

**Industrial Consultancy Services**  
**on**  
**Energy Audit, Power Quality, Energy Conservation,**  
**Thermography based Audits and**  
**Energy Management**



**Sri Eshwar<sup>TM</sup>**  
**College of Engineering**

Accredited by NAAC with 'A' Grade  
Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai



**Submitted by**  
**SRI ESHWAR COLLEGE OF ENGINEERING**  
**SRI ESHWAR ENERGY DIVISION (SEED)**

**Kondampatti [Po], Vadasithur (via)**  
**Coimbatore, Tamilnadu, India - 641 202.**

**Phone : 04259-200300, Cell : 0-9942029372, Fax : 04259-200388**



## **1. About Sri Eshwar Energy Division (SEED)**

**Sri Eshwar Energy Division (SEED)** an exclusive division to cater the needs for electrical energy sector has been formed in our institution in the Department of Electrical and Electronics Engineering offering industrial consultancy, testing and research in power quality, reliability, mitigation techniques in Industrial distribution system. SEED provides real time solutions in the field of Energy Management, Power Quality Audit and Harmonics, Power factor Corrections, Earthing, Electrical Safety, Thermography based testing on equipments, PQ training for interested professionals and Renewable Energy. The SEED consists of team of faculty being headed by Dr.S.R.Sivarasu, BEE Certified Energy Manager (EA-27299/2018). He is also a Lead Auditor for ISO:14001:2015

## **2. Testing and Consultancy Activities in SEED**

SECE strongly believes that the relationship with industry shall be mutual, while the institution receives lot of support from the industry; it also has a moral obligation to give back to the industry. In this context, with its well experienced faculty team, SECE is offering various consultancy services to the industry at a very nominal cost, which have been well received and appreciated by the industry. SECE has built the required in-house facilities and invested necessary equipment to offer these consultancy services.

- **Power Quality and Energy Audits**
- **Renewable Energy based System Design and Testing**
- **Energy Management and Energy Conversion Practices**
- **Thermography based Testing on Equipments**
- **Testing of Electric Motor and System**
- **Power Quality and Renewable Energy Training**

### 3. Industrial Consultancies Completed:

| Name of the Company   | Domain of consultancy                           | Date                               | Duration |
|---|---|------------------------------------|----------|
| SVS College of Engineering,<br>Coimbatore - 109.  | Energy, Power Quality and<br>Thermography Audit | 01-08-2016                         | 1 Day    |
| Sri Kumarn Coir Products,<br>Pollachi-642 007.  |   | 03-09-2016                         | 1 Day    |
| Ambrra River Resort,<br>Pollachi-02.  |   | 09-09-2016<br>&<br>10-09-2016      | 2 Days   |
| Tekno Plastic Systems,<br>Coimbatore – 641 635.   |   | 20-10-2016<br>&<br>21-10-2016      | 2 Days   |
| PPG Institute of Technology,<br>Coimbatore – 641 035.                                     |   | 15-12-2016                         | 1 Day    |
| Airport Authority of India,<br>Puducherry Airport,<br>Puducherry - 605 008.               |   | 21-23 March<br>2017                | 3 Days   |
| Best Forgings India (P) Limited,<br>Private Industrial Estate,<br>Coimbatore-641 021,     |   | 13-04-2017<br>& 17-04-<br>2017     | 2 Days   |
| Agni College of Technology,<br>Navallur, Chennai - 600 130.                               |   | 26-27 May<br>2017                  | 2 Days   |
| Airport Authority of India,<br>Coimbatore International<br>Airport, Coimbatore – 641 014. |   | 28 June 2017<br>to 03 July<br>2017 | 5 Days   |
| Airport Authority of India,<br>Coimbatore International<br>Airport, Coimbatore – 641 014. |   | 12-14<br>September<br>2017         | 3 days   |

|   |   |                                 |       |
|---|---|---------------------------------|-------|
| Saami Processing Mills,<br>Veerappan Chatram (Post),<br>Erode – 4,    | Supply Power Factor and<br>Energy Consumption   | 04 November<br>2017             | 1 Day |
| Airport Authority of India,<br>Madurai Airport,<br>Madurai – 652 022. | Energy, Power Quality and<br>Thermography Audit | 01-12-2017<br>to 04-12-<br>2017 | 4 day |

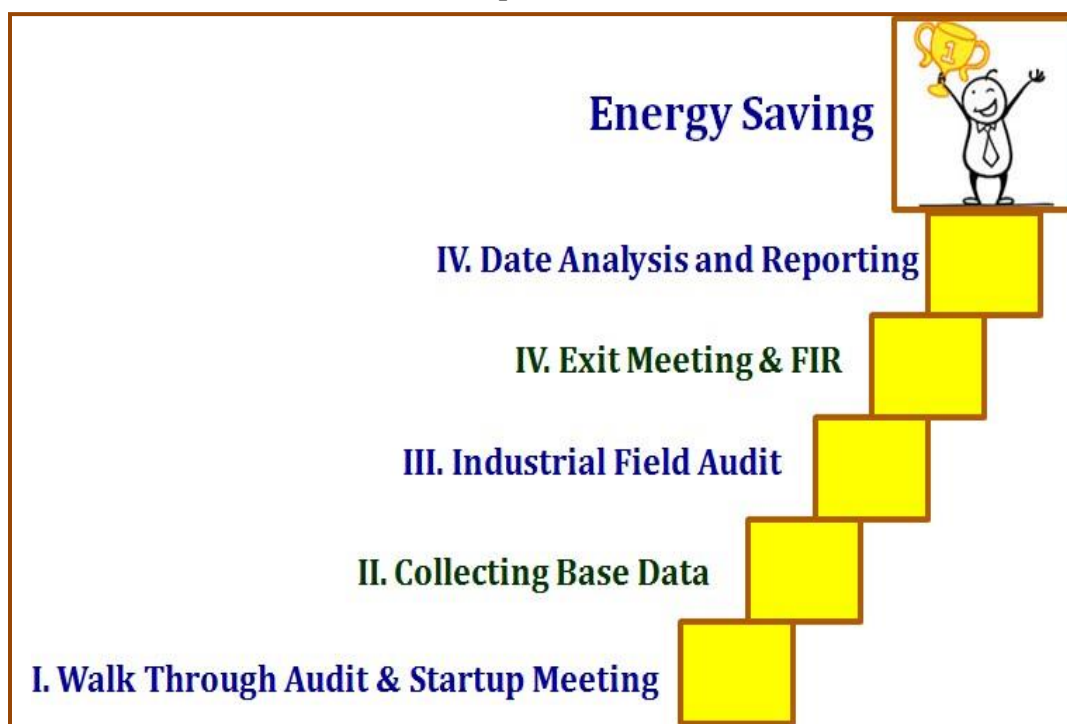
#### 4. Details of Audit Team Members and their Specialization

| S. No | Name and Designation   | Specialization   | Year of Experience |
|-------|--|--|--------------------|
| 1.    | <b>Shri. S. Ashok</b><br>BEE Accredited Energy Auditor<br>(Mentor-SEED)                  | Energy Audit and Energy Conservation                                   | 25                 |
| 2.    | <b>Dr. S.R. Sivarasu</b><br>Professor,<br>Department of EEE                              | Energy Audit, Energy Management and Renewable Energy Systems           | 15                 |
| 3.    | <b>Dr. V. Chandrasekaran</b><br>Professor & Head,<br>Department of EEE                   | Electrical Machine Design and Fault Diagnostics in Electrical Machines | 25                 |
| 4.    | <b>Mr. W. Rajan Babu</b><br>Assistant Professor(Sr.Gd),<br>Department of EEE             | Electrical Machines and Renewable Energy System                        | 15                 |
| 5.    | <b>Mr. B. Hemanath</b><br>Assistant Professor,<br>Department of EEE                      | Power Electronics, Electrical Drives and Power System                  | 08                 |
| 6.    | <b>Mr. Kannan Narasimhan</b><br>IT Director, (Former Vice President-<br>Mahindra Satyam) | Information Security, Project Management and Six Sigma                 | 25                 |
| 7.    | <b>Mr. Ilango Murugesan</b><br>IT Director, (Former Group General<br>Manager-HCL)        | Project Management, Quality Analyst and Certified Service Manager      | 25                 |

## 5. Equipments Availability in SEED

| S. No. | Name of the Equipment                                | Model/Range          |
|--------|--|----------------------|
| 1.     | Power Quality Analyzer with all necessary equipments | Fluke 434 –Series II |
| 2.     | Infrared Thermal Imager                              | Fluke TiS-20         |
| 3.     | Digital Clamp Meter                                  | Fluke – 317          |
| 4.     | Digital True RMS Multimeter                          | Fluke-115            |
| 5.     | Digital True RMS Multimeter                          | Fluke-15B            |

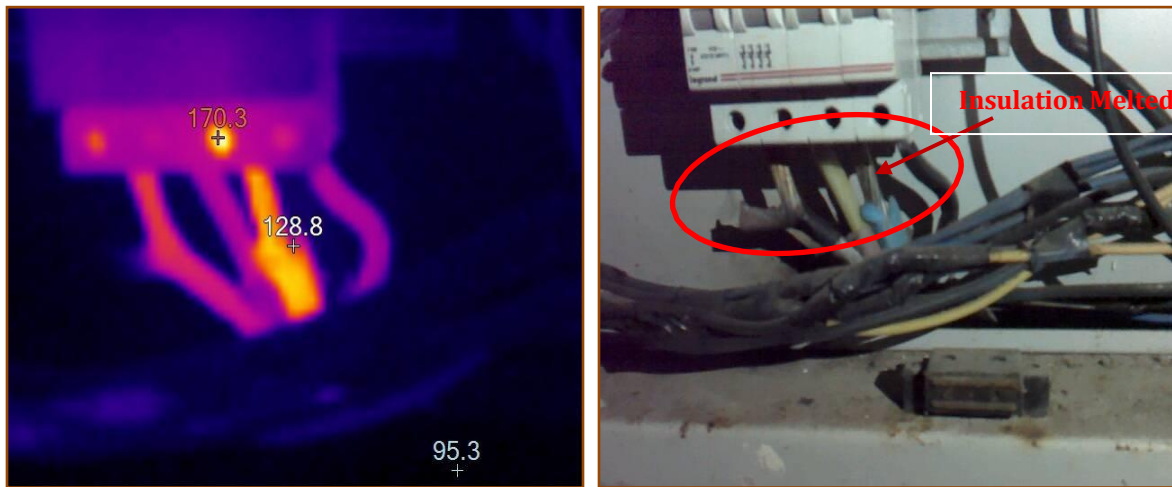
## 6. Procedure for Audit-Best Practice Adopted



## 7. Major Recommendations from Real Time Audits

### i. Observations and Recommendations (Thermography Analysis)

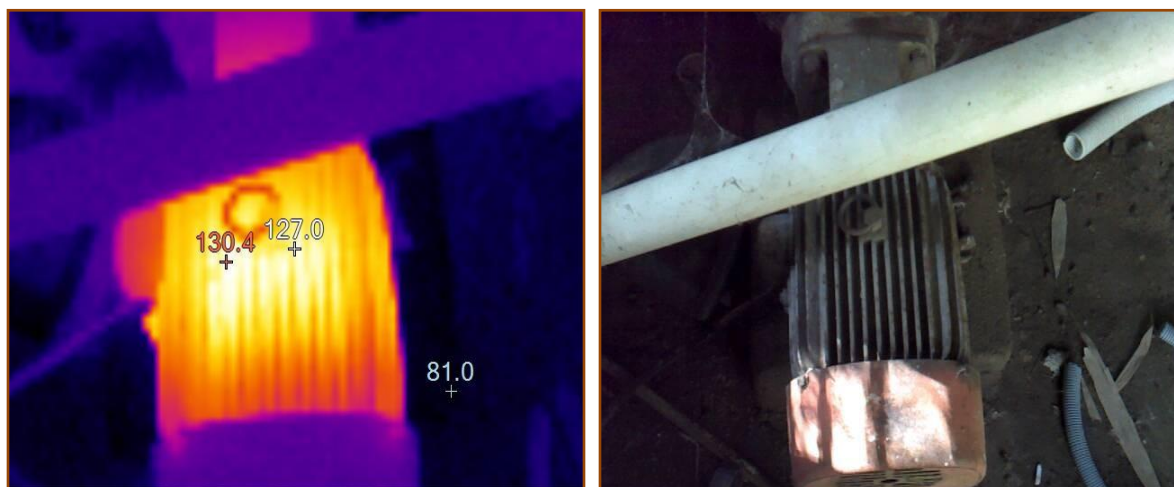
1. It is observed that, excessive temperature rise (170.3°F) in one phase (it may be B-phase) of incoming section of the distribution panel located back side of the guest room.



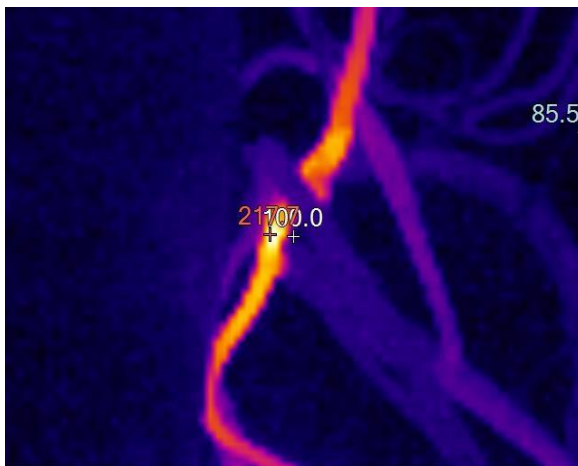
**Thermography Image on in DB (Located back side of the guest room)**

|                       |   |
|-----------------------|---|
| Problem Observed      | Excessive temperature rise in one phase (it may be B-phase) of incoming section |
| Cause for the Problem | High current/improper sizing of conductor/Corrosion/loose connection            |
| Effect of the Problem | Melting due to high temperature and supply interruption                         |
| Down Time             | Minimum of 1-2 hour   |
| Recommendation        | Problem must be immediately addressed   |

2. In the same motor excessive temperature rise (ranging from 122.0°F to 130.4 °F) is found in the motor body. Hence it is recommended to completely check the motor and rectify the faults identified.

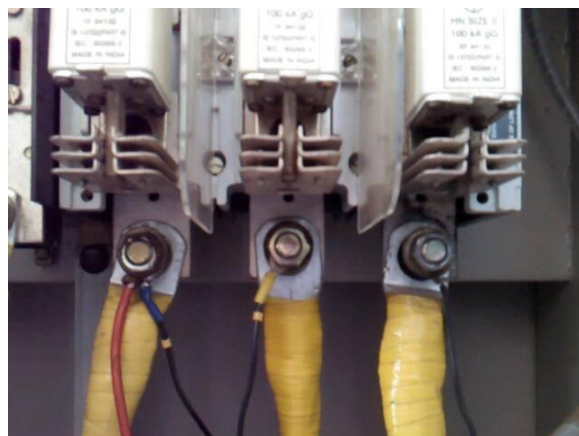
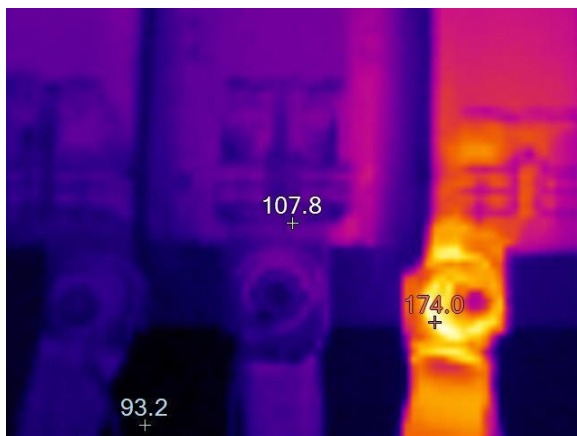


**Thermography Image on swimming pool pump motor (Motor Body)**



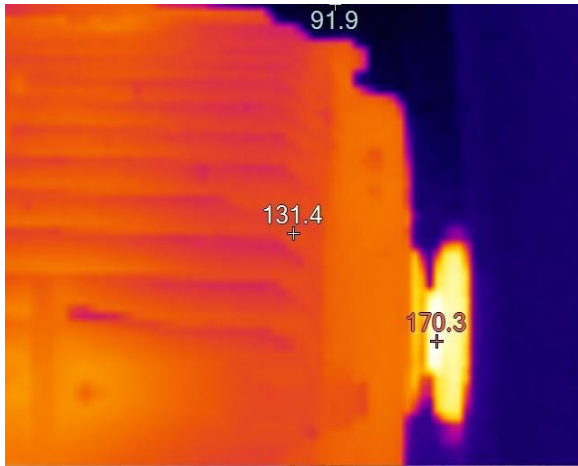
**Thermography Image on EB-Main Incoming (Backside)**

|                       |   |
|-----------------------|---|
| Problem Observed      | Excessive temperature rise in backside of EB main incoming – Cable joint  |
| Cause for the Problem | Weak joint/ Loose connection  |
| Effect of the Problem | Melting due to high temperature and supply interruption   |
| Down Time             | 1-2 hour (minimum) production loss  |
| Recommendation        | <ul style="list-style-type: none"> <li>• Problem must be quickly addressed during monthly maintenance time</li> <li>• Recommended to root the wires properly with sufficient panel board</li> </ul> |



**Thermography Image on Fiber Screener Incoming Point (R-Phase Incoming)**

|                       |   |
|-----------------------|---|
| Problem Observed      | Excessive temperature rise in R-Phase Incoming  |
| Cause for the Problem | Loose connection  |
| Effect of the Problem | Melting due to high temperature and supply interruption   |
| Down Time             | 1 hour (minimum) production loss  |
| Recommendation        | <ul style="list-style-type: none"> <li>• Problem must be quickly addressed during monthly maintenance time</li> </ul> |

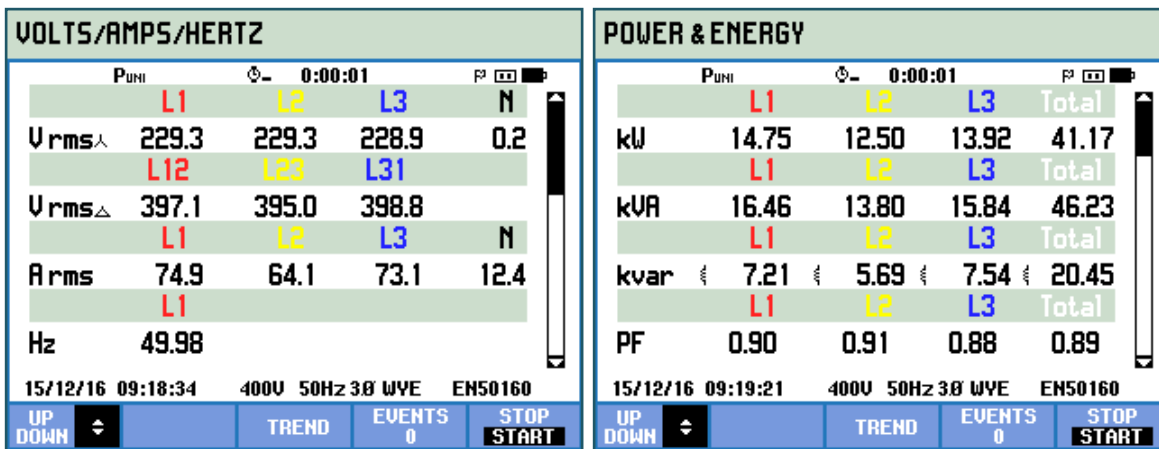


**Thermography Image on Decorticator I (Fiber Screener-Polishing Motor)**

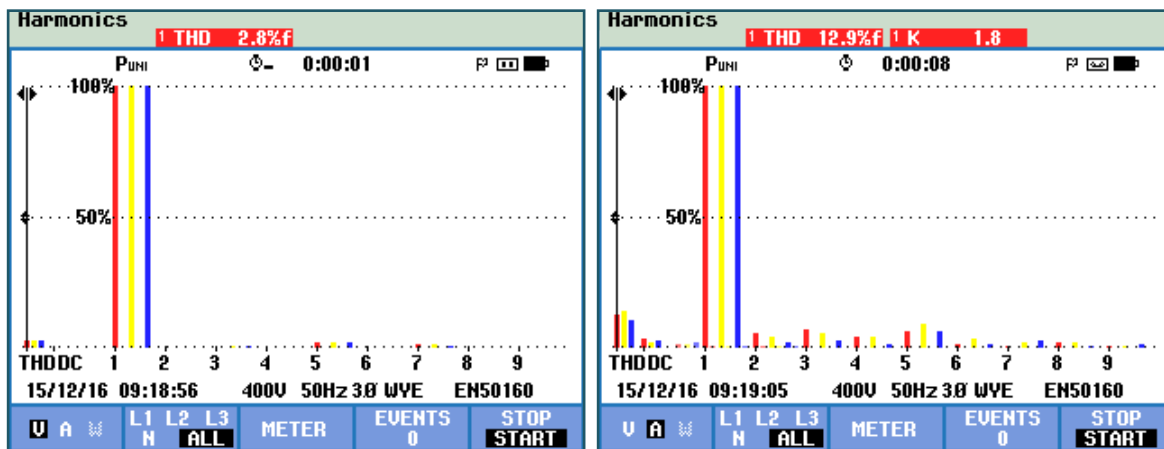
|                       |  |
|-----------------------|--|
| Problem Observed      | Excessive temperature rise in front cover/bearing  |
| Cause for the Problem | Bearing weakness/High belt tension/Tightness in front cover  |
| Effect of the Problem | Bearing failure  |
| Down Time             | 1 hour (minimum) production loss   |
| Recommendation        | <ul style="list-style-type: none"> <li>• Check the belt tension</li> <li>• Oil/creasing in the contact points</li> </ul> |

## ii. Observations and Recommendations (Power Quality Analysis)

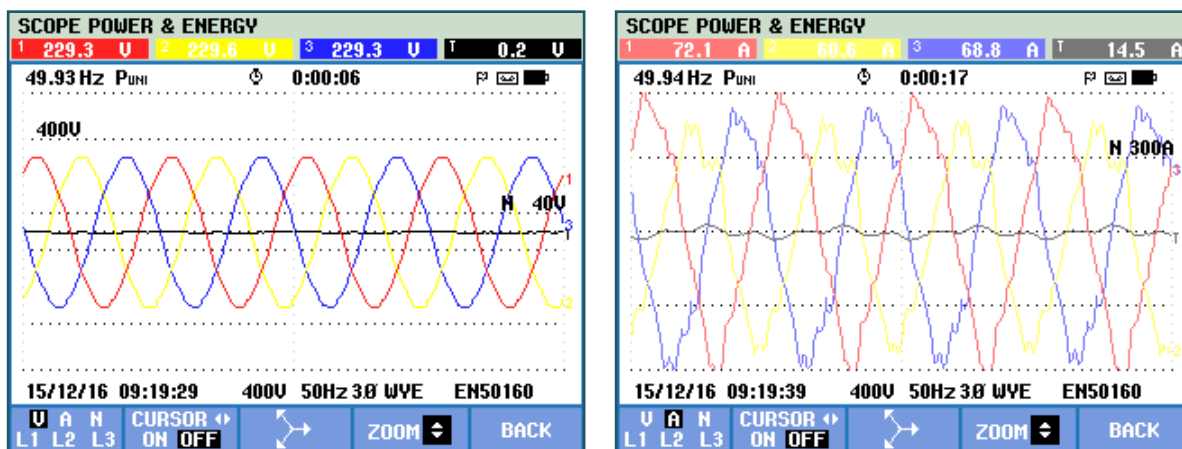
The power quality analyzer is placed in the input side of the main incoming panel board and the following screen shots are measured at the main panel board incoming point on Day-1.



**Voltage/Current/Frequency & Power/Energy-Screen Shots recorded in Main Incoming Panel**



THD<sub>V</sub> & THD<sub>I</sub> -Screen Shots recorded in Main Incoming Panel



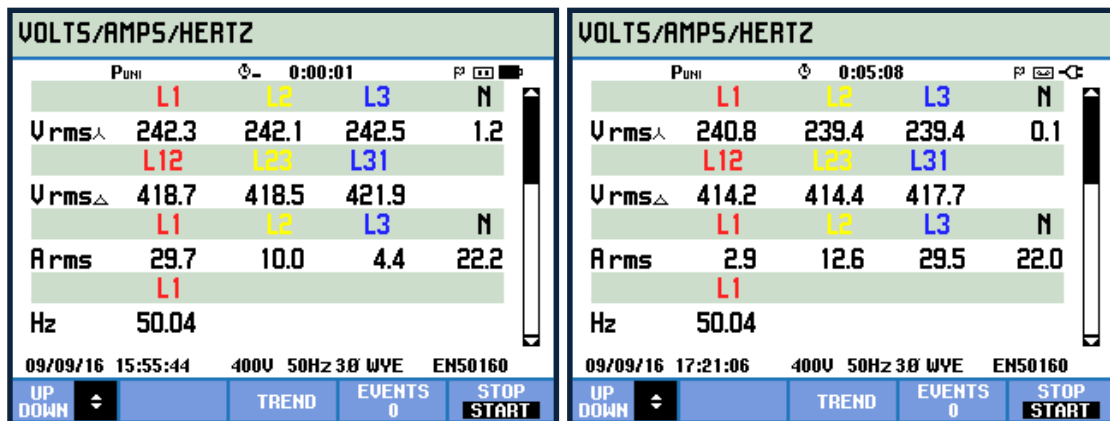
Voltage and Current Waveforms -Screen Shots recorded in Main

|                        |   |
|------------------------|---|
| Problems Observed      | <ul style="list-style-type: none"> <li>Unbalance in three phase circuit</li> <li>Higher value of Total Harmonic Distortion (THD) in current waveform</li> <li>Moderate power factor</li> </ul>  |
| Causes for the Problem | From the observation, R phase is heavily loaded followed by Y-phase and B-Phase. This is due to unequal distribution of large single phase loads.   |
|                        | From the observation the value of current THDi is about 17.2 % as against 8 % recommended by the CEA. Higher value of THDi is mainly due to Electronic chokes, Stabilizers, UPS, Inverter and Servo stabilizers not having input filter chokes. |

|                        |  |
|------------------------|--|
|                        | Even though the APFC connected at the input side, the power factor at the time of above measurement is only 0.85. This may due to a) severe unbalance in the circuit , b) capacitor tuning in APFC is not adequate and c) single CT APFC functioning.  |
| Effects of the Problem | <ul style="list-style-type: none"> <li>• High neutral current.</li> <li>• Equipment heating and reduction of their life</li> <li>• Higher energy consumption and increased kVA demand</li> </ul>   |
| Recommendations        | <ul style="list-style-type: none"> <li>• Strongly recommended to distribute the single phase loads equally</li> <li>• Provide active or passive filters in the input side (In consultation with the manufacturers)</li> <li>• Turning the APFC with maximum power factor of 1.00 and check their PF calculation method.</li> </ul> |

### iii. Observations and Recommendations (General)

**A. Phase Change:** It is observed with R phase and B phase from the incoming side to the main panel board is interchanged. That is from the incoming side (near to TNEB point) R-Y-B is the sequence where as in the main panel board it is B-Y-R. It should be checked in all the points.



R and B phases are interchanged in main incoming side to main panel board

**B. Need for proper earthing:** The overall observation from the complete walk through process of the plant is, many places require proper earthing connection. Even the main incoming panel board does not have the earthing in either side. The important places are shown in Fig. as follows.

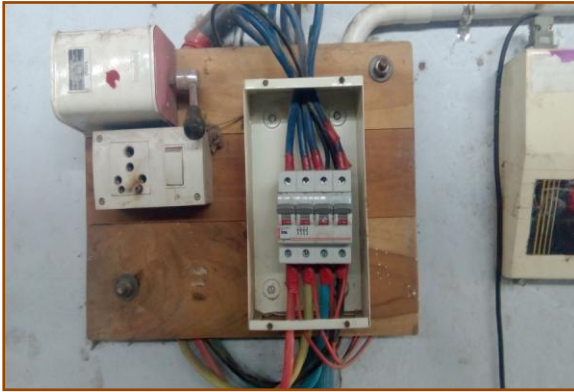


**No earthing connection in the main panel board**



**Improper/No earthing connection in other distribution/panel board**

#### iv. Observations and Recommendations-(Electrical Safety Issues)



- Multiple connections in single MCB
- Injection Molding machine and lighting loads are connected in same MCB
- Lighting interferences may affect the electric motors/electronic circuits in the



- No fuse link in two phase and is directly connected
- During faulty condition, one phase will be isolated
- This may lead to uneven voltage applied to the machine/system



- Earth pit located near to the generator is not maintained properly.
- One more earth pit is also available in the same locality with same condition.



- Incoming panel board does not have the load details. It is recommended to paste the appropriate stickers in each DB switch.
- Also paste DANGER symbol with high voltage indication.



- The cable trench must be closed. Provide sufficient spacing for inlet and outlet points.
- Provide adequate ventilation in the cable trench for temperature evacuation.



- Loosely rooted electric wires/cables/telecommunication cable
- Recommended to root the cable through cable ducts

### 15. Training/Awareness Programmes Organized

| S. No | Title of the Programme   | Date and Location                                     | Target Audience                         | Outcome   |
|-------|--|---|---|---|
| 1.    | Awareness Programme on "Energy Conservation, Power Quality Issues and Mitigation Techniques in Process Industries" in association with TANGEDCO, Pollachi. | 10 August 2016<br>Pollachi                            | Executives from various coir industries | Provided an awareness on energy conservations practices in coir industries            |
| 2.    | Hands on Training on "Energy, Power Quality and Thermography Audit"  | 16 December 2016<br>Messer Cutting System, Coimbatore | Executives/Engineers                    | Provided real time training on power quality measuring instruments in HT service line |
| 3.    | "Energy Conservation & Cost Reduction through Energy Audit" in Coimbatore SIDCO Industrial Estate Welfare Association (COSIEMA)                            | 14 February 2017                                      | Executives/Engineers                    | Provided an awareness on energy audit and their benefits to all the Industries        |

