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measuring stress and strain in the field of civil engineering. Acceleration Transducer Acceleration transducers or accelerometer is a transducer that converts the acceleration of a body into an electrical signal. It can sense the change in velocity. Accelerometer uses various operating principles. Acceleration is caused when force is applied on an object. A piezoelectric crystal can sense the force acting on it and generate an electrical signal proportional to the force. Therefore, it can translate the acceleration into an electrical signal. Characteristics of Transducer There are some characteristics of a transducer that determines the overall performance of a transducer. It is divided into two types; Static Characteristics Dynamic Characteristics Static Characteristics These characteristics do not depend or vary with variation in the input signal or with time. Here are some of the static characteristics; Accuracy The accuracy of a transducer is the maximum difference between its actual value and the indicated value. It is expressed in a percentage of the actual value. A transducer must have high accuracy to measure the physical quantity accurately. Linearity The ability of a device to vary its output linearly with the input signal is called linearity. The output is in proportional with the input signal. A transducer having linearity has a more accurate reading and it can easily translate the signal to its corresponding output value. Robust A transducer must be able to withstand extreme environmental conditions and mechanical stress. A rugged and robust transducer's performance is not affected by its environment. Repeatability The ability of a transducer to generate an identical output signal multiple times when applied with the same input signal. The output signal must repeat itself and do not vary with time. Stability The capability of a transducer to provide a stable output and does not fluctuate. Sensitivity The ability of a device to sense the smallest change in a physical quantity and translate it efficiently into an electrical signal is called sensitivity. A device having higher sensitivity can measure more accurately and precisely. Size A transducer having a small size is crucial for installing compact devices without taking much space. Dynamic Characteristics The dynamic characteristics of a transducer are dependent of time and they may vary little. Here are some of the dynamic characteristics of a transducer: Dynamic Range The dynamic range is the ratio between the highest amplitude and the lowest amplitude the device can efficiently convert. A transducer having a high dynamic range has better performance and sensitivity. Error The error is the difference between the measured reading and the actual reading. The error can be caused by various factors. Speed The speed of a transducer plays a vital role in its performance as it shows how quickly it translate a physical quantity into a stable electrical signal. Noise Noise is a random unwanted signal that distorts and inflicts error in the original signal. A transducer adds noise in its signal. A low amplitude signal is more affected by noise than a high amplitude signal. Hysteresis Hysteresis is the ability of a device whose output not only depends on its current input but the previous input as well. Efficiency of Transducer The efficiency of a transducer is the ratio of output power to input power. The percentage efficiency of a transducer is never 100% as some of the energy is wasted during the process of conversion. For example, the efficiency of a photovoltaic cell is below 30%. Most of the energy is wasted in the form of heat and reflection. Related Post: Automated Fingerprint Identification System and How it Works? Advantages & Disadvantages of Transducers Advantages Here are some advantages of Transducer The electrical signal of a transducer can be easily and quickly processed using electrical circuits and microprocessors. It requires less energy to control electrical signals thus more energy efficient. The electrical signal is easier to transmit and receive over long distances. The electrical signal can be easily amplified, added, mixed with other signals. Modern tech is becoming smaller and more compact day by day. Thus electrical signals can be processed and stored using very small gadgets and devices. There are no mechanical parts involved, thus it reduces the mechanical wear and tear problem. Disadvantages Here are some disadvantages of a transducer Some transducers especially the more accurate ones are relatively very expensive. Transducers are not reliable as compared to mechanical instruments in long-term use. Noise in an electrical signal can affect the accuracy of the measurement. The battery-operated transducer's performance is affected by the charge remaining in the battery. Applications of Transducer The conversion of any physical quantity into an electrical signal is used in almost every field. Here are some applications of transducers. In Biomedical Instrumentation, different transducers are used to help patient diagnosing such as ultrasound machines, thermometers, ECG, ECHO, CT, MRIs, and other instruments. They convert various signals generated from our body into electrical signals and display them on a screen. In civil construction, stress gauges are used to measure the stress on a building, bridge, etc. The temperature is converted into an electrical signal that is processed to maintain temperature in a room. They are also used in fire alarms. A transducer such as an antenna converts the electromagnetic signal into an electrical signal that enables data transmission over a long distance. The pressure of any liquid or gas is easily measured using a transducer. Transducers such as microphones convert sound waves into electrical signals that can be amplified as well as processed, modified, and stored. Photoelectric transducer such as solar cells is a source of green energy. They are used to produce electrical energy from solar energy. Other LDR, photodiodes and photo-transistors are used in various electrical projects. Modern driverless cars operate on transducers that convert different signals from its surrounding into electrical signals and process them to make decisions. In robotics, Robots depend on transducers to understand and process real-world quantities using their microprocessors. In general, we use multiple transducers in our daily life such as the lighter we use in our kitchen has a piezoelectric crystal that generates a spark when hit with a spring-loaded hammer. Almost every electrical equipment or gadget has a transducer embedded in it. different types of transducers are used in electronic measurement devices. Related Posts:

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