

# Automation of Fertilizer Producing System

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**Abstract**— In this paper we present the idea of automation of fertilizer producing system operated with Arduino mega 2560 which is the main component required. So, in this way manual intervention is not required for monitoring and controlling of flow of liquid. This system can be used for fluids in chemical industries or factories. The main aim of this project is to provide optimal water and acid distribution and moreover reduce manpower involved in it.

**Key words:** Fertilizer Plant, Float Sensor, GSM, Arduino, Mixing Proportion, Automation, Tank, Water Pump Motor, Relay

## I. INTRODUCTION

Fertilization increases efficiency and obtains better quality of product recovery in agricultural activities. Plant growth is important to agriculture because farmers need to produce food efficiently. Fertilizer assists in plant growth. A plant needs nitrogen, phosphorus, potassium, calcium and magnesium the most to grow healthy. Nitrogen, phosphorus, and potassium are the top three elements needed in plant growth. In older method the fertilizers are prepared through blending and granulation process. To produce fertilizer in the most usable form, each of the different compounds, ammonium nitrate, potassium chloride, ammonium phosphate is granulated and blended together. One method of granulation involves putting the solid materials into a rotating drum which has an inclined axis. As the drum rotates, pieces of the solid fertilizer take on small spherical shapes. They are passed through a screen that separates out adequately sized particles. A coating of inert dust is then applied to the particles, keeping each one discrete and inhibiting moisture retention. Finally, the particles are dried, completing the granulation process. The different types of particles are blended together in appropriate proportions to produce a composite fertilizer. The blending is done in a large mixing drum that rotates a specific number of turns to produce the best mixture possible.

After mixing, the fertilizer is emptied onto a conveyor belt, which transports it to the bagging machine. The main disadvantage in manual way of preparation is it requires more man power, handling of acid constituents without safety measures will be harmful and the grinding and blending machines consume more power. This project focus revolves around the basic operations of mixing, granulating and reacting. Mixing principle enables a wide range of consistencies such as water, dusts, sludge, acid and filter cakes to be processed. This automation is possible to produce granules with the desired specification that are stable. This can supply a product of stand-alone granulation systems to turn key fertilizer systems. Objective of this project is to provide fertilizer using a electronic control unit there by produces high yield with less effort. The ratio of constituent resource to be added is also adjusted accordingly. Both the electronic and mechanical components support the fertilizer plant to be in automated form. Whereas the Arduino

mega acts as electronic part and Alternative current single-phase motor and RO system acts as mechanical support. The connection is made through relay, contactor to make the pump control manual or automatic in the flow of process. The integration of several different motors is connected through the relay and contactors and their working flow programmed in the electronic module. Meanwhile the individual process in plant automation can also be controlled manually. The level of mixing of liquid constituents such as water and acid are monitored through level sensors. The duration of flow of acid and water in the dilution tank is determined through delay timer which is fixed along with dilution tank motor.

Thus, this project requires less human support tends to be highly economical process. Simple system concept closed system keeps emissions to a minimum short batch times, mostly between 1 max. 1 1/2 hours. Proportion of mixing can be adjusted to individual requirements and extensive formula management possible.

## II. NEED FOR AUTOMATION

Programmed automated system for proportions the acid and water ratio for producing fertilizer is advantageous particularly for the individual's farms and also for other chemical industries and factories. In the event that introduced and customized legitimately, programmed automated frameworks can even spare you cash and helps in rationalising the liquid content. If we invest funds on programmed automated liquid monitoring system that can able to go beyond that. Handling acids with bare hands can cause harmful hazards which can be avoided as well. Programmed water and acid rationalising system frameworks can be provided to release more exact measures of mixed solution in a focused-on range which can be used in other chemical industries also. We can switch on/off the motor from which ever place we are.

## III. WORKING

The fig1 shows the hardware kit of automatic fertilizer producing system. The system has a circulated wired network of water float sensors connected to each water tanks in the fertilizer plant. Since each motor pump connected to the tanks are driven electrically it is essential to control the pump through the Arduino which can be done with the help of relays. The automation concept mainly deals with the different three tanks they raw water tank, acid tank and mixer tank included with reactor chamber. Once the raw water tank and acid tank gets filled the water level sensor in both the tank indicates that the tank is filled mean while stops the motor run. The next process is carried out in the mixer tank where both the acid and water from the two different tanks are mixed with appropriate proportion as prescribed in program .The float sensor is placed in the mixer tank because the liquid in the mixer tank has to be maintained for particular duration after which the liquid is transferred through the next

processing unit, it should be noted that until the tank gets empty any flow of water or liquid to mixer tank should avoid. Once after the tank mixer tank gets completely empty the next flow of mixing proportion gets started.

In this task Arduino is heart of the undertaking all information changing and controlling of outside peripherals can be controlled by Arduino. In this undertaking float level sensors, relays, contactors are utilized for using so as to check nature those data we turn ON/OFF water pump and will keep up yields and analyst without labour should be possible via naturally. To start with we consider checking the initial level of liquid in the tanks that is monitored by water level sensors like persistently observing and sending the sign to the Arduino if level of liquid in mixer tank recognized then quick data will be sent until which delay timer starts to work sequentially.

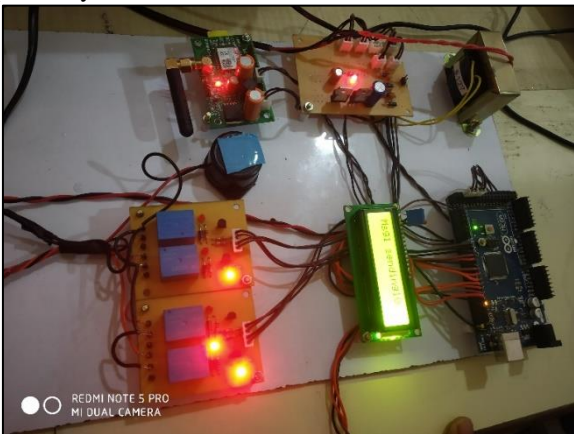


Fig. 1: Working model of automated fertilizer plant

When one complete process of producing system gets over then the delay timer switches to off mode there by it sends a notification to the user mobile mean while the motor run also turned off in order to prevent the dry run, the Arduino takes the control over the relays of motor and the contactors. The GSM module is connected to the Arduino which states the information about motor and level of liquid in each flow state of tank to the user mobile. Then the current operation and current state of status is updated in the LCD which is plugged with Arduino mega to advanced utilizing of Arduino the contactors connected with VFD variable frequency device is used to control the frequency level of motor. These complete processes take place sequentially in the same order for each flow of liquid.

#### IV. CONCLUSION

The framework furnishes with few advantages and that work with a less labour. A framework provides correct proportion of water and acid required for fertilizer preparation in automated form. This perfect way of proportioning the liquid in automated form is in need because handling of acid mixing in manual form is unsafe and requires more safety precautions to be undertaken. In this way the framework is productive and perfect to evolving environment. The programmed watering and acid proportions system framework executed is observed to be plausible and practical for real time installation. This frame work permits development in spots with fertilizer production. Implementation of this frame work could handle the flow of motor and also reduces the chance of dry run more

over the outcome from system is sufficient decreases the importing of fertilizer from other countries. Energy during this framework, applicable when essentially vital for naturally yields and other rural items, where the interest in electric power supply required is reliably less. The main benefit is that the proportion required for each sort of fertilizer could be adjusted at any cause of requirement else the constant value could also be maintained but changing of constant proportioning value would involve in change program that is the previous value has to be changed to new proportion value in the program and it should be dumped in to the hardware. The exact setups of the mechanized system permit it in the direction of scale up meant for fields. In addition to this system, other advantage is data of motor running, water level and acid level can be monitored mean while the data could be notified through cloud. Controllers duplex communication framework provides a strong choice making gadget idea for an adjustment to few growth scenarios. Furthermore, the web link permits the management of liquid through the versatile telecommunication devices. For ex- a Smartphone. Other than the money related investment funds automation of fertilizer production process, the significance of the conservation of this regular asset legitimize the utilization of this sort of frameworks.

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