

IMPLEMENTATION
OF
ENERGY EFFICIENCY
IN
BUILDING

LOCATION
KUBER BHAVAN, VADODRA

CLIENT
GOVT. OF GUJARAT
ROADS AND BUILDING
DEPARTMENT

CASE STUDY

ENERGY SAVING ESTABLISHMENT WITH ELECTRICITY BILL REDUCTION : CASE STUDY OF CENTRALIZED MIXED LOAD ENERGY SAVER, INSATLLED AT GUJARAT ROADS AND BUILDING DEPARTMENT, KUBER BHAVAN, VADODARA.

Electricity utilization is common among all sectors viz commercial, industrial, residential etc. Each and every entity it may be private, government or individual use electricity by efficient way. But the limitations are choice of products available in the market. Due to competitive market low cost products are preferred and these products are directly or indirectly responsible for losses and wastage of energy. Indian consumers neither verify electricity utilization nor calibrate the meters. Thus losses and wastage of energy carry forward by years after years. Consumers pay for it over the years. Therefore, it is necessary to utilize the Electricity by Energy Efficiency improvement method, but centralized in manner so that instead of individual changes major part can be covered. Implementation of Energy efficiency in building is a crucial and sensitive subject required in depth study and analysis. Scientific approach can only provide results with financial and non-financial benefits.

Energy efficiency improvement lead to KWH reduction, simultaneously it also impact on various parameters of electricity. Considering all these aspects the Centralized systems must designed in such a fashion that, (AMC) annual maintenance contract can be avoided with self-life span of 10-15 years. This is very important aspect while Energy Efficiency improvement, to get long term benefit. Else energy saving part is compensated with AMC charges. At the same time IEEE standards can not be neglected.

Energy efficiency improvement directly impact on –

- 1) Electricity consumption (KWH) reduction
- 2) Demand KVA reduction
- 3) Power factor improvement
- 4) Harmonics reduction
- 5) Maintenance reduction due to Earth and Neutral leakage

Global facts considered to Building Energy Efficiency improvement

- 1) Commercial Buildings continue to be built in a conventional manner therefore losses and wastage of energy are neglected.
- 2) The focus of Energy efficiency is limited to LED Lamps installation. The reduced consumption compensated by burden of Harmonics related distortion.
- 3) Over the period of years appliances reduce efficiency need monitoring by calibrated instruments.
- 4) After repeated maintenance increased power consumption of appliances need monitoring by calibrated instruments.
- 5) Computers & peripheral's, UPS, Inverter based Air conditioners, LED lamps increases Harmonics and related distribution losses.
- 6) Even if Active Harmonics Filters are used it can not support considering parallel connection. It is beneficial to supply company.
- 7) Office equipment's /appliances are mostly single phase Loads leads to unbalanced current.
- 8) Unbalanced current shifting current to Neutral leads to leakage between Neutral and Earthing.
- 9) Unbalanced current can not maintain near unity power Factor.
- 10) Weak power Factor increases Demand KVA
- 11) Higher Harmonics and lower/weak power factor increases Transformer burden.

All above Parameters not only contribute to Losses and wastage of energy but also increases Yearly maintenance cost.

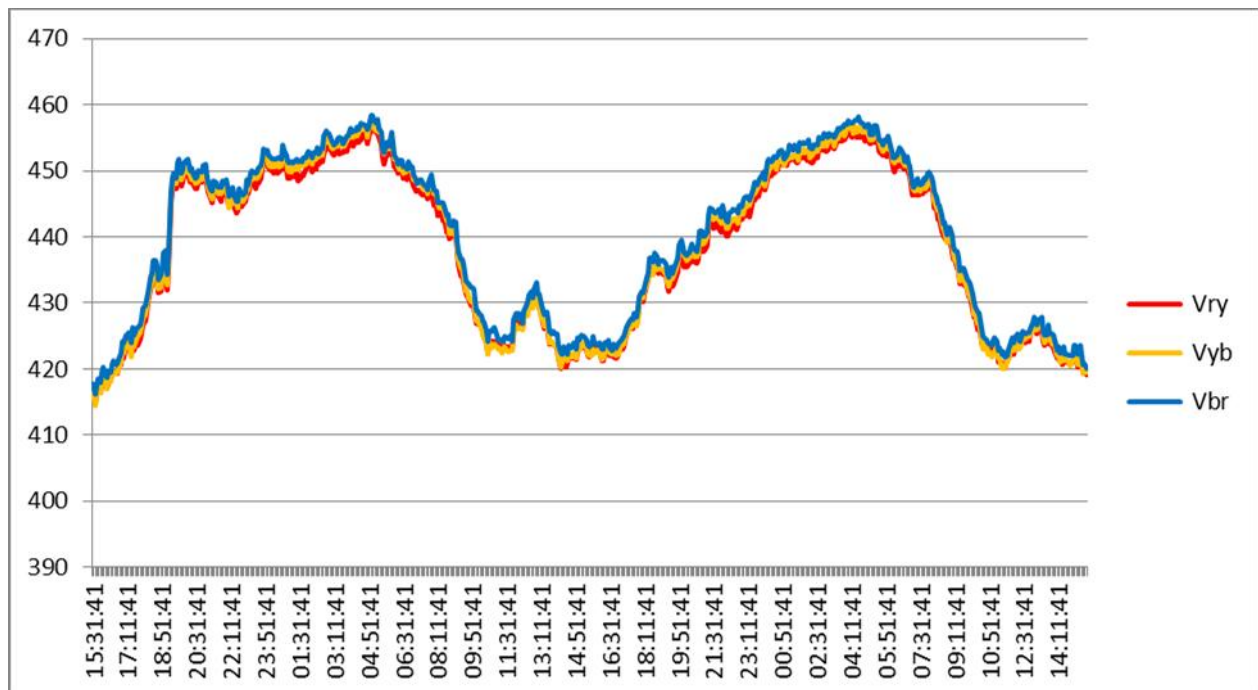
Also individual action for all parameters can cost higher and self-losses can increase power consumption. In such situation our Magnetic amplifier can only be the solution to resolve all the issues designed by our team of experts unanimously. This is not a overnight solution decided and designed to cater all simultaneous issues. The preliminary survey conducted and data collected on 18-20 th June, 2018. Further the evaluation carried out and online data monitoring continued as on today. Preliminary data and respective electricity bill can manifest the previous situation.

PREVIOUS BILL SUMMARY

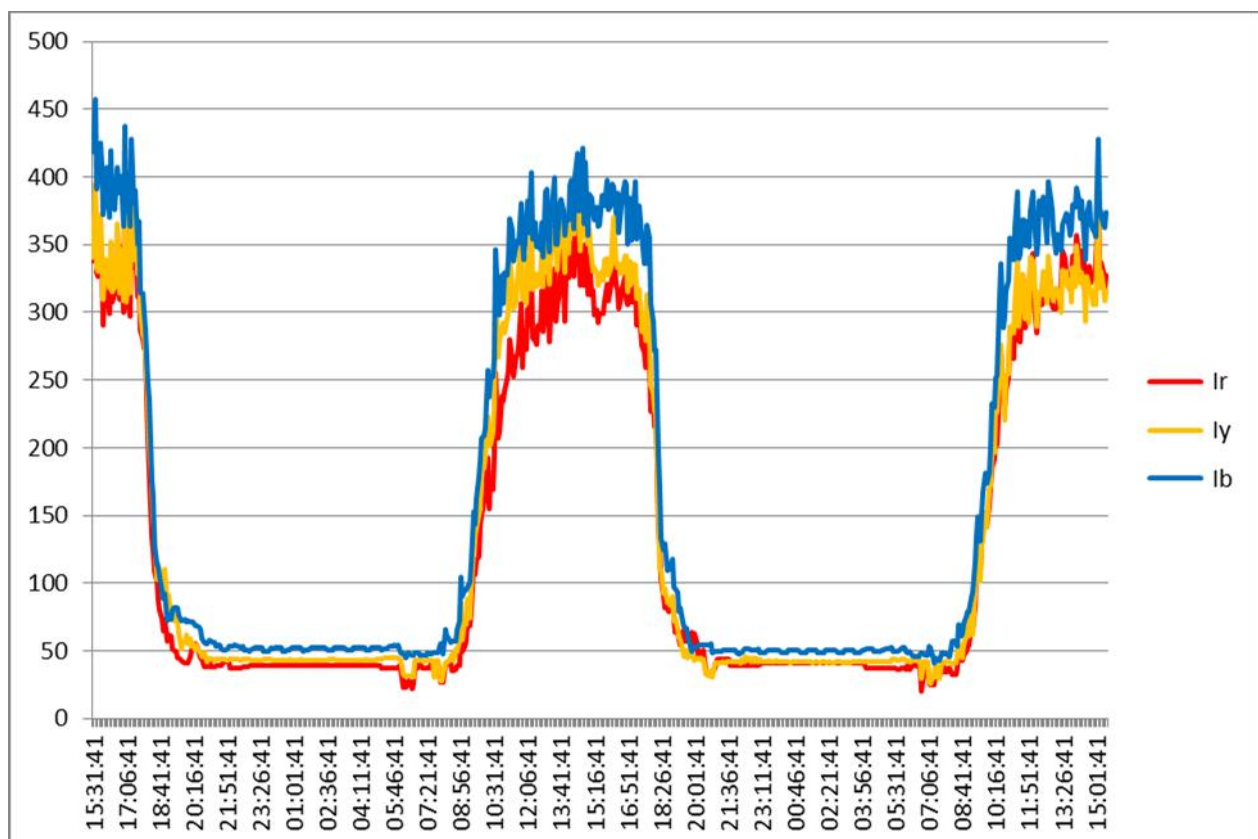
Sr. no.	MONTH	KWH	CURRENT BILL	UNIT RATE	ACTUAL MD KVA	CONTRACT DEMAND	PF	PF Incentive
1	APR-15	60,160	560,120	9.3	268	300	1	6,392
2	MAY-15	59,600	638,419	10.7	279	300	1	6,481

GRAPHICAL PATTERN

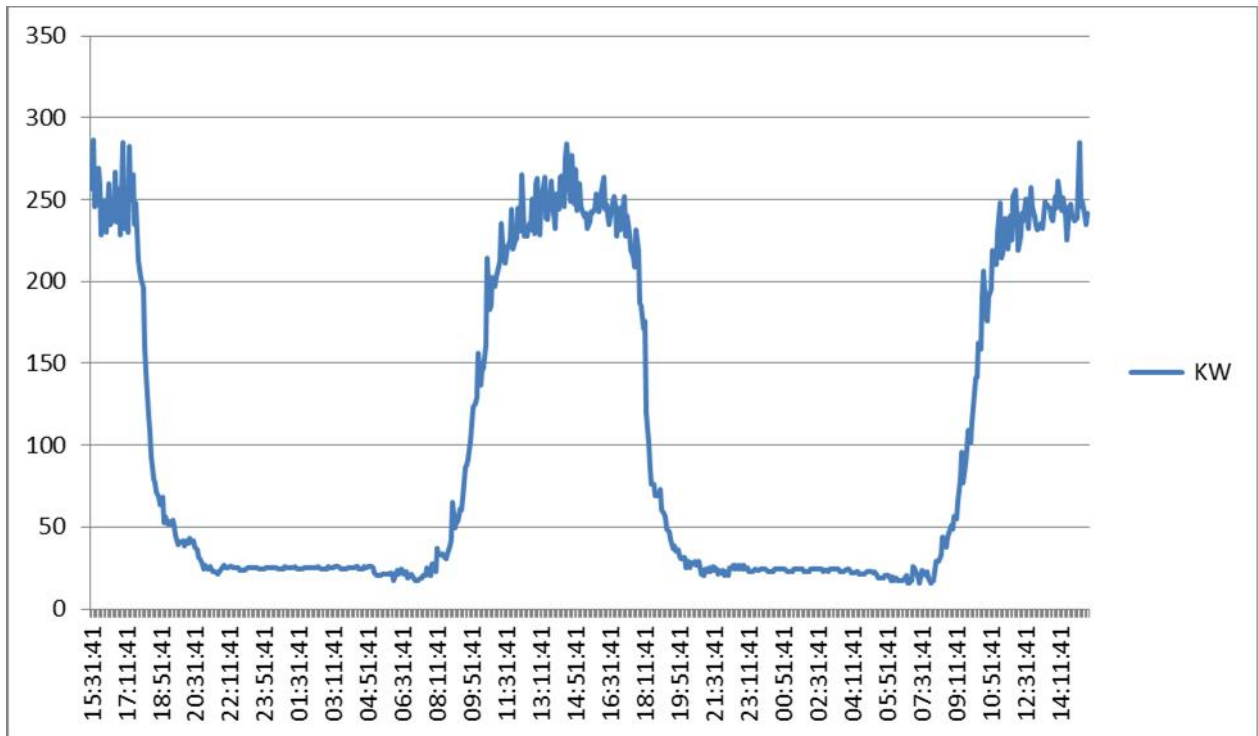
(PRELIMINARY DATA COLLECTED 48HRS. 18-20 th June,2018)



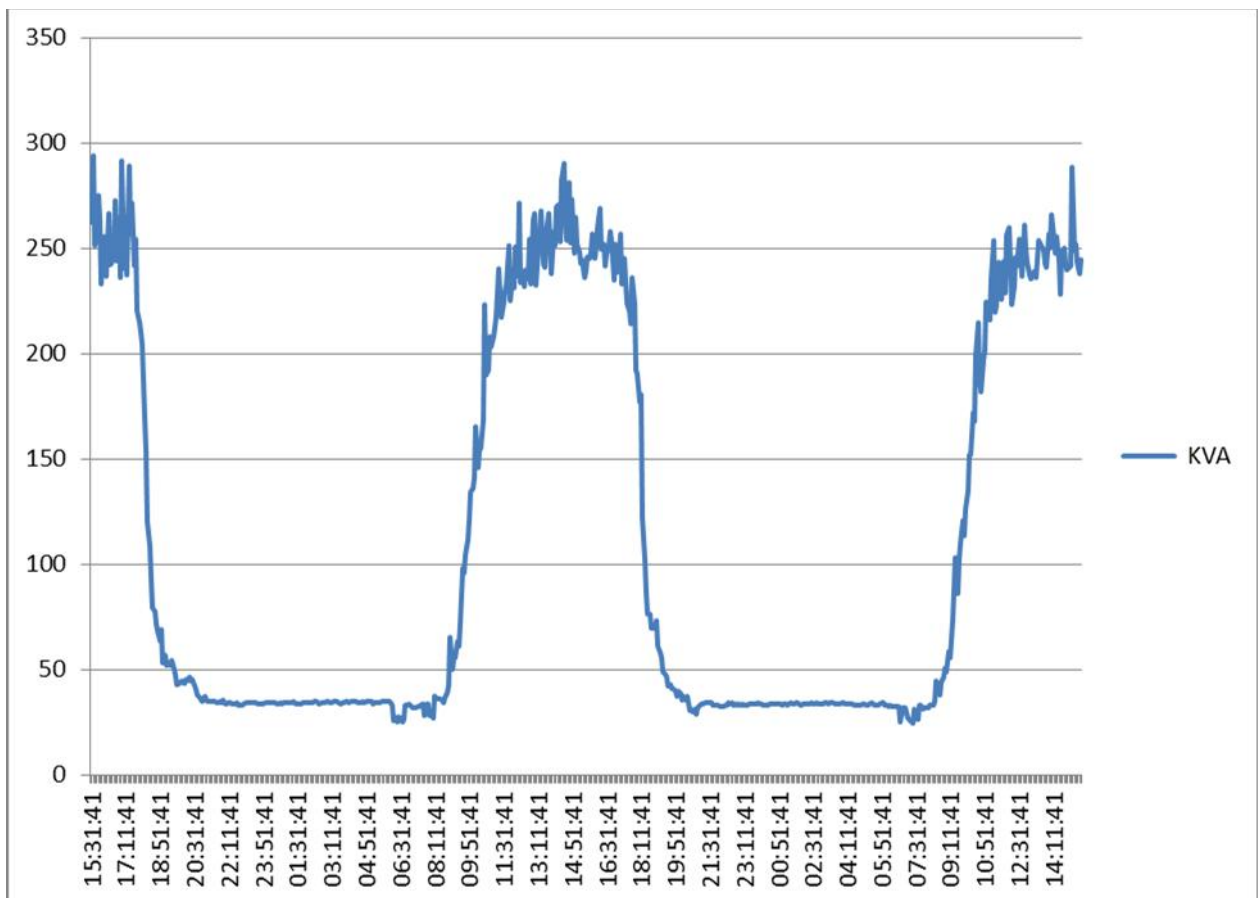
VOLTAGE PATTERN - VOLTAGE VARRIES BETWEEN 415 TO 450VAC



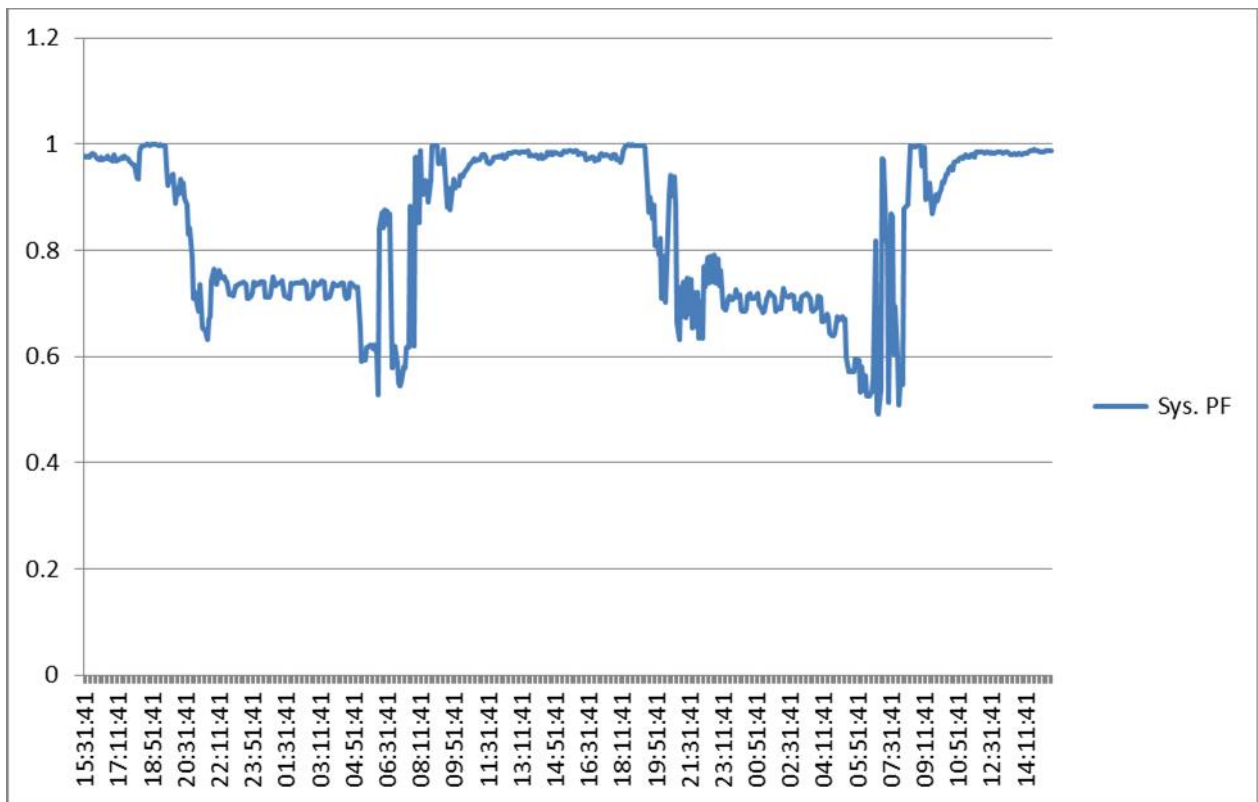
CURRENT PATTERN - CURRENT FOUND UNBALANCED DURING FULL LOAD



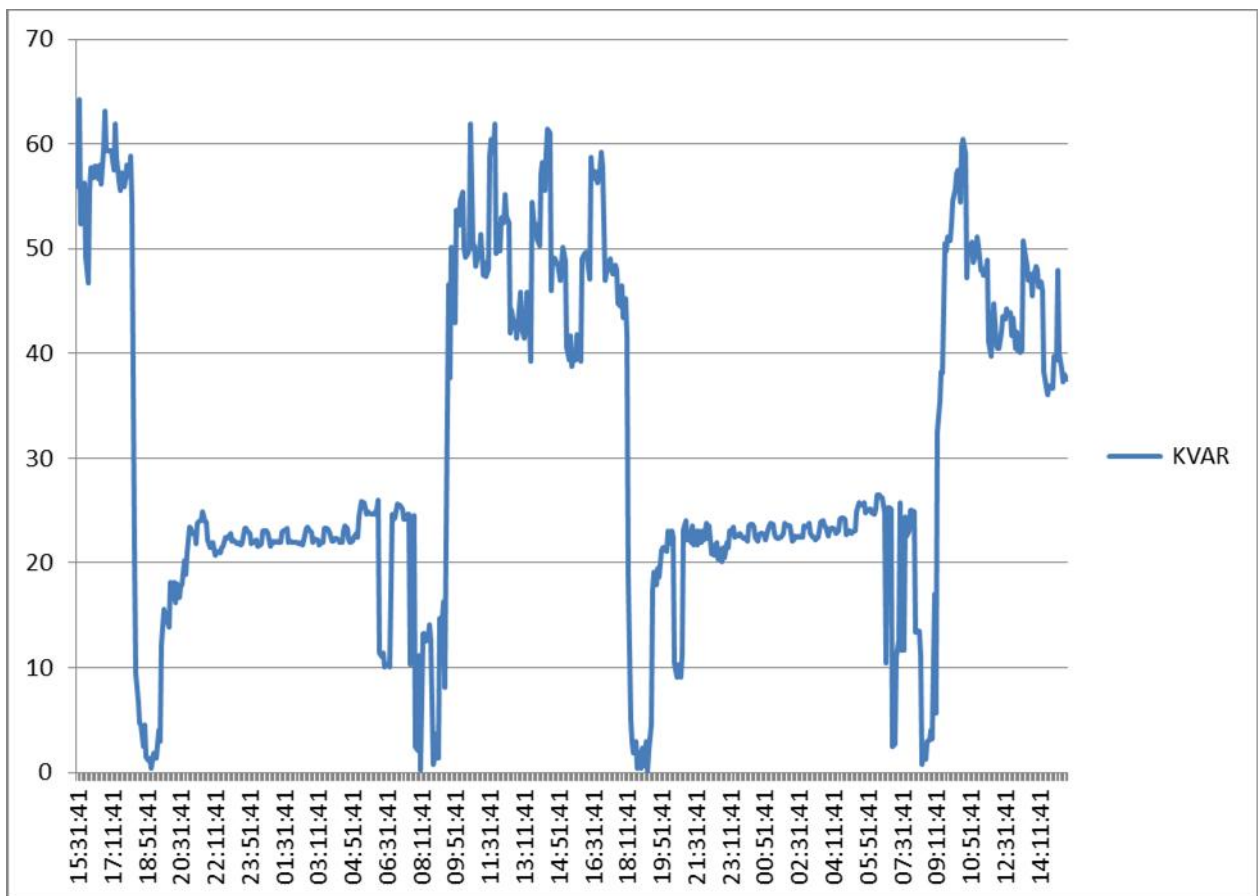
KW PATTERN -PEAK LOAD INCREASES BETWEEN 09.00HRS. - 18.00 HRS.



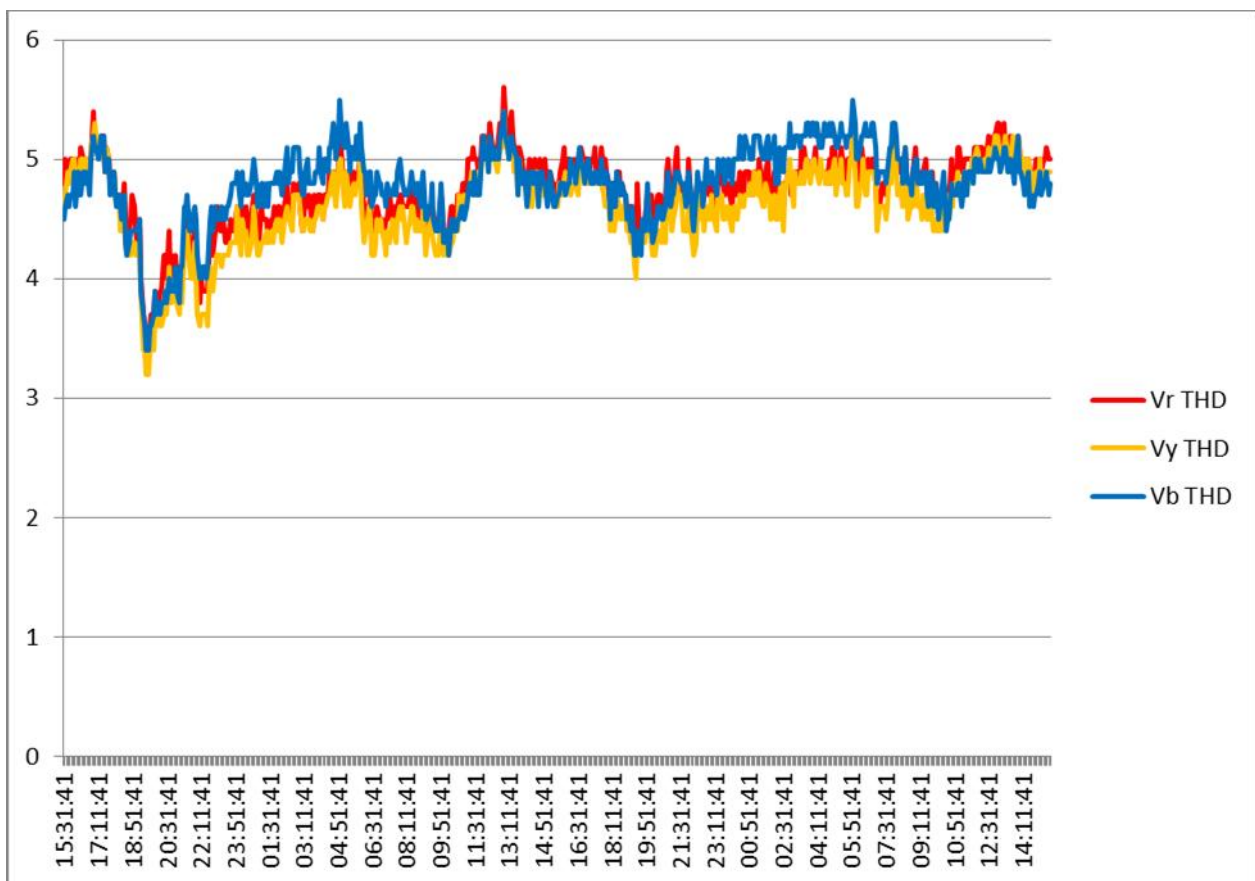
KVA PATTERN - PEAK DEMAND ALMOST SAME AS THAT OF LOAD IN KW BETWEEN 09.00HRS. - 18.00 HRS. BECAUSE OF UNITY POWER FACTOR



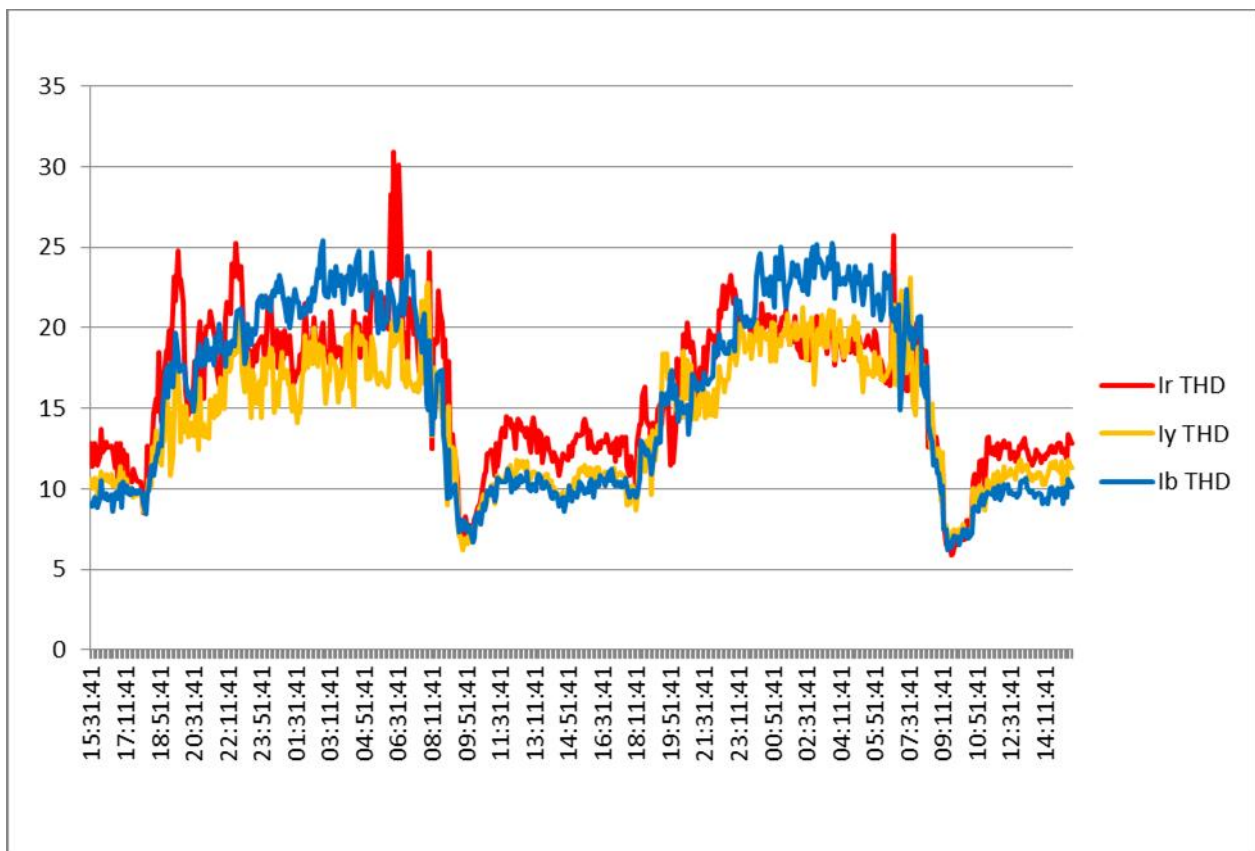
POWER FACTOR PATTERN - DURING FULL LOAD POWER FACTOR MAINTAINED NEAR UNITY, WHEN LOAD OFF POWER FACTOR DROPPED.



KVAR PATTERN -DURING FULL LOAD POWER FACTOR SHORTFALL FOUND



% (V) THD PATTERN - HARMONICS EXCEEDS THE IEEE LIMITS



% (I) THD PATTERN - HARMONICS EXCEEDS THE IEEE LIMITS

PROJECTED RETURN ON INVESTMENT

(Considering Min. 8 % saving)

Ref. BILL FOR THE MONTH OF MAY- 2015

Total Units consumed in Month (May.2015)	= 59,600 Units
Current months Bill	= Rs. 638,419 /-
Unit rate (638,419 / 59,600)	= Rs. 10.7 per Unit
Min. No. of Units saved per (8%) Month	= 4,768 Approx.
Savings per Month (4,768 Units * Rs. 10.7)	= Rs 51,018/- Approx.
(After installation of Energy saver) Rs. Invested for Installation of Energy Saver	= Rs.16,20,000 / -
Payback in Months = Rs. Invested / Min. saving per month = 16,20,000 / 51,018	= 32 Months Approx
Min. Saving (8 %) per Annum	= Rs. 51,018 *12 = Rs. 612,216 /-

Projected Annual saving in Rs (Lakhs)				
% saving	8 %	10 %	12 %	15 %
Amount(Lakhs)	6.12	7.65	9.18	11.47
Payback(Months)	32	25	21	17

ENERGY SAVER OFFERED 360 KVA, 3 PH., 415VAC,

Note- KVA ratings offered are totally on the basis of loading through Electricity bills referred by us. Any additional increase in load will change KVA ratings OF Energy Saver.

ELECTRICITY WASTAGE TO ENERGY SAVING OPPORTUNITY

Government of Gujarat Roads & Building Department,
Kuber Bhavan, Vadodara, Gujarat

Location	- Executive Engineer (ELE. S/D) (Kuber Bhavan) Baroda
Type of entity	- Government of Gujarat Roads & Building Department
Contract Demand KVA	- 300KVA (Transformer 500KVA*2)
Full load working Hrs.	- 8.00 Hrs. - 18.00 Hrs.
Harmonics Mitigation Method	- Installation of Passive Harmonics Filter
Load & Monitoring	- By GPRS based Online Data Monitoring
Energy Saving Established	- Monthly Bills comparison Last Year vs This year
Harmonics Difference	- Harmonics filter Save & Bypass % THD(I) reading
Energy Saving Opportunity	- Reference Monthly Electricity Bills Reduction

COST BENEFIT ANALYSIS

COMPARISION OF MONTHLY ELECTRICITY BILL (SEPT 2017 Vs 2018)				
SR.NO	PARAMETER	MONTH OF SEP-17	MONTH OF SEP-18	DIFF
1	KWH CONSUMPTION (UNITS)	51,008	43,372	7,636
2	MAX MD (KVA)	286	242	44
3	CURRENT MONTH ELECTRICITY BILL AMOUNT (A)	3,36,603	2,84,209	52,394
4	ADDITIONAL BENEFIT	44 KVA MD *Rs.150 per KVA		6,600

TOTAL MONTHLY AVERAGE SAVING IN RS. = 52,394+6,600 = Rs. 58,994
YEARLY PROJECTED SAVING IN RS. = 58,994*12 = Rs. 707,928

ELECTRICITY BILL KWH & MD (KVA) DIFFERENCE							
MODE	SR. NO.	MONTH	KWH	CURRENT MONTH BILL (RS.)	UNIT RATE	PF	MD (KVA)
BEFORE INSTALLATION OF ENERGY SAVER							
BYPASS	1	May-18	54,428	3,52,814	6.5	0.944	289
	2	Jun-18	56,324	3,72,419	6.6	0.959	315
	3	Jul-18	54,700	3,59,203	6.6	0.945	306
Average			55,151				303
AFTER INSTALLATION OF ENERGY SAVER							
SAVE	4	Aug-18	46,920	3,04,352	6.5	0.950	251
	5	Sep-18	43,372	2,84,209	6.6	0.951	242
	6	Oct-18	42,268	2,03,758	6.6	0.95	241
Average			44,186	2,94,281			245
KWH REDUCTION IN UNITS			10,965	DEMAND REDUCTION PER MONTH (KVA)			58

Advantages and Benefits

ENERGY SAVER WITH HARMONICS MITIGATION

- 1) Reduction in Electricity Bill by virtue of realistic Energy saving.
- 2) Safeguards sensitive devices from spikes and transients.
- 3) Avoid Voltage & Current unbalance.
- 4) Prevents premature failure of switchgears.
- 5) Reduces heating of Transformers/switchgears/ cables etc.
- 6) Reduction in transformer burden and reactive / active power losses.
- 7) Reduction in Earthing related issues.
- 8) Reduction in Neutral related issues.
- 9) Maintain IEEE standard for Harmonics free environment.
- 10) Maintain Voltage and current individual and Total Harmonics distortion.
- 11) Avoid nuisance tripping of MCB/MCCB/Fuses etc.
- 12) Reduces load side Triplen Harmonics & % THD.
- 13) Support in PF improvement near unity.
- 14) Support in Demand KVA reduction.
- 15) Support for preventive maintenance.
- 16) Reduction in Electrical breakdown and maintenance.
- 17) Support for High efficiency equipment / lamps life long.
- 18) Ready for upcoming Harmonics standards by Electricity board.
- 19) Self-life more than 15 years.
- 20) No AMC required.
- 21) Load side Passive Harmonics Filter Reduces.
 - Distribution losses
 - Transformer losses
 - Possibility if fire due to cable heat
- 22) Efficiency more than 99.6 % ensures no losses.

Projected Annual saving in Rs (Lakhs)				
% saving	8 %	10 %	12 %	15 %
Amount(Lakhs)	6.12	7.65	9.18	11.47
Payback(Months)	32	25	21	17

Actual Annual saving in Rs (Lakhs)	
Average KWh saving per Month = 10,965*6.6 = 72,369 KWH	
Average KWh saving per ANNUM = 72,369*12 = 868,428 KWH	
% saving	11 %
Amount(Lakhs)	8.68
Payback(Months)	23