



Role of metrology in modern world

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INTRODUCTION

The word metrology actually derives from the Greek words 'metron' and 'logos' which translated means the study of measurement. The origins of measurement go back even further than the Greeks to the Egyptians. They would use standards of measurement, with regular calibrations, to ensure stones were cut to the correct size for their building projects.

Metrology is the science of measurement; it encompasses both experimental and theoretical determinations at all levels of uncertainty and in all fields of science and technology.

Fields of Metrology

In the modern world, the study of measurement is a vital component in many fields, including manufacturing, engineering, science and technology. Within these fields, metrology is used to validate and verify to pre-defined standards. These standards are the bedrock of metrology and as such, are tested and verified against a recognised quality system by certified laboratories.

Metrology is split into three subfields that each deal with distinct subsets of the topic. These are Scientific Metrology, Industrial Metrology and Legal Metrology.

Scientific Metrology, also known as Fundamental Metrology, covers the establishment of units of measure, unit systems and quantity systems. It is scientific metrology that sets the standards that are adopted as the definite magnitude of a physical quantity.

Industrial Metrology, also referred to as Applied Metrology, covers the calibration, maintenance and quality control of measurement instruments used in industry.

Legal Metrology is the branch that looks after the regulatory aspects of measurement and measurement instruments.

Metrology in manufacturing

Metrology is relevant to part production in two primary ways. Before manufacturing starts, metrological instruments are used to calibrate the machinery and tooling that will be used during production, which helps to ensure accurate and precise parts. Parts that have been optimized for manufacturability will also factor in specific tolerances, so that the anticipated minor variations in exact component size will not affect their final fit or function, which may help mitigate quality risks.

Metrology is also used post-production to verify that the parts

meet design specifications and customer expectations. If the measurements don't match up, it might be a sign that the manufacturing equipment needs to be adjusted or realigned.

As manufacturing technology has become more advanced, so too has the level of quality demanded by product teams. Parts increasingly require levels of surface finish detail, feature resolution, and other material properties that cannot be measured manually. Quality assurance now relies on technology with the ability to make measurements as accurate as a fraction of a degree or a millionth of an inch in variance. For industries that depend on extreme precision — such as the automotive, medical device, and aerospace sectors — measurements of this exactitude are vital for producing superior parts.

Importance

Metrology allows manufacturers to produce products more accurately, more quickly and to a higher standard. These benefits are passed onto consumers as products become cheaper to purchase and are made to a higher quality.

The car is a good example. Historically, 100,000 miles was considered a good mileage for a car to achieve. Wear and tear and parts failure generally meant that after this sort of distance, it was time to trade-in for a newer model. Today, many cars can comfortably reach 200,000 miles and beyond and still be in good working order.

The automotive industry was one of the pioneers in production lines. The sector quickly realised the importance of metrology in producing standardised parts. Over the years, they have improved and refined their processes which means the cars they now make are of a much higher standard.

CONCLUSION

Metrology is basic to the economic and social development of a country. It is concerned with providing accurate measurements which impact our economy, health, safety and general well-being.

Without metrology, life would be very difficult. Imagine the following:

- filling up your vehicle at the gas station and not knowing if you are getting the amount of gas that you are being charged for;

- buying produce in the marketplace and being unsure if the scale is measuring accurately;
- shipping for export and being uncertain whether your shipment will weigh the same when it reaches the importing country;

administering a lifesaving medication and being unsure of dosage