Awareness Creation on Power Quality (PQ) Problems in Industrial Customers

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Introduction

• Long power interruptions and power quality problems almost daily.
• Demand for quality of voltage and current rising every year.
• Very few works on the quality of power in Ethiopia and centered near the capital city.
• Questionnaire-based survey (i.e. AUG to OCT, 2019).
• Investigating the main (PQ) problems:
  – To identify PQ problems.
  – To introduce PQ problem mitigation methods.
  – To reduce economic losses.
Organization of the survey and its contents

- organized into main four parts.
  - awareness level on power quality problems and terms.
  - process type and process equipment.
  - availability of monitoring power quality data.
  - Economic aspects of PQ issues.
Methodology

- Focused on primary data through questionnaire based survey.
- 42,953 companies’ details collected.
- Based on European survey PQ report and other similar studies.
- Economic activities of towns, Budget and time constraints also added for selection criteria.
- 212 sectors in Mekelle, Maichew, Adwa, and Adigrat.
- 38 federal service firms were added to the sample size.
- Paper based questionnaire, online and offline system (Kobo Collect) used.
Results and discussions

- Only 54.4% companies responded to the questionnaire.
- Some companies were not willing to fill the questionnaire.
- Some industries do not exist.
- Fig. 1 summarizes basic companies information.
- Fig. 2 presents delivered voltage level at the entrance of the companies.
Awareness of PQ disturbances

- Industrial customers’ awareness on different PQ issues.

- PQ disturbances occurrences

Fig. 3

Fig. 4

- observations and Process disruption are the techniques used to identify PQ issues.
Process Types and Equipment

- Day-type load (58%), continuous load (32%), and night and intermittent load type (10%).

- Majority of the companies believed PQ problems such as:
  - Voltage fluctuations,
  - Overvoltage,
  - Undervoltage,
  - Short and long interruptions could have high and severe consequences on their plant equipment.

- But dips/swells, harmonics, transients and frequency variations.

Fig. 5: Sensitiveness of process equipment.
Monitoring and availability of data

- 72% of the company do not conduct PQ measurements while the 28% claimed they conduct measurements.
- Further request to access PQ data measurement from companies done.
- Simple voltage measurements confirmed such as undervoltage and over voltage.
- no companies conduct continuous PQ measurements.

- measurements are done at random intervals.
- Possible reasons for no conducting PQ measurements

![Graph showing reasons for non-conducting PQ measurements]

Fig. 6
Economic aspects of PQ problems

- 96% of the companies agreed economic losses due to PQ issues but 4%.
- No sufficient data regarding economic losses related to power outages.
- Average outage hours a day

![Fig. 7]

- Idle hours per week
  - 0-10 hours
  - 10-20 hours
  - 20-30 hours
  - 30-40 hours
  - 40-60 hours
  - 60-80 hours

![Fig. 8]

- Idle employees wage
  - Majority: less than 50,000.00 Birr.
  - Very few (about 8%): between 100,000.00 and 200,000.00 Birr.
  - 6%: between 500,000.00 to 1,000,000.00 Birr.
Conclusions

- Better awareness exists on Voltage fluctuations, Overvoltage, Undervoltage, Short and Long interruptions.
- Many of the companies are not aware of various PQ problems like Voltage dips, Voltage swell, Voltage spike, Flickers, Wave distortion (e.g. Harmonics), Transients, and Frequency variation.
- No concerned PQ measurement conduction.
- No studies to assess the costs associated with PQ problems.
- Necessary to create awareness among industries, utilities and academics and authorities.
- Make case studies to show the PQ monitoring importance.
Thank you