Process Automation Through PLC And SCADA

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Abstract

Automation and digitalization are the key factors of advancement in technology. Thus, this project gives an insight to such a system where manufacturing machinery can be monitored from any corner of the world. Here, a PLC (Programmable Logic Controller) and SCADA (Supervisory Control And Data Acquisition) will be used for controlling and monitoring the machine parameters. An on-screen machinery will be created for user interaction where by using different switches, various faults can be inserted into the machine through PLC and using SCADA, the output can be obtained on the SCADA screen and mobile. If any kind of fault occurs in the machine parameters, immediately an alert SMS will be received on the SCADA screen (created using RS LOGIX-500), as well as on the mobile (using VISUAL BASIC). Also, on-line machine status monitoring and production tracking can be easily achieved through this system.

Keywords: gas turbine, combustion chamber, cooling techniques, turbulent flow.

I. INTRODUCTION

A. Need of the project

- Bias plant is 20 year old with old machinery, technology and conventional tyre manufacturing process.
- It requires significant interventions for setup, running, troubleshooting and controlling the process.
- Transparency level of the manufacturing process is not up to the mark resulting in product quality loss and dissatisfaction among the customers.

B. Hence to get solution for the above discussed points, the project is planned to improve utilization of tyre curing process through

- Set-up time reduction, i.e to reduce the time taken to insert various process matrix. Practically in the industry there are different chemical recipes, which is to be entered and which is being done manually, each time before starting the new process, and time wasted in this procedure is about 45 minutes.
- Online production tracking system, i.e the production of tyres in the plant can be monitored from anywhere – anytime as the system will be online, and tracking can be done by triggering of time based messaging or event based messaging or both as per the requirement of supervisor.

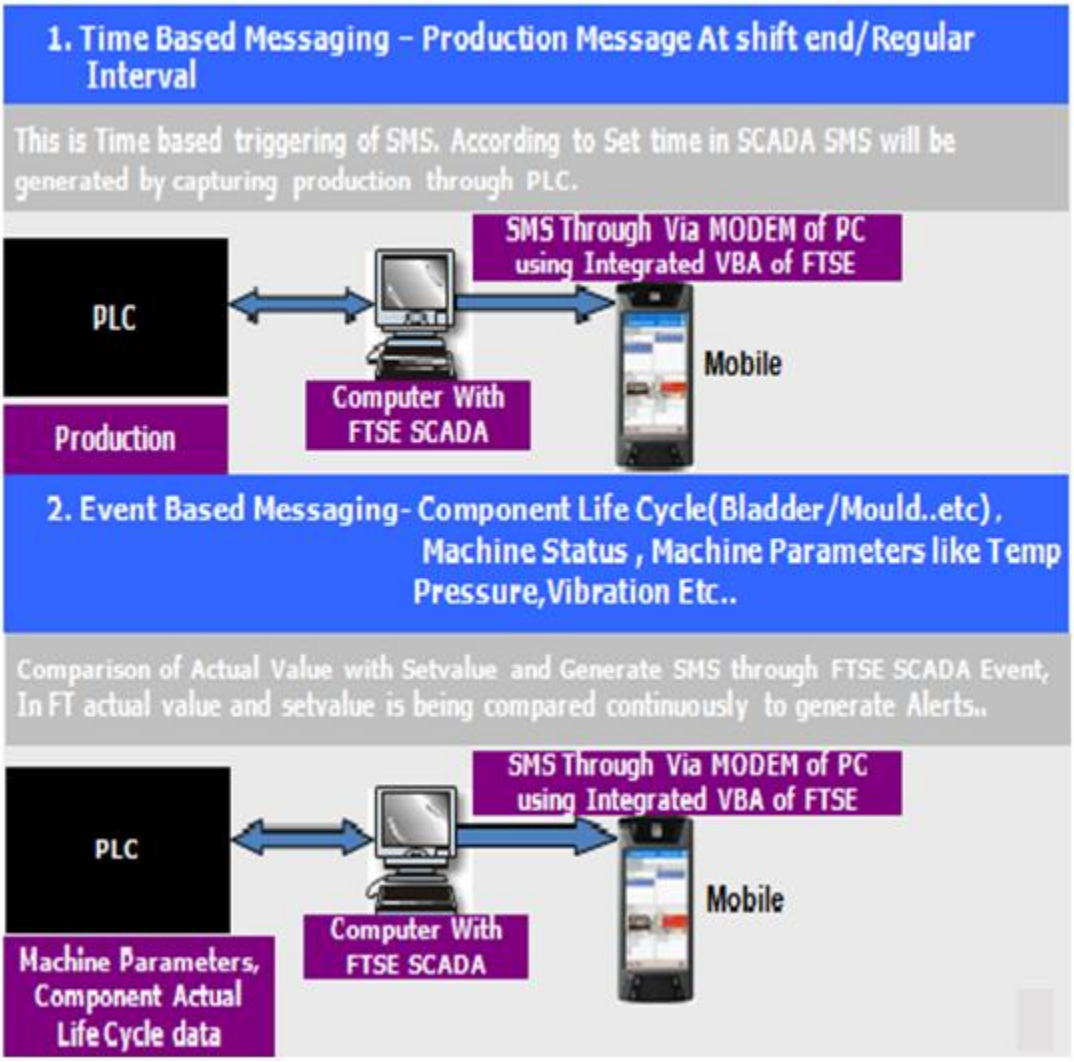


Fig: Getting SMS alerts on the mobile through online system

– Eliminating defects through components life cycle over alerts, i.e. the product counting process is basically manual and thus more chances of error in counting process, now the particular tyre curing press and bladders used in tyre production are having a particular life-cycle (for example 500-600 tyres), after that they must be Replaced, otherwise it would give rise to quality issues, through the automation process the alerts can be obtained at particular time according to the requirement.

Fig: Bladder

Fig: Tyre curing press photograph and Tyre curing press product

– To optimize and control current processes with low cost automation, i.e. the total cost for the project must be sufficiently low so as to incorporate the project successfully in the industrial domain and control the process effectively.

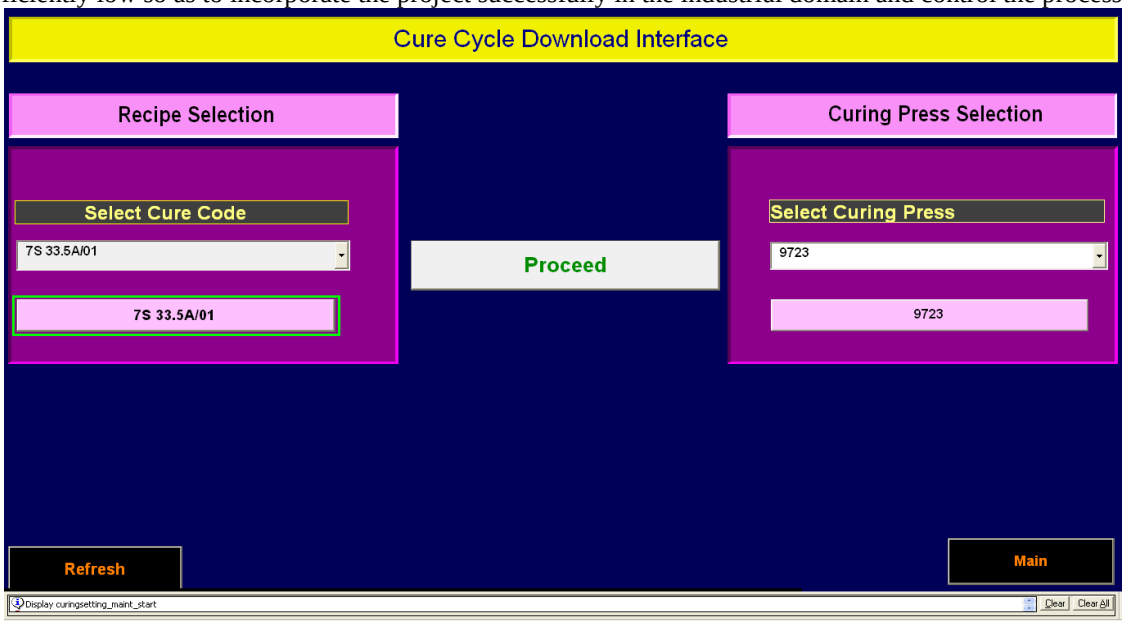


Fig: Automation of recipe entering process instead of manual process.

Thus with this model project many of the industrial processes can be automated, and managed effectively and precisely at supervisory level, thus reducing the possibility of errors in the system, and thereby reducing losses in the manufacturing process. After the deployment of this particular project, various benefits that can be obtained are as follows:

– Component life-cycle (i.e. mould, bladder) – The loss due to component life cycle is 72 tyres per year, which can be reduced to zero as no scrap is expected as we get alarm and SMS alerts, so maintenance/replacement schedule is being followed through system.
– Wrong cure cycle setting – Due to this, tyre scrap is (12tyre/ quarter), but with this model no scrap is expected as process of cycle setting is fully automated.
– High set-up time -- 8 tyres/day losses due to high set-up time, which will be totally eliminated through the process automation, as parameters, need not to be entered and checked manually.

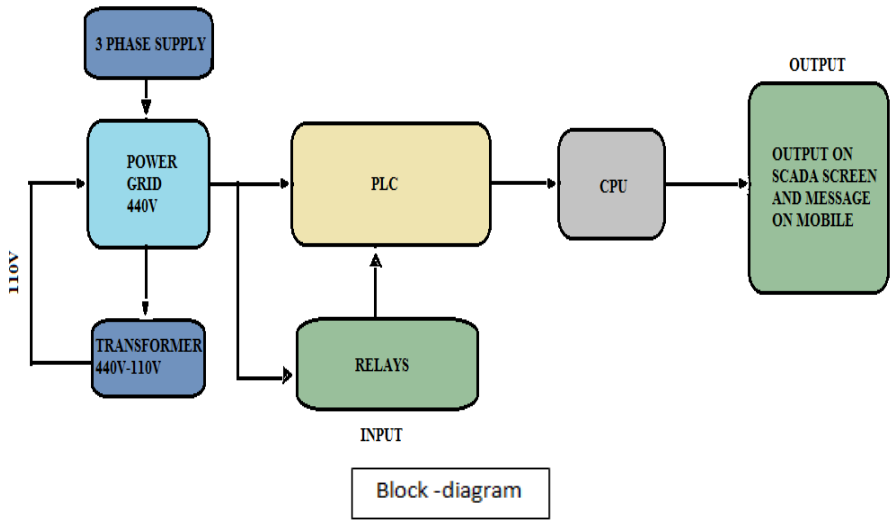
Hence this project gives insight to complete automation of various processes in the industry, at the supervisory level, by using PLC and SCADA, and using VB(visual basics) to create a on-screen interaction machine to enter inputs from user (i.e. various faults) and get the SMS on mobile, and hence present a demo model for the project.

II. PROCESS

Here we are going to deal with industrial environment where 3-phas supply (440V) is used for running motors. PLC series being used is 1766-L32AWAA of Allen Bradley MicroLogix 1400. MicroLogix 1400 is programmed with RSLogix 500 programming software (version 8.1 and above).Main features of PLC includes Ethernet/IP, On-line editing and a built-in LCD panel. This

controllers feature a higher I/O count, faster high speed counter, pulse train output, enhanced network capabilities and backlight on the LCD panel. Controllers without embedded analog I/O points provide 32 digital I/O points, while analog versions offer 32 digital I/O points and 6 analog I/O points. Also, it adds to cost effectiveness of the system. Voltage rating of PLC is 110 volt. Since, the initial supply of 440V is too high as compared to PLC rating; hence a step down transformer is used. Thus, power supply from the power grid (240/415V) is step downed using transformer to 110V. This 110V is again fed to the power grid which then distributes it to the relays and PLC. 4 relays are used as inputs to the PLC. These relays are electromechanical relays.

Basically, three types of programming are used in PLC-ladder logic, control system flowchart, statement logic. Here, we are dealing with ladder logic programming. RSLinx is used to communicate PLC hardware to the PLC software. The output from the PLC is passed to the CPU from where it is obtained on the SCADA screen through RSView 32 (used to create a screen to access the data acquired from the sensors) and on mobile using Visual Basic.



Block -diagram

III. CONCLUSION

This project effectively supports portability and enables us to monitor the process on the run from anywhere. The main factor holding the project up straight is the instant alertness and messaging on the SCADA screen and mobile. Using this, manual handling is reduced up to a great extent, also the scrap reduction is achieved thus saving wastage of material and time.

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