Measurement and instrumentation lvdt sheet - lab report example

Engineering

Measurement and Instrumentation LVDT sheet

Linear Voltage Differential Transformer (LVDT) Introduction The linear variable differential transformer is one of the most widely used transducers for measuring linear displacement. It offers many advantages over potentio-metric linear transducers such as frictionless measurement, infinite mechanical life, excellent resolution and good repeatability (Herceg, 1972). Its main disadvantages are its dynamic response and the effects of the exciting frequency (Kim et al., 2010). General guidelines regarding the selection of an LVDT for a certain application can be found in (Herceg, 2006).

LVDT Construction

The basic construction of an LVDT is explained and shown in the figure below. The device consists of a primary winding (P) and two secondary windings named S1 and S2. Both of them are wound on one cylindrical former, side by side, and they have equal number of turns. Their arrangement is such that they maintain symmetry with either side of the primary winding (P). A movable soft iron core is placed parallel to the axis of the cylindrical former. An arm is connected to the other end of the soft iron core and it moves according to the displacement produced.

The LVDT is also used as a secondary transducer in various measurement systems. A primary transducer is used to convert the measurand into a displacement (Scholey et al., 1995). The LVDT is then used to measure that displacement. Examples are:

1. Pressure measurement whereby the displacement of a diaphragm or

Bourdon tube is detected by the LVDT (e. g., diaphragm type pressure transducer, (Daly et al., 1984)).

2. Acceleration measurement whereby the displacement of a mass is measured by the LVDT (e. g., LVDT used within an accelerometer, (Morris, 2001).

3. Force measurement whereby the displacement of an elastic element subjected to the force is measured by the LVDT (e. g., ring type load cell, (Daly et al., 1984)).

Results

Difference output Voltage Vs Displacement

Fig. 1

The graph above shows the plot between the resulting voltage or voltage difference and displacement. The graph clearly shows that a linear function is obtained between the output voltage and core movement from the null position within a limited range of 4 millimeter. The results showed that there is linear relationship between displacement and voltage and this relationship continues till the maximum displacement of 40 mm, after that output voltage was decreased drastically towards negative side.

The results revealed that there is very strong repeatability in LVTD as show in fig. (2). There is almost no difference in output voltage when the experiment was replicated second time. These results are supported by the findings of other researchers who reported the similar results. (Tariq et al., 2002 ; Wu et al., 2008 and Drumea et al., 2006). It is evident from the data that the instrument has high sensitivity, resolution and repeatability.

Maintains a linear relationship between the voltage difference output and displacement from each position of the core for a displacement of up to 40 millimeter.

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