INOVANCE

Port Applications and Solutions

Intelligent Solution with High Energy Efficiency



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Tailored for Harsh Working Conditions

Port transportation

As the gathering point and junction station of land and water transportation, ports undertake the comprehensive functions of berthing, loading and unloading, embarking and disembarking, and supplies replenishment in the international maritime cargo transportation. In addition, ports have a huge commercial radiation effect on the surrounding areas and inland areas. The efficient operation of ports will effectively promote the development of regional economy and trading.

Port businesses of Inovance Technology

Inovance Technology provides efficient and reliable electrical products, drive technologies, and solutions to meet the custom requirements of customers in the port and hoisting industries. With rich experience in industrial control and hoisting and its adaptivity to harsh working conditions, Inovance's well-proved solutions ensure the safety and reliability of equipment and low energy consumption to the greatest extent, while meeting the needs of high-performance hoisting.

In the era of efficient competition, Inovance Technology helps ports and hoisting machinery in implementing efficiency upgrading and import substitution in terms of automation, electrification, and intelligence for greener and smarter ports.

Business cases

China: Port of Shanghai, Port of Tianjin, Port of Qingdao, Port of Guangzhou, Port of Ningbo, Port of Hong Kong, Port of Qinghuangdao...

Overseas: PTP Malaysia, Costa Rica, NPCT1 Jakarta Indonesia...

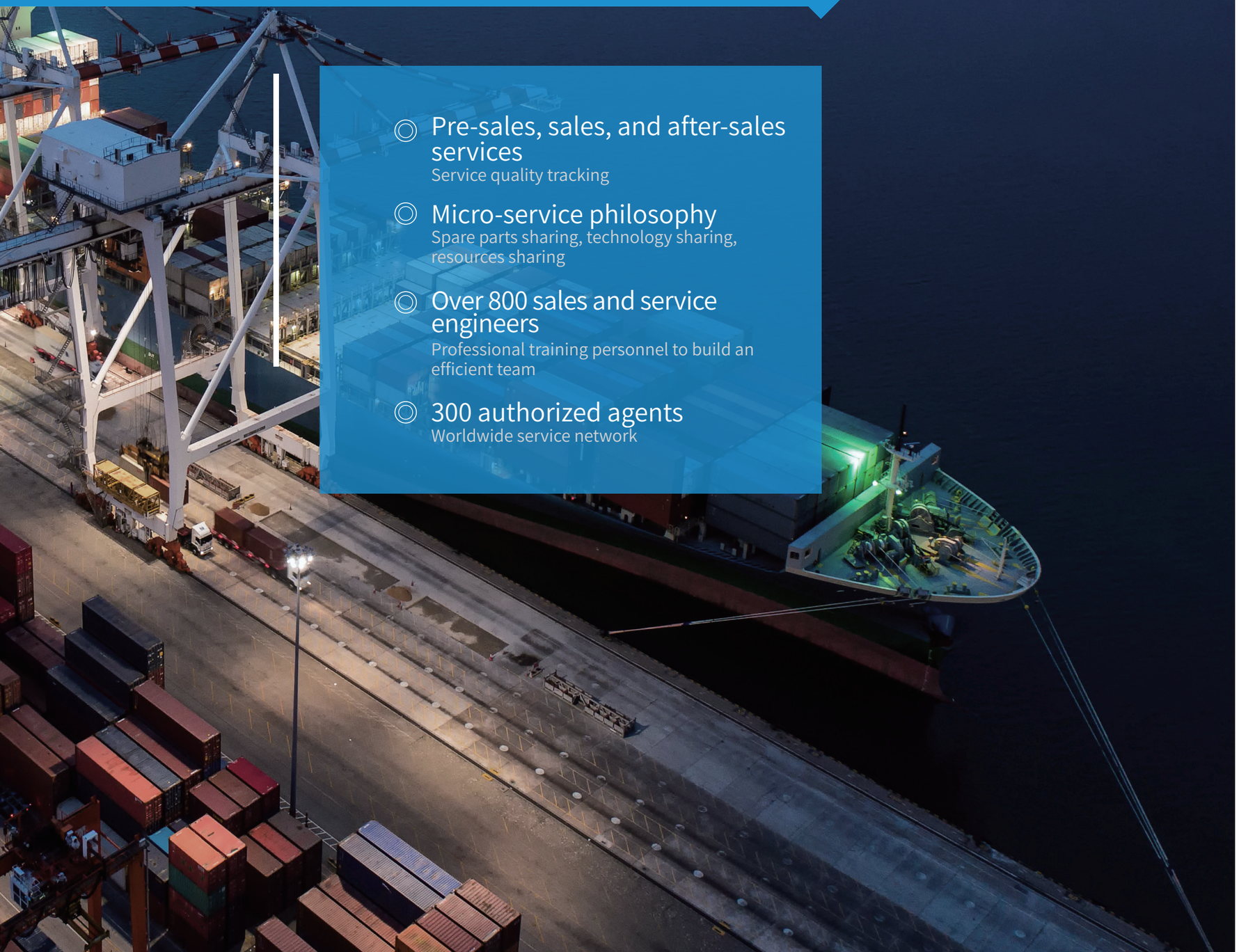
Green ports

- Energy conservation
- Emission reduction

Smart ports

- Control process module
- Smart

Reliable Partner Throughout the Lifecycle of Port Facilities



- **Pre-sales, sales, and after-sales services**
  Service quality tracking
- **Micro-service philosophy**
  Spare parts sharing, technology sharing, resources sharing
- **Over 800 sales and service engineers**
  Professional training personnel to build an efficient team
- **300 authorized agents**
  Worldwide service network

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Intelligent System Solutions

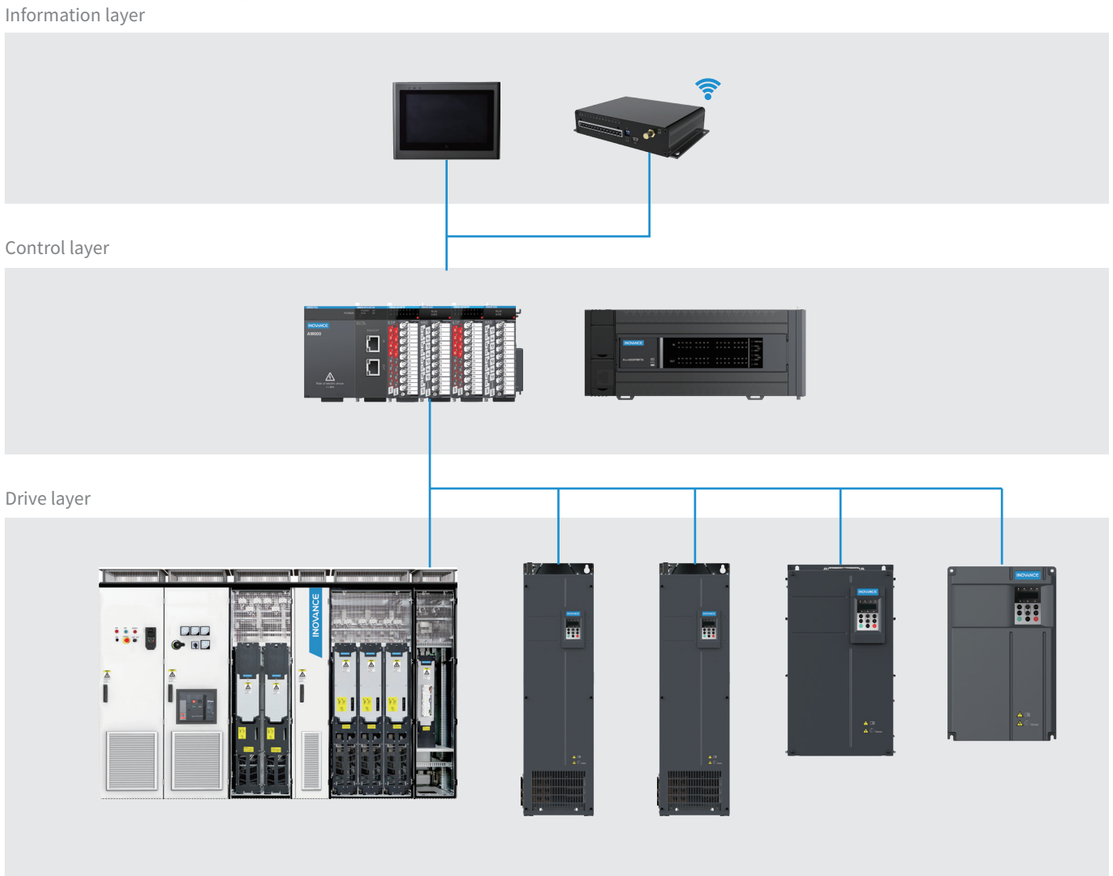
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Providing Reliable Products for Port Machinery and Equipment



MD880 Series AC Drive (Multidrive System)

An MD880 model is a high-end platform product. With single-motor drive and multi-motor drive topologies, MD880 series features high-end drive application, high-performance speed and torque control, high reliability, flexible system integration, convenient commissioning and maintenance, and high power density. The series sets an example in the industry with respect to model structure, power density, response, precision, and scope of application.

Power range

380 V: 2.2 kW to 4500 kW
690 V: 55 kW to 5600 kW

Basic features

· Hardware/Software modules matched freely, without changing parameters
· With ten-year service life and multiple troubleshooting mechanisms, production can be recovered within 30 minutes on average.
· Well compatible with all host controllers without changing the PLC program
· Professional configuration design, application setup with software InoDriveStudio, PC, and LCD operating panel

Applications

Port cranes and other heavy crane equipment, including quayside container cranes, grab ship unloaders, portal cranes, large shipbuilding gantry cranes, and large metallurgical casting cranes.

Mode of supply

Rectifier module, inverter module, and AC drive cabinet

MD050N Series Active Front End (AFE)

The MD050N series active front end (AFE) unit is an active power supply unit independently developed by Inovance Technology. The product can regenerate the energy produced by the motor in the braking process to the power grid to recover more than 95% of the regenerative electric energy while realizing effective braking.

Power range

380 V to 480 V: 45 kW to 450 kW
690 V: 55 kW to 560 kW

Basic features

The AFE provides multiple protection functions including overtemperature, overvoltage, and overcurrent protection, and features low noise, low harmonics pollution, and high power factor.

Applications

Hoisting loads such as RTGs, RMGs, and portal cranes.

Mode of supply

Rectifier module, inverter module, and AC drive cabinet

CS710 AC Drive for Cranes

The CS710 AC drive for cranes is tailored for all harsh working conditions in crane industries. Various hoisting process software is designed for hoisting applications to reduce the difficulty of field commissioning, without compromising high performance and functionality. Based on years of persistent pursuit of drive technology and experience in various industries, the company has great achievements in improving ease of use, maintainability, environmental friendliness, installation space, and design standards.

Power range

380 V to 480 V: 0.4 kW to 450 kW

Basic features

· The industry's high standard of design ensures high performance, high quality, and high power density, and improves user experience.
· Proprietary under-voltage protection, quick stop, and limited continuous duty, preventing the failure of hoisting hooks
· Accurate positioning, achieving accurate parking in the specified position with optimal efficiency without crawling
· Built-in trolley deviation correction, hoisting synchronization, accurate positioning, grab control, anti-roll control, and tower control modules

Applications

RTGs, RMGs, portal cranes, general cranes, and tower cranes

Mode of supply

Rectifier module, inverter module, and AC drive cabinet

CS600D Series Bi-directional DC Transducer

CS600D is a high-power DC/DC product developed by Inovance Technology for energy storage applications in ports based on the deep research of IGBT and power electronics industries. CS600D is connected between the bus and the energy storage components (batteries, ultra-capacitors) to realize charging and discharging.

Power range

200 A to 850 A

Voltage range

550 V-750 V for DC bus, and 200 V-550 V on the energy storage side

Basic features

· Free management of energy flow, manual/automatic charging and discharging
· The product has the function of voltage and current limiting to prevent the battery from over-charging and over-discharging or charging and discharging at high current, and effectively guarantee the service life of batteries.

Applications

Battery transition, hybrid RTG, eRTG, and energy storage

Mode of supply

DC transducer, DC transducer + modules, and cabinet

CS710-EPS Inverter Power Supply

The CS710-EPS series is a product dedicated to AC drives developed by Inovance Technology based on the CS platform.

Power range

37 kVA to 450 kVA

Input voltage

AC380 V-480 V, DC540 V-750 V

Basic features

· A power supply with constant voltage and constant frequency, equipped with a sine wave filter, can stably output 50/60 Hz AC.
· Features low harmonics, wide input voltage, and strong overload capacity.

Applications

Widely used in double-input AC drive, battery transition, and small capacity shore power.

Mode of supply

Inverter power supply, inverter power supply + modules, and cabinet

Quayside Container Crane System Solution



Configurations

MD880 AC drive (multidrive system)

Solution advantages

Implementation: Supplied in the form of a standard drive cabinet, standard design, production, and testing processes, and improved system reliability.

Modular design: All control units (HCU) are the same, with same power, same drive unit and power supply unit, and common parts. Modules can be freely and flexibly assembled to improve the flow efficiency of spare parts and shorten the troubleshooting time.

Free programming: Flexibly adapting to the communication program and well compatible with all host controllers without changing the PLC program.

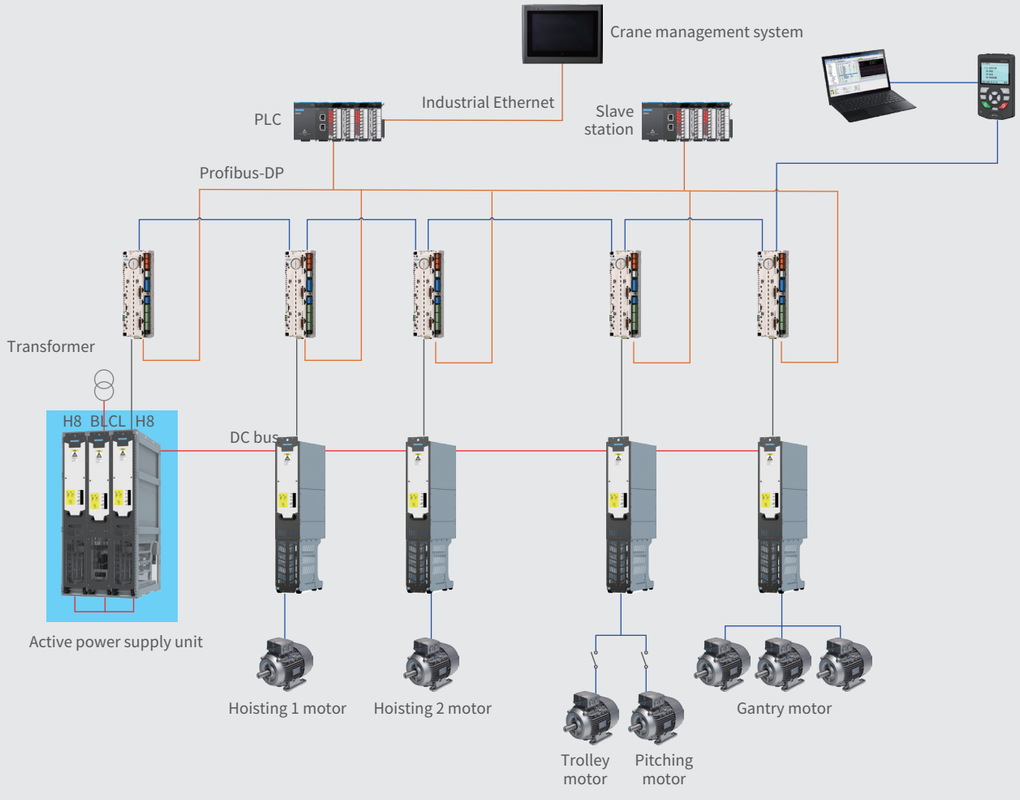
Special hoisting macro: Built-in special software to implement the following functions, including braking timing sequence, high speed at light load, and braking force detection.

High-end configurations: Selected automotive-grade components, strong overload capacity, and durable design.

Reference cases

Shandong Qingwei Port

Schematic Diagram of Typical Drive System of Quay Crane



RTG/RMG Crane System Solution

Configurations

MD050 series active power supply unit

CS710 AC drive for cranes

Solution advantages

Safety: Braking force detection.

Reliable: Dual redundancy with double power supply systems (diesel and grid power), ensuring that the system can work normally in both modes.

Energy efficiency: The off-grid energy can be recovered to the power grid for use by adjacent facilities, improving the energy efficiency by more than 30%.

Professional: Hoisting control macro, switching on or off at 0 Hz.

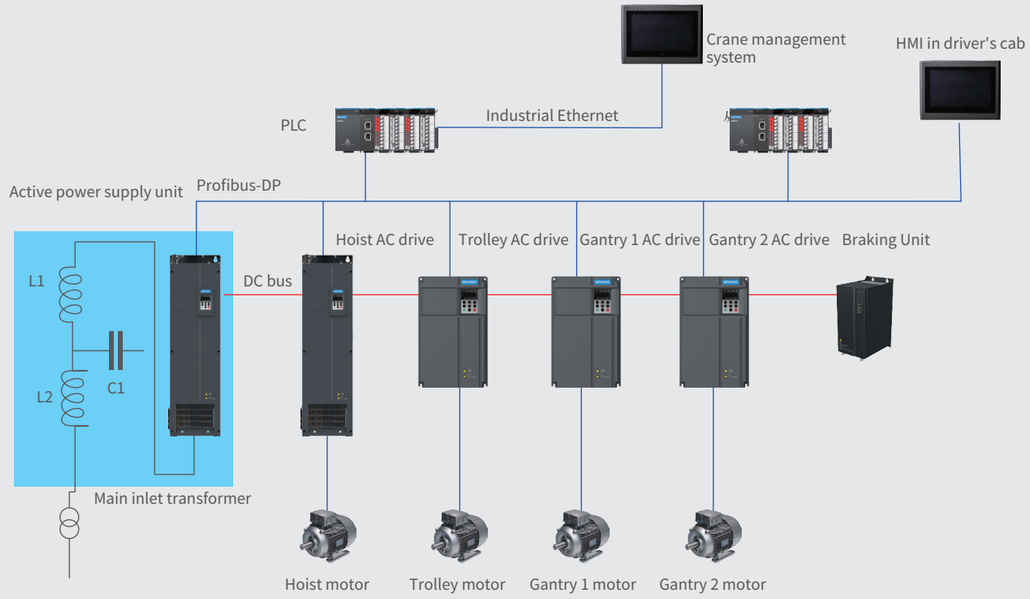
Ease of use: Custom parameters, easy and convenient commissioning and maintenance.

Reference cases

Shenzhen Yantian International Container Terminal, Tianjin Port Container Terminal, Xiamen Port Hairun Container Terminal, Port of Shanghai, and Port of Nantong.



Schematic Diagram of Typical Drive System of RTG



Portal Crane System Solution



Configurations

MD880 AC drive (multidrive system)

Solution advantages

Modular grab: The grab technologies such as deep cutting, rope adapting, and balancing are integrated into the AC drive and can be easily called without programming, eliminating difficulties in commissioning and maintenance.

Flexible rotation: A proprietary rotation algorithm is used to solve the contradiction between large inertia rotation start-stop response and jitter.

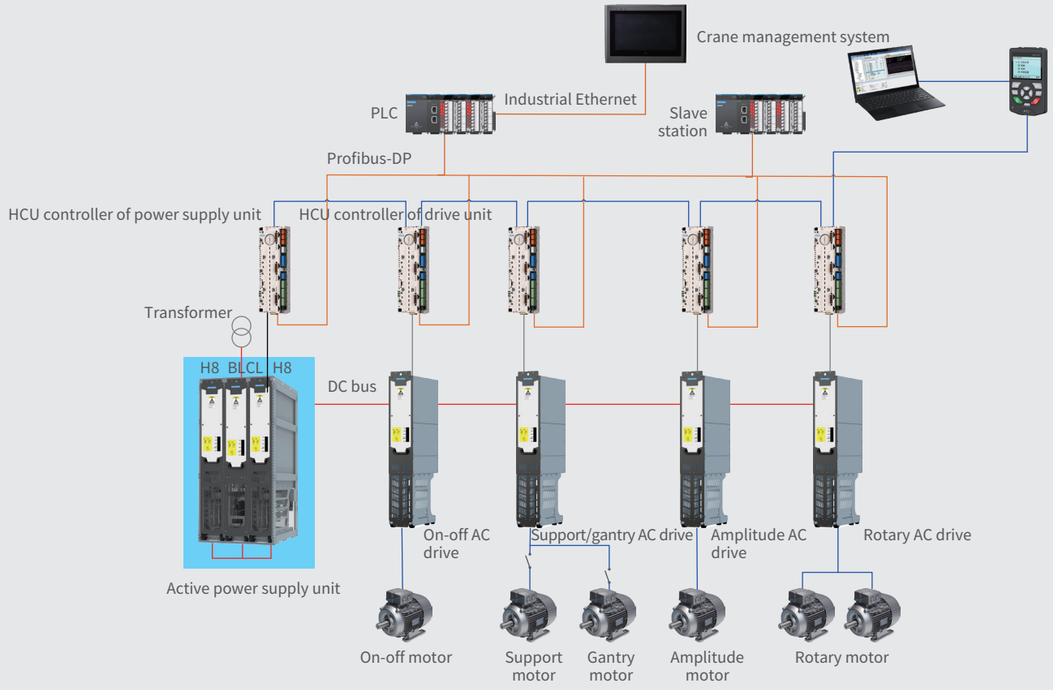
Implementation: Provide electric control according to product standards to improve the overall reliability of equipment.

Simple commissioning: Built-in complex processes, simple commissioning, and maintenance.

Reference cases

Port of Taizhou, Zhuhai Gaolan Port Co., Ltd., Port of Ma'anshan, Fuzhou Port Luoyuanwan Terminal, and Port of Jiangyin.

Schematic Diagram of Typical Drive System of Portal Crane



Ship Unloader System Solution

Configurations

MD880 AC drive (multidrive system)

Solution advantages

Implementation: Supplied in the form of a standard drive cabinet, standard design, production, and testing processes, and improved system reliability.

Modular design: All control units (HCU) are the same, with same power, same drive unit and power supply unit, and common parts. Modules can be freely and flexibly assembled to improve the flow efficiency of spare parts and shorten the troubleshooting time.

Flexible programming: Flexibly adapted to the communication program and well compatible with all host controllers without changing the PLC program.

Professional: Built-in special software to implement the following functions, including braking timing sequence, high speed at light load, and braking force detection.

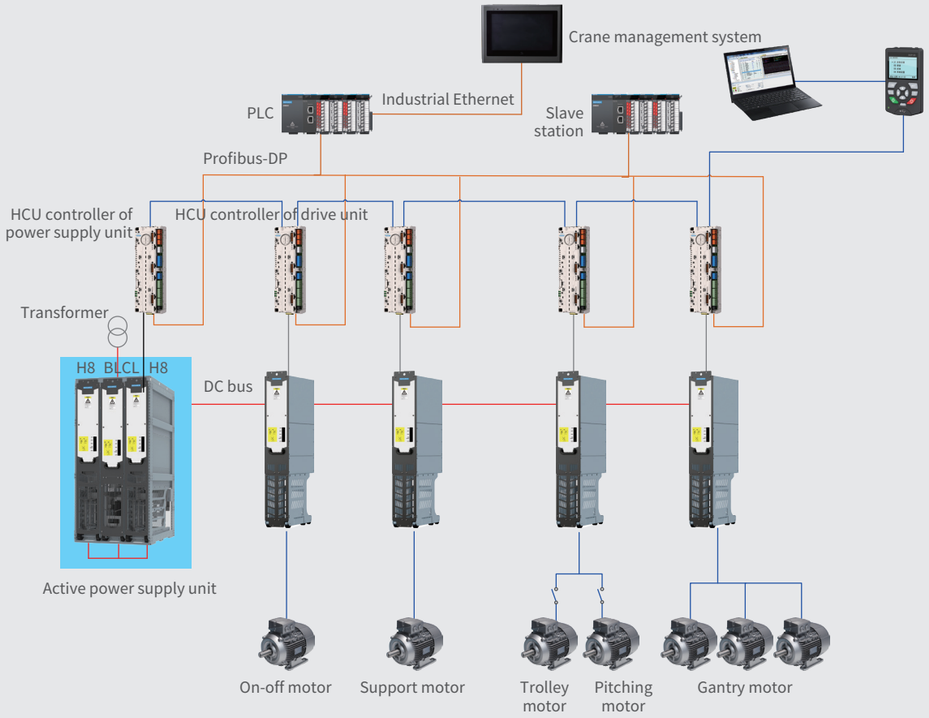
High-end configurations: Selected automotive-grade components, strong overload capacity, and durable design.

Reference cases

Ezhou Power Plant, shield tunneling machine terminal of China Railway 14th Bureau Group Corporation Limited.



Schematic Diagram of Typical Drive System of Grab Ship Unloader



RMG/RTG Semi-automatic Control System Solution

Description

The Yangshan Port automated terminal will set an example and lead the upgrading and transformation of traditional terminals, but the construction of a fully automated terminal will take a long time with high investment costs. Therefore, this may not be suitable for all terminals. Therefore, semi-automatic transformation is more valuable for traditional terminals as this can improve the safety and efficiency of equipment and improve the productivity of drivers.

Inovance's RMG/RTG semi-automatic control system solution

The production operations in terminals will not be affected during transformation and good adaptability is assured.

This can effectively improve the productivity of drivers, and enable one driver to operate multiple equipment, while effectively improving the working environment and workload of the drivers.

The safety of equipment will be improved to avoid production accidents caused by mis-operation.

Configurations

AM610 + CS710 + laser contour scanning

Solution advantages

Reliable: The combined laser scanning and vision system is used to adapt to outdoor operations in harsh environment in ports.

Safety: Features anti-collision, anti-hoisting of container trucks, and anti-bowling to avoid mis-operation.

Efficient: Features mechanism positioning, keyhole positioning, and container truck positioning, enabling one driver to operate several equipment.

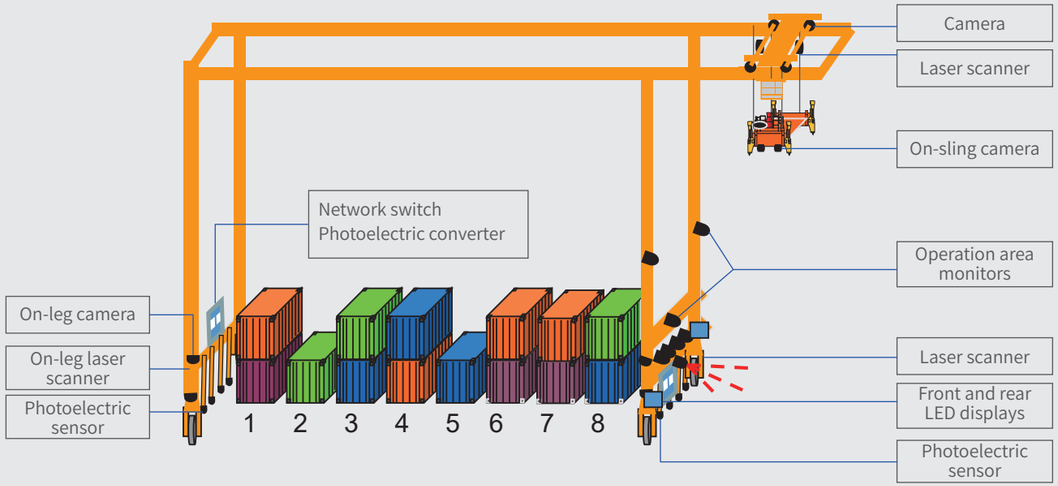
GPS positioning correction, slide wire distance correction, and visual detection white line correction.

Reference cases

China Waterborne Transport Research Institute (CWTRI) of the Ministry of Transportation and Zhuhai Hongwan Terminal.

Schematic Diagram of RMG Semi-automatic Control System

Loudspeaker
PC touch panel
Tablet PC
Container location management PC
Remote console



Portal Crane Semi-automatic Control System Solution

Description

Cargoes in bulk cargo terminals are mainly loaded and unloaded by drivers currently, which is a monotonous and repetitive work and prone to the collision accident of gantry crane boom due to mis-operation. With the development of various detection sensors and the maturity of various control technologies, such problems can be effectively solved.

Inovance's semi-automatic control system solution

By setting the coordinates, a portal crane automatically runs between the pickup point and the placement point to load and unload materials and realizes the semi-automatic loading and unloading operation.

Configurations

AM610 + CS710 + positioning and collision avoidance system

Solution advantages

Auto detection: Based on the closed-loop anti-rolling, this function can realize the three-dimensional anti-rolling of the grab and the detection of torsion and fracture of the wire rope.

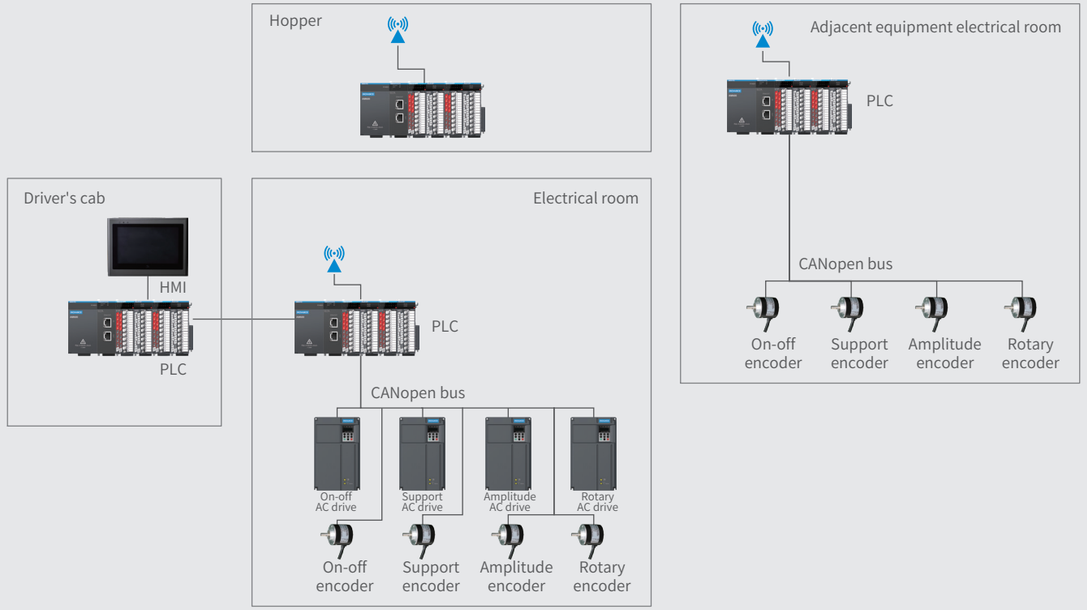
Grab control: Controls the grab capacity, automatically opens and closes the grab, and realizes load balance during hoisting without material leakage.

Automatic anti-rolling: Realizes the three-dimensional anti-rolling of the operating grab through visual imaging.

Boom anti-collision: Detects the position of the two adjacent portal cranes, realizes the anti-collision of boom and portal crane, and predicts the operation trend to activate the early warning system and automatically enable the avoidance mechanism.

Material detection: Detects the existence of materials at the discharge port. If the discharge port is blocked or full, there is a mechanism to pause the portal crane.

Schematic Diagram of Semi-automatic Control System of Portal Crane



Belt Conveyor Sync Direct Drive Solution

Description

A large number of belt conveyors are required for transporting and transferring bulk materials. The direct starting solution combining asynchronous motor, gear reducer, and hydraulic coupler is used mostly, which is not only inefficient but also results in a lot of energy waste.

Inovance's sync direct drive solution

The solution can directly drive production machines and features simply-structured drive train system, improved efficiency, reduced noise, maintenance-free property, and good economic value.

Configurations

MD880/HD9× series drive + permanent magnetic direct drive motor

Solution advantages

On-load start and stop: The breakaway torque can reach 2.2 times the continuous torque, which can meet the starting requirements at heavy load.

Reliable: IP67 rated. The N38UH high-grade permanent magnet is used for rotors to prevent demagnetization.

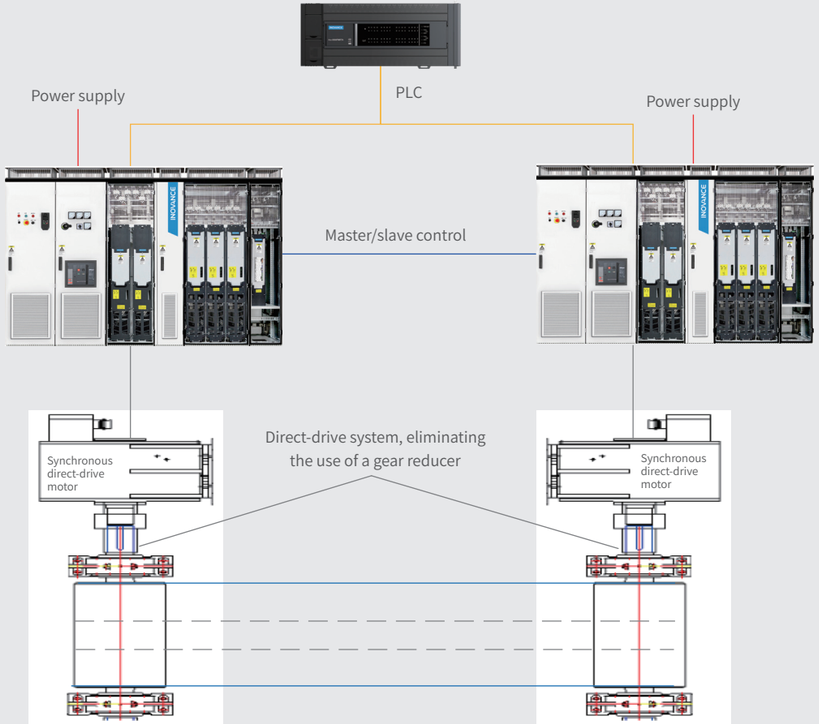
Efficient: Compared with "asynchronous motor + gear reducer + hydraulic coupler", the efficiency of a permanent magnetic direct drive system is increased by about 15%, saving a lot of electric energy.

Smart: As the intelligent module nearest to the equipment, the drive can obtain the real-time operation information of the equipment, sense the operating status and load flow through edge computing, and be expanded with the intelligent speed governing and system sequential starting.

Reference cases

Port of Qinhuangdao

Schematic Diagram of Belt Conveyor Sync Direct Drive System



ERTG Battery Transition Solution

Description

The RTGs that have been transited from diesel power to battery power still need to be powered by the original diesel generator. There are problems such as high engine maintenance costs and restart of the electric control system when switching from diesel power to battery power, which will affect the transition efficiency, exhaust gas emission, and noise pollution.

Inovance's ERTG battery transition solution

A battery pack is added as an energy storage element to provide power for the system during RTG transition. At the same time, an EPS is added to the DC bus of the system, inverting the DC power into three-phase AC power to ensure the continuous power supply to the control system.

Configurations

MD050N + CS710 + EPS inverter power supply

Solution advantages

Improved transition efficiency: The power supply of the electric control system can be switched with one button without the need of restarting, significantly improving productivity.

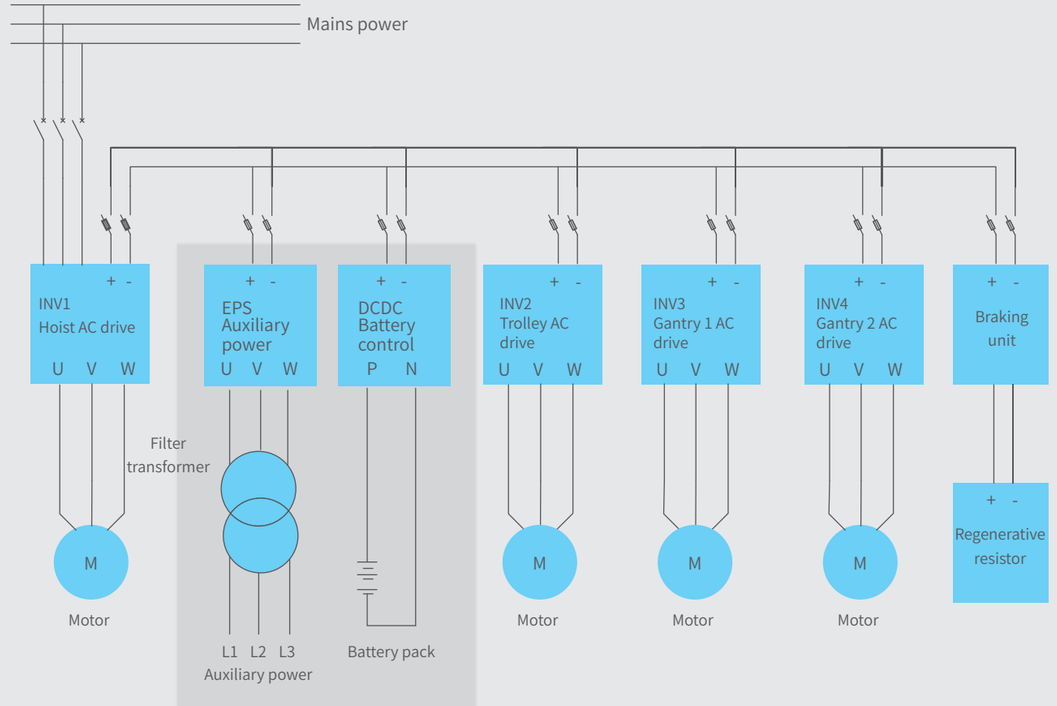
Energy conservation and emission reduction: No diesel engine, no emission, and no pollution, complying with the national and port energy conservation and emission reduction requirements.

Less commissioning and maintenance-free: The battery power supply system is maintenance-free, labor-free, and cost-free.

Reference cases

Port of Tanjung Pelepas (PTP), Malaysia
NPCT1 Terminal, Jakarta, Indonesia
Oriental Sea and Land Container Terminal Co., Ltd., Port of Tianjin
Tianjin Port Container Terminal Co., Ltd.

Schematic Diagram of ERTG Battery Transition System



Portal Crane Hybrid Power Solution

Description

A large amount of energy will be generated when a portal crane runs down during loading and unloading cargoes into/from ships.

Inovance's portal crane hybrid power solution

The electric control system uses DC bus and adds an ultra-capacitor bank as energy storage element to collect the energy generated in the lowering process for hoisting in the next cycle. This improves energy efficiency and effectively solves the problem of resistance consumption and the inability to collect energy-saving data.

Configurations

MD050N + CS710 + EPS inverter power supply

Solution advantages

Improved energy efficiency: Energy saving by more than 25% in a single cycle. Under normal operating conditions, there will be a return on investment in 3 years.

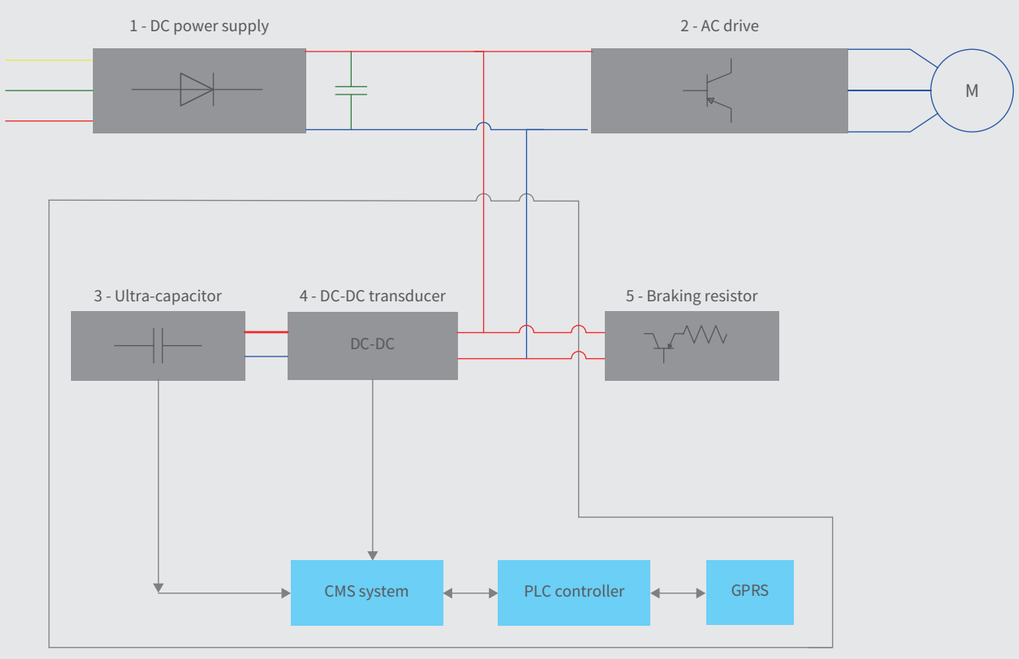
Stable individual energy flow: No impact on the power grid during hoisting and lowering.

Stabilized power grid by distributed energy storage: Peak-load shifting, solving the root cause of the impact of devices on the power grid.

Reference cases

Qingdao Port Dongjiakou Ore Terminal Co., Ltd., 2nd Branch of Rizhao Port Co., Ltd., Zhuhai International Container Terminal, and Zhanjiang Port Group Co., Ltd.

Schematic Diagram of Portal Crane Hybrid Power System



Intelligent Shore-to-Ship Power Supply System Solution

Description

Stopping the marine generator and switching to the shore power supply during berthing can reduce the operating loss of the marine generator, reduce the environmental pollution around the port, and achieve energy conservation and emission reduction.

Inovance solution

Inovance Technology provides a shore-to-ship power supply system solution, in combination with customized intelligent monitoring system and Internet of Things solution to achieve remote monitoring.

Configurations

HD90P series MD880 series

Solution advantages

Intelligent reverse power: A diode rectifier is used, without the need of adding hardware equipment. The software is used for AC drive control to prevent reverse power ultimately and guarantee the service life of the AC drive.

CBC control of inrush current: Suppresses the surge excitation current generated at the moment of closing when the load is provided with a transformer to avoid over-current fault.

Low harmonics: Low harmonics output at a low voltage. The output voltage harmonic is controlled within 3%-5% to provide stable power supply and ensure normal power supply to shipborne equipment.

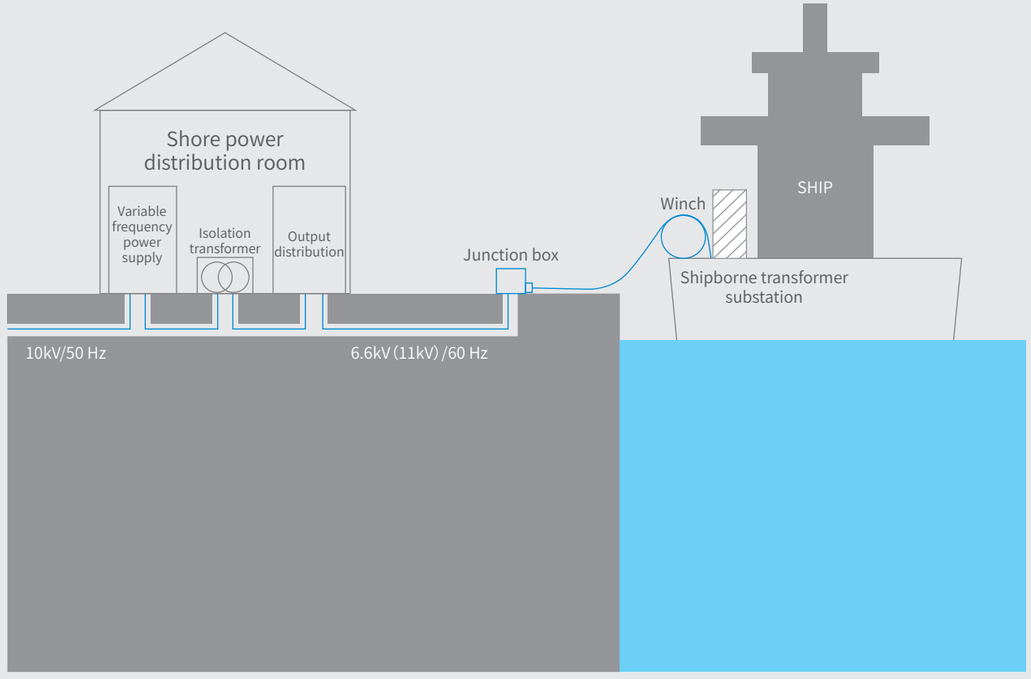
Remote monitoring: 24-hour 3G wireless communication is supported. System data can be accurately recorded to reduce the workload of field data acquisition and monitoring. A self-alarm mechanism is available to ensure safe and reliable operation.

Easy commissioning: Voltage and frequency can be separately controlled, and there is one button to switch between power supply specifications and output phase sequence.

Reference cases

Port of Dalian, Port of Jinzhou, Port of Taizhou, Port of Tangshan, Port of Tianjin, Port of Caofeidian, Port of Huanghua, Port of Suzhou, Port of Taicang, Zhenhua Base, Port of Ningbo, Port of Guangzhou, Port of Humen, and Merchants companies.

Schematic Diagram of Shore-to-Ship Power Supply System



Energy Management System Construction Solution

Description

This solution, based on power electronics technology, is a unified platform based on the energy flow direction of all the electrical consumers in the port, regardless of charging, discharging, or energy conversion. Therefore, this solution allows a decentralized layout of energies in the terminal, establishes a unified energy monitoring and management platform, and makes the energy utilization more efficient in the port.

Configurations

MD880 + PCS power supply + IoT module

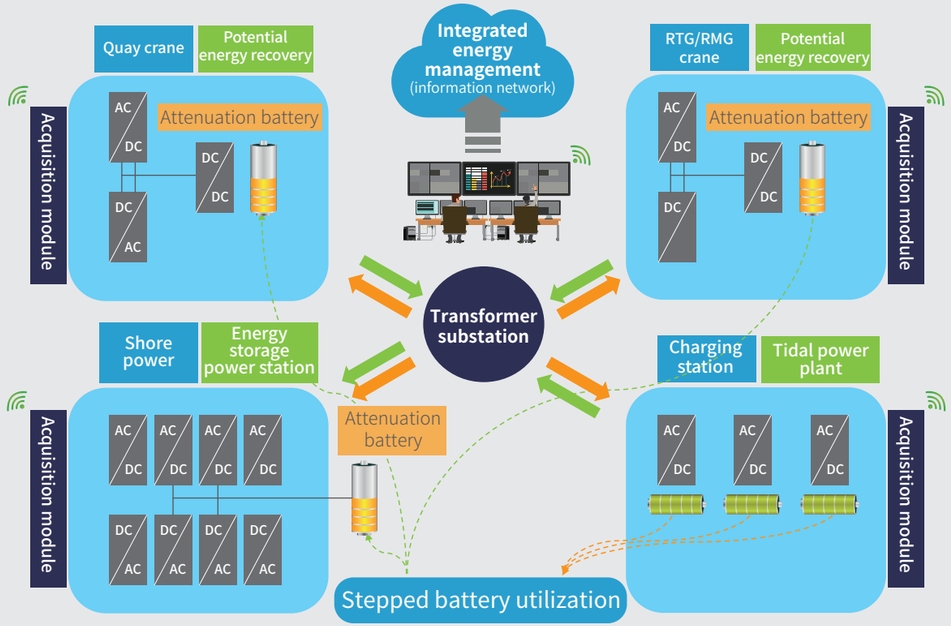
Solution advantages

Stable: A potential energy recovery device is installed in hoisting equipment to save energy of individual equipment, reduce the peak-valley impact of the power grid, and stabilize the power grid.

Energy efficiency: The waste batteries are utilized in a cascade manner and an energy storage device is added on the grid side to be used as an energy storage power station in ports.

Improved efficiency: Integrates a shore power supply system with charging pile to realize comprehensive utilization of existing resources.

Schematic Diagram of Energy Management System



Company Introduction



Shenzhen Inovance Technology Co., Ltd.

Headquartered in Shenzhen, Inovance has also set up subsidiaries in Suzhou, Hong Kong, and other places.

With its focus on automation, digitization, and intelligence in the industrial sector, Shenzhen Inovance Technology Co., Ltd. has engaged in the core technologies of "information layer, control layer, drive layer, execution layer, and sensor layer".

Through 17 years of development, Inovance's businesses extend to general automation, elevator electrical support, new-energy vehicle, industrial robotics, and rail transit. The products include: ① general automation business, including core components such as various AC drives, servo systems, control systems, industrial vision systems, sensors, high-performance motors, high-precision lead screws, and IoT products and optic-mechanical-electric-hydraulic integrated solutions. The main downstream industry includes: air compressor, 3C manufacturing, lithium, crane, machine tool, textile and chemical fiber, printing and packaging, plastics and rubber, metallurgy, petroleum and petrochemical, metal products, wire and cable, construction materials, mining, and injection molding machine. ② Elevator support business, including integrated elevator controllers (dedicated AC drives), HMIs, door systems, control cabinets, cables, cable harnesses, shaft components, and IoT products. Mainly provide integrated electrical support solutions for elevator manufacturers and the aftermarket of elevators. With the successful acquisition of Shanghai BST in 2019, Inovance further completed its product series such as human-machine interface, door system, and cables. ③ Business of new-energy vehicles including AC drives, high-performance motors, DC/DC and OBC power supplies, 5-in-1 AC drives, electric drive assembly, and power supply assembly. Mainly provide integrated solutions and services of low cost and high quality for new-energy commercial vehicles (including new-energy buses and new-energy logistics vehicles) and new-energy passenger vehicles. ④ Industrial robotics business including core components such as dedicated control system for robot, servo system, vision system, high precision lead screw, SCARA robot, and 6-axis robot, as well as downstream industry, which includes 3C manufacturing, lithium, photovoltaic, LED, and textile. ⑤ Rail transit business, including traction converters, auxiliary converter, HV box, traction motor, and traction systems such as train control and management system (TCMS). Mainly provide traction system and service for subway and light rail.

Inovance is a nominated National High-tech Enterprise that has been dedicated to R&D, production and sales of products in the fields of industrial automation and new-energy. Inovance not only masters the core technologies of products such as vector AC drives, servo system, programmable logic controller, encoder, and permanent magnet synchronous motor, but also grasp applied technologies in the fields of new-energy vehicle, elevator, crane, injection molding machine, textile, metal products, printing and packaging, and air compressor. By December 31, 2019, Inovance obtained 1,800 patents and software copyrights (excluding pending patents and copyrights), among which, 307 are patents of invention, 1,018 are patents of utility models, 278 are patents of designs, and 197 are software copyrights. In September 2010, Inovance released the IPO on the GEM Board of the Shenzhen Stock Exchange, and its stock code is 300124.

67 offices all over China **300** authorized distributors Over **800** sales service engineers

900 warranty centers **6** regional spare parts centers

All these help guarantee a timely response to the client's demand.

Reference Cases



1 Quay crane, Port of Qingwei, Shandong

The existing system was upgraded to the Inovance MD880 multidrive system.
Upgraded from basic rectification + dynamic braking to four quadrants, guaranteeing higher energy efficiency for returning the falling potential energy to the power grid.
MD880 was more compact and compatible with the existing facilities.
Flexible BICO self-programming capability. The DP communication unit of the existing system could be seamlessly integrated without the need of upgrading the host controller program.
System commissioning and PLC upgrading were completed synchronously.



2 800 t/h ship unloader in Ezhou Power Plant

Rated production capacity: 800 t/h.
Hoisting capacity (including grab): 20 t.
The system used MD880 AC drives to form a multidrive rectification feedback structure. The AC drives were modularly assembled to realize compact design and ease of installation.
Power factor＞0.99, harmonic current＜3%, dual redundancy, high reliability.



3 40 t-35 m portal crane, Haili Port, Shagang Group

Rated hoisting capacity: 40 t.
Hoisting speed: 35 m/min.
The Inovance multidrive system was used:
EMC design and thermal design were subject to verification under load conditions. The system was subject to aging test under load conditions before leaving the factory. The concept of integrated design improved the system reliability by an order of magnitude.
Modular and standardized design, with significantly reduced outline dimensions, and more reasonable room layout.
The multidrive rectification feedback structure improved energy efficiency by 30% and power factor up to 0.99, significantly reducing the current flow into the network.



4 Upgrading of RTG drive, Port of Yantian

Rated hoisting capacity: 40.5 t.
The electric control system used the Inovance CS series AC drive for cranes. A common DC bus was used for both the hoisting mechanism and gantry/trolley mechanism. Braking sequence and easy switchover between high speed at light load and low speed at heavy load were available for port cranes, featuring good safety, high reliability, and simple commissioning, and meeting RTG application requirements. Total 18 installations had been upgraded and our products and services had received favorable comments from customers.



5 RTG battery transition, Port of Xiamen

Based on the concept of green development, batteries were used instead of diesel generators according to the requirements of the Port of Xiamen. The CS600-D bidirectional transducer was used to charge and discharge batteries, improved the utilization of batteries, and guaranteed the service life. The use of CS710-EPS enabled sine wave power output at constant voltage and frequency. The seamless transition was implemented to meet customer requirements.



6 SMQB8038 portal crane, Port of Zhuhai

Rated hoisting capacity: 65 t under hoisting appliance.
Rated hoisting speed: 32 m/min.
In quick response to the Port upon AC drive failure of the existing system, the CS series AC drive for cranes was used instead to shorten downtime.
Strengthening prevention capabilities, improving the equipment reliability, reducing the failure rate of the equipment, and meeting the requirements of the Port according to the site requirements and the marine environment.



7 RMG remote control upgrading of CWTRI, MOT

Sample project for intelligent terminals. The Inovance solution was used. The combined laser scanning and visual detection system were used to adapt to outdoor operations in harsh environment in ports.
Safety: Features anti-collision, anti-hoisting of container trucks, and anti-bowling to avoid mis-operation.
Efficient: Features mechanism positioning, keyhole positioning, and container truck positioning, enabling one driver to operate several equipment.
Green: Features battery/ultra-capacitor energy storage, storing potential energy generated during lowering, shifting peak-load, and reducing system power.



8 Upgrading of direct-drive belt conveyor in Qinhuangdao

Conveying capacity: 6000 t/h.
Motor Power: 315 kW, 3 sets.
The Inovance HD9× series AC drive was used to a control permanent magnet synchronous motor (PMSM) to directly drive production machines, eliminating the use of a gear reducer and a hydraulic coupler.
Simply-structured drive train system, improved productivity, easy installation, and high energy efficiency.
Large breakaway torque and strong overload capacity.
Avoids grid and mechanical impact.
Intelligent speed governing.

Reference Cases

Device Type	Specifications	End User	Core Product
Quay crane system drive	40 t	Weihai Qingwei Container Terminal	MD880
Quay crane energy storage system	40.5 t	Yunfu Xingang Port, Zhuhai	CS600-D
Quay crane energy storage system	40.5 t	SINOTRANS Jiangmen Container Corporation, Guangdong	CS600-D
Ship unloader rectification feedback system	800 t/h	Ezhou Power Plant	MD880
Ship unloader rectification feedback system	600 t/h	China Railway 14th Bureau Group Corporation Limited	MD880
RTG electric control system	40.5 t	Yantian International Container Terminal	CS700
RTG electric control system	40.5 t	Zhuhai International Container Terminal (Gaolan)	CS700
RTG electric control system	40.5 t	Tianjin Port Container Terminal	CS710
RTG electric control system	40.5 t	Beilun 3th Container Co., Ltd., Port of Ningbo	CS710
RTG electric control system	65 t	Gaolan Port, Zhuhai	CS700
RTG electric control system	35 t	Zhuhai International Container Terminal (Hongwan)	MD880
RTG rectification feedback upgrading	40.5 t	Zhendong Container Terminal, Port of Shanghai	MD050N
RTG rectification feedback upgrading	40.5 t	Xiamen Hairun Container Terminal	MD050N
RTG rectification feedback upgrading	40.5 t	Port of Ningbo	MD050N
RTG hybrid power system	40.5 t	Yantian International Container Terminal	CS600-D
RTG hybrid power system	40.5 t	Zhuhai International Container Terminal (Gaolan)	CS600-D
RTG hybrid power system	40.5 t	International Container Terminal, Port of Hong Kong	CS600-D
RMG remote control system	40.5 t	China Waterborne Transport Research Institute (CWTRI) of the Ministry of Transportation (MOT)	CS710
E-RTG battery transition system	40.5 t	Xiamen Hairun Container Terminal	CS600-D/CS710-EPS
E-RTG battery transition system	40.5 t	Xiamen Haitian Container Terminal	CS600-D/CS710-EPS
E-RTG battery transition system	40.5 t	Port of Tanjung Pelepas (PTP), Malaysia	CS600-D/CS710-EPS
E-RTG battery transition system	40.5 t	Ningbo Daxie Terminal, CMICT	CS600-D/CS710-EPS
Electric control system for portal cranes	80 t-38 m	Gaolan Port, Zhuhai	CS700
Electric control system for portal cranes	40 t-35 m	TZ Terminal, Tianjin Lingang Port Corporation	CS700
Electric control system for portal cranes	40 t-35 m	Qinhuangdao General Cargo Port Corporation	CS700
Electric control system for portal cranes	40 t-35 m	Haili Port, Shagang Group	MD880
Electric control system for portal cranes	25 t-33 m	Taizhou Port Corporation	CS700
Electric control system for portal cranes	25 t-33 m	Ma'anshan Haichen Storage	CS710
Ultra-capacitor energy storage system for portal cranes	40 t	Qingdao Dongjiakou Port	CS600-D
Ultra-capacitor energy storage system for portal cranes	40 t	Port of Rizhao	CS600-D
Ultra-capacitor energy storage system for portal cranes	65 t	Port of Hongwan, Zhuhai	CS600-D
Ultra-capacitor energy storage system for portal cranes	40 t	Zhuhai Gaolan International Terminal	CS600-D
Belt conveyor direct-drive system	6000 t/h	6th Branch of Qinhuangdao Port Corporation	HD93, PMSM
Bucket-wheel drive system		SDIC Caofeidian Port Co., Ltd.	CS700
Bucket-wheel place/pick drive system		Qinhuangdao Port Service II Corporation	CS700
Port shore power supply	5 MVA	Port of Ningbo	HD90P
Port shore power supply	4 MVA	Port of Tianjin	MD880P
Port shore power supply	3 MVA	Port of Guangzhou	MD880P
Port shore power supply	3 MVA	Port of Dalian	HD90P
Port shore power supply	3 MVA	Port of Tangshan	HD90P