

A preliminary study on intelligent support system for High-quality development of Xiamen port

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Abstract: Xiamen Port is an important hub of the national comprehensive transportation system, a main coastal port of the container,a port of departurethe.It is the main carrier of Xiamen southeast international shipping center and an important port of exchange across the Taiwan straits.According to the master plan of Xiamen port (2035) issued by Xiamen port authority,it will actively promote the integration and structural adjustment of port resources, expand modern shipping services,to develop the port into a modern port with reasonable layout, perfect functions, advanced facilities, green security.The rapid development of Xiamen port is inseparable from the ship support for cargo transportation, but also from the port support system such as waterway, navigational service, maritime supervision, pilotage and rescue.This paper expounds the structure, implementation direction and implementation path of the support system, hoping to provide reference for relevant departments or personnel.

Key words: port, high quality, intelligent support

Xiamen Port is an important hub of the national comprehensive transportation system, a main coastal port of the container,a port of departure.It is the main carrier of Xiamen southeast international shipping center and an important port of exchange across the Taiwan straits. It is also an important support for the industrial layout and economic development of Xiamen and Zhangzhou.The port support system such as waterway, navigational service, maritime supervision, pilotage and rescue,are the important foundation for the sustainable, efficient, intelligent and green development of Xiamen port, and play an extremely key role in ensuring the normal operation of Xiamen port.From the perspective of external environment, with the continuous promotion of marine economic powerful nation strategy and the belt and road strategy, the standards for environmental protection are more stringent,Shipping safety and port security have drawn more attention from the public.From the internal perspective of Xiamen port,with continuous optimization of functional layout, improvement of port construction, more complex navigation environment and gradually increasing maritime activities,the higher requirements for waterway information, navigational service, emergency assistance and other services Ports have have been put forward.Therefore, we should make use of high-tech, information technology and refinement to build xiamen port with high quality.Adopt new technology, new mode and new system to create multidimensional maritime safety supervision to escort incoming and outgoing ships, provide guarantee for cargo transportation in Xiamen port, and contribute to the economic development of Xiamen.

I. Main components of intelligent support system of the port

(1) Waterway system

Waterway is the safe navigation channel,transportation hub and inevitable

channel for ships to enter and exit the water area of harbor. Waterway and port coexist mutually and provide the basis for the location layout of the water area of harbor. Scientific and reasonable construction ,maintenance and supervision of the waterway are the basic premise for ensuring the safety of navigation of ships, improving shipping capacity, improving operation efficiency of the port , increasing the cargo throughput, and preserving the ecological environment, which is of great significance to the high-quality development of ports.

High-quality construction of the port requires waterway authority to publish channel dimensions and real-time channel depth more scientifically and extensively, so that ships can master channel technical parameters at any time and ensure their own navigation safety. The construction and maintenance of the channel not only promotes the economic development of the port, but also brings heavy social burden, which has a negative impact on the ecological environment, marine organisms and hydrogeology. Based on the strategic thought of ecological civilization construction put forward in the 18th national congress of the communist party of China,the construction of ecological civilization of waterway is the policy requirement of sustainable development of waterway. Therefore, the current maintenance mode of channel should be transformed and adjusted along with the high-quality development of ports,and should provide support for port development and ecological channel management according to the construction of digital channel.

(2) Navigational service

Navigational service authority manages the AtoN, hydrographical survey of ports,navigational publications and radio navigation and safety communication which are kinds of the public security infrastructure. Navigational service conforms to the marine economic powerful nation strategy and the development of maritime economy.Navigational service is the eyes of navigators. Scientific, reasonable, normal and stable AtoN, accurate, timely, comprehensive and objective nautical chart ,stable and reliable Satellite communication and land communication, are related to the development of port and safety of ship . It is the basic, technical and guarantee work for the realization of navigation safety, the sustainable and healthy development of port and the development of Marine resources, and plays a vital role in the development of port.

Recently,navigational service has developed rapidly. There are built more than 400 AIDS to navigation,set up integrated navigation infrastructure such as differential DGPS , Beidou CORS station, AIS station, VHF communication and radar station in Xiamen port. In order to adapt to the needs of the development of ship, navigational service authority has built a platform for releasing navigational AIDS,created a palm APP- Hai E , electronic chart table and other information-based navigation aid products, hoping to provide more comprehensive navigation aid support for the development of Xiamen port.The high-quality development of the port requires the first-class navigational service to reach the advanced level of the world's navigational service. Advanced navigational service requires the use of big data, 5G, artificial intelligence, block chain and other advanced technological to build "smart navigational service", which can realize the self-perception, acquisition,

organization and distribution of information related to maritime traffic safety. It can provide on-demand, real-time, efficient, safe and environmental navigational service and make navigation safer, shipping cheaper, and oceans cleaner.

(3) Maritime supervision

According to laws and regulations of China, MSA is responsible for waterborne traffic safety supervision, prevention of ship pollution, environmental protection, survey of offshore installations and administrative enforcement of law. It also performs management functions such as production safety. Maritime supervision plays an important role in ensuring the normal operation of berths, maintaining shipping order and guaranteeing shipping safety. The level of maritime supervision is directly related to the safety of ships. The effective supervision of maritime affairs is to ensure the realization of "seaworthiness of ships, suitability of crew, safety and smooth, effective supervision and quality service", and to provide a safe, orderly and stable water traffic for port.

Through many years of efforts, Xiamen MSA has made great progress. It has built a series of management platforms such as CCTV, VTS (six stations and one center), VHF communication system, individual equipment for law enforcement, and ship dynamic management system, and other information systems such as ship inspection, ship supervision, crew management, danger prevention information and dangerous accidents. The application of these systems effectively maintains the navigation order of ships in ports and guarantees the safe navigation of ships. At present, MSA is facing a complex and severe situation, and the pressure of maritime supervision is increasing day by day. It is urgent to build an advanced intelligent scene by building a real-time, accurate, intelligent and efficient intelligent maritime supervision platform to realize the fine management of all elements such as wharves and ships in the area of jurisdiction.

(4) Pilotage and rescue

Pilotage is that which to provide pilotage service for local and foreign ships to enter and leave the port. It is to ensure the safety of ships, improve the traffic efficiency of ships and ensure the navigation environment by strengthening the ship control in technical aspects. Influenced by the IMO's E-Navigation plan, pilotage agencies in China have carried out the construction of pilotage informatization (E-Pilot) in different degrees in combination with their own development. Various new information technologies, such as electronic berthing instrument, pilotage dispatching system, dynamic monitoring system of ships and portable equipment, have been applied in pilotage. The application of these equipments has realized the networking, digitalization and intellectualization of pilotage business to a great extent, and has played a great role in ensuring safety, maintaining order, improving efficiency, enhancing the technical level and service capacity.

Maritime search and rescue involves prediction, monitoring, emergency disposal, communication and navigational service and others. With the economic development and ocean development of Xiamen port, the east port area of Xiamen, Gulei Port area, artificial channel dredging and other operations continue to increase, then navigation accidents are increasing, resulting in more complicated and onerous

search and rescue tasks.

II. Development direction and realization path of intelligent support system of port

In recent years, the Ministry of Transport and other ministries and commissions jointly issued the action plan for the development of intelligent ships, the guidance on the construction of world-class ports and the guidance on the development of intelligent shipping, which all pointed out the direction for the development of local ports and support systems of port including maritime supervision and navigational service. It indicates that China has made an important strategic choice for the development of ports and shipping. According to national relevant requirements of the development of intelligent ports, the coastal container hub will initially form a intelligent system with comprehensive senses and Widespread connectivity by 2025, and will basically build an intelligent system by 2035. Further improve the integration capabilities of technology and system of smart ports in the construction, operation and management, and form a smart port with "high efficiency, transparent management, sustainability, low-carbon" as the construction goal and "comprehensive perception, extensive interconnection, highly sharing, intelligent decision-making, independent operation and in-depth coordination" as the main characteristics.

(1) In-depth coordination and extensive interconnection to strengthen the core capabilities of ports.

Establish a supervision mode to promote and guarantee the high-quality development of the port, further expand the content of maritime service and supervision, and fully integrate and excavate the resources of each unit, to provide all-round, multidimensional technical support for the port operation, and to build a new business form matching the high-quality development of Xiamen port. Promote the construction of digital twin ports which are "comprehensive information perception, comprehensive coordination of factors, comprehensive intelligent production, transparent service" among the port operation, navigational service and maritime supervision. Expand and enrich the connotation and extension of management services, and provide standardized and comprehensive water traffic information. Different information resources can be unified planning, integrating and sharing to provide accurate services through big data, artificial intelligence and other technologies for analysis and processing.

Further expand maritime service content and supervisory means. In the support system of ports, various units such as MSA, channel security center, navigational service, pilot station and rescue bureau need to comprehensively integrate and deeply excavate the resources of each unit to provide all-round and multidimensional technical support for port operation. Take the port as the center to create and realize the full-time connectivity between the port and the ship, the port and the supervision department, the port and the navigational service, and to promote the construction of digital twin ports which are "comprehensive information perception, comprehensive coordination of factors, comprehensive intelligent production, transparent service" among the port operation, navigational service and maritime

supervision. Deepen the connection of intelligent production ,organization and scheduling in sea areas and ports to realize unified reporting, coordination, announcement and execution when ships entering and leaving ports. Expand and enrich the connotation and extension of management services, and provide standardized and comprehensive water traffic information. Different information resources can be unified planning, integrating and sharing to provide accurate services through big data, artificial intelligence and other technologies for analysis and processing, and contribute to the high-quality development of Xiamen port.

(2) Comprehensive perception, high degree of sharing, improve service level of the port.

Focus on improving the perception ability of navigation environment of port, to further expand the means of perception , broaden the scope of perception , improve the content of perception and improve the efficiency of perception .Realize real-time perception of navigation environment and Condition of ship ,information exchange between ship and shore,data aggregation and analysis between departments,and generate basic marine spatial geographic information, ships, marine meteorological environment and other relevant maritime safety information of Xiamen port in the whole region. Construct a modern intelligent water-traffic safety system of "land, sea, air and space" with dynamic perception of multi-dimensional , smooth information, rapid response and efficient command. Improve ship-to-shore communication network, and further build a positioning and navigation system covering inbound and outbound channels to ensure reliable, accurate and coordinated collection, integration, exchange, display and analysis of information between ship and shore, ship and ship .

Regional high-reliability geospatial information infrastructure will be built to provide high-precision ship positioning and navigational assistance, prediction and warning of navigation risks for ensuring ship safety. The construction and upgrading of the Enhancement system of Beidou and VHF shore-based stations which adapt to the application scenarios of sea surface coverage will achieve signal coverage of broadband along the coast 20-30km. Promote the construction of the Beidou navigation system , low-orbit communication satellites, maritime communication satellites actively. Based on the application of "sky" based resources such as communication satellites, through the analysis of remote sensing and telemetry of satellite , the real-time and effective perception of ships in Xiamen port is implemented to provide support for optimizing the allocation of security resources of port .

(3) Intelligent decision-making, low-carbon, supporting the sustainable development of the port.

Further collect and gather all kinds of maritime data , open up data of "islands" , integrate and build big data resource pools among ports, MSA, navigational service authority and ships, and establish a "big platform" for multi-party cooperation and mutual benefit. Integrate the data of ship sailing, berthing, pilotage, loading and unloading and other cycle information, and the elements such as traffic flow, risk, accident statistics, and functional divisions, to build

a unified "information platform of producting, scheduling and commanding of Xiamen port".Collect, integrate and clean the basic dynamic and static data, and build a data service platform for weather, channel and anchorage, AIDS to navigation and nautical chart.Provide ships with standardized and comprehensive information on water traffic services such as electronic charts, dynamics of AIDS to navigation, hydrometeorology, maritime safety information, etc., to achieve "one-screen grasp" of information of water traffic , "one-glance discovery" of navigation risks, and "one-click access" of supervision provisions, "one-click submission" of ship reports, "one-click application" for rescue ,to achieve "smooth communication" between ships and supervisory personnel, and to provide "full guidance" for ship navigation.Build a new model of "one ship panorama", "one port panorama", "one member panorama", "one company panorama" and "one domain panorama",and a "personnel integration", "power integration" and "command integration".Establish a second-level dynamic safety supervision center of "integration of personnel", "integration of affairs and powers", and "integration of command",which has set up a risk control center for "real-time warning", "search and rescue", and "intelligent investigation and punishment".And form a integrated water-traffic law enforcement system for "business coordination", "orderly traffic ", "Intelligent law enforcement", "rapid emergency response" .

III Conclusion

To achieve the high-quality development of Xiamen Port, it is necessary to comprehensively promote the construction of intelligent support system of ports.Establish a work pattern that supports the interconnection of all units in the system and a extensive interconnected mode for all port elements online and offline. Promote the construction of digital twin ports which are "comprehensive perception of information , comprehensive coordination of factors, comprehensive intelligent production, transparent service" among the port operation ,navigational service and maritime supervision.It is necessary to focus on improving the perception ability of navigation elements.Construct a modern intelligent water-traffic safety system of "land, sea, air and space" with dynamic perception of multi-dimensional dynamic , smooth information, rapid response and efficient command to improve the service level and management level of Xiamen Port, and to contribute to the economic development of the port.

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