

## **NEW PRODUCTS: ADDITIVES USED WITH SEA SAND AND SEA WATER FOR MOTAR & CONCRETE – THE BETTER APPLICATION FOR CONSTRUCTION PROJECTS AT ISLAND AREAS**

In early May of 2019, with the approval of the Disaster Management Authority - Ministry of Agriculture and Rural Development, Next Build Group, together with Tech Build Co., Ltd., has a presentation to introduce new products: **Additives for mortar and concrete using sea sand and sea water ECO- CSB and ECO-CSSB**. Next Build Group is known as the manufacturer of ECO-CSB and ECO-CSSB products, and Tech Build Co., Ltd. is the exclusive distributor in Central Vietnam. Participants include Leaders of all levels of the Disaster Management Authority, representatives of professional departments, Next Build Group's leaders, Tech Build Company's leaders and members of the research team.

**1. Back ground of Miclayco technology and social meaning of the products:** The presentation based on the reality of the exploitation and the indiscriminate use of fresh water and sand resources, which has rapidly been increasing with the development of the construction industry. This has been seriously affecting the environment and the quality of human life. Since then, the search for solutions to overcome those above problems has urged the inventor, Dr. Nguyen Hong Binh – the former Director of Ho Chi Minh City Department of Water Resources and a group of scientists from Ho Chi Minh City Science and Technology Association. , launched ECO-CSB and ECO-CSSB products - Additives for mortar and concrete using sea sand and sea water.

Cost for transportation of sand and fresh water from land to island accounts for a high proportion in the construction cost structure, making cost higher than usual price because of seriously lacking sand and fresh water. Also, with the desire to minimize maintenance costs (in order to maintain stability and solidity of the project in long term), Dr. Nguyen Hong Binh firstly focuses on construction works at islands, taking advantage in using local and on-site available raw materials, with treatments of clay/salt for aggregates, minimizing construction costs by applied solutions of using sea sand and salt water to produce concrete and mortar.

Since then, in 1994, MICLAYCO technology was discovered. The nature of this technology is still based on the traditional theory of producing concrete and mortar, but using sea sand (possibly silt) and sea water (or alum water, alluvial water) with the application of ECO-CSB and ECO-CSSB used MICLAYCO technology. Blending cement, sand saline, salt water, and just with required average technical level (rural masons) can produce mortar, plaster, concrete, and making floor tiles, etc. Evidently, its advantage due to the fast hardening additive will make the price down, socialize in construction investment, shorten construction time, and put building into operation; solve the deadlock because of lacking clean sand and fresh water resources; reduce the risk of landslides and environmental pollution; contribute to improve the quality of human life.

This is really a breakthrough in technical innovations to overcome the traditional solutions of producing concrete, bold in replacing available but poor quality local resources in construction, diversify construction materials and reduce the exploitation of traditional raw materials.

**2. Effects of additives:** ECO-CSB and ECO-CSSB will overcome destruction caused by swelling of clay particles and unstable, and porous Hydroxides of cement motar with sea sand that makes mortar shrunked when it gets dry; and caused by  $\text{Na}^+$  (in dissociated salt  $\text{NaOH}$ ) combines with water obstructs the clotting of mortar.

**SCIENTIFIC BASIS:** Concrete and mortar mixture, with Miclayco technology application, are formed on the theory of clay/salt treatment in materials (soil, sand, stone, water) as main materials in cement mortar and concrete. This mixture was developed on the basis of "bonding clay layers, and reject various sorts of salt (in soil, sand, stone, water) out of clay by using electro-chemical method, creates inert material that is no longer swollen or shrinking"

Effects of ECO-CSSB in hydrolysis process of cement is explained as followings:

- NaCl, which is in sand and in the solution, is dissociated into Na +, Cl-. Na in alkaline environment (OH) of cement slurry combined with organic acid into organic salt.
- Cl- which is released, in suitable catalytic conditions, becomes organic acid Chloride.
- Organic salt (carboxylate) combines with organic Chloride (Chloride cabrboxylic) to larger organic ingredients and take NaCl in the form out of solid non-dissolved salt

Thus the principle of the process is the absorption of salt electrolyzed from seawater to form an organic salt and an organic chloride acid, and two those later combine together into a new molecule and take NaCl salt out of with crystalline form. This last phase occurs only when the solidification develops rapidly due to the hardening of mortar and concrete.



Reinforced concrete is drilled April 20, 2019 – Item: wharf  
(Phuong Nam Pearl Island Construction - Can Gio completed in 2004)



POULO CONDOR project in Con Dao  
(using local sea sand and ECO CSSB additive application in producing unburnt bricks)

## CHEMICAL CHARACTERISTICS

ECO CSSB additive used with sea sand and sea water for mortar and concrete is an organic compound, liquid, viscous, milky white, concentrated, soluble in water, pungent odor, non-flammable, high corrosion.

- pH: 1 ÷ 2
- Color: milky white
- Odor: pungent odor as sulfuric acid
- Volume: 1.03 3 1.05g /ml
- Viscosity: 135 -145 Ku
- Boiling point:  $\geq 1000\text{C}$
- Freezing point:  $\leq - 40\text{C}$
- % mass of insoluble matter:  $\leq 7\%$

- All kinds of local sand can be used: saline sand, sea sand containing NaCl
- Local water can be used in mortar and concrete, including water in salty/saline/alum/alluvial areas
- Common types of cement in Vietnam can be used with ECO CSSB additives in mortar and concrete, such as PC, PCB30, PCB40 (According to TCVN 4032-85).
- ECO CSSB will work with clay and salts in topical aggregates to form a highly flexible mortar or concrete.

### Mixture method

- Quantity of ECO-CSSB used with aggregates in mortar, concrete depends on quantity and characteristics of the local materials (containing more or less clay/salt). The average amount of ECO-CSSB can be used is about 250-330 ml/m<sup>3</sup> of aggregates
- Blending ECO-CSSB mixes with water in a certain proportion due to the moisture of the materials. This additive helps to reduce the amount of water mixed but still ensures features of concrete
- ECO-CSSB with non-clay or no salts in aggregates will form to concrete more quickly, about  $\leq 1$  hour

Economic efficiency: Using Miclayco technology to shorten the schedule of construction (because local materials could be controlled and the time that concrete gets settle could be shorten), reduce the indirect cost significantly. The difference prices of sand and water, and other additional factors affected by it make the different cost of two these products

### Legal basis of the product

- TCVN 12588- 1- 2018: Additive for mortar and concrete using sea sand and sea water - Part 1 - Technical requirements
- TCVN 12588- 2- 2018: Additive for mortar and concrete using sea sand and sea water - Part 2 - Test method

**Actual images of construction works have used ECO-CSSB**

*1/ The breakwaters, bridges, and dumb houses - Hon Ngoc Phuong Nam Resort - Can Gio District, completed in 2004. Applied CSSB additive to treat sea sand and sea water for reinforced concrete and mortar.*



*2/ Coastal embankment project - Phuoc Tinh - Ba Ria Vung Tau Province (completed 2010)*



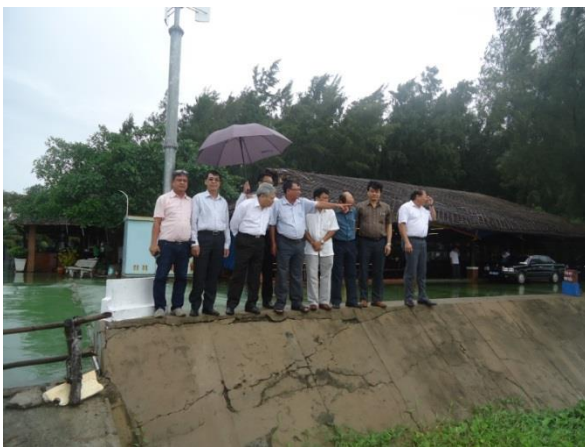
*3/ POULO CONDOR Project in Con Dao (completed in 2014)*



*4/ Embankment at Cua Dai – Hoi An – Quang Nam province (completed 1/2018)*



*5/ In September, 2017 , the Deputy Minister of Construction Department visited the embankment project - Song Bien - Can Gio Province (completed 2005)*



**General Department's Ideas:** After listening to the presentation introduced the new products, the additives ECO-CSB and ECO-CSSB, members of the Disaster Management Authority have made very practical contributions to help Next Build Group to improve more the products as followings:

- Determine the salinity of sea sand of each region, and accordingly to issue the respective quota of usage of ECO-CSSB, contributing to improving practical applications for users.
- Applied for TCVN for additives in reinforced concrete
- Re-calculate the price of the additives to offer more reasonable cost
- To organize scientific conferences regularly to gain awareness about the usefulness of these additives, put additives into construction applications sooner.
- Combination of similar products has been used in the world for further developing in Vietnam market

Next build has received all the ideas with thanks and will keep studying to have more effective practical applications in the near future.

### Some photos at the Presentation of ECO-CSSB



