

CONFORMITY OF THE QUALITY IN THE MEASURES

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Abstract- We'll want to implant the awareness of the importance at measurement's quality that must have with systems acquisition of own design. The choice of system acquisition will be very important because this system will must fulfill our expectations.

Keywords- acquisition's system, traceability, uncertainly, accuracy

I. INTRODUCTION

In any method or acquisition's system we must think the next question: "the data that we'll want to acquire have the sufficient accuracy that we wish?". Normally this concept is very clear for the designer however we must have answer another question: "the uncertainly of my system of measure will be sufficiently small in order that from the data acquisition could extract conclusions?".

II. BASIC CONCEPTS

Uncertainly according to the definition of CEM [1] "The uncertainly is a quantitative measure of the quality measurement result, which allows that the measurement results should be compared with other results, with references, specifications or standards". The uncertainly is calculated by probability. Some the probability distribution more used are the normal distribution and the uniform distribution. At Fig. 1. We can see graphically theses probability distributions calculated with a histogram:

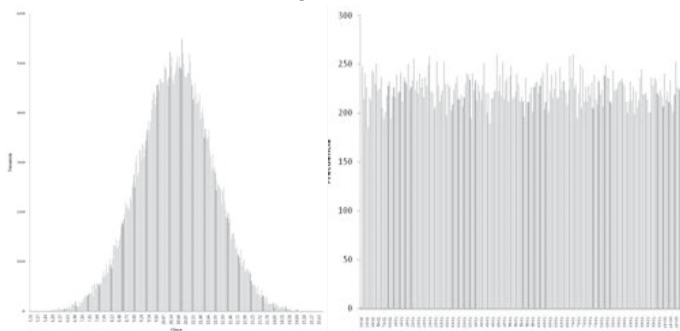


Fig. 1. Histograms representing the normal distribution and the uniform distribution respectively

The usual notation of uncertainly is shown in equation 1.

$$Y = X \pm U$$

Equation 1. Typical notation of the uncertainly in a result

Traceability

According to the definition of CEM [1] "A traceability chain, see Fig.2., is a unbroken chain of comparisons, had established all uncertainties. This ensures that a measurement result or value of pattern is associated with references to higher levels, up to primary standard."

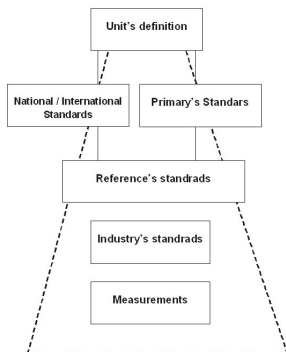


Fig.2. La cadena de trazabilidad

III. SYSTEM ANALYSIS

Before beginning the design of the system we must evaluate the uncertainly that must have the system. For example if we choose a system for acquiring for

pressure variations and I'll need evaluate variations around to 1 atm, and the resolution of the equipment used is 0,5 atm, i can think that system is good for make the work. Such an analysis is not valid, because we must calculate the uncertainly system. In fact is possible that the uncertainly's system can be over 1 atm and my acquisition system isn't good for the work.

Equation 2, according to UNE-EN 30012 [2] we can relate the expanded uncertainly (U) of the equipment with the value of Tolerance (T) of the measurement

$$3 < \frac{T}{2 \cdot U} < 10 \quad \text{Equation 2. Relation between Tolerance (T) and expanded Uncertainly (U)}$$

we want to do. In our case the tolerance is the minimum value that we want to see, in the previous example is 1 atm.

The values 3 and 10 have the next explication:

The value 3 indicate that the system has the top value of uncertainly compared to tolerance. In this case our system has the minimum requirements to have a value acceptable.

The value 10 indicate that our system has a lowest value of uncertainly compared to tolerance. This is an ideal case, but if we want to get 10 usually the equipments that we need are very expensive.

For this is reason, all equipments or systems must pass a calibration by the manufacturer, which will give the accuracy, by ourselves through some internal method. The most important is maintenance the traceability chain.

IV. TOLERANCE'S MODIFICATION

One time that we calculated the uncertainly of our measure's system, we must know that the minimum value that we want to see no longer corresponds to the initial value, because has been altered by uncertainly. Now our tolerance (T) will have been modified and will become (T'). This variation is showed in the Fig. 3.:

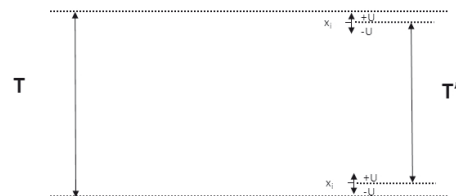


Fig.3. Tolerance's modification of the process

V. SYSTEMATIC

To determine the best equipment for the purpose that we wish, we must choose that equipment or measurement system. In the next diagram, Fig. 4., we can see the steps to follow for a good choice:

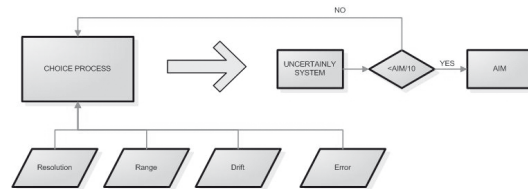


Fig. 4. Diagrama de sistemática del proceso

VI. CONCLUSIONS

We carried out a systematic study to make a choice according to our needs. In this way we can reduce the purchase price of equipment and give a validation for the value that we want to analyze.

REFERENCES

- [1] Edición del Centro Español de Metrología (CEM). "la metrología abreviada". M-20557-2005.
- [2] Norma UNE-EN 30012."requisitos de aseguramiento de la calidad de los equipos de medida. Parte 1: Sistema de confirmación metrológica de los equipos de medida (ISO 10012-1:1992). (Versión oficial EN 30012-1:1993)"