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Sealing capacity of different materials for the reclamation of cracked concrete fish tanks

Eze, J. O. / Nnaji, J. C. / Okojie, L. A.

Abstract

The sealing capacity of latex sealant and Portland cement for the reclamation of cracked concrete fish tanks was investigated for a period of three months. Concrete fish tanks (5m x 5m x 1m) were divided into duplicate treatments (T1 and T2). The latex sealant was utilized in treatment 1 (T1) while Portland cement was utilized in treatment 2 (T2). The tanks were initially filled with water and the seepage rates were determined within five days and results showed that the rate of seepage was very high which led to the abandonment of the tanks. The surfaces of the tanks were cleaned thoroughly before the application of the sealant and cement. In T1, the sealant was mixed in a ratio of 1:4:7 (sealant: water: cement) and applied with brush in two layers before the mortar was finally applied. The Portland cement was also mixed in a ratio of 1:3 (cement: plaster sand) and applied on the other two tanks in T2. The tanks were filled with water after curing for one week. The seepage rate determined in T1 was 4mm per day when the weather was clear (sunny) which may be as a result of water loss by evaporation while the seepage rate determined in T2 shows a continuous decrease of 12mm every 24 hours, irrespective of weather condition.

Keywords: Sealant, concrete tank, seepage, portland cement.

Introduction

Water is very vital in fish culture since fish lives in water throughout its life time. The cracking of concrete fish tanks may lead to the abandonment of such tanks due to excessive leakage and this result in loss of revenue. It is therefore important that the tanks are sealed to enhance the production of fingerlings and brood stock all year round. If a concrete tank shows signs of cracking, rust staining, or any other sign that might indicate distress, the first task is to find out how serious it is, what caused it, and how it can be repaired? There are many possible causes of distress in concrete tanks and these include; movement of the foundations (earth pressure), inadequate materials during construction, structural overloading, accidental damage, sulphate attack, alkali aggregates, and the rusting of the reinforcement (Peter, 1987). Concrete made with Portland cement has certain characteristics; it is relatively strong in compression but weak in tension and tends to be brittle. The weakness in tension can be overcome by the use of conventional rod reinforcement and to some extent by the inclusion of a sufficient volume of sealant (super latex) applied on the surface of the concrete tank before the final plaster. Live cracks are those cracks which undergo some movement in direction, width or depth over a certain period of time. Cracks due to overloading and thermal expansion (change in temperature) are examples of active cracks (Suresh, 2011). Concrete sealants and waterproofing compounds perform similar functions in different ways. Sealants form the initial protective layers over the surface of the concrete, while waterproofing compounds penetrate into surfaces to fill in gaps.

These cracks can cause the concrete tank not only to leak and drain away the water contained therein, but may also allow bacteria to build in the cracks making the water unsafe for use. It is therefore important that different potential materials that can be used for the sealing of tanks are studied since the use of cement has been found to be inadequate.

Materials and Methods

Four concrete fish tanks (5mx5mx1m) were divided into two duplicate treatments and used for the study. Latex sealant (Dr. Fixit brand) was utilized in treatment 1 (T1) while normal Portland cement was utilized in treatment 2 (T2). The tanks (plate1 and 2) were initially filled with water and the leakages and evaporation were determined. The surface of the four tanks were thoroughly cleaned (removal of loose materials, oils, grease, grasses, etc.) by wire brushing and the surface was damped but in a touch dry manner. The sealant was mixed in ratio of 1:4:7 (super latex: water: cement) and was applied with brush on

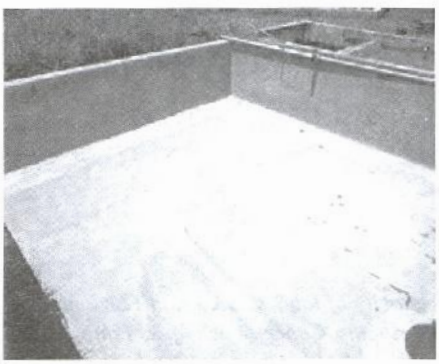
the two tanks in T1. After the first coat (layer) was dried, the second coat was applied after 24hours, when the second coat was dry, plaster (mortar) for protection and finishing was applied. Portland cement was also mixed in a ratio of 1:3 (cement: plaster sand) and applied on the other two tanks in T2. The tanks were cured for one week to flush away the toxic materials of the sealant and cement that may contaminate fish. After that, the tanks were filled with water to a level of 0.7m and *Clarias garepinus* fingerlings were stocked in the treatments at a density of 10 fingerlings/ m^2 for three months and the seepage rates (decrease in water level per day) were determined.

Results and Discussion

The result obtained before the application of sealant and Portland cement (T1 and T2) is shown in figure 1. It was confirmed that seepage was very high and this led to abandonment of the tanks for several years. But after the application of latex sealant in T1, the seepage determined shows a slight drop (decrease in water level) of 4mm/day when the weather is clear (sunny) which may be as a result of water loss by evaporation while the seepage determined in T2 was 12mm/day and showed a continuous decrease irrespective of weather condition as shown in figure 2. Plate 1 and 2 shows the nature of concrete tanks in T1 and T2 before and after application of sealant and Portland cement. Tanks stocked with fish after treatments are shown in plate 3.

Plate 1: The nature of concrete tanks in T1 before and after application of sealant.

BEFORE



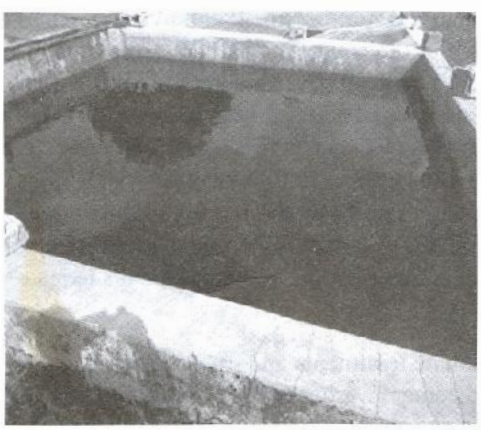
AFTER

Plate 2: The nature of the concrete tanks in T2 before and after application of Portland cement.

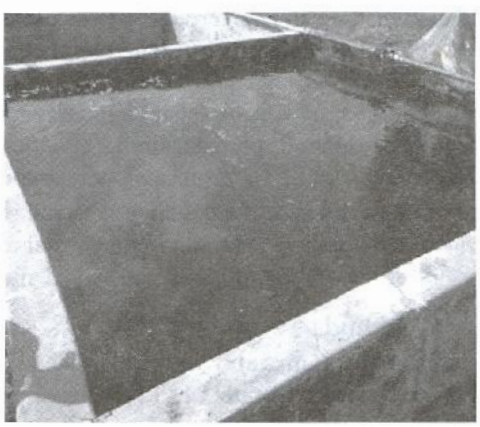
BEFORE

AFTER

Plate 3: Tanks stocked with fish after treatments.



Treatment 1 (T1)



Treatment 2 (T2)

Plate 3: Tanks stocked with fish after treatments

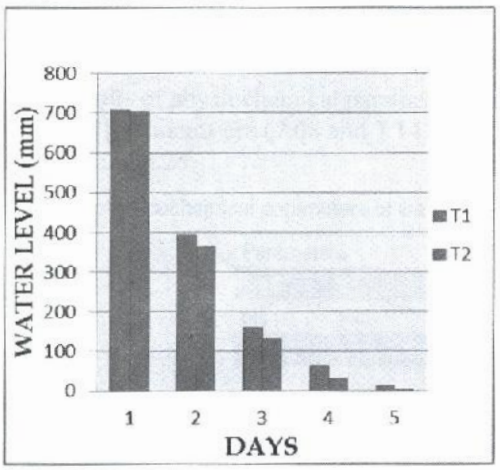


Fig. 1: Seepage before Application of Sealant and Portland cement.

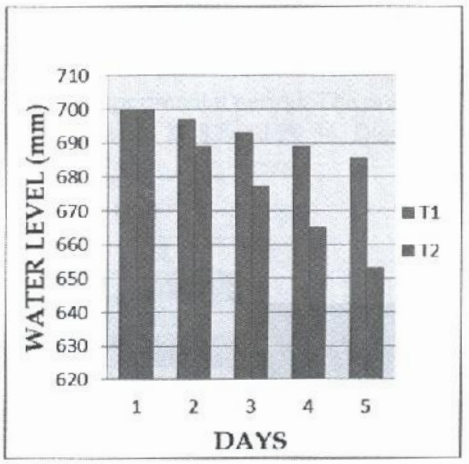


Fig. 2: Seepage after Application of Sealant and Portland cement.

Conclusion and Recommendations

The study shows the importance of observing any cracked concrete fish tank before adopting any repair method and the use of artificial sealants may provide a good alternative for the reclamation of such tanks. The use of latex sealant is better than Portland cement and is recommended for sealing cracked concrete fish tanks. However, further studies are needed on the sealing potentials of other materials for use in cracked tanks. In addition, the cost of the sealants vis-à-vis Portland cement and water loss by evaporation should also be determined in future studies.

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