

после выключения КУ будет отдавать теплоноситель (горячую воду) постепенно заполняясь охлажденной водой с температурой 25–30 °С (рис. 2).



Рисунок 2 – Передача горячей воды на дальнейшее расстояние

Благодаря КУ, используемым в паре с газовыми турбинами, можно повысить общий КПД вплоть до 90 %. Установка котлов-утилизаторов после ГТУ позволяет увеличить энергетическую эффективность предприятия, снизить выбросы дымовых газов в окружающую среду, а также уменьшить расход топлива.

Список использованных источников

1. Шулепов, Д. С. Пиково-резервный энергетический источник = Peak-backup energy source / Д. С. Шулепов; науч. рук. Т. А. Петровская // Актуальные проблемы энергетики – 2022 [Электронный ресурс]: материалы студенческой научно-технической конференции / сост.: И. Н. Прокопеня, Т. А. Петровская; редкол.: Е. Г. Пономаренко (пред.) [и др.]. – Минск: БНТУ, 2022. – С. 120–122.

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ANALYSIS OF MECHANICAL PROPERTIES OF SHELL AGGREGATE AND REED FIBER REINFORCED CONCRETE

Юй Хаосюань, Ван Сяньпэн, Ковшар С. Н.

Белорусский национальный технический университет

e-mail: kovshar-36@tut.by, wxpxueshu_phd@163.com,

yuhaoxuan2001@gmail.com

Summary. In this paper, the reed fiber added to shell aggregate concrete is analyzed, the effect of adding reed fiber on the strength of concrete under different shell aggregate replacement rates is studied, the method of mechanical property test is adopted, and the bending, compressive and frost resistance experiments are designed, and finally the shell aggregate and reed fiber have good mechanical properties and solidity, and the addition of reed fiber to a certain proportion of shell aggregate can bring considerable social and economic benefits.

With the innovation of science and technology and the overall progress of society, sustainable development plays an increasingly important role in research, and the importance of environmental protection is particularly prominent in this context. In order to protect the environment, we believe that the development of green building materials is essential due to the destruction of a large number of natural resources due to the growing demand for buildings. Therefore, after discussing the existing research, we found that shell aggregate can provide sufficient concrete strength while reducing the exploitation of natural resources, and adding fibers to concrete can improve the strength of concrete, so we carried out the mechanical properties analysis of shell aggregate and reed fiber reinforced concrete.

The properties of shells used for concrete. When replacing the traditional aggregate, the shell strength is higher, and it also has good mechanical properties and firmness, which can withstand the load and stress in the concrete, and ensure the safety and stability of the concrete structure; it has low water absorption and adsorption, and reduces the loss and evaporation of cement slurry; it ensures the workability of concrete, and has a reasonable particle gradation and shape, which can reduce the porosity in the concrete, improve the compactness and strength of the concrete; it has a low alkali activity and harmful substance content, and avoids the reaction with the alkali in the cement, resulting in the cracking of the concrete. In addition, studies have shown that the appropriate proportion of shells instead of fine aggregates can fill the pores of the material, improve the overall compactness, reduce the absorption rate, improve the compressive strength, and improve the workability, strength, and durability of the mortar.

Reed fiber used for the performance of construction. Reed fiber in the application of concrete, as a fiber material to improve cement or lime-based mortar, it can enhance the mechanical properties of concrete, as a reinforced brittle material. A significant advantage is the flexural performance after cracking, in addition, it plays a fundamental role in improving the mechanical properties of composite materials, and the reinforcing materials are distributed in the composites, which have effective sealing and bridging crack capabilities under bending or tensile stress, so the post-crack toughness caused by reed fibers in cement materials may allow the large-scale construction use of such composites.

Experimental process. According to the characteristics of shell and reed fiber, the basic idea of achieving the research goal in this study is to add reed fiber at the addition rate of 1–6 % of the cement mass under the replacement rate of 10 %, 30 % and 50 % shell aggregate, and pour the block on this basis. frost resistance, so as to further discuss the effect of shell aggregate substitution on the mechanical properties of concrete.

Experimental materials. The cement used in this study is R45. The experimental blocks were divided into standard group and reference group, and the material ratio of the standard group was: cement 0.5 kg, water 250 ml, sand 0.6 kg, stone 0.9 kg. On this basis, shells are added to the concrete according to

10 %, 30 %, 50 % and other quality substitute stones, and reed fibers are added to the concrete at the addition rate of 1–6 % of the cement mass, and the cube specimens of 40 mm × 40 mm × 160 mm are formed.

When shell and reed fiber are mixed with shell in a certain proportion, the crack resistance, impact resistance and mechanical properties of the cementitious material system can be improved, and the compressive and flexural strength of the concrete test block are greatly improved. The experiment shows that in the performance test of the specimen, the strength of the block does not decrease at 28 d, and the shell as an aggregate does not cause the reduction of the early strength of the concrete, which not only maintains the advantages of ordinary concrete, but also has the advantages of waste utilization, and will not affect the basic properties of the mortar. The microstructure test results show that the adhesion between the shell and the cement slurry is good, and the irregular shape of the shell significantly improves the distribution of the latter in the cement matrix, which fully shows that the shell is used as a fine aggregate, and even significantly enhances the workability of concrete compared with the traditional aggregate. Therefore, under the premise of reducing the consumption of primary aggregates and environmental protection, the use of shell aggregates does not affect the construction quality, and can significantly reduce the price of building materials. In addition, the flexural capriciousness of reed fiber can well improve the flexural strength of concrete, so the use of shell aggregate and reed can produce considerable social and economic benefits, and well realize the sustainable development of green building as the concept.

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A NEW FLYWHEEL ENERGY STORAGE DEVICE FOR CONVERTING POTENTIAL ENERGY INTO KINETIC ENERGY

李政洋 (Li Zhengyang)

东北大学 (Northeastern University)

e-mail: 1697923587@qq.com

***Summary.** Generally, vehicles with axle structure do not use the gravitational potential energy of people and objects reasonably during transportation, but use the extra energy to make the vehicles operate. The purpose of this project is to study a flywheel energy storage device that converts potential energy into kinetic energy, so as to store gravitational potential energy and convert it into kinetic energy for output on demand, which is widely used in industry, civil transportation, medical rescue and other fields.*

With the rapid development of the times, the problem of insufficient energy supply has appeared all over the world. Under the background of the times, General Secretary Xi Jinping put forward the “double carbon” plan. Under the goal of carbon peaking and carbon neutralization, new energy will grow by leaps and bounds. In addition, the unique advantages of new energy technology