

Quality Monitoring and Control: A Key to Success

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Abstract -- Quality is a synonym to success in this hyper competitive world. Successful companies have not fundamentally redefined the word quality but have included design and service to retaining “conformance” quality. Businesses need total quality management because, unlike in the past, when customers had few options and demand generally exceeded supply, customers today have many more options and can select products that offer the highest value. A total quality approach helps any company to be more tuned to its customer’s needs and expectations. If the brand can successfully respond to customers’ requirements, the business prospers. The efforts for maintaining a consistent quality in organizations can start by improving methods and calibrating equipment’s without involving much costs. The cost quality characteristics must be met because consumers must receive value for the products or services they pay, and often the cost of a product or service is directly reflected in the price paid.

Keywords: Process Parameters, Quality Monitoring, Packaging, Consumers, Equipments

I. INTRODUCTION

QUALITY can be defined as a product or service with bundle of benefits, characteristics and features that has the ability to satisfy the stated and unstated wants and desires of a customer. Quality changes with the type of goods, services, time, perception and hence is not absolute. If the quality has to be improved or maintained it cannot be controlled in one day or only at final Q.C. or at inspection point rather the control is to be carried out in process. Quality is not synonymous to product alone rather it is a process based control. Generally it is misunderstood by us that quality is destroyed or destructed on workers level but the basis of problem starts at designing of a product and if the specifications and details are provided to the follow up of a product then it can be manufactured defect free. In countries like Japan , workers have the full authority to even stop the production line if there is a serious quality problem and then the management team has to work & stay at floor till the problem is not solved.

Commitment of quality must begin at the top of the organization and there should be a clear company vision for quality and its business value. There is no point having a quality policy and yet delivering goods below standard. A clear documented quality policy ensures less chances of making mistakes. Team

work is key to quality. Productivity improvements can also be done by maintaining and managing good quality as rework will be almost negligible by improving quality. Organizations should invest in training of manpower, special purpose machine, designs & research so as to improve the quality, as good design and quality are the keys to survival in any business.

II. QUALITY PARAMETERS

Design confirmation: Once the prototype and development phase is completed, usually by the brand or resourcing company the next step is to prepare for the commercialization and preparation of bulk production by the company that will actually make the product. This handover is critical, and is often the point where misunderstandings and confusion can occur. It is essential to have not only a physical example of the intended product and a detailed specification, but also a clear description or definition of the quality of the finished product. In case of leather, where there is likely to be significant variations in surface appearance between and within skins, a catalogue or examples of acceptable and unacceptable defect appearance is essential. A similar approach is necessary for materials which are subject to colour variation – there should be either physical examples of the acceptable range or quantifiable value using colour measurement equipment.

Managing procedures- Process control is about the management of process, people and equipment. It is, therefore, a basic requirement of manufacturer. All manufacturers exercise process control and labour costs being equal in one way or another, what distinguishes the successful company from the not-so-successful one is the effectiveness of the process control used.

All processes must be checked to ensure that they have been carried out correctly and meet the company's needs. So it is important to consider how best to monitor each one and to ensure that procedures make monitoring possible.

The procedures must generate evidence that action has been taken. In many cases, this will only require individuals to confirm that they have completed a specific task, such as signing against that operation on the work documentation.

However, where measurements are made (for example, in manufacturing processes), these should be recorded to generate feedback and traceability, in case of quality problems. This objective evidence is then examined, often by carrying out an audit – the management tool that is used to assess quality.

Innovation: The personnel creating new styles will spend much of their time in collecting consumer feedback, analysing fashion trends, as well as identifying new materials. They will then produce prototype styles for brain storming. At this stage, the information about the new style will inevitably be present – perhaps an outline specification, details of the last selected, and an approximate idea of the price band that the final version will occupy.

III. PROCESS MONITORING TOOLS

Accurate control of time and temperature play an important part in footwear manufacture and a for monitoring purposes variety of low-cost tools are available. Although the hand-held digital thermometer is one of the most versatile devices available, alternatives include heat-sensitive crayons, labels and paper strips. The crayons remain the best choice for measuring adhesive re-activation temperatures, and heat sensitive labels can be helpful when attached to hot surfaces to give a continuous indication of operating temperature. A number of changes in colours at specified temperatures show a reversible colour change on cooling.

Infrared thermometers are becoming a viable alternative for many temperature measurements. However, care must be taken to ensure that the 'gun' is properly targeted so that it is not influenced by any other sources of infrared radiation from nearby devices.

Most of the machines have indicator switches attached for temperature, pressure and time in control panel. These measurement gauges give information on the control of the process, so they must be properly maintained and checked for accuracy using independent, calibrated equipment. Machines are more sophisticated now days and are fitted with comprehensive monitoring facilities, either as standard or optional. However, it is important to remember that the monitoring systems only monitor and it is the control system that implements actions. In some cases, highly visible warning systems (such as alarms or flashing lights) are also built in, so that any malfunction is immediately evident.

Time, temperature and light levels: For shoe manufacturing as a case the throughput times and temperatures are key parameters (within the specified parameters laid down by the quality control department) fortunately, there is a wide choice of measurement tools available, from low-cost, low-tech apparatus, through to sophisticated electronic equipment. All the time controllers on processing equipment should be checked, and a correction chart

must be pasted alongside the equipment. If no time controller is present, speed settings must be specified and posted on the machine. A simple stopwatch is the preferred time measurement option, and this must not be underestimated as an important part of process control. For operations such as the inspection of leather or finished goods, adequate lighting is essential. Electronic light meters are readily available to ensure & check the level of light is correct.

Pressure measurement: There are a variety of ways to check the pressure applied in various processes while manufacturing shoes. For example insole manufacturers should check the uniformity of pressure in insole moulding machine and ensure that adequate pressure has been applied and whether or not the pressure was above a given threshold value. This procedure can be stated in the in-factory process control documentation that describes the frequency at which the process should be done & checked.

Another machine can assess the uniformity of sole bonding pressure. In this carbon paper create an imprint on a sheet of paper that is situated on the sole unit. Areas showing a lack of imprint are not receiving sufficient pressure during the operation. Whatever tools are used for process monitoring, they must be regularly maintained and calibrated, as it is pointless measuring process conditions with an inaccurate tool.

IV. PROCESS PARAMETERS: MANAGING AND MONITORING

If the preparation is completed successfully, then the manufacturing process will be simple without facing any difficulty. The work content that is previously established will provide the shoemaker with the information to plan and balance the production line for maximum efficiency. Manufacturing is unorganized in most of the Asian countries & relies mainly on a large number of operators each carrying out a part of a complex and skilled task. For example, cutting upper components may require several operators who inspect the material, mark surface defects, collect upper, lining & other materials and cutting dies, cut the components and inspect & check the quality of cut pieces – tasks that would traditionally be carried out by one person in the more established shoemaking countries.

The Asian approach enables the introduction of new styles with minimal training and also the introduction of new labour, and rebalancing of existing lines with little disruption. The process control conditions specified earlier need to be constantly monitored – it is quite common for the buyer / brand / customer to request written confirmation of these checks, or even insist that their own manpower / personnel are involved in the checking process. If there is requirement of any lab test during manufacturing, or of the finished product, these test reports may also be required and demanded by the brand / customer at the time of sample confirmation or delivery of goods.

Process control is a vital part of modern shoemaking. Done correctly, it aids the selection of the correct materials, eliminates product variability and reduces factory rejects and wear failures. Ultimately, it should ensure that the customer receives a consistently high-quality product.

If properly organized, effective process control is not a costly exercise. An effective process control system can be a well-targeted use of quality management time and effort, producing significant savings. The most involved aspect of process control is process monitoring. However, as identified here, only low-cost tools are needed, and little time is taken in taking the necessary measurements. Initially, the number of measurements may seem large, but, as experience of each process grows, the number can be reduced.

All the processes require control mechanism & there are many shoemaking processes that require process parameters for control. However, not all of the processes can be measured directly or easily. Consider the force exerted by a riveting machine. In such cases, the alternative is to assess the result of the process – for example, the depth & width of the rivet. If the rivet is deep or too narrow, it suggests something is wrong. It could be that too little force has been applied, or the patterns may be wrong for the materials being used. A simple gadget restricting the width & depth must be made for such simple measurements.

In addition, for operations such as forepart lasting, the effectiveness of the process is dependent on the operator's skill. Humans cannot be programmed to perform a task precisely the same way every time. However, this does not prevent in-process inspection in place of measurement.

In the case of forepart lasting, the focus areas would be:

1. Checking that the lasting allowance is correct as per specifications or not
2. Ensuring the eyelets are straight
3. Checking vamp toe cap forepart straight
4. Making sure that the upper with lining / interlining etc. are 'down to the last'
5. Confirming that the leather is not cracked.

Process control may involve changing a procedure, based on the results of process monitoring. Once the process monitoring tools have detected an 'out of control situation', the person responsible for the process makes a change to bring the process back into control. If the process is out of control, the person responsible looks for a typical programme for process control might incorporate the following:

Out of control action plans detail the action to be taken once an out of control situation is detected. The person responsible can take a remedial action following a specific flowchart through

the corrective procedure provided for each unique process.

For few of out of control measurement Advanced process control loops' are provided which means automated changes to the process that are programmed to correct for the size. Control charts are used to routinely monitor quality. Depending on the number of process characteristics to be monitored.

Process monitoring records - Where process monitoring record sheets are used, these should be designed to ensure that they contain all relevant information and can be quickly completed by the person taking the measurements.

It is best to have charts for each process, since this allows out of control conditions to be quickly identified. Action limits can be drawn on the charts, so that if conditions stray outside established parameters, they become immediately apparent and corrective action can be taken.

For a number of processes, part of the monitoring procedure will involve calibrating temperature or time settings. Therefore, the records must be referred to during production, to ensure that operatives use correct settings. Monitoring records should be prominently displayed alongside the process for easy reference. If the settings used by operatives are not displayed on the individual processes, they should be recorded on the work tickets to provide traceability back to the monitoring exercise.

V. DEVELOPMENT AND CONCEPTUALIZATION

The process of converting the designer's concept into a practical and cost-effective bulk production proposition will be the responsibility of the production & planning engineers. These can be either part of the customer. Company or employed by the manufacturer – or the development team may include both sets of personnel. Their task is to ensure that the many essential steps are correctly undertaken. These will include:

- Planning for production
- Creation of a bill of materials
- Calculation of material consumption
- Identification of suppliers for materials and components
- Requirement of calculation of labour requirements based on pilot run
- Identification of additional skills or manufacturing equipment if required
- Sample production run for quality and fitting tests
- Grading of the article as per requirement in other sizes.
- Inbound logistics.

At this stage, the new design should be tested before hand to ensure its fitting and performance properties will meet the customer's expectations, and a reasonably clear idea of the manufacturing cost, contribution margin can be calculated. In terms of quality, using suppliers with a known and proven track

record of reliability, as well as the ability to provide test reports to confirm the properties of the materials or components to be purchased, is often the preferred method of controlling the supply chain inputs. As the development process continues, more and more detailed information will be created, for example:

- To identify problems in wear
- Alternative suppliers of materials and components
- Process control parameters during manufacturing
- Detailed measure of work content for line balancing in manufacturing
- Possible variations in patterns or sequence of operation for increased efficiency in manufacturing.

At this point of time there should be samples of all sizes available for fit test and to check that the aesthetic properties of the original sample have been maintained across the size range. Ideally, wear tests, or simulation of wear in the laboratory, are carried out to confirm the performance properties. It is during this latter phase of development that many of the brands/customers will hand over the responsibility to the manufacturing company, with an agreed purchase price and delivery schedule. The shoe manufacturer can, and should, produce a detailed analysis of the manufacturing costs, looking for minor variations that will provide opportunities for internal efficiencies that can not only save money but also reduce the throughput time. Because the planned production is likely to rapidly follow this stage, this is the final opportunity for the shoemaker to ensure that the relevant equipment and skill base will be available when needed.

VI. NEW TECHNOLOGY AVAILABLE

Ethernet/internet-based data monitoring brings new methods, capabilities and unprecedented access to process measurement and monitoring. With such instrumentation, remote access can be from anywhere with smartphone signal. Using standard process sensors – such as pressure transducers, flowmeters or other sensors that produce a standard analogue or pulse output – can be monitored, controlled or logged in almost any location, whether in the office next door or in another country.

From the simplest application, viewing data through the web browser on a cell phone or laptop, to more sophisticated uses (such as sending a text or email message when an alarm occurs, or transmitting a data over the internet from a remote location to a central office), a user can gain access at any time and from any location that has internet access.

The ‘passive monitoring’ that is built into ethernet-based systems also brings a fresh understanding of ‘process control’. The user has the knowledge that the process measurement and control system – no matter how large – is functioning optimally, and can be confirmed by a glance at a web browser.

As an example of the capability of these devices, consider

monitoring the environment in a warehouse or storage facility where conditions are critical. Perhaps temperature, humidity or maybe even the security need to be maintained. Thanks to units with built in sensors, temperature, humidity and dew point can be maintained without requiring anyone on-site. The system can send an email to the responsible person, as well as to a distribution list. It can also send a text message to any cell phone. If an IP camera or web cam is available, the scene can also be viewed on a computer.

Transportation: Around 50 per cent of the time from design to delivery of the order will be taken up by the transportation and distribution phase. The finished footwear – which represents the maximum value of work in progress – should be protected from physical damage and also the effects of the transportation conditions.

A recurring problem with footwear in the global supply chain is damage that the finished product can sustain during transit. Physical damage can be minimized or prevented by suitable packaging. This should not only physically protect the product for impact damage, but can also protect it from damage due to the transit conditions. However, mould growth can also be an issue.

For example, in few cases it was observed that the cause of mould growth on leather products was transportation. Footwear transported from Asia to the USA or Europe may be in a metal container for over six weeks. During this time, the temperature range can be from around 10°C up to 50°C, and with a possible change in relative humidity. These conditions are ideal for the growth of mould. The actual shoebox absorbs some of the moisture in the air.

There is now a range of antimicrobial products which can be applied on footwear to help – ranging from self-adhesive patches that can be fixed inside the shoe or the box, to wrapping paper, which is impregnated with an antimicrobial coating.

Not only mould is a possible problem, but so high temperature sustained over an extended period, which can begin the breakdown of adhesive bonds. When allied to high levels of humidity, this has been shown to cause shrinkage which, in extreme cases, can lead to deformation and loss of fit.

Increasingly, consumer legislation in the Western countries has focused attention on the issue of recycling – not only the footwear, but also the packaging. The traditional cardboard box should not cause any problems, it is worth noting that the European Union packaging directive requires that all types of packaging must not contain more than 100 parts per million of cadmium, mercury, lead or hexavalent chromium. Some packaging has been implicated in the discolouration of white or light coloured materials during transit – often due to the anti-

oxidant, which is found in some cardboard, tissue paper and plastics. Therefore, to prevent discolouration, the packaging should be specified.

Customer Satisfaction: Quality is most often associated with the perception of the consumers & post purchase dissonance. The final customer – who try on shoes and decide whether to buy them – will make his or her decision based on the fit, feel and style of the finished product with, perhaps, brand loyalty also playing a part. However, the customer’s perception of the product’s performance is often influenced by the promotions, advertisements and advice received from the retail personnel. As the use of self-service grows in the retail environment, the customer is increasingly relying on the written information provided with the product & once it the product is purchased mostly it is compare with the previous purchases of the same category with other brands.

Therefore, the user instructions may be the only channel of communication between the distributor and the customer. User information that accompanies the footwear should be carefully worded to ensure that there is no confusion (such as describing a product as ‘waterproof’ rather than ‘water-resistant’) and should confirm the performance in wear that the customer can expect.

The global supply chain can stretch many thousands of miles across countries and time zones, and requires the input of hundreds of people to ensure that the finished product arrives on time, within budget and to the expected level of quality and performance. It requires active management by the relevant personnel of each phase to maintain this output.

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