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Analysis of Mechanical and Technical Measures for Subgrade and Pavement Compaction in Highway Engineering Construction

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Abstract: With the social progress and rapid economic development, the increasing innovation of science and technology, there are more and more road construction and traffic projects. The research and development of science and technology has continuously improved the efficiency and material utilization rate of engineering projects, resulting in many social and economic benefits, which is of great significance for the development of technical measures and the use of machinery. This study discusses the subgrade compaction construction technology, expounds the internal and external factors of subgrade and pavement compaction construction quality, and summarizes the correct methods of compaction construction technology in various ways.

1. Introduction

Road engineering is the focus of national transportation development, which requires not only rigorous construction technology, but also efficient means and high-quality construction results to complete the whole road engineering content. Every link in the construction process needs to be rigorous, so as to realize the long-term service life of the road and the damage degree of long-term use under the condition of ensuring safety, and reduce the later maintenance work.[1]

With the rapid development of China's economy and science and technology, transportation has become the focus of China's infrastructure construction. As one of the three modes of transportation in China's traffic engineering, highway transportation is the driving force of national economic development, and it is also a great power to realize a strong country. Highway transportation should meet the needs of the people and the country. With the rapid development of China's market economy, transportation has become the top priority. As one of the three modes of transportation, the mechanical and technical measures of subgrade and pavement compaction in highway engineering construction can improve the construction quality of the whole highway engineering and make it[2].

In the overall construction process of subgrade, in order to ensure the overall construction quality of highway construction, it is necessary to control and manage industrial equipment and raw

materials in every aspect. In the overall construction process, the compactness of subgrade and pavement will directly endanger the pavement performance, and the safety and comfort of driving can not be met as a whole, resulting in greater security risks. For the whole construction team, it is necessary to control and manage the subgrade compaction of highway engineering projects, use appropriate construction methods and technologies of mechanical facilities, improve the technical level of the overall compaction project, ensure the construction quality of the whole highway construction, and promote the sustainable development of highway projects in China (Figure 1) [3].

Figure 1: China's highway infrastructure.

2. The Importance of Road Subgrade Pavement Compaction Construction Technology

2.1. The Smoothness of Subgrade and Pavement Needs to be Guaranteed

For the whole highway project subgrade compaction, the main problem is whether the subgrade and pavement are uneven, so the actual effect of compaction needs to be guaranteed. If the compaction effect is not ideal, the overall settlement of subgrade and pavement will be caused, which will bring some harm to drivers and drivers and affect their personal safety. In addition, if the overall subgrade of highway construction lacks compaction, it will affect the subsequent road maintenance management. Better compaction construction technology can increase the overall maintenance cost, ensure the overall road traffic safety, and reduce the cost (Figure 2)[4].

Figure 2: Pavement compaction.

2.2. Compaction Strength of Subgrade and Pavement Needs to be Guaranteed

For highway construction projects, in order to save the overall construction cost, fake and inferior raw materials and highway capital construction are used to save the overall construction cost. In this case, the strength of the whole highway subgrade needs to be specified according to the compressive strength, and the pavement can not meet the requirements of the whole bearing capacity. The use of this kind of road can not only improve the damage degree of road subgrade, but also improve the insufficient compressive strength of subgrade and prolong the service life of highway [5].

2.3. The Durability of Subgrade and Pavement Needs to be Guaranteed

An important factor affecting the quality of highway subgrade and pavement is durability, which has a long service life and will affect the later maintenance of the road. Besides, there are many factors affecting the durability of the road, such as the harm of compaction quality, which will cause abnormal conditions of the overall road pavement, which will bring great quality risks to the strength and reliability of the road pavement and the bearing capacity and reliability of the road pavement.

2.4. The Stability of Subgrade and Pavement Needs to be Guaranteed

For the whole subgrade compaction, the whole compaction density is reduced, which increases the porosity of engineering materials. If the road is immersed in rain for a long time, serious pavement damage will occur. When the whole precipitation enters the building materials, the overall compressive capacity and compressive strength of the road will be reduced, and the reliability of the whole road will be improved due to the external load. Therefore, it is necessary to strictly follow the compaction project of highway subgrade pavement to fully improve the quality of the whole highway subgrade.

3. Common Problems in Compaction Construction of Subgrade and Pavement in Highway Engineering

3.1. Subgrade is Damaged

From the analysis of the whole subgrade construction process, it can be seen that the construction quality plays a key role in the whole project process. First of all, the standardized engineering construction is not carried out according to the construction time in the overall construction process, and in addition, a series of subsequent construction operations can not be carried out normally, especially for the application and paving of various building materials, and it is impossible to check the use quality and usage of raw materials with high efficiency and high quality. The most important process is that, In the process of construction, some construction teams don't supervise, control and construct according to the specific needs of the project, which makes the construction quality fail to meet reasonable specifications, makes the quality of the project not guaranteed, and can't help the follow-up operation of road construction, which will cause greater problems[6].

3.2. The Pavement is Uneven

For the design and planning process of the whole subgrade project, the smoothness of the ground must be ensured first, otherwise, vehicles will not be able to run normally on the road, which will lead to the danger of driving safety. During the analysis of the construction stage of highway engineering projects, it will be found that the construction can not be strictly stipulated in accordance with the engineering construction plan, which is the specific reason why the standardization management of industrial equipment cannot be realized and the smoothness is affected at present. Many problems will be caused in the whole vehicle driving process. In addition, if the situation of concrete air entraining agent cannot be guaranteed and it is not arranged according to the specified proportion, it will lead to problems and erosion of its internal structure(Figure 3)[7].

Figure 3: Uneven road surface.

4. The Main Construction Technology of Highway Engineering Subgrade Pavement Compaction

4.1. Rolling Construction

For the technical problems of rolling construction of subgrade compaction project of overall highway engineering, we should focus on the construction standards and dynamic management of surrounding areas, so that the project can better meet the overall project requirements. Therefore, for ultra-heavy machinery and equipment, it is necessary to judge the actual effect according to the current highway engineering capacity, on the other hand, it is necessary to choose according to different machine models, and colleges and universities should judge the technical standards of raw materials. Including the specifications and standards for the use of machines in the field construction stage, it is necessary to judge the overall rolling process according to the traditional standards, and to ensure the quality and specifications of the overall construction according to the process rate and operation sequence of machinery and equipment. In this case, it is necessary to ensure the operation sequence and standardization of machines, and to ensure the rolling time and speed, not too fast or too slow, because this will affect the relative density of the overall building materials, and all kinds should be carried out in strict accordance with the specifications(Figure 4)[8].

Figure 4: Schematic diagram of pavement compaction.

4.2. Compaction Construction

(1) For the overall pavement construction, we need to consider the specific content of the overall construction, formulate relevant construction design schemes for air temperature and natural environment, and keep the thickness of paving at about 20cm. We need to make an overall transformation with reference to the overall construction situation, and use the method of parallel pavement to make the safety factor do a good job in the overall paving construction [9].

(2) According to the overall control measures, the overall flatness of road subgrade pavement can be guaranteed. For compaction construction, the ground is subjected to relatively uniform compressive strength. In addition, the construction subgrade needs to meet higher quality assurance of construction products. For the overall construction, the compaction construction method should be used to carry out the overall construction work, which can effectively improve the content and situation of locomotive skidding [10].

(3) For the whole wet-cold coating, the specific compaction value should be improved in the process of compaction construction. For the case of exceeding, quicklime powder and stream materials should be properly added in the whole process of construction to carry out the whole soil fixation construction.

4.3. Specific Compaction Construction Method

(1) The necessary process in the early stage of construction

In the early stage of construction and compaction, it is necessary to compact the whole subgrade surface and detect the water content of the whole subgrade. The water content is 3% as the overall standard, and the overall water content of subgrade and pavement is not more than 3% as the qualification degree. When the overall water content exceeds the standard, it is necessary to carry out the process of pressure dewatering on the whole and lay limewater on it to keep the whole subgrade dry. In the early stage of continuous construction, it is necessary to ensure that the subgrade will not be lost or collapsed during the whole compaction construction, and its reinforcement needs to be carried out in different ways according to the local actual situation, such as planting flowers and trees [11].

(2) The choice of construction machinery

In the whole construction process of subgrade and pavement compaction, large-scale machinery is the main facility and technical completion demand of construction. In the overall preparation process of construction, it is necessary to ensure the quality of the national laws, regulations and standards for the project and this process can guarantee the overall construction process. Therefore, there are specific requirements for large-scale machinery: (1) Choose machines according to the requirements of national team construction, and carry out construction according to the specified time and specifications, and strictly control their strength and workload. (2) It is necessary to prepare for the construction according to the site. Under the condition of ensuring the quality, it is necessary to abide by several standards of the project, so that the whole construction process can be well improved. For large machinery, it should conform to the overall process and make appropriate machine selection according to the overall environment of the subgrade and the size of the construction site. (3) According to the calculated effective cost, the selection of machinery needs to ensure its high quality, and the speed and content of machinery are in demand (Figure 5) [12].

Figure 5: Schematic diagrams of large instruments.

(3) The specific choice of construction technology

After improving the overall compaction machinery and necessary measures, it is necessary to construct the overall compaction project. The essence of compaction technology is actually the relationship between the length and content of compaction. For its influence according to temperature, it is necessary to consider the necessary relationship between them. The greater the grace, the smaller the length of compaction, so there will be many problems such as compacting wheels in the overall construction process, which can remove the asphalt mixture. Nor can it be on the newly constructed pavement, but in the case of asphalt mixture, the overall improvement and material consideration can be made for the construction personnel to determine the overall compaction length [13].

(4) The overall subgrade and pavement are not compacted

Due to problems such as too fast construction process, the overall compaction work of some roads is not done well, which also leads to the low degree of compaction of subgrade and pavement, which reduces the overall density between the overall asphalt mixture and subgrade materials, thus causing rainwater to enter the subgrade and pavement with cracks in the materials, which will reduce the service life of the road as a whole. In the process of rainwater erosion, due to the pressure of the overall vehicles on the road, it will lead to the collapse of the whole subgrade, make

the whole highway uneven or potholed, and seriously affect the whole construction process and the final service life of the highway.

5. Specific Improvement Measures

5.1. Reasonable Selection of Subgrade and Pavement Compaction Technology

For the overall road pavement compaction, it is necessary to use more scientific compaction technology to ensure the construction quality and content of the overall road engineering. The common compaction technology includes loess subgrade compaction construction technology and sandy soil layer. In the overall compaction process of sandy soil layer, it is necessary to determine the raw materials according to the sandy construction of its pavement subgrade, and also to deal with its moisture absorption device to rationally ensure the soil preparation effect before construction. In order to ensure the construction convenience to the greatest extent, the stability of its construction can be improved and strengthened, so that it can ensure the actual effect of soil to the greatest extent, and the use of pavement and subgrade will become more firm and reliable. In the analysis of the content of building decoration materials, it is necessary to strengthen the reliability of technical standards and ensure the stability of the construction process to a certain extent. For the construction content of loess subgrade, its soil layer is easily affected and changed as a whole. Therefore, the smoothness of the whole pavement is affected, and the situation of continuous sliding and rolling is avoided. In the second rolling process, it is necessary to ensure that the processing frequency is more than 30 times, so as to ensure the relative density of soil to the greatest extent, to achieve the engineering standards of highways in China and to ensure the overall highway construction quality [14].

5.2. The Proportion of Construction Materials needs to be Strictly Controlled

For the application of the overall compaction construction technology of highway subgrade, the content of the overall engineering quality should be determined with the overall mortar. In addition, the content of pavement compaction should be determined, and the proportion of raw materials should be carefully controlled to achieve a certain balanced contrast. In the process of using the experimental mortar ratio, different materials need to be proofread to different degrees to make the overall construction material ratio achieve a certain construction specification [15]. So that each material should be in a suitable range, such as the volume of soil layer needs to be controlled, otherwise it will affect the overall quality and problems of the pavement, which will lead to uneven pavement.

5.3. Scientific Control and Utilization of Mixed Materials

In the overall project, it needs to have a greater impact on the overall temperature and the project, which can effectively improve the compaction and compactness of the pavement and reduce the overall content, so as to improve the quality and quantity. On the contrary, it can have a certain impact on the construction [16]. The temperature of the mixture also needs to be maintained to a certain extent. For the road surface rolling that cannot be eliminated, the construction process should be strictly supervised, and it needs to be rolled immediately after the paving to ensure that the mixture reaches the actual mixing value.

5.4. Test the Compaction Quality of Highway Subgrade and Pavement

The most common detection methods for compacted pavement are sand filling method and nuclear density detection method. The former has good experimental effect, while the latter has excellent detection effect. In the case of 20cm thick pavement compaction, transmission method can be used. The common detection methods of compacted pavement quality detection are nuclear densitometer method and sand filling. Densitometer method has a good practical effect in pavement asphalt mixture detection. However, the equipment and instruments should be turned off immediately after the detection and accurate measurement, and their safety should be ensured. Among several methods, sand filling method can test the compactness of pavement to a certain extent and change the principle, so that the symmetrical sand can be in a free falling stage and high content, which has a rational content problem in the process of testing the compaction quality of highway pavement.

6. Summary

According to the above research, it is shown that the development of overall construction will affect the service life of the overall highway. The research on highway engineering projects and subgrade technology has been established, and the integration of construction technology and methods have been explored, so that the overall highway project can be guaranteed, so as to achieve the standardized standards of construction and ensure the construction quality of the overall highway construction.

The most critical process of highway engineering should be the compaction of pavement subgrade, and its overall construction quality will affect the construction quality of the whole project. For the compaction process of highway, three stages need to be integrated. First, before construction, construction process and construction results, the overall water content of subgrade and pavement should be tested to ensure that the water content of subgrade and pavement does not exceed 3% of the whole, and then compaction machinery can be selected. According to the provisions of the state and the specific content and situation of the project results, the relevant content is tested, and the actual situation is finally adjusted. After the construction, relevant methods are used to test and test the durability of the compacted pavement.

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