Automation To Ensure Global Compliance Of Food Products In Quality

By
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The application of sophisticated automation in food processing industry has already achieved the realms of importance because of two basic requirements such as:

(i) The scale of economy of new units in the developed countries is too large to be able to synchronize its operation with any manual commands or even adjust effectively to any semi-automatic process control systems. &

(ii) The quality norms of the finished food products for human consumption getting more and more stringent leave hardly any scope for error due to lapse or laxity in the manual operation not able to react somewhat spontaneously to a process mal-function.

The application of modern process control automation through micro electronic and/or bio-sensors based instrumentation interfaced with centralized PLC to monitor, control, record and communicate the data for precise control of process parameters at desired speed is already a reality in practice. The modern technological marvels in instrumentation are likely to find applications in instant genetic analysis of a food product with respect to it's suitability for a specific human being.

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Imagine a situation that the order for meals that you book on the computer in your hotel room is rejected for being served. The explanation as sought for reveals that the keys of the mother board being equipped with special sensors have analyzed your cellular genetics to conclude that the recipes ordered by you could be detrimental to your health and hence the room service is forbidden to serve the food as ordered. However the options out of the proprietary recipes as available from the kitchen, and compatible with your system, get in the

meanwhile highlighted on the monitor screen, to enable you to select your choice and re-order your meal accordingly, that would mean your well being

The application of sophisticated automation is getting more and more relevant to food processing industry, because it is one area of manufacturing where the quality of even the same raw material as organic farm produce keeps on varying while the finished produce is always expected to be of the uniform quality. This industry therefore needs precision monitoring and maintaining the quality from the very growing of the raw materials, their harvesting and transportation, followed by processing and distribution until the finished product reaches your dining table for consumption.

Well, coming back to the theme i.e.” Automation in Food Processing Industries “ , let me illustrate the subject with some case studies.

A 200 TPH i.e.4800 TPD plant for processing and packing of super high viscosity tomato paste built by M/S Rossi Impianti in Italy is operated by only one supervisor and six operators. The entire operations is monitored from one centralized control room, equipped with computer with mimic panel that displays continuously each and every processing activity in operation alongwith all the in-process data such as flow-rate, concentration, temperature, pressure, pH, rheological properties, besides the technical performance of the processing and conveying equipments etc. Is it possible to monitor the production and control product quality at each process step, that too of such a large capacity plant without the application of sophisticated automation?

A packaging line built by JAGENBERG, Germany for tomato paste and other beverages in disposable packs made of multilayer composites for a capacity of 72,000 packs per hour of 500 gms. each is so fast, that it is possible only through a stroboscope with a microprocessor back-up to visualize the quality parameters of the packs with regard to formation and printing of the packs

followed by filling ,sealing and conveying etc. until their palletization and shrink-wrapping takes place, as otherwise there is hardly anything perceptible to the naked eye

A plant built up by RAISIO ENGG. in Finland for processing of about 100 TPH of wheat into gluten and starch-A in solid form, starch-B , E.N.A. and DDGS as cattle feed ,is a huge set-up with lay out distributed in 4 floors. This entire unit in production is managed just by 3 personnel in a shift ; one confined to the control room monitoring the entire process plant in operation from the mimic panel and adjusting the process parameters simply by turning the knobs in front of him. He is able to manoeuvre the CCTV's fixed at every point to watch the performance of any given equipments from the control room itself, the second operator responsible for the quality control, involves himself in drawing periodically the samples at every stage of production for analysis,. The data gets immediately transmitted to the centralized PLC control for incorporating any adjustments in the operations if necessary.

We are presently involved in the engineering of a FPU which includes a fully automatic line for production and packaging of Indian flat breads (PARATHAS) with an installed capacity of about 54,000 pieces per hour on each line. The state of art packaging line is incorporated with four basic systems operated automatically by highly efficient, reliable and user friendly software. These systems include : i, Inspection & rejection system that analysis individually the quality parameters of the bread for toast marks ,grease marks ,rot marks ,transparency ,diameter and the roundness etc. based on which it automatically sends the acceptable pieces in the green box and the rejected ones in the red box: ii All Inverter Actuated Counter Stacker—the system that automatically stacks the desired number of pieces as initially programmed and the count is recorded in the computer and displayed continuously on the screen: iii, Stack Accumulator & the Transfer System & iv, Flat Bread Bagger & the Sealer System.

The inbuilt PLC based microprocessor synchronizes the continuous operation of the interlocked mechanical, pneumatic, hydraulic and the electronic components of the integrated line for an absolutely flawless production of the quality breads in such a large quantity, which is simply amazing.

A number of units producing ready-to eat food products in sealed retortable pouch packs, mostly at small scale level, have been finding it rather difficult to sustain the quality of the product in absence of suitable automation able to monitor and control the process parameters as desired. The stability and the shelf life being a direct function of the degree of sterilization, its in-process measurement on the products lying sealed inside the pouch packs that too at various zones inside the pressure retort is rather difficult. The finished product therefore is cleared for sale only after keeping it under observation for a period of 21 days for the appearance of any pathological activity inside the pouch. With the availability of ELLAB ,Process Validation and Monitoring System supplied by a Danish Company, the in-process product quality defined by the Cook Value (Co Value) and Food Sterilization Value (Fo Value) measured, monitored and recorded continuously on the computer, the clearance of the product for consumption has become instant, much to the relief of the small scale entrepreneurs whose economic viability has considerably improved, because the products are available for sale immediately after production.

The electronic sorting machines used for removal of undesired particles present in grains or colour sorting of Apple and Tomato etc. and the automatic metal detectors used for detection and removal of metallic particles present in the finished products at incredible speeds are further examples of some fantastic applications of automation in FPI to ensure global compliance on quality.,

The automation based on modern techniques using miniaturized microprocessors now finds formidable applications in the small scale operations

as well. The use of Biosensors in Rapid, Sensitive and Specific detection of Pathogens in a food product before it is cleared for distribution substantially mitigates the threat of any health hazards.

The speed at which the modern food processing and distribution systems operate, surely need automation for testing and monitoring that can detect an infectious dose of even a single organism or the bacteria that may be a fraction of an otherwise benign population of various micro-organisms. In this regard, the biosensors have already found diverse applications in the stringent quality control procedures in food processing industry such as the development of multi-pathogen detection processes suitable for ground meats etc. In the near future the biosensors are poised to facilitate the development of procedures for simultaneous detection of pathogenic bacteria and their toxins through their time resolved fluorescence, They offer integrated bio-luminescence approach for detection of spores and viable pathogens and simple visual detection methods using enzymatically generated silver stains .Biosensors also develop multiplexed immunoassays for food borne pathogens in micro array formats. In the near future we will see that biosensors in conjunction with microelectronics facilitate the analytical revolution and resolve the remaining problems that hinder the exploitation of the biological molecules and their analogues.

A Food Processing Unit can not be a success if it is devoid of backward and forward linkages. The backward linkage implies its close interaction with the farmers responsible for growing quality raw materials that yield the finished product compatible with the global standards. The automation in .FPI therefore is required to be addressed from the very farm level. The testing equipments for all kinds of farm produce should be such that they are able to display the analytical test data rather instantly and are simple to the extent that even a farmer is able to make use of it..

For example there are already rapid test kits available which are based on GENE PROBE technology to detect easily with accuracy and reliability the pathogens like E.Coli, Salmonella ,Listeria Monocytogens and Staphylococcus infections in basic foods and beverages ,in a matter of hours rather than days as in case of conventional methods of testing. The kits for the on-site tests for detection of food allergens and mycotoxins are also now available. These kits represent a break-through in instrumentation technology and are a boon to the FPUs . Such equipments have the possibility to be inter-linked through the satellite communication with the FPU for instant transmission of data regarding the source of the raw material and its quality aspects so as to take care of the statutory provisions on traceability and the tractability conforming to global CODEX norms as prescribed under WTO guidelines.

“Automation In Modern FPI “ is a subject that has already evoked immense importance because it offers an integrated approach to process, production and quality control in a food processing unit without leaving any scope for human error, so as to ensure that the finished products are globally compatible in quality and command a premium..

Let me now thank you very much for your patient hearing.