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Ultrasonic Thickness Measurement: A Definitive Guide

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Ultrasonic thickness measurement or simply UTM is **essential** in many industries, especially those where the **materials** are exposed to **harsh environmental conditions that may lead to wear and damage due to corrosion and erosion**.

What is ultrasonic thickness measurement?

Ultrasonic measurement is a common **non-destructive technique** used to **measure the thickness** of a part in detail.

This means that the integrity of the part is not affected in the process. Another important aspect is that it is possible to obtain results by measuring only one side with the help of a probe. In other words, it is not necessary to complicate the measuring process like having to go inside a metal vessel. Measuring from the outside will do.

Why is ultrasonic thickness measurement essential in many industries?

Ultrasonic thickness measurement can be applied to many different components and structures, and it provides a simple way to detect different problems. Some of the most common ones include:

- Material loss due to corrosion and erosion.
- Structural and welding problems on ships hulls and other components.
- Damage resulting from splitting materials.
- Defects on the surface finish of a finished product.

It is also a **great way to control the quality** of metal sheets and coated materials, which can be useful for manufacturers to validate the products received from their suppliers.

How to measure ultrasonic thickness?

The instrument used to **measure thickness** with this technique is commonly called an **ultrasonic thickness gauge**.

Operating an **ultrasonic gauge** consists of **accurately measuring the time it takes for an ultrasound pulse** generated by an ultrasonic transducer, known as the probe, to **pass through the thickness of the sample**, which gets reflected on the opposite surface, and finally **returns to the probe**.

After the time is measured the **ultrasonic thickness gauge** performs the **calculation of the thickness of the material** and displays the result on the digital screen, integrated within the instrument.

The calculation is performed by means of the following mathematical expression:

$$T=(V)x(t/2)$$

where

T = the thickness measure

V = the velocity of sound in the test material

t = the measured time

At this point, it is important to highlight that **the velocity of the sound waves significantly varies from one material to the other**, so it is important to calibrate the **ultrasonic thickness gauge** for the material being measured.

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Fortunately, modern instruments like Olympus or any digital thickness gauge can make this calibration very easy and able to measure the thickness on a wide range of materials such as:

- Steel, Cast iron, Aluminium
- Copper, Brass, Zinc
- Quartz glass
- Polyethylene, PVC
- Gray cast iron, Spheroidal iron

Another important aspect of how **ultrasonic thickness measurement** is performed is the fact that some instruments require the material to be free of any coating, painting and residues such as rust caused by corrosion. This makes **measuring thickness** difficult in certain situations.

What are the applications of ultrasonic thickness measurement?

As described above, **ultrasonic thickness measurement** is essential in many industries. Some of the **sectors** that commonly perform **ultrasonic thickness measurement** include, but are not limited to:

- Oil and gas
- Energy generation
- Structural contractors
- Foundries
- Aerospace
- Pharmaceutical
- Food processing

Ultrasonic thickness measurement is generally used for **quality control** activities and **maintenance inspections** to detect corrosion on the workpiece.

Nevertheless, **more Specific applications** are:

- **Wall thickness loss detection** on piping, which require on-line and in-operation ultrasonic measurement. Different types of corrosion, and erosion due to flowing liquids and air bubbles can cause this material loss that may result in pipe failure, costly shutdowns and industrial accidents.
- **Nautical and maritime maintenance**, like in the case of bulkheads, tanks, ship hulls, etc. The ultrasonic gauges capable of measuring through coating mentioned above are particularly useful for this application. A specific thickness gauge model which is suitable for measuring materials such as fiberglass is the **Fiberglass Ultrasonic Thickness Gauge.**

Fiberglass is widely used in the boat manufacturing industry for recreational and work crafts.

- The **pressurized containers** field, including **fire extinguishers, gas tanks, industrial boilers** and others. Again, the ultrasonic gauges capable of measuring through coating mentioned above are particularly useful for this application.
- **Lighting columns**, also known as poles, are often exposed to harsh environmental conditions, water splashes from cars passing by and condensation on the swage joint. **To avoid structural collapse, authorities are required to perform ultrasonic thickness measurements in a regular basis.**