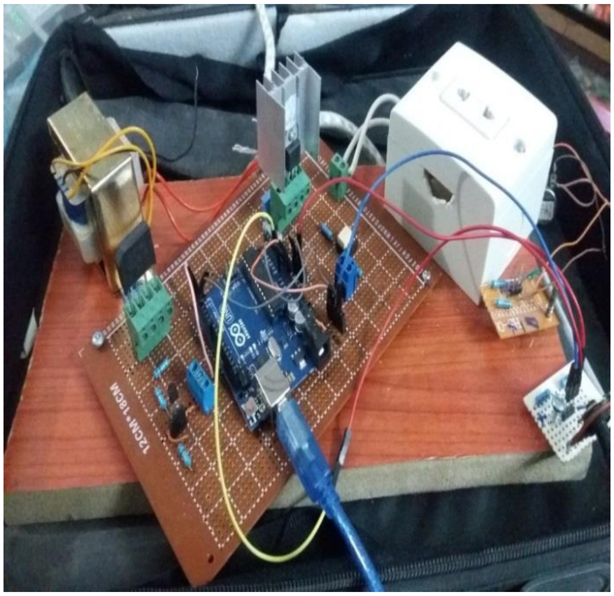
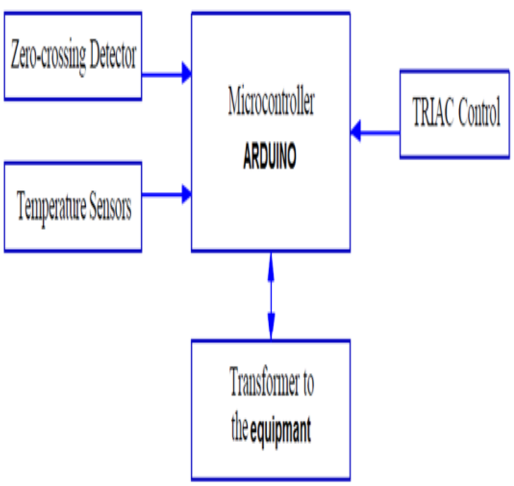


Figure 6: Process circuit.



Figures 6: diagram of the circuit

IV. ZERO-CROSSING DETECTION CIRCUITS

A zero-crossing detection circuit was developed to provide trigger signals — a pulse train to the microcontroller for a phase -control of the heater (Figure 7). The zero-crossing detection circuit consisted of:

• Adapter to reduce voltage.

• Full-wave rectifier. In each cycle of the sine wave, there are two zero crossing points: one occurs when the signal changes from negative to positive, and the other from positive to negative.

• R1-R2 is used to protect the transistor from high currents.

• Transistor.

The output signal enters the microcontroller. The signal emerging from the zero-transit circuit is wide pulses at a frequency of 50 Hz. The voltage source must be the same as the main transformer source; otherwise the phase shift may occur to affect the accuracy of the control.

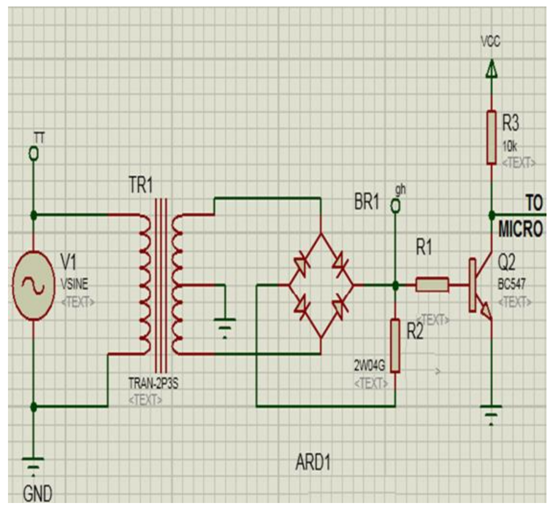


Figure 8: zero-crossing detecting circuit

V. TRIAC CONTROL CIRCUIT

A power TRIAC (Q4025L6-ND, Teccor Electronics Inc., Des Plaines, IL, U.S.A) was used to control the AC source (120V, 60Hz), . The TRIAC was wired to the low-voltage side (the primary coil) of the high-voltage transformer.

To conduct the reverse current that may occur in the TRIAC during the power-off period, an RC circuit was installed in parallel with the anode-cathode of the TRIAC (Fig. 9(.

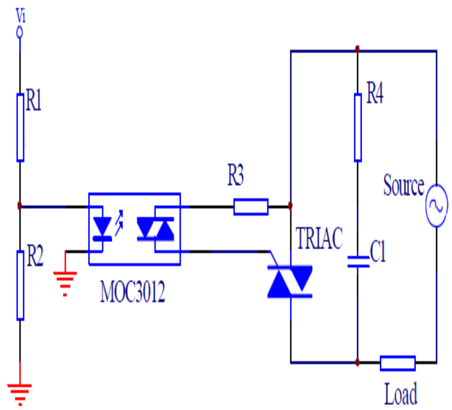


Figure 9: Triac output circuit to control loads

A MOC3012 opto-coupler was used as a high voltage isolator to protect the microcontroller>

R1 was used to load majority of the +5V of the signal to protect the MOC3012; R2 was used to dissipate the reverse current to speed up the reaction time of the MOC3012.

R2 must be much larger than R1 to ensure that most of the input voltage Vi is directed to the MOC3012..

In phase control, after each zero-crossing point, the power was cut away at a "delay" angle (in time) and then conducted for a "conduction" angle (in time) (Figure10). magnetron. time.

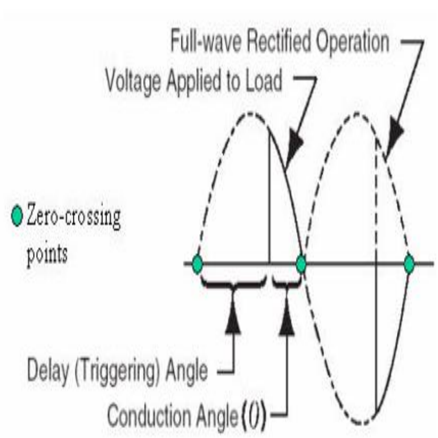


Figure 10 Concept of phase control (Courtesy: Teccor Electronics Inc.(

VI. RESULTS OF TESTS WITH A CONTROL SYSTEM

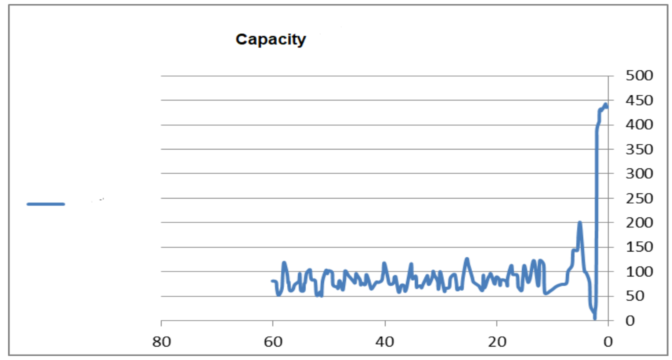


Figure 11: Power curve of the circuit with control system

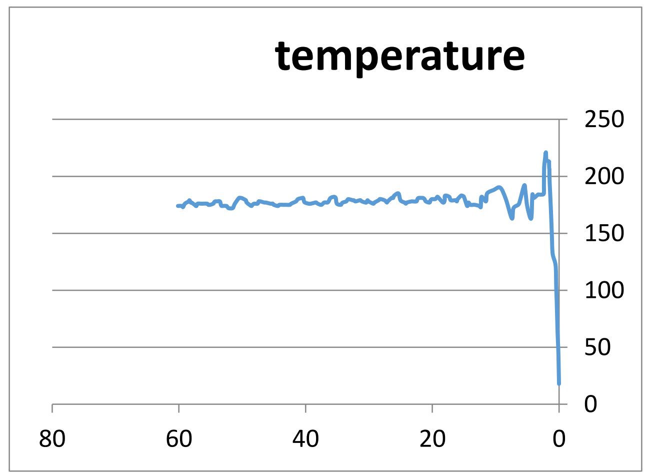


Figure 12: curved heat circuit with a control system

VII. COMPARISON RESULTS

Tv/T	10 %	20 %	30 %	40 %	60 %	80 %	90 %
W(wh) Without control	50	100	150	200	300	400	500 0
W(wh) With control	65	68	71	74	77	81	84

Table1 : Comparison of results in case of different degree of application of the role

From the previous table, we find that the capacity after adding the feedback to the iron, and replacing it with thermal heat resistance and microcontroller circuit has decreased significantly with changing conditions of the medium.

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