4. Methodology

The temperature measurement and monitoring system for industrial induction motor. The aim of temperature monitoring system is to analyze and alarm an abnormality of the motor and prevent the damage in case of unbalance voltage. This system was tested by an induction motor of pointing machine. The experiment setup consists of a temperature measurement circuit [26]. Therefore, in order to extend the insulation life, it is critical to monitor the stator winding temperature and protect the motor under thermal overloading conditions such as motor stall, jam, overload, unbalanced operation, and situations where the cooling ability of the motor is accidentally reduced [27]. The temperature measurement method in this case uses temperature sensors installed in stator windings and rotor parts [28], [29].

Anantharaman and Satish[30] developed a thermal imaging system for a battery module enclosure that includes first and second battery module enclosure components between which a weld is formed includes a thermal imaging camera that focuses on the first and second battery module enclosure components within a predetermined amount of time after the weld is formed and that acquires a thermal signature. A control module includes an image processing module that receives the thermal signature and that locates a predetermined reference point in the thermal signature. An image comparison module receives the thermal signature and uses the predetermined reference point to compare the thermal signature to a template signature in order to verify structural integrity of the weld. The image comparison module computes a relative measure of deviation of the thermal signature from the template signature and identifies the weld as defective when the relative measure of deviation is greater than a predetermined value.

The temperature changes due to maintenance-related problems could be isolated from all the other factors that contribute to bearing heat, a properly designed monitoring device could detect bearing failure at the Stage 2 level. A newly patented technique is being evaluated that could have significant benefit to industries that need to analyze bearing and lubrication life in difficult-to-reach areas, such as under train cars. The heart of this technique is that cancels all thermal variables except the increase in bearing temperature due to wear or lubrication failure. The procedure takes heat data from each bearing on a common shaft and compares the data. Because the load, speed, ambient temperature, and run duration are common to all the bearings common to the shaft, their effects on temperature are canceled. Any recorded temperature variation is the result of unwanted maintenance- or repair-related conditions such as over- or under lubrication, bearing damage, misalignment, or loose-foot condition. If the utility temperature is greater than the predetermined value then the health of it will be in question and the root cause of the increased temperature must be determined.
The methodology involves the following:

- Temperature sensors are attached in close proximity to parts of utility.
- The sensors apply input to a sensing unit that is self-contained and has wireless technology for communication with warning devices.
- The temperature data of each unit is analyzed and compared electronically.
- If the temperature of utility varies more than predetermined value, an alarm is transmitted and an LED indicator will light.
- The system is self-powered by a small power supply which is actuated by the movement of the equipment.
- There is a maximum allowable temperature in case utility are out of normal operating range.
- This technique will never be as accurate as oil or vibration analysis, but in remote or hazardous locations where these tools are not an option, it will provide an increased level of condition monitoring that was not available in the past.
# 7. Schedule of study

The research work activities/studies will be completed as per the following schedule

<table>
<thead>
<tr>
<th>Sr.No</th>
<th>1&lt;sup&gt;st&lt;/sup&gt; year</th>
<th>2&lt;sup&gt;nd&lt;/sup&gt; year</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Literature survey &amp; study of related publications</td>
<td>Actual experimentation &amp; confirmation of process parameters. Analysis of process parameters &amp; correlation with newly designed PTC concentrator.</td>
</tr>
<tr>
<td>2</td>
<td>Industrial visits &amp; observations of feasibility of work, Study of parameters and response</td>
<td>Comparisons of various techniques, Confirmation of results of test and thesis submission.</td>
</tr>
<tr>
<td>3</td>
<td>Finalization of process parameters. Making set of experiments</td>
<td>Submission of thesis and viva.</td>
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