Analytical Hub
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MSA – Measurement System Analysis

Measurement system analysis is to evaluate, monitor and ensure that there is no error in the entire measurement process.

In testing laboratory we do the measurement and generate data. The data may be variable or attribute. Whatever the data is, but on the basis of this data many critical decision are taken, may be on product or may be on producers/providers. So, the credibility of the laboratory service provider fully depends on the measurement system, and so the analysis of measurement system is most important.

Each testing laboratory have to make a procedure to ensure the validity of test results, and this procedure can make systematically and MSA is the base of it.

The measurement and producing the test result depends on many factors, such as, sampling, transportation, preservation, handling during process, sample preparation and analysis. Each has equal opportunity to misguide. According to me, these all should be part of measurement system analysis.

In order to effectively manage the variation in process, we first should know:

- What the process should be doing (specification)
- What can go wrong (PFMEA)
- What the process in doing (evaluation)

One very simple example is elemental analysis. It can be done by AAS, ICP-OES or by ICP-MS (there are other technologies also available). As each all these instrument has a limitation on range, so, selection of technology is the first step. In this example, if someone wants to estimate Ca (100ppm), Mg (50ppm), Fe (1ppm), As (1ppb), then which technology will be selected? If ICP-MS selected, then the sample to be diluted to measure Ca, Mg; and this dilution can contribute to an error. So, the owner of the process must know how to correctly use this equipment and how to analyze and interpret the results.

The measurement system gets impact by both random and systematic sources of variation. These sources of variation are due to common and special causes. In order to control the measurement system variation:

- Identify the potential sources of variation
- Eliminate or monitor these sources of variation

To present and categorize the sources of variation, we can use cause-effect diagram, fault tree diagram, etc.

To focus on the elements of a generalized measuring system, the acronym S.W.I.P.E (Standard, Workpiece, Instrument, Person and Procedure, and Environment) is used or can call 6M (Man, Machine, Method, Material, Measurement, and Mother Nature). Factors affecting those six areas need to be understood so they can be controlled or eliminated.

Before develop the MSA design, get the answer of below questions:

To know more, write to Abhijit.bhar@outlook.com; abhijit@analyticalhub.in; or WhatsApp on 9867423453

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1) What is to be measured?
2) For what purpose will the result of the measurement process be used?
3) Who will use the process?
4) Training required?
5) Identified the source of variation?
6) FMEA developed?
7) Measurement system is flexible or dedicated?
8) Environment impact
9) Sampling and measurement location?

Once the MSA designed, be ready for the resistance. Following are the issues:

1) Support
2) Training
3) Personnel
4) Data management
5) Long term stability

What to be measured for MSA in testing laboratory?

1. Sampling – to ensure the collected sample represent the whole sample.
2. Transportation & sample handling – to ensure that sample integrity has not changed during transportation, storage, sub-sampling, and during analysis.
3. Competency of the analyst - the IQC report.
4. Instrument performance – Sensitivity, linearity and repeatability.
5. Environmental condition – the temperature and humidity of the work area.

Mail to abhijit@analyticalhub.in to know the following about MSA:

1. Purpose of MSA
2. The measurement process
3. Measurement strategy and planning
4. Measurement source development
5. Measurement issues
6. Measurement uncertainty
7. Measurement problem analysis
8. General concept for assessing measurement system
9. Selecting/developing test procedures
10. Preparation for measurement study
11. Analysis of results
12. Recommended practice for replicable measurement system

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