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Study of SCADA Mixes of RMC for Government Project

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ABSTRACT: Supervisory Control and Data Acquisition (SCADA) is a process control system that enables a site operator to monitor and control processes that are distributed among various remote sites. The acquisition of data, the processing of those data for use by the operator, and operator control of remote devices are the fundamental building blocks upon which all modern utility control systems are based. The systems to accomplish these functions are known as Supervisory Control and Data Acquisition (SCADA) systems. This paper provides an overview of the functions of SCADA and the fundamentals of operation of SCADA systems. The properly designed SCADA system saves time and money by eliminating the need of service personal to visit each site for inspection, data collection /logging or make adjustments.

KEYWORDS: Remote monitoring system, SCADA, Sensors.

I. INTRODUCTION

SCADA stands for Supervisory Control and Data Acquisition. As the name indicates, it is not a full control system, but rather focuses on the supervisory level. As such, it is a purely software package that is positioned on top of hardware to which it is interfaced, in general via Programmable Logic Controllers (PLCs), or other commercial hardware modules. SCADA systems are used not only in most industrial processes: e.g. steel making, power generation (conventional and nuclear) and distribution, chemistry, but also in some experimental facilities such as nuclear fusion. Supervisory Control and Data Acquisition systems are computers, controllers, instruments; actuators, networks, and interfaces that manage the control of automated industrial processes and allow analysis of those systems through data collection. They are used in all types of industries, from electrical distribution systems, to food processing, to facility security alarms.

Supervisory control and data acquisition is used to describe a system where both data acquisition and supervisory control are performed. SCADA is an acronym for Supervisory Control and Data Acquisition. SCADA systems are used to monitor and control a plant or equipment in industries such as telecommunications, water and waste control, energy, oil and gas refining and transportation. These systems encompass the transfer of data between a SCADA central host computer and a number of Remote Terminal Units (RTUs) and/or Programmable Logic Controllers (PLCs), and the central host and the operator terminals. A SCADA system gathers information (such as where a leak on a pipeline has occurred), transfers the information back to a central site, then alerts the home station that a leak has occurred, carrying out necessary analysis and control, such as determining if the leak is critical, and displaying the information in a logical and organized fashion. These systems can be relatively simple, such as one that monitors environmental conditions of a small office building, or very complex, such as a system that monitors all the activity in a nuclear power plant or the activity of a municipal water system. Traditionally, SCADA systems have made use of the Public Switched Network (PSN) for monitoring purposes. Today many systems are monitored using the infrastructure of the corporate Local Area Network (LAN)/Wide Area Network (WAN). Wireless technologies are now being widely deployed for purposes of monitoring.

II. LITERATURE SURVEY

Various previous works related to **Supervisory Control and Data Acquisition** are as follows:

In PWD Handbook Chapter No. 41, this chapter covers the requirement for the production and supply of mechanized batched mixed concrete produced in captive batching plants and/or concrete produced in and procured from commercial ready mixed concrete plants. Batching control should be such that process identification at every stage and back traceability (later on) can be ensured. It is always desirable to have automation in batching process and its control.

Preferably a SCADA system shall be installed. SCADA is Supervisory control and data acquisition, is a type of industrial control system for monitoring and control industrial processes that exist in physical world. Similarly it should be ensured that the computer printouts are taken for every batch and proper record shall be kept.

In the paper titled, "What is SCADA" published in International Conference on Accelerator and Large Experimental Physics Control Systems, Trieste, Italy. This paper describes SCADA systems in terms of their architecture, their interface to the process hardware, the functionality and application development facilities they provide. Some attention is paid to the industrial standards to which they abide their planned evolution as well as the potential benefits of their use. SCADA systems have made substantial progress over the recent years in terms of functionality, scalability, performance and openness such that they are an alternative to in house development even for very demanding and complex control systems as those of physics experiments. SCADA systems are widely used in industry for Supervisory Control and Data Acquisition of industrial processes. Companies that are members of standardization committees (e.g. OPC, OLE for Process Control) and are thus setting the trends in matters of IT technologies generally develop these systems. As a matter of fact, they are now also penetrating the experimental physics laboratories for the controls of ancillary systems such as cooling, ventilation, power distribution, etc. More recently they were also applied for the controls of smaller size particle detectors such as the L3 muon detector and the NA48 experiment, to name just two examples at CERN. SCADA systems are a vital tool for keeping our society going. As electronics and communications have improved, so have the capabilities of SCADA systems. SCADA systems make controlling large and small processes easier for Operators in construction industries.

In the paper titled, "SCADA system security: Complexity, history and new developments" published in The IEEE International Conference on Industrial Informatics (INDIN 2008). The security of SCADA systems has been the subject of research, standardization and industrial practices for several years. However, the attacks on SCADA system is getting more frequent due to the openness of the SCADA network platforms, the advancement of hacking techniques and the increased availability of hacking tools. It will rise to a significant level in the future according to the investigation and study by the Committee on Homeland Security [2]. The cooperative efforts from control/automation and IT specialists are the key to combat the threats facing the SCADA systems. New protocols, standards and products are expected to strengthen the security levels of various existing and future SCADA systems. In this paper, we have briefly discussed the major differences between control network security and traditional IT network security. The complexity of SCADA system security is presented. The progress on SCADA system security researches and developments is reviewed. Efforts on the SCADA security from governments, international standardization bodies and research communities are summarized. Some representative products, proposed protocols, and applications are presented. The technical trend and direction on the SCADA security research are discussed. A few research topics, such as high speed real time intrusion detection, artificial immune system for SCADA system, and SCADA security vulnerability assessment, are identified as promising research areas.

In the paper titled, "Supervisory Control and Data Acquisition System (SCADA) in Construction Industries" published in Journal of Advances and Scholarly Researches in Allied Education [JASRAE]. SCADA systems are a vital tool for keeping our society going. As electronics and communications have improved, so have the capabilities of SCADA systems. SCADA systems make controlling large and small processes easier for Operators in construction industries.

In the paper titled, "Remote Data Acquisition Using Wireless – SCADA System" published in International Journal of Engineering (IJE). This paper describes about "Remote site Safety & security Application by using Controller" to achieve to produce an input data file for each of the Data Logger, build a Controller Area network, Collect & manage data in the Control Area Network (CAN) and Send SMS to a monitoring centred. GSM communication performed almost flawlessly data transfer from sensor at remote area was executed without incidents. Since all communication between data logger and user are wireless based, this translates into lowest cost compared to all others system. In this project all the database is stored in a central database in the data logger; user has global access to consolidate data from many system or locations. Wireless based solutions have universally accepted, familiar and user friendly system. Real-time logging would allow warnings to be flagged to the relevant personnel (e.g. an SMS warning message to the supervisors) and allow corrective action to be taken before the quality and value of the catch is degraded. With the proposed setup in Figure 3 temperature was successfully monitored remote location and it was measured to be around 30°C. Similarly energy meter reading from remote location was also successfully implemented using demonstrated hardware setup of wireless SCADA system. The recorded energy meter reading as demonstrated in Figure 2 is 223 KWH. Hence the wireless SCADA system is powerful setup for monitoring and controlling the various applications from remotely placed location. It can be further extended for various area of application like health monitoring system, Home security system, Vehicle Security system etc.

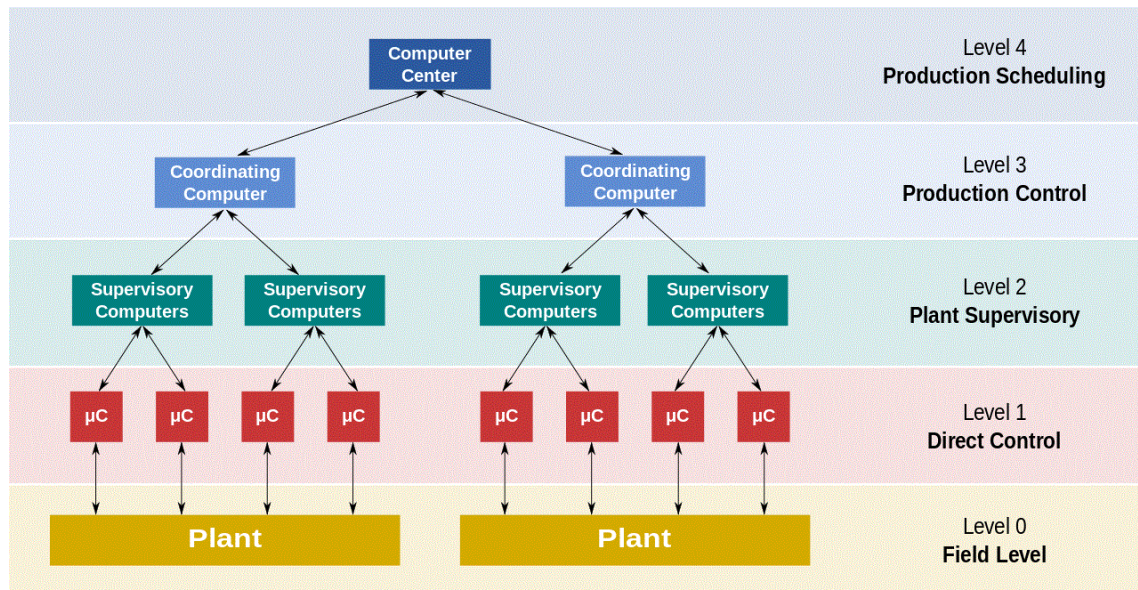
In the paper titled, "Security Aspects of SCADA and DCS Environments", this paper describes about analysing technological advances in the SCADA network architecture and to show how different ICT systems have converged in

real-time monitoring processes and also to show how the control system is dependent on these ICT systems. Nowadays, isolated SCADA networks are converging on standard ICT-based systems bringing new security challenges and a large number of potential risks due to threats, vulnerabilities and failures. Some of these are associated to the TCP/IP standard, the use of open (hardware and software) components and wireless communication technologies. In order to address some security issues, special attention should be paid to the network management. Critical control networks (SCADA or DCS systems) must supervise, through computational systems, the constant performance of other critical systems, whose services are essential for survivability, like for example electric energy. A failure or threat in the control of a critical system could mean the (total or partial) disruption of its services, and therefore massive chaos among interdependent infrastructures whose impact could be devastating for the well-being of our society and economy.

In the paper titled, “Techno-economic analysis of selecting the aggregate supply system based on optimal equipment layout in ready-mixed concrete plants” published in The Indian Concrete Journal August 2016. As aggregate supply in ready-mixed concrete (RMC) plants is either a star or a linear system, loaders are used to load aggregate in both systems, therefore, the cost of supplying equipment, repair and maintenance, depreciation, and human resources increases. This means that using the loader is non-optimal. The purpose of this paper was to study aggregate feeding in batching plants techno-economically. The results revealed that the use of the loader in a star system produced 12.5% efficiency, and its cost was 81% of the total capital of setting up the production line. These figures in a linear system were 25% and 75% respectively. Moreover, the cost of supplying loaders in a star system was four times as big as the cost of supplying a batching plant. To improve the continuous efficiency in production and to decrease the required capital, the correction of the aggregate feeding line was considered. Therefore, the funnel-conveyor system was introduced. The ratio of the cost of the equipment for such a system (funnel-conveyor) to the cost of a loader and a mini-loader was 10 and 30 per cent respectively. This means that 70 to 90 per cent of the initial capital required for a batching is economized. It should be mentioned that in this system, supplying aggregate by trucks needs to be checked carefully so that in critical times, the lines are not stopped due to lack of resources.

III. SCADA SYSTEM

A Supervisory Control and Data Acquisition (SCADA) system is a powerful tool which, when implemented properly in construction industries can lead to improved service to more effective operations and in some cases a reduction in costs (less labor, less energy, etc.). However, widespread adoption of SCADA and automation technologies remains a technical and financial challenge for most construction fields. In spite of many good hardware and software products available on the market now, putting all the pieces together requires specialized expertise. Nevertheless, by following some straightforward strategies and rules of good practice, combined with advanced control techniques, even very complex automation systems have been successfully implemented. These implementation steps are briefly outlined with a focus on lessons learned. Updated implementation costs for typical system components are given to aid in project planning, well as quality of the work taking place at other field remote location. This paper provides an overview of experience implementing SCADA systems. By investing in advanced communications and electronics technologies, construction industries are striving to benefit from reduced operations costs, improved system performance, and increased responsiveness from a management standpoint. In practice, many engineers face challenges in each step of the project-cycle that mean achieving these benefits is far from automatic. The below given diagram shows the how SCADA works from field;



Referring to the diagram,

Level 0 contains the field devices such as flow and temperature sensors, and final control elements, such as control valves.

Level 1 contains the industrialised input/output (I/O) modules, and their associated distributed electronic processors.

Level 2 contains the supervisory computers, which collate information from processor nodes on the system, and provide the operator control screens.

Level 3 is the production control level, which does not directly control the process, but is concerned with monitoring production and targets.

Level 4 is the production scheduling level.

Level 1 contains the programmable logic controllers (PLCs) or remote terminal units (RTUs).

Level 2 contains the SCADA software and computing platform. The SCADA software exists only at this supervisory level as control actions are performed automatically by RTUs or PLCs. SCADA control functions are usually restricted to basic overriding or supervisory level intervention. For example, a PLC may control the flow of cooling water through part of an industrial process to a set point level, but the SCADA system software will allow operators to change the set points for the flow. The SCADA also enables alarm conditions, such as loss of flow or high temperature, to be displayed and recorded. A feedback control loop is directly controlled by the RTU or PLC, but the SCADA software monitors the overall performance of the loop.

Levels 3 and 4 are not strictly process control in the traditional sense, but are where production control and scheduling takes place.

Data acquisition begins at the RTU or PLC level and includes instrumentation readings and equipment status reports that are communicated to level 2 SCADA as required. Data is then compiled and formatted in such a way that a control room operator using the HMI (Human Machine Interface) can make supervisory decisions to adjust or override normal RTU (PLC) controls. Data may also be fed to a historian, often built on a commodity database management system, to allow trending and other analytical auditing.

SCADA systems typically use a tag database, which contains data elements called tags or points, which relate to specific instrumentation or actuators within the process system according to such as the Piping and instrumentation diagram. Data is accumulated against these unique process control equipment.

SCADA technology can be used in construction industries as this makes the work easy with less labour and the quality of work is maintained. As in this paper we have mentioned the technic used in various construction field, like hot mix pant, RMC plant, road roller ,etc. this gives good result in the particular field. Where the cost is maintained due to labor's. On RMC plant the only one person can handle the hole plant with help of SCADA and this further can be seen in the other office of engineer through internet, this this displays the quantity of concrete used in the concrete like cement, sand and aggregate and admixture. The final report also can be seen in this method so that if missed by the engineer the all data can be recorded and can be seen again.

Not only in RMC plant but also on site the work of JCB can be handled by using this equipment, like how much the excavation is done can be seen from the site to the office, the road roller movement kilometers can be seen in this technic thus the equipment's of construction are handled easily.

In HOT MIX Plant the various sand and the tar is been used the SCADA helps to take the amount of material like 6mm, 10mm 12mm, aggregate in the container and the sprinklers the amount of tar in the mixer so that the asplat is prepared easily without the labours with perfect quantity and all this data is been seen through internet in the engineer's office and other head office too with the help of internet. This is AN advance technic and must be used in construction to make the work easy. The barriers occurred during the working can be easily detected without visiting the site or plant.

SCADA (Supervisory Control and Data Acquisition) is a system to automate industrial control and monitoring. SCADA includes field sensors, Programmable Logic Controllers (PLC) and Remote Telemetry Units (RTU). SCADA use can also be found in power generation, manufacturing automation, oil and gas exploration and utilities monitoring and control. SCADA can be used to monitor parameters such as temperature, pressure, flow rate, pH, etc. SCADA can set off alarms based on collected and observed data and remote access function can be enabled through a web based interface or specialized software on networked machines. With the advantage of high efficiency and excellent environment adaptability, SCADA is widely employed in a lot of industry fields. Although the SCADA is widely, there are still some shortcomings like data fusion and data mining on the data acquired from RTU. Regarding this problems, the Service-oriented architecture is introduced and a system constructing method is proposed which will improve the efficiency and reduce the labour cost. The case of electricity using ESB is employed to prove the validity of the method proposed. With the rapid development of information technology, People become more and more dependent on the automatic technology in some special industries like oil, electricity and chemistry. As a novel technology, SCADA is widely deployed in this field, which greatly reduce the manpower requirement and improve the efficiency at the same time. SCADA (supervisory control and data acquisition) is a type of industrial control system (ICS). Industrial control systems are computer controlled systems that monitor and control industrial processes that exist in the physical world.

IV. CONCLUSION

- [1] A large number of processes occur in large industrial establishment. Every process you need to monitor is very complex because each machine gives different output. The SCADA system used to gather the data from sensors and instruments located at remote area. The computer then processes this data and presents in a timely manner.
- [2] SCADA system provides the liberty to store a huge amount of data in a facility. SCADA helps in showcasing the data in a variety of formats according to the user requirements. The interface can connect hundreds of sensors in a pretty long area for completing different monitoring and controlling works. The real data simulations can be attained using the operators.
- [3] SCADA system ensures strict quality control at RMC Plants.
- [4] The redundancy of units are incorporated in the SCADA system in order to have backup in the event of faults or failures. This makes system more robust. It is fast in obtaining response. With the advanced protocols and application software's, the data can be monitored from anywhere and not just from local site.

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