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Displacer Level Transmitter Simulation With Neural Network

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Abstract: The measurement of level is defined as the determination of the position of an existing interface between two media. These media are usually fluids, but they may be solids or a combination of solid and a fluid. The interface can exist between a liquid and a gas, a liquid and its vapor, two liquids, or a granular or fluidized solid and a gas. The purpose of this paper is to demonstrate the principle of variable displacement level measurement. In this paper we explain the operational procedure of variable displacement level devices for open-and closed tank application, and explain the operation of three major components in a variable displacer level device and expound on the significance of the torque tube.this paper state the effect of the specific gravity of the measured fluid with respect to the selection and design of the measurement system and explain the procedures for calibration of variable displacer level transmitter and amethod of signal generation for both electrical and pneumatic signals. After knowing the displacer level transmitter we explained a little about control methods and usingmems as angular and linear position sensors. At last according to value and useful of displacer level transmitter atindustry, we simulate it with neural network.

Key words: Displacer Level Transmitter, Neural Network, Feed Forward Network, Back Propagation

INTRODUCTION

In a real sense, the type of measurement devices previously discussed operate on the displacement principle. That is the float used for measurement fluid until a volume of water is displaced that is equal in weight to that of the float is generally adjusted by weight either internal or external to the float so that the float maintains a half-submerged position. This causes the float to attain a maximum operating force.

When the specific gravity of the liquid remains constant and the weight of the displacer or float remains constant, the float rises and falls the same amount as the level. Therefore, regardless of the position of the level, the float will assume a constant relative position with the level, and the float position is a direct indication of the level.The type of displacement principle just described defines a constant displacement device.

2. *Variable Displacement Measuring Divices:*

When the weight of an object is always heavier than an equal volume of the fluid into which it is submerged, full immersion results and the object never floats. Although the object (displacer) never floats on the liquid surface, it does assume a relative position in the liquid, and as the level moves up and down along the length of the displacer, the displacer undergoes a change in weight caused by the buoyancy of the liquid. Buoyancy is explained by Archimedes' principle, which states that the resultant pressure of a fluid on a body immersed in it acts vertically upward through the center of gravity of the displaced fluid and is equal to the weight of the fluid displaced. The upward pressure acting on the area of the displacer creates the force called buoyancy. The buoyancy is of sufficient magnitude to cause the float (displacer) to be supported on the surface of a liquid or a float in float-actuated devices. But, in displacement level system, the immersed body or displacer is supported by arms or springs that allow some small amount of vertical movement or displacement with changes of resulting buoyancy forces caused by level changes. This buoyancy force can be measured to reflect the level variations.

When a body is fully or partially immersed in any liquid, it is reduced in weight by an amount equal to the weight of the volume of liquid displaced. A displacer arrangement is shown in Figure1.The vessels shown are open to atmosphere, but the principle described applies to closed-tank measurement also.

In vessel A, the displacer is suspended by a spring scale that shows the weight of the displacer in air. This would represent zero percent level in a measurement application. The full weight of the displacer is entirely supported by the spring and is shown to be 3 pounds. In the center vessel, the water is at a level that, in this case, represents 50 percent of the full measurement span. Note that the scale indicates a weight of 2 pounds. The loss in weight of the displacer (1 pound) is equal to the weight of the volume of water displaced.

When the water level is increased another 7 inches to a full scale value of 14 inches, the net weight of the displacer is 1 pound, which represents a change of 2 pounds when the water level rises along the longitudinal

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axis of the displacer 14 inches. That is, when the water level changes from 0 to 100 percent, 0 to 14 inches, the weight of the displacer changes from 3 pounds to 1 pound. As the weight of the displacer decreases, the net load on the spring scale decreases by an amount directly proportional to the increase in water level. For the displacer question, a 14-inch increase in level is equal to about 55 cubic inches of water displaced. This is the volume of the immersed portion of the displacer, which is determined by multiplying the cross-sectional area by the submerged length of the displacer.

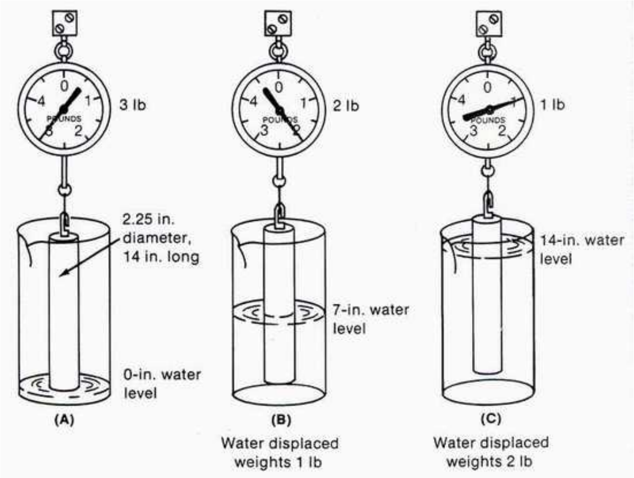


Fig. 1: Illustration of the operating principle of displacement level measurement.

Another severe disadvantage is that use is limited to local indication. What is important to realized, however, is that displacer can be used as transducer to produce proportional, repeatable, and accurate movement representations of level variations. Also of major significance is the fact that by appropriate and careful selection of displacers along with consideration of fluid density, wide ranges of level applications are feasible.

The system in Figure 2 illustrates the concept of variable displacement level measurement in an open tank. Note that the scale graduations are in pounds to signify the principle of weight variations with the vertical displacement of level. In an actual level application, the pointer movement would be slight because of the usual small displacer movement. The pointer movement must be amplified for scale resolution. Generally, however, the displacer movement is converted to a scaled electrical or pneumatic signal for transmission.

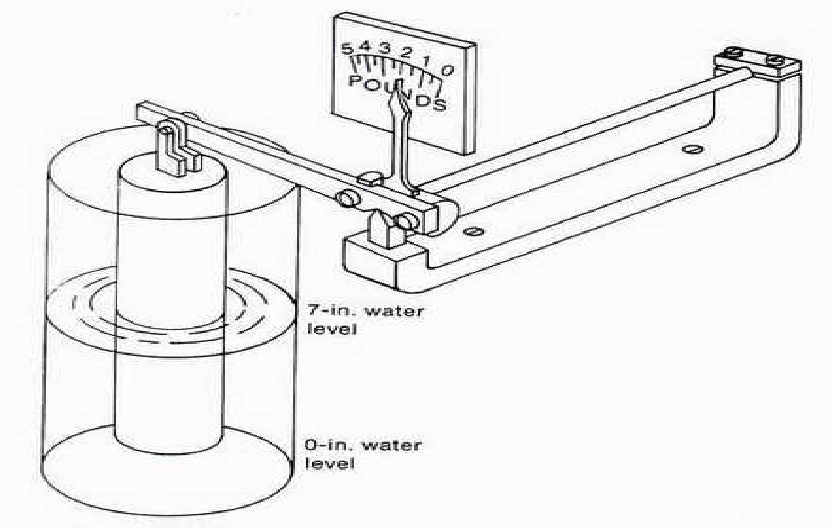


Fig. 2: Displacer and torque tube for open-tank level measurement.

For closed-tank level measurement, the process vessel must be sealed from the instrument. To provide such a sealing device for frictionless operation that can be used over a wide range of pressure and temperature variations under a variety of corrosive conditions has been a basic problem for manufacturers of displacement level instruments. Most companies use a torque tube type of seal for this purpose. A torque tube displacer level instrument is shown in Figure 3.The torsion spring (torque tube) in the figure and a torque arm have replaced the spring scale. The diameter and length of the torsion spring must be selected so that the full weight of the displacer can be supported in the absence of buoyancy, as is the case for zero level conditions.

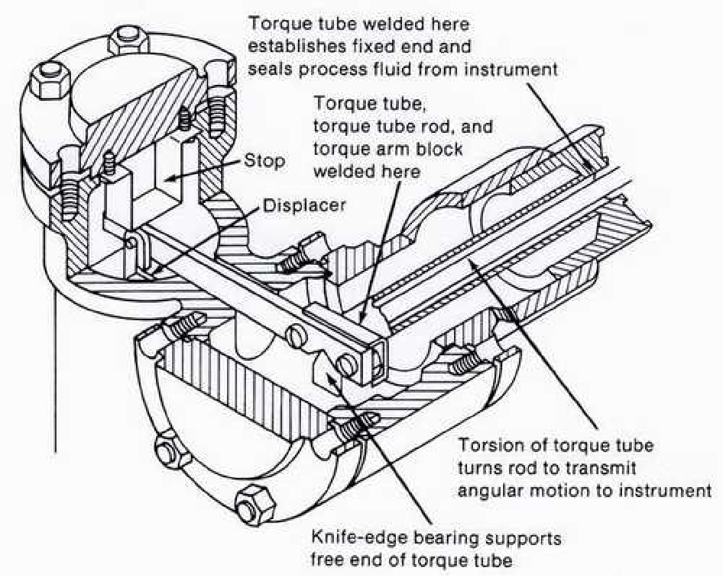


Fig. 3: A torque tube level instrument.

A solid or a hollow tube can be used, but the latter has distinct advantage. The hollow tube provides the required frictionless pressure seal. This type is generally used because it is not only able to support the displacer weight, but the displacer movement can be transferred from the inside of a pressurized vessel to the instrument readout mechanism, which is at atmospheric pressure. The four to six degree angular rotation is used to establish a flapper-nozzle relationship for pneumatic transmission or as an electrical transducer for electrical transmission. The knife-edge bearing at the free end of the torque tube provides a nearly frictionless support for the displacer. Because of the small movement of the displacer and torque tube assembly, wear at this point is very minimal and trouble-free service of many years is common.[1]

3. *Variable Displacers Used for Interface Measurement:*

It was mentioned earlier that level measurement is the determination of the position of an interface between two fluids or a fluid and solid. It can be clearly seen that displacers for level measurement operate in accordance with this principle. The previous discussion concerning displacer operation considered the displacer suspended in two fluids with the displacer weight being a function of the interface position. The magnitude of displacer travel is described as being dependent upon the interface change and upon the difference in specific gravity between the upper and lower fluids. When both fluids are liquids, the displacer is always immersed in liquid. The principle of liquid interface measurement is illustrated in Figure 4.

A 14-inch range displacer is shown immersed in liquid and used to measure the position of the interface between water and a liquid hydrocarbon or distillate. The specific gravity of the distillate is 0.8 and that of water is 1.0. With the displacer completely immersed in the distillate, the weight of the displacer is 1.4 pounds. The weight of the displacer in air is 3.0 pounds. The net weight o the displacer as shown on the scale, 1.4 pound, is the weight of the displacer in air minus the weight of the volume of distillate displaced. As shown in Figure 4(B), The water level is increased to 7 inches and the displacer weight decreased to 1.2 pounds. This decreased in weight is a result of the increase in buoyancy caused by the difference in specific gravity between the distillate and water. When the water level is increased further to the 14-inch level shown in Figure 4(c), the displacer weight is reduced to 1.0 pound. This further reduction in weight is the result of a greater portion of the displacer being immersed in the heavier fluid, which is, in this case, water. From this discussion, it should be clear that the weight of the displacer is a function of the interface position. Also, recall that as the displacer weight changes, the tension on the torque tube changes in a rotary motion of the tube. This motion then is related to the change in the interface position.[1],[2]

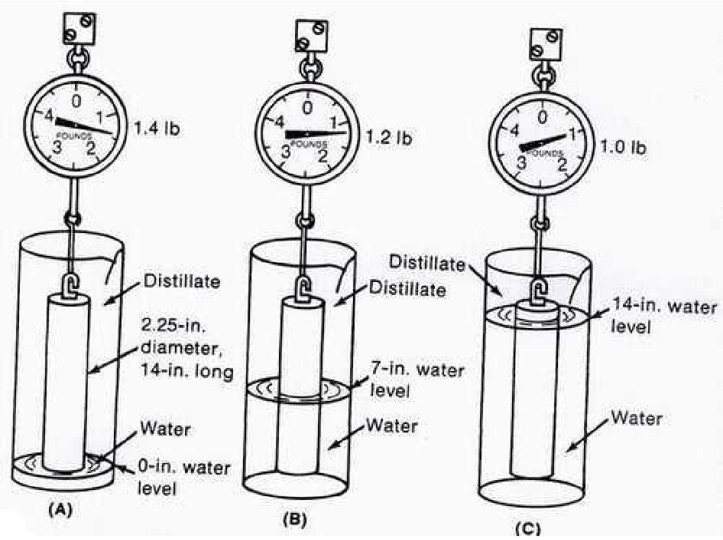


Fig. 4: Liquid interface measurement.

4.Filed-Mounted Interface Controllers:

In many applications, especially in the chemical and petroleum industries, interface control is more important than measurement. However, for feedback control, measurement must be provided. For example, if the water distillate interface level in a separator is controlled at some point around the mid-level value, the water can be drawn off through a valve whose position is a function of the interface level. The main concern in such an application is that the valve be closed when the distillate level is low to prevent the loss of product and open when the level is high to permit the separation of water from the distillate. The field-mounted liquid level controller shown in Figure 5.

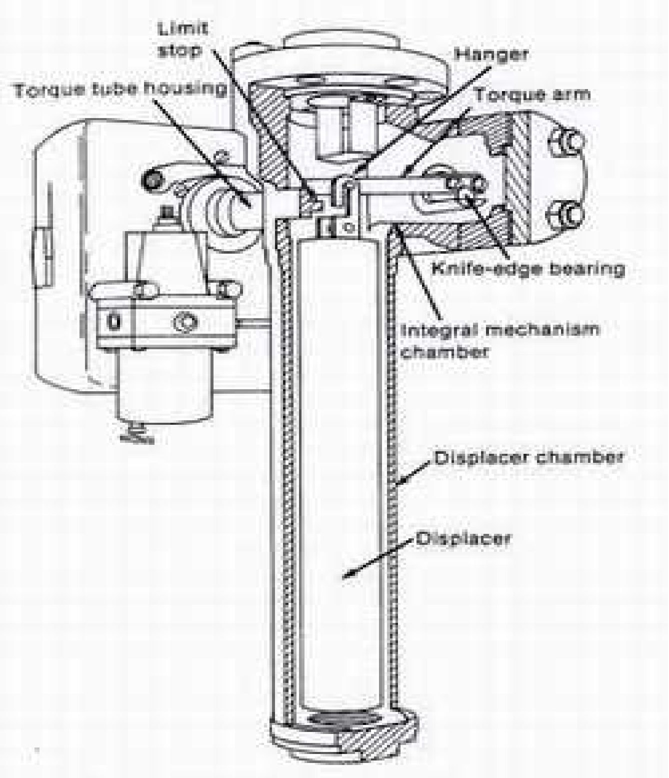


Fig. 5: Field-mounted liquid level controller.

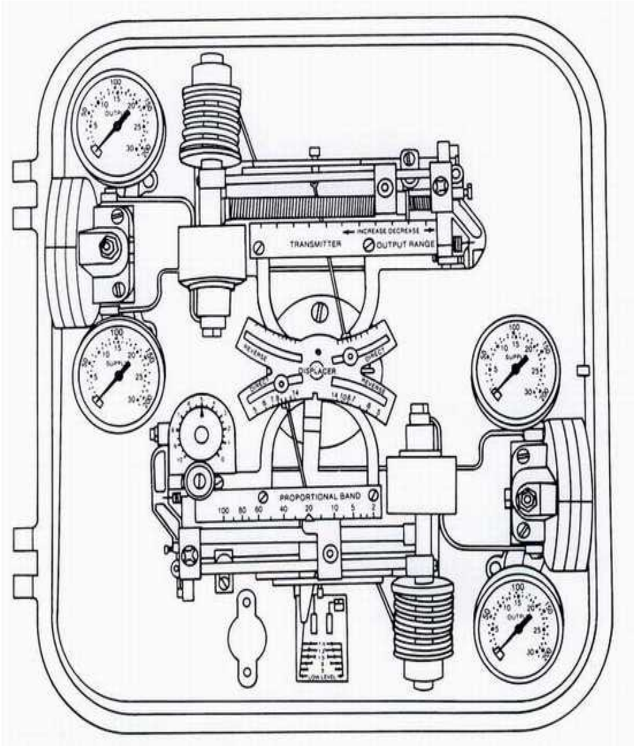


Fig. 6: A Duplex controller.

A level controller used for interface service should be able to respond over a wide range of adjustments of specific gravity differences. A standard controller and displacer may be used for such values that would otherwise be beyond the adjustable limits of the devices.

When it is desired to measure as well as control a liquid level, a duplex-type controller-transmitter is available. Such a device is shown in Figure 6; it operates from a single displacerand torque tube assembly to generate two completely independent signals. One is from the control segment that positions a final control element for control purposes, and the other is used for the remote indication or recording of the level valve. The duplex controller shown, a pneumatic type, incorporates the use of a four-arm reversing arc to transmit angular motion of the torque tube to the pneumatic mechanism that generates the outputs. By adjustment of a linkage mechanism along these arcs, specific gravity values can be set. When the linkage is moved from one side of the arc to the other, the controller action is changed from direct to reverse or vice versa.

A pneumatic signal is generated by the relative position of a flapper with respect to a nozzle, which is determined by the rotation of the torque tube (a function of the displacer position resulting from the interface position). Operation of the control and transmitting segments are identical; an explanation of the proportional controller will be discussed. An increase in level allows the torque tube to rotate the reversing arc in a counterclockwise direction as shown in Figure 7. This motion is transmitted through a control linkage to the control arm. This lowers the control arm, allowing the flapper to move closer to the nozzle and resulting in an increase in nozzle backpressure. The increased nozzle pressure is amplified by the relay, resulting in an increase in controller output. Feedback is provided by the expansion of the proportional bellows with the increased output causing the right end of the control arm to move downward. The downward motion results in a clockwise rotation of the reversing arc. This moves the flapper away from the nozzle, which decreases the output.

The movement of the flapper necessary to cause a full 12-psi change in output is about 0.001 inch. Any change in the arc rotation tends to cover or uncover the nozzle, depending on an increase or decrease in level. The resultant reply action causes the proportional bellow to move the flapper in the opposite direction to establish equilibrium. This is negative feedback generated by the force-balance principle. For any level and corresponding link position, there is only one possible position of the proportional bellows that will establish this equilibrium.

The operation of the transmitting segment of duplex controller or a single-element transmitter is very similar to that described for the controlling segment. In fact,a controller with a 100 percent proportional band could be used as a transmitter to measure level. By adjusting the proportional band clamp along the proportional spring, the effective spring length is varied. This determines the feedback force necessary for the proportional bellows to balance a force caused by an initial response. With the clamp in Figure 8in the extreme left position, the feedback force will have maximum effect; when the clamp is in the extreme right position, the feedback force will have minimum effect. The maximum effect situation defines a wide proportional band, and the minimum effect is for a narrow proportional band. The proportional band scale is independent of the specific gravity scale because the motion transmitted to the link from the reversing arc to the control arm is constant for any value on the specific gravity scale.

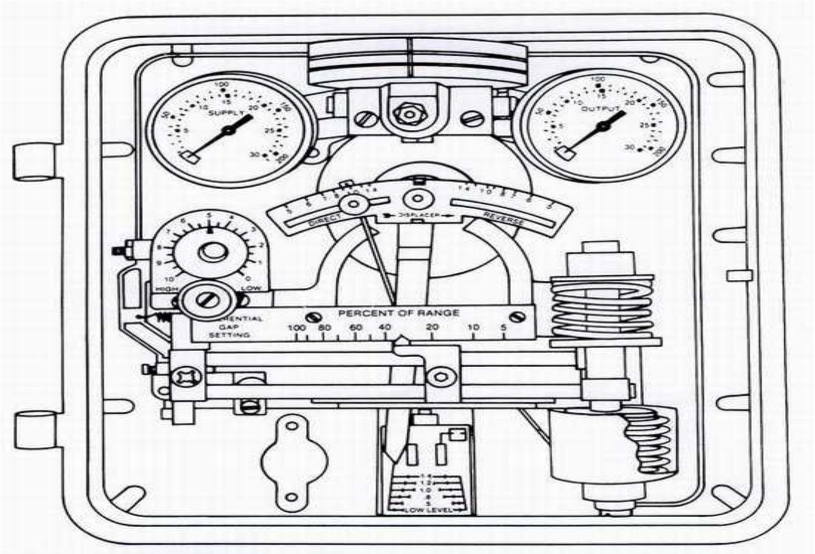
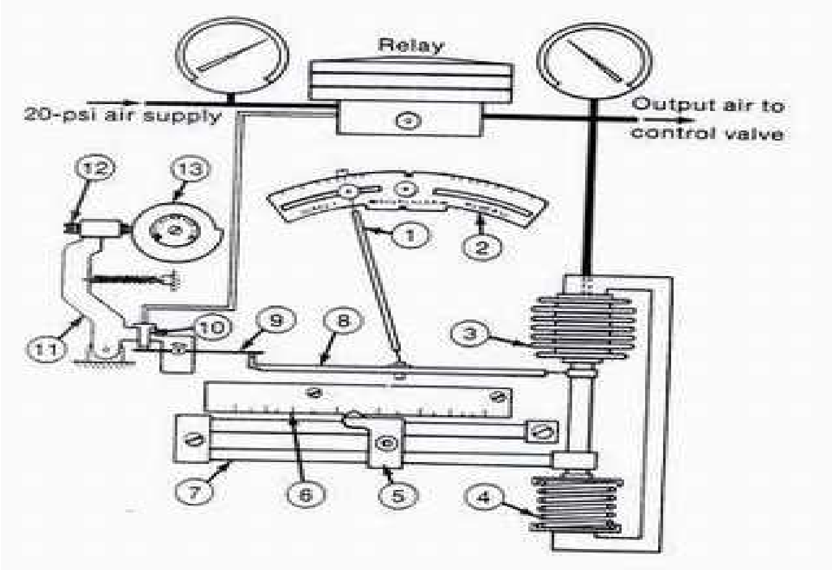


Fig. 7: A Proportional controller.

The relay shown in Figure 9 also operates in accordance with the force-balance principle. An increase in nozzle pressure creates a force on the top of the diaphragm that forces the valve plug away from the seat, closes the exhaust port, and opens the supply port. This allows more air to flow from supply to output, increasing the output presser. The output will increase until a force is generated on the lower side of the diaphragm great enough to balance the force caused by the initial increase in nozzle pressure.



1-Control link
2-Reversing arc
3-Propotional bellows
4-Bellows spring
5-Proportional band clamp
6-Proportional band scale
7-Proportional spring
8-Control arm
9-Flapper
10-Nozzle
11-Nozzle bracket
12-Alignment micrometer
13-Control setting cam

Fig. 8: Schematic of a proportional Controller.

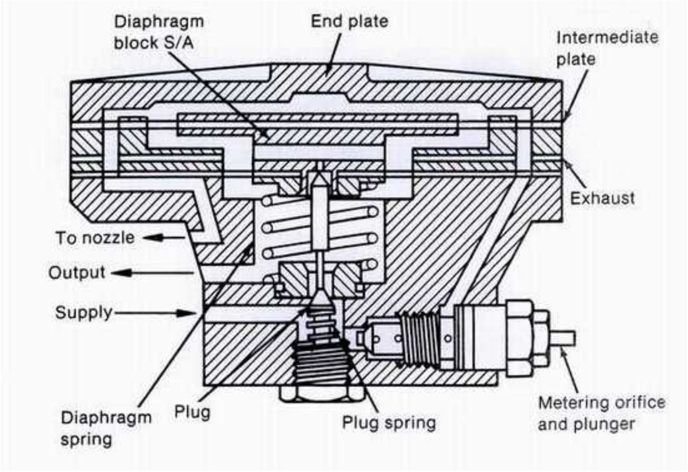


Fig. 9: Relay for Transmitter and Controller.

Although the control of level at a precise point may not be required, the offset resulting from proportional-only controllers may be significant. This is especially true in the case of wide-band level control applications. When desired, proportional-plus-reset control is provided.

With no deviation between process variable, level, and set point, the output of the controller is stable and the pressure in the proportional and reset bellows are equal. When the level moves away from set point, the proportional mechanism acts on the deviation to generate an output an output that changes the pressure in the proportional bellows. The instantaneous pressure in the reset bellows being different from that in the proportional bellows creates a pressure drop across the reset restrictor. This causes a flow of air from one bellows to the other and results in a repositioning of the flapper with respect to the nozzle. The changing flapper-nozzle relationship changes the output. The output will continue to change until the two pressures are equal and the process is returned to set point.

Electronic transmitters can be used with displacer-type instruments. The rotation of the torque tube positions the core of a rotary variable differential transformer (RVDT). The induced voltage is rectified and amplified for a standard 4 to 20 or 10 to 50 milliamp signal. Direct- or reverse-acting signals can be selected from a standard unit. The instrument housing is certified intrinsically safe for Class I, Division I, Group B, C, or D operation.[1]

5. *Application of Displacer-Actuated Level Controllers:*

The various configurations in Figure 10 show the possible arrangements available. Possibly the greatest limitation of displacer application is the stipulation that the displacer length must equal the level span. Displacers usually vary in length from 14 inches to feet or more.

In fractionating tower (distillation column) operation, it is necessary to add heat energy at different levels along the tower to vaporize the distillate from the feed and bottom product. This is normally accomplished by a heat exchanger called a reboiler. A weir in the kettle-type reboilershown in Figure 11 maintains a constant level around the heating tubes. The level controller positions a control valve to maintain the rate of product leaving the vessel in accordance with level changes in the downstream side of the weir.

A duplex level controller-transmitter is used in the crude tower level arrangement shown in Figure12. The control valve is manipulated to regulate the flow of the bottom product of the crude fractionating column in accordance with the level variations in the column. An independent signal is generated and transmitted to a receiver instrument at a central location for level monitoring.

It is sometimes desirable to implement a cascade arrangement to control level. In Figure13, a field-mounted level controller regulates the set point of a flow controller to maintain the level. This cascade system adds stability to the system.

In application where three fluid phases exist, as is common in a gas/ water separator, two level controllers can be used. In Figure14, the lower level controller maintains the interface level of the two liquids and the upper controller controls the level of the lighter liquid.

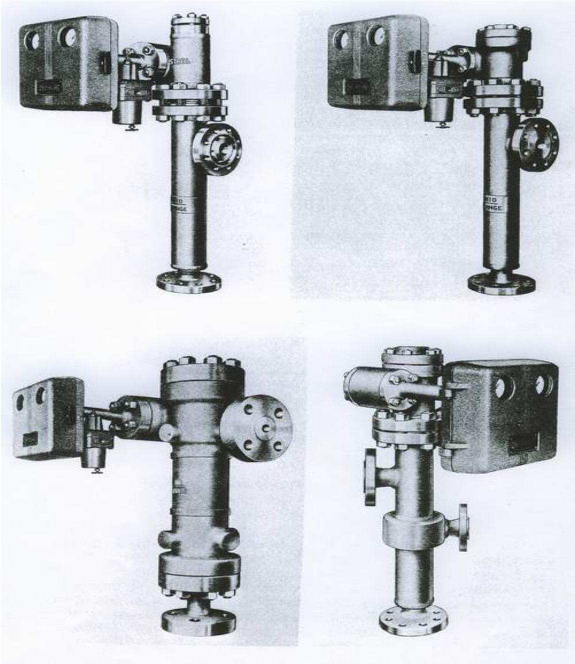


Fig. 10: Flange-Mounted Displacer.

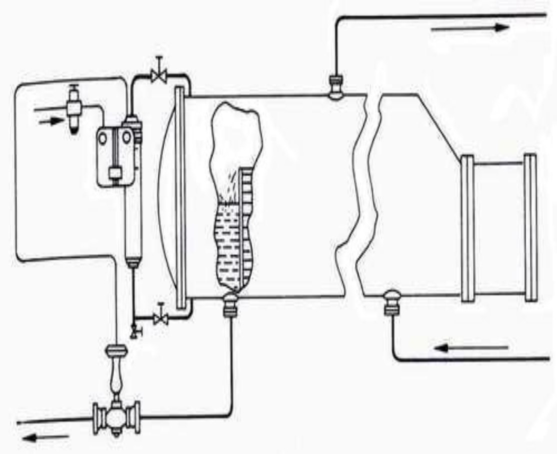


Fig. 11: Control of product level in a reboiler.

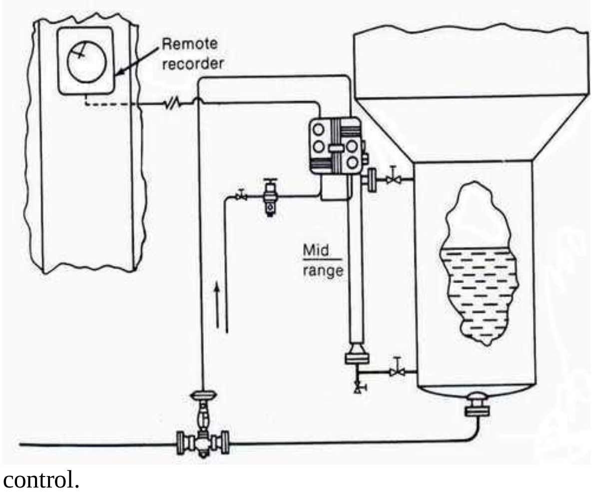


Fig. 12: Crude tower level control.

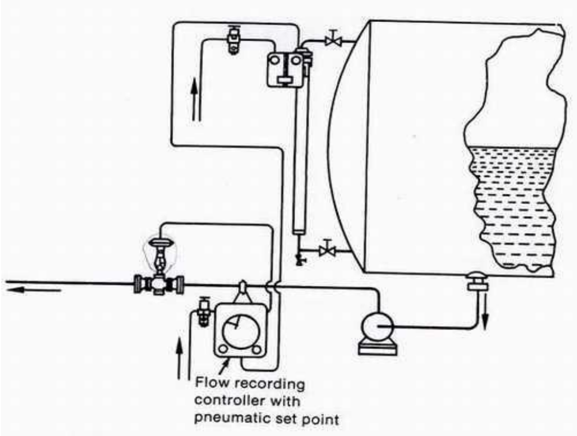


Fig. 13: Flow level casecade control.

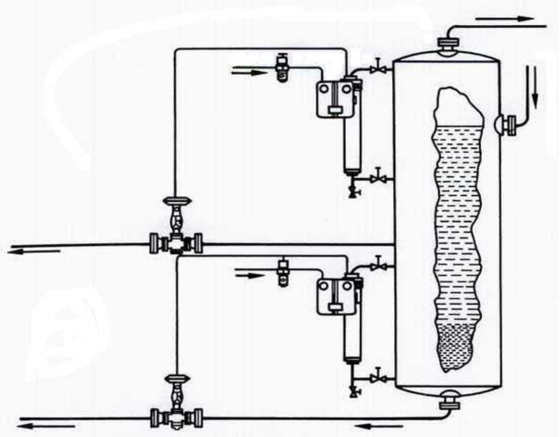


Fig. 14: Dual level control in a Gas-Water Separator.

In applications where the flow from a level process must be maintained constant, a transmitter is used to transmit level changes to a centrally located panel. A flow controller and level receiver instrument is used to permit an operator to adjust the flow rate in accordance with wide variations of level. The transmitted signal from the level transmitter can be used for local indication if desired. This operation is similar to the cascade arrangement of Figure13 except that the operator manipulates the set point of the flow controller. The flow is maintained at a more constant value and the level is allowed to fluctuate. Such a system is shown in Figure15.

Avery common application of a field-mounted displacer-actuated level controller is the level transmission and control of a reflex accumulator on a fractionating column. In Figure16, exchangers are used to maintain the level in an overhead accumulator to produce a reflux supply but no liquid overhead product. The level in the accumulator is controlled by regulating the flow of cooling water to the overhead condenser. In this application, a duplex controller-transmitter is used to provide remote monitoring of the accumulator level.

In large process refrigeration units, it is necessary to measure and control the level of the refrigerant in the evaporator portion or chiller of the refrigeration system. In the chiller chamber shown in Figure17, the displacer chamber is built into the vessel and connected to the vessel by the external piping as shown. The liquid in the displacer is maintained at the same temperatures as the liquid in the vessel. This arrangement prevents false and erratic level measurement, which can result when the measurement is made at externally mounted chambers where flashing of the liquid could occur as the liquid is warmed by the ambient atmospheric temperatures. Hand valve are provided to isolate the chamber from the vessel.

A counter flow deaerating feed water heater is shown in Figure18. In this application, steam enters the vessel at a side port and is directed by baffles to the upper section where it contacts the water entering from the top. The water condenses the steam. The level of the condensed and cooling water is collected in the lower portion of the vessel. The cooling water flow is regulated by a displacer level controller to maintain the level in the lower portion.

In Figure19, the interface level in a setting tank is controlled by a field-mounted displacer level controller. The displacement level controller on the side of the tank measures and controls the interface level. A backpressure regulator on the raffinate discharge line controls the backpressure in the setting tank.[1],[2]

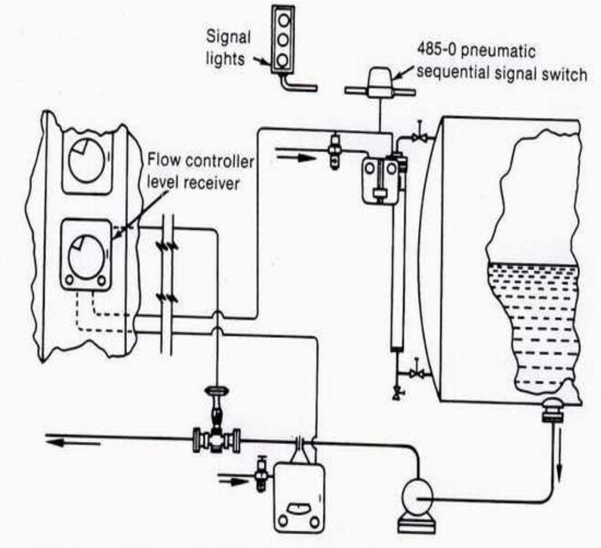


Fig. 15: Level transmission to a remote recorder.

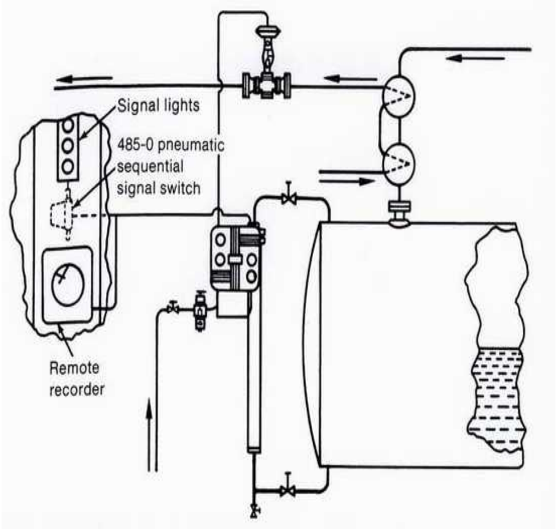


Fig. 16: Transmission and control of level in a reflex accumulator.

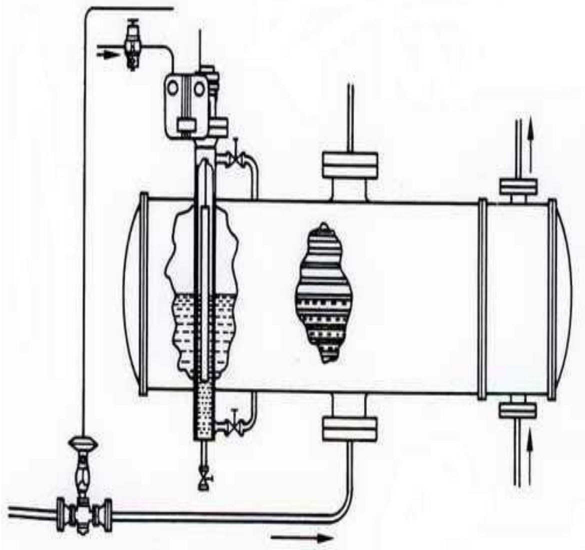


Fig. 17: Refrigerant Control in a Chiller.

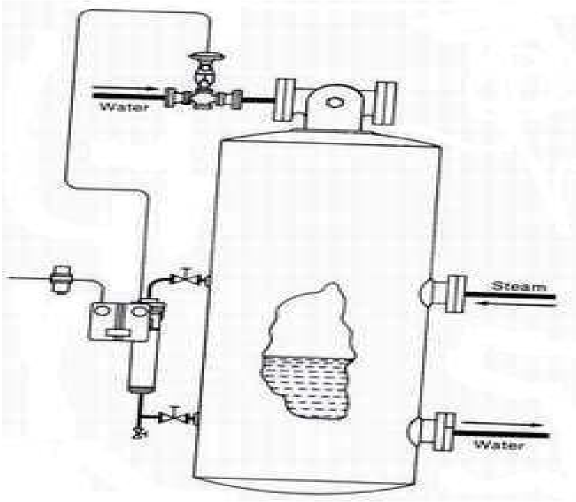


Fig. 18: Level Control in a Counterflow Feed Water Heater.

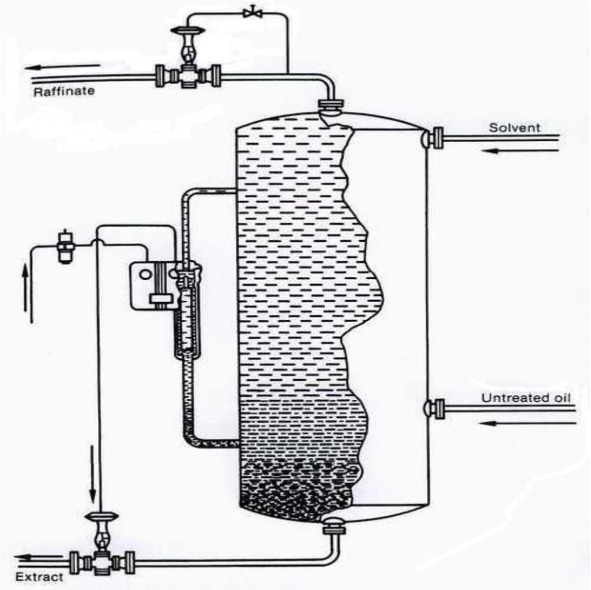


Fig. 19: Control of interface Level in Setting Tank.

6. *Control Methods:*

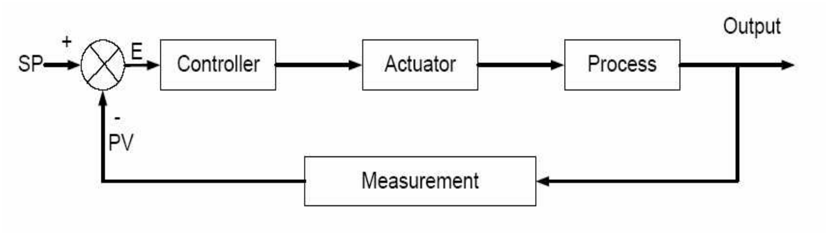
The six methods of control :

1. Feedback Control System
2. Ratio Control System
3. Cascade Control System
4. Feed forward Control System
5. Override Control System
6. Batch Control System

The base of the above methods is control annular. In all methods usually there is a feedback method that it is useful for stability of system.the mean of control in this paper is a PID controller that it has special configuration for own control parameters as for process conversion function, also sometimes maybe PI or P controller has used instead of PID.we explain the methods that more applicable in liquid surface controlling.

Feedback Control System:

We know in feedback control at the first must have a difference between SP (set point) and PV (process value) or an error then the control changes its output to improve and fix the error by one of the functions as for one of the PID modes, after the it confirm the situation of Final element or Actuator to improve the process (Figure 20).[3]



Error signal : E=SP-PV

Fig. 20: Block diagram of one feedback loop control.

In liquid surface controlling in a tank, as for the selected PID controller after change deal of the error signal, the output of the controller and follow it the deal of the valve control will change. This changes show its affect in correct liquid surface to improve it.

In case that needs to discern error before it done and correct it we use Feed forward controller. In control systems as for using that and mean of that we use one or admixtion ofsevaral control loop (with difference methods).

Tree Element Control System:

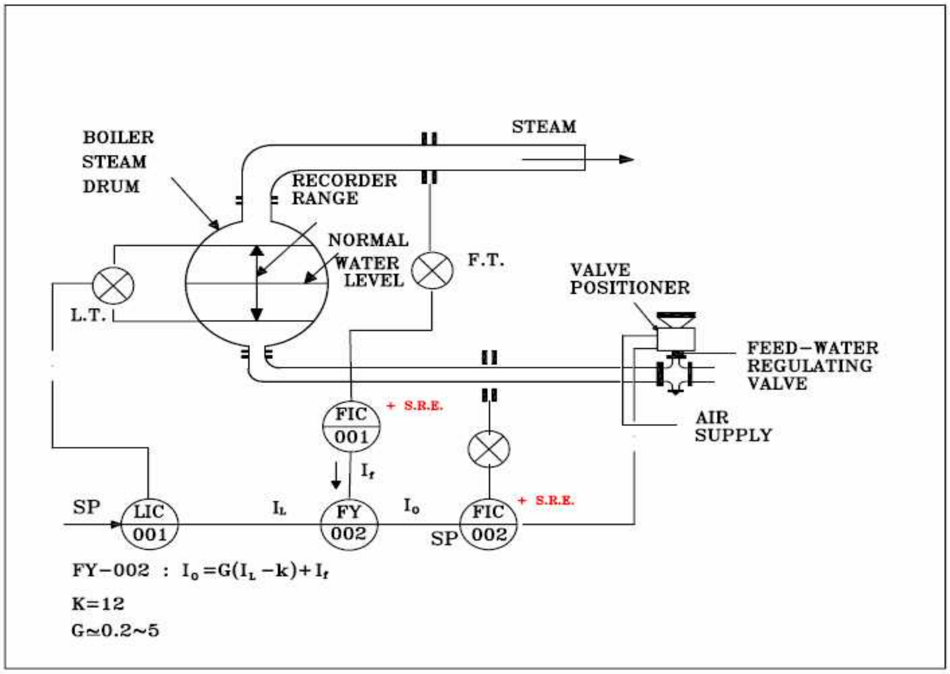
The another method for liquid surface controlling special in Steam Drum of boiler is Three Element control system (Figure 21).

At the firstsingle,two- Element control systemhave used but ache of them had deficiency, and now after improvement of methods, we use three method.

In this method for measuring the liquid outlet and put a feedback control system on it, cause to decrease deficiency and a high safety factor for the system.

In stead to act the out let of adder FY directing on POSITIONER value, use it as set point (SP) of liquid inlet controller (cascade control).

Tree methodis a complex of 4 methodsRatio, Feedback/Feed Forward/Cascade, that ache of them is cover the deficiency of other methods.



SRE= Square Root Extractor

Fig. 21: Tree Element control system

The first and the more infraction is for Feed Forward, in minimum changes of steam outlet in orders to controller to set the liquid inlet in boiler and config it.If an error appear in beneficiary action and control, the feedback controller that there is on the surface of tank liquid. Adjust stand deletes the final error. Cascade method with its with its LIC outlet controller can be one of the FIC configurator operation, and at the last the outlet steam that has measured from boiler use as the another FIC operation, it is as Ratio.[3]

7. *Application of Mems Technology:*

Todey, MEMS technology is used in many sensors,and since this technology can be used in displacer level transmitter, in this section expressed the describe overall about MEMS.

Sensors and actuators are the critical system components that collect and act on information in the analog environment and link it to the world of digital electronics. The functional groups of sensors, software, controller hardware, and actuators from the backbone of present and future automotive systems. Unit volumes for sensors and actuators in the automotive industry are measured in millions per year and at a unit cost of a few dollars. The design of sensors and actuators has increasingly made use of microelectromechanical systems (MEMS) technology. This technology is well suited to producing a class of micromachined sensors and actuators that combines signal processing and communications on a single silicon chip or contained within the same package.

MEMS systems will have applications in a variety of areas, including:

1-Remote environmental monitoring and control. This can range from sampling, analyzing, and reporting to doing on-site control. The applications could range from building environmental control to dispensing nutrients to plants.

2-Dispensing known amounts of materials in difficult-to-reach places on an as- needed basis. This could be applicable in robotic systems.

3-Automotive applications will include intelligent vehicle highway systems and navigation applications.

MEMS manufacturing of automotive sensors began in 1981 with pressure sensors for engine control, continued in the early 1990s with accelerometers to detect crash events for air bag safety systems and in recent years has further developed with angular-rate inertial sensors for vehicle-stability chassis systems. What makes MEMS important is that it utilizes the economy of batch processing, together with miniaturization and integration of on-chip electronic intelligence. Simply stated, MEMS makes high-performance sensors available for automotive applications, at the same cost as the traditional types of limited-function sensors they replace. In other words, to provide performance equal to today’s MEMS sensors, but without the benefits of MEMS technology, sensors would have to be several times more expensive if they were still made by traditional electromechanical/discrete electronics approaches.

Angular and Linear Position Sensors:

Position sensors measure linear displacements ranging from lessthanonemicron(atypicalfull-scalesensing-elementmove- ment inside a MEMS sensor) to over 200 mm (the stroke/travel of a strut in an active suspension system). This is a 200 000:1 variation in full-scale displacement range. An example of an an- gular-position application is the measurement over four com- plete revolutions, with a 1-degree measurement accuracy re- quirement, of steering-wheel angular position. Position sensors have the third greatest unit sales and the third highest gross salesrevenue, which makes them number three in the present catego- rization scheme.

1) Potentiometric: Potentiometric sensors utilize the prop- erty that the resistance of an appropriately made film, or screen- printed track, varieslinearly with length. The wiper(s) can be ei- ther linearly or angularly displaced by the part whose position is to measured. The use of multiple, redundant, wipers and tracks provides improved sensor reliability

2) Hall Effect: In an appropriate magnetic circuit, Hall sensor voltage varies as ; where is the angle between flux density acting on the sensor and bias current applied to the sensor. Typically, two Hall sensing elements are mounted in quadrature (geometrically oriented 90 from each other). The two Hall elements each provide output signals; one varying as “ ,” and the other as “ 2 ”. The output signal is derived from the inverse tangent of “ ,” the ratio of the quadrature element signals. This provides a linear indication of the angular position of the magnet creating field (attached to the shaft), thereby determining the angular position of the shaft. Hall sensors are also used for linear position measurements, where magnet “head-on” and “slide-by” movements detect linear position.

3) AMR Anisotropic Magnetoresistive: This sensor was previously described in part 5 of Section A. The sensor exhibits changes of resistance as an external magnetic field rotates with respect to its sensing-elements. Two sets of four sensing elements are typically used, each set is physically mounted (mechanically) offset from each other by a 45 angle. This 45 offset again produces a quadrature 90 electrical phase angle difference. The two sets of sensing elements are connected in Wheatstone bridge signal-detection IC circuits. Both bridge circuits respond to the orientation of the external magnetic field (not its field strength). In a manner akin to the Hall sensor, output signals from the two AMR-sensor bridge circuits are obtained; but in this case, the signals vary as, “ 2 ” and “ 2”. From these signals, the inverse tangent of their ratio similarly produces a linear measure of the

angular position, “2”, of a magnet (attached to a shaft). Here, the electrical angle goes through two cycles, as angular position of the shaft/magnet traverses one 360-degree revolution.

4) Optical Encoder: For a steering-wheel angle sensor application, a slotted-aperture optical-encoder sensor is combined with a gear-reduction-driven potentiometric sensor. The potentiometric sensor provides a continuous measurement of steering-wheel angle over a four-turn lock-to-lock turn range, but with less accuracy than the optical encoder. The encoder, with two offset bands of 90 aperture slots each, is accurate to within 1-degree accuracy, but it can’t determine the absolute position of the steering wheel. Whenever the vehicle starts up, the sensor’s encoder “learns” the true center (or zero) absolute position of the steering wheel by starting with the position indicated by the potentiometer and then refining the calibration based on a period of straight-road driving (as detected by vehicle yaw angular-rate sensors like those described below).

5) Magnetostrictive Pulse Transit Time: Magnetostrictive- pulse transit-time sensors are used to make long, 200-mm, linear-position measurements. A donut-shaped magnet is attached to and travels with, a displacement-varying element of a suspension strut. A fixed metal rod, concentric to the center axis of a strut, serves as both a magnetostrictive medium and as an acoustic waveguide. A current pulse is applied through the entire length of the rod. When the pulse passes the magnet (attached to the strut), an acoustic pulse is created in the rod due to the interaction of the magnet’s field with the applied current in the magnetostrictive rod (i.e., the direct magnetostrictive effect). An acoustic wave is launched back up the rod. When the wave reaches the top end of the rod, the magnetic permeability of the rod material is modulated by the interaction of the acoustic wave with an applied field of a bias magnet (the inverse magnetostrictive effect). This permeability change creates a voltage pulse in the sense coil circuit and the measured transit time between initiation of the current pulse and the detection of the return-wave voltage pulse, determines the magnet position (the displacement of the suspension strut).

Automotive Applications: Because of their mature state of development and low cost;potentiometric sensors are exten- sively used to measure fuel-float level, accelerator pedal angle, and transmission gear position. Due to the harsh environment of the engine and the high number of lifetime dither cycles, noncontact Hall sensors are used to measure throttle angle, EGR valve position, and wheel-to-chassis height (via a 2-bar, linear-to-rotary displacement linkage). AMR position sensors are used in the same applications as for potentiometric and Hall sensors, however, these are sensors of choice when larger air gaps and/or higher-limit maximum operating temperatures must be accommodated. Hall sensors are also used in seat belt buckles for high-reliability detection of proper buckle engage- ment, proper linear positions of latch and tongue parts inside the buckle. Because optical sensors can be susceptible to contamination by dirt/oil, they are used in applications that provide environmentally protected mounting locations. A good example is the optical-encoder steering-wheel angle sensor used in vehicle stability enhancement systems, which is mounted on the steering column, near the IP (instrument panel). In active suspension systems, the stroke/position of a strut is accurately measured over an extended-length using magnetostrictive-pulse transit-time sensors.[4]

8. *Particular of Neural Network:*

As respect for training and deleting and decreasing output errors, we need feedback in design network, and because of ideal results feeds to network and it makes the objective vector, so we have to use a way for decreasing errors. So the best network for us is Feed Forward Network that it use with B.P algorithm for error correct learning law.

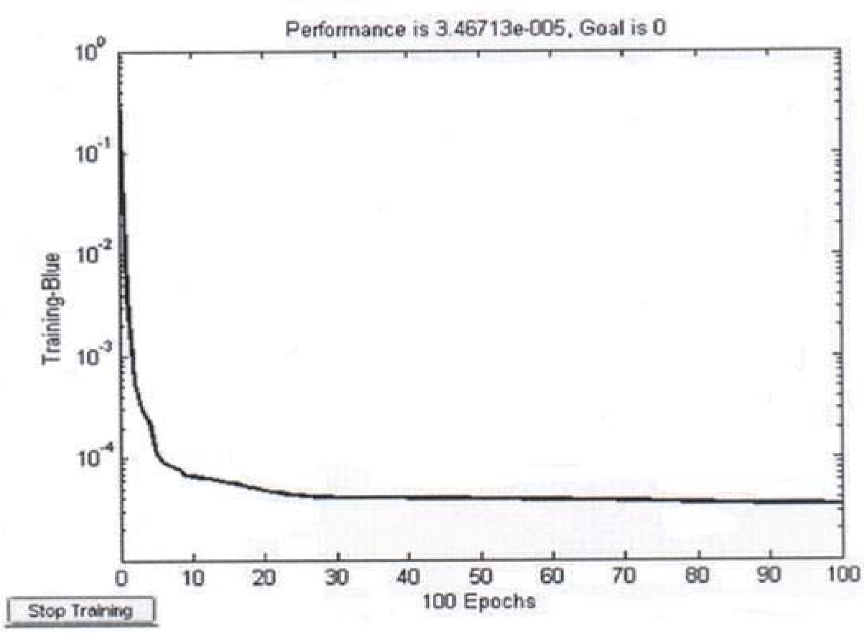
In going path of this algorithm we assume that the parameters of the network are constant, and in the return path this this parameters are adjust with error correcting law. We do this work until that in the output layer of network, the signal of network error appear acceptable for operator. Error vector is the difference between desirable response and real response.[5]

9. *Straucture of offer Neural Network:*

Designed neural network is Feed Forward with Back Propagation algorithm and it has 3 layers. We designed in first layer, 1 neuron (as input) and in second layer 5 neurons (that is response desirable) and in third layer 1 neuron (as number of output parameters).

Function of first layer is Tan sigmoid and second layer is Log sigmoid and third layer is Linear (Purelin). Input and output layers are effect with number of and number range of input and output.

10. *Traning and Error:*



11. ***Result:***

We can simulate displacer level transmitter with using Feed Forward Network and low error.

REFERENCES

Donald R. Gillum, 1984. "Indastrial level measurement", Instrument Society of America.
Installation of Refinery Instruments and Control Systems, APIPR 5504. Honeywell Training Manual.
Peter Harriott, " Process Control"
William J. Fleming, 2001. "Overview of Automotive Sensors" IEEE Sensors Journal, 1(4).
Hagan, M.T., H.B. Demuth, M.H. Beale, 1966. "Neural network design"