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DCS - The Best Platform for Automation of Process Industries

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Abstract - Process industries have gone through many changes over the years. Right from the microprocessors, PLC, SCADA the automation is steeply increasing. Many process industries are not properly automated. Hence man power, hazards, money spent and maintenance are also high. So in order to avoid all problems automation is very essential.

Every process industry must be properly automated with DCS. Here we have come up with a proposal to automate **cement mill in a cement industry using DCS with an interlock.**

AUTOMATION:

Automation is the use of control systems and information technologies to reduce the need for human work in the production of goods and services. From the scope of industrialization, automation is a steep beyond the mechanization. Automation greatly decreases the need for human sensory and mental requirements as well. Automation plays an increasingly vital role in the global economy and in daily experience.

NEED FOR AUTOMATION:

- Replaces human operators in tasks that involve hard physical or monotonous work.
- Replaces humans in tasks done in dangerous environments(i.e. fire, space, volcanoes, nuclear facilities, under water, etc)
- To perform tasks that are beyond human capabilities of size, weight, speed, endurance, etc.
- Economy improvement: Automation may improve the economy of the enterprises, favoring most of humanity. For example, when an enterprise invests in automation, technology recovers its investment; an appropriate example would be one such thing happened at countries like Germany or Japan in the 20^{th} century,

"**By using DCS we can automate any process industry. Here we have proposed an idea to automate cement industry."**

INTRODUCTION:

A Distributed Control System (DCS) is a distributed control and centralized monitoring system. It usually refers to a control system of a manufacturing process or any kind of dynamic system, in which the controller elements are not central in location (like the brain) but are distributed through out the system with each component subsystem controlled by one or more controllers. The entire system of controllers is connected by networks for communications and monitoring.

- Control function is distributed among multiple CPUs. Hence the failure of one CPU doesn't affect the entire plant.
- Redundancy is available at various levels.
- Field wiring required is considerably less.
- Cost effective in long run
- Maintenance and trouble shooting becomes very easy.

Keeping these advantages in mind, DCS is a very broad term used in a society of industries, to monitor and control distributed equipment. Few of them are:

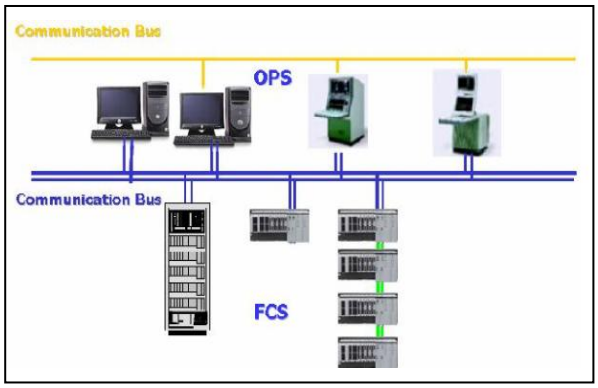
- Electrical power grids and electrical generation plants.
- Environmental control systems
- Oil refining plants
- Metallurgical process plants
- Chemical plants

- Pharmaceutical plants
- Dry cargo and oil carrier ships.

SOFTWARE USED:

YOKOGAWA CENTUM VP.

ELEMENTS OF DCS:



- ✓ Field control station
- ✓ Operator station/Human Interface Station
- ✓ Communication bus

SYSTEM IMPLEMENTATION:.

ASSUMPTIONS:

- WEIGH FEEDER1 -PUMP1
- WEIGH FEEDER2 -PUMP2
- WATER SPRAYER -PUMP3

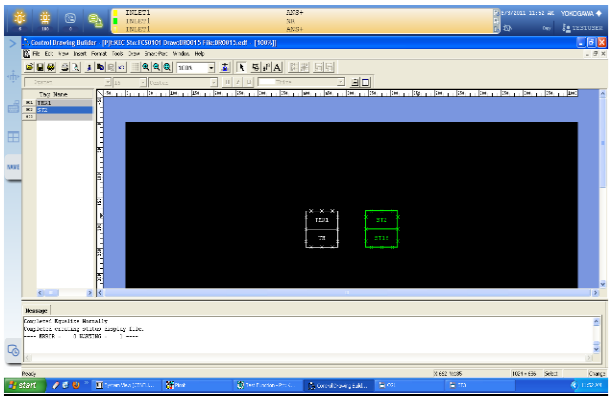
LOGIC:

The weigh feeders and pumps are connected through a block called **ST16.**

The process works on the principle of **AND** logic. A timer is introduced with the time delay of few seconds depending upon the input that is feed in. The timer starts only when both the pumps are switched **ON**. After a few seconds, the third pump (water sprayer) gets automatically switched **ON** and starts to spray the water into the cement mill.

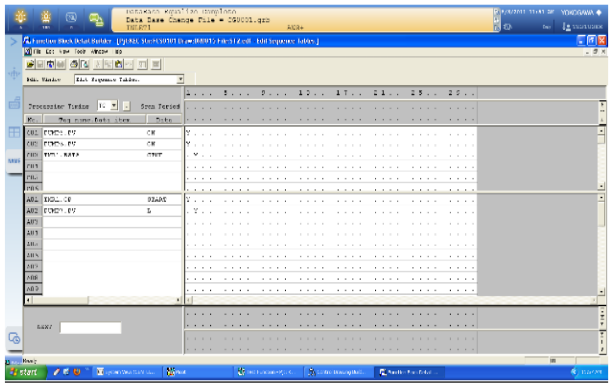
BLOCK DIAGRAM IN CONTROL DRAWING BUILDER WINDOW:

This is the window where the functional blocks which are required to complete the process are simply dragged and dropped. For our automation process, the most suited block is **ST-16.**



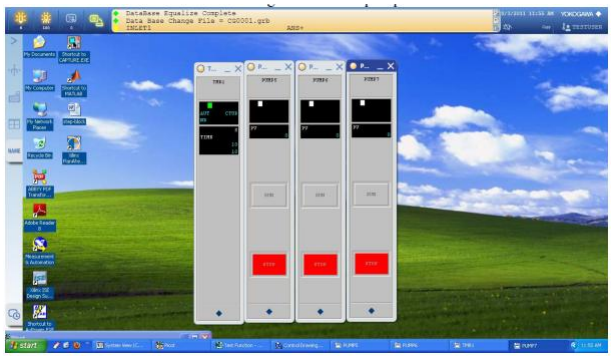
FUNTIONAL BLOCK WINDOW:

This is the functional edit detail window of the block **ST-16**.The input and output details of the process which is to be controlled is fed in this window.



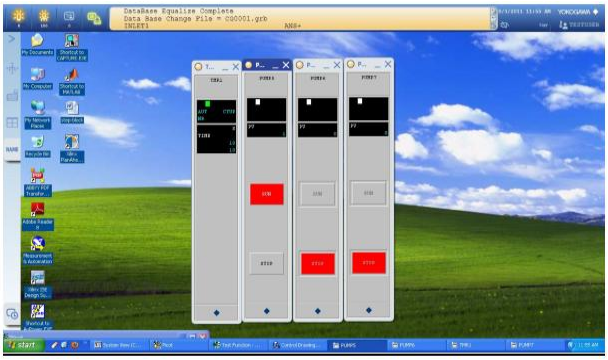
INITIAL STAGE-BEFORE STARTING THE WEIGH FEEDERS AND PUMPS:

These are the simulation results which we have obtained. These are the face plates of the weigh feeders and pump where their state can be switched. It is nothing but a switch which is used to turn ON or OFF the weigh feeders and pumps.



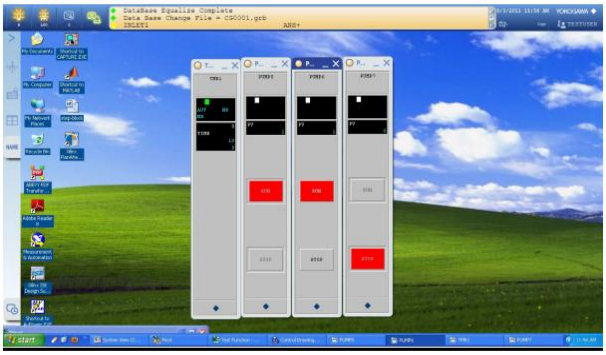
AT THE START OF THE FIRST WEIGH FEEDER (CLINKER) IS STARTED:

Now lets start the automation process in a cement mill. Initially the weigh feeder I carrying **CLINKER** is started. Now it starts heading towards the final stage.



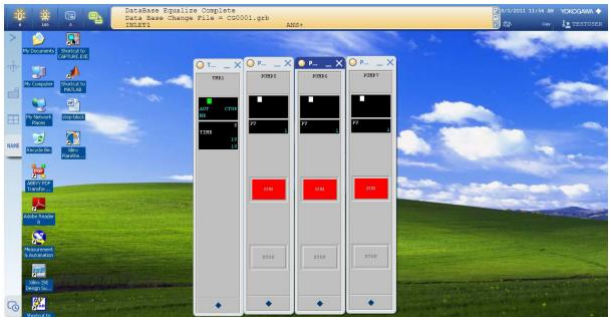
AT THE START OF THE SECOND WEIGH FEEDER (GYPSUM) IS STARTED:

Now the weigh feeder II which is carrying **GYPSUM** is also started. Now this weigh feeder also starts to move. But it follows the weigh feeder I.



THE FINAL PUMP (SPRAYING OF WATER) AUTOMATICALLY STARTS:

According to our logic, since both the weigh feeders start their movement, the output pump, **WATER SPRAYER** starts spraying the water.



BENEFITS OF USING GRAPHICAL SYSTEM DESIGN APPROACH:

- Programming knowledge is not required. So a lay man can also work in the system.
- Control function is distributed among multiple CPUs.
- Errors can be easily identified by alarms and notifications.
- Redundancy is available at various levels.
- Cost effective in long run.
- Maintenance becomes very easy.
- No man power required.
- Job can be completed easily
- Quality of the product becomes best.

CONCLUSION:

The implementation of the new capabilities of the integrated process control systems will allow the cement producers to optimize their energy consumption and improve operational efficiencies throughout their additional facilities. The integration of energy and asset management information is now available in one central location, increasing the operability and streamline plant cost of operation. It is not a question of whether or not cement plants will embrace new technologies; the plant economics will make it inevitable. Those facilities that will embrace new technologies will be in a better position to accelerate market shares and increase profit margins.

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