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AUTOMATIC IMMACULATION OF MILK SILO

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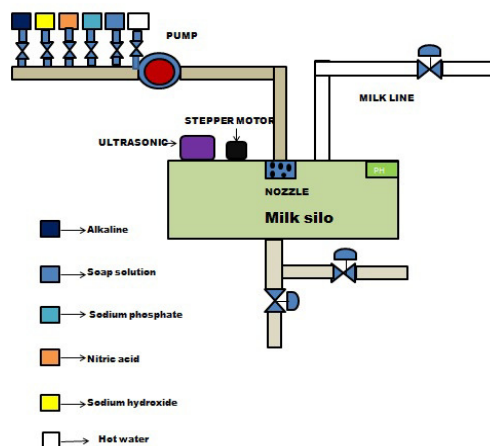
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Abstract—Cleaning-in-Place (CIP) is a crucial part to be automated in batch process industries. In many Process industries after completion of a batch, the equipment cleaning is done by using CIP process. There are many methods used for cleaning the industrial equipment like tanks in food and pharmaceutical industries, such as 3-step, 5-step and 7-step CIP. In any industry, once the batch product is manufactured, the equipment used for manufacturing should be cleaned to have hygienic products. The tanks, pipes are cleaned with different chemical solutions, such as caustic, acids, enzymes etc. To have an economical production, sometimes the solutions are recovered and reused. This paper is primarily addicted with a scene to provide combination of the concepts and application of automation of CIP in the process industries like food, dairy, beverage and pharmaceutical verticals. Proposed work for dairy industries contains CIP defined for cleaning and sterilizing of tanks, valves, and pipes with the help of acid, lye and consequent sterilization with high energy efficiency.

Keywords— Automation, CIP, Arduino, Dairy.

I. INTRODUCTION

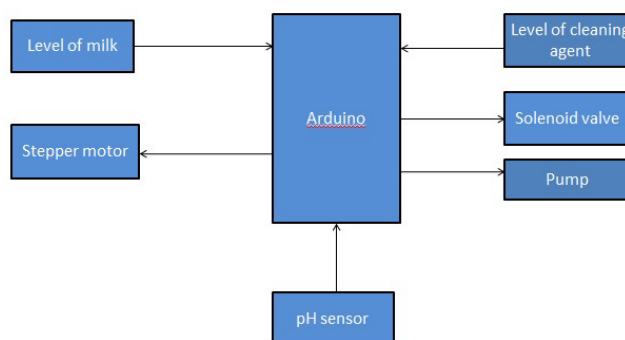
According to the CIP manual of Society of Dairy Technology(SDT), the definition of CIP is cleaning in place, it is adopted by National Dairyman's Association (NDA).Cleaning-in-place (CIP) process is becomes indifferent activity in all pharmaceutical, beverage, dairy and food processing plants. Now days in India the processed food and beverages industry is shifting towards the CIP process over the last 5-10 years, while considering the use of technology in the dairy industry, which shows increased requirements from customers in terms of CIP validation and verification to provide improvements in hygienic plant, quality of finished product, microbiological considerations and related shelf-life. Traditionally, cleaning is done by a manually; now days in many small-scale operations cleaning is done by manual process, so it is important that there is careful attention on the reasons of the health and safety of the mild and aqueous chemical solutions, disinfectants and detergents can be used, and stiff trust to cleaning procedures is critical. In the more complex plant and equipment involved common approach is to employ the automated CIP programs. The CIP system consists of a four major programs which are mainly i) Acid CIP, ii) Lye CIP, iii) Sterilization and iv) Flushing. Automated CIP station is as shown in the following figure, the basic principles of CIP process of washing is explained in the dairy industry . The advantages and significant results of the study are summarized in conclusions.



II. PROPOSAL IDEA

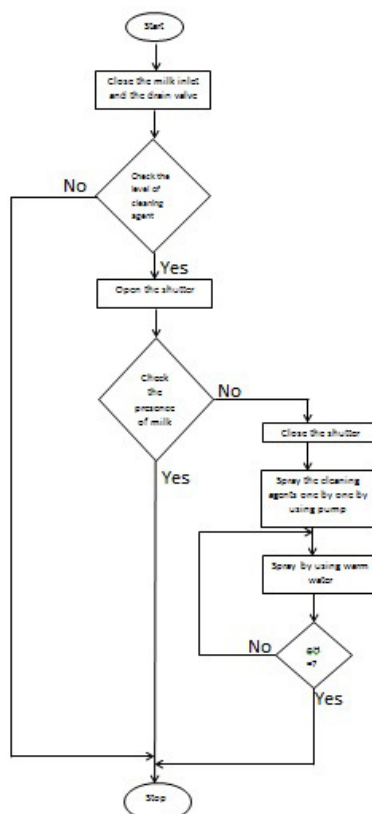
Good cleaning of dairy plant using CIP system cannot be accomplished without hygienic design and proper installations of system. Soil is a combination of the scale, product residue and unwanted deposition of matters which is to remove from the plant surfaces by using the CIP process. In food processing industry soil includes fat, protein, sugar, minerals, fruit cells, gums, starches, emulsifier and stabilisers, which is difficult and complex to clean by using detergents. The objectives of the CIP system using arduino automation systems are as i) Good hygienic design of the engineering installations, ii) Design of CIP station and iii) Optimization of flushing step.

III. BLOCK DIAGRAM



Arduino mega acts as the main controller of the project. Ultrasonic sensor is used to measure the level of the milk and the cleaning agent. Though ultrasonic sensor is non-contact type of instrument to measure the distance of an object and can measure the level inside a medium, it is preferred as a level measuring instrument. Additionally, Stepper motor is used to make the function of shutter which protects the ultrasonic sensor from the spraying process. Solenoid valve used here is to automate the process of flow of cleaning agents and milk in their inlets and outlets sequentially. Pump is to spray the agents likewise into the tank. pH sensor is used to check the purity of the tank after cleaning process is done. After all the cleaning process is done the pH sensor is used the ensure the purity of the tank after cleaning.

IV. FLOW CHART



Our system uses ultrasonic sensor to measure the level of the tank , if there is presence of milk then the total process will not get started .If the tank is empty then the cleaning process will start. To check the level of the cleaning agents the ultrasonic sensor is placed .If the level of the cleaning agent is lower than the required level, the process will not get started. When all the conditions are satisfied the total cleaning process is get started. The pump is used to spray the cleaning agents in the required pressure. Each cleaning agent is closed by solenoid valve. All the Actuators and sensors were connected to microcontroller. Where the total controlling process is done and the signal is received from the sensor. Depending on the program the output to the actuator is generated. After all the cleaning process is done the pH sensor is used the ensure the purity of the tank after cleaning.

CONCLUSION

We have successfully developed a modular and flexible CIP system in dairy industry, using arduino automation systems are used for hygienic design of the engineering installations such as materials and surface roughness, pipes and equipment must be able to drain, avoid dead ends in pipe connections, avoid dead end in tanks, a minimum velocity is required in the cleaning agent to create a mechanical shear stress to remove the soils from the wall, design of CIP station such as recommendation to reuse system with monitoring tools and optimization of flushing step by using rinsing time based on temperature or concentration, reduce rinsing time between chemical solutions, reuse of rinsing water for other industrial water uses and based on temperature or conductivity value. Modern methods of food processing and production are used various secure technologies for sanitation and washing of the equipment, which is provide and maintain product safety and acceptable, good quality of production.

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