How Computerised Automation is implemented in Control Engineering

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Introduction

The present era is the era of computers. Like banking, share market, education & research streams computers have stepped into the field of mechanical & electrical control system based instrumentation. The entire process is very complex but very much suitable for the speed of product manufacturing which reduces costs & manual labours.

The total procedure of automation system in steel industries is divided into four levels. They are as follows :

i) Machine Level.

ii) Level 1 : PLC systems.

iii) Level 2 : Software Control system.

iv) Level 3 : Management Information & Control system.

Machine Level

Every mechanical or electrical machine is switch driven. That means when the switch is turned on, some electrical signals pass to the machine, which, in turn, generates mechanical torque, that disbalances the systems. The system tries to restore its stability showing some response to the external triggering & is forced to perform some steps of working which are set as nothing but the expected operation from it. If an electronic control system can generate this stimulating signal then the procedure remains no more manual.

In Machine level of the automation, the mechanical & electrical machines are stimulated by sending electrical signals to the switches or drives which control the operating levers or motors that operate the said machines. This analog signal comes from its higher level & before using it is amplified using amplifiers, or increased using transformers.

PLC Systems Level

PLC (Programmable Logic Control) is a part of automation system that maintains the link between software level & machine level. It may be a microprocessor control based circuit or any micro programmed based digital system. It decodes the incoming machine language written data from software level & generates the equivalent logical controlling massages in the form of different voltage signals to machines. It always receives some digital input from its higher level but generates analog signals.

Software Systems Level

The main & most important level is this. It has two parts, namely, front-end & back-end. The front-end part generally serves I-O purposes. It is coded using Ansi C / C++ / VB / Developer 2000. The back-end part is a database connectivity process, which can be implemented using any standard RDBMS like ORACLE / INFORMIX / SYBASE / DB2.

A large database is maintained, which includes all possible situation instructions that the entire process has to face during its operation in different situations. This front-end software interacts with the external world giving all data about the current process & inputs the instructions that is to be given to the automation system at the crisis period

while the solution cannot be generated from the list of solutions kept in the stored database. Generally, some Artificial Intelligence Programming controls the total part of this system. This Artificially intelligent part continuously watches the automation procedure & in regular time interval it collects output results as a feedback & depending upon the output values, it decides the next action either from its stored database or asks the external world through the front-end software.

Managerial Information Systems Level

In a large factory there are many local automation systems running simultaneously. So a Management Information System or Decision Support System is implemented which keeps tracks of all such small automation systems & it constantly gives managers reports about the conditions of different automation procedures going on. Also it can link communication different automation systems & threads them together. During any crisis period it can arrange the local automation units in such a way so that they can jointly work to manage the problem. A server with a strong network is required to implement this. Use of parallel processing in server increases the system performance highly. To make compatible the server with its different sub-units a separate operating system kernel & shell with a controlling server program is required. This part is generally written in the platform of Digital's Open VMS / VAX operating system or any UNIX / LINUX / AIX based distributed system using ANSI C language. The use of UNIX / LINUX / VMS is for their real time processing ability with multi-tasking supports & capability of parallel processing management which cannot be done so efficiently in DOS or WINDOWS.

Incoming Technologies

In the coming future, a total automation system will be written only in JAVA & using JINI technology. Because of Java's networking capabilities, easy database connectivity routines (JDBC) & easy graphical user interface designing, it is regarded as the best language in the current purpose. As JAVA is platform independent so the requirement of developing OS Kernels & Shells will not be required anymore. Also JINI will bring the facility of accessing the local systems from all over the world through appropriate protocols using World Wide Web connectivity. So, the future of automation systems is the JAVA Technologies, as hoped by the automation developing experts.

Pictorial View of Total Process

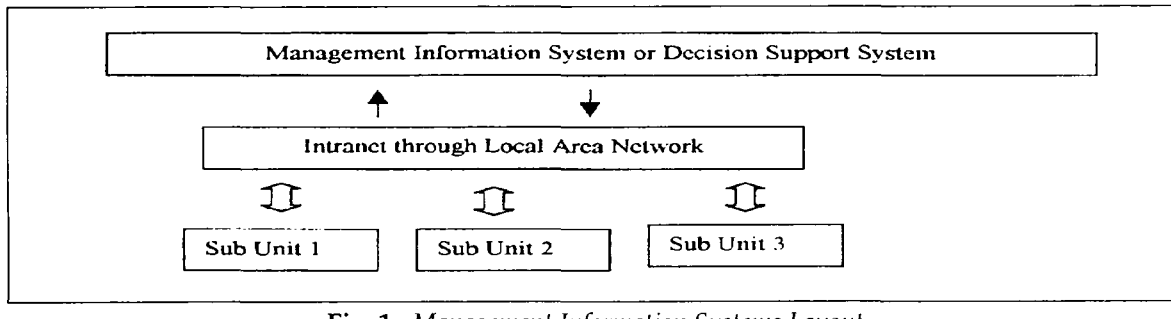

Fig. 1 : *Management Information Systems Layout*

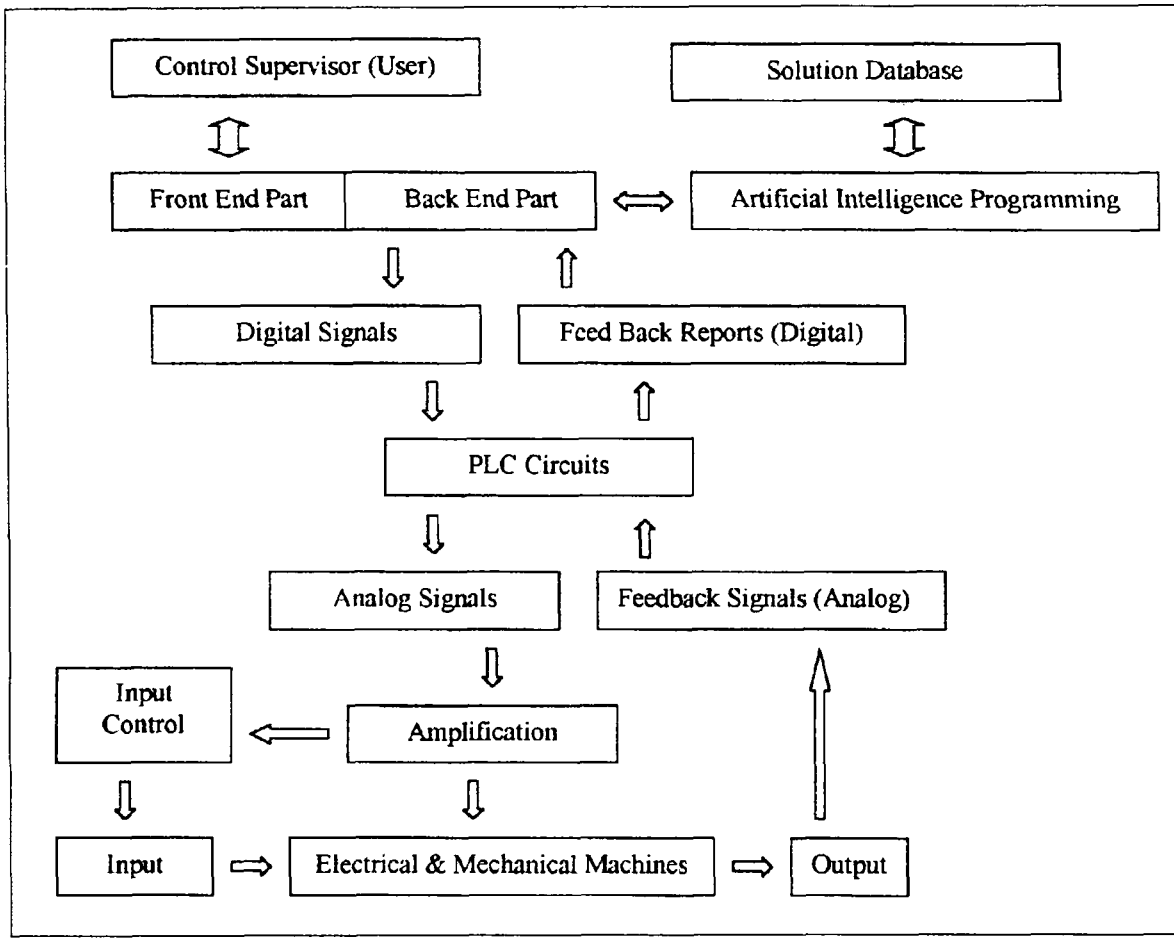

Fig. 2 : *Systems Design of a Sub Unit*

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