IRRIGATION SYSTEM AND AUTOMATIC DRIP IRRIGATION FOR THE COMPANY FLORICULTURE MAPOREX & ROSS

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1 Summary

With this project results more efficiently at the time of fertigation and drip irrigation were obtained as the opening times of each valve are more accurate when automatically switch from one to another and so resources are optimized as they are : labor, water and fertilizer. better management of water and fertilizer in growing roses is promoted to obtain a drip irrigation technified; therefore better quality roses.

The system works by hydraulic, electrical, control elements and display, giving the best system performance

Keywords: *Fertirrigación, Floriculture, Drip, head, Evapotranspiration*

1.1. Introduction

In our country the production of roses or flowers for export started since the 70s, so since that date the floriculture activity grew largely to currently become one the countries most exporters rose as the second in South America positioning itself behind Colombia what is its main competitor in the production of roses since the market where they can be exported American, European, Oceania and Southeast Asia. (Gostinchar Juan, 2000)

The roses were first cultivated in Asian countries then in the countries of the Middle East and going to Europe and today being more cultivated in South America. Since long ago roses are considered the most beautiful flowers that can be grown. Today it has many varieties of roses that goes approximately 20 000 varieties which are of many colors being the most representative the colors red, white, bicolor, etc. (Gostinchar Juan, 2000).

I. THEORETICAL BASIS

In Ecuador where is located the largest area of floriculture is in the northern center of the country.

Rose occupies one of the first places of flower production, there are peaks in the production of roses which is where production increases to supply the markets and above and these peaks are in the months of February and May. The rose is one of the most cultivated flowers in the world its botanical classification is:

Table 1: Classification of roses

CLASE	SUBCLASE	SUPERORDEN	ORDEN
Angiospermas	Dicotiledóneas	Ròsidas	Rosales
ORDEN	FAMILIA	SUB-FAMILIA	GÉNERO
Rosales	Rosáceas	Rosoideas	Rosa

Commercially it can be said that there are three groups of roses which depends on:

- Depending on the destination.
- For pot plants.
- For the garden.

II. IRRIGATION SYSTEMS

(Navarro Cadena, 2012) .The irrigation systems are hydraulic systems that allow supply the required amount of water to a given area of cultivation.

It can also be noted that an irrigation system consists of a set of elements and structures that can deliver the necessary amount of water for cultivation.

The technique in which water is applied in a culture will also influence the benefits of the irrigation system.

For efficient management of irrigation water, it is based on the distribution and management of water, for it must have a good design of irrigation methods.

(Navarro Cadena, 2012) You have to know the different types of irrigation that exist and which are used for crops, having thus: gravity irrigation, drip and sprinkler.

For which you have to see the advantages and disadvantages of different irrigation systems and take into account crop conditions so you know what irrigation system would be suitable for cultivation.

In practice to determine which is best for irrigation systems to be implemented in the area to go to work the following analyzes:

• Soil texture.
• The quality and availability of water.
• The temperature of the climate.
• Type of crop.
• Workforce.
• Financing for the irrigation system.

III. DRIP IRRIGATION

At present, the water will increasingly scarce more and that's why we are perfecting techniques of different irrigation systems that allow them to be becoming more efficient with such a history irrigation system is created in most developed countries drip (Navarro Cadena, 2012) says "that began in England after world war II from 1939 to 1945 in nurseries and gardening greenhouses using micro tubes and emitters; however in Israel during the years 1963-1967 where the system begins to develop irrigation drip is known today. "

Drip irrigation is low flow because its goal is to drop drop by drop to the ground because its goal is to get to the root system of plants.

- FERTIGATION

This is also an irrigation system but which has the function to apply fertilizer or fertilizers, minerals, etc. Through drip system prepared from a stock solution which is mixed with irrigation water for application to the crop. Fertilizers are dissolved with water to crops having the following substances roses nitrogen, potassium, calcium, copper and cobalt these minerals uses every 15 or 25 days this is applied to improve the production and quality of the flower. (Navarro Cadena, 2012)

- HEAD IRRIGATION SYSTEM

The head is a set of elements having the function of supplying water as has to be filtered after supply distribution network crop. The head is very important in this irrigation system because since this part is regulated and supplies water to the entire crop and also from this their respective fertilization is done. (Tarjuelo, J. 2005)

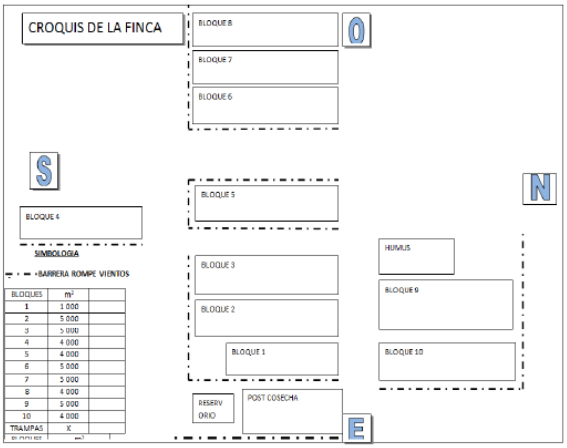
The head consists of the following parts:
• water pumping equipment.
• Filter system.
• fertilizer injection equipment.
• Pressure regulators.
• Distribution valves and shutoff valves

IV. RESOURCES AVAILABLE FOR THIS PROJECT REALIZATION

For the development of this project it has made available two blocks or greenhouses to carry out this project.

The total area that counts the flower is 5 hectares which is divided into 10 blocks greenhouses or as they are commonly known in which has approximately 22 varieties of roses. Below is the sketch of the farm.

Figure 1: Sketch of the farm



DRIP IRRIGATION PARTS

- Reservorio.- where water is kept to use it for irrigation.
- water.- pumps here have different electric pumps to help us push the water from the reservoir to the entire crop.
- Head riego.- where are the filters and fertilizer injectors.
- Tuberías.- has two pipe networks is a primary network which is supplying water from the reservoir to the entire cultivation and secondary are those within each block.
- Goteros.- are elements that are responsible for implementing the water so drop to the different plants that are planted.
- Válvulas.- allow us to open or close the flow of water to irrigate the desired area of each greenhouse.

V. MATERIALS DISTRIBUTION NETWORK HAS WATER FLORICULTURAL

DS8 ELECTRIC THREE-PHASE 220V / 380V

- Model: DS8.
- Power: 5hp.
- Rotor diameter: 147mm.
- Maximum flow: 30m3 per hour.
- Maximum height: 35 m.

MAIN PIPELINE

- The main water network is 4 inches which runs all the blocks from the pump house.

SECONDARY PIPING

- The network of secondary pipes are placed in each block and are 2 ½ inches.

NUMBER OF EACH BLOCK VALVES

- Each block has 5 valves for drip irrigation covering all bedding which features that block.

Number of beds per VALVE

- Each valve side covers 15 beds in total there are 30 beds valve controls the irrigation.

LENGTH OF EACH BED

- Each bed has a length of 32 meters from the main road to the end.

DRIP HOSE AND FLOW

- Dimension hose is 12mm.
- Have a rate of 1 liter per hour.
- Type Hydrogol dropper.
- dripper spacing is 15 cm.

VI. SYSTEM PARAMETERS DRIP IRRIGATION

To obtain all the calculations of the system already implemented in the floriculture must know some parameters which are:

- EVAPOTRANSPIRATION

Evapotranspiration is one of the parameters that are directly related to the climate as this parameter indicates to us or tell us how many millimeters of water a day evaporates from the soil fulfilling the cycle is to transform water from solid to liquid, to there are measuring instruments which help us more accurately, but other manual methods are also used to help us in the same way to calculate the value of this parameter to obtain this parameter. (Navarro Cadena, 2012)

VII. PROGRAMMING SYSTEM

Figure 2: Flowchart automatic drip irrigation

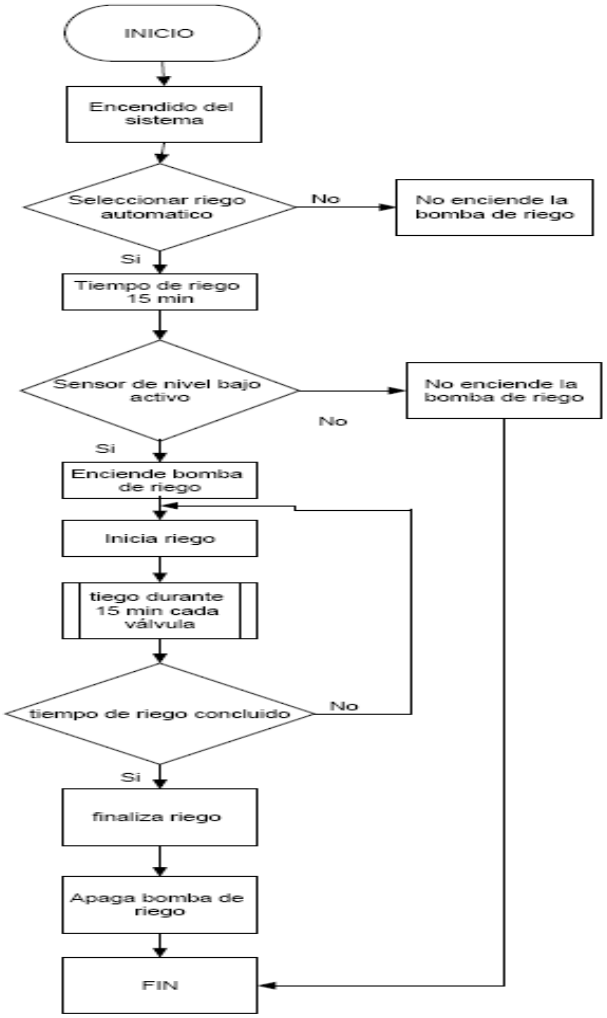


Figure 3: Flowchart on / off irrigation pump

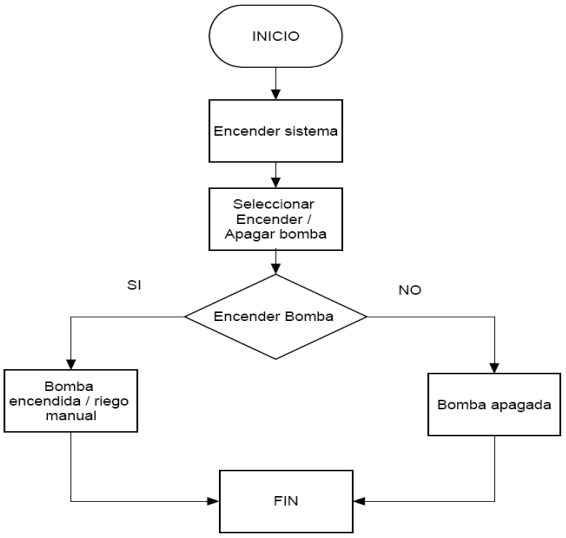
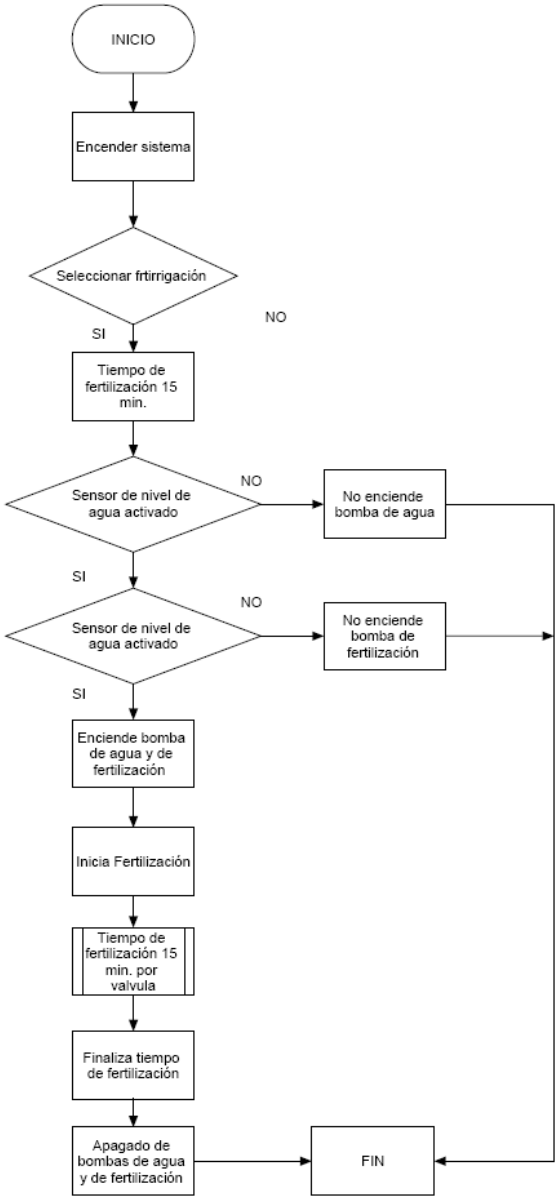


Figure 4: Flowchart, automatic Fertirrigación



VIII. PROGRAMMING PLC

To start programming the PLC, you have to know the times that were used for different cases, such as automatic and manual irrigation, fertigation and manual and automatic backwash.
The times will be used in the timers for PLC programming, it has to transform the minutes in milliseconds with a simple rule of three.
Knowing that 1 min. Has 60000 milliseconds with this data can transform the different times that will be used for programming irrigation and fertilization and backwash.
The cases are:

- Automatic 15 min. For backwash valve and 1.30 minutes.
- Manual 5 and 10 min. For backwash valve respectively and 1.30 minutes.
- Automatic Fertirrigación 15 min. Valve no backwashing.

IX. TEST AND SYSTEM OPERATION

ON EVIDENCE FROM BOMBS HMI
The first thing you should do is turn on the system from the control cabinet, then this is selected on the touch screen, on / off irrigation pump and electro pumps are switched on, the drive pump irrigation was observed in Touch screen.

Figure 5: Power System

TEST ON EACH VALVE ELECTRO

To see if each valve is working properly, you must select one of the options that irrigation has on the Touch screen and so shows that electro valves drip is running.

Figure 6: Activation of the valve 4 in drip irrigation

TEST WATER LEVEL SENSORS RESERVOIR

To know that the sensors are working properly on the screen we go to the section that says reservoir level in this water level is observed, if in high, medium and low.

Figure 7: Water level in the reservoir

X. PROJECT RESULTS

With the implementation of this project it was obtained the desired results; which were to improve the quality of the roses, this means thicker stems and better quality buttons; another result obtained is that improved production in these two greenhouses were automated, thus having increased production.

Table 2: Daily production floriculture MAPOREX & ROSS

	PRODUCCIÓN DE FLORES DE CADA BLOQUE DE LA FLORÍCOLA MAPOREX&ROSS								
Mes	bloque 2	bloque 3	bloque 4	bloque 5	bloque 6	bloque 7	bloque 8	bloque 9	bloque 10
Enero	750	700	450	500	700	750	450	700	500
Febrero	850	850	600	700	900	850	550	950	700
Marzo	800	750	700	600	900	850	500	900	600
Abril	700	700	600	650	750	700	500	800	650
Mayo	800	800	700	800	850	900	650	950	800
Junio	600	650	400	450	700	650	450	700	550

In the above table has daily production of stems of each greenhouse enterprise, the data we are interested in are those that are highlighted in yellow because in those blocks was where the project is developed, then you have the results of daily production since it was implemented automation.

Table 3: Production after automation of the two greenhouses.

Mes	bloque 2	bloque 3
Julio	750	700
Agosto	910	900
Septiembre	850	825
Octubre	750	800
Noviembre	900	850
Diciembre	610	750

In this table will be observed how since July the production is maintained, but from the month of August it is seen as the production begins to vary with the previous data that was had and thus to be able to know that the production increased in a 6 to 7 % Of what was produced in the previous months.

With these results you can see that the project has given good results since it has been observed that the quality of roses improved and production rose from the second month the project was installed.

CONCLUSIONS

- The project that has been developed works effectively, which has fulfilled the objectives that were raised at the beginning of this project
- The components that have drip irrigation systems are effective for technical irrigation, as the water comes into direct contact with the soil and thus has a better absorption.
- The operation of the system is very simple for the operator, since it is a technified system, you only have to choose the different options that are already programmed for irrigation or fertilization to begin.
- With tests performed on the system it was confirmed that it is reliable since the times are exact in each interaction of the solenoid valves that was implemented and thus the opening times of each valve are more efficient than when they were manual.

- This project has been implemented so that Fertigation and drip irrigation is in an orderly and efficient way when fertilized or drip irrigated and in this way the quality and production of roses is improved.
- With the implementation of H.M.I. (Human machine interface) you can see in real time which pump is on, which valve is open and also can know the water and fertilizer levels and which block is being watered.
- By means of the automation of the fertirrigation and drip irrigation system, irrigation and fertilization uniformity were obtained, which has been observed with the increase of production of 5 to 7%, it was also possible to observe an improvement in

the quality of Roses in their button size and stem thickness.

RECOMMENDATIONS

- To perform an automation project, you must know how the process that we want to automate works and know what components and variables are involved in the system.
- It is necessary to regularly train the person (s) who are going to operate the system in order for it to function properly.
- For a good efficiency of the system it is advisable to activate it at night as well as the evapotranspiration is much smaller than in the day.
- Proper maintenance should be given to each part that was implemented so that the system continues to function properly and correctly.
- The sensors in the fertilizer tank must be periodically checked for correct operation when the crop is fertilized.
- It is advisable to make the retro wash periodically in the day when it is manually so that the water that is coming to the crop is as clean as possible and thus do not cover the drip hoses.
- When the system is being used manually always take into account the water level of the reservoir so that the pump does not suck the mud that exists in the bottom of the reservoir.

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