

GWO LION 國聯機械



The World's First Fully Unmanned Factory for AI-Intelligent Wire Drawing Production

The AI-intelligent metal wire drawing production line enables a fully automated manufacturing model with 24-hour unmanned operation and remote factory monitoring. The system ensures complete control over wire quality throughout the production process, preventing defective products caused by human error or improper management. At the same time, it significantly reduces annual labor costs and improves overall production efficiency. With the implementation of an Auto-Learning System Software, even operators with little or no experience can easily operate the production line. The system is integrated with MES (Manufacturing Execution System) and connected with ERP systems to collect and analyze single-order production cost data. When combined with AI analytical modules, the system can gradually evolve into an intelligent decision-support platform—essentially functioning as a company-specific ChatGPT for production operations.

Integrated Intelligent Production Line

This production line is integrated through a centralized **SCADA control system**, which unifies the programming languages and communication protocols of all equipment. The mechanical equipment includes:

- AGV Automatic Lifting Compression Transport Vehicle
- Intelligent Rotating Electric Feeding Machine
- Robotic Arm Wire-Hanging Device
- Intelligent Wire Feeding and Straightening Device
- Intelligent Automatic Wire Pointing Device
- Intelligent Inverted Wire Drawing Machine System
- Gantry Robot Discharge Conveying System
- Intelligent Wire Compression, Steel-Strip Strapping, Weighing and Labeling System
- RGV Roller Conveyor Transfer Vehicle

The central SCADA system collects and stores all production data and displays it in a central control command center, where monitoring personnel can oversee the entire factory's operations in real time. The system provides a unified communication platform for various programming languages, enabling seamless fully automated production processes. The production line is designed with collision prevention systems, error-prevention mechanisms, and automatic error-correction functions. Each stage includes safety checkpoints to prevent equipment collisions and ensure 100% industrial safety accident prevention.

Auto-Learning System

The Auto-Learning System Software records operational parameters when operators manually confirm machine characteristics for different materials and wire diameters. Once each process step is verified as correct, the system automatically stores the parameters as a process recipe. When the same production conditions occur in the future, the stored recipe can be selected, and the production program will automatically load into the production line. Integrated with the MES system, production orders can be automatically assigned to specific production lines, while the corresponding production recipes are simultaneously loaded into the system. The production line supports both manual and automatic operation modes, and all operational activities are fully recorded in data logs. By integrating AI analytical modules, the system can analyze and determine:

- Optimal equipment operating procedures
- Maximum production efficiency workflows
- Optimal power consumption modes

The system can also automatically receive MES data and connect with ERP systems to calculate per-order production costs. Through centralized monitoring and integrated software systems, together with production line monitoring cameras, every process and operation can be supervised. With SCADA handshake communication, all production data becomes transparent, enabling effective tracking, review, and optimization of production performance.

Digital Twin Smart Factory

The smart factory platform includes a Digital Twin system, consisting of:

- Automatic data collection
- Process monitoring and data analysis
- Equipment Overall Equipment Effectiveness (OEE) analysis
- 3D workshop visualization

Through data acquisition, analysis, and algorithm processing, the system enables the digitalization and intelligentization of wire manufacturing production lines. This intelligent wire drawing factory continuously improves production conditions through AI production analysis, making the entire manufacturing process more visualized, transparent, and optimized. Ultimately, the factory operates like a living AI-driven autonomous management system, transforming the traditional image of the wire manufacturing industry into a modern intelligent manufacturing model.

System Architecture

The **Intelligent Wire Drawing Production Line System** consists of multiple software systems, including:

- Production Operation System (Central SCADA Control System)
- Process Monitoring System (L2 Level-2 Control System)
- Wire Weighing, Compression, and Packaging System

During production, the system communicates in real time with several other systems, including:

- AGV Automated Material Handling Dispatch System
- Heat Treatment Spheroidizing Process Information System (MES L2 Control System)
- Inbound and Outbound Production Line Systems
- Intelligent Logistics System
- Smart Warehouse Management System (WMS/WME)

Together, these systems enable fully automated and intelligent operation of the entire factory production line. ■

