Dynamic Systems Measurement Chains

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***Abstract*—this document, develops the topic of measurement chains in dynamic systems, wich are so important in making decisions and carryng out research in the industrial field.**

***Keywords*—dynamic, industry, measurement, signals, systems.**

I. Introduction

The measurements in the industry, gives solutions to problems, using dynamic magnitudes, which can be vibrations, disturbances or impulses, which causes the system to fluctuate and test the different structure and elements of the system, in places such as junctions, moorings, in short, each link that can weaken or put at risk the correct functioning of the system.

II. Measurement chain.

A. Structure.

Before taking a look at a basic measurement structure, let's review what is going to be measured, in our case they would be dynamic magnitudes, which, as shown in figure 1, are divided into two large groups and can be presented in different ways. We must also say that as is well known, the analyzes are performed in another domain different from time, this is the frequency since it provides elements to compare different characteristics of a system.

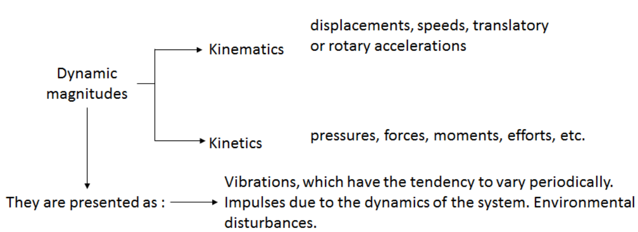

Figure 1

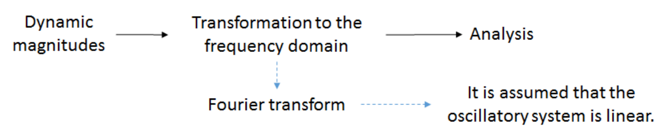

Figure 2

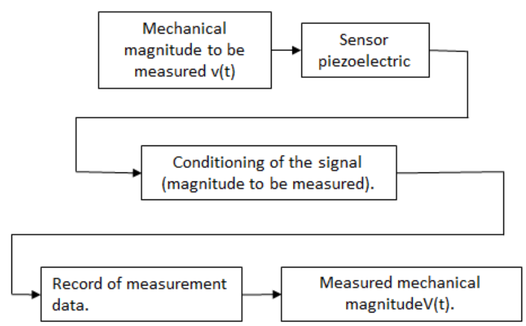

Figure 3

In figure 2 we can see a basic measurement scheme where we can see the structure of a measurement chain, where once the magnitude to be measured is selected, it becomes vital to use the appropriate sensor for the measurement, in our case we will use a piezoelectric sensor that will describes below: The parts of a piezoelectric sensor are: Its operation according to the forces applied to it are

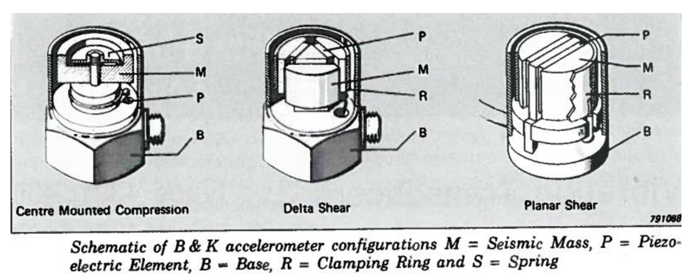

Figure 4 [1]

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Conditioning of the signal is done using A / D converters, filters, amplifiers, etc., which allow the signal to have the proper conditions to perform the acquisition for later storage.

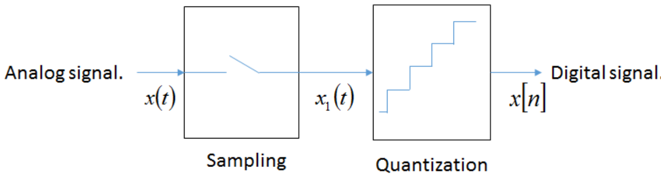

Figure 5

In this process it is of vital importance to elaborate the respective mathematical model, topic that we will touch in the following section.

B. *Equivalent of a mechanical system*

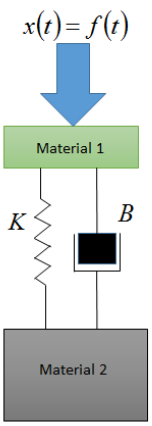

Figure 6

Being x (t) the input force, B the buffer and K the rigidity of the material.

As we see this equivalent system can be simply the interaction between two materials, one can be polymer or a synthetic and the other a metal, and you want to perform the mathematical modeling of it, and characterize the system.

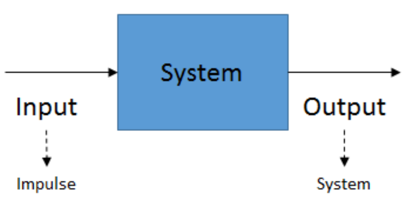

Figure 7

If we excite with an impulse by the nature of the excitation, we know that it tends to disappear, that is to say, the exit can be represented with a function of the form:

$$y(t) = Ae^{-\alpha t}\cos(wt + \varphi)$$

And the inout is represented whit the function delta dirac:

$$x(t) = \delta(t)$$

III. Mathematical Model

To propose the mathematical model we rely on the existing physical theory with the help of differential equations that will allow us to describe the phenomenon in an approximate way, in our case we have a mechanical system that is excited with an impulse, and thus determine the behavior of the system, the lower mass is known, we must determine in some way by experimental means the mass 2 that is not known, we will deal with this in its moment.

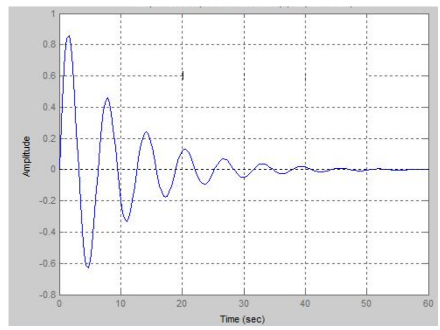

Figure 8

The figure shows the form of the response of the system

IV. Results

In the tests carried out, the following measurements were found.

Figure 9 shows a typical graph of the response to the impulse response of the system; we can also see the frequency spectrum.

In the study conducted, it was possible to see which frequencies are representative of the system and how they correlate.

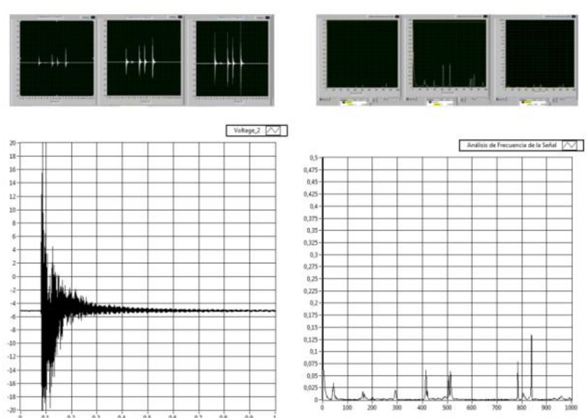

Figure 9

Identify applicable funding agency here. If none, delete this text box.

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