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Foundry Line-2 Sand Plant

Industrial Sand Processing & Quality Control

Dual PLC Integration with MySQL Database

| Cooler PLC | Mixer PLC | MySQL Database |

System Overview
Dual PLC Sand Processing Monitoring

Foundry Line-2 Sand Plant monitors critical parameters from Cooler and Mixer PLCs for quality control

🏭 Dual PLC Architecture: Independent Cooler PLC (192.168.1.11) and Mixer PLC (192.168.1.10)

🌡 Cooler Monitoring: Sand temperature, moisture, air parameters, water pressure, drive current

🛒 Mixer Monitoring: Recipe/batch tracking, sand quantity, additives (bentonite, coal dust, water)

💾 MySQL Database: XAMPP-based local database with automated shift-based data logging

⏱ Real-Time Updates: Cooler data every 10 seconds, Mixer data on batch pulse completion

📊 Shift Management: Automatic A/B/C shift detection based on time windows

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Key Features & Capabilities
Enterprise Sand Processing Solution

I. Multi-PLC Integration: SNAP7 library supporting simultaneous Cooler and Mixer PLC connections

II. Configurable Parameter Mapping: Master settings dialog for flexible PLC memory address configuration

III. Batch Pulse Detection: Monitors DB1.DBX64.0 bit for mixer batch completion trigger

IV. Database Synchronization: Automatic table creation with proper data types (FLOAT, INT, VARCHAR)

V. Connection Health Monitoring: Real-time PLC and database status with green/red indicators

VI. Auto-Connect on Startup: Configurable automatic PLC connection when application launches

VII. Comprehensive Logging: Timestamped system events with color-coded status messages

VIII. Data Quality Tracking: Bad batch count, compactability targets, and quality metrics

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System Configuration
PLC & Database Settings

Key Features:

1. PLC Settings: Cooler PLC (192.168.1.11) and Mixer PLC (192.168.1.10) with Rack 0, Slot 1 configuration

2. Database Config: localhost:3306 MySQL server with 'foundary' database name and root user credentials

3. Connection Test: Purple 'Test DB Connection' button verifies MySQL connectivity before operation

4. Action Buttons: Master Parameter Settings (purple), Connect to PLCs (green), Disconnect (red), Stop Monitoring (orange)

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Real-Time Monitoring
Live Cooler Data Display

Key Features:

1. Dual Status: Green indicators showing both Cooler and Mixer PLCs connected with auto-connect enabled

2. Shift Selection: Dropdown to manually select shift (A/B/C) for proper data categorization

3. Event Log: Real-time monitoring status with timestamps - 'Cooler data stored', 'Monitoring started', 'Batch complete pulse'

4. Live Data Table: Continuous cooler parameters - Inlet/Outlet sand temp & moisture, intake/outtake air temp (updates every 10s)

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Technical Architecture
System Design & Data Flow

I. PLC Communication: S7-1200/1500 series Siemens PLCs

II. Memory Access: Direct DB (Data Block) reading with configurable offsets for Real, Int, Bool data types

III. Cooler Parameters (9): Temperature/Moisture (inlet/outlet), Air temp (intake/outtake), Water pressure, Differential pressure, Drive current

IV. Mixer Parameters (15): Recipe/Batch numbers, Sand quantity, Additives (Bentonite, Coal, Water), Quality metrics

V. Database Schema: Separate tables for cooler_data and mixer_data with timestamp, shift, and all parameters

VI. Threading Model: QTimer-based polling (10s cooler, 1s batch pulse check) on main GUI thread

VII. Data Persistence: JSON configuration files for PLC settings, database credentials, parameter mappings

Cooler PLC Data Points

I. Inlet Sand Temperature (DB1.DBD0): Measures incoming sand temperature before cooling process

II. Inlet Sand Moisture (DB1.DBD4): Pre-cooling moisture content for process control

III. Outlet Sand Temperature (DB1.DBD8): Cooled sand temperature verification

IV. Outlet Sand Moisture (DB1.DBD12): Final moisture content after cooling

V. Intake Air Temperature (DB1.DBD16): Cooling air inlet temperature monitoring

VI. Outtake Air Temperature (DB1.DBD20): Exhaust air temperature tracking

VII. Water Pressure (DB1.DBD24): Cooling water system pressure monitoring

VIII. Differential Pressure (DB1.DBD28): Air pressure drop across cooler

IX. Cooler Main Drive Current (DB1.DBD32): Motor load and power consumption

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Mixer PLC Data Points
Batch Recipe & Quality Control

I.   Recipe Number (DB1.DBW60): Active recipe identifier for batch formulation

II.   Batch Number (DB1.DBW62): Sequential batch counter for traceability

III.   Sand Quantity (DB1.DBD70): Base sand weight in batch mixture

IV.   Bentonite (DB1.DBD74): Clay binder additive quantity

V.   Coal Dust (DB1.DBD78): Carbon additive for casting quality

VI.   Fine Dust (DB1.DBD82): Supplementary fine particle additive

VII.   Water Actual (DB1.DBD86): Measured water addition to batch

VIII.   Mixer Drive Current (DB1.DBD90): Mixer motor load monitoring

IX.   Compactability Target (DB1.DBD94) & Bad Batch Count (DB1.DBW98): Quality metrics

Foundry Multi-PLC Data Acquisition

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Data Management
MySQL Database Integration

Database Engine: MySQL/MariaDB via XAMPP connection

Auto Table Creation: Dynamic schema generation on first connection with proper column types

Cooler Data Logging: Continuous 10-second interval storage with timestamp and shift

Mixer Data Logging: Event-driven storage on batch pulse detection (DB1.DBX64.0)

Shift Tracking: Automatic A/B/C shift assignment based on time windows

Data Integrity: Transaction-based inserts with error handling and rollback

Query Optimization: Indexed timestamp columns for fast historical data retrieval

Connection Pooling: Persistent database connections with automatic reconnection

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📊 Quality Assurance: Real-time monitoring ensures consistent sand properties for casting quality

⏱ Traceability: Complete batch history with recipe, quantities, and quality metrics

🔍 Process Optimization: Historical data analysis identifies optimal cooling and mixing parameters

💰 Cost Reduction: Early detection of process deviations reduces scrap and rework

☑ Productivity: Automated data collection eliminates manual logging and reduces operator workload

🛡 Compliance: Audit-ready database records for quality certifications (ISO, automotive)

Applications: Foundry sand preparation, green sand systems, resin-coated sand mixing

Industries: Automotive casting, industrial machinery, pump & valve manufacturing

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Transform Your Foundry Operations

Our Multi-PLC Data Acquisition System delivers comprehensive sand plant monitoring for superior casting quality and operational efficiency.

THANKYOU

Contact Us

✉ Email: mahaboob@jvsol.co.in

🌐 Website: www.jvsol.co.in

📱 Phone: +91-7795345309, 9380905907

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