The impact of the use of new environmentally friendly materials on the management of construction projects: Taking straw fiber materials as an example

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Abstract. With the rapid development of the construction industry, the social economy has experienced a golden period of development, and the construction industry has experienced an unprecedented high rate of growth. Because of its rapid development, the construction industry has contributed to the development of the world economy, but at the same time, there are other problems, such as the construction of houses, roads, and tunnels, which consume much non-renewable energy and release many harmful gases, leading to the greenhouse effect and the rise in global temperature. As non-renewable energy sources continue to be consumed, society's resources are decreasing, and the earth's ecological environment is gradually deteriorating. Therefore, in the future of the construction industry, not only its materials in terms of strength, durability, and other aspects of higher requirements, but also on the environment-friendly construction materials more attention, so the project cost control and management of materials play a more critical role. This paper takes straw fiber material as an example through the extraction and preparation of straw fiber and then analyses its material in quality, cost, and construction of the three aspects of the content, derived from the material in the quality, cost, and construction of the three sides of the impact, through the rational and effective use of new environmentally friendly building materials, thus to drive the world's new green building materials in the development of scientific and technological innovation, while promoting the world's low-carbon economy in the development of important the role of guidance.

1. Introduction
The rapid development of the construction industry has both advantages and disadvantages. The advantages are that it has boosted the country's economic development, and the disadvantages are that the construction of buildings has consumed a large amount of non-renewable energy, leading to a series of environmental problems and a lack of resources [1]. Therefore, the choice of a new sustainable and environmentally friendly material may solve the current problems faced. As a new environmentally friendly material, the straw fiber material is widely available and exists in most rural areas [2]. Waste straw is usually disposed of by burning, which not only pollutes the air but may also cause a series of problems such as fires [3]. Therefore, the study of the application of straw fiber materials in the construction market has some value, while turning the material into a treasure is in line with world's sustainable development strategy. In this paper, through reading a lot of literature and experimental
analysis, the use of straw fiber materials in the quality, cost, construction of the three parties to analyses the impact, as shown in Figure 1 below, first of all, the quality of its materials in different straw types and different fiber additions in different solutions under treatment, learned that its bending and compressive strength value after treatment by a specific concentration of sodium hydroxide solution is higher than that of ordinary water treatment; then its cost is analyzed in terms of the impact of the purchase, extraction, transport and preparation of the straw fiber itself, suggesting that detailed data survey collection and analysis is still required; finally, this paper analyses the impact of the material in terms of construction, due to the emergence of new materials, causing specific difficulties for both construction companies and personnel, and the need to simulate the complete process of the material in the construction of future construction by a detailed construction manual is developed for the use of enterprises and personnel.

Figure 1 Analysis of straw fiber materials from three aspects

2. Methodology
The methodology of the paper is through experiment and reading a lot of literature and books, analysis research and summary of the impact of straw fiber materials on the management of construction projects, understanding to grasp the previous experts and scholars and other relevant inquiry on the new environmentally friendly materials, and then to analyze and summaries the impact of the material in three aspects: quality, cost, and construction.

3. Study of the impact on the quality of straw fiber materials
The composite material was made using straw fibers; the test was prepared using standard cold-water treatment and 4% sodium hydroxide treatment for numbers A and B, respectively. Then, at room temperature in a specific ratio, the prepared specimens were cured under standard conditions for seven days and 28 days to determine the specimens' compressive strength and flexural strength, respectively. The first is in accordance with the cement 1000g, the water-cement ratio of 0.60, 3000g of sand, straw added into 50g, 100g, 150g, 200g for sample one, and measured flexural strength compressive strength results are as follows Table 1. Secondly, in accordance with the cement 1300g, the water-cement ratio was 0.60, 520g of sand, straw fiber added 65g, 130g, 195g, 260g respectively for sample two, and measured flexural strength and compressive strength results are as follows Table 2.
Table 1  Test results of specimen one

| Number | Cement/g | Water-cement ratio | Sand/g | Straw fiber/g | Flexural strength /MPa 7d | Flexural strength /MPa 28d | Compressive strength /MPa 7d | Compressive strength /MPa 28d |
|--------|----------|--------------------|--------|---------------|--------------------------|--------------------------|-----------------------------|-----------------------------|
| A1     | 1000     | 0.6                | 3000   | 50            | 1.16                     | 1.95                     | 4.36                        | 7.33                        |
| A2     | 1000     | 0.6                | 3000   | 100           | 0.46                     | 1.03                     | 1.59                        | 2.96                        |
| A3     | 1000     | 0.6                | 3000   | 150           | 0                        | 0.47                     | 0                           | 1.12                        |
| A4     | 1000     | 0.6                | 3000   | 200           | 0                        | 0                        | 0                           | 0                           |
| B1     | 1000     | 0.6                | 3000   | 50            | 1.57                     | 2.63                     | 5.94                        | 9.78                        |
| B2     | 1000     | 0.6                | 3000   | 100           | 0.96                     | 1.93                     | 3.19                        | 5.66                        |
| B3     | 1000     | 0.6                | 3000   | 150           | 0.49                     | 0.92                     | 1.51                        | 2.14                        |
| B4     | 1000     | 0.6                | 3000   | 200           | 0.42                     | 0                        | 0.94                        |                             |

According to the comparison of the two different groups of tests, it can be seen from Tables 1 and 2 that the flexural and compressive strengths of the straw fiber material prepared after treatment with 4% sodium hydroxide solution are higher than those of the untreated specimens with the same amount of straw fiber added, from which it can be inferred that after treatment with this solution, the bond between the cement and the fiber is stronger, and with the curing time, at 28d, the flexural and compressive strengths of the specimens were significantly higher than those of the untreated specimens. Although the strength of the treated straw fiber material has changed significantly, the hydration of the cement is an extremely complex process and should be compared with ordinary cement without the addition of straw fiber material, and other properties and applications of different straw fiber contents are subject to further comparative testing.

4. Study on the impact of the cost of straw fiber materials

At present, straw fiber materials are still in their early stages of application regarding their specific dosage and use and are usually used as straw bricks in rural housing [4]. The performance and requirements of rural housing construction are not representative of all buildings in all respects, so the means of construction and the amount of straw fiber material added vary considerably from building to building. As a result, there are significant problems with the statistics of the amount of straw material, the mix ratio, and other indicators, which may lead to difficulties in controlling the cost of construction materials [5]. In addition, straw fiber materials are made from different crop species, and different materials are available in different sizes [6]. In some construction standards, it is necessary to use a specific straw fiber material because it has a higher quality performance, but it is also more expensive, which can increase the cost of construction using this material. Cost control of straw fiber materials is an essential part of the overall project cost management, both in construction and in the budget, to ensure that accounts and materials are uniform [7]. However, the current specifications and grades of straw fiber materials are inconsistent, creating considerable difficulties in the final settlement of construction projects. If these new materials need to be used frequently, it is not conducive for construction companies
to control the economic costs of new construction materials projects, and the straw fiber material currently utilized is a composite material formed by adding straw fibers to the original cement concrete, the composition of which is shown in Table 3. The cost of the cement concrete itself is added to the cost of the solution and other materials utilized in the above tests, which adds to the total cost of materials.

Table 3 Composition of different straw fiber materials

| Type                        | Ingredients                              |
|-----------------------------|------------------------------------------|
| Ordinary cement concrete    | Water, Cement, Sand, Additives, Admixtures, - |
| Wheat straw fiber material  | Water, Cement, Sand, Additives, Admixtures, 4% sodium hydroxide solution, Wheat straw fiber |
| Hemp straw fiber material   | Water, Cement, Sand, Additives, Admixtures, PVA emulsions, Hemp straw fiber |
| Nano straw fiber material   | Water, Cement, Sand, Additives, Admixtures, Nano straw fiber |

Table 3: Self-made (Partial references)

5. Study of the impact of straw fiber materials on construction

The straw fiber material has only appeared in the last decade in people's eyes and in the construction market, and for the previous builders or some of the current builders, they do not have much experience or skills in the application of this new straw fiber material [8]. In the design phase of the building, the personnel concerned also needs to detail the differences between straw fiber materials and ordinary building materials and then combine these differences to make design adjustments [8]. At the same time, the builders may not have a clear idea of how to apply the material effectively in the building, as they do not know much about the nature of straw fiber materials [9]. As a result, these shortcomings may prevent the straw fiber material from being used efficiently in construction and may even cause unprecedented construction problems in the process, affecting the progress of subsequent works and design contract disputes. These problems not only lead to higher costs but also create difficulties in maintaining the project at a later stage.

There are certain differences between straw fiber materials and ordinary construction materials. When using this material, building construction units need to effectively reorganize and integrate the project's construction organization design and other aspects of management according to the requirements for the use of the new material, and only after ensuring the timeliness of the management of these new materials is it possible to ensure the quality of construction. In addition, in the actual construction of straw fiber materials, as many construction personnel and units do not know enough to grasp the knowledge, so the construction site is still somewhat messy, and to some extent, also affects the construction quality of the building project [10, 11]. In the pre-construction phase of building construction, the project requires construction program design work, pre-construction budget, and other work, but these straw fiber materials touch on many new construction techniques and brand-new equipment and devices. Finally, there is no unified, standard construction plan for wheat straw materials, which has led to many construction units being in a state of ignorance and confusion when using these materials.

6. Conclusion

This paper mainly studies the impact of using straw fiber materials on the management of construction project. Through the study and analysis of its straw fiber materials in terms of quality, cost, and construction, its main conclusions are as follows.

(1) Two control tests were carried out on wheat straw, and hansa straw materials with the same water to ash ratio and different straw fiber additions; the material was also treated with 4% sodium hydroxide solution and normal water, and the flexural and compressive strength values were measured at seven
days and 28 days respectively. According to the comparative analysis of the test results, the flexural and compressive strength values of the straw fiber material treated with sodium hydroxide solution were higher than those of the straw fiber material treated with ordinary water. However, due to the chance nature of the test, it was necessary to carry out multiple comparative tests of the concentrations to arrive at the best concentration values for the high-strength straw fiber material. Because of the late start on straw fiber, it is also necessary to pass a large number of tests to derive the indicators of each performance so that the construction personnel or enterprises know these precise quality data so that they can effectively use the straw fiber material in the actual construction and control the quality of the project.

(2) The variety of straw fiber species, which can be extracted from wheat, hansom, and other crops, and the composition of its constituent parts, makes it difficult to control the economic cost of the project. Although the usual disposal method of waste straw materials is incinerated, the cost of raw material selection can be almost negligible. In practice, the extraction, preparation, transport, aging, and later maintenance of different straw fiber materials have not been further studied and analyzed. If the straw material is used in large quantities in the market, it will also raise the requirements of the purchasing staff and testers because not only do they have to master the nature of these straw fiber materials in a short period, but they also need to establish a new set of rules for the use of straw fiber materials.

(3) Straw fiber materials have only appeared in the construction market in the last decade. In the construction, the previous construction personnel and construction units using straw fiber material have not yet reached proficiency. This may cause certain defects in the project due to the construction personnel being unfamiliar with the application of the material, which may cause operational errors during construction. In the design phase, due to the use of new materials, the personnel concerned also have no way to reasonably control the construction and cannot efficiently utilize these materials in the construction. Therefore, it may lead to the whole construction process being affected to a certain extent, and in serious cases, it may also affect the subsequent construction progress. Each figure should have a brief caption describing it and, if necessary, a key to interpret the various lines and symbols on the figure.

7. Future outlooks
This paper analyses the impact of straw fiber materials on construction projects in terms of quality, cost, and construction, and finds that the research on the three aspects of straw fiber materials is still scattered and at an early stage and that the application of some straw fiber materials is also at an early stage. At present, the application of straw fiber materials and exploration in the construction market is still at the beginning of the stage but also needs to the material from the preparation, procurement, construction, post-maintenance, and other aspects of the whole of a large number of simulations and tests. This paper has drawn some of the limiting conclusions through experimentation and reading a large amount of literature, and it is hoped that the following aspects can be studied and explored in-depth in the future.

(1) In this paper, only the flexural and compressive strength values of wheat straw and hansa straw were analyzed in 4% sodium hydroxide solution and water at room temperature, but not in different concentrations of sodium hydroxide solution, e.g., 5% and 6%. In addition, the experiment also requires a comparative analysis of different qualities of straw fibers and different additions of straw fibers, as different concentrations, different material qualities, and additions have a specific influence on the flexural and compressive strength values of the specimens, so a great deal of research is still required in this area.

(2) The cost impact analysis of straw fiber materials in this paper is only derived from a large amount of literature on the partial impact of many new materials, including straw fiber materials on the cost, for the straw fiber itself the purchase, presentation, transport, preparation, and other aspects have not been investigated in detail in the analysis of data. The cost of using materials as a whole is an integral part of the project management, so detailed analysis is needed in this area to form specific cost data tables.

(3) In the analysis of the impact of straw fiber material construction, as it is the emergence of new materials, its application is still in the early stages, so to the construction, no doubt to the construction
enterprises and personnel have caused certain difficulties. Therefore, in future research, it is also necessary to simulate the application of this material in construction to form a regular construction project and compile a specific straw fiber material construction manual for the use of construction enterprises and personnel.

Conflicts of Interest
The author declares that there is no conflict of interest regarding the publication of this article.

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