

Quality control of incoming products

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Using acceptance sampling to assess the quality of incoming products began back in the 1920s as an efficient alternative to 100% inspection. Nowadays, however, more and more industries see acceptance sampling as outdated: why bother as a manufacturer to check the quality of your suppliers' products at all? Simply let them apply methods of statistical process control to the day-to-day quality of their processes to convince you. Or isn't it that simple?

100% inspection no 100% guarantee

Inspecting 100% of incoming products is very expensive - in terms of time, handling efforts and labour costs. Moreover, while 100% inspection gives the impression that each item is individually and perfectly assessed for quality, in practice this isn't the case. In fact, new defects may even be introduced during the inspection process itself and the tiresome nature of the job of inspection means mistakes are easily made. Another possible effect is that the production team is less motivated to deliver high-quality products, as they know the products will be inspected anyway. And finally, the method of 100% inspection isn't always applicable, for example when the inspection process itself is destructive.

Acceptance sampling carries risks...

Acceptance sampling can be an alternative. Rather than inspect all incoming products only a small sample from a lot, or batch, is inspected to decide whether to accept or reject the lot as a whole. This approach greatly reduces inspection time and costs, and allows for destructive testing of products. Nevertheless, it carries risks as a sample clearly doesn't provide a full picture of a lot's quality, and so the decision to accept or reject a lot based on the limited information gained from that sample might be wrong; and the only way to alleviate this risk is by increasing the sample size. High-level quality requirements therefore can't readily be guaranteed by acceptance sampling, as you would need very large samples to achieve the acceptable risk level.

...but these can be avoided

In order to overcome these sampling issues one can check the quality one stage earlier. That is, on the production line itself. Here the manufacturer asks for evidence from their supplier that the supplier's production processes are under control and capable of delivering the specified quality. The supplier does this by applying methods of statistical process control and measuring the relevant process parameters to verify that the specification targets are indeed consistently being met. In this way, the manufacturer can completely avoid having to carry out acceptance sampling.

The limits of statistical process control

In many production environments, statistical process control seems an ideal solution to guarantee high-quality end products. But for a variety of reasons it's unfortunately not applicable in every environment. Measuring the critical product parameters on a daily basis during production may simply require too large an investment (e.g. in measurement tools and technology, training operators, reduced production efficiency) and/or too much effort. It may also be that volumes are too low or it's simply too expensive to create a (near) defect-free production process that always requires 100% inspection.

So does this mean that 100% inspection and acceptance sampling have died out, and statistical process control taken over? Definitely not! The specific demands of the situation at hand will continue to determine the best way to go.

There is a vast amount of experience and background information out there when it comes to setting up a sample plan in order to manage the risks of wrong conclusions in a given situation. The following references are a good starting point and offer more insights.

References:

- A.J. Duncan — *Quality Control and Industrial Statistics* (4th edition, 1974)
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- D.J. Wheeler and D.S. Chambers — *Understanding Statistical Process Control* (2nd edition, 1992)
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