FACTFILE:
ENGINEERING & MANUFACTURING
QUALITY CONTROL

Students should be able to:

- demonstrate understanding of the use of quality control (QC) charts and graphs and evaluate their use;
- demonstrate understanding of the need for product safety regulations and be aware of the following standards and their identifiable symbol:
  - British Standards Institute (BSI);
  - Conformité Européene; (CE); and
  - European Norm (EN); and
- apply appropriate quality control techniques by inspecting, measuring and checking that parts are within tolerance.

Understanding of the use of quality control (QC) charts and graphs and evaluate their use

What is a quality control chart?

Control charts are used to routinely monitor quality. The control chart is a graph used to monitor how a process changes over time. The data is plotted in time order. A control chart always has a central line for the target performance, (prescribed dimensions), an upper line for the upper control limit, (UCL), and a lower line for the lower control limit, (LCL). These lines are determined from specification and performance data.

Components will be tested using measuring instruments and the results recorded and plotted on the chart. If a component, or a batch of components, are recorded as outside tolerance i.e. if the component falls outside the UCL or the LCL, they are deemed to be not fit for purpose and therefore waste.

Process Control Chart

Fluctuations in the quality of the components can be read from these charts with with a time frame identified the quality control inspectors can investigate the cause and take steps to rectify the problems.
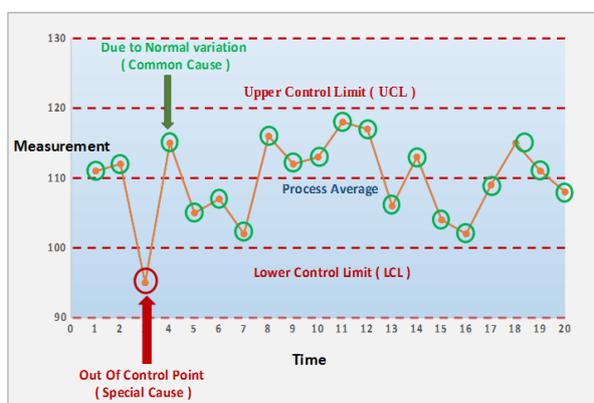
The need for product safety regulations and be aware of the following standards and their identifiable symbol.

Product safety in the UK is governed by a wide regulatory framework consisting of both national and European-derived legislation. The laws apply to any business involved in the import, manufacture and supply of goods to consumers.

If a business carries out any of these activities, it is required to comply with the law and protect consumers by ensuring that their products are safe.

If corners are cut on safety, the company could face criminal prosecution, have to withdraw or recall products from the market and face legal action from consumers to recover damages for the harm caused.

A safe product is one that provides either no risk or a minimum acceptable level of risk, taking into account the normal or reasonably foreseeable use of the product and the need to maintain a high level of protection for consumers.

British Standards Institute (BSI).
The British Standards Institution (BSI) is a service organisation that produces standards across a wide variety of industry sectors. Its codes of practice and specifications cover management and technical subjects ranging from business continuity management to quality requirements.

The BSI began in 1901 as the Engineering Standards Committee to standardise the number and type of steel sections, in order to make British manufacturers more efficient and competitive. Over time the standards developed to cover many aspects of engineering, and then engineering methodologies including quality systems, safety and security.

BSI's best known product in the UK is the Kitemark, a registered certification mark first used in 1903.The Kitemark signifies products or services which have been assessed and tested as meeting the requirements of the related specification or standard within a Kitemark scheme. BSI also conducts testing of products for a range of certifications, including for CE marking. CE marking must be applied to a wide range of products intended for sale in the European Economic Area.
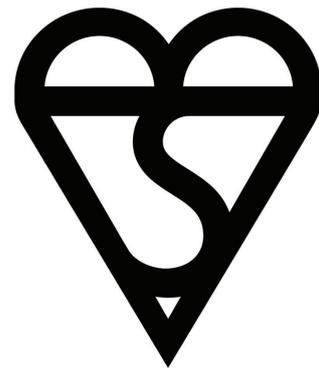
Conformité Européene (CE)

The letters "CE" are the abbreviation of French phrase "Conformité Européene" which literally means "European Conformity". The term initially used was "EC Mark" and it was officially replaced by "CE Marking" in 1993.

CE Marking on a product is a manufacturer's declaration that the product complies with the essential requirements of the relevant European health, safety and environmental protection legislation, placed in practice by what are known as Product Directives. These Product Directives contain the "essential requirements" and/or "performance levels" to which the products must conform.

The CE Marking Is required for the following types of product:

• Toys.
• Machinery.
• Electrical equipment.
• Electronic equipment.
• Personal protective equipment.
• Pressure equipment.
• Medical devices.
• Active implantable medical devices.

European Norm (EN);

European Standards (ENs) are documents that have been ratified by one of the three European Standardisation Organisations (ESOs), CEN, CENELEC or ETSI.

A standard is a document that sets out requirements for a specific item, material, component, system or service, or describes in detail a particular method or procedure. Standards facilitate international trade by ensuring compatibility of components, products and services. They bring benefits to businesses and consumers in terms of reducing costs, enhancing performance and improving safety.

• Specific CEN activities cover Air and Space, chemistry, construction, consumer products, energy and utilities, the environment, food and health and safety,
• Specific CENELEC activities cover electrotechnical standardization in sectors such as:
• electric vehicles, household appliances, information and communication technologies (ICTs).
• ETSI, The European Telecommunications Standards Institute is an independent standardization organization in the telecommunications industry in Europe.

The application of appropriate quality control techniques by inspecting, measuring and checking that parts are within tolerance.

Quality control extensively uses charts to measure the acceptance level of the product samples. The objective is to ensure that products fall within pre-decided upper control and lower control limits. Any sample falling outside the limits is inspected further for corrective action.

Quality control techniques require extensive usage of statistical tools which can broadly be classified into following categories:
• Acceptance sampling.
   – this is done on the basis of inspection, which includes physical verification of colour, size, shape, etc.
• Statistical process control.
   – helps in confirming whether the current process is falling within pre-determined parameters.

The major objectives of inspection are:
• to detect and prevent defects in products and process, and
• to identify defective parts or product and prevent it from further consumption or usage.

The scope of these inspections covers all aspects of the manufacturing process. Key to the success of any such testing are highly trained inspectors who carry out rigorous testing on the components and products. However, many industries now have automated production lines with industrial robots responsible for the manufacture of elements of a product.

The increase in the use of and the precision of such industrial automated systems, including self checking manufacturing processes has reduced the waste in production materials, time, and output across a wide range of manufacturing industries.

Revision Questions:

1. What is the purpose of a quality control chart?
2. What is meant by the initials UCL?
3. What is meant by the initials LCL?
4. Give two areas of manufacturing a quality assurance check would examine.
5. Explain what is meant by acceptance sampling.
6. Explain why manufacturers are controlled by a regulatory framework consisting of UK and European legislation.
7. What is the purpose of the BSI?
8. Why is it important to have standards such as the BSI Kitemark and the Conformité Européene; (CE)?
9. Explain why is the CE mark so important for consumers.

Additional Resources:

http://www.technologystudent.com/prddes1/kite1.html
http://www.businessdictionary.com/definition/tolerance.html
https://www.bsigroup.com/en-GB/
http://www.technologystudent.com/prddes1/standard2.html