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The Role of PLC in Automation and Industrial Applications

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I. INTRODUCTION

Due to the high demand for more efficient controllers within the industrial sector, there has been intense pressure on the existing high-quality control devices and techniques for the general production process. Therefore, this situation engendered the production of special electronic devices known as PLCs. As a result of their simple make up and toughness, the presence of these devices within industries has reduced maintenance costs and enhanced productivity greatly. These PLCs have carried out important functions especially in automation and many other industrial processes. This research will aim at identifying the use of PLCs in automation and also enumerate the different industrial uses of PLCs

II. DEFINING PLCS

Fully described as the programmable logic controller, the PLC refers to a solid user-programmable control device which controls logic, data manipulation, sequencing, counting capabilities and logic. Concisely, a PLC refers to a device which can be programmed by a user to carry out a number of sequential events. PLCs are made up of a number of hardware modules or components which aid it in its performance of this sequence of events. These components are the input and output section, the central processing unit, the memory and the power supply (Kaushal, 2015). The processing unit handles the execution of all crucial computation which involves taking in input and giving out an appropriate output. The input section majorly operates field devices like switches and sensors and the output section, on the other hand, controls motor pumps, solenoid valves and lights. The power supply refers to a component which delivered the needed amount of power to this entire system. According to Kaushal, this power supply to the entire system is achieved by transforming AC power to DC power and this is then consumed by the input and output sections as well as the central processing unit (2015).

PLCs are regularly referred to as industrial computers and they are majorly used by the industry for manufacturing processes. Some of the common manufacturing processes in this case are assembly lines and the control of robots and robotic devices. The major use of PLCs is to give quick monitoring and also control to several independent automated applications. The programming application of the PLC can be applied in several industries. These include the food, printing, textile, manufacturing and the travel industries. According to Brandley (2017), PLCs are noticeably different from the regular computer and smartphone systems. This is because PLCs have more developed input and output arrangements when compared with the computers. They equally have more intelligent microprocessors which have enlarged and more developed input and output interfaces and these in turn have extensive distributed processing. PLCs are also equipped with high-level programming languages which confers on it higher programming flexibility during data manipulation. Due to these features, PLCs are majorly built to be very tough and able to endure extreme vibration, temperatures and electrical noise. The above features explain why these devices are in high demand for application in various industrial processes (Mouser electronics, 2017).

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III. The Role of PLC in Automation

Automation is the application of machines for manipulating information as well as system technologies (Kaushal,2015). PLCs have helped in improving the productivity of automation. Raymond explains that the production of goods and services has increased production costs. For manufacturing a commodity, according to Raymond, certain costs exist which the manufacturer cannot control, these include labor costs, material costs etc. PLCs helps automation by lowering the amount of power consumed by working machines, controlling systems via proper keeping of records and reducing required manpower via the supply of manpower.

The programming logic controllers (PLCs) have also helped lower automation maintenance. As regards this (Siemens, 2017), offered to analyse a situation where a corporation uses automated storage and recovery systems for managing its warehouse. If a business uses trailing cables for operating the automated storage and recovery systems, this will cause time wastage and higher costs. The higher cost is due to the fact that these cables will need frequent maintenance and replacement. Applying PLCs in automating these systems lowers maintenance costs and also reduces needless downtime (Siemens, 2017).

PLCs have been effective in reducing automation downtime. Downtime means those periods when a computer network or server is unavailable to users (Goel and Alok, 2012). PLCs are becoming cheaper and smaller and yet increasingly powerful with time (Kaushal, 2015). Due to its capabilities, PLCs are becoming more exclusive than conventional personal computers and workstation arenas. The PLCs are now able to share data rapidly within and between companies. This rapid data sharing has helped reduce downtime as PLCs are capable of automating the FTP and web servers, international databases and even email sending. A good instance is Java web servers which have achieved a high level of versatility in their interactions with the PLC, thus enhancing data sharing and lowering down time (Automation, 2017).

IV. Industry Application of PLC

As stated above, PLCs are industrial computing systems which continuously monitors the input devices and based on this, it decides on how to control the output devices. Several machine functions used in industries apply this form of control system (Kaushal, 2015). The use of PLCs in the industry is normally to endure extreme conditions like dust, heat etc. The industrial uses of PLCs are characterized by different applications. The continuous bottle filling process is one where the use of the PLC is very important. Within this industry, the bottles have to filled with the right liquids and they are moved by conveyor belts. The PLC works by detecting the bottles first and then queuing them into the right positions where they are filled with the right liquids. This PLC application helps reduce time and also quantity disparities in comparison to manual filling (Goek and Alok, 2012).

PLCs can also be used within the glass industry. It's application is seen in the glass assembled piece by piece. It's major application in the industry, however, is for controlling material ratios and also for producing flat glasses. Furthermore, it is also applied in the production of float glasses. According to Goek, for the glass industry applications, the technology which is majorly applied for producing the PLC models is the bus technology which features a distributed-control system (2012). PLCs applied within this industry helps to enhance the production process and the reliability of the produced glass.

PLCs are also applied within the cement industry. To procure the optimum quality of raw materials, very accurate information is needed. The PLCs are applied in helping the mixing inside the kiln so as to make sure the derived output is the optimum quality available (Magazine, 2017). Following the trend of explaining the various applications of PLCs, they are also applicable within the marketing industry for producing the lead acid battery and also within the extruder factory for operating the silo feeder control system. PLCs are also used within the printing industry for assisting the screen washing system's multi-staging and for offsetting web press print register control (Brandley,2017). Another industry where it is used is the food industry where it helps to manage the filling machine control process and it also controls the major factory feed water pump network.

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Another industrial application of PLCs is the travel industry where they are used for controlling the operation of escalators. The major role of PLC is for maintaining a supervised safety control network. It also helps monitor the safety of the lift process. PLCs are also applied within the agriculture industry where they are used for controlling ventilation, watering systems for glasshouse crops and also glasshouse heating. Another application of PLCs is in the control of air conditioning systems where a basic air conditioner could be made up of a single air compressor which is switched off automatically at low temperatures and switched on at high temperatures. Another industrial application is in the batch mixing process. PLCs help ensure that both liquids are mixed in the right proportion to produce a batch (Brandley, 2017).

V. CONCLUSION

PLCs have been described as electronic devices applied in industries for controlling and monitoring production processes. PLCs have been determined to be very robust design-wise. This is necessary as they have to withstand extreme vibrations, humidity and temperatures. PLCs have equally helped to improve production, reduce overtime and ensure automation management. The various industrial applications which have been determined to employ PLCs are the bottling process in the bottling industry, the control of lift operations and escalators in the traveling industry and several others.

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