Based on the Technical Transformation of Bridge Engineering Machinery and Equipment

Haichao Li

Shanghai Interlink Road &Bridge Engineering Co., Ltd, Shanghai, 200000, China

Email: 472609100@qq.com

Keywords: Bridge Engineering; Equipment; Technology; Transform

Abstract: In bridge engineering construction, bridge engineering machinery and equipment are important facilities. The level of bridge construction technology is directly related to the number of mechanical equipment and the process technology used. The large-scale development of bridge engineering construction has higher requirements for construction. In order to ensure the smooth progress of construction, it is necessary to upgrade the technology of bridge machinery and equipment, implement necessary transformations, and improve the efficiency of the use of machinery and equipment. This thesis focuses on the problems of technical transformation of bridge engineering machinery and equipment.

Introduction

China's economic development has continued to accelerate, its industrial structure has been upgraded, and its development model has been adjusted accordingly. The level of production and the degree of development of the enterprise, the level of technology played a decisive role. Mechanical equipment is indispensable in the bridge engineering process. The technical level, energy consumption, and processing efficiency have played a decisive role in the use of mechanical equipment and are directly related to the comprehensive competitiveness of the construction enterprise [1]. To adapt to the market environment and improve competitiveness, enterprises must ensure the high quality of machinery and equipment, and implement the necessary technical transformation based on the actual needs of the project, which can also play a role in promoting the development of the enterprise.

1. Basic introduction to the project

Someone is building a bridge over the tunnel, and the design radius of the bridge is 6315 mm. In order to reduce the difficulty of construction, the design of the tunnel radius was changed to 6421 mm. Judging from the layout of the bridge construction site, the equipment transported during the construction process needs to pass through 9 tunnels, and the complexity of the working conditions is very high. In this work, if the traditional separated frame transport method is adopted, when the equipment is transported to the bridge level, it cannot pass through the tunnel girder, and the beam transport vehicle cannot pass through the tunnel, which has become a technical problem in construction. In the face of this situation, it is necessary to carry out technical transformation on the 900-ton split rack transport equipment.

2. Equipment technology transformation plan

After a feasibility analysis of the equipment transformation plan, a decision was made and the transformation of the 900t split rack transport equipment was implemented in accordance with the displacement platform type tunnel tunnel rack transport integrated machine. By applying this transformation method, the host can take the beam from the beam feeding platform by itself, without manual operation. The displacement platform is arranged at the tail of the guide beam, and the height of the displacement platform can be adjusted to adjust the track surface on the tail of the

guide beam relative to the bridge. The height of the platform has been erected on the bridge deck [2]. When the main engine is operated, it will not be limited by the space of the inner wall of the tunnel. As long as the roadbed is flat and the bridge interface is not uneven, the driver has skilled driving skills. When it is in no-load operation, the speed can reach 7 Kilometers, and the heavy-duty transportation speed is 5 kilometers per hour. The technical transformation of the award-winning equipment not only guarantees construction safety, but also improves construction efficiency. Judging from the main structure of the equipment, it mainly includes power units, hydraulic systems, electrical control devices, running systems, displacement platform devices, and outrigger devices.

3. The Technical transformation measures for bridge engineering machinery and equipment

3.1. Make full use of the hydraulic system

In order for the 900-ton tunneling and transporting all-in-one machine to function better, it is necessary to implement technical transformation. Specific work requires 116 hydraulic cylinders, including 32wheel steering cylinders. The 16 steering cylinders of the original transport beam wheel group are fully utilized, and 16 new steering cylinders are in use. The 32wheel set buffer cylinders are all the original transport beam wheel sets and do not need to be replaced with new ones. Eight 900 steering support cylinders, half of which are the support cylinders of the original bridge crane, and the remaining parking support cylinders of the beam carrier are newly installed. There are a total of two lifting cylinders with variable span adjustment cylinders. This is not enough, and new cylinders need to be added as needed. The eight lifting point devices laterally adjust the oil cylinders. They all retain the four lifting beam trolleys on the original bridge crane to adjust the horizontal oil cylinders. Four new oil cylinders are also added as needed. The lifting point device moves longitudinally to make adjustments to 4 oil cylinders. A trolley suspended in front of the original bridge crane is used to laterally adjust the oil cylinders, and then 3 new oil cylinders are added. The fixed legs at the back of the beam guide machine are newly supplemented with 2 flip cylinders and 2 support cylinders. The front rollers of the beam guide machine retain the original 2 cylinders and make up for the 2 cylinders. It is not enough to retain the original cylinders of the front leg roller legs of the guide beam machine. It also needs 4 new support cylinders. The front nose bridge of the guide beam machine adds 2 new flip cylinders on the basis of retaining the original cylinders. In addition to retaining the original cylinders, the two cylinders of the nosepiece spreader of the two beam guides need to be replenished with new oil. The six cylinders of the beam guide platform of the beam guides need to be replaced with new oil cylinders. 55 new cylinders need to be added. When it is necessary to pay attention, the hydraulic hose of the oil cylinder cannot be replaced with the original one, but the hose must be replaced with a new one, and the joint must be replaced with a new one to ensure the safe use of the oil cylinder [3].

There were a total of 64 oil cylinders on the original transport equipment. After technical transformation, there were 4 auxiliary guide beam support cylinders, only 2 support cylinders for the front outriggers of the bridge crane, and 1 suspension cylinder for the crane of the bridge crane. There are 7 cylinders that have not been fully utilized and cannot be used in new equipment.

3.2. Technical transformation of equipment transmission part and technical transformation of lifting part

The newly rebuilt integrated frame transport machine has retained the original 4 winches. The original bridge machine is used, and the motors of the 4 bridge winches of the original bridge machine are 32 kilowatts. With the original reducer, these devices can play the winch drive. effect. The bearings on the pulley cannot be replaced with new ones, and all seals must be replaced with new ones. The steel wheels installed on the original transport equipment will be severely worn during long-term continuous use, the support force is slightly insufficient, and the tread size does not meet the relevant regulations, so it cannot be used [4].

3.3. Structural transformation of equipment

1. Problems existing in the technical transformation of the equipment department

The technical transformation of the integrated beam and beam machine is adopted, and high-strength steels such as Q460 and Q690 are better for the main stressed parts. The original equipment is Q345C / D as the main steel. If the original steel structure is still selected in this technical change, the rigidity of the original main beam needs to be increased, the strength of the main beam also needs to be increased, and the section of the equipment box beam needs to be increased, especially the section of the guide beam. Increase, this requires the equipment to be smaller in size after technical transformation, which is inconsistent with the original design intention, so it cannot be used. If the fatigue stress of steel is not equal to the new steel on the steel structure, the following problems will occur.

The first, it is difficult to control welding quality.

The second, stress will be generated after the new steel and old steel are welded together. If there is a problem of mismatch, the life of the main beam will be shortened, and its safety performance cannot be guaranteed.

The third, the manufacturing process is very complicated, and it has high process and technical difficulties. It requires a lot of capital in the technical transformation, which is not low compared with the new manufacturing, and the transformation process is cumbersome.

The equipment's own weight increases, it has higher technical requirements for equipment overload, and fuel consumption increases.

The equipment is very high, the center of gravity is relatively high during the process of lifting the beam, and its stability is difficult to guarantee [5].

2. Advantages of technical transformation of equipment

Given that returning the original equipment to the manufacturer also requires disassembly, loading, and transportation, all of which require a certain amount of capital. If the original rack transport equipment is changed and the material of the main steel structure is replaced, the original performance of the equipment can be restored even if it is not necessary to cross the tunnel and bridge, and the erection work can be restored in a short time, which is not only fast. , And high security and reliability, and the cost is relatively low. The advantages of adopting this technological transformation scheme are as follows.

First, the main structure of the equipment is technically modified to improve safety and reliability.

Second, the power system is retained, and the cost of fuel consumption will not be significant.

Thirdly, the beams passing through the tunnel can be successfully implemented to ensure the construction progress.

Fourthly, the beam is erected in the case of negative distance from the tunnel entrance, or in the case of zero distance.

Fifth, erection of double-line well beams.

Sixth, when a small curved bridge is erected, a 1500-meter curved beam is also erected.

Seventh, the two-way beam can be achieved without turning the host. The guide beam can be turned 180 degrees on the erected beam surface, and it can be turned 180 degrees on the open roadbed.

Eighth, this kind of transformation technology can be adopted by the construction workers in mountainous areas. If it is necessary to repeatedly turn around, or in the construction environment with high frequency of changing direction, this transformation technology can also be adopted.

Ninth, the equipment has high safety and stability after technical transformation. The construction is carried out across the existing line. During the construction, the normal use of the tunnel under the bridge will not be greatly affected. [6]

Tenth, when a bridge is erected, many high-altitude operators are not required to participate, thus ensuring construction safety.

In the process of transforming the structure of the equipment, it is necessary to fully consider the actual needs and compare the performance with the original equipment structure. It is found that the equipment after technical transformation has many advantages and ensures the smooth construction.

Accelerate construction progress. The steel structure of this kind of integrated rack transporter requires less capital than the steel structure of the old equipment, and the performance is optimized, the equipment is safe, and the life is extended.

Conclusion

From the above research, it is clear that in a fiercely competitive environment, and in order for the bridge engineering construction units to continue to develop steadily, they need to strengthen the technical transformation of their equipment. Establishing a modern concept and implementing technological transformation of machinery and equipment will not only help improve the performance of machinery and equipment, but also increase the competitiveness of enterprises.

References

[1] Zhang Peng. Application and Management of Mechanical Equipment in Bridge Engineering [J]. Pearl River Water Transport, 2018 (11): 21-22.

[2] Li Chunlin. Discussion on Life Cycle Management Strategy in Road and Bridge Construction Machinery Equipment Management [J]. Sichuan Cement, 2019 (02): 61-61.

[3] Li Jiachun. Innovation and Development of Road and Bridge Engineering Technology [J]. Building Materials and Decoration, 2018 (14): 58-59.

[4] Pang Yi. Discussion on Strengthening Road and Bridge Construction Technology to Ensure Construction Quality [J]. Enterprise Technology and Development, 2019 (05): 165-166.

[5] Liu Chen. How to Improve the Performance Guarantee of Bridge Machinery and Equipment [J]. Science & Technology Information, 2018 (02): 94-94.

[6] Zhang Lianglong. Correlation analysis on how to improve the performance of bridge machinery and equipment [J]. Jiangxi Building Materials, 2017 (08): 207-208.