industry (i.e.) for the concrete mixing and curing. In this paper the properties of sea water and traditional water are considered. The conceivable outcomes of salt water utilized in concrete for casting and curing are seen. This paper additionally focuses on the variables influencing the quality of cement blended as concrete and cured with ocean water are examined and a few proposals to those issues were given.

Selection and peer-review under responsibility of the scientific committee of the International Conference on Newer Trends and Innovation in Mechanical Engineering: Materials Science.

1. Introduction

Ocean water is a mind boggling blend of 96.5% of H_2O (water), 2.5% of salt substance and the rest with different substances including dissolved organic, inorganic substances, particulates and some atmospheric gases. From the reports, obviously in construction industry numerous billion a lot of water is every year utilized as blending water, cleaning water, curing water (For solidifying the concrete) around the globe. For saving the fresh water, it is acknowledged that the chances of abuse water as mix water in concrete should be analyzed really.

To save drinking water (Fresh Water), Sea water (Treated Saline Water) in construction industry as Mixing water, Curing water seems imperative. Moreover if the utilization of ocean water is allowed, it will turn out to be progressively advantageous and conservative for the constructions close to beach front areas and seaward structures can be built without any problem. And if the transportation is feasible means this can be used in normal constructions also. In the literature examinations the opportunities for the ocean water as blending water and curing water of concrete is seen and the greater part of the papers gathered in this investigation had positive suppositions.

2. Scope of the study

1) To look at the physical and chemical properties of ocean water and fresh water in order to see the probability of sea water being used.
2) To improve the quality requirements of sea water in order to use that in construction field.
3) To investigate the effects of compression quality and flexural quality on concrete casted by both sea water and new water.
4) To recommend some achievable opinions for the utilization of saline water in concrete as blending water and curing water.
5) By providing alternate materials, the usage of fresh water can be reduced.
6) And to provide a better solution to the society.

3. Literature reviews

B. Sathish Kumar et al. in April 2018 [1]: Recommended that the quality of concrete made with ocean water is high in beginning period when contrasted with the quality of concrete made with traditional water. But eventually the steel in the concrete gets corroded and the strength got decreased. Sea water can be treated and its pH value and hardness are brought to the permissible limits then the water can be used in concrete as blending or mixing water

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and that can be used as curing water. The compression strength and split tensile strength will be high when compared to the traditional concrete.

Olutoge F. Adeyemi et al. in July 2014 [2]: Recommended that the compressive quality of cement blended and cured with ocean water is high when contrasted with the cement blended and cured with fresh water to form a concrete structure. But this suit's only for PCC (Plain Cement Concrete) and not for the RCC (Reinforced Cement Concrete) because the steel reinforcement will get rusted and the strength will gets decreased. In order to protect the steel from corrosion the reinforcement bars can be coated with cement slurry which is made with fresh water can be used.

Arunya A. et al. in 2018 [3]: Researched the solid evaluation of M25 was made with ocean water and tried for compressive quality, split rigidity and flexural quality. From the outcomes unmistakably in the beginning time, the quality of cement blended and cured with saline water has higher quality (for example about 4% to 7%). Be that as it may, the tensile strength has diminished and the compressive quality of that concrete following 90 days got diminished as well.

Prof Sagar Gawande et al. in April 2017 [4]: Created elective four structure contemplations for blending and curing of concrete solids, they are: concrete solids casted and cured with ocean water, concrete solids casted with ocean water and cured with conventional water, concrete solids casted with conventional water and cured with ocean water, concrete cubes casted and cured with conventional water. From those the concrete solids casted and cured with ocean water have the highest compression strength. And afterward the concrete solids casted and cured with conventional water have higher compression strength in the order.

Dr. Nagabhushana et al. in May 2017 [5]: In his study, the salt was added to the normal water and the concrete specimens were casted. The proportions like 25, 30, 35, 40, 45 g/liter were added. And some of the specimens were mixed and cured with conventional water for comparison. From the outcomes plainly there is an expansion in strength of concrete mixed in ocean/salt water and cured in conventional water as compared with conventional concrete. But this is limited only to the Plain Cement Concrete, in the case of RCC structures (Reinforced Cement Concrete); high thickness of concrete cover blocks can be provided in order to protect the reinforcement from rusting.

Vigneshwaran V. et al. in March 2019 [6]: In his paper he suggested a solution for the water scarcity problem. And this process is made by the low cost materials. This paper comprises the process of vapor compression and it has lot of efficiency. And the salt rejection was over 90%. The main advantage of this method was there is no defects in the out coming of fresh water and in this method there is no energy consumption. So that this method is comparatively successful and it seems to be very economical. By this method the author gave a solution to the water scarcity problem.

Apurva Wadnerkar et al. in February 2016 [7]: Suggested a solution for the corrosion problem for the steel. In this paper the development of blend of epoxy silicone resin was done and the characterization of the physical and chemical properties of paint was investigated. In this paper the hybrid chemistry was achieved by combining an aliphatic epoxy with a silicone resin. By this development the cost of that paint was reduced. And from the experimental investigations it is clear that there is an improvement in the chemical properties such as immersion test, solvent resistant test and water resistant test.

Omkar S. Landage et al. in March 2019 [8]: In his paper, he conducted a series of experiments for the concrete grade of M30; specimens were mixed and cured with both sea water and fresh water. What's more, the compression quality, split tension and flexural quality of those examples were examined on 7th day, 14th day and for 28th day and from the test examinations obviously there is a negligible increment in the strength and durability of concrete mixed and cured via ocean water. But this research was limited only to the PCC works i.e. Plain Cement Concrete works.

Moshood N. Tijani et al. in November 2015 [9]: In this paper, the potential impact of the ocean water on the solid concrete structure was examined, so as to discover the strength and sustainability. An all-out number of 96 concrete cubes of various water/cement proportion were casted and the two diverse mix proportions (M15 and M20) were likewise casted. In this testing the blocks were likewise cured in ocean water, the quality of the cubes cured in ocean water was nearly low. Be that as it may, the cubes mixed with fresh water and casted in ocean water appear higher compressive quality. This paper demonstrated that higher concrete substance can expand the durability of the concrete structure.

Akshat Dimri et al. in March 2015 [10]: This paper speaks to the distinctive studies and their outcomes that were done before on the exploratory assessments on the nature of concrete in ocean/seawater. From all the past assessments it might be induced that there is no impact of ocean/sea water (i.e.) there will be a high in the strength of concrete which is mixed and cured with ocean/sea water at 7 days. And after that the strengths of concrete like compression strength, split tension strength and flexural strength are getting decreased with respect to time (at 28 days and at 90 days). In like manner, the quality increment up to a couple of days when concrete is mixed just as cured with ocean/sea water anyway lessens with respective to time. The components which impact the nature of concrete in marine condition are rusting of reinforced metallic bars realized by chloride particles, damage to the bonding nature of cement did by sulfate assault, and developing interference of cement if soluble base responsive totals are accessible in the concrete.

Sakthivel R. et al. in December 2018 [11]: This investigation shows the impacts of saline water and conventional water for easing on compressive nature of concrete. The concrete cubes are casted with two particular courses of action of setup mix of M20 and M30 using commonplace and sea water for curing reason. The concrete blocks are cured for 7, 14, 28, 56, 84 days in new and just as in ocean water. Finally the outcomes show that the compressive quality of cube with curing of seawater doesn't give a lot of variation when contrasted and typical regular water utilized in curing of concrete. So the concrete cubes cured in sea water have lower strength when compared to conventional curing method.

Abdulaziz Alrowaih et al. in May 2018 [12]: This paper looks at the impacts of ocean/sea water on the mechanical strength of concrete through the experiments. And the sodium chloride ions are incorporated in the concrete cubes in order to with stand the impacts of ocean/sea water. This test ask about gives a standard of the contrasting habits by which sea water affects concrete and the reliance of the components in question. The results show that the compression and durability notwithstanding part split tension of the concrete mixed just as cured in ocean/sea waters was higher as per that of concrete solids mixed just as cured in conventional water. The results moreover show that sea water conversely impact durability of concrete under various ecological conditions.

4. Suggestion

This study focuses on how the sea water can be treated and used in concrete for casting purpose and curing purpose. In order

to protect the reinforcement from corrosion the following suggestions can be followed:

- High thickness of concrete cover blocks can be provided.
- Coating of cement slurry (made with fresh water) in the reinforcement bars.
- Using "Epoxy Silicon Resin" as corrosion controller.
- Higher cement substance lessens the impacts of ocean water in the RCC (Reinfored Cement Concrete) structure. (i.e.) it expands the sturdiness of concrete.

5. Conclusion

The usage of ocean/sea water should be welcome and not feared for mixing and curing of concrete and most especially in off shore constructions and also in onshore constructions like constructions near the coastal regions. From the above literature findings, we can reason that there is no decrease in the strengths and durability of concrete which was mixed and cured a role as plain cement concrete utilizing ocean water. This idea can be utilized for locales having increasingly salty water and in the coastal regions having salty bore water. This concept can also be used in offshore constructions; this will be more economical and feasible. In the case of reinforcement cement concrete the strength will be affected by the corrosion of steel. In order to protect the steel from corrosion the above mentioned alterations can be done in the concrete. The related test ought to be directed and their outcome ought to be contrast all together with utilize the ocean water in the construction industry.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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