

Soil Health And Fertility Detector Using Electronic Sensor

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Abstract: This project is aimed at determining the fertility of soil in terms of three prominent factors (nitrogen, phosphorous, potassium) present in soil. Accordingly readings are obtained and calibrated to obtain deficiency of these minerals in the sample soil. These results will be useful in improvement in quality of soil.

I. INTRODUCTION

The term fertility refers to the capacity of soil to produce the desired product (i.e. fruit, flowers etc.). fertility of soil depends upon three key parameters namely nitrogen, potassium and phosphorous. By calculating the proportion of these nutrients in soil sample, we can determine the fertility of soil. We have decided to provide a console in which each sample would be tested electronically and immediate results would be provided. In this project, we are using ISE's (ion selective electrodes) which would give an output voltage corresponding to the proportion of desired nutrient present in soil. This ISE obtains information about desired content in terms of voltage, but we need the information in the form of binary bits so we are using an ADC. This ADC will generate information required for the satisfactory operation of microcontroller. the primary function of microcontroller is to generate information regarding the nutrient in deficiency. From this entire assembly, we have produced information about exact proportion of nutrients required and suggest the fertilizer suitable for specific soil.

By providing this facility, we are looking forward to achieve following objectives

- Reduction in time required for soil testing
- Reduction in work load on central labs.
- Achieving greater production by using the fertilizers in appropriate proportions.

II. DESCRIPTION

The main objective of this paper is to reduce the time required for soil testing. the traditional method of soil testing is by using chemicals. There is one regional laboratory in every 100km, where soil testing is performed so every farmer in this locality would approach this laboratory for soil testing. this results in excessive work

load on these laboratory. The time taken by central laboratory to produce the results is 7 days whereas our project would produce the results in 5-7 minutes. This assembly would reduce the time required significantly in producing the results. by using this assembly, we can increase the efficiency of production.

III. FLOWCHART

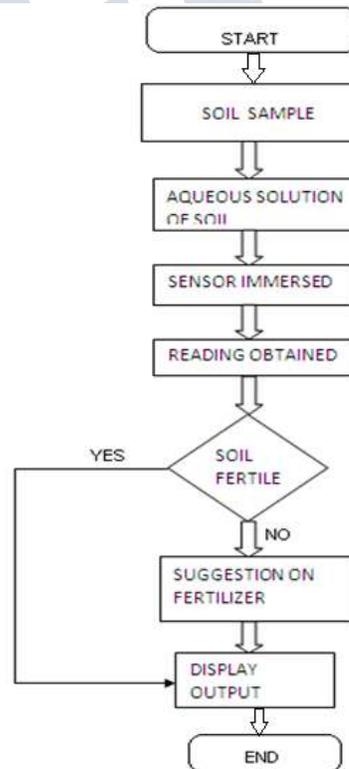
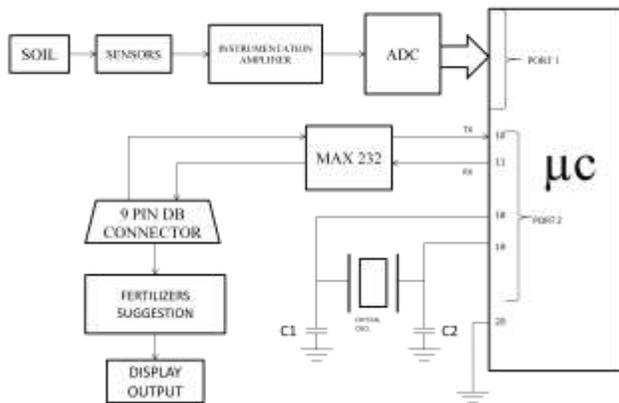


Figure 2: Flowchart of Project

IV. BLOCK DIAGRAM



The system is divided into following sections

- A. Sensor
- B. instrumentation amplifier
- C. ADC(analog to digital converter)
- D. Microcontroller
- E. Max 232
- F. 9 pin DB connector

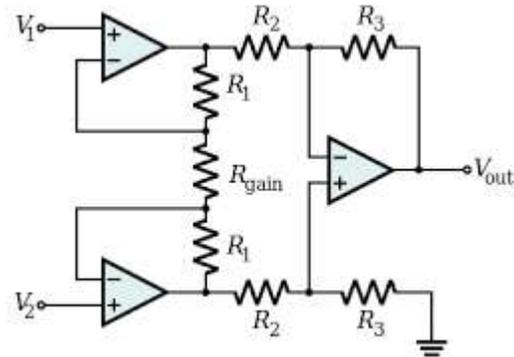
A. Sensor

Sensor is a sensory device which is used to obtain information about any desired parameter. It produces proportionate voltage according to the presence of desired parameter. In this case, sensor is an ion selective electrode which generates information about the content of nutrient present in soil. This sensor is highly sensitive to smallest of variations in the nutrient concentration. The specifications useful in selecting the sensors are PH, response time and internal resistance. Ion-sensitive probes are based on the potentiometric measurement principle. The probe includes at least two electrodes, a reference and a measurement electrode. The measurement electrode is equipped with a special membrane, capable of binding specific ions reversibly.



B. Instrumentation amplifier :

This amplifier is used for amplifying the voltage provided to it by sensor. The voltage generated by sensor is very small in magnitude, but for the satisfactory operation of microcontroller we need a specific level of voltage. To achieve this voltage, instrumentation amplifier is used.



C. ADC(analog to digital converter):

This circuit is responsible for converting analog voltage to digital information required for satisfactory operation of microcontroller. The maximum no. of inputs that can be provided with ADC is 8.

There are 2 status pins which describe function of ADC

1).soc(start of conversion): when the status of this pin becomes 1, ADC starts converting the data from analog to digital.

2) Eoc (end of conversion): when the status of this becomes 1, it indicates that conversion of data is done. The operating clock frequency of ADC is 1.25KHZ. This circuit is provided with two reference voltages pins(+vref and -vref) to approximate the inputs to a pre-determined voltage level.



D. Microcontroller:

We are using 89c51 microcontroller which is a small computer on a single integrated circuit. The 89c51 microcontroller is a 40 pin IC. This microcontroller IC four

ports. We are using port 0 of microcontroller to obtain output information. This microcontroller IC requires 5v DC supply. The operating frequency is 11.592 MHz.

The microcontroller produces output information regarding deficient mineral and proportion of the three desired minerals. Microcontrollers are also designed for embedded applications, in contrast to the microprocessors used in personal computers or other general purpose applications



E. Max 232 :

Max 232 is an integrated chip used for interfacing between microcontroller and display output. Max232 is basically a TTL to c-mos converter which is essential for connecting microcontroller and display output (pc). It communicates with microcontroller by giving status on Tx and Rx pins of microcontroller. The MAX232(A) has two receivers (converts from RS-232 to TTL voltage levels), and two drivers (converts from TTL logic to RS-232 voltage levels). This means only two of the RS-232 signals can be converted in each direction. Typically, a pair of a driver/receiver of the MAX232 is used for TX and RX signals, and the second one for CTS and RTS signals.



9 Pin Db Connector:

It is a connector used for connecting the display output with mx232. It allows the display output to communicate with the entire circuitry. It uses RS-232 serial communication standard for communication with the display output. Many uninterruptible power supply units have a DB-9 connector on them in order to signal to the attached computer via an RS-232 interface

V. CONCLUSION

The widest application of D-sub is for RS-232 serial communications, though the standard did not make this connector mandatory. RS-232 devices originally used the DB25, but for many applications the less common signals were omitted, allowing a DB-9 to be used.

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