International Solid Waste Association (ISWA) Specialised Conference

"MSW: Management Systems and Technical Solutions"

28-29 May 2013, Russia, Moscow, IEC "Crocus Expo"

Post Conference review

International Solid Waste Association (ISWA) Specialised Conference MSW: management systems and technical solutions was held between 28-29 May 2013 in Moscow, Russia. The scope of the event was to discuss innovative approaches in the field of municipal solid waste processing and disposal and to advise efficient solutions for emerging countries.

The two-day Conference was jointly organised by ISWA and SIBICO International and took place alongside the leading International Exhibition for Waste Management, Recycling, Renewable Energy and Environmental Technologies - WasteTech 2013 (www.waste-tech.ru).

Sponsored by the company **NAUE GmbH & Co. KG** the Conference has attracted more than 230 participants from a wide range of backgrounds (industry, academia, regional and national institutions, consulting bodies and private individuals) and from more than 26 different countries: Austria, Azerbaijan, Belarus, Belgium, Brazil, Denmark, Estonia, France, Germany, Greece, Hungary, Iran, Israel, Kazakhstan, Korea, Latvia, Lithuania, Malasia, Portugal, Russia, Saudi Arabia, Switzerland, the Netherlands, UK, Ukraine, USA.

80 oral presentations in four parallel sessions were presented in the scientific fields of waste management, collection, transportation, sorting and recycling, thermal treatment, waste-to-energy and environmentally friendly technologies for waste landfilling.

Derek Greedy, ISWA WG on Sanitary Landfills, UK**:** It was indeed a pleasure for me as Chair of the ISWA Landfill Working Group to attend what was a very well organised and vibrant conference. The sessions were all very well attended with much good debate which went on both inside and outside of the sessions. WasteTech exhibition was well attended and was ideal for networking. Although I am often critical of parallel sessions I think running just 2 did work for this conference and I would hope that you can keep to this for future events. Clearly you have a good formula for the event and to attract so many delegates from so many countries is commendable and speaks volumes.

Christian Stiglitz, ISWA, Vienna: I was quite impressed by the size and scope of the WasteTech exhibition 2013, and clearly the ISWA Special Conference was the right supplement to it. While visitors received plentiful information on technical products and services in the exhibition, the ISWA Conference gave a depth insight into the waste management challenges, theories, projects, and results from many districts of Russia as well as international regions and countries. The presentations were of high quality and I am sure that the visitors` expectations were not disappointed.

I found the attendance quite satisfactory and audience as well as speakers of high professional quality. I am sure that the idea of having a waste management conference as co-event to the WasteTech will have a promising future and such a forum can grow tremendously in size and content in the future.

Frans Willemse, ISWA WG on Collection and Transportation Technology, the Netherlands: I must say the quality of the presentations was good. Speakers from all over the world participated in the conference. The audience is very much interested in the developments in Europe and it was good to see that Russian universities are doing research on different subjects related to waste handling and processing. I am convinced that this conference is of great importance for the future in Russian waste management. A good combination is made with the WasteTech exhibition. Not only Russian companies were participating but also many companies from Europe and Asia.

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RECYCLING OF TEXTILE WASTE BY REINFORCING EARTHY RENDER WITH MICRO-FIBER

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ABSTRACT
Earth construction is worldwide spread. It is a valuable heritage to preserve because of its cultural and socio-economical relevance. Furthermore, earth construction, since it needs significantly less energy than modern construction techniques, and works with local materials, it contributes for thesustainable development. In Portugal, there is an impressive earth construction heritage that requires maintenance. Among the Portuguese traditional building techniques related to earth construction, the rammed earth, the adobe and the tabique are the most relevant ones. This work is focused on attempting to apply textile waste micro-fiber as an alternative sustainable reinforcement solution of earthy render of tabique walls. Therefore, several earthy render samples reinforced with 1% textile waste micro-fiber content were prepared and mechanically tested. The main experimental results are presented and discussed, and the main conclusions are drawn. This study also contributes for recycling a specific waste, namely short fibers from needling machines used to produce nonwoven fabrics.

INTRODUCTION

Reinforcement of cement based render is a common building practice. Its main purpose consists on increasing the tensile strength of the render in order to reduce

possible cracking phenomenon. This pathology may be due to structural and/or to water shrinkage causes. The incorporation of steel or glass fiber nets into the cement based render are two possible reinforcement technique solutions. Alternative reinforcement solutions have been studied and proposed. Some of these are acrylic fiber, sisal fiber and textile waste micro-fiber. In these cases, obtaining a solution that is simultaneously technically efficient and environmental friendly has been the main goal to achieve, by applying an industrial waste or by using an organic material. Additionally, recent research works have been focused on applying textile waste as alternative building materials such as thermal insulation [1]. In this context, this research work intended to study the potential of using textile waste micro-fiber as a reinforcement of earth-based render (detail II of Figure 1.a). Earth-based render is applied in earth based construction as rammed, adobe and tabique (Figure 1.a), among others. On the other hand, textile waste micro-fiber (Figure 1.b) is a waste of different industries such as those of nonwoven fabrics andmattresses.

Tabique walls may be partition or exterior. In both cases, they may have an important structural function. They are the main vertical structural elements of a traditional tabique building. A traditional tabique building is considered as being a sustainable building solution since it is built up essentially with green materials such as: stone, timber and earth. Basically, a tabique element is formed by a timber structural system covered by earth or by an earthy render. In this last case, there is a small percentage of lime added into the earth. The earthy render has an important role on the integrity of a tabique element because it protects the structural timber system from the insects attack, from the water degradation and from fire. Cracking is one of the most detected pathologies in earthy render of tabique elements and as Figure 1.a highlights (red lines). Fiber reinforcement may be a technical building solution able to reduce this vulnerability.

a)Atabique construction.

b) Textile waste micro-fiber.

Key: I – White wash; II – Earthy render; III – Timber pavement; IV – Peripheral timber beam; V – Plaster; VI – Straw; Red lines correspond to cracks

Figure 1: A tabique construction example and the used textile waste micro-fiber.

EXPERIMENTAL WORK

An earth-based render sample was collected from a tabique wall of a typical Portuguese tabique dwelling. This sample was considered as a representative of an earthy render and all the samples prepared in this research work were based in this material. Taking into account the significant integrity and consistency of the

material, there is a high possibility of the existence of a certain amount of lime added into the soil. This fact required a previous trituration process of the earthy render sample. A granulometric analysis has concluded that there are particles sized up to 20 mm. The percentage of thin particles (silt and clay) is about 20%. These results are in accordance with a typical earthy render of tabique construction. Meanwhile, the used textile waste micro-fiber was also experimentally analyzed and it was concluded that it is 100% acrylic, its length and thickness are approximately500 μm and 12 μmrespectively, its density was estimated in 122.5 kg/m^3 and its water absorption capacity is about 270%.

In order to evaluate the textile waste micro-fiber reinforcement potential of earthy renders, the mechanical behavior of an earthy render sample without fiber (plain earthy render) and of a reinforced earthy render sample (with 1% content of textile waste micro-fiber, in terms of weight) was done by performing bending tests, and it were followed the same experimental procedures successfully applied in the study of reinforced cement based renders [2]. In both cases, a water content of 18% (in terms of weight) was added into the earthy render. Workability and reducing the risk of cracking were the main reasons for this option.Nine plain earthy render samples (designated as samples 1 to 9) and seven reinforced earthy render samples (samples from 10 to 16), sized 0.04 m × 0.04 m × 0.16 m (i.e. width × height × length) were prepared according to [3-4]. The samples were tested at the age of 28 days. During the curing time, the samples were kept under the controlled thermo hygrometric conditions of the laboratory (i.e. temperature and relative humidity of 22ºC and 40%, respectively). A Seydner Mega 10/250/15D testing rig was used in the three-point bending tests. The span was 100 mm. The mass (m) and the obtained bending strength (f_m) of each sample are presented in Table 1. The average (Avg.), the standard deviation (SD) and the coefficient of variation (CoV) of these material properties are also provided in Table 1.

Table 1: Mass (m) and bending strength (f_b).

Plain earthy render			Reinforced earthy render		
Sample	m (g)	f_b(MPa)	Sample	m (g)	f_b(MPa)
1	396.7	0.049	10	331.1	0.045
2	401.8	0.056	11	338.2	0.056
3	399.7	0.060	12	335.0	0.064
4	420.3	0.045	13	330.7	0.060
5	417.9	0.053	14	322.7	0.053
6	421.0	0.060	15	328.8	0.053
7	397.1	0.056	16	290.6	0.041
8	396.8	0.049	-	-	-
9	376.6	0.053	-	-	-
Avg.	402.9	0.053	Avg.	325.3	0.053
SD	13.6	0.0048	SD	16.0	0.0080
CoV (%)	3.4	9.0	CoV (%)	4.9	15.1

DISCUSSION OF THE RESULTS AND FINAL REMARKS

The results presented in Table 1 lead us to the conclusion that there is no tensile strength benefit by incorporating the studied textile waste as micro-fiber in earthy render. In fact and apparently, the obtained bending strength (which indirectly is related to the tensile strength) values were very similar between plain and reinforced

earthy render samples. In terms of average, they were equal to 0.053 MPa. However, it is worth to notice that the higher bending strength value (f_b= 0.064 MPa) occurred in Sample 12 which is a reinforced earthy render sample. In contrast, the mass between plain and reinforced earthy render samples has shown significant discrepancy. The plain earthy samples were heavier than the reinforced earthy samples.This could be due to an improper compaction of the mixture with micro-fibers, since the relatively high fiber content affected workability. This aspect may increase the difficulty in comparing the bending strength of the two render types. Other technical aspects may fundament the above conclusion.The length of the micro-fiber may not be suitable for the maximum soil particles' dimension, as it may be too short for the dimensions of the soil particles and taking into account that the thin particles percentage is relatively small.Moreover, it was difficult to disperse uniformly the micro-fiber in the earthy render resulting in ananisometric composite material.For the latter it contributed the fact of the micro-fibershaving a significant water absorption capacity, whichmight reduce the workability (resulting in compaction problems of the samples) and may increase the required necessary curing time. Therefore, additional research work is suggested in this topic in order to solve these questions. Thinner soils should be used or, alternatively, adding a certain amount of a binder (for example: 5% of a natural hydraulic lime) should be considered. Different textile waste micro-fiber and water contents should also be taken into account.

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