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A Natural Building Material From The Arabian Sea & Backwaters; A Dying Art Of The Esoteric Mukuvans Of Vipin Islands.

Kumayam

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An obscure group of islands called Vipin, cut off from the Indian landmass by backwaters of the Arabian Sea, is home to a uniquely interesting culture that depends solely on the sea for its basic necessities- food and shelter. The fishermen vehemently oppose using chemically processed cement and instead, have their own building material that they extract from the sea bed and process with natural materials from site. They have open-air laboratories in their backyard in which they make the product and then build their homes with it; the product is called Kumayam. Here is the process:

Raw Material: The raw material used for this process is Clam shells (natives call it 'Ithall'). Clam shells are found only in specific locations of the sea bed. The location is dependent on the temperature of the water (the target spots where warm water mixes with cool water), pockets of intense undergrowth, and quantity of light on surface of sea bed.

Clam shells are of two types, based on their site of origin and formation. The taupe-beige clam shells are found only on sea bed, and the sepia-burnt umber clam shells are found on the bed of the backwaters only (backwaters are called Kayal).

There is a significant difference in use for either type; one is for aesthetic purposes and the other is for structural purposes. Kumayam (final product obtained from processing these shells) from seabed shells is the prime ingredient for plastering walls. Walls project an extraordinarily luminous, reflective quality when plastered with Kumayam, much like the walls of the Nelson Atkins museum of Kansas City. Kumayam plastered walls help tremendously in dissipating the intense heat and humidity from within the homes of the islanders. Kumayam's aesthetic quality as a silvery-grey paint is favoured by the locals. Mixed only with water, and brushed on with coconut strands, Kumayam gives the house a light, airy look and most importantly, it also acts as a natural insect repellent. Every year, right after monsoons, the homes of Vipin island fishermen are whitewashed in Kumayam; it is a ritual that is performed by the entire family as a whole and has continued through the ages unchanged.

Kayal (backwater) clam shells are used for structural purposes predominantly. They are an indispensable component of the building material for walls, floor and roof structure. They are stronger and heavier than sea bed clam shells. Kayal Kumayam is mixed with sand from the island and used as mortar for locally quarried Laterite rock, which is used as the building blocks for island architecture.

Seabed clamshells are more readily available than Kayal clamshells, but also more expensive. They also produce more Kumayam than Kayal clamshells, but Kayal Kumayam has much greater adhesive properties.

The proportion for Kumayam mortar is – 5 units sand from site 2 units Kumayam, 1 unit water.

Laboratory: The laboratory consists of two spaces- an open area for mixing raw material and seiving end product, and a shed covering a 4' high cylinder with an inverted conical base. At the nadir of the base is a 6" diam. aperture, which is the synapse between the cylinder and an air channel running below the base of the cylinder. At the distal end of the channel is a fan (panga) connected to a motor of 1.5 horsepower.

The walls of the cylinder are made of laterite and Kayal kumayam. Kayal kumayam has a flaw; if it is constantly exposed to salt, osmosis will cause Kumayam to effervesce and lose its adhesive properties over a period of time. In such cases, surface reapplication of kumayam will be required where water table is high and brine in nature. Symptoms can be seen when walls have powdery patches, typically along plinth, and ant trails begin to appear.

The air channel is 6" wide and 8" deep. It has to be free of moisture before the process of Kumayam begins. Monsoons make this a tedious task to overcome. Hence the air channel is covered by wooden planks at ground level instead of concrete. In order to dry the channel of rainwater, the planks are removed and the channel is exposed to the hot tropical sun. After drying, the planks are replaced and the fan blows air into the channel to complete the drying process in the inaccessbile area of the channel under the cylinder.

Process: Kumayam making is a two-part process, conducted over two days and at very specific times of the day. Stage 1 comprises shovelling, mixing (lift and fold method) and baking; Stage 2 comprises

hydrating, effervescing and powdering.The reason it is conducted over two days is because of the intense exothermic nature of the process.

Stage 1: Under direct sunlight , 3 materials are heaped separately on site- virgin Ithall (clam shells), half-baked Ithall, and combustion compound. Combustion compounds are of 3 types; palm wood residue recycled from the cook-pit of the house, copra (coconut shell) residue after cooking, and coal.

According to the combustion material, the ratio of the Ithall-combustion compound also changes:
5 units Kayal Ithall, 1/2 unit half-baked Ithall, 2 units residue wood chips
9 units Kayal Ithall, 2 units half-baked Ithall, 1 unit copra shell residue
10 units Kayal Ithall, 2 units half-baked Ithall, 1 unit coal


For this study, copra was the combustion compound and Kayal Ithall was the raw material. We began this process at 1pm in the afternoon because according to the Mukuvan (Mukuvans are fishermen who are trained through generations in this specialized process), this is the ideal time when ignition and combustion is most effective.


First, virgin Ithall and copra are shovelled and folded thoroughly three times. Half-baked Ithall can be seen on the right; its colour has changed from sepia to light grey. It is solid at this stage, but if pressure is applied, it will become amorphous.

Preparation

The ignition drum is swept and wiped clean of moisture along the wall, floor and central air channel. Stones are placed on edges of the hole and a thick, perforated iron plate is placed over the hole.


The purpose of the fresh copra shells is for ignition only. It serves no other function in the process of making Kumayam. Coconut shells were obtained from the coconut palms on site.

The metal plate is completely covered with coconut shells in a specific pattern. Then a small fire is lit and left to burn for half an hour, until all the coconut shells are actively burning. Virgin Ithall is now placed above the burning coconut shells. Ithall is brought in baskets and placed evenly in concentric circles above and around the central fire, layer upon layer, one at a time.

The panga (fan) is started so that the air channel blows in a steady stream of air from below the mound. After all the virgin Ithall is placed over the fire, then the half-baked Ithall is placed in the same pattern over the mound. After every fill, the mound is packed tightly so that the heat is contained and distributed evenly throughout the mixture.

As the Ithall starts to cook, the atmosphere of the place begins to change rapidly; firstly an intense amount of smoke is released into the air. Eyes tear up and the density of the smoke lessens visibility considerably.

Slowly over time, the Ithall will change its colour from sepia to light grey. However, it still retains its morphology.Sea Ithall needs lesser time to bake than Kayal Ithall. The baking process for Kayal Ithall takes six hours. It remains undisturbed in the cylinderical drum until the topmost layer has changed colour to light grey. The panga is turned off after six hours of time. After the baking process is over , the light grey mound of Ithall is left undisturbed overnight so that it cools down slowly and evenly.

The second change is the noisome odour that pervades the entire area. This odour comes from the the remnants of the dead organism inside the Ithall, which is referred to as 'Kakka' . Kakka odour is so tangible and unretractable that people from other places have come to associate this odour with Vipin island dwellers.

Stage 2: Second part of this process commences the following day, after dawn, around 6 am.

The mixture mound looks white in colour, becomes a combination of crystalline and amorphous form, and the Ithall that retains its form remains hard even if pressure is applied to it. The mixture is hot to touch at this point. Very carefully, the outermost layer of the mound is scooped out and placed aside. This is the half-baked Ithall that will later be used again in the subsequent processof Kumayam making. After one thin layer has been kept aside, then the rest of the Ithall is scooped out and placed out on a coir sheet in the open air, in the same way as it was placed inside the cylinderical drum. The copra shells at the bottom of the drum are completely incinerated so we do not see any trace of it.

The amorphous Ithall released into the air while scooping out the mound can cause coughing, sneezing, watery eyes and itchy skin.

Now the most crucial part of the process takes place; it requires two people to work simultaneously. Water is brought in buckets from the backwaters and placed near the mound. Then water is added, a bucket at a time. Whle one person hydrates, simultaneously the other person is rapidly mixing the Ithall in shovel-fold motion. When water hits the Ithall, there is an intense exothermic reaction; steam is released and the mixture effervesces instantly. The rapid mixing action is to prevent globules from forming. It is crucial to know the quantity of water to add; if overdone, then the mixture becomes ineffective, in which case, it would have to be mixed with virgin Ithall and used in another Kumayam making process. In essence, there is no wastage in this eco-friendly process. After the right amount of water is added and the mixture is mixed, the endproduct of Kumayam is now ready.

After effervescence has taken place throughout the mixture, Kumayam is ready for use in construction. It is only mildly warm at this time, but interestingly, if it is packed immediately in plastic bags, then it will melt the plastic. Therefore it is left to cool for another three hours before being bagged for storage and transportation to construction sites.

All the houses of the island of Vipin and most of the houses of the state of Kerala, India, used to be built with Kumayam as mortar, paint, insect repellent and wall plaster. It used to be affordable and readily available. Unfortunately, this art of making Kumayam is rapidly fading in today's world, and the Mukuvans who are pundits of this process are now a very select few. The reason for this is the heavy taxes and permits from local legislatures that Mukuvans are burdened with and cannot afford to pay, owing to their impoverished fiscal conditions.

Kumayam is a gift from nature. It originates in water, and returns to earth, unaltered in organic constitution. It is completely bio-degradable. It has inherent qualities that would make it a valuable product to use in construction. If we can harness the potential of Kumayam and apply it to today's architecture, we would lessen our dependence on non-sustainable materials like cement.

This paper is part of my ongoing independent research to find sustainable solutions for building and design from ancient practices of esoteric cultures. —- -Hasna Salam