To Sound Informatization Engine
**Viewpoint**
To Sound Informatization Engine …… 2

**Footprint**
Solidify Port Machinery Fortress for Russia …… 3
Zhanjiang Port Development History …… 6

**Cover Story**
Establish New Type Data Center …… 10
Management Informatization–Based Boosters Company Soar …… 12
Advance Management Informatization of Wharf Equipment …… 16
Establishing “Files” for Steel Bridge Weld Joint …… 14

**Innovation**
Reduces Weight for Netherlands Crane …… 18
“No Martensitic Lath” Assembly …… 20

**Market**
A Race against Time …… 22
Port of Long Beach will Receive ZPMC Crane …… 24
Chasing Wind at Sea …… 26
“Ergate” at Wharf …… 28

**People in ZPMC**
“Arlen” Never Stops Innovation …… 30
Sing out Song of Youth …… 32
Solidify Port Machinery Fortress for Russia

By Jiao Xu

There is no denying that Russia is the largest country in the world, it stretches across European and Asian continents, and has abundant natural resources and unique local manners and feelings; we can’t help having a strong longing for Russia just for its reputation of “son of ocean”. Russia faces Pacific Ocean on its east, connects with Finish Gulf of Baltic Sea, its coastline can reach 33,807 kilometers, and many ports in Russia including Alexandrovsk, Vostochny, Vladivostok and Saint Petersburg enjoy great prestige in the world and play important roles in world shipping history.

Sincerity: Thousands of Miles

Novoroslesex is an important port city at northeast bank of Black Sea in Russia. This port city has become an important fortress in the early nineteenth century, is the largest petroleum delivery port which can berth 85,000-ton oil tanker, and acts as important energy hub in Europe.

To Sound Informatization Engine

In fierce competition at “age of big data”, informatization is the key to succeed. In past 21 years, ZPMC has accomplished outstanding achievements in global port machinery market depending on its scientific and technical advantage and talent advantage. Informatization has become an irreversible trend of the world under the new situation. To sound informatization engine will promote smooth, stable, continuous and healthy development of ZPMC.

Informatization is a double-edged sword, and digital gap will become watershed of advantages and disadvantages of enterprises in informatization age. However, informatization will be the booster of enterprise development if it can be utilized appropriately and fully. All enterprises share equal opportunity in front of information resources, which provides a great opportunity for development.

Information construction is an important support for promoting company management. At present, ZPMC has established application system which covers its core business, established system module for production, purchase, product service, office automation and finance, and promoted overall operating efficiency of the company. ZPMC should take the initiative to engage in informatization wave, push forward its information construction, eliminate “information isolated island” within the enterprise, form information resources sharing and provide convenient and smooth environment for information construction. Utilize informatization to improve management level and intelligent decision-making to provide scientific basis.

Information construction is essential for ZPMC to conduct internationalized business operation. Information technology is changing with each passing day, so enterprise should adjust mode of business operation continuously. ZPMC should advance information construction level, accelerate handling and application of information, establish effective and quick response system and provide competitive advantage in time for internationalized business operation. At the same time, it is necessary for ZPMC to utilize global resources, optimize configuration, improve development level, change development mode and pave the way for internationalized business operation.

Information construction is a solid foundation for building digital ZPMC and promoting development level. Possession, application and management of information technology determine enterprise development quality. During company development process, replacing artificiality with informatization and experience with intelligence, and establishing strategic decision-making on abundant information resources and scientific information analysis will improve contribution rate of informatization to company development continuously and lay foundation for construction of digital ZPMC. 
It may be said that distance between Novoroslesex and Shanghai in China is thousands of miles. One day in the second half of 2005, Management Department of ZPMC received an e-mail from Novoroslesex port. The mail expressed that Novoroslesex port plans to update port facilities and intended to cooperate with ZPMC. After frequent mail exchange and communication, representatives from Novoroslesex port arrived in Shanghai and visited Changxing base of ZPMC at the beginning of 2006. This business trip to Vladivostok in Russia was also known as “Musical tour” because ZPMC sent representatives to go to Black Sea headed for Vladivostok instead of going back to Shanghai in the same year.

Vladivostok is also known as Haishenwei (in Chinese) which is the largest port and largest trading port in Russian Far East; and annual throughput of the port can reach approximately 10 million tons. ZPMC subtly realized potential market in Vladivostok and turned this opportunity into business success.

Cooperation: Clear up Concerns

In 2006, Novoroslesex port invited tenders for two quayside container gantry cranes, one rail mounted gantry crane and two rubber-tyred gantry cranes, offer made by ZPMC was lower than that of international market which made Novoroslesex customers tempted as ZPMC machinery product manufactured by ZPMC brought new life to ancient ports in Russia.

Test: Forty Degrees below Zero

After accomplishing task to sign contract with Novoroslesex port, representatives of ZPMC who went thousands of miles to Black Sea headed for Vladivostok instead of going back to Shanghai in the same year.

In 2008, ZPMC delivered all port machinery products successfully to Novoroslesex port, product quality got approval from costumers and putting into production of this batch equipments improved efficiency in loading and unloading significantly at Novoroslesex port.

and development strength to consider low temperature resistance capacity of two quayside container gantry cranes and narrow track gauge quayside container gantry crane was successfully delivered. Personalized port machinery product manufactured by ZPMC brings new life to ancient ports in Russia. 
Zhanjiang Port Development History
By Zhou Qiong

As the first modernized port which was self-designed and built by our country after establishment of new China, Zhanjiang Port has a history more than 50 years and has developed into one of twelve main hub ports from a small port at home. This port has the largest bulk cargo wharf in southwest region, and only one quayside container gantry crane in active service which was manufactured by ZPMC.

Only and One Quayside Container Gantry Crane

In 1993, along with container service business development in Zhanjiang Port, traditional approach by using gantry crane to hoist container is not only low in efficiency but also extremely dangerous. Under the circumstance that price of imported quayside container gantry crane stays at a high level, Zhanjiang Port purchased a second-hand Japanese quayside container gantry crane, but business development need still call the met.

Zhanjiang Port turned its attention to domestic market. At that time, domestic ports generally imported quayside container gantry crane from abroad, while ZPMC has exported its first quayside container gantry crane to America, which showed obvious “star effect”. Zhanjiang port ordered one 35.5 tons quayside container gantry crane from ZPMC depending on its trust and support for China-made products, this cooperation is kind of like a “violent first hand”. After half year construction, quayside container gantry crane was delivered, but stopped in Xiamen and took here as a shelter from the wind because Zhanjiang Port was hit by typhoon, and finally arrived in Zhanjiang Port one month later. These equipment delivery guys who have been waited such a long time got busy immediately.

During handover process, typhoon hit again. Heavy rain was pouring and fierce wind was roaming, it was urgent to bind quayside container gantry crane immediately so as to guard against typhoon. Fang Jun who is the leader of wharf square quayside container gantry crane team and other guys became flustered due to being unfamiliar with equipment, Zhou Tong who is the member of ZPMC handover team voluntarily joined in and helped conduct quayside container gantry crane anchoring and windbreak stay rope. After eight hours hard work, quayside container gantry crane binding was accomplished and got over the first “intimated contact” with typhoon safely.

In 1996, rampant typhoon hit Zhanjiang Port again, the second-hand Japanese quayside container gantry crane at wharf crashed into sea. Two gantry cranes moved with wind, fortunately they were blocked by quayside container gantry cranes established by ZPMC and dodged the disaster of “crashing into sea”. However, quayside container gantry cranes which have been collided needed to be repaired.

Zhou Tong went to Zhanjiang Port again, detected electric motor insulator, switched on after confirming that equipment was in good condition, and then quayside container gantry crane ran normally.

Twenty years have passed, former apprentice Zhou Tong is now one of persons in charge of electrical debugging in ZPMC, and Fang Jun is now manager of Technology Department in Zhanjiang Port. Profound friendship has been established between them after so many years contact, this only quayside container gantry crane on active service in Zhanjiang Port not only maintains friendship between Zhou Tong and Fang Jun, but also symbolizes friendship between ZPMC and Zhanjiang Port.

From “Fashion Product” to Market Mainstream

Compared with quayside container gantry crane, bulk-cargo equipment manufactured by ZPMC experienced some twists and turns when entering Zhanjiang Port. In 2003, Zhanjiang Port began to “purchase equipments” for its 200,000 tons ore terminal under construction, two 2250 ton/hour ship unloaders were in demand. As early as five years ago, ZPMC self-designed and built two 2500 tons/hour differential trolley ship unloaders which were the first self-designed and built ship unloaders at home. Compared with these imported from abroad, China-made ship unloader can save construction costs of RMB 20 million Yuan per set. Since then, overseas ship unloader never entered Chinese market. Through understanding demands of Zhanjiang Port, Zhang Jingao who is responsible for bulk-cargo business in ZPMC visited Zhanjiang Port and recommended differential trolley ship unloader three times from June to August 2003.

At that time, differential trolley ship unloader was still considered as “fashion product” , traditional main and auxiliary trolley ship unloader was main stream in market. But compared with traditional trolley ship unloader, differential motion trolley ship unloader has obvious economical efficiency; just use quantity of steel wire ropes can reduce 2/3, which facilitates using process and maintenance. When recommending new products, Zhang Jingao got approval from users of Zhanjiang Port which made him confident. However, users of Zhanjiang Port chose main and auxiliary trolley ship unloader provided by other domestic manufacturers. Failing in the first battle, Zhang Jingao who is now manager of Bulk-Cargo Machinery Business Department reflected and said, “There is a process for new product to be accepted, user also needs a process to learn, understand and accept. Generally speaking, this process may take five years. That failure experience also brings many inspirations for present: how to recommend new product effectively and shorten market cultivation period”.

Time will tell everything. In 2006, two main and auxiliary trolley ship unloaders couldn’t meet operation demands in Zhanjiang Port. Users of Zhanjiang Port voluntarily ordered one 2250 ton/hour differential trolley ship unloader, and ZPMC won the bidding without any doubt. From then on, users of Zhanjiang Port ordered bulk-cargo equipment from ZPMC in batches again. As time goes by, main and auxiliary trolley ship unloader which has been main stream in the market now has disappeared. So far, ZPMC has built 265 differential trolley ship unloaders which are put into wharfs of many large ports at home and abroad.
In fierce competition at "age of big data", informatization is the key to succeed. Informatization has become an irreversible trend of the world under the new situation. To sound informatization engine will promote smooth, stable, continuous and healthy development of ZPMC.
Establish New Type Data Center

By Zhao Zijian

After office automation system receives an application receipt of department server, staff of information center enters related configuration parameters; a new virtual server is generated in data center of the company after fifteen minutes and can be used immediately. It is difficult to image it several years ago, it takes at least five days to apply, purchase, install, debug and delivery traditional server. Compared with traditional server, fifteen minutes improve delivery efficiency 480 times which is one of benefits brought by new type data center.

As bottom foundation support of information construction, it is important to establish efficient, stable, dynamic, and environmental friendly green data center. In 2012, ZPMC built virtualization data center based on cloud computing, which lays solid foundation for information development of the company and plays important role. Overall data center plans to realize three major functions including server virtualization, application virtualization and desktop cloud, and remarkable achievements in cost control and running efficiency have been accomplished through one year construction.

In the aspect of cost control, at present 77 primary servers run in virtualization data center; at present, only 7 servers are needed instead of 77 servers to meet operation need according to traditional server operation mode. In comparison, costs for servers can save RMB 2.31 million Yuan (calculate according to RMB 30,000 Yuan per server), save electric charges approximately RMB 1 million Yuan each year, thereby costs are reduced greatly.

While in the aspect of running efficiency, delivery time of server is reduced to 15 minutes from original 5~7 days, so delivery efficiency is improved greatly. All available resources including computing, storage and network can be integrated into one virtualization resource pool, thereby conducting unified management and realizing non-interrupted capacity expansion on demand, simplifying operation management significantly as well as improving service level (for instance, expanding server hard disc capacity can be finished in two minutes).

For security system, because data center adopts virtualization, unified storage and many other technologies, data center security system (including synchronization, disaster recovery, backup, and recover) can be realized quickly and efficiently, which improve security and reliability of data center servers.

As bottom foundation support of enterprise informatization, new type data center has vast potential for future development. ZPMC will conduct virtualization and desktop cloud deployment on the basis of data center, implementation of application virtualization will help simplify business system deployment, end-user may access business system through various mobile devices including IPAD, and establish united architecture business system. Application of desktop cloud will help IT department strengthen centralized management and control on terminal desktop computer, reduce costs, improve running and maintenance efficiency, and improve cooperation efficiency of data security and cooperation partner.
Management Informatization-Based Boosters Company Soar

By Zhao Zijian and Zhu Yan

Along with development of information era, computer application of ZPMC has grown from nothing, and developed from small to large, and towards the direction of network application and integration. At present, management informatization application areas can be roughly divided into two aspects: management information system construction and computer aided design manufacturing. In the early stage, attention is mainly focused on disperse and independent individual exploitation and application, for instance, "internal management system", "design institute work management platforms", "production materials management system", etc. In future, construction will head for collaborative design, collaborative manufacturing, and intelligent service direction, for instance, "project comprehensive information platform", "customer service integrated platform", etc.

Overall improvement of information system has great significance for strategy transformation of ZPMC, coping with fierce market competition and improving integral core competitiveness. In 2010, ZPMC made overall planning for information construction blueprint, and improved information construction level based on construction of three major systems.

The first is research and development design system. Take PLM (product lifecycle management) as core, deepen two-dimensional CAD (computer aided design) technology, three-dimensional CAD technology, and normalized and standardized design, provide powerful guarantee for follow-up PLM data extraction and spare no efforts to advance application of process items management. This system acts as link between design and production, shows advantages of planning process quickly, provides related data for ERP system and finally realizes product process management of approval - design - process planning - manufacturing - quality improvement.

The second is manufacturing system. Take ERP system as core, realize integrating management of production planning, materials purchase, inventory management, supplier and other company resources, straighten supply, production and sales process inside the company and realize reasonable allocation of human, finance, materials and other resources.

The last is customer service system. Build up customer-based customer service management system, gradually integrate customer and project information, form unified data resource library, link with research and development and ERP system, apply in product-supported business including sales, delivery, after sale, spare parts, maintenance, upgrading and rebuilding, detection and consultation, improve service standard and level, realize systematization, specialization, standardization, networking, regionalization and localization of customer service, forge global networking paid value added services and key supporting market, and realize the company and realize reasonable allocation of human, finance, materials and other resources.

"Standardization and informatization" are important approach and support for management upgrade of ZPMC. Utilize information approach to seize advantages of information market, advance in-depth application of various information technologies stably, realize intensive management of the company and the most optimum distribution of resources, provide effective support for building whole value chain covering business, product life cycle and customer service whole process management, and inject strong driving force for development of ZPMC.
Modern wharf informatization management is in urgent need of such long-distance management system at group company level. ZPMC Electric Company took wharf equipment informatization management as a powerful “trump card” to create a new world in market competition.

Advance Management Informatization of Wharf Equipment

By Qin Wenyuan

Challenge – Opportunity

In 2011, at the beginning of its establishment, ZPMC Electric Company faced severe market situation in wharf equipment long-distance management system field. Yaskawa, Siemens, ABB, and many renowned companies with solid strength have already begun to provide long-distance management system throughout entire wharf equipment electronic control industry. As a young electric company, how can ZPMC Electric Company have a share in competitive wharf equipments field?

Through current situation research on many domestic wharfs, we found that most wharf equipments are equipped with independent equipment management system, but a only a few of them can realize real-time data collection and implement long-distance management for all equipments on entire wharf. ZPMC Electric Company realized that modern wharf informatization management is in urgent need of such long-distance management system at group company level, which is a challenge as well as a great opportunity.

ZPMC Electric Company was determined to take wharf equipment informatization management as a powerful “trump card” to create a new world in market competition.

Practice – Advance

In the same year, ZPMC Electric Company obtained Wenzhou Information Port Project. Wenzhou Port consists of six scattered wharfs, each wharf is equipped with crane equipments of reasonable quantity and various types, and user required realizing data collection, analysis and unified management for all equipments, which had great difficulty.

After analyzing actual demand of Wenzhou Information Port carefully, ZPMC Electric Company worked out implementation plan quickly. In the plan, ZPMC Electric Company divided equipment management into three levels: individual unit equipment management, individual wharf management and group overall management. For individual unit equipment, multiple key positions of the equipment are equipped with GPS, electricity meter and other devices on the basis of adopting traditional wharf equipment management system so as to collect position data of various mechanisms, electricity consumption and other data information.

Meanwhile, data acquisition software which is self-developed by the company and real-time history database software are used cooperatively so as to collect and store these magnificent data information at the same time. For electricity consumption information, this equipment management system not only saves human capital for wharf compared with traditional manual meter reading method, but also summarizes electricity consumption of each equipment and compares electricity consumptions of multiple equipments. Such information based on analysis are the most valuable for wharf management.

Similar to electric energy management, ZPMC Electric Company proposed solutions one by one for other demands of equipment management put forward by Wenzhou Information Port. For example, ZPMC Electric Company designed new functions as to collect position data of various mechanisms, electricity consumption and other data information. Meanwhile, data acquisition software which is self-developed by the company and real-time history database software are used cooperatively so as to collect and store these magnificent data information at the same time. For electricity consumption information, this equipment management system not only saves human capital for wharf compared with traditional manual meter reading method, but also summarizes electricity consumptions of multiple equipments. Such information based on analysis are the most valuable for wharf management.

Meanwhile, data acquisition software which is self-developed by the company and real-time history database software are used cooperatively so as to collect and store these magnificent data information at the same time. For electricity consumption information, this equipment management system not only saves human capital for wharf compared with traditional manual meter reading method, but also summarizes electricity consumptions of multiple equipments. Such information based on analysis are the most valuable for wharf management.

Similar to electric energy management, ZPMC Electric Company proposed solutions one by one for other demands of equipment management put forward by Wenzhou Information Port. For example, ZPMC Electric Company designed new functions as to collect position data of various mechanisms, electricity consumption and other data information. Meanwhile, data acquisition software which is self-developed by the company and real-time history database software are used cooperatively so as to collect and store these magnificent data information at the same time. For electricity consumption information, this equipment management system not only saves human capital for wharf compared with traditional manual meter reading method, but also summarizes electricity consumptions of multiple equipments. Such information based on analysis are the most valuable for wharf management.

Innovation – Development

Along with implementation of Wenzhou Information Port Project, Nanjing Loutang, Shanghai Waigaoqiao Fourth Stage, and other wharf equipment informatization management projects are coming in a continuous stream. Among newly undertook project, ZPMC Electric Company blended in many creative elements, for instance, add new real-time video monitoring function for Waigaoqiao Fourth Stage project – install multiple video cameras at several important positions of quayside container gantry crane, administrator can monitor operation condition of equipments and personnel just sitting in control room; meanwhile, crane monitoring system of Waigaoqiao Fourth Stage project has function of video storage which can help administrator check and solve the problem rapidly through reviewing and replaying video of history. Furthermore, ZPMC Electric Company also designed new functions including automatic typhoon prevention and wind-speed detection in crane equipment management system, these newly increased functions will bring genuine convenience for crane administrators at wharf.

Along with rapid development of information era, ZPMC Electric Company grasps era development trend, rides the tide, and combines years of accumulated wharf equipment management experiences and self-developed computer application software so as to realize wharf equipment management informatization and promote development of ports in the new era.
Establishing “Files” for Steel Bridge Weld Joint

By Xu Jun

When fabricating steel structure for San Francisco Bay Bridge in America, American main contractor AB/F Company introduced weld joint uniqueness and weld joint management system concepts into ZPMC. ZPMC began to pay attention to weld joint uniqueness follow-up for steel structure bridge from then on.

For Forth Replacement Crossing which is being implemented in Scotland, on the one hand, technologists will distribute prepared weld joint maps to operators before fabricating components, operators will mark serial number of each weld joint at corresponding position according to requirements after components are assembled, and quality control personnel will check information at the same time. On the other hand, specialized document personnel will import these weld joint maps into database system. Matching connection between filed weld joint and database is established through above work, then field working procedure adopted for weld joint can be input into database in real time, and target of establishing "file" for each weld joint can be realized.

ZPMC developed steel structure quality tracking system for Scotland Forth Replacement Crossing Project on the basis of using American steel bridge weld joint data management concept as reference. The system mainly includes three major modules which include basic data management, weld joint management and system management, and realizes weld joint management.

Basic data management module mainly involves management for various resource information concerned with project, for instance, welder, equipment, inspection personnel, etc, also includes management for various notations, general requirements and rules in parting modules of versatility code. Basic data module formed through management for information can provide service for data processing of various parting modules in subsequent weld joint management module.

System management module mainly provides management tool for maintaining overall system, for instance, error management log, system permission setting, system parameter setting, etc. Main function is to ensure normal operation of the system and provide an online platform for programmers and users to solve various problems.

Weld joint management module is core module of overall system and consists of eight parting modules which cover entire process from weld joint definition to completion at the end. Eight weld joint management parting modules and eight auxiliary modules can effectively solve the problems which often occur in general weld joint quality tracking report.

Weld joint information management realizes flexible management for tens of thousands of weld joints. Weld joint database has many basic information, for instance, weld length, type of welded joint, defect length, defect type, welder, etc., which can be combined to analyze many problems, for instance, quality condition, high-occurrence defect type and repair rate of welder at some stage of manufacturing process. Furthermore, weld joint database can be used to avoid problem of connection and cooperation between departments during project manufacturing process; problem that data information is disperse and it is difficult to conduct unified management; problem that logicality of data control is insufficient or lack; problem that preparation of various reports are laggard and high in error rate.

Application of weld joint tracking system realizes direct control over manufacturing process and components quality, and control over personnel assessment, improves brand new understanding of all staff for welding quality, and realizes authenticity and traceability of product quality problem. Application of this information technology greatly improves accuracy and scientificity of quality management process, provides powerful technology and management guarantee for offshore and large scale steel structure manufacturing industry to improve comprehensive service level and quality management control capacity, and provides powerful support for product quality management and control. Successful application of the system also promotes control over costs, progress, risk, and human resource.
In September 2012, ECT Wharf assigned ZPMC to design and manufacture five quayside container gantry cranes. This batch of quayside container gantry cranes are high in technology contents, can meet high speed handling requirements for latest super-large type container cargo ships in the world, lifting capacity of spreader is 70 tons, lifting altitude on rail can reach up to 50 meters and outreach distance can reach 72.5 meters. According to conventional design, total weight of quayside container gantry crane of this specification can reach approximately 1900 tons. However, ECT Wharf which has been put into service since 1967 is limited in weight bearing capacity and low in wharf allowable wheel-pressure.

With abundant design experiences on quayside container gantry crane products, technical experts from ZPMC finally used “three broad axes” to reduce weight for quayside container gantry crane through repeated intense discussions and accurate calculations.

The first “broad axe” is innovating quayside container gantry crane doorframe structure. ECT quayside container gantry crane land side door leg adopts flexible hinge design form which leads to that rigidity in trolley direction is reduced greatly; according to conventional design, both static rigidity and natural frequency of vibration of trolley direction are reduced substantially. In order to guarantee that quayside container gantry crane can meet requirements of bidding documents, designers adopted new type doorframe diagonal brace design, greatly increased rigidity of trolley direction of quayside container gantry crane steel structure and reduced dimension and plate thickness of beam, and reduced weight 15 tons for each set of quayside container gantry crane.

The second “broad axe” is innovating front girder of quayside container gantry crane. In consideration that front girder is longer and load of front girder extension part is smaller, designers adopted lower link bar structure creatively which reduced weight of front girder head, and weight of each quayside container gantry crane is reduced 2 tons. In wharfs around the world, stay cracking occurs frequently in quayside container gantry crane, results ranges from machine halt and repair to collapse of machine. In order to improve reliability of stay of quayside container gantry crane, designers proposed to replace heavy plate with high strength steel plate at positions where stay head fatigue detail is weaker so as to reduce the possibility of fatigue cracking. In the meantime, under the condition that stay open grade is remained the same, shorten length of stay shaft so as to reduce bending moment of stay shaft and reduce diameter of stay shaft correspondingly, which plays positive role in reducing self-weight of structure.

The third “broad axe” is conducting innovative design for machine room chassis. Chassis design broke through in traditional chassis arrangement form, simplified chassis further under the condition that various properties of chassis remain unchanged. Reducing more than 20 cable open pores and cable covers will reduce weight approximately 15%, and realized the concept of seeking benefits from design. This innovative design will also be recommended to conventional quayside container gantry crane project.

Innovative “three broad axes” to cut off swelling and redundant parts of quayside container gantry crane, and accomplished the target of reducing weight for quayside container gantry crane successfully. Finally, self-weight of each set ECT light-duty quayside container gantry crane is maintained at approximately 1550 tons, customer requirement is met completely, and innovative “three broad axes” also provided successful attempt for technological innovation exploration of company’s light-duty quayside container gantry crane.
“No Martensitic Lath” Assembly

By Chen Di

Since commencement of Hong Kong-Zhuhai-Macau Bridge Steel Box Girder Plate Unit Project built by ZPMC in December 2012, steel structure output has exceeded 15000 tons. During manufacturing process of plate unit, ZPMC positively responded to “no martensitic lath” assembly method advocated by Hong Kong-Zhuhai-Macau Bridge Technical Specification, constructed bottom plate unit, clapboard unit, internal and external web unit and longitudinal beam plate unit at various parts of steel box girder according to technical specifications orderly so as to guarantee site construction at Zhongshan base.

“NO martensitic lath” assembly method means that no martensitic lath is adopted during assemble and welding process. In case of using martensitic lath, it is inevitable to leave little spots no matter how careful to clear away “remains of martensitic lath” after completion of works, and spots still can be seen indistinctly after being coated which will be a blemish in an otherwise perfect thing. In order to meet high requirements of Hong Kong-Zhuhai-Macau Bridge on appearance, ZPMC adopted “no martensitic lath” assembly method, and made a lot of innovations in cutting, and dedicated tools, improved stability of steel box girder manufacturing and production efficiency.

Cutting of steels are one of the working procedures which have the heaviest workload during steel bridge manufacturing process. According to bidding documents of Hong Kong-Zhuhai-Macau Bridge, main parts of steel box girder structure should adopt numerical control automatic cutting. In order to further guarantee cutting accuracy and follow-up assembling precision, ZPMC is strictly accurate to cutting current, voltage, gas pressure, cutting speed, cutting nozzle type, distance between cutting torch and steel plate, flatness of steel plate and platform and other parameters. In order to guarantee quality of groove directly cut from steel plate, and dimensions of parts can meet requirements of project specifications strictly, ZPMC carried out a large number of pertinence tests for dimension board of different thickness, obtained most reasonable parameters through data statistical analysis, adopted numerical control plasma cutting machine to cut and bain for bottom plate, web and top plate which thickness are less than or equal to 30mm, this technology was implemented in steel plate cutting by the company.

During each plate unit construction process, project team designed several sets of tools in consideration of structure shape, dimension, and manufacturing process characteristics of each plate unit so as to improve construction safety, stability, and production efficiency. During manufacturing process of bottom plate unit, I rib needs to be welded on each bottom plate unit, while welding of I rib might cause deformation of bottom plate unit. Install martensitic lath on bottom plate unit according to original construction technology, in order to realize “no martensitic lath” assembly, project team designed reversible deformation tools, conducted reversible deformation for bottom plate unit in advance and maintained a certain radian, when I rib is welded on bottom plate unit and caused deformation, plate unit happens to be reverted to flat state. Because plate thickness and deformation radian are different, project team repeated tests for various steel plates to find out accurate parameters, and used these parameters to make assembly jigs of different sizes. Utilization of this tool got effect instantly, which can guarantee manufacturing quality, improve manufacturing efficiency, and save almost half time than traditional technology.

Web plate unit is restricted by many factors including shape, weight, processing steps, etc, traditional technology needs to weld suspension centre directly on components, or adopts rolling method, which safety factor is low and tool efficiency is low, and parent metal is damaged easily, so it is easy to be deformed during lifting process. Project team designed turn-over tool of web unit which is flexibly installed in web manufacturing assembly jig, forms a web manufacturing working station which integrates multiple working procedures including assembling, welding and turn-over, and effectively protect web plate unit from being deformed and damaged.

Clapboard unit is welded by welding robot. Project team took structural features of clapboard unit into consideration, designed both sides welding plate manufacturing tools which integrated multiple functions including positioning, assembling, welding and turn-over, both sides can be welded, and flatness can be maintained within 3mm after welding both sides of clapboard which is 10 meters in length and 5 meters in width and meet requirements of specifications. This tool also ensures stability of welding quality, protects tool from being damaged, shows advantages of being safe, reliable, convenient and efficient, can produce clapboards in batch.

Successful application of “no martensitic lath” assembly technology in Hong Kong-Zhuhai-Macau Bridge Steel Box Girder Plate Unit Project significantly improves product quality and also manufacturing level of ZPMC.
A Race against Time

By Chen Di

In August 10th, last four ship unloaders for Tianjin Nanjiang Bulk-Cargo System General Contracting Project were successfully delivered from ZPMC Changxing Branch, and all equipment manufacturing tasks for this project have been accomplished so far.

This project is the third bulk-cargo system general contracting project built by ZPMC after Taicang Wugang Terminal Bulk-Cargo Handling System and Caofeidian Ore Second Stage Terminal Bulk-Cargo System. The project includes nineteen belt conveyors, two 5000 ton(s)/hour reclaimers, one 5000 ton(s)/hour single-cantilever stacker, two 5000 ton(s)/hour stacker-reclaimers, four 2500 ton(s)/hour ship unloaders, and related power supply, illumination, piping control, drainage, fire protection, environmental protection and other services.

For four ship unloaders manufacturing project, customer appointed one ship unloader should be built by another company, but manufacturing task of that ship unloader was transferred to ZPMC when delivery time was less than two months. Interests of the customer are always top priorities. In order to make time for field, project team gave an instruction: delivery time of the project must be guaranteed, which meant final assembly of doorframe, front and rear girder of this ship unloader must be finished within about one month.

This was race against time. It was impossible to accomplish tasks within specified time according to normal installation procedure, and the only method was to find a new path. For time, project team divided operating personnel into two groups which took turns to implement construction during daytime and nighttime; for working procedure, try to make two working procedures connect with each other closed, when previous working procedure is not finished, preparation for next working procedure should have started; meanwhile, establish reward mechanism to reward those personnel who guarantee both quality and quantity and finish tasks quickly.

Ground was grilled by blazing sun in July, temperature in doorframe was extremely high in daytime, it was impossible to construct, so construction could only be implemented in nighttime. Even though, temperature in doorframe which has enjoyed one day sunbath still could reach up to 50℃. So project team used large fan to ventilate and cool for inside of doorframe, and prepared many heatstroke prevention drinks, including salt soda water, salt water ice-cream stick, and mung bean soup for production personnel working at front line of production.

Through concerted efforts of project team and operating personnel, final assembly of doorframes were finished in more than ten days, final assembly of front girder and rear girder took less than ten days, installation of grappling fixture and stringing of steel wire rope only took five days, and ship unloaders were delivered in time. Tang Yun who was responsible for final assembly said, “Final assembly task of bulk-cargo product is finished with fastest speed ever in company’s history”.

Speed of final assembly didn’t affect quality. According to requirements of bidding documents: only lower mouth of ship unloader funnel has requirement of perpendicularity, while supervisors increased inspection points and put forward four points on funnel must be kept on the same plane when applying for inspection. The project team inherits the principle of “meeting user demands with all efforts”, organized personnel to do rework for funnel fabrication so as to meet supervisor’s requirement on perpendicularity.

At present, final assembly for bulk-cargo machinery equipment which parts and components have been delivered to Tianjin Nanjiang Port Terminal earlier is being implemented, and debugging will start immediately after four ship unloaders arrive in field, Tianjin Nanjiang Professional Ore Terminal is scheduled to put into operation formally next year.
Port of Long Beach will Receive ZPMC Crane

By Wu Xueshan

In August, final debugging for two dark blue quayside container gantry cranes was carried out tensely at heavy cargo wharf of Changxing base. Heavy cargo wharf must be used because of wider track gauge, 130 tons lifting capacity, two trolleys at top and bottom, one container transit platform and approximately 2500 tons machine weight, which all make these two quayside container gantry cranes stick out. These two quayside container gantry cranes are double-lifting and double-trolley quayside container gantry cranes which are designed and manufactured by ZPMC for Long Beach LBCT automatic wharf which has highest degree of automation in America, and this is the first time that ZPMC exported double-lifting and double-trolley quayside container gantry crane abroad.

America Port of Long Beach is located in Los Angeles where earthquake activity is frequent. Seismic resistance is the problem which must be taken into consideration for quayside container gantry crane. "In this project, we took time history analysis method to analyze seismic resistance of quayside container gantry crane and took time course of earthquake as input to calculate response of quayside container gantry crane during whole process from static to vibrating and then from vibrating to terminating under the influence of earthquake action, and determine anti-seismic property of quayside container gantry crane and wharf. We reinforced leg column of quayside container gantry crane based on analysis results. designer of quayside container gantry crane", Li Jun said. Meticulous consideration in design optimized many parts of quayside container gantry crane. For instance, select speed parameters reasonably, improve winding type and mechanism arrangement and conduct lightweight design for structural style, which all makes portal trolley much lighter than that of quayside container gantry crane of the same type.

Manufacturing and assembly of Long Beach quayside container gantry cranes are beset with difficulties due to varieties of mechanisms, complex structure, export for the first time and long time of automation debugging. Advanced process technology became "magic key" of the project department, meticulous and comprehensive technical disclosure made workers confident even when they are facing unfamiliar structure fabrication. Technical supervisor, Chen Liang said, "Process sheet of ordinary quayside container gantry crane is about 50 to 60 pages, this project has more than 100 process sheets up to now, and quantity is more than doubled."

What is also multiplied is manufacturing time. Planning cycle for Long Beach quayside container gantry crane from commencement of works in workshop to delivery is one year, while some ultra-short term quayside container gantry crane can be finished in approximately half year. Long manufacturing time doesn’t mean loose time limit for project. Project production supervisor, Wang Yong said, "In March this year, we worked overtime until 10:00 P.M. entire month so as to guarantee final assembly time which was confirmed to be in April. Constructors worked hard round-the-clock which made quayside container crane manufacturing always catch up with planned schedule.

How to ensure time limit for project as well as product quality, project department of Long Beach Quayside Container Gantry Crane Project adopted the method to advocate first time success rate and reduce rework. Project quality inspection supervisor, Gu Jun said, "Inspection points of Long Beach quayside container gantry crane are 10% more than that of ordinary quayside container gantry crane, rework rate is high, so it is impossible to ensure quality and time limit for project". During actual operation, it is difficult to guarantee first time success rate. For instance, stress releasing hole of weld line, in order to prevent weld line deforming easily, steel plate needed to be polished manually with polisher until there was no black spot every time, steel plate was so bright just like it has been machined, and more than 50-60 holes for each quayside container gantry crane needed to be polished; before conducting detection each time, project department adjusted quayside container gantry crane to horizontal position with lifting jack so as to ensure accuracy of detection. "Success for one time is not only the behavior responsible for the company, but also for our users. So only we can well do the work without defect at a strict attitude, then we can make our users feel at ease. " Under the premise of strict control of the Project Department, the average rate of report and inspection of Changtan Shore Bridge can reach 97%.

So far, ZPMC has provided 92 port machinery equipments for Long Beach LBCT Port. In several months, these two quayside container gantry cranes will set sail and be sent to Long Beach, therefrom forward the rest 12 quayside container gantry cranes will be manufactured carefully and delivered successively. They will jointly promote Long BeachLBCT wharf to be the most advanced green container wharf with the state of art in North America.
The first domestic offshore wind power installation platform built by ZPMC is drawing to a close, and installation of four piles has been accomplished successfully. This platform’s operating water depth can reach 30 meters, integrate hoisting, piling and installation into one, can run at any gulf at home. Construction of the wind power installation platform can change domestic wind power development pattern and extend development range from shallow to offshore.

Erected Platform

The largest breakthrough of 800 tons wind power installation platform lies in that: operating environment develops from shoal to shallow sea; way of equipment installation develops from “sitting” to “erecting”. Xie Min, office director of Longyuan Zhenhua said that, “above two changes will show great influence on development progress of offshore wind power in China.”

At present, shoal wind power market is prosperous and wind driven generators are found everywhere at many large and small foreshore. However, shoal construction usually “runs depending on weather”, when tide is changing constantly, constructors usually “follow the moon”, they have to make full use of every minute to install wind driven generator until tidewater recedes and foreshore appears.

800 tons self-elevating installation platform built by ZPMC overcomes awkward and passive situation of operation depending on weather, four piles which are 67 meters in length on the platform can firmly fix platform within 30 meters underwater and resist 5 levels of stormy waves. “At present, domestic wind power development centralizes at shoal or land, while offshore wind power development is in a blank state due to lack of professional installation equipment. Erected platform can fill the blank, can install wind driven generator at shallow sea and develop offshore wind power resources.” Xie Min said.

Offshore wind power market has a broad prospect, after completing construction of 800 tons wind power installation platform, 5 megawatt wind driven generator can be installed and each unit can generate electricity of 5000 kilowatt per hour.

“Impossible” 2 Millimeters

“Stability of platform relies on four piles”, project supervisor Chen Wenwei said. Pile which is 67 meters in length is not special among offshore products, but what truly rare is to attach lifting mechanism on piles. Each pile is attached with 10 lifting electric motors, and every micro-motion of each pile can be controlled within 10 millimeters through gear drive. Underwater sludge is irregular in depth, pile may “fall one leg deep and one leg shallow”, fine tuning can make platform stand stable in water.

But fine tuning has higher accuracy requirement for piles: it is necessary to ensure that piles can be inserted into ship hull and lifting mechanism. Through detailed calculation, project department proposed to control pile vertical accuracy in 2 millimeters. “2 millimeters? It is impossible, you can never do that”, supervisor of American Bureau of Shipping (ABS) said resolutely and decisively. However, a skilled project department, they were ambitious and it seemed that they already had a well-thought-out plan.

Through early stage technology demonstration, project team divided each pile into nine sections to build, ensured accuracy of each pile through controlling accuracy of each subsection, which also brought risks: there are eight joints on each pile, two subsections will be declared as scrap in case there is something wrong with one joint. The project department selected 12 skilled welders from 40 qualified welders, two welders formed a group to conduct symmetry welding so as to control deformation, and each group was closed monitored by one professional quality inspector who carried out an overall check every other two hours during whole process. What is more important is that these 12 welders are key protection targets in construction team, ordinary welders usually play “a guerrilla war”, while “these 12 welders only weld joint on piles and don’t weld anything else”, Chen Wenwei said.

Five thin steel wire lines surround formed piles from top to bottom, which are vertical lines for measuring accuracy of pile. According to newest inspection report of ABS, vertical accuracy of four piles are all controlled within 2 millimeters.

Obtained National Patent for Welding Method

Technical supervisor Huang Ping pointed at a pile of welding wires in workshop and said “Don’t look down upon these welding wires which can reduce welding costs obviously”. Original thickness of pile rack weld line on the platform was 140 millimeters, and ordinary manual welding rods seem to be impossible to handle such super-thick weld lines. Generally speaking, one super-thick weld line needs to use approximately 200 welding rods, utilization rates of welding rods are only 80% and the rest 20% can be only discarded. There are more than 60 super-thick weld lines on entire platform; and wastages of welding materials are very astonishing. Therefore, project group made an invention: offshore engineering lifting pile high efficient flux-coated wire CO2 gas shielded are welding which improves welding efficiency three times, and effective availability of welding wires can reach up to 92%, which has great significance in reducing energy consumption and costs. Huang Ping made a visual analogy to illustrate difference between two welding methods, “Just like a pencil and a propelling pencil, the former has to be sharpened at first then used, when the left pencil is too short for user to hold, it is impossible to use; the latter is just like propelling pencil, refill can be sent automatically and ceaselessly.”

Gao Qiang participated in this invention; the group of 5 persons including him has started to study on new welding method one year prior to commencement of the project. They carried out hundreds times of tests to select welding material, gas and welding parameters. In October 2011, this invention obtained national patent sooner after commencement of this project. New patent has great promotion significance, “Thick plate welding of offshore products is large in quantity, and this welding method shows obvious economical efficiency for thick plate welding more than 100 millimeters”, Gao Qiang said. Furthermore, this method also contributes to improving working environment, which can reduce almost 1/3 sparkle splashes and is very popular among workers.

So far, percent of pass of 10000 weld lines one-time inspection in platform reaches 100%. At present, 800 tons wind power installation platform has been shaped preliminarily and erected at external field of Nantong Company. “In future, infinite possibilities will be filled in wind power installation market for the company”, Chen Wenwei said.
“Ergate” at Wharf

By Chen Di

When walking into workshop, two brilliant yellow trolleys jumped into our sight, taking a close look and clue can be found: no operator’s cab. This is AGV trolley (automation-guided trolley) developed by ZPMC independently for automation wharf, this is “transport worker” at automation wharf, just like “ergate” in ant colony.

The trolley adopts hybrid power system of lithium battery pack and diesel generating set, and shows advantages of low power consumption, less pollution, low noise emission, and low maintenance costs. The trolley can run at the maximum speed of 25 kilometers per hour only with lithium battery pack, and can work for three hours continuously under working condition of full load of 60 tons.

Skilful Use of Mathematical Model

Most of common vehicles are front-wheel dual-wheel driven and direction is controlled by front-wheel, while the trolley is four-wheel driven and direction can be controlled by front-wheel and rear-wheel, this characteristics makes the trolley have powerful driving force, and flexible enough to finish front-wheel steering, rear-wheel steering, side push diagonal moving, small radius steering, even make a turn or change lane at narrow place. Because rotation angle of inner side tire is little greater than that of outer side and rotation angles of four tires are different when the trolley turns, designers needed to calculate force of friction of various tires accurately so as to extend service life of tire. In face of enormous calculated quantity, designers utilized mathematical model skilfully to control angle of four tires when the trolley turns, calculate relationship between two wheels and improve reliability of data.

With help of mathematical model, designers found that redundancy function occurs to encoder, which controls steering of tires. At present, there are four encoders, steering of trolley can be controlled with only two trolleys, the rest two sets are “substitutes”. When operating steering encoder breaks down, the user may manually switch to “substitutes” steering encoder so as to ensure normal running of trolley. Originality of mathematical model is also embodied in standardization of AGV trolley. Designers reserved multiple interfaces on trolley so as to facilitate increase special function in future which can be realized by writing corresponding interface program. Implementing local replaceable design on standard basis makes AGV trolley find balance equilibrium point between standardization and customization.

High-Precision Test

There are two important indicators to measure AGV trolley control system dynamic performance: overshoot and steady-state time. The larger overshoot, the shorter steady-state time; the smaller overshoot, the longer steady-state time. How to balance these two volumes really “stamped” the project team. The project team carried out more than 100 adjustments and tests in three days and finally found out optimum parameters.

The user had extremely high requirement for this project, when implementing static and dynamic function tests, representatives of the user prepared two test sheets which are 27 pages and 30 pages which listed various modules to be tested densely, while working conditions and parameters of each module under many situations needed to be needed. For instance, when testing steering situation, it is necessary to test parameters of trolley running under four conditions of 10°, 15°, 20°, and 25°. Since fully preparation has been made in early stage, project team finished tests time after time in two weeks test period.

“John Woo” in Project Team

“Look! Our John Woo is coming back!” members of project team pointed at sweaty Zhang Guozhao who has just entered the office. After seeing I am suspicious, members of project team began to introduce the origin of this title. Since there is no operator’s cab on AGV trolley, person can’t stand on trolley, in order to measure various data of trolley accurately during running process, Zhang Guozhao who is electrical supervisor bought one high-performance wireless router and placed it on trolley at his own expenses, which is just like what John Woo paid out of his own pocket to realize ideal cinematic effects, therefore he got the title of “John Woo”.

“However, what was more Zhang Guozhao paid was time and energy. During one debugging, project team member suddenly found that instrument couldn’t monitor situation inside trolley, what is the problem?”

Zhang Guozhao checked the trolley immediately and found that problem was caused by electromagnetic interference which should not be underestimated. Consequences caused by electromagnetic interference might range from causing instability of system and reducing system accuracy to causing dead halt of control system or malfunction, causing equipment damage or endangering personal safety. AGV trolley can’t guide electric current underground depending on contact of four rubber tires and ground, but through adjusting cable direction of trolley, Hence, Zhang Guozhao and other members took professional instruments to check and adjust hundreds of cables one by one, classify according to equipment or AGV/DG. Through one week check and adjustment, electromagnetic interference was reduced successfully. It was in hot summer, all members of project team took their sweat-soaked clothes as if they have just enjoyed sauna at the end of work everyday. Zhang Guozhao said proudly, “If the first batch AGV could achieve success at automation wharf in Singapore, AGV trolley will have broad market prospects”. At present, delivery condition for AGV trolley has been prepared, and can be put into service after user finished field test.
Through more than twenty years development, shipping design has experienced a process from following to innovation and from innovation to pursuing excellence, and achieved glorious achievements. Behind these achievements, many innovative and passionate young dream-seekers made great contributions, Lan Canzhang is one of these dream-seekers, and we are used to call him "Arlen". In March 2009, Arlen graduated from Shanghai Jiaotong University with master degree in shipping and ocean structure design and manufacturing major, and then he was admitted by ZPMC and began to work in shipping design department. Arlen made significant contribution to shipping technology development of the company with profound knowledge, precise and realistic working spirit. Many innovative technologies broke foreign technological barrier and filled the blank in domestic shipping technology development of the company with leadership; the multifunction stowage software reached domestic leading level, met international standards and saved a great quantity of research and development expenses for the company.

This project adopted authoritative wave database developed by British BMT Company. However, this database only provides original data, it is necessary to conduct tedious operation and a series of complex calculation to obtain designed significant wave height on ship route, which requires strong professionalism and wastes time and energy. In order to facilitate designer to inquire rapidly and accurately, Arlen built up a local wave database inquiry website, convert 12300 pieces of data including 104 sea areas, 4 seasons and 1248 sheets on BMT website, and saved at local database website. From then on, design only can inquire project designed significant wave height and wind speed through visiting local website and clicking the mouse.

For project calculation, the company introduced advanced foreign computer software. However, Arlen didn’t believe in foreign software completed, he put forward several corrective actions based on his specialized knowledge and years of complete machine transportation experiences so as to make computer software more reasonable and realize accurate calculation of ship single voyage. At present, nearly more than 100 voyages have implemented single voyage acceleration speed calculation which has great significance in optimizing shipping design and reducing binding costs.

Conquer Sinking Pipe Floating Transportation Technology
Hong Kong–Zhuhai–Macau Bridge attracts world attention, and sinking pipe floating transportation in island tunnel project is construction difficulty. This sinking pipe is the largest seabed sinking pipe in the world up to now, this sinking pipe is 180 meters long with water displacement approximately 80,000 tons which equals to the weight of a large aircraft carrier. Towing of such a colossus in narrow shallow water channel is influenced by many environmental factors including ocean current, wave, water area terrain, and meteorological condition. Only a few companies in Europe have mastered large sinking pipe tunnel floating transportation and immersion installation technology, which forms an oligopoly situation, therefore foreign manufacturers offered a “sky-high price” of EUR 100 million for sinking pipe floating transportation and immersion installation scheme.

To break market monopoly and overseas technical barrier, shipping design department commissioned by general manager office of Hong Kong–Zhuhai–Macau Bridge Island Tunnel Engineering Project undertook the arduous task of sinking pipe floating transportation scheme research and development. Arlen and his team struggled against the headwind, looked up a large quantity of foreign literatures, studied on related theories, comprehensively analyzed many discrete hydrological, meteorological and model test data, and conquered technical difficulties one by one through assiduous study. Among them, sinking pipe attitude in floating transportation process is the key of floating scheme. He assumed various schemes and made comparisons, and put forward a direction which aims at relative velocity instead of channel and water flow direction. Theoretical calculation proves this measure can avoid frequent adjustment of sinking pipe attitude, and make lateral resistance of sinking pipe floating transportation and total resistance minimizer. Excellent accomplishment of the scheme design passed expert review one time, the scheme was highly appreciated by experts from Ministry of Communications and general manager office of project, provided powerful guarantee for smooth implementation of island tunnel engineering project and won extensive compliment for the company.

Along with development of offshore engineering, the company needs to innovate shipping technology constantly. “The way to get profound knowledge and grand morality is so far that I will search them from the paradise to the hell wholeheartedly.” Arlen who is innovative and daring to challenge is set his foot on new journey to conquer one and one peaks of shipping technology.
Sing out Song of Youth
By Zhou Qiong

In July, we have waited for entire two days and immediately went to Guishan Island by ship after typhoon “Rumbia” just left Zhuhai; after a very rough ride on rising dust sand road, we finally arrived in sinking pipe factory for pre-fabrication of Hong Kong-Zhuhai-Macau Bridge and saw the young team which has been known as “steel structure expert”.

They undertook a pipe section outfitting task of Hong Kong-Zhuhai-Macau Bridge Island Tunnel Engineering Project from 2012. They took only one year to reduce outfitting time from 90 days to 40 days, made pipe section outfitting as large as two standard swimming pools match closely and “impermeable” under the sea.

General Manager of Hong Kong-Zhuhai-Macau Bridge Island Tunnel Engineering Project, Lin Min said, “Outfitting is an important link in overall engineering project; once there is defect in outfitting quality, risk of overall engineering project may be caused, which required each staff of outfitting project department should concentrate”.

Passion
At 9:00 A.M., blazing sun grilled the ground; the skin will feel burning hurt in only fifteen minutes. It is miserable to work in external field airtight pipe section, working condition is very hard, even a sound in low voice like “o” will resound for torment nerves of sense organs in turn; once various machines start, noises and dusts envelop one’s ears, “walked on walls” for eight times in dim pipe sections, he found that his legs were so aching and limp to hover hand, “walked on walls” for eight times in dim pipe sections, he found that his legs were so aching and limp to hover hand, “walked on walls” for eight times in dim pipe sections, he found that his legs were so aching and limp to hover hand.

Compared with dormitory, having meal is much more difficult. When project team was just established, there was no kitchen; they could only have instant noodles. Later, 2nd Navigational Bureau outfitting project department issued meal card, excitement of this group of southerners for spicy Sichuan cuisine everyday didn’t last very long, they began to get inflamed and got ulcer in mouth with addition of hot weather. Wei Jie was very anxious, how to ensure work normally without eating well. Sometimes he gave special treatment for everyone to improve meals. But price of commodities is extremely high, even price of most ordinary green vegetables is six or seven times higher that in Zhuhai City. Wei Jie brought vegetables back when he had opportunity to get off the island.

What personnel of project team are looking forward most is to get off the island every three months. Every time when someone came back from outside, everyone gathered around him and listened to him for something new. However, these get off the island couldn’t stop worrying about their jobs on island; they usually took a vacation less than one week and came back to island to work.

Inspector Wang Jian was one of the first came to Guishan Island. For him, he made great determination to leave his old mother to come to Zhuhai. As a “general medical practitioner”, he is responsible for inspecting paint, weld line, and appearance. “For such a huge project, I can’t just let go.” During E5 and E6 pipe sections inspection, weld line first time percent of pass reached 100% due to strict self-checking and reporting supervisors in time. In “Second Battle Third Node” labor competition, Wang Jian won the title of “Advanced Individual”.

At the moment of getting certificate of merit, he was too impatient to take a picture and send to his mother, wife and son who are in Jiangyin.

As the only safety supervisor of project department, Pan Rongxin is responsible for monitoring a construction team of 63 persons. Although he often chats with workers, Laopan never be soft in case of steel girder may fall. After Laopan discovered, he criticized the young man with sharp words. Sooner Laopan caught the young man was climbing high without fastening safety belt. Laopan almost roared, “If you fall down and hit other person, they will suffer with you together”. The young man was dismissed afterwards. On the day packing luggage, Laopan went to see him off.

Cooperation
At working area that project department is located at, reputation of “steel structure expert” has been obtained for a long time. After E3E4 pipe sections impoundment tests succeeded, Lin Min thumbed up to outfitting project team and said, “You are worthy the name of steel structure experts.”

When implementing E3 and E4 outfitting, end steel shell is impossible to be installed due to pushing deformation of previous working procedure, which directly affected pipe section immersion schedule. Time was so urgent, responsible person of third working area found Wei Jie and asked for assistance. Even through they were short of hands, manager of outfitting installation project department, Wei Jie still sent seven workers to help accomplish reinforcing cage pushing and solved deformation problem successfully. Furthermore, problem of big pipe section embedded parts installation error troubled three working zones, after understanding this fact, Wei Jie voluntarily to offer help and successfully reduce error rate of embedded parts 20% through optimizing technology.

During cooperation, outfitting “more and more got into a groove”, “In E3 and E4 pipe section outfitting process, technology optimization has commenced, E5 and E6 outfitting has entered standardization operation”. Wei Jie said.

In sinking pipe factory for pre-fabrication on Guishan Island, there are still many moving stories. This young and vigorous team constantly sweats and sings out song of youth during construction process of Hong Kong-Zhuhai-Macau Bridge Island Tunnel Engineering Project.