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Development of PLC based Transdermal patch evaluation system

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Abstract - *The paper describes the basic adhesion which signify combination of all interfacial intermolecular interactions where "practical adhesion "present forces & work need to be disrupted of interfacial region to adhere the system .there are many factors which influence practical adhesion and basic adhesion is discussed. Basically thickness of adhesion cannot be determined by common techniques for that ideal practical adhesion test is outlined. Some of the adhesion measurement techniques thin films, thick films, and coasting are discussed briefly, and references are made to the recent reviews on this topic.*

For the adherence all techniques are different while measuring the adhesion. While measuring the adhesion involved difficulties are highlighted, and the unresolved problems are brought into sharper focus. Examination of failure surfaces carried out using analytical tools to ascertain the locus at failure is important to understand mechanism.

***Key Words*: programmable logic control, adhesion, force, motor, load cell, peel, substrate, speed, transdermal drug delivery.**

1. Introduction

This system describes patch is peeled away from the substrate peeling of patch test is mechanical test that has been used to determine adhesion strength. In an evaluation system patch that is bonded to substrate by adhesive layer is pulled apart at same angle to the underlying substrate the force needed to separate the adhered from the substrate. The peeling force is basically an adhesion strength used for joint design purposes, recently the peel force test also used by pharmaceutical industries to identify strength of adhesion of tds patch over the substrate & many studies have been carried out to clarify & define the mechanism of adhesion between the two dissimilar materials. This procedure is repeated for five samples if the peeling force is out of range product fails the test determine during development of product & or statistical assessment of multiple product batch over the product shell life. on the system we apply the force on tds patch which is adhered to steel surface & it is pulled by mechanical assembly of servomotor this force is measured by strain gauge, the transducer which convert mechanical force into electrical signal plc based system will perform the operation by the ladder programming &will display the status on human interface panel.

2. Objective

Test method signifies permanence of adhesives & peel ability of self–adhesive patches .so, this instrument checks the adhesion strength of patches. In earlier days the adhesion strength of patches is done manually due to which quality of patches are reduced. Sometimes parameters of patches changes due to manual testing. So, to improve quality of patches our system develop innovative idea

1. This system improve quality Of transdermal patch
2. To achieve speed , force , angel by this system

3. Literature review

In earlier days quality of patches is determined by manual testing. Due to manual testing parameters of patches are vary and degradation of quality of patches. So, we introduced these "development of programmable logic control based transdermal patch evaluation system" to maintain quality of patches. This system performs 180°& 90° test for checking quality of patches.

4. Design Methodology

It includes requirement for the testing the samples , block diagram and Utilization. Adhesion test acceptance range of product is specific and should be defined generally that adhesion of each patch is assure of transdermal drug delivery system is within the range specified by the product design and is consistent between batches on the product development specifications or statistical assessment of multiple product batches over the product's shelf life.

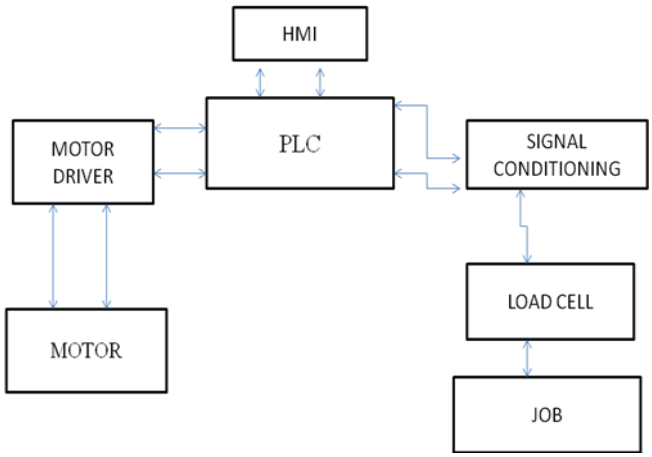
4.1 Facilities required

Test equipment**:** A tensile tester , capable of peeling a laminate through an angle of 180 degree with a separate jaw rate of 300mm per minute with an accuracy of 2%Test plates made of float glass or similar plate glass, standard test roller.

Test pieces**:** These should be strips taken from a individual sample of material. The strips should be 25mm wide and have a minimum length of 175mm in the machine direction. The cuts should be clean and straight. At least three strips should be taken from each material

sample. Test conditions temperature 23°C_2°C, 50%RH_5%RH. The test sample or least strips should be conditioned for not less than 4 hours before testing.

4.2 Block Diagram



4.3 Utilization

1) PLC-

- High speed CPU module with greater expansions
- Eight input eight outputs
- Circuit breakers
- Flexi logic is compact plc
- Two serial ports
- One Ethernet port
- RISC processor is of 32 bit
- Easy ladder programming

2) HMI

- Digital input &output integrated
- Rated 24v DC
- Input connected to plc
- High speed Counter & timer
- IP65 design
- Feature with Alarms
- Ladder logic operated
- Future with PWM functionalities

5. Hardware section

5.1 PLC (programmable logic control)

Fig1.PLC module with HMI expansion

Also referred to as Programmable controllers they are in computer family. Used in commercial and industrial applications. A PLC accept the Inputs from HMI, makes decisions by the ladder programming , and controls Outputs.

5.2 HMI (human machine interface)

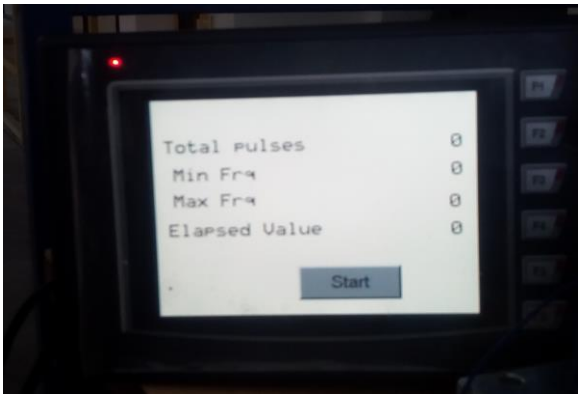


Fig 2.touch screen

The Human/Machine Interface is multi-function descriptor is “versatility”.
The HMI has three modes of operation: Programmable Display, Thumbwheel Emulation and Register. Modes can be switched on-the-fly. Also have six programmable function keys, 64 registers that store numerical, and 4kbytes of user storage. The HMI can be programmed by using the included Graphic User Interface: The HMI Screen Builder, or by using escape codes.

5.3 Sensor

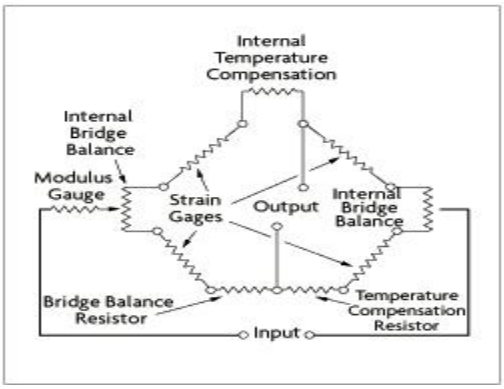


Fig 3. S-type load cell

A load cell is a sensor that converts force pressure into electronic signal. This signal may be a voltage change, current change or frequency change that depends on the type of load cell and circuit used. Load cells use the principle of change of resistance in response to an applied load. This is termed piezo-resistive.

5.4 Motor

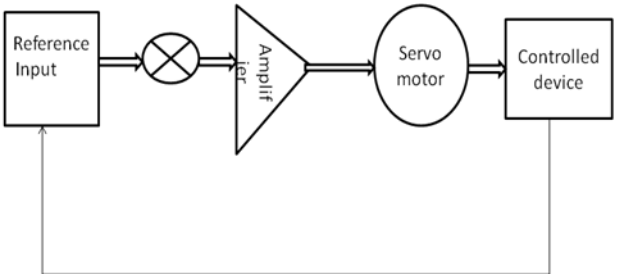
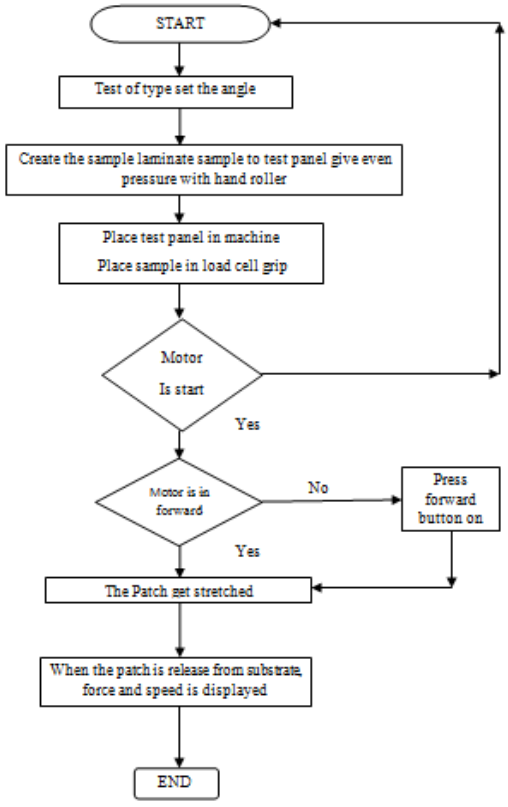


Fig 4.DC servo motor

The servo motor is assembly: a normal DC motor, a gear reduction unit, a position-sensing device, and a control circuit. Servo motor functions are to receive a control signal that perform a desired output position of the shaft, and apply power to motor until its shaft turns to that position. It uses encoder at the feedback that senses the position of the shaft; the servo has a 3 wire connection: power, ground, and control. And has continuous power source; the servo has its own drive electronics that draw current from the power lead to drive the motor.

6. Software Section

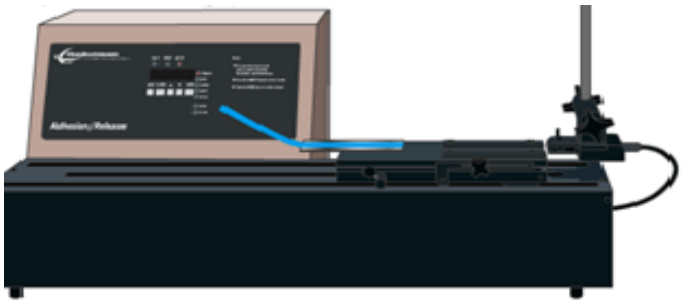
6.1 Flow Chart



7. Experimental set up

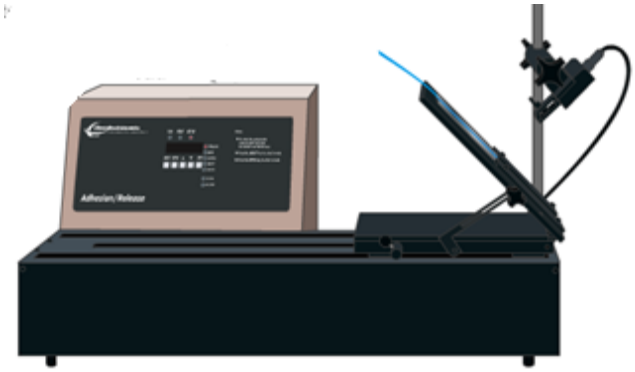
7.1 180° test

This is a quality control checking instrument for 180° test Prepare the sample for test patch is cut using the specimen cutter and the patch is adhered on test panel with help of hand roller with even pressure Patch is adhered to the test panel and test panel is place on the slide bar and fixed with the jaw one end of the tds patch is grip to the fixtures and command is processed to motor through HMI with extension of PLC and patch is peel away and force and speed displayed. When command is processed slide bar slide in reverse horizontal position



7.2 90° test

This is a quality control checking instrument for 90° test Prepare the sample for test. Patch is cut using the specimen cutter and the patch is adhered on test panel with help of hand roller with even pressure Patch is adhered on the test panel here fixture is adjusted according to 90° angle by moving the jaw upward And by fixing it slide bar plate is tilted 90° position test panel is place on the slide bar and fixed with the jaw one end of the tds patch is grip to the fixtures and command is processed to motor through HMI with extension of PLC and patch is peel away and force and speed displayed. When command is processed slide bar slide in reverse horizontal position



8. Conclusion

By the evaluation of the system we can monitor the adhesion of patches and improve the quality of patches by performing various test 180° and 90° test according to American standard. and check the force applied on the patch i.e. when the patch is peeled away from the substrate force recorded and displayed on the HMI panel similarly the HMI will display the ten sample interval peak reading.

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