EDITORIAL

Many papers sent to TECNURA correspond to research results that involve sampling, measuring, testing, or laboratory analysis. The use of laboratories in the development of research projects needs to take into account a sensitivity analysis of the equipment and the tests used in the measurements of the response variables. Likewise, other activities developed at the industrial level in order to know different phenomena that are subject of study also require this sensitivity analysis. This happens because these measurements allow to obtain the numerical values that ultimately define the behavior of these phenomena.

There are different types of measurable variables depending on the processes involved; Some are measured directly and others indirectly. For the variables that are measured directly, different instruments are used and the result of this measurement corresponds to the value of the variable. On the contrary, in the case of indirect variables, the process is slightly different: The variable is measured in the physical environment and then processed through interaction with other variables and through mathematical and systemic treatments to obtain the value of the variable of interest without it being measured directly. In many instances, indirect variables are not measurable, or perhaps complex or costly measuring instruments or procedures are required. Therefore it is advisable to carry out the measurement of simpler variables that allow carrying out the desired determinations; as usually occurs in many fields of technology.

All measuring instruments have a range of uncertainty. That means that from one point the measurement stops being completely accurate and begins to present slight variations; it is that point where the uncertainty in the measurements is considered. Depending on the degree of uncertainty of the measurements (data), the uncertainty may appear in the results since these are directly influenced by the data depending on the treatment or the different operations applied to them. Uncertainty is an issue inherent in measurements. Any measurement, however large or small, has some degree of uncertainty that is in agreement with the magnitude of that measurement.

An observer can find uncertainty in measurements while reporting results because it is widely assumed that the decimals included in the results correspond to those that are certain. For example, if there are three certain digits for the measurements, it is useless to include more than three digits in the results because it would not be completely achúrate. However, it is important to mention that if a mathematical operation changes somehow those digits, these should be reported; this is, for example, if we squared a value, the significant figures reported will be those that result from raising the uncertainty squared.

The required sensibility negree in a process depends largely on the process, on the way the different measurements are used, and on the size of the measurement. At the industrial level, where it is possible to work with larger quantities (of the order of tons, cubic meters, and others), the accomplishment of these measurements requires measuring instruments that must not be extremely sensitive. For instance, it is practically the same to use 10000 or 10000.0001 tons in a process; in this case, the sensitivity of 0.1 kilogram makes no difference. On the contrary, if the quantity to be used is two (2) grams, 1 Kilogram does make the difference since it is 500 times the amount required. In this case it is significant whereas in the first case it is not.

In general it can be said that as the quantities decrease, the degree of accuracy and sensitivity of the measuring instruments increases. In the first case, for example, a device whose accuracy level reaches a unit of kg is required; In the second case, it is necessary to have a scales that can discriminate even milligrams. This difference implies more accurate and generally more expensive measuring instruments

The high quantities are related to industrial and large-scale production activities; small amounts are used experimentally and investigationally. This indicates that high-precision instruments are mainly used for research and small-scale sectors, although it is important to note that industry can also require highly accurate measuring instruments since they measure very small magnitudes. For example, in the freeze-drying processes vacuum meters of the order

of mercury microns (10^{-6}) are required in equipment that can easily measure up to 10 meters long by 3 meters wide. Therefore, the measuring instrument must be suitable for the magnitude and precision required by the measurement itself.

In these specialized fields there are processes that require instruments with degrees of accuracy of sub-levels such as microns, nanos, pico, etc. When analyzing the absorbance in a laboratory, for example, it is necessary to measure wavelength radiation in nanometers; Therefore, the measuring instruments must allow measurements to be made with certain accuracy. Finally, low resolution instruments tend to be very similar to high resolution instruments in terms of the mechanism used to measure; However, in some cases they are not, and can be very different depending on the accuracy required.

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