

# Analysis of New Materials Application in Municipal Road Construction

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**Abstract:** In order to promote the development of road traffic in our country, it is necessary to strengthen the research on municipal road construction technology, constantly innovate construction technology and construction technique, and then effectively ensure the rapid development of urban traffic. This paper mainly elaborates on asphalt road surface regeneration technology, modified asphalt concrete, concrete road surface anti-cracking technology, three-dimensional printing technology, composite material road surface, polymer composite materials, etc., to ensure the development of urban transportation and the quality of municipal road projects.

**Keywords:** Road construction; Asphalt; Material

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## 1. Introduction

With the rapid urbanization of our country, the scale and amount of road engineering construction has increased. In order to promote the development of road traffic in our country, it is necessary to strengthen the research on municipal road construction technology, constantly innovate construction technology and construction technique, and then effectively ensure the rapid development of urban traffic. With the application of new materials in municipal road construction, the construction quality has been effectively improved. Urbanization has promoted the development of urban road engineering construction. But in the process, many problems have been discovered in municipal road projects. For example, with the acceleration of urbanization, road projects have gradually increased. However, due to lack of attention, the quality of municipal road projects is poor, and their service life is relatively short. Therefore, in order to ensure the development of urban traffic and the quality of municipal road engineering, it is necessary to strengthen the research and application of new materials for municipal road construction.

## 2. Application value of new materials for municipal road construction

### 2.1. Reducing urban road maintenance costs

The urban road construction project is a major project that requires a lot of manpower and material resources. At the same time, in order to ensure the quality of urban road construction, higher standards have been put forward for construction operations, making the construction of the entire project more difficult <sup>[1]</sup>. Moreover, when building roads, if building materials are not selected properly, it is likely to cause various problems on urban roads, which will in turn lead to an increase in maintenance costs in the later period. In the construction of urban roads, increasing the intensity of new use can ensure the quality of road construction from the root, reduce various accidents caused by material problems, and thus reduce

maintenance costs in the later period.

## **2.2. Reducing the impact on the surrounding environment**

In the construction of urban road projects, due to its construction characteristics, it is bound to cause great disturbance to the surrounding natural environment. In particular, conventional building materials such as conventional asphalt concrete have caused great damage to the surrounding natural environment. At the same time, the process of paving the road is very noisy. Increasing the use of various new asphalt building materials can effectively solve the problems above, reduce the impact on the surrounding natural environment and the consumption of heavy polluting energy such as oil and gasoline, and improve the natural environment around the city, so that the environmental benefits of the city can be reflected to the greatest extent.

## **2.3. Increasing the benefits of urban road construction**

The use of new building materials with excellent characteristics can solve various construction problems in the construction of urban roads, and it can greatly alleviate the workload of urban road engineering, ensure the quality of engineering work, and achieve better results. In the past, the low efficiency of engineering construction had a lot to do with the quality of building materials. Therefore, the use of new building materials can not only solve the problem of urban construction fundamentally, but also carry out technological innovation in urban construction, thereby improving the comprehensive benefits of urban construction.

## **3. Applying new materials and technologies in municipal road construction**

In order to ensure the construction quality of municipal road projects, new materials should be actively applied. For example, new materials such as high-performance asphalt mixture, plastic-stabilized gravel, and foam concrete have been widely used in municipal road construction. However, due to the late start of municipal road construction in our country and the immaturity of related technologies, there are still some problems in the application of new materials. Therefore, relevant enterprises should intensify research on municipal road construction technology to improve the application efficiency of new materials in municipal road construction <sup>[2-4]</sup>.

### **3.1. Asphalt road surface regeneration technology**

Asphalt road surface regeneration technology refers to adding a new surface layer on the asphalt road surface to make it into a road again. However, in the process of asphalt road surface regeneration, it is important to pay attention to the following issues: (1) The old asphalt road surface needs to be crushed, screened, heated, etc. before being paved on the new asphalt mixture to form new asphalt; (2) the control of regeneration temperature and time is very important, because it directly affects the quality of the regenerated road surface; (3) in order to avoid secondary pollution during the regeneration of the old asphalt road surface, it is necessary to protect the original environment and try to use environmentally friendly materials to process recycled asphalt mixture; (4) when overlaying old asphalt road surface, regenerative must be added to the original road surface according to a certain proportion, so that its quality be guaranteed; (5) if the original asphalt road surface needs to be resurfaced, the milling thickness and the amount of old asphalt mixture after milling should be determined according to the actual situation when milling the road surface; (6) when heating the original road surface, in order to improve the temperature and quality of the mixture, a high-temperature heating vehicle or heating furnace can be used. In addition, the equipment and raw materials required in the regeneration technology is costly. Therefore, it is necessary to strengthen the research and application of regeneration technology, and constantly innovate its technological level and

construction technology, so as to effectively ensure the quality of municipal road construction.

### **3.2. Performance of modified asphalt mixture**

Modified asphalt is a commonly used mixed material in road engineering, which can meet the requirements of road engineering and has been widely used in construction sites <sup>[5]</sup>. The anti-rutting performance of the road has also been significantly improved, and its main features are as follows:

(1) It improves the surface characteristics of asphalt

Modified asphalt mainly consists of natural stone and colloidal polymers, which contain a large amount of nitrogen, sulfur, and oxygen elements, which can improve the viscosity and stickiness of asphalt, thereby ensuring the stability of asphalt and achieving better results. In addition, asphaltene has a greater adsorption effect on colloids, which makes it easier to form colloids, thereby significantly improving the bonding strength with aggregates. In short, modified asphalt improves the anti-rutting performance of asphalt concrete.

(2) It has a grid structure and has a restrictive effect on strengthening the road surface

In the preparation of the asphalt mixture, the composition of asphalt mixture preparation can be adjusted accordingly. In addition, under the action of stirring, shearing, etc., the mixture of asphalt and aggregate will be more homogenized in the modified asphalt. After adding modified asphalt into the aggregate, the final form would be in filaments or flats, thus constituting the fiber-reinforced composite material of the composite material. The deformed body of the asphalt road surface additive has the effect of restraining and strengthening when compound is formed. Besides, this mixture has high anti-rutting properties, which is of great significance to road construction and use.

(3) It is stable, durable, and has high anti-rutting ability

High-performance asphalt mixture is a new type of asphalt mixture, which has good stability, durability, anti-rutting ability and is able to withstand high temperatures. In addition, high-performance asphalt mixture has good noise reduction ability and durability, and at the same time, it has good application value in municipal road construction. Some measures need to be taken to further improve the application of high-performance asphalt mixture in municipal road construction. (i) The quality of the raw materials should be improved, and the storage of raw materials should be scientifically managed. Besides, the mixing process of asphalt mixture should also be improved. (ii) The time of asphalt mixture mixing should be properly selected. (iii) Road compaction should be done well to improve the quality of road rolling.

### **3.3. Anti-crack technology of concrete road surfaces**

If the construction of concrete road surface is not up to standard, it will lead to cracks on the road surface, which seriously affects the performance of the road surface. Therefore, it is necessary to strengthen the research on anti-cracking technology of concrete road surface in the construction of municipal roads. Anti-cracking technology for concrete road surfaces mainly include two aspects. Firstly, before the concrete road surface is constructed, it must be thoroughly inspected to ensure that all parameters of the concrete road surface meet the standard requirements. Secondly in order to further improve the construction quality and efficiency of municipal roads, new materials should be applied, especially the comprehensive definition of the application range of new materials. The most commonly used new materials include high-performance rubber asphalt, cement fly ash cementitious material, mineral fiber and carbon fiber. The quality of concrete road surface and crack resistance of concrete road surface can be improved by applying new materials in municipal road engineering. When selecting new materials, various factors must be considered. The impact and ratio of raw materials, the impact of the ratio of raw materials and structure of road on the performance of the road should be fully considered. Secondly, the ratio of materials should be done well-designed in this

process. At the same time, the research and application of municipal road engineering construction technology and construction technique should also be strengthened [6].

### **3.4. 3D printing technology**

Three-dimensional printing technology is a new technology that can realize the free combination and change of materials, making the design of engineering structures more flexible, and has a wide range of applications in municipal road engineering. Different from traditional design methods, 3D printing technology mainly involves creating models through software, optimizing them, and turning them into solid models, and completing the designs according to design drawings. Calculation and analysis are performed using computer software, and the data is processed and corrected accordingly. The model is printed using a 3D printer. The application of 3D printing technology can improve the construction quality and efficiency of the construction of municipal road projects [7,8]. In addition, the application of this technology in municipal road construction can also effectively save raw materials, thereby reducing costs.

### **3.5. Composite road surface**

There are big problems with traditional road surface of urban roads. For example: when the traffic volume is large, the road surface tends to crack, which will not only affect the performance of the road surface, but also cause great traffic safety hazards. In this case, composite road surface can be used. The material belongs to a new type of composite material, which is mainly composed of high-strength fiber and low-modulus cement concrete. Compared to traditional materials, this material not only has better toughness, but also has strong flexural and impact resistance [9]. In addition, this material also has good elasticity. This is mainly because it has good deformation ability and is less prone to cracks. Compared to traditional road surfaces, composite road surface has better performance in terms of structural strength, impact resistance, deformation capacity, and earthquake resistance. This material is also highly feasible in construction. However, since this material is a new type of material, there are still many problems in the actual construction process that need to be further solved. Therefore, to maximize the advantages of composite materials in municipal road construction, it is necessary to further strengthen the research and application of this material.

### **3.6. Polymer composites**

Polymer composites are a new type of composite material made of polymer compound as the matrix with several other compounds added. Polymer composites have many advantages compared to traditional materials. For example, polymer composite materials are not easily affected by external factors during construction; the material loss during construction is small, and the environmental pollution is minor. Polymer composites also have a certain degree of flexibility and can be processed many times. Therefore, the application of polymer composites in municipal road construction helps to improve the quality of the project [10]. With the rapid development of the economy and the advancement of science and technology, the construction of municipal roads is also developing rapidly. In the process of municipal road construction, new materials can effectively improve the quality of roads, thereby providing people with a better, safer, and more comfortable living environment. Municipal road engineering is one of the important infrastructures of urban construction. Through the rational application and innovation of new materials, the quality of municipal road engineering can be effectively improved, thereby effectively improving the level and quality of urban construction.

### **3.7. Plastic-stabilized gravel**

Plastic-stabilized gravel is a new type of composite material, which is formed by adding polymer particles

to the gravel and extruded to form a road surface base with strong bearing capacity, deformation resistance, and aging resistance. Plastic-stabilized gravel is a low-density, high-strength material that can be used in constructions such as urban roads and airport runways. Some enterprises in our country have begun to research and explore related technologies of plastic-stabilized gravel and have achieved great results. The application of plastic-stabilized gravel can improve the strength and stiffness of the road surface and prevent reflective cracks on the road surface. However, since plastic-stabilized gravel is a new type of material, its performance is still lacking compared to traditional materials, so there are some problems in its application. For example: the quality inspection technology of plastic-stabilized gravel is not well-established, and the relevant standards are not uniform enough. Hence, relevant enterprises should continue to explore the construction technology of plastic-stabilized gravel to improve the quality of the project.

### **3.8. Foam concrete**

Foam concrete is a type of lightweight porous concrete with low density, which is made of cement or Portland cement as the main cementitious material, and it is directly foamed by a foaming machine. Compared with ordinary concrete. It is less dense, and has good thermal insulation performance, good frost resistance, and is highly impermeable, so it has been widely used in municipal road construction. However, foam concrete structure itself comes with a few disadvantages such as insufficient pores and it is easily eroded by rainwater. The process of manufacturing foam concrete is simple, it can be easily applied in construction, and it is strong, durable, and can resist corrosion. However, due to the high density of foam concrete, it may affect traffic safety when it is applied in municipal road construction. For this reason, construction personnel should optimize the density of foam concrete according to the actual situation. In addition, it is necessary to do a good job in drainage design to ensure that the drainage system is functional.

### **4. Conclusion**

In conclusion, with the continuous development of social economy, people's living standards continue to improve. In the process of urban construction, municipal road projects are gradually increasing, which can not only make travelling more convenient, but also enhance the image of the city. This means that the construction of municipal road projects is closely related to people's quality of life. Therefore, new materials can be used based on the project to ensure that its quality meets the relevant standards and technical requirements. In addition, new materials must be fully understood, and construction technologies and construction techniques must be constantly innovated.

### **Disclosure statement**

The authors declare no conflict of interest.

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