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Mini Review

A study about economic factors of using Aluminium as a construction material

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Abstract: Aluminium is being used as a construction material in various constructions. There are lots of benefits that could gather from using Aluminium as a construction material. Furthermore, Aluminium structures are everywhere in building structures. Most people have used Aluminium fabrication in their buildings. Aluminium is using construction of doors, windows, ceilings, showcases, wall panels, cupboards, etc. However, there were few analyses and findings of the economic factors of Aluminium as a construction material. . Therefore, this study was conducted to investigate the economic impact of using Aluminium as a construction material. According to the findings Aluminium material structures are lightweight, reusable after recycling can reuse, have a minimum waste generation, the cost of cutting, the cost of transport is less than compared to the other material, and the minimum number of laborers can work and finish the structures. Finally, constructed structures are more durable and economical.

Index Terms: Economic factors, Construction material, Aluminium manufacturing

1 INTRODUCTION

There are lots of construction materials in the world. Aluminium is a good material which is used for construction projects such as for high-rise buildings and other areas of construction. The use of Aluminium in buildings, auditorium theatres is very extensive for functional purposes [1]. Most of the residential buildings also used aluminum doors, windows, ceilings, pantry cupboard, etc. Doors are used for providing entrances from the outside into the building. As well as doors are used for inter room connections for the easy approach [2]. Windows are more considerable sections of the entire building construction for enhancing the utility of the houses [2]. Due to various environmental regulations as well as awareness in the society, so many academic research institutions and different industries are forced and try to discover new materials as well as technologies [3]. Aluminium material was established as an essential element in the construction industry and enabled every possible architectural concept to be realized [4]. After a long period of technological development, the initial structures created of Aluminium alloys. It was in the form of prefabricated systems in early 1950s [5]. Construction industries need to consider the economic impacts of the materials. Therefore, it is necessary to find out the economic impact of Aluminium as construction material.

2 ALUMINIUM MANUFACTURING PROCESSES

There were many ways of metal matrix composite materials formed. They combined a distinct element with another organic. The other way was ceramic material with a binder. It improved mechanical properties than conventional materials [6]. The 40% forming and fabrication of Aluminium by its mass Forming and fabrication of Aluminium is 40% by mass [7]. According to the research finding, strength, wear resistance and stiffness were improved. Density also lowered [6]. On the other hand, different fabrication approaches are carried-out. Such as the solid state method, liquid state method, deposition method and in-situ method [6]. L. Gardner and his team have done a study of an office building. They found the primary cost of the structures. As for the other findings, maintenance costs, decommissioning costs, residual values, and the life cycle cost of the aluminium alloy structure were less than the stainless steel structure [8].

3 ECONOMIC IMPACT OF ALUMINIUM MATERIAL

Cost efficiency can be achieved by using strategies and methods [3]. In addition, the different principle life cycle costs are to be considered. That principle was checked at the outset of the construction project. Those three strategies were the initial cost, the cost contained in use, and the recovery cost [3] .

In addition to that using Aluminium fabrication is more economical than using steel. Aluminium alloy structures found as cost-effective, considering some factors. The facts were material’s price. The material's price depends on the choice and purpose of use. The comparisons were based on price per unit of mass, due to different strengths and densities. Furthermore, handling, transport, erection, and maintenance were facts. Therefore, Aluminium has more benefits if compared to steel [9].

Under the given facts, the following applications present the most impactful economic benefits [9] .
There are construction places that are hard to reach, aggressive, and structures that cause lots of maintenance [9]. Most of the Aluminium structures are constructed easily above position. On the other hand, the process is fast. Additionally, Aluminium building products be recycled. Due to that reason, more building owners decide to deconstruct rather than demolish older buildings [4].

Furthermore, using Aluminium as construction material, the cutting waste definitely occurred. Therefore some facts should be considered in a waste prevention program. The causes are cutting and managing waste. Therefore, they should be given priority over others. Using design interventions cutting waste is minimized. Also, by adapting controlled delivery of materials to the sites. That could be done by ordering the materials on time. As for the other facts ordering the exact and economical quantities. Those causes a considerable portion of material waste can be avoided [10]. Compared to other materials such as steel, Aluminium alloys are considered economical and also the maintenance costs are less and the sustainable feature of durability is achieved [11]. In addition to that Aluminium alloys are more competitive in applications such as it’s self-weight is low [5][12]. In the building and civil engineering, sometimes the low weight is determining the choice of Aluminium [13]. While considering the low specific weight of Aluminium alloys, it enables and facilitates such simplification of construction phases. Apart from this, there are some other facts. They were the transport of fully prefabricated elements and minimize of load transfer to foundations. Not only energy saving during construction but also reduced the need for physical labour [5] [12] [13].

There is an important protective film on the Aluminium surface. It is contained oxygen film. Also enabled the minimized the maintenance costs. Therefore, Aluminium material is provided excellent performance in corrosion aggressive locations. Furthermore, the functionality of structural shape and the improvement of geometrical properties of cross sections in the design of minimum-weight shapes. While Structural efficiency is high. On the other hand, structures are created in stiff forms without using complex parts. These kinds of Aluminium fabrications avoiding welding or bolting. Subsequently, using simple methods they are connected [12] [13].

Aluminium material was used for lightweight structure creation [4] [5] [8] . There are various ways to clean Aluminium. Cleaning Aluminium could be done using plain water. It should be used governed by the finish as well as the shape of the structure, the size of the structure, and location of the surface type to be cleaned [14]. Therefore, Aluminium materials have a low maintenance requirement. In addition, they ease fabrication and reduction of costs. [5]. Customers and fabricators could get economic benefits from these kinds of cost reductions. Aluminium applications can be both structural and non-structural [11]. Using Aluminium was reducing landfills by 5-8% every year by recycling. Aluminium ensures optimal performance over a very long serviceable lifetime, which is weatherproof, and unaffected by the harmful effects of UV rays [4].

4 CONCLUSION

Firstly, most of the studies are qualitative analyses. Some of them were experimental research. Most of the researches were done in different countries. Subsequently to the findings Aluminium can be recycled and can get economic benefit from it. Furthermore, recycling is a much more considerable factor in Aluminium structure construction industry. They are technical benefits, ecological benefits, and economical. As well as Aluminium has a minimum environmental impact because of recycling. Using Aluminium material for construction can get a lot of economic benefits. Such as Aluminium can use for constructing lightweight structures, durable structures. As well as less maintenance cost and good corrosion resistance. Therefore, Aluminium material gives various benefits compared to other materials in construction.

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