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Plc.'s in Mexican Food Biosystem Automation, Current Status and Perspectives

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Abstract

The inclusion of technologies in agriculture is not only inevitable but immensely necessary. Time is a fundamental resource in all human activity, and in the agriculture, it is a factor of critical importance. Therefore, it is vital to automate daily agricultural work and make more efficient production processes in food biosystem agriculture, horticulture, livestock, beekeeping and other related to food production). Mexico currently has the problem of the food supply of a growing population in both urban and rural areas, which makes necessary the revision of the ways of producing them, in order to substantially increase this production. Although the process of implementing the technologies has already begun already mentioned, it is necessary to consider that these can be the triggering factor for the increase of the productiveness in this branch of the Mexican economy. In this work reference is made to the state of the application of the PLC, s our agriculture and livestock production. This paper discussed PLC´S in Mexican Biosystem reviewing various works done by previous authors. From the review, many authors agreed that PLC´S was profitable. Generally, the authors concurred used PLC´S in biosystems is good, again, in the rural areas. This study therefore, concludes that for a sustainable development to be achieved both in urban and rural areas, adequate solutions should be provided for PLC´S uses. Although in Mexico the use is least, it should be increased research work in universities and agricultural research centers.

Key Words: Plc´S, México, Agriculture, Automation, Biosystem

Introduction

The inclusion of technologies in agriculture is not only inevitable but immensely necessary. Time is a fundamental resource in all human activity, and in the field, it is a factor of critical importance. Therefore, it is vital to automate daily agricultural work and make more efficient production processes in food biosystem(agriculture, horticulture, livestock, beekeeping and other related to food production) Negrete J.C., (2015),(2016),(2017a),(2017b),(2018a),(2018b),(2018c),(2018d).Mexico currently has the problem of the food supply of a growing population in both urban and rural areas, which makes necessary the revision of the ways of producing them, in order to substantially increase this production. Currently several cutting-edge technologies such as microprocessors, the internet of things, Negrete J.C. (2018a), (2018e), as well as the transmission of data through wireless networks, are available at an affordable price, which makes them attractive for application in the agriculture of our country. Although the process of implementing the technologies has already begun already mentioned, it is necessary to consider that these can be the triggering factor for the increase of the productiveness in this branch of the Mexican economy. In this work reference is made to the state

of the application of the PLC, s in our agriculture and livestock production.

Materials and Methods:

These researchers made use of a review of academic articles, textbooks, internets materials, news articles and publicly available materials on housing problems. A systematic and thorough search was conducted for data collection in printed data bases, Internet, magazines scientific, graduate and postgraduate university thesis, newspaper articles, etc. The method used is a review of academic articles, textbooks, internet materials, news articles and publicly available materials

Literature Review:

Definition. - is a control system based on a microprocessor and the elements necessary for this microprocessor to operate in a convenient way.Being based on a microprocessor, allows the function that the PLC performs is programable for each user in order to satisfy each specific control need, which makes it in a useful and flexible tool. Its development over time has experienced successive in the sense of increasing their benefits, benefits that have been consequences direct advances in the technology and performance of microprocessors. Domingo (2003).

Plc's in World Agriculture, An Overview:

AUTHOR AND YEAR	DESCRIPTION	COUNTRY
Amaya. (2015).	The design of the automated irrigation system and the implementation in a greenhouse owned by the ENA. All the devices of the automated irrigation system are governed by a Programmable Logic Controller, PLC.	Salvador
Satish (2016)	Used a user-friendly module SCADA interfaced with PLC to give control to the farmer irrigation systems.	India
Bhongle (2016)	Greenhouse automation for agriculture using PLC & SCADA	India
Meivel (2017)	Programmable Logic Controller(PLC) for its general robotization. PLC computerization forwater trickle Irrigation framework, pesticide and compost splashing	India
Dhivya (2012)	Dhivya, A.; Infanta, J.; Chakrapani, K. (2012) Automated Agricultural Process using PLC and ZigBee Journal of Artificial Intellegence.DOI:10.3928/jai.2012.	India
Pathak (2017)	PLC programming software and then implemented a programme demonstrating an Automated Irrigation process.	India
Irfan (2017)	Automatic irrigation system based on PLC employing moisture and PH sensors. The function of soil moisture sensor is to identify the amount of water required for irrigation; PLC controls the water pump	India
Naik (2016)	Agriculture automation using PLC.	India
Ghassoul	Automatic irrigation system using a programable logic controller	
Sarojini (2017)	Aautomated drip irrigation using PLC and biosensors for monitoring and managing the agriculture field	India
Lanje (2015)	PLC and µC along with various sensors can prove a milestone in increasing the productivity of land, reducing water use reducing soil infertility, reducing use of electricity and making the irrigation system smart	India
Sandhu. (2012).	Develop a system to automatically monitor the condition of livestock. Using an Arduino PLC, an accelerometer and additive manufacturing techniques	England
Hudzari(2016)	Proposed an automatic irrigation control system. The brain of the system is the PLC	Malaysia
Manthan (2014)	ZIGBEE based Wireless Monitoring and Controlling of Automation System using PLC & SCADA	India

Kalaivani1(2012)	Proposed project is to control and maintain the temperature in storage area which prevents the formation of microorganisms and spoilage of grains using PLC and SCADA	India
Ruiz (2001)	Proposed a Control de dos estaciones de bombeo mediante PLC y SCADA	Spain
Gutierrez (2006)	Design a system consists of installing an underground domestic watering system, which is to be controlled by a logic circuit by managing the flow of wáter. The control circuit is implemented through a PLC Siemens S7-200	Perú
Otoya (2015)	Concludes that the automation technologies analyzed according to their structure that can be applied to the automation of irrigation systems in nurseries are the PLCs and the DCS	Perú
Aliaga (2015)	Realize the Design of Humidity Control System Relative To A Greenhouse Using The Programmable Logic Controller	Perú
Dickinson (2006)	Describes a low-cost PLC trainer developed for use in a universitylevel agricultural electricity course.	USA
Sigrimis (1999)	Elaborates on the possibilities of using AI decision support tools in synergism with low level process controllers or schedulers. With PLC In field optimizing tools for agricultural process control	Greece
Diaz (2008)	A control program was developed to control and log temperatures and other operating parameters to monitor the greenhouse. A Programmable Logic Controller (PLC) was installed to actuate the various vents, shading, heating, cooling and irrigation.	USA
Zhou (2009)	Researched fuzzy control system based on multi-factor control of greenhouse.With real-time monitoring environmental parameters,and based on the physiological characteristics of crops and the reaction of the environmental conditions in the greenhouse,the fuzzy control algorithm is applied to PLC program to be adjusted within the environment in the greenhouse,	China
Bian (2014)	Designs the overall control scheme for greenhouse,constructs PLC(Programmable Logic Controller) control system by applying S7-CPU226,EM231,HMD40Y and other equipments,writes control programs of every actuators and fuzzy algorithm programs,configurates the monitoring picture of this system.	China
Liu Kai (2009)	The study is depend on the research foundation of transplanting seedlings manipulator which was designed for automatic grafting machine.First,multi-information fusion examples based on distributed situation of seedling,condition information of mechanical arm and positional information of cell tray,designed the control system of PLC and introduced the components and the work principles of the system	China
Shao Limin (2007)	A real-time control system of the automatic variable rate fertilizer applicator was presented. The control system takes PLC as the mainframe, and integrates with the optical sensor and automatic control equipment.	China
Dai (2007)	Realizing the software design of temperature control subsystem, irrigation control subsystem of greenhouse control system was emphatically introduced. The serial transmission of the computer was employed to control this system by transferring control data to CPM2AE-60CDR-A PLC	China

Shi (2012)	Design a system for realized automatic control of micro spray and shutter according to environmental information.In order to speed up the unified management of intelligent and standardization of rice seedlings,and improve the production efficiency of rice seedlings,air temperature and humidity,soil temperature,soil moisture parameters in rice seedlings tabernacle were real-time acquisited and monitored with PLC as the core.	China
Wang (2008)	Realizing change Temperature control by PLC is introduced. By method.The circuit for PLC connection is simple using components are little Reliability of system is high and quality of change temperature in greenhouse can be ensured.	China
Han (2004)	The specific features of the greenhouse's circumstance are introduced. According to this, the requirements of the temperature for the greenhouse are put forward, and PLC is adopted as the key to set up the control system of greenhouse's temperature	China
Wang (2012)	Aiming at the backward status of control technology of temperature control system in liquid fertilizer production,the authors introduced liquid fertilizer production process and the principle of PID control algorithm,described the methods for realizing PID control algorithm based on PLC	China
Chen (2010)	Here the PLC and MCGS are adopted to design a monitor and control system for greenhouse,which implements a two-level monitor,the bottom control system adopts PLC to monitor and collect a real-time environmental data of the greenhouse as well as operates the actuator according to the command of the host computer so as to obtain the optimal growing environment.	China
Lishengduo (2010)	Used programmable logic controller as control equipment,by using its built -in PID function command and expansion function modules the automatic sprinkler irrigation control system of crops was achieved	China
Wang (2008)	Through analysing the principle of pneumatic seeding and the request of the control,this design uses the PLC to control the seeding process of Pneumatic Seeding.At the same time,the paper introduces the component of control system in Pneumatic Seeding,the choice of PLC,the control system of seeding	China
Chen (2011)	Aiming at the problem of high fault rate and unperceivable working fault,a fault diagnosis alarm system for the combine harvester was introduced.PLC and display were the control terminals in the system.The PLC collected the signals in the operation process such as feed-in screw conveyor,conveying channel,threshing cylinder,transporting auger,cleaning loss and attachment loss,then calculated and treated in the manner of fault diagnosis subroutine based on the trend of the signals.The test showed that the fault diagnosis method could realize the early warning for the combine and improve the working quality and efficiency of combine harvester.	China
Johns (2007)	Poultry Farm Utilizes PLC Control to Increase Efficiency configured PLCs, Marathon motors, GS1 inverters and analog diffuse proximity sensors to control the egg flow.	USA

Plc´S in Mexican Agriculture:

Manzo (2011): Design a control device using a PLC as a central element, with control peripherals of opening and closing overhead windows, hydrogen potential (Ph), mixing and irrigation of nutrient solution and temperature and humidity sensors to ensure efficient growth of Habanero

Chile pepper.

Guzman (2015): Developed a system of acquisition of meteorological data in real time, using a programmable logic controller (PLC) as an alternative within the commercial weather stations. For sensing the air temperature, relative humidity, solar radiation, precipitation, wind speed and direction, commercial sensors were used during 2013, to test the station, in the meteorological station of the Graduate College, Campus Montecillo the system consists of a PLC (CX1020 model), a laptop where an application for real-time monitoring that was developed in Visual Basic 2010 Express and the database MySQL was installed to store information, which can be used for several purposes. The interaction between the PLC and the application of monitoring was performed using wireless communication Wi-Fi. TwinCAT System Manager programs were used (for configuring the hardware) and TwinCAT PLC Control (for programming the PLC)

Guadarrama (2014): Made the automation design for greenhouse systems located in Cuajimalpa, D.F. The automatic heating system has been proposed by means of biogas using PLC, according to the conditions of the area, that most of the time is cold and the system has been designed for tomato production taking into account the variables that lead to its development.

Baltazar (2014): Development of automation proposals for a greenhouse with the use of PLC, Arduino, PIC microcontroller and a temperature control Shinko concluding that the project is accessible and easily accessible to operators.

Rodriguez (2014): Presents a conceptual framework for automating the greenhouse one of the Technological University of the West of Guanajuato. It is presented as a concept where proposals for climate control of variables such as temperature, humidity, air flow is present; models and run times. The control system for greenhouse vegetables should be such a system that allows control in the first place: The humidity, temperature, air flow and irrigation, so that control can be adjusted depending on the type of vegetable farming.Was used a Micrologix 1400 PLC

Candia (2010): Development a prototype hybrid system (wind and solar) for pumping water, which has great potential for intensive residential and agricultural irrigation (greenhouses), with a high impact of expansion that allows significant savings consumption of electricity, particularly applicable in rural areas of Mexico. Was used a PLC.

Hernandez(2013): Development automation of greenhouses with programmable logic controllers PLCs what it offers savings in time and human personnel, constant security, generation of tendencies to be able to make later decisions, facilities and comfort while we can take care of in other activities, and only supervision will be necessary so that an automated greenhouse can carry out its work concluding that The National Instruments LabVIEW environment, along with the DSC and OPC Server modules, provides engineers with the tools they need to succeed in design, construction and integration of distributed systems. With the implementation of the SCADA system using LabVIEW as HMI, the sequential programming in the SIEMENS S7-1200 PLC and the OPC Simatic s7-200 pc Access server, the general objective and the specific objectives set out above were satisfactorily achieved. achievements obtained which are: the real-time general graphical visualization of the state of the plant, the easy access and intuitive navigation for the management of the HMI screens, the programming of sequences and routines by means of a programmable logic controller (PLC), the generation trends and historical variables to control and visualize and continuous and autonomous operation only requiring supervision. Introducing technology to agro-industry provides great long-term benefits, by using it implementing an automated greenhouse we obtain high standards in terms of productivity and quality, thus being competitive in the market inside and outside the country.

Carrillo (2008): Development automation of the temperature, relative humidity, irrigation and soil moisture systems of a greenhouse. For this, a prototype was designed on a scale of the greenhouse that is in the Academic Unit of Agronomy, to carry out tests for the improvement of the systems and the sensing of the different variables that form them. One of the objectives was to give a practical solution to the problems of semi-automated greenhouses. the PLC S7-200 was used, since with this it is possible to have control of all the variables simultaneously, besides having an easy handling. With this PLC, the systems can be precisely controlled, since when

using sensors, they will send signals when any of the variables have been altered.

Ramon (2015): Develop a program in PLC for the control of vertical tillage depth to three different depths in laboratory conditions. A simulation card of sensors and actuators was obtained that allowed to simulate the truth table designed for variable tillage using PLC, the developed programs they allowed to check the operation of the PLC which included equations and logical doors.

Gonzales (2007): Design a skid measuring device in tractors capable of providing number of turns of the driving Wheel rapid and accurate measurements, when performing the tests under laboratory conditions, the proposed device used aPLC Allen-Bradley 1000, an alptpo, a box with electronic circuits, a disk mounted to an electric motor of354rpm, and put everything on a New Holland 6810 tractorthe programming of the micrologix 1000 PLC was also carried out.

Conclusion

This paper discussed PLC´S in Mexican Biosystem reviewing various works done by previous authors. From the review, many authors agreed that PLC´S was universal in agriculture.Generally, the authors concurred used PLC´S in biosystems is good. Again, in the rural areas, this study therefore, concludes that for a sustainable development to be achieved both in rural areas, adequate solutions should be provided for PLC´S uses. Although in Mexico the use is minimal, it should be increased research work in universities and agricultural research centers.

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