Hazard Analysis and Critical Control Point (HACCP) programs originated in the United States food industry in about 1970 in response to the challenge to provide safe, high-quality food for the US space program.

Two decades later HACCP is seen as one aspect of a suite of preventative strategies which comprise quality management systems in the food industry throughout the world.

Management’s task
The task confronting the management of any business is to make a product which generates profit on a continuing basis. In the final analysis, repeat sales depend on the consumer having trust or faith in the manufacturer to continue to produce a product which represents fitness for purpose or value for money. Thus the millions of words written on total quality management and all the other quality management systems boil down to ways in which manufacturers can achieve the credibility in the marketplace which will engender the consumer’s trust.

Customary approaches to food quality and safety
Since customary approaches to food quality and safety have not always delivered this desired credibility in the market, it is important to examine their characteristics.

Customary approaches have emphasized final product testing which is expensive, rendered invalid if sampling plans are inadequate and is only capable of discovering problems, i.e. it is curative, not preventative.

The detection of defects in final product is usually based on an implicit assumption that the fault is uniformly distributed through a batch and is consequently readily detectable by random sampling. Many examples exist in food safety of infrequent but potentially catastrophic defects which are not randomly distributed, such as contamination by Clostridium botulinum toxin, Salmonella, pesticide residues and broken glass. Food manufacturers must design quality management systems which close these loopholes. HACCP is the key to the design and operational control of food processes.

In the past, it was not uncommon to find adversarial attitudes or at least poor communication between quality control and production departments. A part from the corrosive effect this had on teamwork within the business, it often led to territorial disputes between departments and to the mistaken beliefs that production targets could be viewed in isolation from quality specifications and that money spent on the quality control department was largely wasted.

Quality management systems
Modern approaches to quality and safety are more attuned to generating profit on a continuing basis because they involve management systems which are designed to preclude foreseen or anticipated faults, and hence are proactive and preventative. Such systems are documented and comprehensive, e.g. modifications to a process in the processing plant must be approved and incorporated in the quality plan before the maintenance staff make the modifications. The immediate objective is to ensure that the process is controlled and predictable so that the product will always meet specifications and the customer’s trust will be achieved.

Quality management systems demand the collection and analysis of data in order to evaluate the performance of the system. This will include data on raw materials, material in-process and final product and cost data at all these points. All deviations from normal operations must be recorded. For each anticipated defect, corrective action must be devised and included in the standard operating procedures.

It is widely recognized that the introduction of a quality management system into a business results in a net decrease in the cost of quality by diminishing failure costs even though there may be an accompanying increase in prevention costs. Failure costs include the cost of diverting product to scrap, reprocessing and retesting, downgrading of product, equipment downtime, complaints, returned product, recall costs and product liability claims (Carson 1989). Companies which do not collect and use this data do not know the true cost of quality. Since prevention costs are associated with planning, one would expect them to rise after the introduction of a quality management system.

The acquisition of data to evaluate the performance of the system is an essential prerequisite to what is a central feature of all modern approaches to quality and safety: the adoption of Kaizen, i.e. a permanent commitment by all employees to never-ending improvement in quality (Perigord 1990). This will usually require a marked change in the culture of the company, driven from the top but permeating all sections of the organization.

Under this system one aims to give all workers an understanding of the basic principles underlying the design of the product and the process so that they can predict the effects of a fault in production and thus be well placed to rectify the fault. Production workers will again become craftsmen, truly responsible for both quality and production targets with quality assurance staff supporting them in terms of system design and calibration.

Quality management systems can be classified as product-centred or customer-centred.

Product-centred approaches to quality
Product-centred approaches are built around a quality manual which sets down the requirements for the process and product.

The manual will cover the company’s policy on quality, organizational chart, raw material and packaging, the process, product, hygiene and sanitation, water supply, calibration and maintenance of equipment and will be supported by more detailed standard operating procedures and a laboratory manual. Included will be vendor assurance procedures, HACCP plans, plant layout and product recall protocols. Such manuals can be audited and accredited by third parties who can act as referees, thus demonstrating the adequacy of the company’s quality management system and giving the customer the confidence that the product does indeed conform to specification. Quality manuals can be used internally or to satisfy fundamental requirements for export certification (e.g. Australian Quarantine and Inspection Service) or to gain accreditation under International Standard ISO 9000.
Customer-centred approaches to quality.
Product-centred approaches focus on those aspects of the company closely related to production to the exclusion of other departments such as sales and invoicing. Total Quality Management (TQM) is total in the sense that the total organization is involved, thus preventing the possibility that non-production departments can frustrate a commitment to quality in production. Product-centred approaches are consistent with TQM; the latter is simply broader and more focussed on attitudes.

TQM is customer-centred in the sense that all the company's activities are regarded as a series of personalized supplier-customer interactions. As an illustration, these may be between individuals in production and the product warehouse or between the warehouse and an external distributor. Such personalized relationships are more likely to deliver higher quality to the ultimate customer.

TQM is a philosophy which works in a climate of trust rather than fear, and which starts with senior management then permeates all levels so that we can truly say, 'Quality is everyone's responsibility' (Perigord, 1990).

HACCP
Since its introduction by the Pillsbury Company in Minneapolis in the early 1970s, (Bauman 1974), HACCP has become an indispensable strategy throughout the world in the manufacture of safe, high-quality food. It is common for pedagogical reasons and because of the importance of foodborne microbiological disease to explain HACCP in a microbiological context (e.g. ICMSF 1988). However, it is best seen as a management tool for assessing the physical, chemical and microbiological risks associated with the production and distribution of food in food service, cottage-industry or large-scale food processing.

This is the approach taken in the numerous HACCP training courses for industry conducted at University of Western Sydney, Hawkesbury since 1985 and will also be followed in this discussion (Hourigan 1988 a, b).

HACCP is applied to a manufacturing process by summarising in a Product Overview Sheet (POS) the critical raw materials, product specifications, preservation principles and hazards.

The process is summarized in a flow process chart (FPC) using internationally standardized symbols for operations, inspections, transportation, delays and storage. Values for critical temperatures, pH, water activity and similar parameters must be specified. This process step where preservation occurs is noted and whether preservation is microbiostatic or microbioidal.

At each step of the process the question is posed: Is there a potential risk which would result in an unsafe product? At steps where a potential risk does exist (critical steps or operations), one identifies the risk, the factors which can be manipulated to eliminate it (these are critical control points), the control limits for each factor, monitoring methods, sampling and inspection frequencies, the persons responsible and corrective action. Most of this information is summarized in a Hazard and Audit Table (HAT) and the remainder detailed elsewhere in the quality manual.

Control Sheets are prepared for the inspections at each critical operation. Control Sheets should have provision for batch numbers, dates, acceptable quality ranges, frequency of inspection, actual results and action (what and by whom). These are for inspections made by production staff and hence should utilize rapid, simple, visual tests wherever possible. The HACCP plan is supplemented by a plant layout diagram which shows the product's physical path through the plant. One of the functions of this diagram is to detect whether it is possible to contaminate finished product with raw materials which may carry high microbial loads.

In food manufacturing, HACCP is central to the success of quality management systems whether they use the ISO 9000 or the more broadly-based TQM approach. Whatever the approach, the quality manual will be the 'road map' to the system. The sections of the manual dealt with process control will be particularly reliant on HACCP. HACCP will greatly facilitate auditing of the system for verification of the quality and safety of the product. HACCP will rely on trustworthy calibration and maintenance of test and process equipment. Other elements of quality manuals will include standard operating procedures, laboratory procedures, cleaning and sanitation procedures, staff hygiene, water supply standards, pest, and waste control. Customer complaints procedures and product recall plans.

In the Hawkesbury approach to HACCP, physical, chemical and microbiological hazards are considered and HACCP is seen as a management tool which must be implemented on the production floor. It must not be allowed to become marginalized in the laboratory. Potential risks are addressed in order of decreasing priority: safety, regulatory, quality.

Why is HACCP used?
HACCP is a proactive approach to product safety which emphasizes good design of the process and product in order to pre-empt problems. It focuses the attention of management on key trouble spots and guards against the dilution of scarce staff time over a plethora of tasks, some of which are only of minor importance to product safety. Strong pressure to adopt HACCP in the food industry comes from authoritative groups such as the Codex Alimentarius Commission, WHO and ICMSF and the demands of regulatory groups such as FDA and AQUIS to certify the safety of food in international trade. However, HACCP cannot succeed in isolation: it must be part of a quality management system.

References

Other references on HACCP as a quality management tool
greater ownership of those standards and are more committed to ensuring that the standards are achieved.

The fourth and current stage in our program is the development of self-managing teams. Our objective is to ensure even greater commitment and involvement of our employees by removing the first level of supervision in our organization and allowing the teams to assume responsibility for the operation of their unit. Whilst we are still learning about this method of operation we have been impressed with the results to date.

The enthusiasm displayed by our employees towards this approach has been overwhelming and has not been dampened by their need to absorb new skills in order to accommodate their new roles. We have seen both efficiency and quality improvements as operators take on ownership of the processes, but more importantly we have seen the development of employee self esteem and personal satisfaction; it has given them a cause, and that alone is sufficient to suggest that it is a worthwhile development.

We see the establishment of self-managing teams as being an integral part of our continuous improvement program.

Cost is a consideration that arises whenever one talks about accreditation. It is difficult to quantify all the costs associated with the introduction of a quality management program. The costs for registration, auditors, etc., are simple to calculate, but there are also the costs associated with the implementation of the management systems, and these are more difficult to determine.

But when one considers that there are benefits associated with productivity improvements, quality improvements and wastage reduction, as well as safety considerations, then the cost of the program becomes insignificant when compared with the potential benefits. It should be considered as an investment.

The question we should be asking is not what a program such as this would cost but rather what is the cost of not implementing a quality management program. One product recall situation with all of its associated ramifications would pay for several such programs.

I have not dealt with how an organization goes about achieving accreditation. There is considerable literature on this subject, and there are numerous organizations ready to consult and advise.

What I have tried to emphasize is that there are several basic requirements necessary for the achievement of accreditation and an effective quality management system. They are:

1. A management structure committed to the goal of accreditation.
2. An operational strategy that embraces the philosophy of continuous improvement.
3. An organization that is not threatened by the idea of change, but which effectively manages change in order to derive maximum benefit from that process.
4. A systematic approach to the establishment of standard operating procedures which evaluate at each step the potential for loss (loss of product, loss of quality, loss of equipment, loss of productivity and personal loss).
5. A means of reviewing the loss potential identified in an operation and effectively applying controls to manage that loss.
6. A level of trust in an organization that allows all employees to work together co-operatively to achieve agreed goals.
7. Finally, acceptance by management that employees must be more involved in the decision-making processes of an organization in order to increase the level of commitment of those employees and improve the quality of the resulting decisions.

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