Local pressure water jet cutting concrete technology on the local expressway

Application of reconstruction and extension construction
Hu Xin, Fan Wen Month
( Zhong Jian Luqiao Group Co., Ltd., Hebei Shijiazhuang 050011

Abstract: The construction of crushing treatment of concrete structures in expressway reconstruction and extension Project, focuses on the mechanism and characteristics of high-pressure water jet, apply on site Research on the crushing parameters of high pressure water jet the, The economic benefit is analyzed with the example of engineering application.

Keywords: High Pressure water jet; action mechanism; Water cut device; Crushing Parameters

Introduction
In recent years, as traffic continues to increase, Road Cement pavement disease Increase, Road Extension Works more and more, for road cement pavement maintenance repairs, Bridge widening construction Engineering technology and quality requirements also more and more higher. High pressure water jet breaking concrete construction process with small vibration, no powder dust, High efficiency, has advantages over existing structures such as no damage, Consolidation in Road and Bridge The project is widely applied.

This item is located in Shijiazhuang to Ci County (ji yu boundary ) Road reconstruction Project K99 superscript, Large-scale application of high-pressure water jet in the construction of old bridges Concrete construction process, On the basis of an in-depth study of the principles of technology and equipment, on site actual application, System Analysis technical parameters and control points subscript, The summary obtains some research results and construction experience.

1. Research Overview at home and abroad
In century era, advanced countries in Europe and America have been in the concrete structure of the repairs, Universal application of high-pressure waterjet technology in the renovation project. In repair, change Build works, Cement Concrete Pavement, Highway bridge deck and pier large exposed concrete bodies need to clear the surface concrete and expose the steel bars, for re-pouring. With vibrating hammer, pneumatic picks, Traditional methods such as sandblasting remove the bar between the the concrete, will not only damage the rebar, and is likely to vibrate out of the frequently now new crack. With increasing social labor
costs, and also to ensure construction efficiency and quality, replacing traditional crafts with advanced construction technology has become an inevitable trend. So high pressure water jet break concrete construction work The market is very broad [1].

2. action mechanism

to pass water at atmospheric pressure through a high-pressure water generator (Supercharger or High Pressure plunger pump) form High Voltage, through control system, Last Special spray mouth-jet energy height set, very fast flow. This flow is called High Pressure water jet [2]. high pressure water jet cutting concrete, is to convert pressure energy to to kinetic energy, when high-speed high-pressure water jet impacts cut material, kinetic energy. The again becomes the pressure that acts on the surface of the material, When the pressure energy is greater than the coagulation Tension between soils, Concrete will be torn and broken, at the same time, high-pressure water. The crushing effect of the jet on the material is mainly the impact of the water jet on the particles and the water wedge. with interaction between particles and the wall, because for rebar (bind wire Evenly solid material, Water cannot break through steel and binding wire * surface, so high-pressure water jets do not damage the steel bars (bind Wire).

3. Cutting Devices

in Shijiazhuang to Ci County (jiyu boundary) Road reconstruction Project KJ 9 label Section Zhang River Bridge stitching construction, Applying high-pressure waterjet cutting concrete technology „Cutting Flange slab concrete mechanical Equipment "R 0 bot " 365 " robot The high-pressure pump system uses the supercharger mode. that is, its high-pressure water formation by the oil pressure system low pressure oil push big piston reciprocating move, Its direction is automatically controlled by a reversing valve system. Water purification First and adding antirust additive, then press the feed pump out of the low-pressure water from the one-way valve into the high-pressure cylinder, Booster To get high-pressure water. The actuator is the direct mechanism for cutting jobs, Road break The effect of the shredding depends on the actual performance of the organization [3].

4. Break parameter Analysis

The main technological parameters for high pressure waterjet cutting concrete are: Water Pressure, water flow, Nozzle structure Parameters (inner diameter, Long path ratio, materials and shapes, target distance, stroke, Impact Angle, relative to move speed and to cut concrete thick degrees. where, the jet pressure and jet flow have a direct effect on the water jet Strike Force affect, The relationship between jet target distance and waterjet Strike Force is important, This topic We will study the high-pressure water jet from these two aspects.

4.1. relationship between jet pressure and jet flow and water jet Strike Force

parameter selection of high-pressure waterjet directly affects the performance of the device (Water jet Strike Force), Analysis of significantly affected parameters [4].

4.1.1. effect of jet pressure change on water jet Strike Force

Water pressure determines jet velocity and erosion kinetic energy, continuously pressurized water jet to hit strike all increases, cutting ability is enhanced. as shown 1flow amount to 7 ol/min relationship between jet pressure and water jet strike Force when, in ~ MPa The relationship between jet pressure and water jet Strike Force in the range of is more than steep, and % ~ MPa Scope of the jet pressure and water jet strike force of the close The curve is significantly smoother than many. so that, when traffic is certain, with pressure increase of Force, Water jet strike force increases gradually decrease, so cut The increase in capacity of the decreases as well..

4.1.2. effect of jet flow change on water jet Strike Force

in our country, pressure ranges for high-pressure waterjet equipment operations are generally in MPa around, So this article selects MPa The pressure to conduct a research analysis. Generally speaking, more water flow, total power greater, cutting efficiency higher. from Chart 2 with water pressure " MPa The relationship between the jet flow
and the water jet Strike Force Show, Traffic in Ten ~ l/min scope of the jet flow and water jet strike force of the relationship curve significantly steeper, and ~ l/min range of jet flow with water. The relationship curve of the jet strike force drops abruptly and continues to smooth. from the, When water pressure is timed, with traffic increasing, The increase of the water jet Strike Force degrees decrease, therefore, the increase in cutting capacity also decreases.

4.2. The relationship between jet target distance and water jet Strike Force

The jet target is the distance from the nozzle port to the cleaning surface by the water jet, The IS generally determined by measurement, water jet to liquid cone, with nozzle distance Increase, Its scatter radius becomes larger. nozzle diameter confirmed, water jet target distance is the only variable that affects the change in the Jet coverage area [5]. for different jobs like and hydraulic parameters, The corresponds to a different optimal target distance. This article studies when The fire when water pressure and flow are certain, The relationship between jet target distance and water jet Strike Force,

from Diagram 3 Know, increases with target distance, water jet Strike Force decreasing small. So, site construction needs to be tested in several groups according to actual conditions targeting and coverage, Relationship between Strike Force and job time, to determine that break the optimal target distance of the job surface, Clean more jobs in the shortest time Face, Increase construction efficiency.

5. Benefit Analysis

To break the long m, Wide cm, Thick cm example of the deck of the: high-pressure water The comprehensive economic benefits of the two processes of jet cutting concrete and planting bar For example table 1.

finds by contrast, Although high pressure water jet is invested at a single more than large, But the cost of the construction of the relative artificial crushing and reinforcement treatment significantly reduced low. Comprehensive promotion of concrete construction technology with high pressure waterjet, this process will become more and more mature, single construction cost will gradually decrease.

6. Epilogue

The high-pressure water jet is fully compatible with our current pursuit of high efficiency, Green, Section can, low -consumption concept, has significant economic and social benefits, with our country vigorously promotes the development of infrastructure projects, especially in the rebuilding project Modification and utilization of existing reinforced concrete structures in, high-pressure water jet The flow cut concrete construction technology will completely replace the traditional construction method, This entry Technology is highly competitive, wide application Outlook, on further deep After the research and improvement of technology will have a limitless value of the promotion of.

References:

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