

Low-Cost Remote Supervisory Control System for an Industrial Process

Abstract

A low-cost remote supervisory control capability is added to a packaging process, in which a low-voltage signal is used to communicate between a distant HMI control panel and a PLC network using the AC power line as a communication medium. The network is a star-topology and uses a Master-slave protocol. Remote Supervisory control is achieved using a user-defined toolbox of control functions.

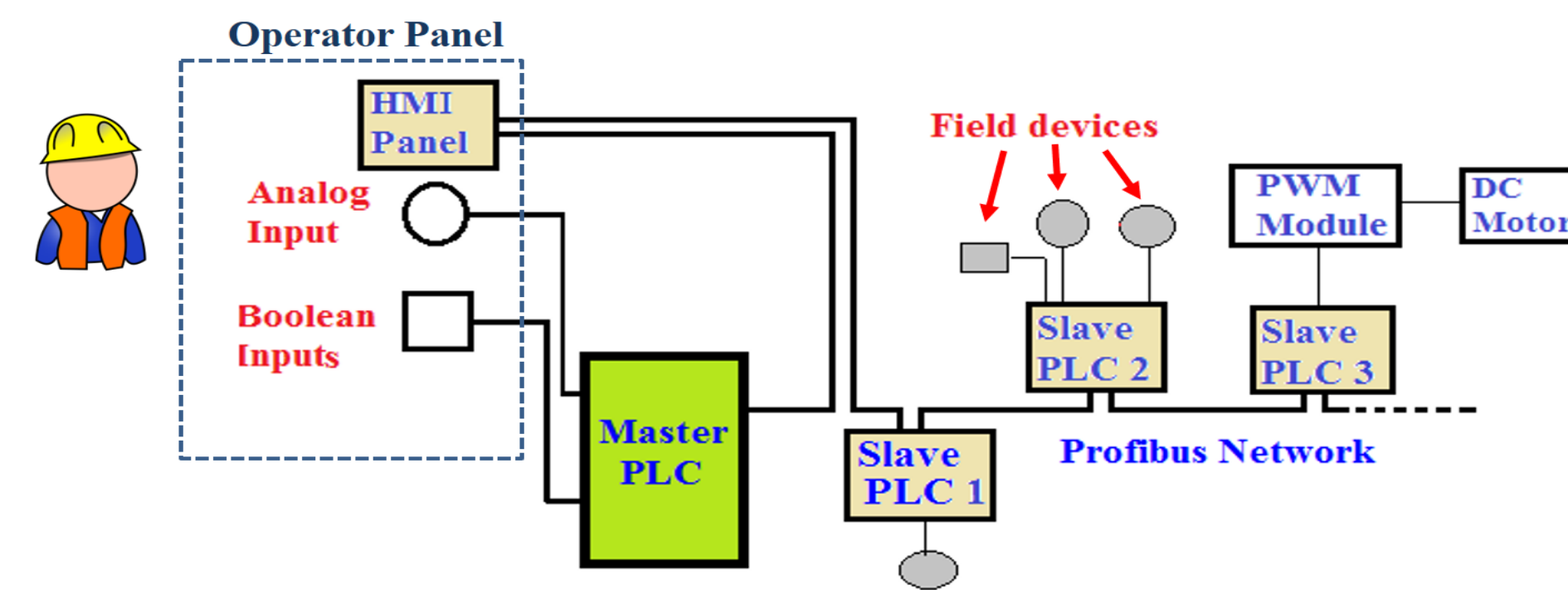
In this system, a Programmable Logic Controller (PLC) is used to control a process and interface with the operator through a Human Machine Interface (HMI) Panel. A star topology ethernet network is used to connect the PLCs and the HMI panel.

Introduction

- Supervisory Control and Data Acquisition Systems (SCADA) are commonly used in factory settings to provide a centralized control and monitoring of processes in industrial plants [1-6].
- These systems consist of a master computer unit connected to Programmable Logic Controllers (PLCs), which are connected to field devices such as actuators, motors, CNC machines, and sensors.
- The master control unit is equipped with a sophisticated software such as Matlab [1] to perform the control functions as well as a capability to be interfaced to the PLC devices.
- SCADA systems are also used in a wide range of applications that include water and gas distribution systems [3]

Results: Model 1 of this Project

A low-Cost supervisory control system was designed and illustrated in reference [4].

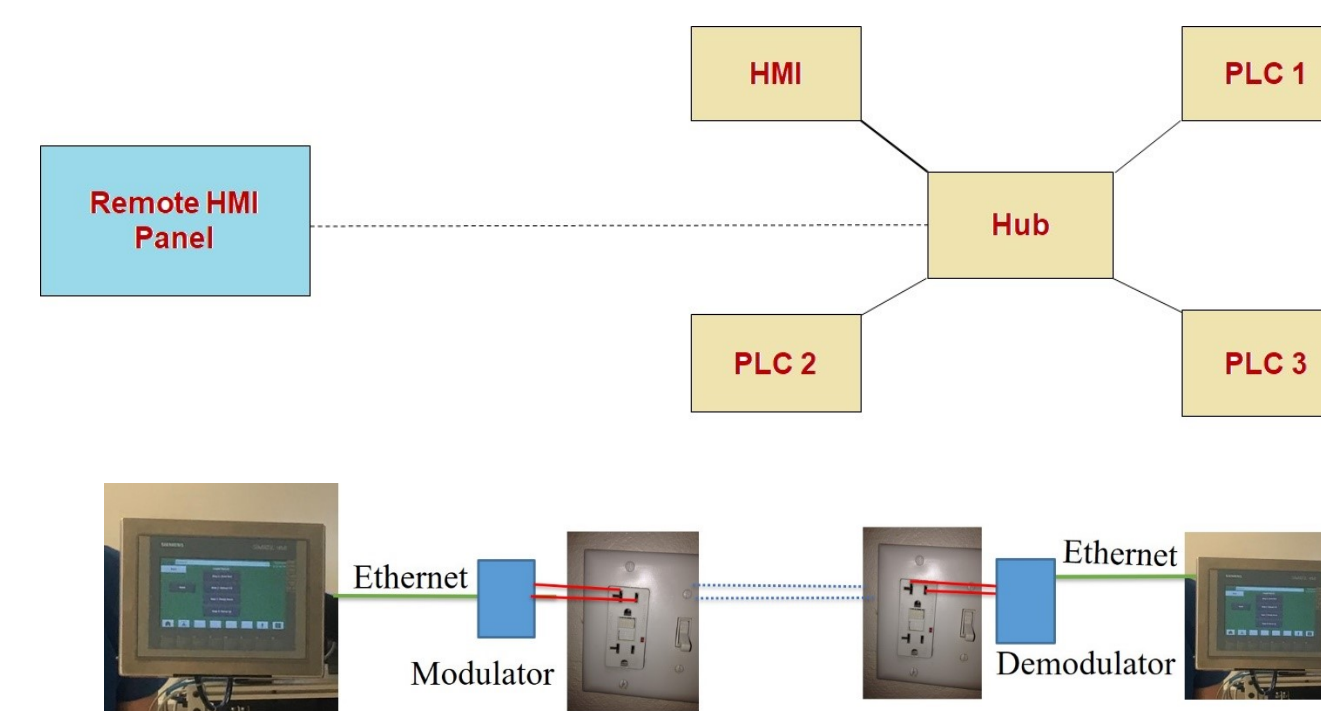


Features of this model:

- The system implemented speed control of a DC motor over a deterministic Profibus Network.
- The system used a collection of block-oriented Ladder Logic programs collected in a toolbox of programs that may be used as multi-purpose functions.

Model 2: Remote Supervisory Control and Data Acquisition

The first model was improved:



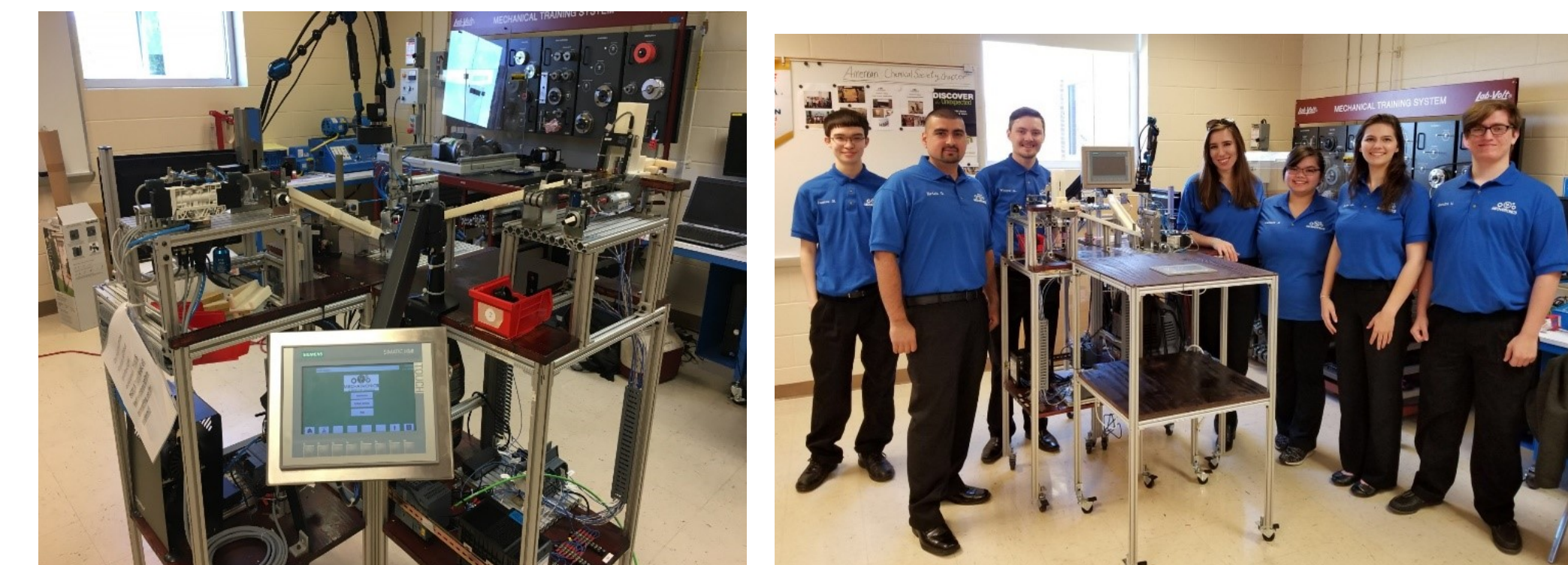
Features of this model:

- The system used a star-topology network over the bus topology that was used in model 1
- A remote control capability was added in which the HMI remote control panel is connected to the network through the power line at a high frequency.
- Block-oriented programming is used in this model as well, in which a toolbox of functions is used.
- Data acquisition is demonstrated through the use of a vision system and other sensory systems.

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Conclusion:

- A Low-Cost Remote Supervisory Control System is designed and built.
- The system uses ladder logic functions that are packaged together in a toolbox.
- Two models were built:
 - the first model is demonstrated on a dc motor control, and used a bus-topology network
 - The second model included a remote control capability demonstrated on a bearing packaging process.



The Low-Cost Remote Supervisory Control System is demonstrated on a bearing packaging process, that includes three stations that perform package cap and body dispensing and handling, and assembly and quality check functions.

References

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