



### Research Article

## Use of Recycled C&D waste, Fly Ash, Bottom Ash, Dredged Marine Sand and Gypsum for Construction of Sustainable Salt Pan Beds for Enhancement of Salt Productivity through Prevention of Brine Percolation



A DST funded Project was carried out by Collaboration of CSIR-CSMCRI & Nirma University. Dr Sonal Thakkar and Dr Urmil Dave from Nirma University and Dr Bhoomi Andharia and Dr Arvind Kumar from CSIR-CSMCRI, Bhavanagar were the members of the project team. The objective of the project was to utilize generated waste in concrete and increase the yield of salt as well as reduce the health hazard of the salt workers.

India is the third largest producer of salt 30 Million MT (~10 % of world production) after China (22.7%) and USA (16.5%). Annual salt demand in India is rising by 5-6%, Projected demand by 2022: 35-40 Million MT. Salt production per acre area is approximately 50 tons. Production can be increased to 60-70 tons per acre of land through the proposed intervention of technology. Presently salt harvesting is done by manual compaction of soil by foot or by static roller. Therefore there is brine losses and health hazards. The main objective of the project was to design an economical concrete mix for salt-pan bed which is sustainable, made from locally available waste material and has good durability for specific field conditions to prevent brine losses and to support mechanization in salt harvesting.



In order to make sustainable salt beds, alkali-activated concrete was developed using industrial waste like fly ash, ground granulated blast furnace slag, waste gypsum, recycled coarse aggregate, dredged marine sand and sodium-based activators. Various trial mixtures were carried out to evaluate the effect of various combinations on the mechanical properties of concrete. Figure 1, shows few of the cast specimens. After significant number of trials, it was possible to get desired compressive strength of M25 grade concrete along with flexural strength. Figure 2 shows the graph of compressive strength of three alkali-activated concrete(AAC) mixes.

Figure 1:  
Casted Specimens

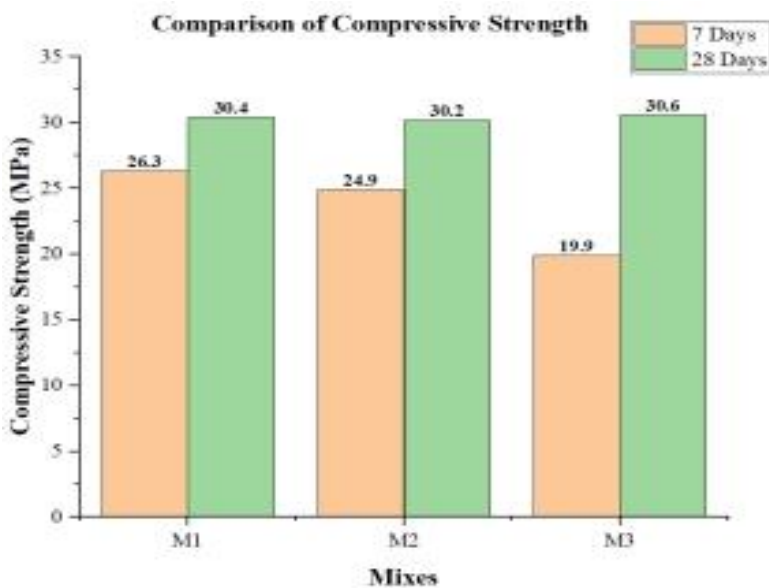


Figure 2:  
Compressive Strength of AAC



Fig. 6 Construction of Ponds



(a) Leveling

(b) Bricks wall of pond







(c) Plastering



In order, to validate the results at laboratory scale, four ponds were created and all the ponds were filled with salt water and brine losses are measured in actual conditions. Tests are also being carried out to measure durability parameters of the developed concrete to assess the life cycle of the concrete into actual salt pans.



## PhD Completed

	Name of Faculty	Title of the Thesis	Name of the Guide	Name of awarding Institute /University
	Prof. Anand Bhatt	Experimental Investigations on Wickless and Wicked Multi-branch Heat Pipe in Different Orientations	Dr R.N.Patel Dr S.V.Jain	Institute of Technology, Nirma University
	Prof. Hiren Prajapati	Synthesis and characterization of magnetorheological fluid for design of double coil force actuator	Dr Absar Lakdawala	Institute of Technology, Nirma University
	Prof. Usha Patel	Active learning based Hyperspectral image classification	Dr. Vibha Patel	Gujarat Technological University
	Prof. Harsh Kapadia	Advanced imaging techniques for concrete damage characterization	Dr. J.B.Patel and Dr.P.V.Patel	Institute of Technology, Nirma University



## New Faculty Joining

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Electronics & Communications	Prof. Khushboo Sinha	Ph.D.
Electronics & Communications	Prof. Krupa Purohit	Ph.D.
Electronics & Communications	Prof. Amrin Kagdi	Ph.D.
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