

Preparation and Control of Chemical Filling Station by using DCS

Mr. J. Asokan¹ M. E. (Ph.D), S. Gobisha², T. Haritha², K. P. Thivyapriya²

¹Assistant Professor, ²UG Student,

^{1,2}Department of Electronics and Communication Engineering,

^{1,2}Paavai Engineering College, Namakkal, Tamil Nadu, India

ABSTRACT

Here, we are monitoring, controlling and maintaining the chemical filling station by using DCS automation. Distributed control system is an embedded system which is a combination of hardware and software used for control operations. Each chemical has different method of packing. Some chemicals should be handled more carefully. Each and every chemical undergoes number of process one by one to obtain the resultant product. Here we are using sodium soap as chemical solids. This sodium soap is used in De-inking process in paper industries for removing the ink from the recycling paper, where sodium soap is used in large amount in liquid form. Sodium soap are normally obtained in solid form, we have to undergo number of manual operations to convert it into liquid form which is quite complex and requires time and continuous monitoring. This manual operations are converted into automation by introducing (DCS) Distributed Control System.

KEYWORDS: Distributed Control System (DCS), 800XA control software, Temperature Transmitter, Level Transmitter and Magnetic Flow Transmitter

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1. INTRODUCTION

Sodium soap is a solid form of a fatty acid used in a variety of cleaning and lubrication products. In a domestic usage, soaps are usually used for washing, bathing and other types of housekeeping. In industry, sodium soaps are used as thickener, component of some lubricants, and precursor to catalysts.

When used for cleaning, sodium solubilizes particles, which can then be separated from the article being cleaned. Sometimes sodium soaps acts as surfactants, emulsifying oils to enable them to be carried away by water.

Sodium hydroxide is used to adjust pH. The role of the surfactant used for de-inking to create hydrophilic, dispersed ink particles. Sodium Hydrosulfite is also commonly used to reduce the colors in recycled paper industry.

For de-inking process, the required chemical should be in liquid form. To convert the solid chemicals into liquid it has some manual operations. The bags of solid chemicals is dropped into the hopper, it carries the solid chemicals to the cooking unit through the conveyor belt. In the cooking unit the water is added to the solid chemicals and it is steamed at a particular temperature, this converts the solid chemical into liquid which is cooled and brought to the packing unit and packed at the particular amount into the containers as per the requirements.

This overall process is a manual operation which is converted into automatic process with the help of (DCS) Distributed Control System which is a computerized control system.

2. LITRATURE SURVEY

Chandima Gomes [1] "Characterizing Of Bentonite With Chemical, Physical, and Electrical perspectives For improvement Of Electrical Grounding Systems" the main objective of the paper is use application of bentonite as electrical grounding improvement material (GIM) has been investigated.

R. Yesodha [2] "Effectiveness of Firefly Algorithm in solving Bin Packing Problem" the main objective of the paper is to solve the Bin Packing Problem (BPP) with the help of Bio-inspired computing and FireFly Algorithm.

Dieter Schrenk [3] "Literature report on food packing materials and their potential impact on human health", the main objective of this paper is to present and discuss the major facts and perspectives related to assessment of health risks of food packaging materials (FPMs) issue also comparing the properties of a broad spectrum of FPM with respect to food safety.

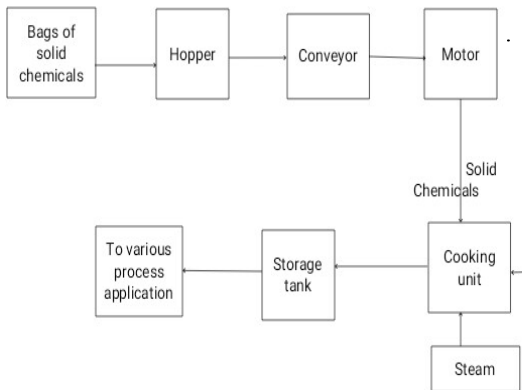
A. SYSTEM ARCHITECTURE:

The scope of this control system is to maintain the chemical packing system of chemical solids at all loads. Each chemical has different method of packing. Some chemicals should be

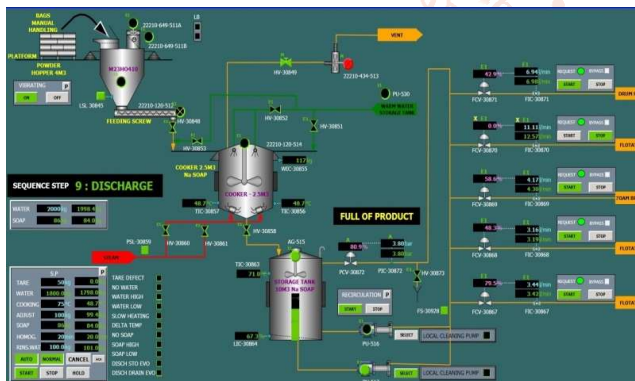
handled more carefully. Each and every chemicals undergoes number of process one by one to obtain the resultant product. Here in our project, we are replacing the programmable logic controller (PLC) with the distributed control system (DCS). DCS is a control system where each individual controller communicating to a central computers acting as workstations. Such a systems has the advantage that failure of a single component will not cause system failure, shutdown; Sometimes called graceful degradation.

B. PROPOSED SYSTEM:

Bags of solid chemicals is dropped into the hopper, through conveyor they are brought to cooking units. The cooking process is done by including water and steam to it and stored in storage tank and then supplied to various process application, these overall process is monitored, controlled and maintained with the help of DCS. Here the timer and counter is used to calculate the number of products should be produced at a particular duration of time. The temperature and level transmitter is fixed to determine the temperature and level of the liquid chemical respectively. The magnetic flow transmitter is used to measure the speed of the liquid chemical.



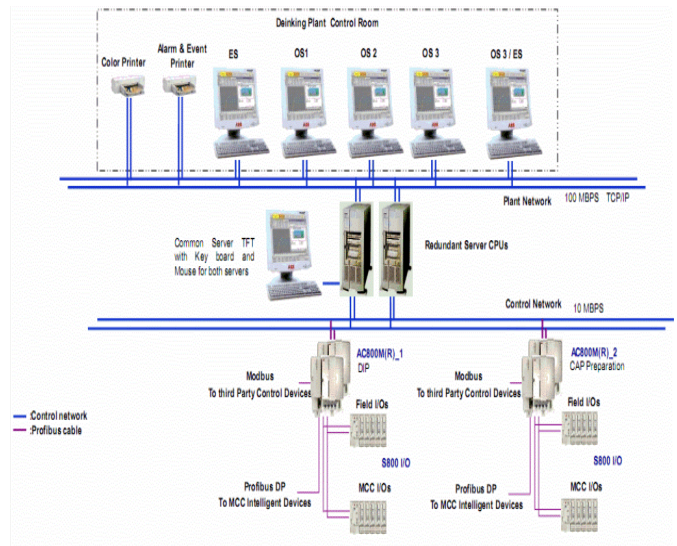
Block Diagram of Preparation and Control of Chemical Filling Station using DCS



Software display of distributed control system

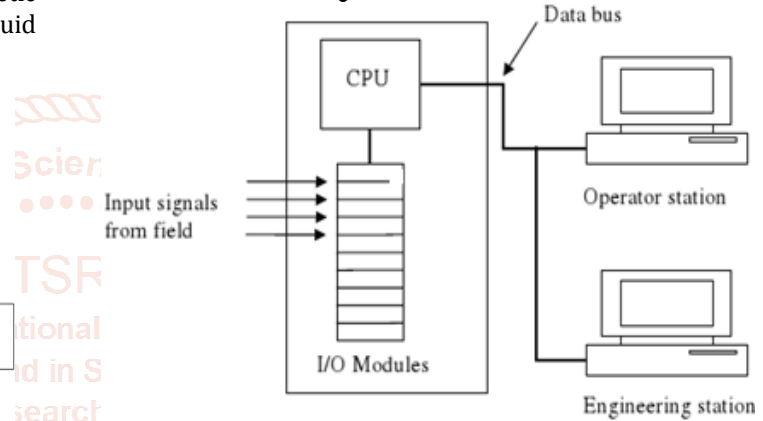


Image of DCS Hardware



DCS structure

3. HARDWARE REQUIREMENT OF DCS



Basic Configuration of DCS

Field Control Station (FCS)

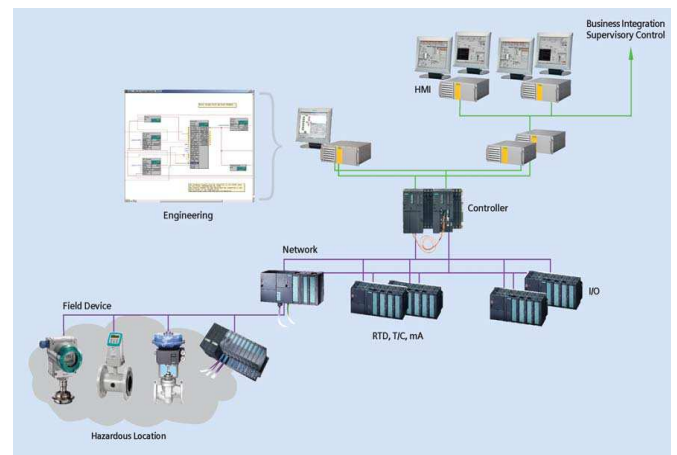
It consists of input/output modules, Control loops and Communication bus.

Operator Station

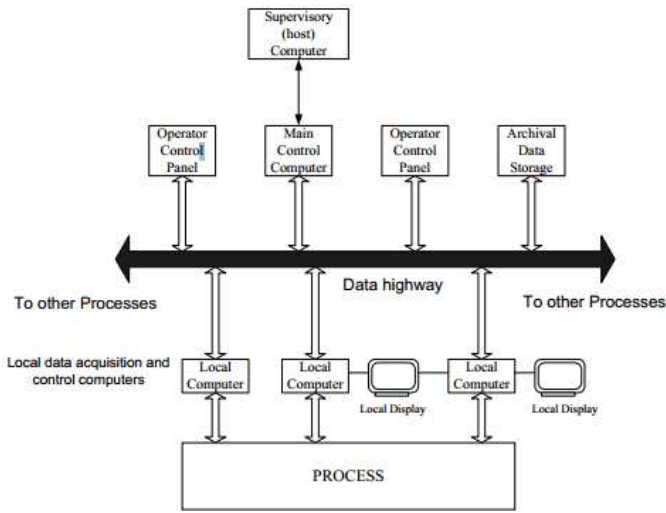
It is basically human interface machine with monitor, the user can view the process in the plant and he can change any setting, print reports, etc.

Engineering Station

It is used to configure all input & output and drawing and anything required to be monitored on Operator station monitor.



General DCS architecture



The elements of a commercial DCS network

4. 800XA CONTROL SOFTWARE

AC 800M control applications can be created in any of the five IEC 61131-3 dialects by using Engineering workstation, and then be downloaded to controllers using the Control Builder. Control applications can be distributed and executed on several controllers and communicate with each other on Control Network using named variable communication. Parts of the application can be downloaded to different controllers. The functionality range for control applications is wide, from binary control to closed loop control, with advanced functions like auto tuning PIDs, fuzzy control, etc. Pre-defined process objects like motor objects, valve objects, etc. are available. It is possible to build user-defined function blocks, and also to hide its content in order to protect the intellectual property. User-defined serial protocols can be developed in structured text with the support of special functions needed, e.g. for checksum calculation. Control Modules extend the IEC 61131-3 language to an object-oriented configuration method. The Control Module concept raises the abstraction level of engineering by hiding details in pre-defined control blocks. This enables reuse to a higher degree, making repetitive engineering very efficient.

5. THE PROGRAMMING LANGUAGES

- **Function Block Diagram:** Function Block is a graphical language for depicting signal and data flows with the help of library-stored software elements.
- **Structured Text:** Structured text (ST) is a high-level programming language which contains comprehensive range of constructs for assignments, function calls, expressions, conditional statements, etc.
- **Ladder Diagram:** Ladder diagram (LD) is a graphical language based on relay ladder logic which define interlocks and control actions in terms of relay contacts and coils, and other functions as "black boxes".

- **Sequential Function Chart:** Sequential function chart (SFC) is a graphical language for describe the sequential behavior of a control system.
- **Instruction List:** Instruction list (IL) is a low-level, execution-efficient PLC language it has a structure similar to Assembler.
- **Configuration and Downloading:** Applications can either be loaded into the target controllers by non-volatile Flash memory cards.

6. CONCLUSION AND RESULT

The demand for recycled fiber is globally increasing by more than 4% annually compared to around 2% for virgin fibers. This means the recycling of is increased. A higher proportion of deinked fiber will also be used in especially magazine grade papers. Newsprint is already produced with 100% deinked pulp. For deinking process sodium soap are highly consumed that too in liquid form, Which is achieved with the help of DCS. DCS minimizes the manual operation by atomizing it.

These trends signify that more deinking and other recycling process to reach the same quality target, the requirement of chemicals will be high.

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