

What is intelligent instrumentation?

An instrumentation system is a physical system which is a collection of physical objects connected in such a way to get the desired output for a given input condition.

Such instrumentation is termed as intelligent instrumentation when the system is made capable of automating the process by just simply feeding in a software program in it and secondly capable of storing the processed data in its memory for its further use.

Thus a system is said to be an intelligent instrumentation system when ~~the system is made~~ it is included with a microprocessor and memory thus acting as a micro computer.

- The processor within an intelligent instrument allows it to apply preprogrammed signal processing and data manipulation algorithms to measurements. This prewritten software is often termed as embedded software.

- One of the main functions performed by the intelligent instruments is compensation for environmental disturbance to measurements that cause systematic errors.

Thus apart from primary sensor to measure the variable of interest, intelligent instruments usually have one or more secondary sensors to monitor the value of environmental disturbances.

⇒ this point is continued..

- These extra measurements allow the output reading to be corrected for the effects of environmentally induced errors, subject to the following preconditions being satisfied.

1. The physical mechanism by which a measurement sensor is affected by ambient condition changes must be fully ~~understo~~ understood and all physical quantities that affect the output must be identified.
2. The effect of each ambient variable on the output characteristics of the primary sensor must be quantified.
3. Suitable secondary sensors for monitoring the value of all relevant environmental variables must be available that will be operate satisfactorily in the prevailing environmental conditions.

Feat

Features of intelligent instruments:-

1. Correction of the loading effect of measurement on the measured system.
2. Switchable ranges (using several primary sensors within the instrument that each measure over a different range).
3. Switchable output units. (e.g. display in imperial or SI units).
4. Linearization of the output.
5. Self-diagnosis of faults.

6. Remote adjustment and control of instrument parameters from up to 1500m away via 4-way, 20mA signal lines.

→ The size of intelligent instruments has gradually reduced over years and the functions performed are steadily increased.

One particular development has been the inclusion of a microprocessor within the sensor itself, in devices that are usually known as smart sensors.

Block diagram of intelligent or smart instrument:-

