The Technology of Double Deck Paving of Asphalt Pavement

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ABSTRACT: In recent years, with the development of building construction, highway construction has gradually attracted people's attention. In the highway construction, the asphalt surface is a crucial part of the construction, the construction technology of high and low quality of the whole project has largely influence. Conduct a comprehensive analysis by the process of the construction of the double-paving asphalt pavement construction for reference.

1 INTRODUCTION

Double deck paving pavement construction field is a revolutionary technology innovations, its characteristic is abrasion of adhesive layer and the layer 2 asphalt paving at the same time. Roller can be up and down 2 layer asphalt compaction operations at the same time. Double deck paving technology makes the compaction and paving equipment don't have to through from the adhesive layer, the adhesive layer of the lowest deformation. Abrasion and adhesive layer and the depth of the asphalt layer together, equipment for asphalt layer 2 and at the same time doing moderate compaction. Compared with the traditional paving process of asphalt pavement, double deck paving technique has the following advantages : (1) to reduce the energy consumption in the production process of mixture and emissions; (2) improve the service life. (3) Highway maintenance and overhaul costs greatly reduced; (4) to reduce the construction cost; (5) save materials; (6) reduce because of the weather reason influence on construction, etc.

2 DOUBLE DECK PAVING APPLICATIONS AT HOME AND ABROAD

Since 1995, small-scale experiment was carried out by double deck paving technology. In 1997, the special double layer asphalt concrete paver is born and practical engineering applications, up to now, Europe Sweden, the Netherlands, Germany, to master the mature technology of double deck paving.
Since 2005, double deck paving equipment manufacturers will start the process is introduced to China, get a lot of highway engineering and technical personnel. Double deck paving technology is introduced into our country, the application of mature experience, also need to do some basic research in the following aspects, for the application of double deck paving technology deeper flow: One is for the application of the double deck paving pavement construction in low temperature environment, grasp the different layer thickness of the minimum construction environment temperature, and pressure under the condition of low temperature on asphalt concrete paving implementation work technical requirement, construction organization and management methods, as well as the method of quality control, etc.; Layer on the pavement structure design optimization study of the application of test, under the double deck paving surface layer of different thickness of pavement performance, durability, differences, and to optimize the thickness of surface layer.

3 CONSTRUCTION MACHINERY EQUIPMENT AND KEY CONSTRUCTION TECHNOLOGY

Combined with a double deck paving construction project, the construction control of the double deck is paving engineering analysis and research. The project of highway widening transformation, construction around the time the highest temperature of 12 °C, half width of the highway is 14 m, use two sets of mechanical step paving.

3.1 Crushing equipment selection

Double deck paving of the mixture compaction equipment recommended as shown in table 1.

<table>
<thead>
<tr>
<th>The name of the machine</th>
<th>specifications and models</th>
<th>Quantity/Taiwan</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMPACTORS</td>
<td>LSS220</td>
<td>2</td>
</tr>
<tr>
<td>COMPACTORS</td>
<td>Cuhk DT1600</td>
<td>1</td>
</tr>
<tr>
<td>TIRE ROLLER</td>
<td>XP261</td>
<td>1</td>
</tr>
<tr>
<td>ROAD SPRINKLER</td>
<td>WSISA</td>
<td>1</td>
</tr>
</tbody>
</table>

3.2 Mixture mixing coordination

For the double deck paving construction technology of pavement, it is proposed according to the characteristics of the double deck paving technology, can be on the upper and lower two layers of thickness, gradation optimization adjustment. Asphalt concrete pavement structure layer thicker, the dosage of the mixture, mixing station feeding in need of two or more, shall be
obliged to the production of hot mix asphalt mixture sampling test the various performance indicators, to ensure the consistency. Its requirements and differences between control values are as follows: brand, type, asphalt content is the same; The same type of mineral aggregate; Additive type, the same number; Marshall hammer test specimen of the difference of void fraction, the maximum of no more than 0.5% (volume); Difference between the filler content, maximum of no more than 0.5% (mass); Difference between the total sand content, the maximum of no more than 1% (mass); Particle size of the total amount of more than 2 mm aggregate differences, most no more than 1.5% (mass).

3.3 Transportation equipment

Structure and working process of the double paver as shown in figure 1, figure 2. Each two paver itself has two separate feed, spraying, preloading systems and a share of walking system, able to two layers of the asphalt mixture paving on the bottom layer in turn. Its basic module is actually an improved, enhancing the carrying capacity of the paver walking system, the basic module and an ordinary paver form system used alone. When the double deck paving operations, will be required to have a broaden module. Broaden the module contains a hopper, two feeding screw feeder, and another screw feeder and the second set of iron tablets. The module has its own power supply system, in addition is also equipped with two wheels, can fall in the assembly when screed to support role. When using the paver back into broaden the module and lock.

![Figure 1. With 3 f300cs Am300 module after double layer asphalt paver.](image1)

![Figure 2. Double paver construction.](image2)

4 THE WORKING PRINCIPLE OF DOUBLE DECK PAVING TECHNOLOGY

4.1 Improve the compaction degree of asphalt mixture

Double deck paving of asphalt mixture compaction work principle is by improving the paving layer thickness, slowing down mixture temperature reducing process, and raise the temperature of asphalt mixture pressure in real time and the degree of compaction of the road, especially the
surface layer, so as to improve the ability to resist deformation of asphalt concrete pavement, durability and compactness, waterproof performance.

Experiment shows that the temperature of the asphalt mixture has a great influence on the density and porosity. Thickness of asphalt layer affect the cooling speed of mixture, the thinner with a thick layer of mixture, the faster the temperature drops. Research shows that: the thickness of asphalt layer is inversely proportional to the temperature decrease speed, its coefficient is 1.8. This means that if the layer thickness increased from the original 2 times, under the condition of the environment temperature has not changed, the cooling time increased to 3.5 times. So double deck paving can prolong the time of cooling to effective resistance to low temperature environment and the influence of the bad weather, ensure that there is enough time to rolling, the surface abrasion fully compacted layer.

4.2 Improve the combination between the layers

In traditional pavement structure, only by oil spill glued layer between layer and layer to guarantee bond, effect is not ideal. Double deck paving technology to improve the working principle of asphalt mixture layer combination between up and down as follows: through "the hot" paving, "soft on soft" paving, between the two layer of asphalt mixture aggregate can be embedded into each other, the binder asphalt material to mutual confluence, thus effectively improve the combination between different asphalt mixture layer.

4.3 Optimization of pavement structure

Double deck paving construction in economy and technology has remarkable superiority. On the economy, on the one hand, double deck paving technique improves the efficiency of asphalt concrete pavement construction; On the other hand, reduced the asphalt mixture paving compaction machinery machine-team and people with the use of material and adhesive layer oil and clean up the lower, sprinkle the cloth glued layer construction costs, effective use of waste heat for the bottom of the asphalt mixture, reduce the engineering investment.

5 THE ADVANTAGES AND DISADVANTAGES OF DOUBLE DECK PAVING

5.1 Compaction effect

The double deck paving the influence of deformation layer reduced by 4 cm to 2 cm and above, the surface of a high degree, make the deformation stability of pavement correspondingly increase (50 ~ 70%).Good rolling received small voids, so water (peeling) and air (aging) the negative impact of greatly reduced. Due to two layer is paved with the construction time is
greatly reduced, so as to shorten the construction period, to speed up the construction schedule, improve the service life of road.

5.2 Economy

About the double deck asphalt mixture paving of asphalt mixture and usually middle and below the surface of economical comparison experiments between the data (see table 2):

Table 2. Double deck asphalt mixture paving of asphalt mixture and usually economical comparison between the middle and the surface.

<table>
<thead>
<tr>
<th></th>
<th>Epoxy resin asphalt mixture</th>
<th>middle course</th>
<th>surface</th>
<th>Usually asphalt mixture (SMA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pay cost (RMB/hour)</td>
<td>765.40</td>
<td>365.50</td>
<td>365.50</td>
<td></td>
</tr>
<tr>
<td>Equipment cost (RMB/hour)</td>
<td>784.50</td>
<td>285.90</td>
<td>313.00</td>
<td></td>
</tr>
<tr>
<td>Operating materials (Yuan/hour)</td>
<td>115.80</td>
<td>53.30</td>
<td>55.80</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>1665.70</td>
<td>704.70</td>
<td>734.30</td>
<td></td>
</tr>
<tr>
<td>Efficiency (m²/h)</td>
<td>2000.00</td>
<td>1800.00</td>
<td>1500.00</td>
<td></td>
</tr>
<tr>
<td>Paving cost (Yuan/m²)</td>
<td>0.83</td>
<td>0.39</td>
<td>0.49</td>
<td></td>
</tr>
<tr>
<td>Material cost + spray asphalt (Yuan/m²)</td>
<td>14.45+2.99</td>
<td>11.56</td>
<td>5.98</td>
<td></td>
</tr>
<tr>
<td>Product standards (Yuan/m²)</td>
<td>18.27</td>
<td>-</td>
<td>18.57</td>
<td></td>
</tr>
</tbody>
</table>

If often paving layer (4 cm thick) service life for 12 years, so the dual function of asphalt mixture using for 2 times, namely, 24 years of life started a save in the new period. In Dresden university used data, save the cost of the following: leveling, carry away waste, cleaning, construction site safety facilities: 2.50 Yuan/m²; spraying emulsified asphalt: 0.15 Yuan/m²; 4 cmsma: 5.98 Yuan/m²; Placement: 0.49 Yuan/m²; Company cost saving: 9.12 Yuan/m².

6 CONCLUSION

This article through studies and combined with engineering practice the following main conclusions:

(1) Double deck paving technology of the engineering construction period can be significantly shortened, and good construction effect is better, that to effectively reduce the labor intensity and save equipment affecting get etc.

(2) The application of the double deck paving technology can effectively improve the interlayer bonding condition, optimize the structure of pavement, and reduce construction
cost. So, in the adoption of double deck paving process for construction of highway asphalt inside, must to analyze the actual construction condition and corresponding steps for accurate processing, installation in the double deck paving technology improved the construction technology of improving efficiency of construction projects at the same time.

REFERENCES


