RESEARCH ARTICLE OPEN ACCESS

Flux Linkage Non Destructive Testing By Electromagnetic Waves

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ABSTRACT
Recent years the conductor, insulator and semiconductor are prepared by melting the raw materials in manufacturing industries and it will filling the moulder .In moulder raw materials made to condense during the condensing process the material get definite shape. At the time the voids are created due to the air – bubbles. The voids are not inspected by naked eyes. If we use the void material, the material quality is affected. The voids are inspected by electromagnetic wave. The shape, size and location of voids are identified. Depending upon void the material is under goes reconstruction process**.**

Keywords - conductor, Electromagnet, steel material, Non destructive testing , Electromagnetic wave

I. INTRODUCTION

Every product is made in industries by melting the raw materials .During the melting process the raw materials is came to lava state.
Heavy temperature is applied due to that pressure is increased inside the melted raw material. After melting the raw material, the lava state melted material is filled inside the moulder. The moulder is consist of condenser. The condenser is used to cool the hot raw material. Duringthecondensation process the temperature is reduced and proportionally the pressure is also reduced .Due to that variations in pressure the air bubbles is created inside the material .The air bubbles is the main reason for void production inside the material. The void not directly identified.so if we use the void material the tensile strength of the material is reduced and the material is chance to broke downed

II. STRONG ELECTROMAGNET

Electromagnet is device. That consist of an strong iron core .The insulator is placed over the iron core. Then the copper winding is wound over the iron Core.

When the supply is given (50 hz 230 v ac supply)Due to the Faraday Effect the core get magnetized .Due to the ac supply. The alternating magnetic field is produced, per sec the core gets alternatively 50 times north pole and south pole is produced. The magnetic field intensity is controlled by controlling the ac supply. The electro magnet is demagnetized by cut down the supply

Fig.1 Strong Electromagnet

III. ANALYSIS OF VOID DETETION

Composite materials are made from two or more constituent materials with extensively different physical or chemical properties, that when combined, produce a material with characteristics different from the individual components. Glass Fibre Reinforced Plastics (GFRP) is a key area in the composites industry. It is a lightweight, exceptionally strong, and robust material. Though the strength of GFRP is lesser than carbon fibre and less firm, it is typically less brittle and raw materials are cheaper. Its bulk strength and weight properties are also very favourable when compared to metals. The non-destructive evaluation (NDE) techniques used for conventional materials cannot be extended for composites since these materials have properties which are unique to them. The multi-layered structure of the composites results in higher attenuation and scattering requiring the use of alternative testing methods. Microwave NDE techniques are well suited for testing these structures since these signals can penetrate dielectric materials, such as glass-reinforced polymer skins, foam, and honeycomb, without suffering from considerable attenuation of the signal magneto inductive waveguide loaded patch antenna sensor for defect detection in GFRPs. Previous literature has employed planar coupled spirals, imaging or brilliant sensing for defect detection in CFRPs [3]–[5] and MIW sensors for conductivity measurement [6]. This letter proposes a planar sensor for detecting defects in GFRPs. In this letter the micro strip patch is used for the first time to detect voids in FRPs. Section 2 gives the detailed sensor design and describes the sensitivity of the sensor to the presence of air voids. Section 3 concludes with the future scope of work. A necessity of accurate EM assessment for the chip design sign-off step is responsible for a renewed interests in the physics based modelling the EM-induced failures. The techneology development has met recently an enormous difficulties trying to secure a proper chip EM resilience by optimizing the involved processes solely. This EM-induced burden should be shared between materials, process, and design developments. Governed by a technology scaling a continuous reduction of the metal feature sizes accompanying by increase of the current densities, results in an increasingly difficult EM signoff when the traditional EM checking approaches are employed. Widely predicted decrease in EM lifetime due to transition to advanced technological nodes is responsible for the “performance-reliability” paradigm: high chip performance must be accompanied inevitable by a poor reliability and vice versa, a very reliable chip cannot demonstrate the top performance. This pessimistic conclusion is based on the currently employed assessments, which consider an EM-induced failure rate of the individual interconnect segment as a measure of the chip-scale EM induced reliability. In the extreme end, a median time-to-failure (MTTF) of the weakest segment is accepted as a measure for the chip lifetime. It results in very conservative EM-aware current density design rules for the leading-edge technology nodes. A very different way to EM assessment can be proposed if we take a look at the interconnect reliability from the position of chip functionality, where the failure of interconnect just means its inability to function properly, [1]–[3]. The two most important functions of the chip interconnect, which can be affected by EM, are: providing a connectivity between different parts of design for a proper signal propagating, and delivering everywhere a needed amount of voltage. While the EM-induced degrading the resistance of individual segments of interconnect circuits can affect both these functions, the role of EM is quite different in these two cases of degradation of the power supply chain and the signal circuits. The difference is in the types of electrical currents employed in these two cases. Indeed, the majority of signal lines carrying bidirectional pulsed currents are characterized by very long times to the EM-induced failure. It is caused by a repetitive increase and decrease of the mechanical stress at the segment ends, caused by the atom accumulation and depletion due to interaction with the electron flow through a momentum exchange with the conduction electrons, [4], [5]. In contrast, power lines carrying unidirectional currents can fail in much shorter times due to continued stress build up under EM action. Thus, we can conclude that in the majority of cases the EM induced chip failure is happening when interconnect cannot deliver needed voltage (VDD/VSS) to any gate of the circuitry. It means that loss of performance, which is a parametric failure, should be considered as the practical criterion of EM-induced failure rather than a catastrophic electrical breakdown or short. It is clear that a structure of the power grid, which is characterized by a high level of redundancy, can affect the kinetics of failure development. Indeed, due to a redundancy the failure of a number of interconnects segments do not necessarily result in the unacceptable voltage drop in the grid, [3]. Thus, more accurate and less pessimistic full-chip EM assessment and MTTF prediction will require a development of new methodology dealing with the grid structure and taking re- dundancy into account. Discussed EM assessment assumes a prior knowledge of current densities and temperatures in each segment across the interconnect.

3.1. Design Technique

It is a today’s common understanding that the kinetics of the EM-induced failure can be controlled by either a void nucleation mode or a void growth mode or by a mix of these two modes, see for example [11], [16]–[20]. A physical meaning of the void-induced failure is an above-threshold increase of the resistance of an individual line measured at the test conditions characterized by well controlled current densities and temperatures. It is clear that only the void growth mode can be responsible for the line resistance degradation. Indeed, continuous reduction of the metal line cross section area at the location of the growing void, which in the extreme case forces the current to flow through the highly resistive metal liners/diffusion barriers when void cuts the entire metal cross section, is accompanied by line resistance increase. A void nucleation, which represents a transformation of the process induced flaws located at the metal/passivation interface into the stable growing void that happens when a level of the EM-induced hydrostatic tensile stress reaches the critical stress, [19], [21], [22], cannot introduce any noticeable changes in line resistance. Hence, kinetics of the EM-induced degradation of the line resistance should be characterized by the presence of an initial incubation time, needed for void nucleation, followed by the resistance increase caused by the void growth. Exactly this type of kinetics is observed in ex- periments, [23]. Increase of the resistance above some critical value, say 10% of the initial line resistance, is considered as an EM-induced failure. Quite different criterion for the EM-induced failure, as we have mentioned above, is accepted in the case of an on-chip interconnect. An accurate model describing the kinetics of EM-induced degradation of the resistance of elemental EM units, which in this case is the interconnect tree, should be available. Standard industrial practice employed for estimating the em induction.

IV. DESIGN OF VOID DETECTION BY USING ELECTROMGNET

4.1 Electromagnetic Scanning Sensor

Electromagnetic scanning sensor consists of primary and secondary coil separated by insulator.
Each coil has 500 turns.One coil is energized by 12 v ac supply.Secondary coil is energized by two electromagnet .The two electromagnet has different magnetizing strength .which energize the scanning coilDepending upon the void shape and size the resultant flux cut down scanning coil which activate the transistor and relay combination. The dot potter draws the accurate void shape

4.2 ARDUINO

Arduino is the new programming device .It is cheap. Arduino is easy to program. It is programmed by simple assembly language. Is to control the moment of electromagnetic sensor. Arduino is used to control the moment of servo motor in XY direction

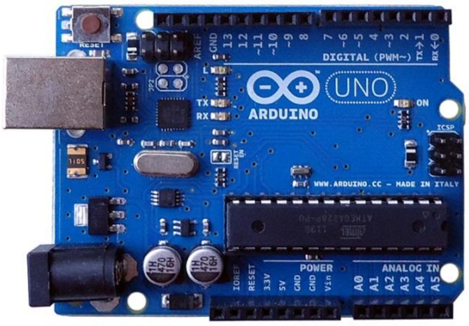

Fig.3 ARDUINO

4.3 Electro Magnetic XY Dot Plotter

According to the void the electromagnetic xy dot plotter .marks the void shape in a paper. The magnetic x y dot plotter moves in both xy directions. From the accurate void shape is identified.

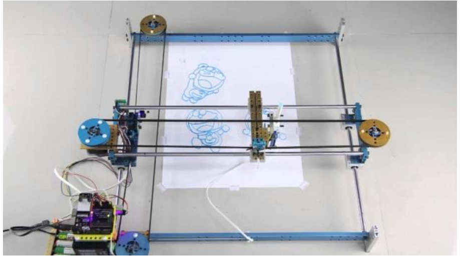

Fig. 1.3 Electro Magnetic XY Dot Plotter

4.4Block Diagram Description

Applying 230 v ac supply to the electromagnet. The electromagnetic waves penetrate through the specimen.in top of the specimen the consist of scanning coil and 12v ac electro magnet .this two electro magnet are used to align the magnetic fields in straight in good area specimen the magnetic field intensity is reduced .but in void are the magnetic field intensity is increased .then two flux interact and the resultant flux cause the voltage in the scanning winding. Then it is rectified and Activates the transistor and relay combination. After that magnetic dot plotter marks dot in void area. arduino control the moment of xy plotter and xy scanner.

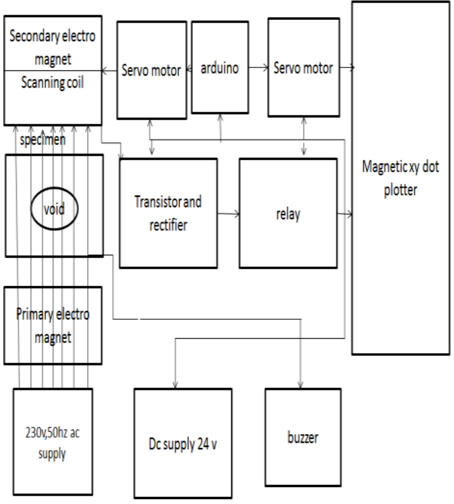

Fig. 1.4 Block Diagram of VOID Detection by Electromagnetic Waves

V. CONCLUSION

From this electromagnetic void detection .any type of material is scanned and accurate void shape is identified. And the material is under go reconstruction process .from this method the lifetime and durability. And quality of the product is improved.

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