Brief History of Programmable Logic Controllers (PLCs)

Programmable Logic Controllers (PLCs) have their roots in the industrial automation boom of the late 1960s. Prior to their invention, manufacturing systems used complex relay-based control systems, which were inefficient, bulky, and difficult to modify. Changes to a system required rewiring of entire control panels, which was time-consuming and prone to errors.

Key Milestones in PLC Development:

1. 1960s - The Birth of PLCs:

- The automotive industry, particularly in the United States, needed a solution for flexible and efficient control systems that could be easily reprogrammed for different tasks.
- In 1968, Dick Morley and his team at Bedford Associates developed the first PLC, which they called MODICON (Modular Digital Controller). This invention was driven by the General Motors (GM) demand for a more efficient way to rewire production lines.
- The first PLCs replaced hard-wired relay logic systems with software-based solutions, making it easier to control processes and implement changes by simply reprogramming.

2. 1970s - Early Adoption:

- Following General Motors' adoption, other industries began to use PLCs due to their flexibility and reliability. During this period, companies like Allen-Bradley (now Rockwell Automation) also began developing their PLCs.
- These early PLCs supported basic logic functions like AND, OR, and NOT, replacing the need for relay logic systems.

3. 1980s - Growth and Standardisation:

- As PLCs gained popularity, manufacturers began developing standardised communication protocols to allow PLCs to interact with other automation equipment.
- Advances in technology led to the integration of more complex functions such as analogue input/output, PID control, and communication capabilities like Modbus.

4. 1990s - Expanding Capabilities:

- The 1990s saw PLCs become more powerful, with the ability to handle more inputs and outputs, perform complex computations, and interface with higher-level systems like SCADA (Supervisory Control and Data Acquisition).
- During this era, PLCs started incorporating networking technologies, enabling remote control and monitoring.

5. 2000s - Modernisation and Smart PLCs:

- Modern PLCs are highly versatile, integrating communication protocols such as Ethernet, EtherCAT, and even wireless technologies. They can control entire production lines with thousands of I/O points, perform real-time data analysis, and connect to cloud platforms.
- Many PLCs now incorporate features like motion control, robotics, and support for IoT (Internet of Things), making them key components in Industry 4.0 automation.

Why PLCs Were Created:

PLCs were designed to replace the traditional relay-based control systems. Their key advantages include:

- Flexibility: Reprogramming the system is easier compared to physically rewiring a control panel.
- Reliability: PLCs offer higher reliability and less maintenance than mechanical relays, which degrade over time.
- Speed: PLCs execute operations faster, resulting in more efficient and accurate production processes.
- Scalability: PLC systems can be easily expanded with additional modules for I/O, communication, or motion control.

Uses of PLCs:

PLCs are widely used across industries for automation purposes, controlling machinery, and automating production lines. Their applications include:

- Manufacturing: Controlling assembly lines, robotic systems, and material handling processes.
- Process Control: Monitoring and controlling variables like temperature, pressure, and flow in chemical, oil, and gas industries.
- Automotive: In vehicle manufacturing for controlling tasks like welding, painting, and assembly.
- Packaging: Automating packaging, labelling, and sorting systems.
- Utilities: Used in water treatment plants, power generation, and distribution to monitor and control operations.

PLCs remain crucial to modern industrial automation, helping industries increase efficiency, reduce errors, and maintain flexibility in production systems.

Introduction to Wecon and its PLC Development

Wecon is a manufacturing company that specialises in the development and manufacturing of industrial automation products, with a strong focus on [Programmable Logic Controllers (PLCs)](#). Founded in 2011, Wecon has grown to become a key player in the automation industry, providing reliable, cost-effective solutions for various industrial sectors.

Wecon's Focus on PLC Development:

Product Range:

Wecon offers a wide range of [PLCs](#), catering to small and medium-sized industrial control systems. Their [PLCs](#) are designed to meet different needs, from basic automation tasks to more advanced motion control applications.

Technological Advancements:

Wecon continuously develops its PLC technology to keep up with industry demands. Their product lines, such as the LX series (LX3V, LX5S, LX5V, and LX6), demonstrate advancements in processing speed, memory capacity, and communication capabilities.

User-Friendly Design:

A key goal of [Wecon's PLC](#) development is to provide user-friendly solutions. Their products are designed to be easy to program and configure, making them accessible even to users with limited technical knowledge.

Industrial Applications:

[Wecon's PLCs](#) are used across various industries, including manufacturing, energy, and transportation, providing efficient control over production processes and machinery.

LX5S Series:

- High-performance small PLC, derived from the LX3V, but with much-improved specifications.
- Key Features:
    - Pulse input/output supports high-speed operation with precise control.
    - High execution speed: 0.03-0.08μs, supporting up to 100 high-speed counter interrupts.
    - Functions like E-CAM, electronic gear, and efficient PID and CCPID self-tuning are available.
    - Supports LX3V series expansion modules.
    - Communication & Power: RS485, USB for program download, AC/DC power options.
    - Available in models with different I/O configurations (e.g., 08/06, 12/08, 16/16, etc.).

LX5V Series:

- This is the flagship small PLC from Wecon, boasting superior performance over the LX3V.
- Key Features:
    - Fast execution speed: 0.01-0.03μs.
    - Supports advanced motion control with up to 8 high-speed pulse outputs.
    - High memory capacity (512KB) for large programs and 100 high-speed counting interrupts.
    - Ethernet support along with other communication ports (RS422/485).
    - Available in several I/O configurations similar to LX5S.

LX6 Series:

- High-performance medium-size controllers intended for advanced applications.
- Key Features:
    - Supports EtherCAT, Ethernet, and multi-axis motion control.
    - Advanced motion control features including support for camming, interpolation, and superposition.
    - Different models (LX6V, LX6S, LX6C) offer various configurations for I/O and performance.

o Programmed using CODESYS, supporting various IEC 61131-3 languages.

Deep Dive Wecon PLC's

1. LX5S Series

Overview:

The LX5S series is a high-performance small PLC that offers a significant performance improvement over the LX3V series. It's designed for applications that require precise control and faster processing.

Key Features:

- Execution Speed: Supports 0.03-0.08μs execution time for basic instructions, making it much faster than the LX3V.
- High-Speed Pulse Output/Input: Supports up to 2 channels of 200KHz high-speed pulse output and 6 channels of 150KHz high-speed input, allowing for more precise motion control.
- Interrupt Handling: Supports up to 100 high-speed counter interrupts and 100us high-speed timer interrupts, which is ideal for applications that need fast responses.
- PID Control: Includes efficient and stable PID and CCPID self-tuning for controlling continuous processes.
- Communication & Expansion: Compatible with RS485, RS422, and supports LX3V series expansion modules and BD boards for added flexibility.

Applications:

- General Process Control: Reliable for standard automation tasks where high precision or high-speed operation isn't critical.
- Precise Motion Control: Ideal for controlling servo motors, stepper motors, and other equipment requiring high-speed and precise movement.
- Industrial Automation: Suitable for automated production lines where speed and accuracy are essential.
- Food Processing Equipment: Well-suited for tasks requiring PID control for temperature or pressure regulation.
- Packaging Systems: Suitable for controlling conveyors, sorting machines, and packaging equipment.
- General Process Control: Reliable for standard automation tasks where high precision or high-speed operation isn't critical.

Why Useful:

The [LX5S series](#) offers high-speed processing and precise control features that are important for applications where timing and accuracy are crucial. It's an affordable option for those who need either general process control or precise motion control without the high cost of the [LX5V series](#).

2. [LX5V Series](#)

Overview:

The [LX5V series](#) is Wecon's flagship small PLC, offering superior performance and advanced features for more complex automation systems. It's designed for high-end applications that require robust motion control and fast execution.

Key Features:

- Execution Speed: One of the fastest small PLCs available, with an execution speed of 0.01-0.03μs.
- Memory Capacity: Supports up to 48,000 program steps, providing more space for complex logic and control systems.
- High-Speed Motion Control: Handles up to 8 channels of high-speed pulse output and 8 channels of 150KHz input.
- Ethernet Support: Features built-in Ethernet, allowing for easier integration into modern industrial networks.
- Advanced Motion Control: Supports features like E-CAM and electronic gearing, making it ideal for controlling multi-axis motion systems.
- Flexible Communication: Supports RS422, RS485, and Ethernet (optional) for communication with other devices and systems.

Applications:

- Robotics and CNC: Excellent for controlling multi-axis robotic systems and CNC machines, where high-speed and precise movements are essential.
- Packaging and Material Handling: Ideal for complex conveyor systems and packaging lines that require high-speed coordination of multiple processes.
- Automotive Manufacturing: Can be used to control welding, painting, and assembly processes in automotive plants.

Why Useful:

The [LX5V series](#) is the top choice for applications that require high precision, speed, and memory capacity. Its ability to handle complex motion control tasks makes it the go-to solution for industries like automotive, robotics, and high-end manufacturing.

Part Numbers:

- [LX5V-1412MT-AN/DN: 14 DI / 12 DO, transistor output](#).
- [LX5V-1616MT-AN/DN: 16 DI / 16 DO, transistor output.](#)
- [LX5V-2416MT-AN/DN: 24 DI / 16 DO, transistor output.](#)

3. LX6C Series

Overview:

The LX6C series is Wecon's high-performance, medium-sized controller. It's designed for large-scale automation systems that require multi-tasking and advanced motion control.

Key Features:

- High Processing Power: Uses a quad-core 1.8GHz processor, capable of handling multiple tasks simultaneously.
- Motion Control: Supports multi-axis motion control, suitable for robots and CNC machines.
- EtherCAT and Ethernet Support: Built-in support for EtherCAT and Ethernet for real-time control and communication.
- Advanced Programming: Uses CODESYS, a powerful, manufacturer-independent programming environment, making it easier to integrate into existing systems.
- Scalability: Supports up to 32 expansion modules, allowing for large-scale systems with thousands of I/O points.

Applications:

- Robotics and Motion Control: Ideal for controlling industrial robots, automated guided vehicles (AGVs), and other advanced motion systems.
- High-End Manufacturing: Used in industries requiring precise control over large machines, such as aerospace and electronics.
- Process Control: Suitable for chemical processing and energy industries where real-time data and fast response are essential.

Why Useful:

The LX6C series is ideal for large, complex systems requiring real-time control and multi-tasking. Its EtherCAT and Ethernet support makes it

highly effective in environments where fast communication and precise control are necessary.

4. LX6V Series

Overview:

The LX6V series is designed for advanced automation applications that require high-speed motion control and data communication. It's part of Wecon's high-performance bus-type PLCs, supporting large-scale systems.

Key Features:

- High-Speed Processing: Execution time of 0.01-0.02μs, ideal for high-precision tasks.
- Multi-Axis Control: Supports up to 128 axes of motion control, making it suitable for complex machinery.
- EtherCAT and Ethernet: Built-in support for EtherCAT for motion control and Gigabit Ethernet for communication.
- Large Program Capacity: 5MB of program memory allows for detailed and complex automation systems.
- High-Speed Input/Output: Supports 4 channels of 200KHz high-speed pulse output and 8 channels of 150KHz input, making it ideal for high-speed machinery.

Applications:

- Precision Manufacturing: Suitable for industries like semiconductor production and pharmaceuticals, where precise control over large machines is necessary.
- Robotics: Perfect for controlling multi-axis robots in high-speed assembly or material handling tasks.

Why Useful:

The LX6V series offers exceptional performance for large-scale, high-speed automation systems. It's ideal for companies that require sophisticated motion control and real-time data handling.

5. LX6S Series

Overview:

The LX6S series is a more cost-effective version of the LX6V, designed for applications that don't require the same high-speed capabilities but still need advanced control features.

Key Features:

- Processing Speed: Slightly lower than the LX6V, but still supports high-speed pulse outputs and EtherCAT.
- Simplified Motion Control: Supports up to 16 axes, making it suitable for less complex systems.
- EtherCAT and Ethernet: Similar communication features to the LX6V, but at a lower cost.
- Expandable: Supports a good range of expansion modules for additional I/O.

Applications:

- Smaller Manufacturing Systems: Suitable for automated assembly lines and smaller robotics systems.
- Energy Management: Can be used in systems like solar power plants or wind farms, where real-time data monitoring and control are needed.

Why Useful:

The LX6S series is an economical option for businesses that need advanced control features but don't require the full capabilities of the LX6V. It's suitable for less complex automation systems that still need EtherCAT and multi-axis control.

Conclusion:

Each [Wecon PLC](#) model series is tailored to meet different levels of industrial automation needs:

- LX3V: For simple, cost-effective automation tasks.
- LX5S: For fast, precise control at a budget-friendly price.
- LX5V: High-performance small PLC for complex motion control and networking.
- LX6C: A powerful medium-sized PLC for multitasking and large-scale automation.
- LX6V: Advanced high-performance PLC for real-time control in complex systems.
- LX6S: Cost-effective version of the LX6V for smaller but advanced systems.

These models offer flexibility across a range of applications, from simple tasks to advanced robotics, making [Wecon PLCs](#) suitable for a wide range of industries.

Wecon Comparison with Mitsubishi, Schneider, Siemens and Allen Bradley

1. LX3V Series:

Comparable to:

- Mitsubishi FX3U/FX5U: Both series offer basic automation capabilities with I/O flexibility, and are designed for smaller automation tasks.
- Siemens S7-1200: The S7-1200 is also focused on small-scale automation and supports basic communication protocols, making it a direct competitor to the LX3V.
- Schneider Modicon M221: This series is used for compact machines and offers good expandability, like the LX3V.
- Allen-Bradley Micro820: Allen-Bradley's Micro820 fits into the same category of small, flexible PLCs for smaller automation tasks.

Use Cases:

The LX3V and its competitors are used for tasks like basic process control, machine automation, and packaging systems.

2. [LX5S Series](#):

Comparable to:

- Mitsubishi FX5U: The LX5S offers improved processing speeds and motion control, much like the Mitsubishi FX5U, which also focuses on high-speed applications with expanded memory.
- Siemens S7-1200: While Siemens' S7-1200 series covers both basic and more advanced functions, the LX5S matches in terms of execution speed and flexibility for high-speed tasks.
- Schneider Modicon M241: Schneider's M241 has similar capabilities in terms of motion control and high-speed pulse input/output, making it comparable to the LX5S.
- Allen-Bradley Micro850: The Micro850 supports more complex applications than the Micro820 and aligns with the LX5S for small but performance-critical automation.

Use Cases:

The LX5S is ideal for applications requiring faster execution times and high-speed pulse control, such as packaging lines, conveyor systems, and machine automation.

3. [LX5V Series](#):

Comparable to:

- Mitsubishi Q Series (Q03UDE): The Mitsubishi Q series is used in high-end, high-speed automation, with advanced motion control and communication capabilities, much like the [LX5V](#).
- Siemens S7-1500: The S7-1500 is a high-end model for complex tasks requiring speed and memory, which matches the [LX5V](#) in terms of high-speed processing and motion control.
- Schneider Modicon M251: Schneider's M251 offers flexibility for larger systems, supporting Ethernet and multiple communication protocols like the [LX5V](#).
- Allen-Bradley CompactLogix (1769-L33ER): The CompactLogix family, particularly the L33ER, is focused on handling large programs and high-speed motion control, making it comparable to the [LX5V](#).

Use Cases:

The [LX5V](#) is suitable for high-speed multi-axis motion control, making it perfect for applications in automotive assembly, robotics, and complex CNC machines.

4. LX6C Series:

Comparable to:

- Mitsubishi iQ-R Series: The iQ-R series is designed for large systems requiring real-time control and multi-tasking, making it a strong competitor to the LX6C.
- Siemens S7-1500 (High Performance Models): In complex systems requiring a large I/O count and multi-tasking, the S7-1500's higher-end models match the capabilities of the LX6C.
- Schneider Modicon M580: Schneider's M580 series is a high-performance PLC for critical systems and is comparable in terms of scalability, flexibility, and processing power.
- Allen-Bradley ControlLogix (1756-L85E): The ControlLogix series is designed for large, high-performance systems, matching the LX6C in its ability to handle complex processes, motion control, and communication.

Use Cases:

The LX6C is best suited for multi-tasking environments such as high-end manufacturing, chemical processing, and power generation where performance, reliability, and real-time data processing are critical.

5. LX6V Series:

Comparable to:

- Mitsubishi iQ-R (High-end Models): The iQ-R series supports large-scale motion control and multi-axis systems, making it comparable to the LX6V, particularly for high-speed, complex applications.
- Siemens S7-1500 (Advanced Models): The S7-1500's advanced models are designed for large, complex systems requiring high-speed control and high I/O counts, much like the LX6V.
- Schneider Modicon M580: Like the LX6V, the M580 series is aimed at large-scale industrial automation requiring fast processing and EtherCAT support.
- Allen-Bradley ControlLogix (High-end Models): The ControlLogix L85E is a direct competitor in terms of high-speed execution, multi-axis control, and communication capabilities.

Use Cases:

The LX6V excels in high-speed, multi-axis motion control for large-scale applications like robotics, CNC systems, and precision manufacturing.

6. LX6S Series:

Comparable to:

- Mitsubishi iQ-F: The iQ-F series offers mid-range capabilities with motion control and communication flexibility, similar to the LX6S.
- Siemens S7-1500 (Standard Models): For applications requiring less performance than the advanced S7-1500, the standard models of Siemens match the LX6S.
- Schneider Modicon M251: This PLC can be used for mid-scale automation, where EtherCAT and Ethernet communication are required, making it comparable to the LX6S.
- Allen-Bradley CompactLogix 5370: The 5370 series from CompactLogix is comparable to the LX6S in terms of performance and scalability for mid-sized applications.

Use Cases:

The LX6S is designed for cost-effective yet complex automation tasks, offering the ability to control motion, handle EtherCAT networks, and integrate into mid-sized manufacturing processes or energy management systems.

Conclusion:

Wecon's PLCs, especially the LX5V, LX6C, and LX6V series, offer strong alternatives to the Mitsubishi iQ-R, Siemens S7-1500, Schneider Modicon M580, and Allen-Bradley ControlLogix. The comparison shows that

Wecon can effectively replace these high-end PLCs in many cases, particularly for cost-sensitive industries looking for robust automation solutions without sacrificing performance. However, the choice between brands depends heavily on system complexity, communication needs, and regional support for each platform.

If you are interested in the LX6 Series or any other Wecon PLC, please give Amir a call at 01424 850 660.

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