

How Intelligent Loading Arms Enable Unmanned Operations



Lianyungang, Jiangsu Mar 3, 2026 ([IssueWire.com](https://www.issuewire.com)) - As the global oil, gas, and chemical industries accelerate toward automation and digital transformation, terminal operators are increasingly pursuing safer, more efficient unmanned workflows. At the center of this evolution is the [Fully automatic intelligent loading arm system](#), which is redefining how bulk liquids are transferred in modern energy infrastructure. Lianyungang Hechang Machinery Co., Ltd., a specialist in fluid loading and storage solutions since 2009, is helping terminals worldwide transition from labor-intensive operations to highly automated, intelligent handling environments.

The Industry Shift Toward Unmanned Terminal Operations

Across refineries, LNG receiving stations, tank farms, and petrochemical terminals, operators face mounting pressure to improve safety, reduce labor dependency, and enhance throughput. Traditional loading arms require significant manual intervention for positioning, monitoring, and emergency response. These manual steps introduce risks such as human error, exposure to hazardous environments, and inconsistent loading efficiency.

In response, the industry is moving toward unmanned or minimally staffed terminals powered by intelligent equipment and digital control systems. Governments and major energy companies are also tightening safety and environmental regulations, further accelerating adoption of automated loading technologies. Intelligent loading arms now serve as critical infrastructure enabling remote operation, real-time monitoring, and predictive maintenance.

Hechang Machinery has aligned its product development with this global trend, delivering integrated solutions that combine mechanical engineering excellence with advanced automation technologies. The company's intelligent loading arms are designed not merely as mechanical devices but as smart terminal nodes within a fully digitalized energy logistics ecosystem.

How Intelligent Loading Arms Make Unmanned Operations Possible

1. Automatic Positioning and Alignment

One of the biggest barriers to unmanned loading has traditionally been the precise docking of the loading arm with tank trucks, railcars, or marine vessels. Hechang's intelligent auto-alignment technology uses sensors and control algorithms to automatically guide the arm into the correct position.

Key capabilities include:

Real-time position detection

Adaptive motion control

Anti-collision protection

Remote override capability

By eliminating manual guidance, terminals can significantly reduce operator exposure to hazardous zones while improving connection speed and accuracy.

2. Integrated Quantitative Loading Control

Accurate batch control is essential for both safety and commercial custody transfer. Hechang's quantitative loading control systems work seamlessly with intelligent loading arms to deliver precise, repeatable loading cycles.

The system enables:

- Automated preset batch loading
- High-precision flow measurement integration
- Automatic valve sequencing
- Real-time data feedback to control rooms

This level of automation ensures that once a loading task is initiated, the entire process—from arm positioning to flow cutoff—can proceed without manual intervention.

3. Multi-Layer Safety Interlock Architecture

Unmanned operations demand extremely robust safety protection. Hechang incorporates multiple redundant safety mechanisms into its intelligent loading solutions.

These typically include:

Emergency Shut Down (ESD) linkage

Overfill protection

Static grounding monitoring

Pressure and temperature alarms

Quick release hook integration for marine terminals

The multi-layer design ensures that even in abnormal conditions, the system can automatically respond to prevent spills, equipment damage, or safety incidents.

4. Remote Monitoring and Digital Connectivity

Digital visibility is the backbone of unmanned terminals. Hechang's systems support integration with DCS, PLC, and terminal management platforms, enabling operators to supervise loading operations from centralized control rooms—or even remote locations.

Key digital features include:

- Real-time operating status
- Fault diagnostics and alerts
- Historical data logging
- Predictive maintenance support
- Optional cloud connectivity

This transforms the loading arm from a passive mechanical tool into an intelligent, data-driven asset.

5. Intelligent Motion Control for Smooth Operation

Traditional loading arms can suffer from mechanical shock, uneven motion, and wear caused by manual handling. Hechang applies advanced hydraulic, pneumatic, and electric drive options with optimized motion curves to ensure smooth, controlled arm movement.

Benefits include:

- Reduced mechanical fatigue
- Longer service life
- Lower maintenance frequency
- Improved operational stability

This reliability is particularly important for high-frequency terminals pursuing continuous unmanned operation.

Broad Application Across Energy Infrastructure

Hechang's intelligent loading arm systems are widely deployed across multiple sectors, including:

- Oil refineries
- Petrochemical complexes
- LNG receiving terminals

- Tank storage farms
- Chemical industrial parks
- Marine loading jetties
- Energy engineering projects

Whether handling crude oil, refined fuels, LNG, or specialty chemicals, the company provides tailored configurations such as standard tanker arms, gantry types, cryogenic LNG arms, and intelligent auto-alignment models.

The flexibility of skid integration and modular engineering allows customers to scale from semi-automated facilities to fully unmanned terminals over time.

Proven Global Project Experience

Since its establishment in 2009, Lianyungang Hechang Machinery Co., Ltd. has built a strong track record in the energy handling sector. The company has served more than 2,000 domestic and international clients and successfully delivered over 6,000 projects.

This extensive project experience gives Hechang deep insight into real-world terminal challenges, including:

Harsh coastal environments

High-throughput tank farms

Hazardous chemical handling

Cryogenic LNG transfer

Retrofit of legacy terminals

By combining engineering expertise with field feedback, the company continuously refines its intelligent loading technologies to meet evolving customer requirements.

Full Life-Cycle Service Capability

A key advantage of Hechang lies in its comprehensive service model. Rather than supplying standalone equipment, the company provides full life-cycle support covering:

- Technical consulting
- Engineering design
- Equipment manufacturing
- Inspection and testing
- On-site installation guidance
- Commissioning support
- After-sales operation and maintenance

This end-to-end capability is particularly valuable for customers implementing unmanned terminals, where system integration and long-term reliability are critical success factors.

Supporting the Future of Smart Energy Logistics

As global energy infrastructure continues to digitalize, the demand for intelligent, low-risk, and labor-efficient loading solutions will only grow. Unmanned and remotely operated terminals are rapidly moving from concept to industry standard.

Hechang Machinery is actively investing in:

AI-assisted alignment technologies

Enhanced sensor fusion

Remote diagnostics platforms

Energy-efficient drive systems

Integration with smart terminal ecosystems

These innovations position the company to support next-generation facilities, including hydrogen energy terminals and ultra-low-temperature LNG projects.

About Lianyungang Hechang Machinery Co., Ltd.

Founded in 2009, Lianyungang Hechang Machinery Co., Ltd. specializes in loading, unloading, storage, and transportation system solutions for the oil, chemical, gas, and energy industries. Its product portfolio includes marine loading arms, tanker loading arms, fully automatic intelligent loading systems, quantitative loading control systems, quick release hooks, gangways, hose handling systems, steel trestles, and floating pontoons.

With a strong engineering foundation, extensive global project experience, and a commitment to innovation, Hechang continues to help energy terminals worldwide move toward safer, smarter, and more autonomous operations.

For more information, visit: <https://www.chinaloadingarm.com/>



Media Contact

Lianyungang Hechang Machinery Co.,Ltd

*****@lyghechang.com

8615261392066

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