THE AUTOMATION IN DAIRY INDUSTRY

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RESEARCH ARTICLE

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ARTICLE INFO	ABSTRACT
	The advancement of Information Technology has given birth to new systems and designs to society for quickening the work process and management of the large volume of repetitive work in a more productive and systemic way. This has helped the decision making process of the management of the industries and organizations very effectively. The application of computers in dairy processing is not new, because it has its application over the years not only in India but other countries of the world. The dairy sector also adapted the trend for mechanization. The uniqueness of the system involved in all the steps of production to distribution of a dairy item. If we see the genesis of the past, we will see that automation in dairy industry began to crop up after Second World War. The factors led to computerization in dairy industry are consumer demands, customer demands and availability of labour.

INTRODUCTION

The advent of modern Information Technology methods opened the new concept of automation. The benefits of automation include the making of same quality of material, reducing the cost of production, the flexibility to fulfill the demands of the market and the way to meet the demands of the changing rules in the legal system. The efficient implementation of information technology based automation system brings the consistency in the production of high quality product which eventually increases of productivity. This also minimize the losses, ensure the safety of operation and manpower saving and enables for good product preparation, execution and feedback control.

Information System

We are now living in an information age and right and quick information of any kind helps us to take decisions with more confidence at the decision level. An information System is the basis of interaction between users at different level. In all information system present day computer is well associated. The computer based system is having the 'capability of for storing large volume of data, processing the data efficiently, doing complex computations very fast, producing required information instantaneously'. A system can be defined as a set of similar elements together and their properties connected to one another and to their surrounding environment such that it creates a complete entity. The system consists of inputs which are fed to the processes to produce outputs which are controlled by the feedback control.

Stages of Automation in Dairy

The first wave: Mechanization: It involves feeding the animal and extracting the milk. (*Lund, Sweden,*2011).The farmers implement machines which eliminate the manual feeding and make the milk extraction an easy job. The next phase in the production line is the transformation.

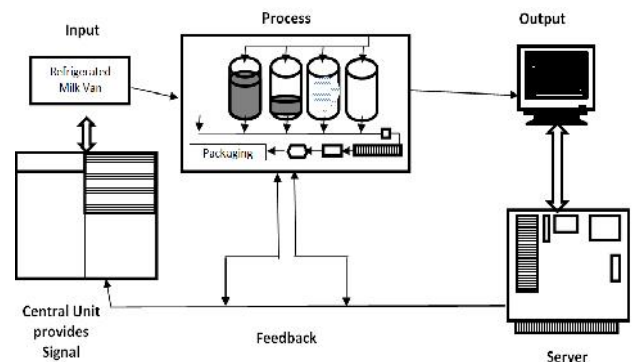### Processing system of milk

Figure 1A Simplified View of the complete processing system of milk which is controlled by the automation process

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The second wave: Automation*:* In this process entire performance work starting from milking to end product it is totally mechanized." The Figure 1 gives a simplified picture of a dairy which has implemented automation. The system takes the input from the environment through refrigerated milk vans. The milk is stored in a series of large containers where different kind of processes are carried out. At the end of the process several checks are performed by a feedback structure, and the product thus produced is sent back to the input for probable corrective operations.

A Typical Example

A general system monitors all the activities through a computer programs. It is user friendly and easy to operate system and detects any malfunction automatically. It is made up of three areas:

1. An area to give commands
2. An area to exchange messages
3. An area to facilitate production

The operator in the control area supervises the first two areas. The **first part** has the main computer and constitutes the central part of the system. The computer identifies the state of the process involved in conversion. This is done taking help of signals associated with the inputs from the area related to production and information processing. The modifications are done accordingly. A program is responsible for giving the output signals. A series of dedicated hardware constitute the first area. It includes consoles, printers and few screens for showing output parameters. The operator is responsible for receiving the information. He also issues the commands to implement possible modification.

The **second part** of this process includes transformation of messages.

The **third part** of the process is the production area. This area has many different mechanical equipments which includes motors and the Motor Control Cabinet (MCC). MCC are assembly of reels and motors along with valves. It also includes instruments such as thermometers conductometers, manometers along with switches level meters.
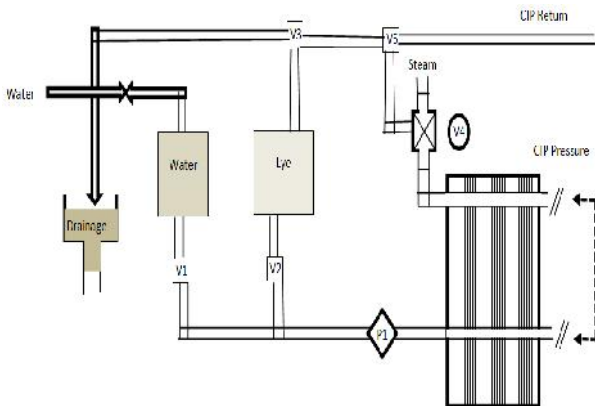
Example of an operation

Figure 2 Clear Up Process

Together they detect the state of the whole treatment. Moreover, the automatic cleaning of the system is also totally computer controlled for safety and hygienic point of view.

The third wave: Cybernation System*:* In this a self-regulating system is implemented which depends on the presence of the difference between the actual performance and the preset goal.

Applications

Multimedia Applications

In the modern system Multimedia plays an important part to integrate business promotions, advertising and product marketing. This has enabled us to reach more than one hundred million farmers.

Computer Based Optimization Techniques

Artificial Intelligence is used in various optimization techniques where we are benefited in many ways namely Animal Cloning by Nuclear Transfer, Analysis of Genetic Relationships and Breeding Population.

Genetic polymorphism and milk protein, molecularendoctrinology, dairy cattle bichem, dairy cattle nutrition, protein nutrition, poultry physiology and nutrition, statistical estimation of parameters determined from the gene collected from recorded data of milk production units.

Information Communication Technology (ICT)

ICT is helping rural farmers in making coordination with village level milk cooperatives; it has provided transparency level throughout the system and helped to create faith and confidence in the farmers. The success is observed when in 1999 India became the world's largest milk producer country. The contribution of National Dairy and Development Board is known to one and all. The Amul industry system is mechanized in such a way that the rural poor received a lot of benefit out of it. This model is replicated in seventy thousand villages in two hundred districts.

The farmers are benefited out of data analysis and design for improving standards, productivity, access to multimedia database, communication.
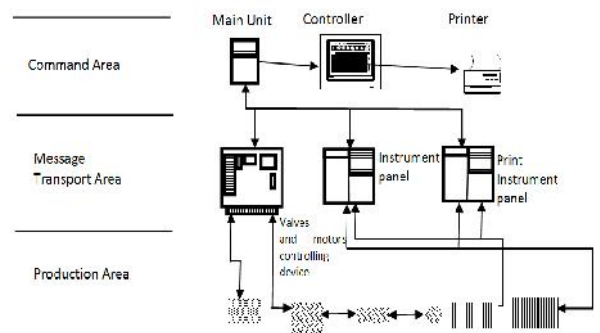
Typical automated system in dairy

Figure 3 An overview of the implementation of the automation system

ICT also helped operation in real time oriented. 'Man Machine Interface' helped facilities like email, fax and networking for different milk cooperatives. The farmers are no longer in the waiting system. ICT platform has enabled farmers to maintain computerized Balance sheets, where by 4000 farmers are benefited.

Automatic Milk collection Unit System

The 'transparency between farmer and cooperative society' could be seen if we examine Gujrat Cooperative Milk Federation Limited. According to the report "Nearly 10755 village cooperatives in Gujrat, are able to collect 6.1 million liters of milk from 2 million members".

Village Level Total Quality Management

Milk production societies are highly benefited with regard to wastage, acidity present in milk, improved microbiological qualities in dairies and cleaning the dairies.

Villagers Acquaintance with System

Out of 70 thousand village societies, only 2.5K societies are computerized. The milk content and pollution aspect is scientifically checked. The e-governance application has expanded the scope of data base.

Model of IT benefits in Dairy Farming in other countries of the world

Australia: 91% of Dairy farmers use mechanized automated dairy systems and use computers in budgeting and financial purposes. Breeding records 73% and production record 67%.Computerised method using ultrasound technique is found to be very helpful in herd care health management.

Computers and Bio Technology in Dairy Systems

Use of computer controlled biosensors show very positive result in various areas namely quality control in milk, determination of glucose and sucrose in milk samples, microbial electrode biosensors to monitor dairy industry effluent, on line monitoring of ethanol in fermentation process of dairy effluent, microbial enzyme based biosensors to monitor heavy metals ions in food samples for quality control, to determine pesticide residue and such factors.

E-Learning to Facilitate the Advanced Learning for The Technology of Dairy System

E-learning is an advanced teaching methodology which is emerging concept in India. It provides an effective medium to deliver content and instruction using ICT tools to a group of students. It allows synchronous as well as asynchronous mode of instruction delivery (*Agriculture Statistics Research Institute,2011*). This is very useful to solve the problem of availing quality faculty in training centers located at remote locations. Students can experience good education which is at par with those top graded institutions. Govt. of India has already started the programs to deliver quality education through NPTEL (*National Program on Technology Enhanced Learning*) in all engineering institutions.

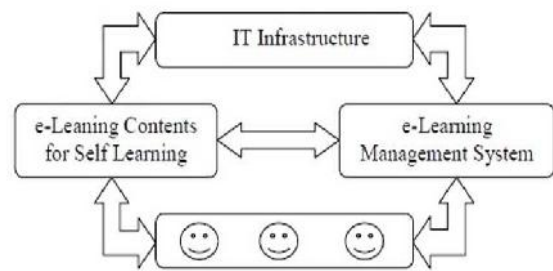### Components of e-Learning System

Figure 4 The major components of an e-learning system in diagrammatical presentation.

1. ***Information Technology infrastructure:*** Computers, wire and wireless connectivity and multimedia for delivery of e-leaning contents.
2. ***Leaning Management System (LMS):*** A platform to deliver, track and manage the educational courses and training programs.
3. ***e-Leaning Contents:*** Programs developed using Content Development Systems (CDS) based on learning theories are used for creating content for e-learning.
4. ***Users:*** **Learners and teachers**.

ICAR (*Indian Council of Agricultural Research, 1998*) is promoting e-Learning for Dairy Industry. It has sanctioned a project which is funded by NAIP (*National Agricultural Innovation Project,2001*) (component-1) and named "Development of Electronic Course for Bachelor in Technology (Dairy Technology) Degree Programme"(*Indian Agriculture Statistics Research Institute,2004*) for developing e-contents of international standards for Bachelor in Technology (Dairy Technology) programme. "Development and Evaluation of e-Leaning Management System (e-LMS) for Dairy Education" has also been started in many institutions to manage the course contents. The aim of these projects is to create an e-leaning environment across the dairy institutions in the country and motivate the trainers to develop training content in digitized form to improve the quality of study material and methods of imparting knowledge. The specific objectives of NAIP funded project are:

- To create interactive course contents for Bachelor in Technology (Dairy Technology) degree program. This is achieved in accordance with the recommendations of ICAR's Fourth Deans Committee.
- To create electronic content to promote classroom and online interaction among teachers and learners.
- To provide on-line and off-line training material to give emphasis to the in house training.
- To create cloud based system which will enablethe sharing of the content to all colleges teaching Dairy Science across India.

CONCLUSION

Thus the implementation of Information Technology based approach is capable of making the Dairy Industry more

productive. The implementation of automation in this industry will not only improve the quality of the product but also reduce the loss and enhance the efficiency of the skilled man power working in this sector. The current emphasis on e-learning in this sector will definitely create more skilled worker who contribute in farther improvement of the working of the industry.

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