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# Novel Design of Breather by Using Heating Coil & Filter Disc with Implementation of Humidity Sensor & Protective Relay Circuit

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**ABSTRACT:** Above the transformer main tank there is one cylindrical drum called CONSERVATOR in that conservator there is small opening from that opening one bent pipe is attached. And at the end of that bent pipe one small cylindrical material is present that material is called BREATHER. BREATHER is basically a cylindrical vessel in which silica gel (Best adsorbent) is present through which non-moist air flow occurs in the transformer. In our proposed system we are using instead of silica gel we are using heating coil to remove the moisture content from air. We are also implementing one filter disc to remove dust particle from air, in this novel system we use humidity sensor at the outlet pipe of breather that sensor output is connected to 8051 microcontroller which will command to relay circuit to trip the transformer if humidity level exceed as well as on protective electromagnetic valve to close inlet pipe of breather.

**KEYWORDS:** NMOS N-type metal-oxide-semiconductor.

### I. INTRODUCTION

BREATHER is basically a cylindrical vessel in which silica gel (Best adsorbent) is present through which non-moist air flow occurs in the transformer. As we know that during the loading or over loading period the transformer heats continuously due to which oil expands and due to this expansion the air flow out of the conservator tank through breather. While during the light load period the oil gets cooled due to which oil contracts (i.e. comes down) during this period the air from the atmosphere comes inside the conservator tank. As we know that atmospheric air contains some moisture so if this moisture comes in contact with the transformer oil it will deteriorate it continuously and thus its insulation property becomes worse. Here comes the BREATHER to help the transformer which absorbs the moisture with the help of silica gel from the atmospheric air and then lets it go inside the transformer and thus helps to maintain the health of the transformer. In our novel design we are using instead of silica gel we are using heating coil to dry air & remove the moisture content from air. We are also implementing one filter disc to remove dust particles from air, in this novel system we use humidity sensor at the outlet pipe of breather that sensor output is connected to 8051 microcontroller which will command to relay circuit to trip the transformer if humidity level exceeds as well as on protective electromagnetic valve to close inlet pipe of breather.

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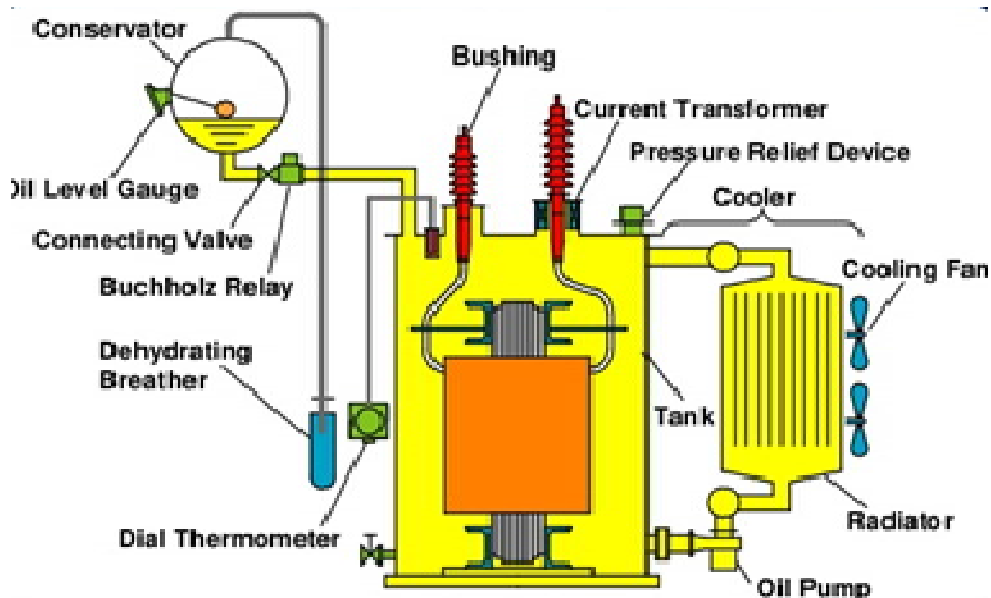


Fig.1 Location of breather in transformer

Silica Gel consisting conventional Breather of Transformer is Whenever electrical power transformer is loaded, the temperature of the transformer insulating oil rises to high Value, which affects the volume of the oil is increased. As the volume of the oil is rises, the air above the oil level in conservator rises & air transfer through breather. Again at low oil temperature; the volume of the oil is decreased or shrink, which affect the volume of the oil to be decreased which again causes air to enter into conservator tank from external atmosphere. The external atmospheric air always consists of more or less amount of moisture in it and this moisture can be merge up with oil if it is allowed to enter into the transformer. The air moisture should be avoid during entering of the air into the transformer, because moisture is very harmful & hazardous for transformer insulation. A silica gel breather is the most ordinary element used way of filtering air from moisture. Silica gel breather for transformer is connected with conservator tank through breathing pipe.

### Construction of Silica Gel Breather

The silica gel breather of transformer is very easy to build in the aspect of design. It is nothing but a pot of silica gel through which, air passes during breathing operation of transformer. The silica gel is a very effective & better absorber of moisture. Freshly regenerated gel is very efficient as compared to gel which in used, it may dry down air to a dew point of below  $-40^{\circ}\text{C}$ . A well maintained silica gel breather will generally operate with a dew point of  $-35^{\circ}\text{C}$  as long as a large enough quantity of gel has been used.

Silica gel crystal has highly effective of absorbing moisture. When air passes through these crystals in the breather; the moisture of the air is absorbed by crystal. Therefore, the air reaches to the conservator is free from moisture, the dust particles in the air get trapped by the oil in the oil seal cup in breather. The oil present in oil sealing cup behave as barrier between silica gel crystal and air when there is no flow of air through silica gel breather. The color of silica gel crystal is dark blue but, when it absorbs moisture; it transform pink.

When there is ample amount of difference between the air inside the conservator and the outside air, the oil level in two components of the oil seal changes until the lower oil level just reaches the rim of the inverted cup, the air then traversal from high pressure compartment to the low pressure compartment of the oil seal.

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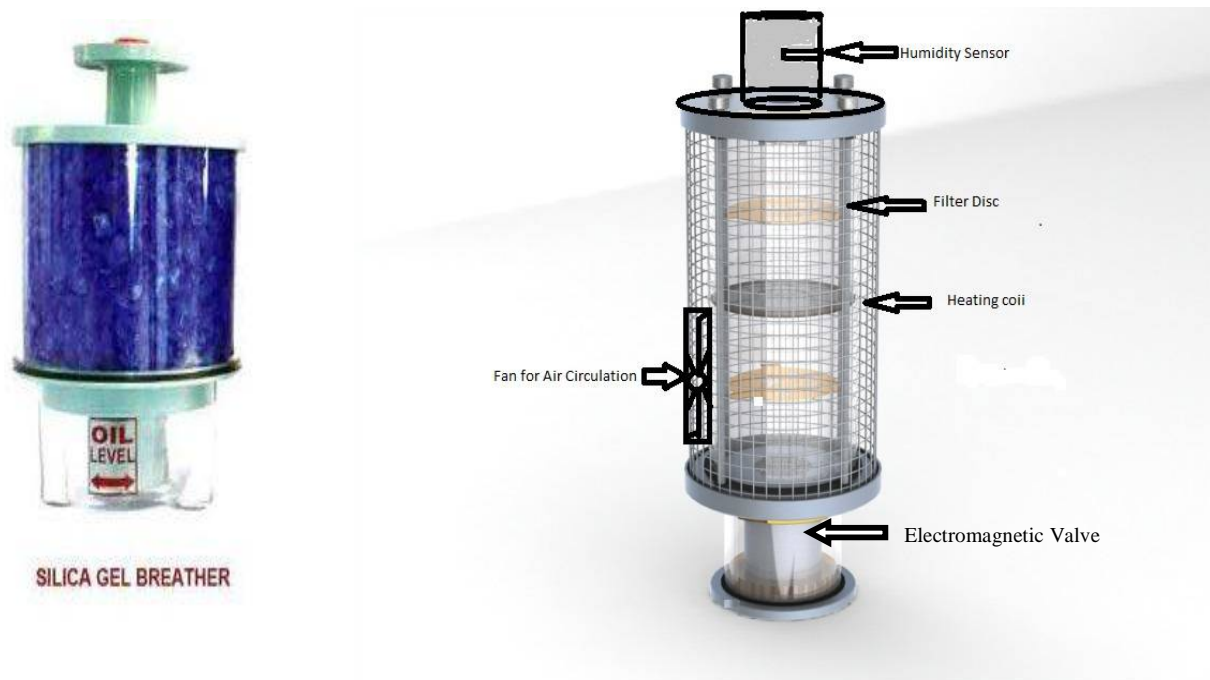


Fig.2 Traditional Design &our novel design of breather

## II.DESIGN COMPONENTS OF BREATHER

### A.Heating coil

Nichrome: Most heating elements use nichrome 80/20 (80% nickel, 20% chromium) wire, ribbon, or strip. Nichrome is most suitable material, because it has relatively high resistance and forms an adherent layer of chromium oxide when it is heated for the initially. Material below this layer will not oxidize, preventing the wire from breaking or burning out. Resistance wire. Metallic resistance heating elements made upof ribbon, straight or coiled. They are used in common heating devices like toasters and hair dryers, grills, furnaces for industrial heating, floor heating, roof heating, pathway heating to melt ice accumulated, dryers, etc. usuallyclasses of materials used include material as Kanthal (FeCrAl) wires, Nichrome 80/20 wire and strip, Cupronickel (CuNi) alloys for low temperature heating.



Fig.3 Heating Coil

### B.Humidity sensor

monitoring humidity is importance in many industrial & domestic applications which having humidity as affecting factor . In semiconductor industry, humidity or moisture levels needs to be properly controlled during wafer processing manufacturing. In medical applications, humidity control is required for respiratory equipment’s such a sterilizers, incubators, pharmaceutical processing, and biological products. Humidity control is also necessary in chemical gas purification, dryers, film desiccation, paper and textile production, and food processing. In agriculture, measurement of

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humidity is important for plantation protection , soil moisture monitoring, etc. In all such applications and many others, humidity sensors are employed to provide an alert of the moisture levels in the environment or atmosphere.



Fig.4Humidity sensor

## C.8051 Microcontroller

The 8051 Microcontroller was designed in 1980's by Intel. Its basically was on Harvard Architecture and was developed principally for initially into play in Embedded Systems. At first it was invented by means of NMOS technology but as NMOS technology needs more energy consumption to function therefore Intel re-intended Microcontroller 8051 employing CMOS technology and a new version came into introduce with a letter 'C' in the title name, for illustration: 80C51. These advanced Microcontrollers need fewer amount of power consumption to function in comparison to their forerunners.

There are two buses in 8051 Microcontroller one for program and other for data transfer function . As a result, it has two storage rooms for both program and data of 64K by 8 size. The microcontroller comprise of 8 bit accumulator & 8 bit processing unit to process instructions. It also having 8 bit B register as majorly functioning blocks and 8051 microcontroller programming is done with embedded C language which utilizeKeil software. It also has a number of other 8 bit and 16 bit registers.For internal functioning & processing Microcontroller 8051 comes with integrated built-in RAM. This is prime memory and is employed for storing temporary data storage. It is unpredictable memory i.e. its data can get be lost when the power supply to the Microcontroller switched OFF be realized by employing a Gm-C circuit.



Fig.5 diagram of 8051 microcontroller

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### D. Electromagnetic valve

Solenoid valves differ in the performance of the electric current they use, the strength of the magnetic field they produce, the operation for they use to regulate the fluid, and the type and properties of fluid they control. The mechanism varies from linear action, plunger-type actuators to pivoted-armature actuators and rocker actuators for holding. The valve can use a two-port design to regulate& control a flow or use a three or more port design to switch flows between ports. Multiple solenoid valves can be placed together on a manifold.

Solenoid valves are the most usually used control elements in fluidics. Their tasks are to shut off, release, dose, distribute or mix fluids i.e. overall flow regulation. They are found in many application areas. Solenoids offer fast and secure switching without leakage, high reliability, long service life, good medium compatibility of the materials used, low control power.



Fig.6 solenoid valve

### E. Filter Disc

Filter disc is use for the removal of dust particle from air& clean air which is traversal in conservator .if dust particle will be enter in transformer that will harmful for insulation.



Fig.7 filter Disc

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## III. BLOCK DIGRAM SYSTEM DEVELOPMENT FOR BY BRATHER & RELAY SYSTEM

### Relay

Relays are devices which allow low power circuits to switch a relatively high Current condition/Voltage ON/OFF situation. A relay circuit is generally with a smaller switch or device which drives function of (opens/closes) an electric switch that is capable of carrying much larger current amounts.

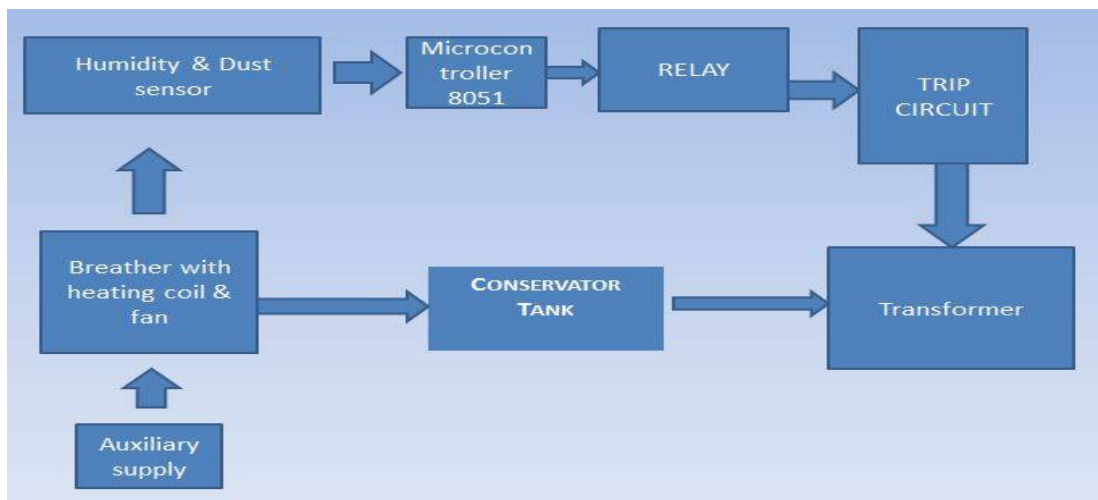


Fig.8 Block diagram of novel design of breather

### Interfacing Relays with 8051

Fig. shows how to interface the Relay to microcontroller. There are 2 input channels for connecting input signal. Each input is connected to the triggering coil of the respective relay to chain in trip circuit to operate. There are 2 output channels that each refer to an input. When the input is give signal, the relay turns on and the '+' output is connected to +12v. At the time off condition of relay, the '+' output is connected to Ground. The '-' output is permanently wired to Ground.

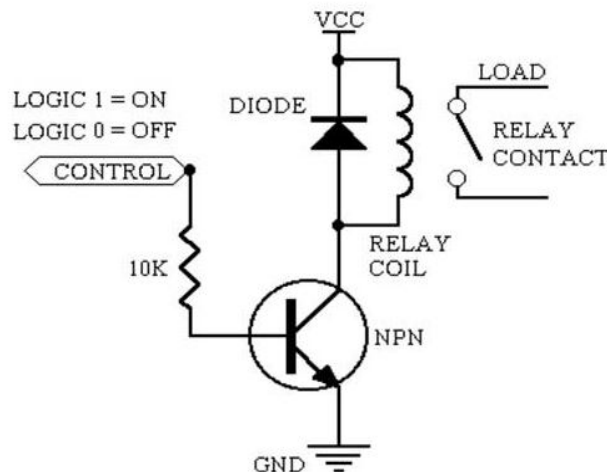


Fig.9 Relay interfacing with 8051



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## IV.CONCLUSION

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