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A JOURNAL DEVOTED TO RAILWAY ELECTRICAL ENGINEERING

भारतीय रेल विद्युत इंजीनियरिंग संस्थान, नासिक रोड

India Railways Institute of Electrical Engineering, Nasik Road

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भारतीय रेल विद्युत विभाग की पूर्ण रूप से एकमात्र तकनीकी पत्रिका
(त्रैमासिक)

(रेल विद्युत कार्यालयो मे निशुःल्क वितरण हेतु)

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संरक्षक
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निदेशक

कार्यकारी संपादक
श्री. एच. आर. खांडेकर
व. प्राध्यापक (टीएल ॲण्ड एसी)

सह-संपादक
श्री वसंत कुमारन
सहा.ग्रं. एवं सू.अधिकारी

लेखों में दिये गये विचार लेखक के हैं, इरीन के नहीं।

VIEWS EXPRESSED IN ARTICLES ARE OF AUTHORS, NOT OF IRIEEN

PLEASE ACKNOWLEDGE AFTER RECEIVING THE JOURNAL

FRONT COVER : **IRIEEN MAIN BUILDING**

संपादकीय

इरीन संस्थान द्वारा प्रकाशित इस अंक में निम्न विषयों पर तकनीकी जानकारी प्रस्तुत की जा रही है ।

1. प्रथम लेख में ''**ENERGY AUDIT OF BOREWELL PUMP INSTALLATION IN IRIEEN AND PUMP AUTOMATION**''से संबंधित जानकारी उपलब्ध कराई गयी है ।
2. द्वितीय लेख में ''**INTRODUCTION OF LC FILTERS IN AIR CONDITIONED (SELF GENERATION) COACHES**''में रेलवे के वातानुकूलित कोचस् में एल सी फिल्टर (स्वयं उत्पादित) का परिचय पर विशेष जानकारी उपलब्ध कराई गयी है ।
3. तृतीय लेख में -''**HARNESSING GREEN ENERGY & ITS GRID CONNECTIVITY**''भारतीय रेलवें में ग्रिड कनेक्टिविटी में हरित ऊर्जा के प्रयोग पर जानकारी दी है ।
4. चतुर्थ लेख में –"**PROVISION OF V-BELTS ON WASHING/STABLING LINE-AN INNOVATIVE APPROACH.**" एक नवीन दृष्टिकोण के अंतर्गत वासिंग/स्टेबलिंग लाइन में वी-बेल्ट के प्रयोग की जानकारी दी गयी है ।
5. "यूनिकोड एक परिचय"- से संबंधित जानकारी दी गई है ,जो कि तकनीकी क्षेत्र में हिंदी को बढ़ावा देने के लिए महत्वपूर्ण है ।

हम आशा करते है कि इरीन जर्नल में प्रकाशित लेख आपके ज्ञानवर्धन के साथ ही साथ नयी जानकारी से भी रूबरु करायेंगे ।

हम हमेशा की तरह आपके विचार एवं बहुमूल्य सुझावों का इंतजार करेंगे ।



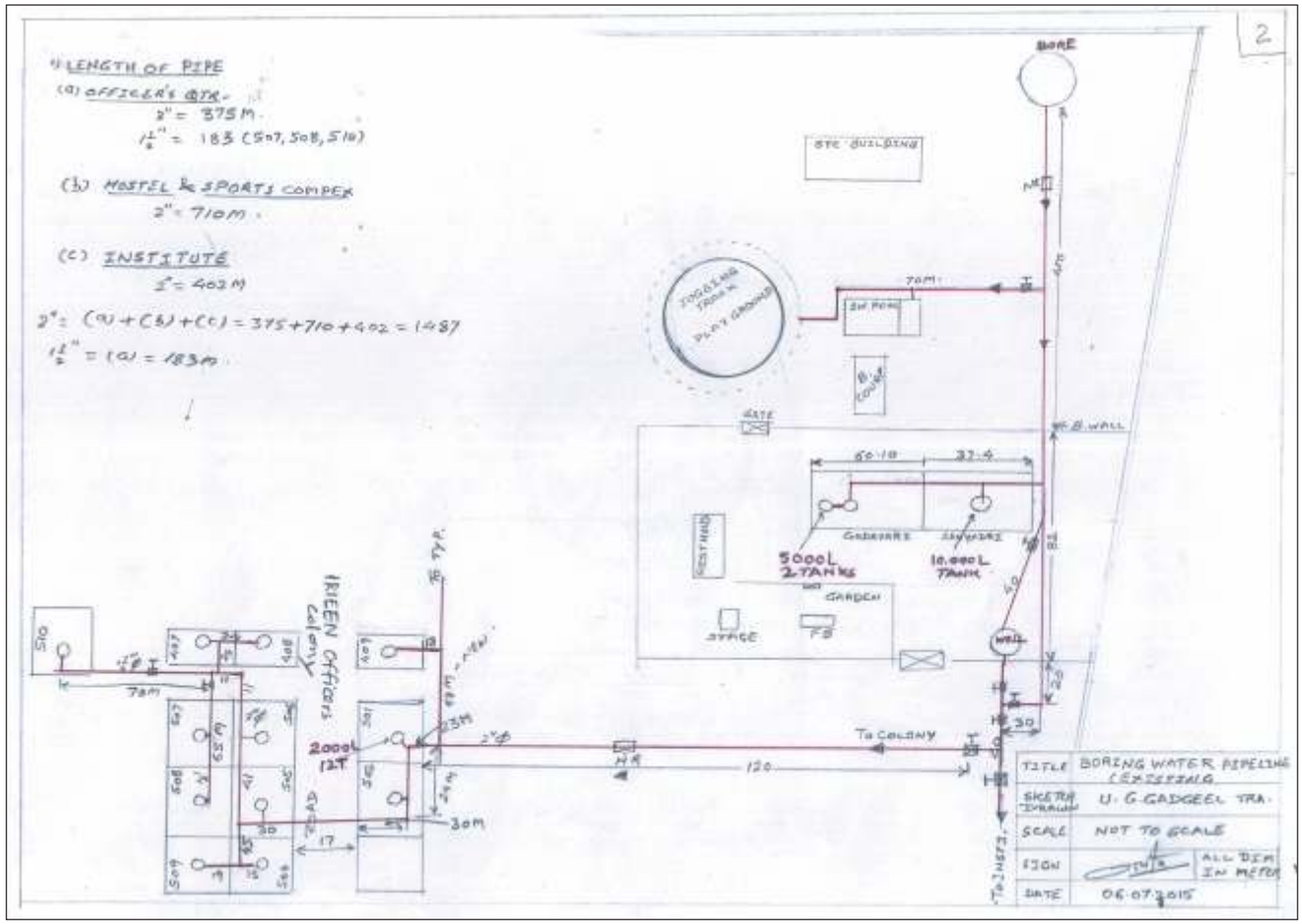
- संपादक

ENERGY AUDIT OF BOREWELL PUMP INSTALLATION IN IRIEEN AND PUMP AUTOMATION ★★

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DIRECTOR
IRIEEN, Nasik Road

1.1 Introduction

A vertical multistage submersible pump installed in a bore-well in IRIEEN compound supplies most of the water requirement of IRIEEN campus except drinking water requirement, which is supplied through Traction machine workshop (TMW) pipelines. IRIEEN campus consists of Administrative Block, Electronic block, Office garden, IRIEEN Probationary Officers Hostel and Officer's colony.The existing bore-well pump network is illustrated below as a schematic line diagram.



★★[The Project case study report , carried out in association with IRSEE (Probationers)
1) Abhishek Verma 2) Kaveri Gupta 3) Ankita Shrivastava & 4) Prashant Joshi]

The existing borewell submersible pump is connected through a 2" GI pipe network , which is more than 22 years old. The pump is connected through non return valve and control isolating wheel valves to the old and new probationary officers hostel. Through isolating valves as shown the IRIEEN administrative Block cum electronic Bloc is fed through 2" pipelines. The officer's colony is fed through suitable valves situated near the security kiosk outside the Hostel gate . The valves are operated in such a way that at a time only either a) Hostel tanks are supplied b) Irieen administrative block cum electronic Blocks tanks are supplied c) IRIEEN officers colony is supplied. The irieen office garden is supplied through the overflown water from the IRIEEN administrative block tank which is collected in the IRIEEN office underground garden tank. This method was resulting in loss of water and pumping water for more time and making it overflow and collect it in the underground office garden tank. Obviously this method was also resulting in loss of Energy. The following are details of the water collection tanks.

HOSTEL

The Old Officers Hostel (Sahyadri) has one 10,000 litreTank.New Hostel (Godavari) has 2 Nos of 5000 litre tanks. These two overhead tanks cater to the water requirement of the officers hostel as fed from the borewell pump. It may be noted that this water is not for drinking purposes, but for all remaining requirements of water.

IRIEEN & ELECTRONICS BLOCKS

The IRIEEN Administrative Block has one 10,000 litre tank. The Electronic block has a separate 10,000 Litre tank. As earlier mentioned above, the overflown water from the IRIEEN administrative block tank is collected in the IRIEEN office garden underground tank and the underground tank water is used for watering of the lawn and office garden by means of sprinklers and through hoses.

RAILWAY COLONY

The water requirement of the officers colony excluding the drinking water is fully supplied by the bore-well submersible pump. There are 12 officers quarters. Each quarter has two Nos 1000 litre overhead tanks.

ENERGY AUDIT

Energy audit of the pump installation was conducted. The following aspects were considered.

The borewell size is 6" diameter and a vertical submersible borewell pump has been recently installed in 2014 and is a 5 star rated pump of KSB make model number (UQD 212 + UMA 150 (Motor). The submersible pump of 10 stages have been selected considering the design depth of the borewell pump and the yield(Discharge) available from the bore-well.

The GI pipes of approximate length of 2500 meters are very old , more than 22 years old and have outlived their codal life. These pipes are expected to be totally corroded and the lesser than anticipated flow was likely to be due to the increased friction head. This will be clear when the pump flow readings are observed after necessary measurements. The associated control valves, non-return valves were also 20years old and were contributing to the loss of head and consequent increase in Energy consumption.

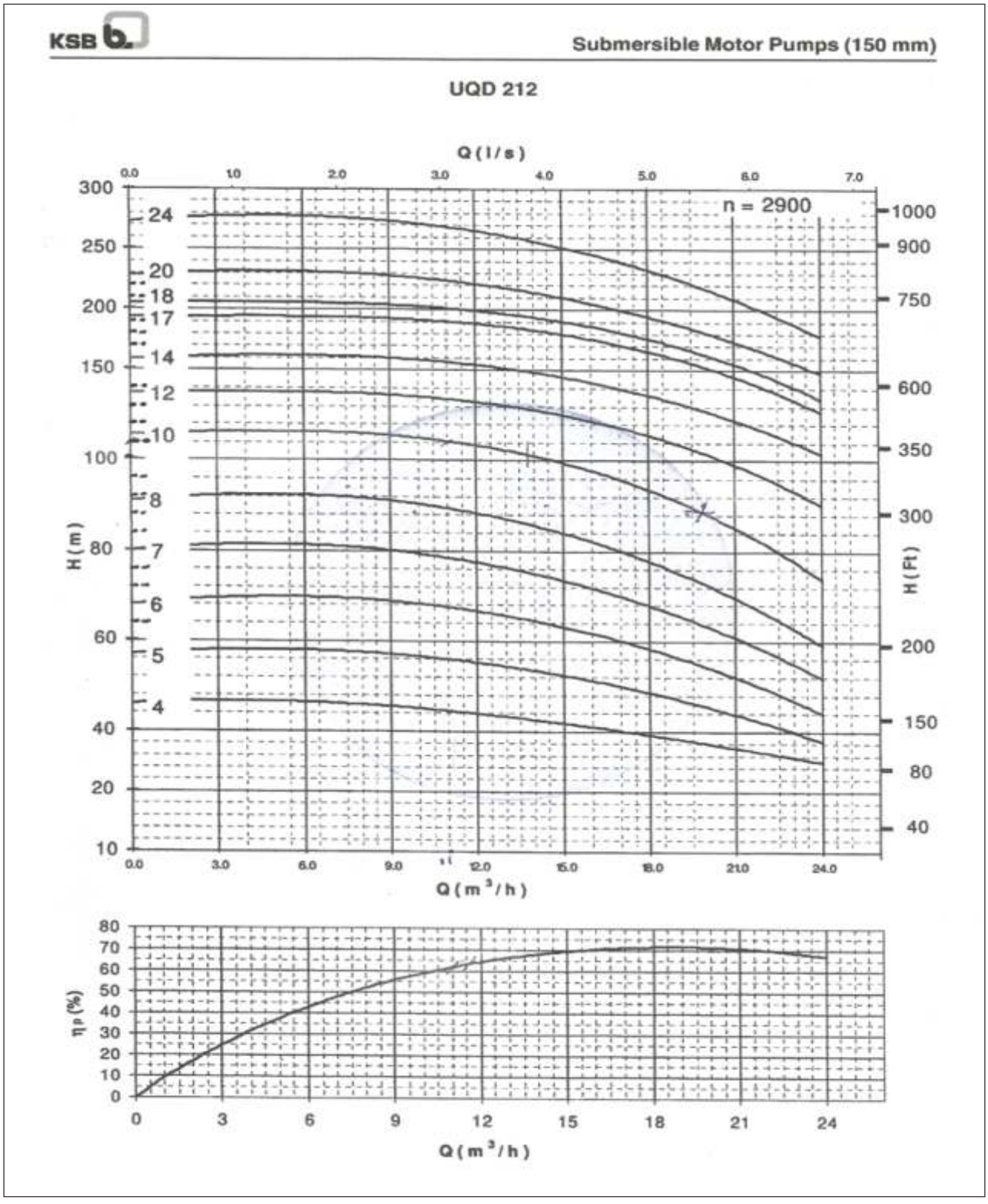
The pump flow Vs Head characteristics are as follows

Submersible Motor Pumpsets

KSB

For 150 mm (6") Borewell Submersible Pumpsets : UQD 212 + UMA 150

Pump type	Motor type	Motor rating		Cable size	Starting method	Rated current	Overall length	Weight approx.		Discharge							
UQD 212 /	UMA I 150	kW	HP	mm²		A	mm	kg.	m³/hr.	0	10	12	16	18	20	22	24
									lpm	0	167	200	267	300	333	367	400
3	2 / 22	2.20	3.00	1.5	DOL	5.8	1138	57	Head (m)	34	34	33	31	29	27	25	23
4	3 / 22	3.70	5.00	1.5	DOL	8.4	1270	63		46	45	44	41	39	36	33	30
5	3 / 22	3.70	5.00	1.5	DOL	8.4	1300	65		57	56	56	51	49	45	42	37
6	4 / 22	4.50	6.00	2.5	DOL	10.0	1390	65		68	68	67	62	58	54	50	44
6	6 / 22	5.50	7.50	2.5	DOL	11.8	1430	68		68	68	67	62	58	54	50	44
6	6 / 22	5.50	7.50	1.5	S/D	11.8	1430	68		68	68	67	62	58	54	50	44
7	6 / 22	5.50	7.50	2.5	DOL	11.8	1480	70		80	79	78	72	68	63	58	52
7	6 / 22	5.50	7.50	1.5	S/D	11.8	1480	70		80	79	78	72	68	63	58	52
8	8 / 22	7.50	10.00	2.5	S/D	15.6	1500	75		91	90	89	82	76	72	67	59
10	8 / 22	7.50	10.00	2.5	S/D	15.6	1600	79		114	113	111	103	97	91	84	74
12	9 / 22	9.30	12.50	2.5	S/D	18.5	1810	87		137	135	133	123	116	109	100	89
14	13 / 22	11.00	15.00	2.5	S/D	22.0	1940	94		159	158	155	144	136	127	117	104
UQD 212 /	UMA H 150																
17	16 / 22	13.00	17.50	2.5	S/D	30.0	2185	111		194	192	189	174	165	154	142	126
18	16 / 22	13.00	17.50	2.5	S/D	30.0	2235	113		205	203	200	185	175	163	150	133
18	21 / 22	15.00	20.00	4.0	S/D	33.0	2295	114		205	203	200	185	175	163	150	133
20	21 / 22	15.00	20.00	4.0	S/D	33.0	2395	118		228	226	222	205	194	181	167	148
24	24 / 22	18.50	25.00	4.0	S/D	42.0	2665	134		273	271	266	246	233	217	200	178


KSB
Submersible Motor Pumps (150 mm)
UQD 212
Q (l/s)
0.0 1.0 2.0 3.0 4.0 5.0 6.0 7.0
n = 2900
24
20
18
17
14
12
10
8
7
6
5
4
300 250 200 150 100 80 60 40 20 10
H (m)
1000 900 750 600 350 300 200 150 80 40
H (Ft)
0.0 3.0 6.0 9.0 12.0 15.0 18.0 21.0 24.0
Q (m³/h)
80 70 60 50 40 30 20 10 0
ηp (%)
0 3 6 9 12 15 18 21 24
Q (m³/h)

In the bore-well pumping system there was no automation, but pumping was carried out as per a time table schedule,which is indicated below.

Sr No	Time From	Time to	Location	Pumping hours
1	05.00	06.00	OFFICERS HOSTEL	1
2	06.00	07.00	COLONY	1
3	07.00	09.00	IRIEEN	2
4	09.00	11.00	REST	---------
5	11.00	12.00	OFFICERS HOSTEL	1
6	12.00	13.00	COLONY	1
7	13.00	16.00	IRIEEN	3
8	16.00	17.30	REST	----------
9	17.30	18.30	COLONY	1
10	18.30	20.00	IRIEEN	1.5
11	20.00	22.00	OFFICERS HOSTEL	2
12	22.00	05.00	REST	--------
			TOTAL	13.5

A total of about 13.5 hours of pumping was carried out as per the time table. Many times the tanks were becoming full in the stipulated allocated timings. In the Officers Hostel tanks were provided with float ball valve which was shutting up the supply when tank is full, but pump used to run with throttled type of flow wasting Power. The IRIEEN administrative block tank was not provided with float valve but the excess over flow water after filling up the over head tank was made to flow through pipe to the underground tank. From the underground tank another small pump was pumping water to the sprinklers in the office garden.

Detailed pump performance testing and audit was conducted at the schedule timings of pump working. Only typical performance testing of one set each for the OFFICERS HOSTEL, IRIEEN OFFICE BLOCK and IRIEEN COLONY is tabulated

In the bore-well pumping system there was no automation, but pumping was carried out as per a time table schedule,which is indicated below.

Sr No	Time	Flow m^3/hr	Pressure Kg/m^2 recorded	Pressure Of pump in m as per chart	KW	P.F.	Hydraulic power	Pump efficiency	Overall efficiency
1	20.00hrs	8.45	9.5	113	5.93	0.75	2.60	55%	43.8%
2	20.15	11.5	9.1	110	6.88	0.79	3.45	62.5%	50.1%
3	20.30	11.2	9.1	110	6.84	0.79	3.35	62%	49%

The measurements were taken during the 20.00 to 22.00 hours slot in the schedule of pumping water to the officers Hostel on 21/5/15. The pressure gauge readings have been corrected after adjusting a zero error of 0.7 .

The borewell pump which is supplying water as per schedule to the officers colony, officers hostel and IRIEEN office building inclusive of electronics block has been recently installed in the year 2014 after repeated failures of the old pump. The pump is of KSB make 10 HP (7.5 KW) vertical submersible pump with 10 stages . The model No of the pump is UQD 212 suitable for 6 inch borewell and the motor is UMA 150. The pump performance characteristic curves are shown above. From the curves, it can be seen that this pump works in the Best efficiency regions between 13 m^3 / hr to 21m^3/hr over a long band of discharge with Hydraulic pump efficiency of about 66% at 13m3/hr discharge rate, reaching an efficiency of 72% at 18 m^3/hr flow rate.

From the measurements taken during the pump audit of the Hostel, the hydraulic efficiency of the pump is calculated from the standard formula for hydraulic power calculation as

Power (Hydraulic) = mxgxh = Q x d x g x h watts,= Qxdxgxh / 1000 (KW)

Where Q is in metres/sec, d = 1000 kg/m^3, g = 9.81 and h = the pump head as extrapolated from the pump performance curve in metres of water.

Power (KW) has been calculated as above and mentioned in the table as 2.60,3.45 and 3.35 KW respectively for the three readings above. The efficiency (Hydraulic) from the curve is 55%, 62.5% and 62% respectively for the three readings taken. And the overall efficiency as per power measurement is 43.8%,50.1% and 49 % respectively. It can be observed that the pump is working below the BEP (Best efficiency points of 66% through 72% of the pump). The overall efficiency is product of motor efficiency and hydraulic efficiency. From the readings motor efficiencies as per actual condition works out to 79.6%, 80.1% and 79.1% respectively.

PUMP AUDIT AND ENERGY MEASUREMENTS FOR OFFICERS COLONY

The measurements were taken between 18.00 hours to 19.00 hours for the colony

Sr No	Time in hrs	Flow in m3/hr	Pressure in kg/m2 recorded	Pressure of pump in metre as per chart	K.W. Measured by power analyser	P.F.	Hydraulic power as per calculation K.W	Pump efficiency hydraulic as per chart	Over all efficiency
1	18.00	9.72	10	113	6.32	0.75	2.98	58 %	47.2
2	18.15	10.63	9.7	112	6.57	0.76	3.24	61%	49.3
3	18.45	10.51	9.7	112	6.57	0.77	3.21	60%	49.2
4	19.00	10.43	9.8	112	6.48	0.75	3.18	60%	49.1

The hydraulic power has been calculated based on the standard formula as done for the pumping case earlier. The hydraulic pump efficiency is taken from the chart of the pump model and the overall efficiency is calculated from the hydraulic power and input power absorbed.

The pipes to the colony comprises of long network of very old pipes more than 22 years and friction head is high due to rust deposition andsedimentation in the pipes, old valves, elbows,Tees and other pipe joints which are also very old. As far as colony is concerned the flow varies / fluctuates depending upon the status of the water level at the smaller 1000 litre tanks, provided in the individual officers bungalows. In this case hydraulic efficiency is 58%,61%,60%,60% for the flow rates of 9.72 m^3/hr, 10.63 m^3/hr, 10.51 m^3/hr and10.43 m^3/hr respectively. In this case also the pump operation falls below the Best efficiency band as can be observed.

PUMP AUDIT MEASUREMENTS DURING PUMPING WATER TO IRIEEN ADMINISTRATIVE AND ELECTRONIC BLOCK

The measurements were taken between 7.00 to 8.00 hours when water was pumped to the IRIEEN Administrative Block

Sr No	Time in Hours	Flow in m^3/Hr	Pressure Measured in Kg/m^2	Pressure head in metres at pump discharge at chart	K.W. Input	P.F	Hydraulic Power as per calculation	Hydraulic pump efficiency as per chart	Overall efficiency of the pump
1	7.00	10.15	9.3	112.5	6.48	0.78	3.11	58%	47.99 %
2	7.15	10.28	9.3	112	6.39	0.79	3.13	59%	48.9%
3	7.30	10.19	9.3	112.5	6.51	0.79	3.12	58.5%	47.9%
4	7.45	10.38	9.3	112	6.47	0.79	3.16	59.5%	48.9%

The hydraulic pump efficiency from the curves are 58%,59%,58.5% and 59.5% respectively for the flow rates of 10.15 m^3/hr, 10.28 m^3/hr, 10.19 m^3/hr and 10.38m3/hr. The efficiencies are much less than the efficiencies of the band from 66% to 72% (BEP) of the pump.

Energy Consumption in the system

A separate Energy (KWH) meter has been installed exclusively for the pump circuit in the month of September, so that the energy consumed by the pumping system is recorded on a daily basis from the month of September onwards. The recorded values are tabulated below on a monthly basis. There is variation in energy consumption mainly in the officer's hostel, where the water requirement depends on the number of trainees, whereas consumption of the IRIEEN office and colony are largely independent on the number of trainees. Hence a figure of average Energy

consumption per day on a monthly basis is considered. However pumping was being carried out as per the pumping schedule earlier given for a 13 hr to 13.5 hour time period without any active feedback of the Tank water level sensing and control. Hence the pumping earlier done was not depending much on the exact water requirement in Hostel (Number of Trainees) as pumping hours were fixed. The extract of Pump Energy measurement reading is given below

DATE	FROM-TO DATE	METER READING	NUMBER OF DAYS	TOTAL CONSUMPTION (KWH)	AVERAGE CONSUMPTION (KWH)
1-10-15		15460.5	------		
31-10-15	1-10-15 TO 31-10-15	17870	30	2409.5	80.3

The pump energy consumption was measured for one month with the pre-audit pumping system and the energy consumed was 80.3 units. As mentioned earlier the pumping system was based on the 13 .5 hour schedule. From 4-12-2015 onwards, the new pumping system with replaced pipes and valves have commenced operation.

Recommendation of the Energy Audit

a) Since the vertical submersible pump has been installed very recently in 2014 and the pump installed is a 5star rated vertical submersible pump it has been decided to use the same pump for the pumping system. Being new, the pumps efficiency and head flow characteristics is considered as the same as given by the pump manufacturers charts and characteristic curves displayed above.

b) The Energy audit recommends to replace the 22 year oldcorroded pipes,all old joints comprising of elbows, tees, control valves with new ones with a view to reduce frictional head of the system in all cases of the pump working and thereby increase the flow rates closer to the band of Best efficiency flow rates and hence improve the efficiency of the pump working. From the curves,it can be seen that this pump works in the Best efficiency regions between 13 m^3/hr to 21m^3/hr over a long band of discharge with Hydraulic pump efficiency of about 66% at 13m^3/hr discharge rate, reaching an efficiency of 72% at 18 m^3/hr flow rate.

c) During the Energy Audit, it is observed that the existing pumping system has many redundant valves giving rise to increased friction losses. There were a total of 44 valves comprising of Non return valve-3 nos, wheel valve 20 nos,40 mm valve 6 nos and 25mm valve 15 nos. After detailed survey and optimization based on bare minimum requirement, Energy audit recommends to reduce the number of valves to only 28 nos, comprising of Non-return valve-3 nos, wheel valves-13 nos, and 25mm valve 12 nos. Hence only 28 valves are projected to be

implemented in the new system which will reduce the frictional losses to that extent.

d) It is earlier mentioned that the pump schedule is for 13.5 hr period. The office garden tank presently was filled up by overflow water from the Administrative block overhead 10,000 litretank. Hence the recommendation of the audit is to have separate pumping schedule for the garden tank at ground level by making separate pumping branch to the tank directly and do away with the overflowing water.

e) In the earlier existing system the pumping is based on schedule. The tank gets filled up most of the time before the closing time of the pump schedule and the float ball valve provided in the overhead tanks of Hostel block, Administrative block and Electronic block was controlling wastage of water, but the pump continues to run with throttling effect, even after the tanks are full till the next time schedule. Hence substantial Energy is wasted also , since there is no active control on the overhead tank level status. Hence the Audit recommends automation/ semi automation of the pumping system.

IMPLEMENTATION OF ENERGY AUDIT MEASURES

In IRIEEN full automation of the valves with servo motor control is a costly proposition with added future maintenance, hence semi automation has been proposed for implementation.

The entire system of pipes, Control valves, non-return valves and all joints like Tees, elbows have been totally replaced by new ones. The number of valves have been reduced from 44 nos to 28 nos. The garden underground tank has been given a separate connection through control valve with the idea of giving a separate pumping schedule time slot for it. Also the number of valves in the various pump circuits have been reduced to the bare minimum. This is expected to reduce the friction head drastically resulting in much better discharge rate.

The semi-automation of the pumping system have been implemented. The various tanks of a) Old Hostel tank,b) New Hostel tank,c) Irieenadministrative block tank, d) Electronic block tank, e) underground tank i.e. Each one of the six tanks have been provided with a floating valve equipment with sensor. The water level at about 40% is considered as lower level and water level at 90% is considered as upper level or full level. Through GPRS wireless communication the status of the tanks are displayed in the room at the hostel security gate.

The indication of yellow or green led lights in the indicator board informs the status of the various water tanks. When water is pumped up to the higher i.e90% level, the green indication is displayed, but the green indication continues till the water level falls and goes below the lower level (40%), when the yellow indication is displayed. The Instructions are clearly given to the security staff to start pumping in the schedule time slot only if the indication is yellow. The pumping can be turned on and off by the power control switch provided at the Hostel entrance gate. The staff has to close/open the proper control valves, depending on where the water is to be pumped i.e, Hostel, IRIEEN office, underground tank or Irieen colony. When the

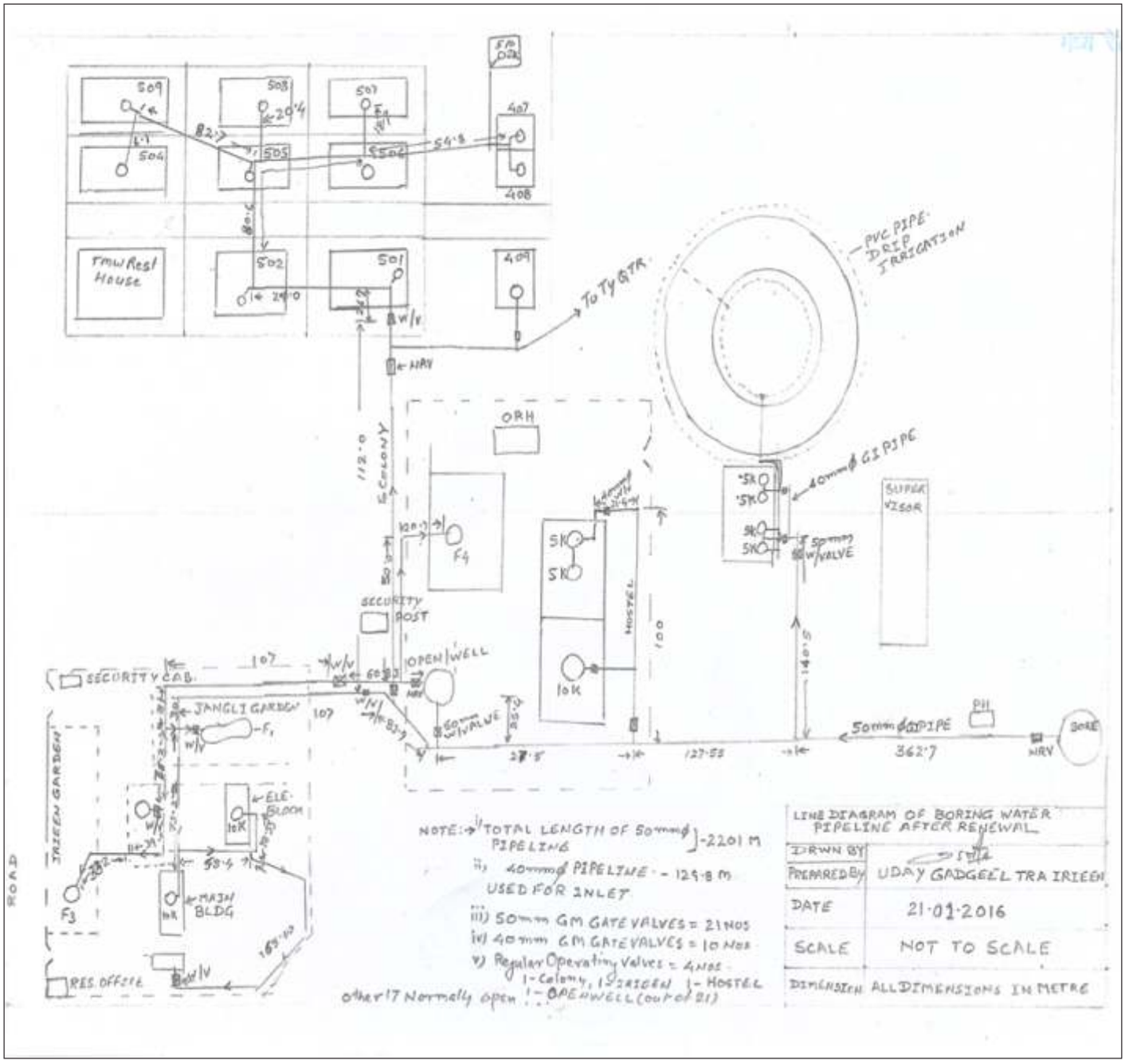
indication becomes green, immediately the security staff has to stop the pump thus controlling the flow .The revised time schedule with instructions is as follows.

SR NO	TIME FROM	TIME TO	DESTINATION	DETAILED REMARKS/INSTRUCTIONS
1	5.00	6.00	HOSTEL	Keep open valve of officers hostel only. If indication is yellow only then pump till green indication comes. If no green indication, pump till schedule closing time.
2	6.00	7.00	COLONY	Keep open the colony valve only. Start pumping at schedule time and close at schedule time
3	7.30	8.30	IRIEEN(Main and Electronic Block)	Keep valve for Irieenonly.Start pumping only if yellow indication exists. Pump till the green indication is displayed or till close whichever is earlier.
4	8.30	9.00	IRIEEN (garden underground tank)	Keep valve for Irieenonly.Open valve of underground tank. Start pumping only if yellow indic ation exists. Pump till the green indication is displayed or till close whichever is earlier.
5	9.00	11.00	REST	Keep the pump motor off
6	11.00	12.00	HOSTEL	Keep open valve of officers hostel only. If indication is yellow only then pump till green indication comes. If no green indication, pump till schedule closing time.
7	12.00	12.30	COLONY	Keep open the colony valve only. Start pumping at schedule time and close at schedule time
8	12.30	13.30	IRIEEN(Main and Electronic Block)	Keep open valve for Irieen only. Start pumping only if yellow indication exists. Pump till the green indication is displayed or till close whichever is earlier.
9	13.30	17.30	REST	Keep the pump motor off
10	17.30	18.30	COLONY	Keep open the colony valve only. Start pumping at schedule time and close at schedule time

11	18.30	19.30	IRIEEN (Main and Electronic Block)	Keep valve for Irieen only. Start pumping only if yellow indication exists. Pump till the green indication is displayed or till close whichever is earlier
12	19.30	20.00	IRIEEN (garden underground tank	Keep open valve for Irieenonly.Open valve of underground tank. Start pumping only if yellow indic ation exists. Pump till the green indication is displayed or till close whichever is earlier
13	20.00	21.00	HOSTEL	Keep open valve of officers hostel only. If indication is yellow only then pump till green indication comes. If no green indication, pump till schedule closing time
14	21.00	05.00	REST	Keep the pump motor off



The Schematic diagram of the pumping system indicating the detailed layout after the Energy audit measures are implemented is given below.



PUMP ENERGY MEASUREMENTS AFTER IMPLEMENTATION OF ENERGY AUDIT

The following measurements were taken for pumping water to IRIEEN Hostel at 11.05 hours on 29/2/16. These measurements are after implementation of energy audit measures like replacement of pipes, valves and implementation of pump automation.

Sr No	Time in hrs	Flow in m^3/hr	Pressure in kg/m^2 recorded	Pressure of pump in metre as per chart	K.W. Measured by power analyser	P.F.	Hydraulic power as per calculation K.W	Pump efficiency hydraulic as per chart	Over all efficiency
1	11.05	14.8	7.6	99	7.13	0.874	3.99	69%	55.9 %
2	11.15	13.15	8.8	106	6.96	0.872	3.79	66%	54.5 %
3	11.20	12.63	9.0	108	6.87	0.86	3.71	65%	54.1 %

It can be observed that the flow rates have increased substantially from the pre-audit scenario and the hydraulic efficiencies have improved .the hydraulic efficiencies have become 69%,66% and 65% respectively for the flow rates of 14.8 m^3/hr,13.1 m^3/h, and 12.6 m^3/hr respectively. The efficiencies are close to the BEP band of 66% to 72% of the pump.

It was also seen that since the flow rates have increased and also due to implementation of pump semi automation the pumping hours for pumping to hostel has come down and the pump needs to be started only if the indication is yellow and the pump needs to be run only till the indication is green and not for the full schedule time as was being done earlier.

The following measurements were taken for pumping water to the colony.

Sr No	Time in hrs	Flow in m3/hr	Pressure in kg/m2 recorded	Pressure of pump in metre as per chart	K.W. Measured by power analyser	P.F.	Hydraulic power as per calculation K.W	Pump efficiency hydraulic as per chart	Over all efficiency
1	11.25	17.5	7.6	94	8.26	0.88	4.47	71	54.2
2	11.30	16.8	7.7	96	7.99	0.89	4.39	70	54.9
3	11.40	15.5	8.0	98	8.0	0.88	4.135	69.	52

In this case of colony water pumping, the flow rates have increased substantially from the earlier scenario. For the flow rates of 17.5 m^3/h,16.8 m^3/h and 15.5 m^3/h respectively the hydraulic efficiencies are 71%, 70% and 69% respectively, which are the Best efficiency points (BEP).

The following measurements were taken while pumping water to IRIEEN Administrative block from 12.30 to 13.30 hours.

Sr No	Time in hrs	Flow in m3/hr	Pressure in kg/m2 recorded	Pressure of pump in metre as per chart	K.W. Measured by power analyser	P.F.	Hydraulic power as per calculation K.W	Pump efficiency hydraulic as per chart	Over all efficiency
1	12.30	17.2	8.0	95	8.26	0.89	4.448	70	53.8
2	12.45	15.42	8.5	99	7.64	0.87	4.16	69	54.4
3	13.00	15.2	8.6	99	7.57	0.876	4.10	69	54.2

In this case of pumping water to the IRIEEN administrative block, the flow rates have improved. The hydraulic efficiencies are 70%, 69%,69% respectively for the flow rates of 17.2, 15.4. and 15.2 m^3/hr respectively.

Obviously the efficiencies are close to the BEP. The pumping time to the administrative block has also reduced substantially from the pre-energy audit scenario due to the increased flow rates and due to pump automation where the indication of status of water level is transmitted through LED bulb indication. The pump needs to be started, when the indication is yellow and will be put off when indication becomes green.

ENERGY MEASUREMENT AND ESTIMATION OF SAVINGS

The Energy measurements were taken by the Energy meter and the relevant extracts are tabulated as below.

DATE	FROM-TO DATE	METER READING	NUMBER OF DAYS	TOTAL CONSUMPTION (KWH)	AVERAGE CONSUMPTION (KWH)	Average number of Hostel inmates /day
4.12.15 -		20311				
17.12.15	4.12 to 17.12.15	21070	13	759	58.4	13
31.1.16	17.12.15 to 31.1.16	23961	45	2891	64.2	
29.2.16	31.1.16 to 29.2.16	25870	29	1909	65.8	66
5.3.16	29.2.16 to 5.3.16	26151	5	281	56.2	18
7.3.16		26256				
22.3.16	7.3.16 to 22.3.16 (phase ii course period)	27234	15	978	65.2	75

There is fluctuation of energy consumption per day mainly in the energy consumed by the hostel due to the fluctuation in the number of hostel inmates/persons who utilize the water for toilet, washing, dish washing etc. In the above table it is observed that average of 75 inmates /day were present in the hostel from the period of 7.3.16 to 22.3.16 which is the maximum number of Hostel inmates recorded after the new pump is installed. These are mainly the 2013 IRSEE batch probationers doing the Phase ii course. There are also some other course participants. Also there are some guests and families too. For comparison purpose the figure of 65.2 kwh/day is taken as a maximum value when the hostel is at its peak strength on an average basis. From 4.12.15 to 17.12.15, the hostel capacity was lean since there were no major courses in progress. This period was before the IRSEE 2014 batch probationers have joined. During this period the number of inmates were 18 /day and the consumption was 58.4 units

An estimation of Energy consumption is done considering the peak periods and lean periods. Thepattern of courses for the fresh year 2016-17 is assumed to be largely similar to last year 2015-16 .We consider consumption of 65.2 kwh/day for the weeks , where IRSEE probationers of two batches are present or IRSME,IRSE.IRSS,IRTS and IRSTE probationers are present .This is for 29 weeks. We consider 58.4 units/day for the remaining lean/average period which is 23 weeks. It is proposed to estimate the annual average consumption on this basis.

Annual average consumption works out to [(65.2 x 29) + (58.4 x 23)] / 52, which works out to 62.2 kwh/day.

The above assessment is approximate and accurate assessment will be available when the energy consumption for a period of one year with the post audit scenario is actually measured.

In the pre-Energy audit scenario the average consumption was estimated to be 80.3 kwh/day. Hence average energy savings per day can be considered as 80.3 – 62.2 = 18.1 units. We consider 18 units as the average energy savings on a daily basis. For the entire year period of 365 days the savings works out to 365 x 18 = 6570units.

CONCLUSION

The average of the unit chargesfor the last six months from October 2015 to March 2016 being paid by IRIEEN is Rs. 9.84/unit. Hence the average estimated annual savings after the implementation of Energy audit is Rs. 64,648. The incidental unit rate levied by TMW on IRIEEN has been taken as the tariff. There is variation in the tariff on monthly basisde pending on various factors. In addition to the energy savings, there is reduction in quantity of water used, since in the post energy audit scenario, there is positive control on pumping due to the tank status level indications and there is no water wastage due to over-flowing.

IRIEEN JOURNAL

INTRODUCTION OF LC FILTERS IN AIR CONDITIONED (SELF GENERATION) COACHES

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CEE / QC /ICF

(Based on Project Report)

1.0 Introduction of LC Filter in Air conditioned (self generated) coaches.

In self Generation AC coaches of Indian Railways 2KVA, 415/190V 3 phase transformer used for Mobile/Laptop charging sockets and compartment fans. The total fan load in the coach and the coach socket with 40W lamp comes less than 1KVA. But 2KVA transformer burning was reported by the zonal railways.

Supply to this transformer is taken from 25KVA PWM inverter, Output of the 2 KVA transformer 110V AC PWM, supplied to the fan loads and sockets.

In recent years frequent complaints were being received from railways regarding burning/overheating of 2KVA tr. During detail study, it was initially suspected that the transformer could be under rated and in one power panel it was tested with full 2KVA load at ICF . The temperature rise of the transformer was found within limits. It was again tested in simulated coach conditions by putting 40W lamp in each socket with all the fans ON . There was no abnormal temperature rise noticed.

During testing as we switched on one by one all the laptop chargers, the core noise in the transformer was increasing and we found within one hour that the transformer had reached its maximum temperature.

Further it was observed that when the input supply to the transformer was given from workshop mains instead of 25kva inverter the temperature rise was within limits.

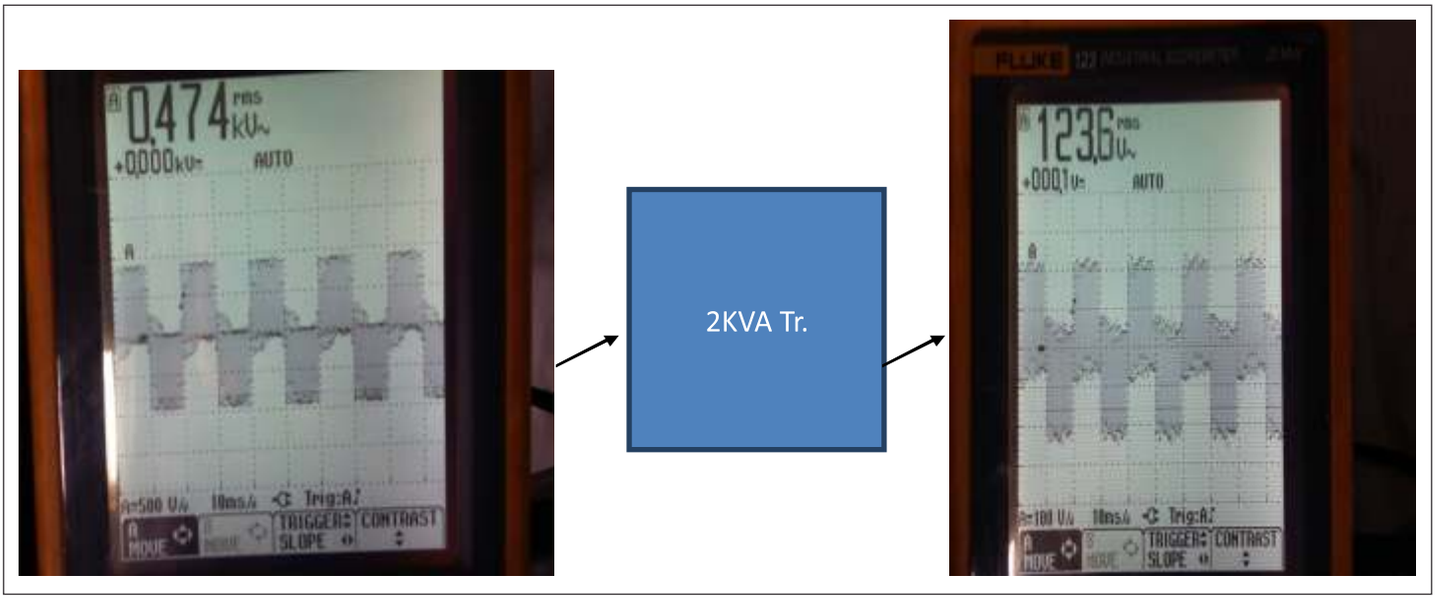
It was noticed that supply of PWM wave to the input of the 2 KVA transformer caused increased effect of harmonics generated by SMPS of the laptop charger resulting in high temperature of the transformer

2.0 PWM SUPPLY AND HARMONICS

In ICF, the AC coaches are provided with 25 KVA inverters mostly giving PWM output except Electro Waves make.

Make	Sciemens	Auto Meter	Hirel	Eletro Waves	Hind Rectifier	Medha	Signitron
Tupe	PWM	PWM	PWM	Sine	PWM	PWM	PWM

WAVE FORM OF TRANSFORMER WITH PWM SUPPLY



3.0 HARMONICS AND NON LINEAR LOADS

Reason for development of harmonics in Air conditioned coaches.

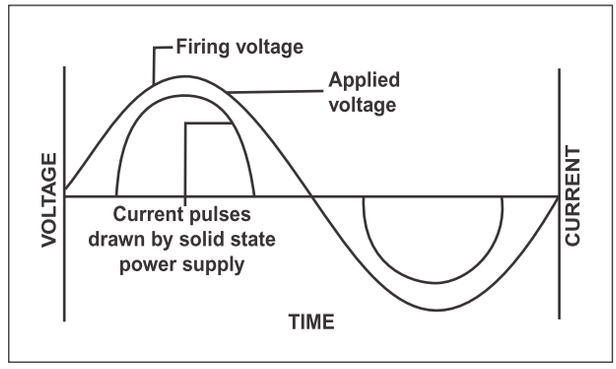
a) Using PWM inverters as source

b) Non linear loads especially SMPS

How Harmonics is generated (Non linear loads especially SMPS).

Harmonics Generated mainly due to Non Linear Load. Electronically controlled devices are more suitable than the transformer based devices for the AC to AC or AC to DC converters generally used for voltage regulation or controlling of induction motors and other devices because of lower cost, fast and simple controllability, smaller size. The main drawback of such systems is that they produce the unwanted harmonics which could cause serious problems such as excessive heating, vibrations, lowering the power factor and electromagnetic interference.

Voltage and current waveforms for non linear



As in Figure , As we apply a voltage to a solid state power supply, the current drawn is (approximately) zero until a critical “firing voltage” is reached on the sine wave. At this firing voltage, the transistor (or other device) gates or allows current to be conducted.

This current typically increases over time until the peak of the sine wave and decreases until

the critical firing voltage is reached on the "downward side" of the sine wave. The device then shuts off and current goes to zero. The same thing occurs on the negative side of the sine wave with a second negative pulse of current being drawn. The current drawn then is a series of positive and negative pulses, and not the sine wave drawn by linear systems.

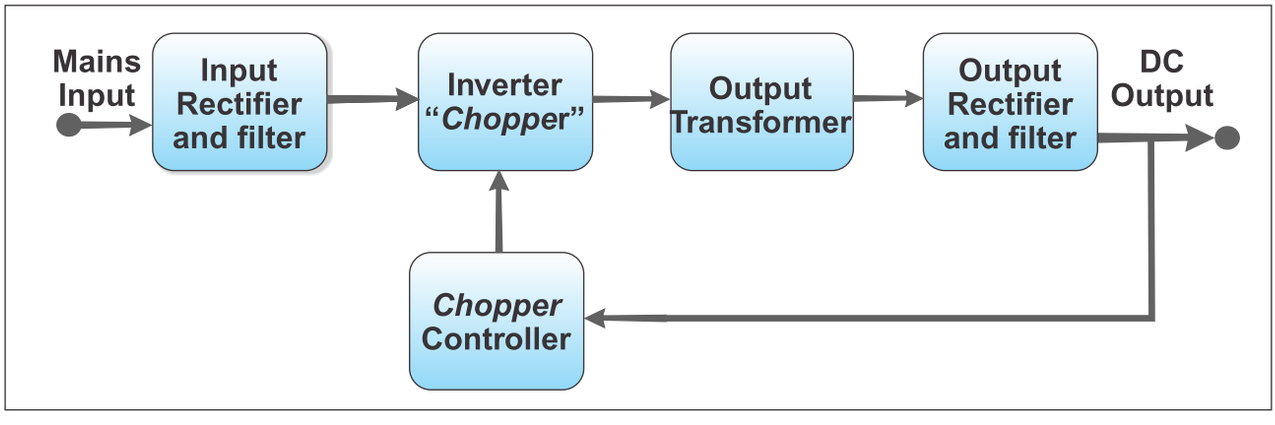
Some systems have different shaped waveforms such as square waves. These types of systems are often called non-linear systems. The power supplies which draw this type of current are called switched mode power supplies. Once these pulse currents are formed, we have a difficult time analyzing their effect. Power engineers are taught to analyze the effects of sine waves on power systems. Analyzing the effects of these pulses is much more difficult Harmonic load currents are generated by all non-linear loads. SMPS are widly used in single phase and three phase systems.

Some examples are

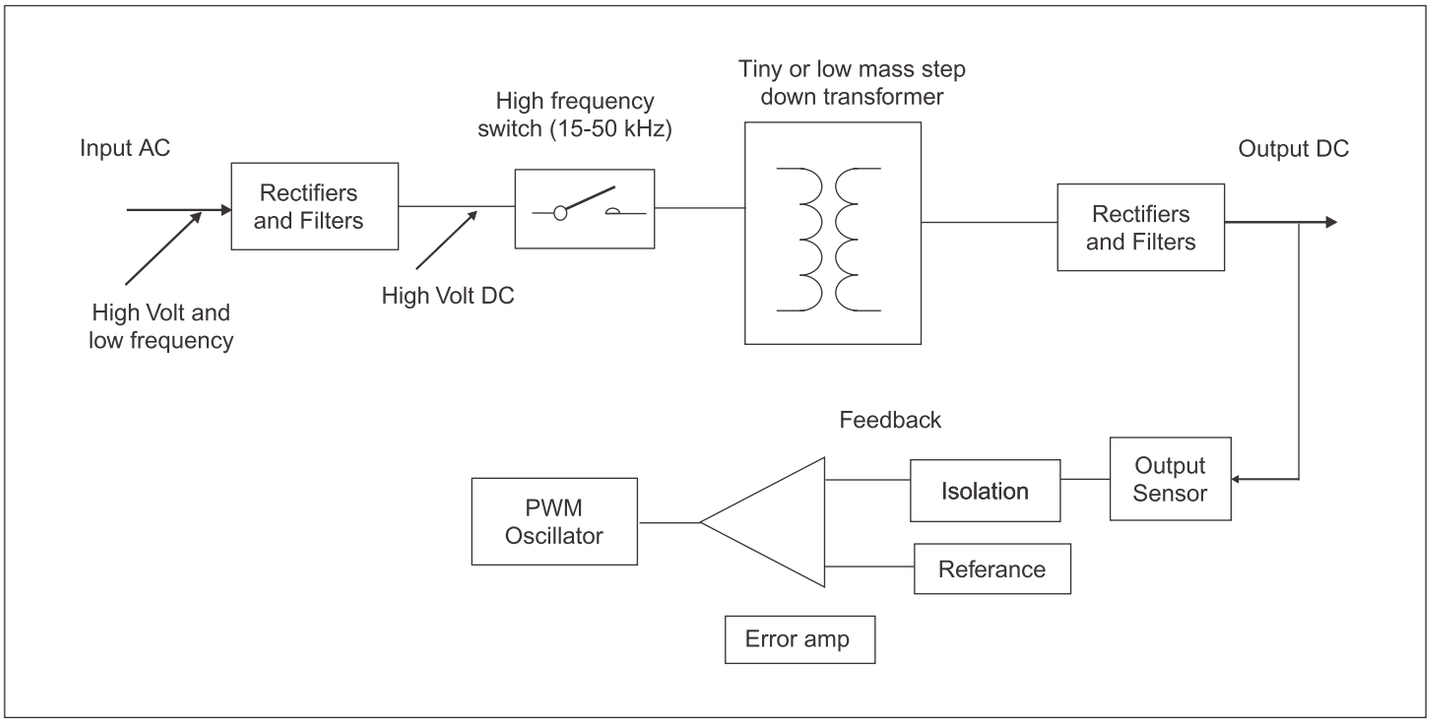
For Single Phase loads, e.g.	For Three phase loads,e.g.
Electronic fluorescent lighting ballsts	**Variable speed drives**
Compact fluorescent lamps (CFL)	**Large UPS units**
Small uninterruptble power supplies (UPS) Units	

Single phase loads

SMPS Block Diagram



Switched mode power supplies (SMPS)



The majority of modern electronic units use switched mode power supplies (SMPS).

These differ from older units in that the traditional step-down transformer and rectifier is replaced by direct controlled rectification of the supply to charge a reservoir capacitor from which the direct current for the load is derived by a method appropriate to the output voltage and current required.

The advantage – to the equipment manufacturer – is that the size, cost and weight is significantly reduced and the power unit can be made in almost any required form factor.

The disadvantage is that, rather than drawing continuous current from the supply, the power supply unit draws pulses of current which contain large amounts of third and higher harmonics and significant high frequency components.

4.0 PROBLEMS CAUSED BY HARMONICS

Harmonic currents cause problems both on the supply system and within the installation.

The effects and the solutions are very different and need to be addressed separately; the measures that are appropriate to controlling the effects of harmonics within the installation may not necessarily reduce the distortion caused on the supply and vice versa.

4.1 Problems caused by harmonic currents:

- overloading of neutrals
- overheating of transformers
- skin effect

4.1.1 Neutral conductor over-heating

In a three-phase system the voltage waveform from each phase to the neutral so that, when each phase is equally loaded, the star point is displaced by 120 combined current in the neutral is zero. When the loads are not balanced only the net out of balance current flows in the neutral. In the past, installers (with the approval of the standards authorities) have taken advantage of this fact by installing half-sized neutral conductors. However, although the fundamental currents cancel out, the harmonic currents do not – in fact those that are an odd multiple of three times the fundamental, the 'triple-N' harmonics, add in the neutral.

The third° phase currents, are introduced at 120 harmonic of each phase is identical, being three times the frequency and one-third of a (fundamental) cycle offset.

In this case, 70% third harmonic current in each phase results in 210% current in the neutral.

Case studies in commercial buildings generally show neutral currents between 150% and 210% of the phase currents, often in a half-sized conductor!

There is some confusion as to how designers should deal with this issue.

The simple solution, where single-cored cables are used, is to install a double sized neutral, either as two separate conductors or as one single large conductor.

4.1.2 Effect on transformers

Firstly, the eddy current losses, normally about 10% of the loss at full load, increase with the square of the harmonic number. In practice, for a fully loaded transformer supplying a load comprising IT equipment the total transformer losses would be twice as high as for an equivalent linear load. This results in a much higher operating temperature and a shorter life. In fact, under these circumstances the lifetime would reduce from around 40 years to more like 40 days! Fortunately, few transformers are fully loaded, but the effect must be taken into account when selecting plant.

The second effect concerns the triple-N harmonics. When reflected back to a delta winding they are all in phase, so the triple-N harmonic currents circulate in the winding. The triple-N harmonics are effectively absorbed in the winding and do not propagate onto the supply, so delta wound transformers are useful as isolating transformers. Note that all other, non triple-N, harmonics pass through. The circulating current has to be taken into account when rating the transformer.

4.1.3 Harmonics and Skin effect

Alternating current tends to flow on the outer surface of a conductor. This is known as skin effect and is more pronounced at high frequencies.

Skin effect is normally ignored because it has very little effect at power supply frequencies but above about 350 Hz, i.e. the seventh harmonic and above, skin effect will become significant, causing additional loss and heating. Where harmonic currents are present, designers should take skin effect into account and de-rate cables accordingly.

Multiple cable cores or laminated busbars can be used to help overcome this problem. Note also that the mounting systems of busbars must be designed to avoid mechanical resonance at harmonic frequencies.

4.2 Problems caused by harmonic voltages:

1. voltage distortion
2. Increased losses in induction motors
3. zero-crossing noise
4. Harmonic problems affecting the supply

5.0 REDUCTION OF HARMONICS – USING FILTERS

Filters are classified into two types namely a) Passive filters and b) active filters

Passive Filter-

- Built-up by combinations of capacitors, inductors (reactors) and resistors
- most common and available for all voltage levels and Low cost:

Passive filters are used to provide a low impedance path for harmonic currents so that they flow in the filter and not the supply.

The filter may be designed for a single harmonic or for a broad band depending on requirements.

Simple series band stop filters are sometimes proposed, either in the phase or in the neutral. A series filter is intended to block harmonic currents rather than provide a controlled path for them so there is a large harmonic voltage drop across it.

This harmonic voltage appears across the supply on the load side. Since the supply voltage is heavily distorted it is no longer within the standards for which equipment was designed and warranted. Some equipment is relatively insensitive to this distortion, but some is very sensitive. Series filters can be useful in certain circumstances, but should be carefully applied; they cannot be recommended as a general purpose solution. The same effect can be obtained by using a 'zig-zag' wound transformer. Zig-zag transformers are star configuration auto transformers with a particular phase relationship between the windings that are connected in shunt with the supply.

Active Power Filter APF:

- Inserting negative phase compensating harmonics into the AC-Network, thus eliminating the undesirable harmonics on the AC Power Network.
- APF-Used only for for low voltage networks.

Active Filters

The solutions mentioned so far have been suited only to particular harmonics, the isolating transformer being useful only for triple-N harmonics and passive filters only for their designed harmonic frequency. In some installations the harmonic content is less predictable.

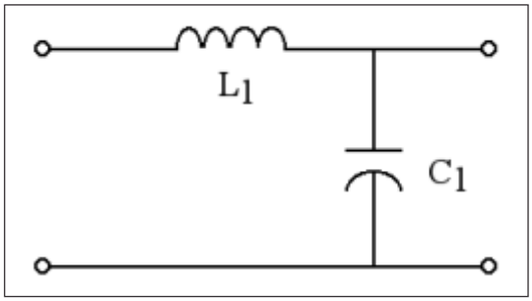
In many IT installations for example, the equipment mix and location is constantly changing so that the harmonic culture is also constantly changing. A convenient solution is the active filter or active conditioner.

The active filter is a shunt device. A current transformer measures the harmonic content of the load current, and controls a current generator to produce an exact replica that is fed back onto the supply on the next cycle. Since the harmonic current is sourced from the active conditioner, only fundamental current is drawn from the supply. In practice, harmonic current magnitudes are reduced by 90%, and, because the source impedance at harmonic frequencies is reduced, voltage distortion is reduced.

6.0 LC FILTERS (PASSIVE FILTERS)

LC Filters

Low pass filters are used in a wide number of applications. Particularly in radio frequency applications, low pass filters are made in their LC form using inductors and capacitors. Typically they may be used to filter out unwanted signals that may be present in a band above the wanted pass band. In this way, this form of filter only accepts signals below the cut-off frequency.



The Versatile LC Filter

The LC, or lumped element, filter) is perhaps the most common of all electromagnetic filter types. It takes its name from the inductors and capacitors upon which it is based. LC filters can be specified in lowpass, bandpass, bandstop, or highpass configurations and in diplexers and duplexers as well. They are useful over a frequency range of below 100 kHz to slightly above 3 GHz. Key parameters for specifying LC filters include insertion loss, stopband rejection, center frequency, cutoff frequency, bandwidth, Q factor, shape factor, and power handling ability.

In an LC filter, capacitors and inductors arranged in either series or parallel resonant circuits result in filters ranging in size from about 0.5 in. at high frequencies to 26 in. at low frequencies. The actual size of a particular LC filter is dictated by the size of these capacitors, inductors, as well as the level of RF power it must withstand.

The performance of LC filters has increased over the years thanks to the development of ferrite materials used to manufacture inductors and the dielectric materials used in capacitors. As a result, high inductor Q factors can be achieved in smaller sizes than with earlier designs.

Advantages	Disadvantages
• Reasonable size at intermediate frequencies • Supports many topologies • Steep transition from pass band to rejection • Multiple case styles • Reasonable insertion loss • Power handling acceptable for most needs • Relatively easy to shift frequencies	• Cannot achieve narrow bandwidths • Elements become impractical to fabricate at high frequencies • Limited power handling • Bulky at low frequencies • Moderate to high cost

Results

LC filter has been connected to the secondary of the 2KVA Transformer was subjected to test.

Particulars of components:

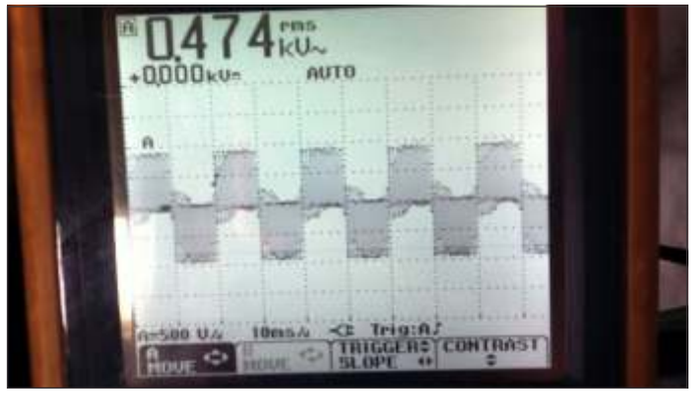
Sl.No	Item	Make	Rating
1	Power Panel	KCIPL	__
2	Inverter	AAL	25KVA
3	2 KVA Transformer	Ramyaa Electro Gear(p) Ltd	2KVA
4	LC Filter	Ramyaa Electro Gear(p) Ltd	C- 10mfd 250 v, Inductance , R-6.47mH, Y-6.58mH, B-6.47mH

The THD content after LC filter was measured

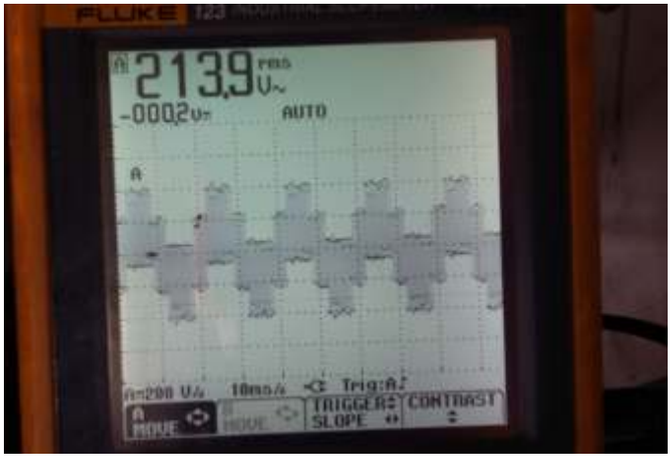
2KVA Transformer (After LC filter)	Total Harmonic Distortion in % (without Load)	Total Harmonic Distortion in % (with Load)
R-Phase	3.12%	3.33%
Y-Phase	3.36%	3.40%
B-Phase	3.11%	3.32%

- LC Filter is mounted in under frame, behind precooling Transformer
- Input Voltage of 2KVA transformer 415V(measured with AAL Display Panel voltmeter)
- Output voltage of 2KVA transformer 123.6V (before filter)(measured with FLUKE SCOPE)
- Output Voltage of LC Filter 106.1V(measured with FLUKE SCOPE)
- LOAD used-[Coach Load + Laptop charger(6 no's)]
- Test was carried out for 5 hrs, and the temperature of 2KVA Transformer body reached to 45.4 oC and maintained.(Temperature measured by infrared gun).

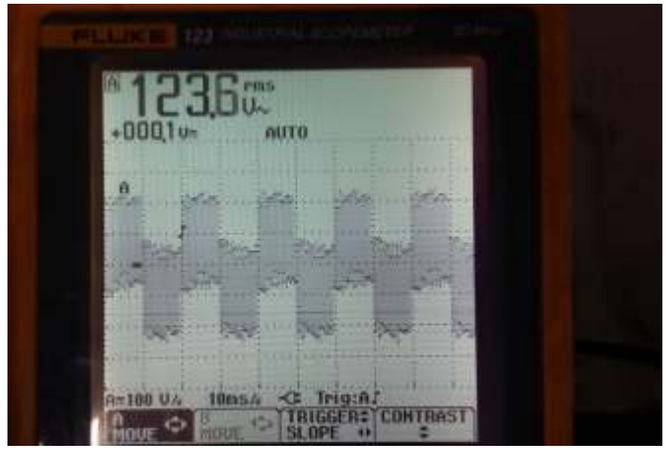
2 KVA Transformer Input Voltage waveform (P-P)



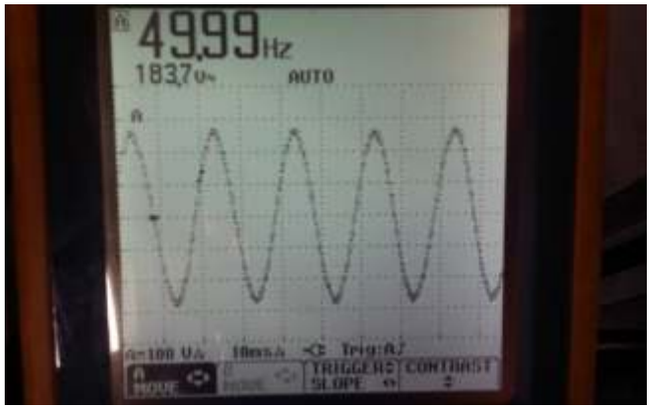
2KVA Transformer output voltage(before Filter)(P-P)



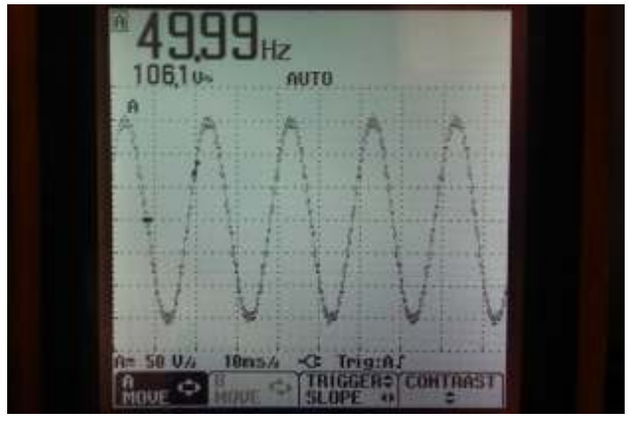
2KVA Transformer output voltage(before Filter)(P-N)



LC Filter output voltage waveform(P-P)



LC Filter output voltage waveform(P-N)



Performance of 2KVA Transformer:

Time	Winding Temperature in deg . C				PRIMARY CURRENT (A)			SECONDARY CURRENT (A)			Ambient Temp. in Deg. C
	R	Y	B	CORE	R	Y	B	R	Y	B	
08:00	29.6	29.7	29.7	29.7	1.1	1.1	1.1	1.9	1.8	2.0	29
08:45	32.3	32.2	31.7	33.6	1.1	1.1	1.1	1.8	1.9	2.0	29
09:15	34.7	34.4	33.9	34.4	1.1	1.1	1.1	1.8	1.9	2.0	29.4
09:45	38.2	38.5	37.2	39.2	1.1	1.2	1.1	1.8	1.9	2.0	31.5
10:15	39.4	40.4	39.4	40.4	1.1	1.2	1.1	1.9	1.9	2.0	31.5
11:15	41.4	42.9	41.4	43.3	1.1	1.2	1.1	1.8	1.9	2.0	33.5
11:30	41.8	43.4	42.2	43.4	1.2	1.1	1.2	1.7	1.9	2.0	33.8
12:00	42.4	44.2	43.1	43.9	1.1	1.2	1.1	1.8	1.9	2.0	33.7
12:30	43.9	44.2	43.2	44.4	1.1	1.1	1.1	1.9	1.9	2.0	33.3
13:00	44.5	44.8	43.9	45.2	1.1	1.2	1.2	1.8	2.0	2.0	33.9
13:30	44.6	44.9	44.1	45.4	1.1	1.2	1.2	1.8	1.9	2.0	33.9

6.0 Conclusion

- When PWM wave is applied to Non linear load the effects of harmonic current and consequent heating is more pronounced
- Self Generated AC coaches 25 KVA Inverter with PWM out put is used to feed 3 phase AC supply to RMPU.
- The same inverter has additional module called “sine filter” which produces sine wave used for the power supply of RMPU control panel.
- Even though LC filter is used at the SY side of 2KVA transformer, the noise generated at primary side persists
- If same sine filter is modified for three phase with higher rating, the subject LC filter can be eliminated.
- IF the 25KVA inverter itself is equipped with sine filter, the problems due to harmonics will be eliminated.

IRIEEN JOURNAL

HARNESSING GREEN ENERGY & ITS GRID CONNECTIVITY

(Based on Project Report)

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CEGE/NWR
Jaipur

1.0 Introduction

Energy security is the key to economic growth of any country. The fossil fuel such as coal, oil, gas etc for conventional power generation is not only fast depleting which will be exhausted in coming decades but also the burning of fossil fuel generates greenhouse gases. Greenhouse gases contribute towards the phenomena of global warming and also adverse impact on climate. The known reserves of fossils fuels are only for limited duration. Gap prevails between the demand and availability of power supply. Under the circumstances, there is an urgent need to conserve energy, reduce the emission of greenhouse gases, prevent global warming and develop renewable energy. Renewable energy is green energy and clean energy.

Renewable energy is generally defined as energy that is collected from resources which are naturally replenished on a human timescale, such as sunlight, wind, rain, tides, waves, and geothermal heat. Renewable energy is an important step towards a sustainable and secure energy future.

Green energy is a subset of renewable energy and represents those renewable energy resources and technologies that provide the highest environmental benefit. Green power is defined as electricity produced from solar, wind, geothermal, biogas, eligible biomass, and low-impact small hydroelectric sources. It is abundant and inexpensive, and as prices are expected to fall even further, it is becoming even more cost competitive. Wind, hydro and biomass power are already competitive and solar is rapidly moving towards being competitive.

Power Sector at a Glance ALL INDIA

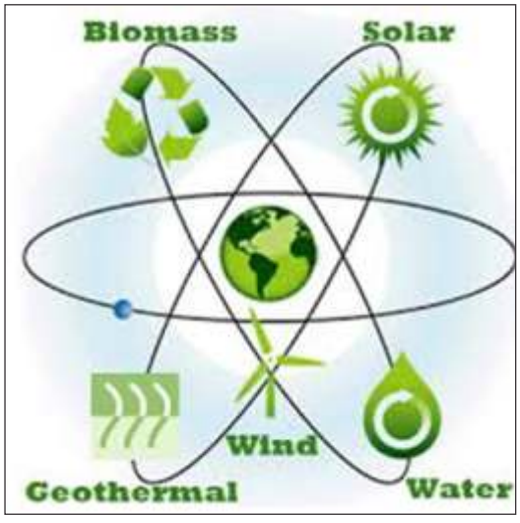
1. Total Installed Capacity: (As on 31.01.2016):

Sector	MW	%age
State Sector	200,740	69.7
Central Sector	175,238	60.8
Private Sector	24,509	8.5
Total	**288,005**	

Fuel	MW	%age
Total Thermal	200,740	69.7
Coal	175,238	60.8
Gas	24,509	8.5
Oil	994	0.3
Hydro (Renewable)	42,663	14.8
Nuclear	5,780	2.0
RES** (MNRE)	38,822	13.5
Total	288,005	

Renewable Energy Sources (RES) include SHP, BG, BP, U&I, Solar and Wind Energy

SHP= Small Hydro Project (<25 MW), BG= Biomass Gasifier, BP= Biomass Power, U & I=Urban & Industrial Waste Power,









Renewable Energy Sources

2.0 Harnessing Green Energy

Off-Grid Power

Distributed/decentralized renewable power projects using wind energy, biomass energy, hydro power and hybrid power systems are being established in the country to meet the energy requirements of isolated communities and areas which are not likely to be electrified in near future.

Off-grid Renewable Energy / Power:

- Biomass based heat and power projects and industrial waste to-energy projects for meeting captive needs
- Biomass gasifiers for rural and industrial energy applications
- Watermills/micro hydro projects – for meeting electricity requirement of remote villages
- Small Wind Energy & Hybrid Systems - for mechanical and electrical applications, mainly where grid electricity is not available.
- Solar PV Roof-top Systems for abatement of diesel for power generation in urban areas

Grid Connected Power

Grid-interactive renewable power projects based on wind power, biomass, small hydro and solar are mainly private investment driven, with favorable tariff policy regimes established by State Electricity Regulatory Commissions (SERC), and almost all-renewable power capacity addition during the year has come through this route.

- Wind Power:
- Bio-power:
- Small Hydro Power
- Solar Power

3.0 Efforts made/being made on Indian Railways as regards harnessing the Green Energy

A lot of efforts as regards harnessing the Green Energy have been/are being made on Indian Railways. The details of such efforts are as under: -

3.1 SOLAR ENERGY

In the Rail Budget 2015-16, it has been announced, "To reduce dependence on fossil fuels, it is intended to expand sourcing of Solar Power as part of the Solar Mission of Railways. Further, 1000 MW solar plants will be set up by the developers on Railway/private land and on rooftop of Railway buildings at their own cost with subsidy/ viability gap funding support of Ministry of Non- Renewable Energy in next five years. "

(a) Railway's funding:

(i) Already Installed:

Indian Railways have already harnessed about 10.5 MWp of solar energy at LC gates, way side Railway stations, solar based street lights, solar water heaters at training institutes/running rooms/hospitals/rest houses/ canteens/base kitchens etc .

The details of some of them are as under:

5 MW through Solar based lighting system at LC gates (4114 nos.),

2 MW plant at RCF Raebareli,

1 MWp solar plant at Katra railway station,

40 KWP each on GM building at SCR, Tirupati, Ajmer Stations,

30 KW solar plant at Railway Board

30KW solar plant at IRIEEN Nasik Road. (This plant generates about 150 units costing Rs. 1000/- every day and)

Others like-

Solar panels at stations (525 nos.),

Solar water heaters (6.7 lakhs LPD),

Solar based street lights (400 nos.) etc.

1 MWp solar power plant at Katra Railway station









(I) Under Installation against sanctioned works:

Solar Plants of total 7.83 MWp, as tabulated below, are being installed in near future on Indian Railways against sanctioned works: -

SN	Initiative	Capacity	Quantity allotted	Status/Target
1	Provision of solar **PV modules at rooftops.** **-10 KWp x 200 stations** **-100 KWp x 20 Offices** **-45 KWp** **-500 KWp x 5 buildings**	6.55 MW	NER-70, NWR-80, NF-50. Zonal Rly GM offices, DLW, ICF & RCF. RDSO. NR, CR, NWR, SCR & Metro.	Work awarded on M/s CEL December 2016
2	**Provision of solar PV modules at 2000 LC gates.**	1.28 MW	Respected Zonal Railways. CR-50, ER-50, ECR-200, EcoR-100, NCR-100, NER-250, NFR-200, NR-150, NWR-170, SR-150, SCR-130, SER-50, SECR-50, SWR-150, WCR- 50, WR-150.	December 2016 On NWR Work Orders have been placed by divisions.

(a) Under PPP:

The MoU has been signed between Ministry of Railways (MOR) and Ministry of New & Renewable Energy (MNRE) for co-operation in the Renewable Energy to bring in a change in the energy mix & Solarization of Railways on 12.08.2015.

IR's Solar Mission: Total 1000 MWp in next 5 years with Viability Gap Funding (VGF) support from MNRE.

SN	Initiative	Cap.	Action/ Progress
a	**I. 50 MW *** on **Rooftop** with Central Financial Assistance (CFA) from MNRE through **tariff based bidding** process by ZR. In principle **approval of MNRE** for Rs.60 Cr subsidy **received.**	50 MW	Zonal Railways. Tenders have been invited by Rlys for **RFQ**.
b	**II. 200 MW** on **Rooftop** through VGF from MNRE under PSU scheme.	200 MW	RB/REMC (Under planning stage)
c.	**III. 100 MW** on **Rooftop** through MNRE/ by having World Bank Loans.	100 MW	REMC
d.	**IV. 650 MW** on **vacant Railway land**	650 MW	RB/REMC (Under planning stage)

*50 MW on Rooftop with Central Financial Assistance (CFA) from MNRE through tariff based bidding is being process by Zonal Railways based on RFP (request for Proposal) model where in Railways will provide roof top of Railway Buildings / Railway stations/station platform sheds/workshop sheds or any other suitable roof top space for solar units and the developer will invest money for putting up the solar unit.

Zonal Railways will sign Power Purchase Agreement (PPA) for 25 years with the developer offering lowest per unit power cost which shall remain fixed for next 25 years through open bidding process. The developer should be responsible for maintenance of the complete system.

Model RFQ, RFP & PPA have issued by Railway Board vide their letter no. 2009/Elect. (G)/150/13/Pt. dated 30.11.2015.

3.2 WIND ENERGY/WIND MILLs:

Already Installed:
(a) Under Indian Railway's funding :

IR first ever Wind Mill Project of capacity of 10.5 MW was commissioned on 30.03.2009 in Tamilnadu for meeting energy demand of ICF, Chennai.

IRIEEN Nasik Road has stalled 6.5 kW hybrid plant of wind and solar.

(b) Under PPP Model

26 MW windmill power plant in Rajasthan commissioned by REMCL in Oct., 2015 & the plant has generated more than 50 Million units till December 2015.

Under Installation against sanctioned works:

(a) Under Indian Railway's funding :

1. IR first ever Wind Mill Project of capacity of 10.5 MW was commissioned on 30.03.2009 in Tamil Nadu for meeting energy demand of ICF, Chennai.
2. A tender is in progress for 10.5 MW wind mill plant at S. Rly.

(b) Under PPP Model
Indian Railways have planned to install 157.5 MW capacity Wind Mills under PPP model. Progress is as under: -

1. 26 (25±1) MW windmill power plant in Rajasthan has been installed by M/s INOX Wind Limited with REMCL and commissioned in Oct., 2015.

2. The remaining 131.5 MW capacity, REMCL is working out in states having adequate wind speed and proper power evacuation arrangements.

Important Features of 26 MW Windmill installed in Rajasthan
Project Cost:-
Total Capital Cost: Rs 160 Cr (approx.)
Equity @ 20% : Rs 32 Cr

Location: Village - Dangri, District - Jaisalmer (Rajasthan)
Power Connectivity to WCR: 3/4 TSS (Kota Division)

Technical Parameters
Rating of WTG: 2 MW, No. of WTG: 13, WTG Hub Height : 80 m
Rotor's Dia. : 93.3m, CUF: 22% (Capacity Utilization Factor)

Anticipated cost per unit: Rs. 6.59 Anticipated Annual Generation: 48 Mus

Grid Connectivity of Roof Top Photovoltaic Systems

In order to promote development of roof top and small solar photovoltaic systems, State electricity Regulatory Commissions (SERCs), in exercise of powers conferred under Section 181 read with Sections 61, 66 and 86(1) (e) of the Electricity Act, 2003 (Act 36 of 2003) and all other provisions enabling it in this behalf, have framed Regulation for their grid connectivity and Net Metering in their respective states. On similar fashion, RERC (Rajasthan Electricity Regulatory Commission) has also framed Net Metering Regulations-2015 (Regulation no. RERC/Secy/Reg.-110 dated 26. 02. 2015) and have been notified in Govt. Gazette Notification dated 16. 03. 2015.

Provisions of RERC Net Metering Regulation- 2015 {Rajasthan Electricity Regulatory Commission (Connectivity and Net Metering for Rooftop and Small Solar Grid Interactive Systems) Regulations, 2015} are discussed as under: -

Scope and application

(1) The Eligible Consumer may install the rooftop solar system under net metering arrangement which,

(a) shall be within the permissible rated capacity as defined under these Regulations.

(b) shall be located on the consumer premises.

(c) shall interconnect and operate safely in parallel with the distribution licensee network.

(2) These Regulations do not preclude the right of State Nodal Agency or Distribution Licensee of the State to undertake Rooftop PV Solar Power Plants of 1 MWp and above capacity through alternative mechanisms.

General Principles

The distribution licensee shall offer the provision of net metering arrangement to the consumer, who intends to install grid connected Rooftop PV Solar Power Plants, in its area of supply on non-discriminatory and first come first serve basis:

Provided further that the Consumer is Eligible to install the grid connected Rooftop PV Solar Power Plants of the rated capacity as specified under these Regulations:

Provided also that the interconnection of such system with the grid is undertaken as specified under these Regulations and in compliance of Central Electricity Authority (Technical Standards for Connectivity of the Distributed Generation Resources) Regulations, 2013.

Connectivity of Roof Top PV Solar Power Plants

(1) The cumulative capacity to be allowed at a particular distribution transformer shall not exceed 30% of the capacity of the distribution transformer:

(2) The distribution licensee shall update distribution transformer level capacity available for connecting Rooftop PV Solar Power Plants under net metering arrangement on yearly basis and shall provide the information on its website as well as to the Commission.

Eligible Consumer and Individual Project Capacity

(1) All Eligible Consumers of electricity in the area of supply of the distribution licensee having or proposing to install a roof top solar energy system may opt for grid connectivity subject to the net metering arrangement pursuant to these Regulations.

(2) The maximum Rooftop PV Solar Power Plant capacity to be installed at any Eligible Consumer premises shall not be more than 80% of the sanctioned connected load/contract demand of the consumer.

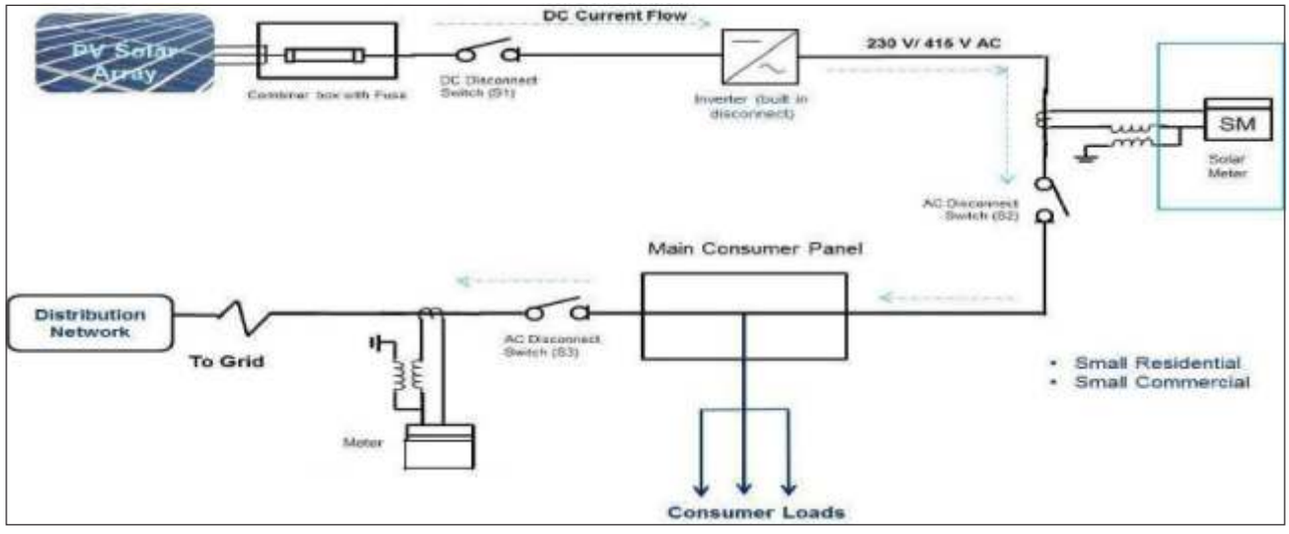
(3) The capacity of Rooftop PV Solar Power Plant to be installed at the Premises of any Eligible Consumer shall be more than 1MWp (1000 kWp) subject to the condition as specified in sub-regulation (2).

Provided that the capacity of the solar energy system shall be in conformity with the provisions relating to the connected load or contract demand permissible under the Rajasthan Electricity Regulatory Commission (Electricity Supply Code and Connected Matters) Regulations, 2004 and subsequent amendments thereto.

(4) Connectivity level

S N	Connected load of Eligible Consumer	Connectivity level
1.	Upto 5 kW	240 V- single phase
2.	Above 5 kW and upto 18.65 kW	415 V-Three phase
3.	Above 18.65 kW and upto 50 kW/kVA	415 V-Three phase
4.	Above 50 kW/kVA	HT/EHT level

Net Metering configuration options



IRIEEN JOURNAL

PROVISION OF V-BELTS ON WASHING/STABLING LINE – AN INNOVATIVE APPROACH.

Ambala Division / N.Rly
Presentation

1.0 Synopsis:

V-belt drive is provided on all self generating AC & TL coaches. In AC coaches, 4 sets of 6 belts each and in TL coaches, a set of 4 belts are provided. For replacement/provision of V-belts, lifting of coach is necessarily required. Though, RDSO specification stipulates the life of V-belt more than coach IOH interval, thus obviating the unscheduled lifting of coach only for V-belt replacements. In reality, V-belts are not lasting as stipulated and in large number of cases, these are required to be replaced without waiting for IOH/ scheduled attention.

As per practice in vogue, for V-belt replacement, coach is detached from rake and placed on sick line.

V-belt provision/replacement is one of the major reasons of coach detachment and consumes lot of manpower, time and energy. Indian Railways have been looking since long for a replacement of V-belt on washing/stabling line, thus saving huge manpower and indirect loss on account of longer outage of coach.

To overcome this repetitive problem, Bathinda Coaching depot of Ambala division has developed requisite tools/tackles and methodology of convenient V-belt provision/replacement at washing/stabling line itself. Thereby no detachment, no shunting, but substantially improved availability of coach for commercial services.

2.0 Practice in vogue for V-belt replacement:

Activities involved are:-

a) Detachment of coach from train rake that necessarily involves shunting, thereby necessitating requirement of shunting engine and man power. In major yards, shunting is troublesome and most time consuming.

b) Detention of train due to detachment and placement of coach to sick line for making the coach fit. Many a times, coach remains sick for substantial duration.

c) Requirement of staff for replacement of V-belt during night and in emergency, else coach idle time becomes abnormally high.

d) Although actual working time in sick line for replacement is about 03 hours with manual operated jacks and 02 hours with power pack jacks, but total outage of coach is much longer.

e) Due to shunting, some other trains invariably get detained on this account.

f) There are chances of upsetting of rakes due to detachment or late fitment of coach.

3.0 Constraints in replacement on washing line:

Though idea of V-belt replacement on washing / stabling line is not new, but it had not been so far implemented for the following major constraints:-

a) Transportation of heavy jacks to washing line.
b) Crossing of jacks over tracks and pits of washing line.
c) Fitment of jack under coach due to different design of washing line, i.e. having plane side floor or having space for provision of jacks like CAMTECH design etc.
d) Ordinary spanners having constraints of repeated application/ removal and require a lot of space for round turn over nut.

4.0 Modifications and innovations done by Ambala division.

Bathinda C&W Coaching depot of Ambala division has come up to expectations and have overcome all the above constraints in following manner:-

a) M&P and tools developed for easy and prompt replacement at different places i.e. in washing line or on stabling line without pit.
b) Long handle 'PANA'/Ring spanner having long handle.
c) Open end ring spanner. Both the above tools help in easy unlocking of tension rod nuts as it does not involve repeated application/removal of spanner over nut.
d) Coach gaping device: This device is innovated for providing gap/ space between coaches without shunting engine. Requirement of shunting engine gets eliminated fully.
e) Jacks for lifting: Wide base, sliding jacks are utilized to ensure extra safety of coach while lifting. These jacks have provision to overcome probable sideward movement of coach, in the event of coach getting tilted or inclined due to curvature or variation in rail level in washing line.

These jacks are light weight, dual operation i.e. electric and diesel operated, portable (fitted on trolley) with wide base having transverse movement.

5.0 Sequence of Operations involved:

a) The coach whose 'V' belt is to be changed is to be placed at a gap from shunting engine or coach gapping device and wooden wedges are to be provided.
b) The tension rod of the coach is to be loosened and jacks under lifting pads are to be provided.
c) The coach body along with trolley is to be lifted such that a gap is created between the wheel and rail line so as to get the 'V' belt out easily.
d) Now old 'V' belt is to be removed and one end of new 'V' belt is to be put inside through the gap.
e) Thereafter the coach body is to be lowered with the help of jacks. Safety straps, truss bar, hanger pin and truss bar safety wire rope of pulley side wheels of trolley at both sides are to be opened.
f) Again the coach body along with trolley is to be lifted such that a gap is created

between dashpot spring and axle guide and 'V' belt crosses through it. Now remove old belts and insert the new belts.

g) Now carefully lower the coach body to normal position with the help of jacks.

h) Then safety strap, truss bar, hanger pinand truss bar safety wire rope are to be put to normal position.

i) Belts and tension rods are to be fitted to normal position by electrical staff.

j) The coach is to be attached to the rake with the help of shunting engine.

















6.0 Benefits/Advantages of proposed system:

With the above modifications and innovations, V-belt provision/ replacement are being done successfully in washing line Bathinda. System has following advantages:-

a) No need to detach coach from rake especially for V-belt replacements. V-belts are replaced on washing line during scheduled primary maintenance.
b) No need of shunting engine and shunting staff.
c) Exclusive V-belt replacement time, which was earlier minimum 12-24 hours, reduced to zero.
d) No detention to other trains due to shunting for detachment and attachment on this account.
e) No requirement for extra staff on sick line for emergent V-belt replacements.
f) No upsetting of rakes on this account.
g) SOC of sick line gets reduced.
h) Elimination of unscheduled coach detachments on V-belt account.

7.0 Cost of M&P, T&P and sick line modifications:-

a) Light weight synchronizing jacks (03 nos.), Rs.2,80,000/-. These jacks can be utilized for other purposes too.
b) Modification in washing line for placement of jacks Rs. 2.0 Lac.
c) T&P Rs. 20,000/-

8.0 Conclusion:

Replacement of V-belts on washing/stabling line being the need of the hour should be adopted by all Coaching depots of Indian Railways. It besides substantially improving the availability of coach, results into appreciable direct/indirect monetary saving.

★★★

All of us do not have equal talents. But, all of us have an equal opportunity to develop our talents

-Dr. A.P.J Abdul Kalam

IRIEEN इरीन जर्नल JOURNAL

यूनिकोड एक परिचय

वी. पी. सिंह
सीनियर सेक्शन इंजीनियर(कंप्यूटर),
इरीन, नासिक रोड.

यूनिकोड, एक कंप्यूटर पर हिंदी में कार्य करने की उन्नत तकनीक है। जैसा कि हमें मालूम है कि मूलत: कंप्यूटर 0-1 डिजिट से बनाये गए हैं । इस प्रकार की फॉण्ट संबंधी समस्याएं न केवल हमारी देवनागरी लिपि में नही बल्कि अन्य लिपियों/भाषाओं में भी सामने आई है । इनके निराकरण के लिए विश्व स्तर के विशेषज्ञों ने मिलकर एक यूनिकोड संगठन बनाया (www.unicode.org) पूरे विश्व के अधिकांश देश इसके सदस्य बने,जिसमें हमारा देश भारत भी इसका सदस्य है । यह संगठन भाषा एवं लिपि संबंधी शोध कार्य करता रहता है और समय-समय पर अपना निष्कृष भी जारी करता है ।

यूनिकोड तकनीक विश्व की सभी लिपियों के सभी संकेतों को लिए अलग-अलग कोड बिंदु प्रदान करता है जो कि एक ही फोन्ट में उपलब्ध रहती है । (जैसे-एरियल,मंगल,अक्षर यूनिकोड अपराजिता आदि) यूनिकोड तकनीक पर आधारित फोन्ट में टाइप किया गया मैटर हमारे सिस्टम में फोन्ट हो या न हो वह उसी भाषा की लिपि में दिखाई देगा और पढ़ने योग्य भी होगा ।

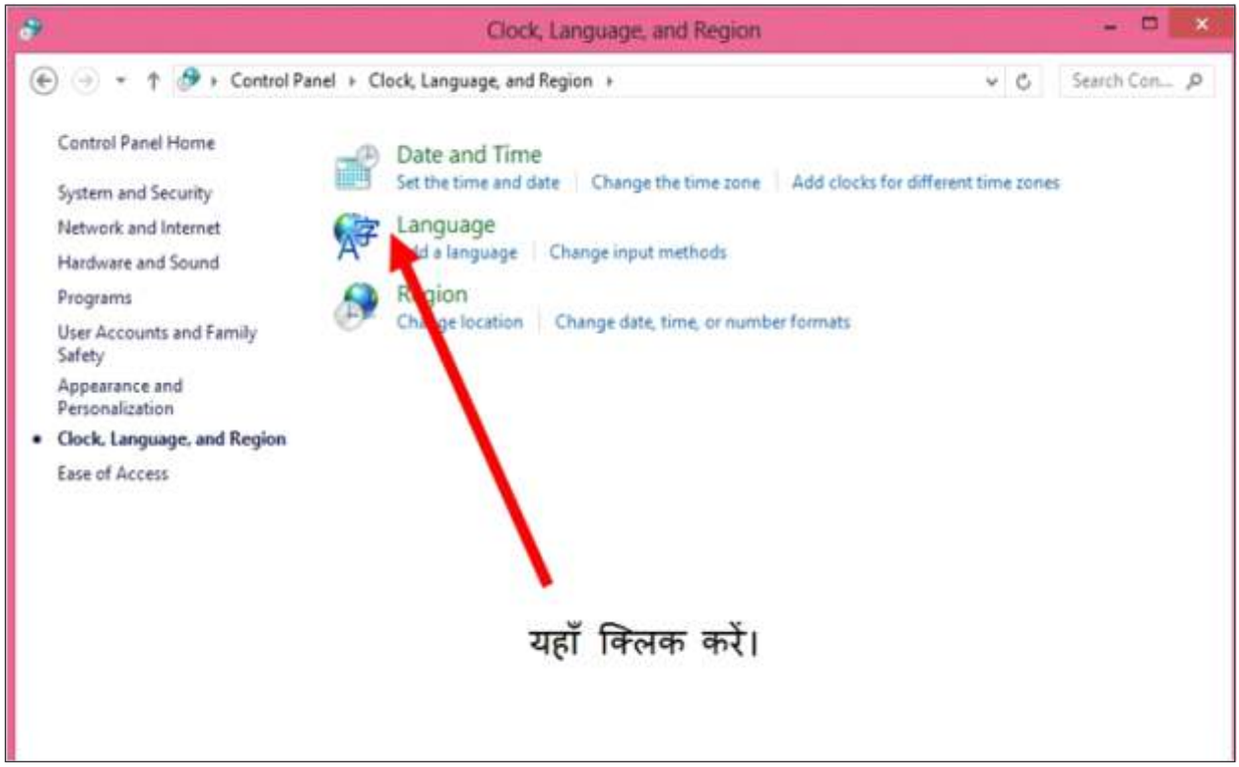
कंप्यूटरों में यूनिकोड इंस्टॉल करने की विधि-

यह सुविधा विंडोज-एक्सपी और उसके बाद के वर्जन के ऑपरेटिंग सिस्टम के कंप्यूटरों में उपलब्ध रहती है । इसके लिए अलग से न तो हार्डवेयर और न ही इंटरनेट की आवश्यकता पड़ती है ।

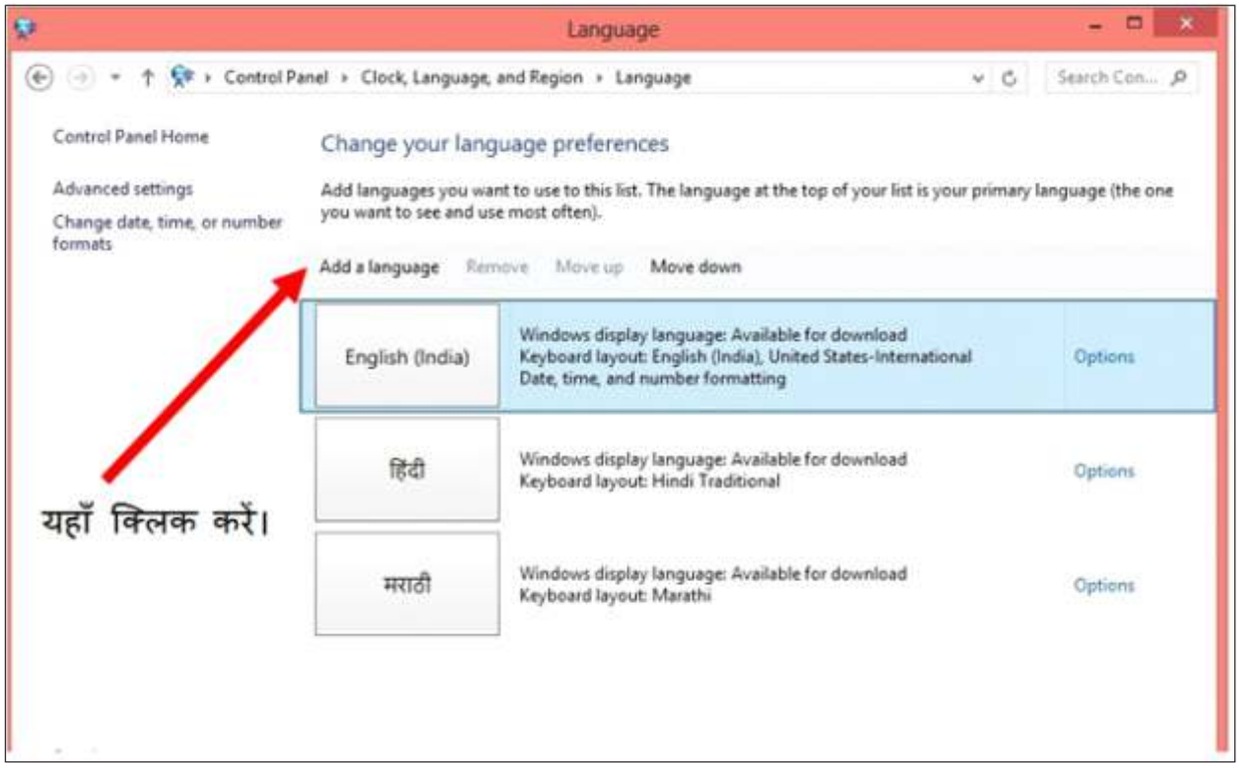
विंडोज-8 या विंडोज-8.1 वर्जन के कंप्यूटरों में यूनिकोड इनस्टॉल करने की संक्षिप्त विधि:-



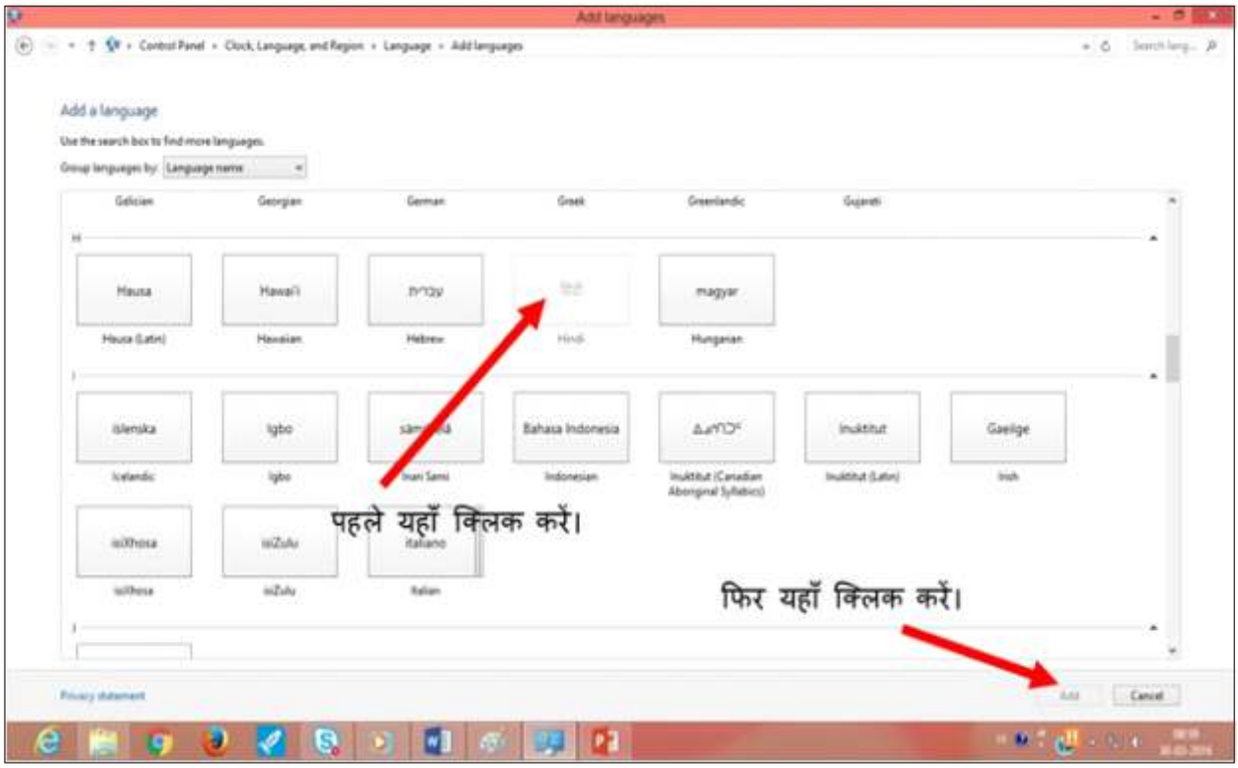
इसके बाद यह विंडो आयेगी और दिये गये मार्क के अनुसार क्लिक करें।



इसके बाद यह विंडो आयेगी और दिये गये मार्क के अनुसार क्लिक करें।



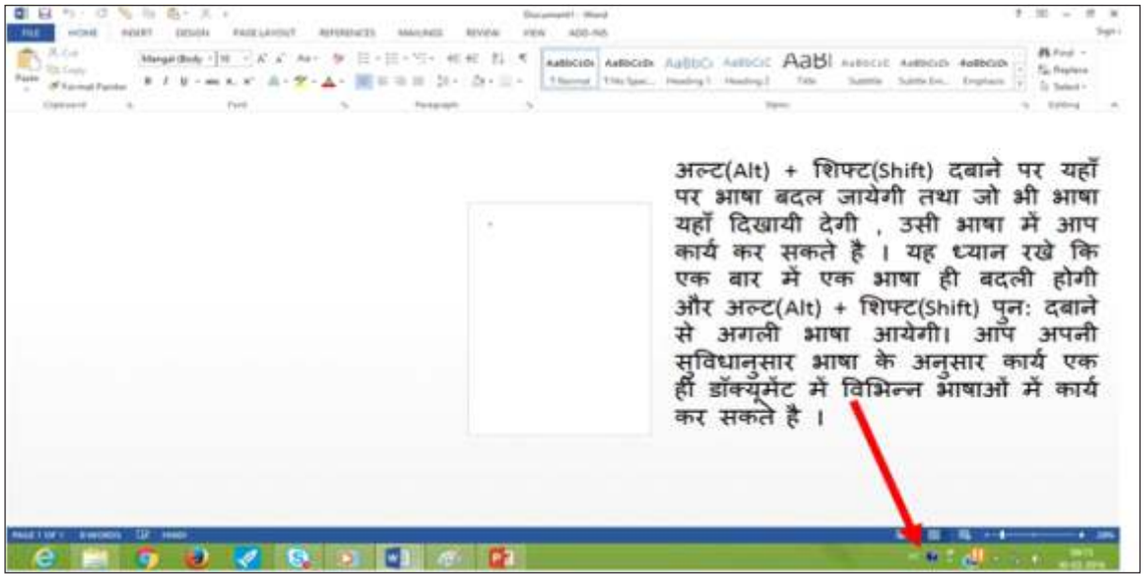
इसके बाद यह विंडो आयेगी और दिये गये मार्क के अनुसार क्लिक करें।



इसके बाद कंट्रोल पैनल को बंद कर दें।

इसी तरह आप अपनी भाषा भी चयन कर सकते है ।

इसके बाद आप अपने प्रयोग के लिए कोई भी डॉक्येमेंट खोले जिसमें माइक्रोसोफ्ट वर्ड माइक्रोसोफ्ट पॉवर पॉइंट माइक्रोसोफ्ट एक्सल खोले तथा अपनी सुविधानुसार हिंदी अग्रेजी या अपनी मनचाही भाषा का चयन निम्न प्रकार से कर सकते है ।

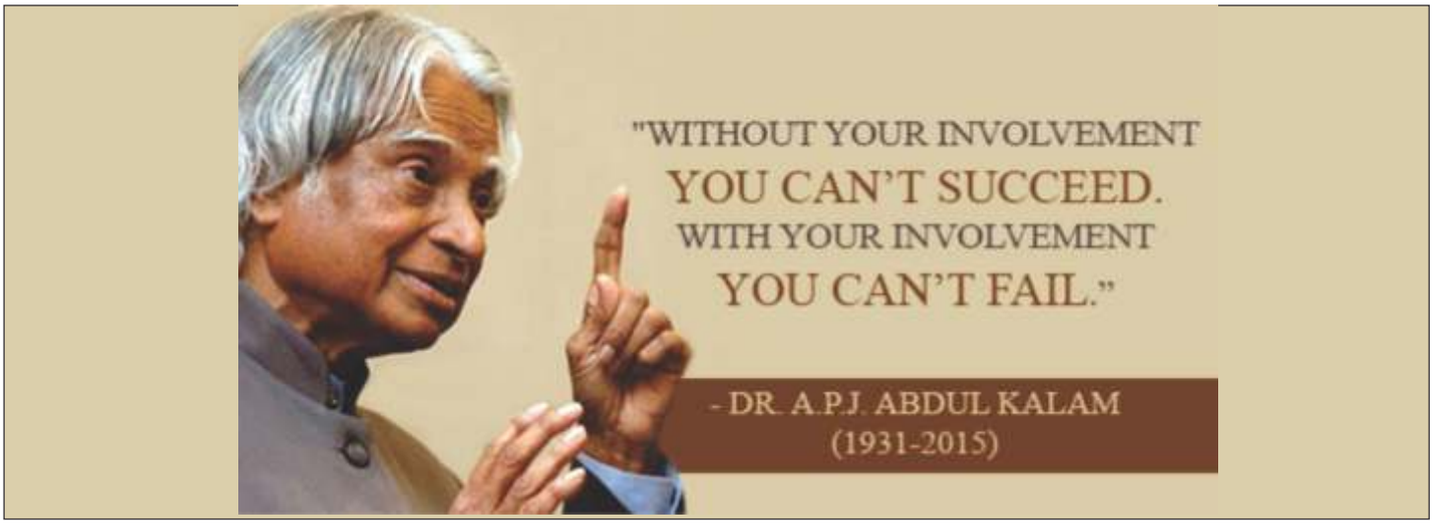


यूनिकोड के लाभ

- यूनिकोड के माध्यम से आप अपनी फाइल का नाम हिंदी में दे सकते हैं
- टेबल या एक्सल में हिंदी में सर्पोटिंग करने की सुविधा है
- माइक्रो या ऑटोकरेक्शन का प्रयोग कर अपना शॉर्टकट की तैयार कर सकते हैं
- Find and replace आदि में ही टाइप कर शब्दों को ढूंढ यानि सर्च कर सकते हैं
- ऑटो नबंरिंग का फायदा भी ले सकते है जैसे- क,ख,ग,घ या अ,आ,इ,ई और एक,दो,तीन,चार ... इत्यादि आगे क्रम में बढ़ते जायेंगे ।
- एक्सल में इसी प्रकार से सेल ड्रैग करने की सुविधा होती है यानि जब सोमवार मंगलवार .....या जनवरी,फरवरी..... इत्यादि
- को साइड में ड्रैग करेंगे और वह आगे बढ़ते जायेंगे ।
- कंट्रोल पैनल में जाकर Language Option में जाकर डिफॉल्ट लैंग्वेज हिंदी सलेक्ट करते हैं तो स्क्रीन पर Date/Month Status पर तारीख और महिने का नाम हिंदी में प्राप्त कर सकते हैं ।
- पॉवर पोंइन्ट,एक्सल,वर्डस या किसी प्रकार के फोल्डर में परेशानी उत्पन्न नही होगी ।
- यूनिकोड होने के नाते वेब बनाने के लिए हिंदी का मंगल फॉण्ट आसानी से HTML में परिवर्तित हो जाता है ।
- विश्व के अधिकांश और लोकप्रिय पोर्टल अब केवल यूनिकोड यानि मंगल फॉण्ट के माध्यम से पढ़ और लिख सकते है ।
- यूनिकोड में सेट करने के बाद या किसी अन्य सर्च इंजन में आप सीधे देवनागरी में टाइप कर वेब को सर्च कर सकते है ।
- यूनिकोड के फॉण्ट प्राप्त करने के लिए इंटरनेट के माध्यम से निम्न वेब साइट पर जाकर डाउनलोड कर सकते है ।

➢www.rajbhasha.gov.in
➢www.bbchindi.com

★★★



COCKROACH THEORY

Here's Sundar Pichai's " Cockroach Theory" that will teach you a thing or two about Life. Sunder Pichai continues to make global news after becoming Google's CEO. Stories about his past, schooling and college days are viral. Well at least in India they are. Here's another story, or rather a speech by Sundar Pichai, that is being massively shared and available in the net. It's a speech about the 'cockroach theory' for self-development. Here's how the theory goes:

"At a restaurant, a cockroach suddenly flew from somewhere and sat on a lady.She started screaming out of fear. With a panic stricken face and trembling voice, she started jumping, with both her hands desperately trying to get rid of the cockroach.

Her reaction was contagious, as everyone in her group also got panicky.

The lady finally managed to push the cockroach away but ...it landed on another lady in the group.

Now, it was the turn of the other lady in the group to continue the drama.The waiter rushed forward to their rescue.In the relay of throwing, the cockroach next fell upon the waiter. The waiter stood firm, composed himself and observed the behaviour of the cockroach on his shirt.

When he was confident enough, he grabbed it with his fingers and threw it out of the restaurant.Sipping my coffee and watching the amusement, the antenna of my mind picked up a few thoughts and started wondering, was the cockroach responsible for their histrionic behaviour?

If so, then why was the waiter not disturbed?

He handled it near to perfection, without any chaos.It is not the cockroach, but the inability of the ladies to handle the disturbance caused by the cockroach that disturbed the ladies.

I realized that, it is not the shouting of my father or my boss or my wife that disturbs me, but it's my inability to handle the disturbances caused by their shouting that disturbs me.

It's not the traffic jams on the road that disturbs me, but my inability to handle the disturbance caused by the traffic jam that disturbs me.

More than the problem, it's my reaction to the problem that creates chaos in my life.

Lessons learnt from the story:

I understood, I should not react in life.

I should always respond.

The women reacted, whereas the waiter responded.

Reactions are always instinctive, whereas responses are always well thought of, just and right to save a situation from going out of hands, to avoid cracks in relationship, to avoid taking decisions in anger, anxiety, stress or hurry.

A beautiful way to understand.....LIFE."

\- SundarPichai

Well that's quite a bit of an insight into the mind of the person who runs Google or better said the internet.

Source &Courtesy : www.mensxp.com(ShantanuPrasher)

" Person who is HAPPY is not because everything is Right in his Life.

He is HAPPY because his attitude towards everything in his Life is Right !!!..."

★TRAINING CALENDAR OF IRIEEN FOR 2016-2017 (As on dated 17.03.2016) - FOR SUPERVISOR

	COURSE NUMBER	COURSE TITLE	DURATION			CD
			WEEKS	FROM	TO	
1	EPA-SUP-1	ENERGY AUDIT PRACTICAL COURSE	1	POSTPONDED		
2	TL-AC-SUP-1	TRAIN LIGHTING , AIR CONDITIONING & LHB	2	25-Apr-16	06-May-16	SPTL
3	TRD-SUP-1	TRACTION DISTRIBUTION	1	09-May-16	13-May-16	PT
4	ECBT-SUP-1	ENERGY COMPUTER BASE TRAINING	1	23-May-16	27-May-16	AP
5	TRS-TRO-SUP-1	TRACTION ROLLING STOCK AND TRACTION ROLLING OPERATION	1	30-May-16	03-Jun-16	PL
6	RE-SUP-1	RAILWAY ELECTRIFICATION	1	13-Jun-16	17-Jun-16	PT
7	IRSOD-SUP-1	INDAIN RAILWAY SCHEDULE OF DIMENSION	1	27-Jun-16	01-Jul-16	PT
8	ECBT-SUP-2	ENERGY COMPUTER BASE TRAINING	1	11-Jul-16	15-Jul-16	AP
9	AT-SUP-1	AUTOMATION AND TECHNOLOGY AND ITS APPLICATION IN INDIAN RAILWAYS	2	18-Jul-16	29-Jul-16	PE
10	EPA-SUP-2	ENERGY AUDIT PRACTICAL COURSE	1	01-Aug-16	05-Aug-16	AP
11	AT-SUP-2	AUTOMATION AND TECHNOLOGY AND ITS APPLICATION IN INDIAN RAILWAYS	2	22-Aug-16	02-Sep-16	PE
12	EPA-SUP-3	ENERGY AUDIT PRACTICAL COURSE	1	05-Sep-16	09-Sep-16	AP
13	ECBT-SUP-3	ENERGY COMPUTER BASE TRAINING	1	12-Sep-16	16-Sep-16	AP
14	AT-SUP-3	AUTOMATION AND TECHNOLOGY AND ITS APPLICATION IN INDIAN RAILWAYS	2	19-Sep-16	30-Sep-16	PE
	TRD-SUP-1	TRACTION DISTRIBUTION	1	03-Oct-16	07-Oct-16	PT
15	AT-SUP-4	AUTOMATION AND TECHNOLOGY AND ITS APPLICATION IN INDIAN RAILWAYS	2	17-Oct-16	28-Oct-16	PE
16	AT-SUP-5	AUTOMATION AND TECHNOLOGY AND ITS APPLICATION IN INDIAN RAILWAYS	2	14-Nov-16	25-Nov-16	PE
17	EPA-SUP-4	ENERGY AUDIT PRACTICAL COURSE	1	28-Nov-16	02-Dec-16	AP
18	ECBT-SUP-4	ENERGY COMPUTER BASE TRAINING	1	05-Dec-16	09-Dec-16	AP
19	AT-SUP-6	AUTOMATION AND TECHNOLOGY AND ITS APPLICATION IN INDIAN RAILWAYS	2	12-Dec-16	23-Dec-16	PE
20	AT-SUP-7	AUTOMATION AND TECHNOLOGY AND ITS APPLICATION IN INDIAN RAILWAYS	2	09-Jan-17	20-Jan-17	PE
21	TL-AC-SUP2	TRAIN LIGHTING , AIR CONDITIONING & LHB	2	23-Jan-17	03-Feb-17	SPTL
22	AT-SUP-8	AUTOMATION AND TECHNOLOGY AND ITS APPLICATION IN INDIAN RAILWAYS	2	06-Feb-17	17-Feb-17	PE
23	TRS-TRO-SUP-2	TRACTION ROLLING STOCK AND TRACTION ROLLING OPERATION	1	20-Feb-17	24-Feb-17	PL
24	RE-SUP-2	RAILWAY ELECTRIFICATION	1	27-Feb-17	03-Mar-17	PT
25	AT-SUP-9	AUTOMATION AND TECHNOLOGY AND ITS APPLICATION IN INDIAN RAILWAYS	2	06-Mar-17	17-Mar-17	PE
26	IRSOD-SUP-2	INDAIN RAILWAY SCHEDULE OF DIMENSION	1	27-Mar-17	31-Mar-17	PT

★In the event of cancellation or postponement of any courses, the same will be notified accordingly well in advance in the IRIEEN website. Therefore, please see IRIEEN website for changes in the course schedule.

INDIAN RAILWAY INSTITUTE OF ELECTRICAL ENGINEERING NASIK

COURSE CALENDAR FOR SUPERVISOR -2016-17 (As on 17.03.2016) (OFFICERS)

Year	Month	From	To	Week No.	AUTOMATION AND TECHNOLOGY AND IT APPLICATION IN INDIA RAILWAYS	ENERGY AUDIT PRACTICAL COURSE	ENERGY COMPUTER BASED TRAINING	TRAIN LIGHTING AIR CONDITIONING	TRS&TRO	IRSOD	RAILWAY ELECTRIFICATIO	TRACTION & DISTRIBUTION	Classrooms	Total No. of Trainees expect
2016	APRIL	4	8	1									0	0
		11	15	2									0	0
		18	22	3		EAP-SUP-1 (POSTPOND)							1	20
		25	29	4				TL-AC-1					1	20
	MAY	2	6	5									1	20
		9	13	6								TRD-1	1	20
		16	20	7									0	0
		23	27	8			ECBT-1						1	20
		30	3	9					TRS&TRO-1				1	20
	JUNE	6	10	10									0	0
		13	17	11							RE-1		1	20
		20	24	12									0	0
		27	1	13						IRSOD-1			1	20
	JULY	4	8	14									0	0
		11	15	15			ECBT-2						1	20
		18	22	16	A&T-1								1	20
		25	29	17									1	20
	AUGUST	1	5	18		EAP-SUP-2							1	20
		8	12	19									0	0
		15	19	20									1	20
		22	26	21	A&T-2								1	20
		29	2	22									1	20
	SEPTEMBER	5	9	23		EAP-SUP-3							1	20
		12	16	24			ECBT-3						1	20
		19	23	25	A&T-3								1	20
		26	30	26									1	20
	OCTOBER	3	7	27								TRD-2	1	20
		10	14	28									0	0
		17	21	29	A&T-4								1	20
		24	28	30									1	20
	NOVEMBER	31	4	31									0	0
		7	11	32									0	0
		14	18	33	A&T-5								1	20
		21	25	34									1	20
		28	2	35		EAP-SUP-4							1	20
	DECEMBER	5	9	36			ECBT-4						1	20
		12	16	37	A&T-6								1	20
		19	23	38									1	20
		26	30	39									0	0
2017	JANUARY	2	6	40									0	0
		9	13	41	A&T-7								1	20
		16	20	42									1	20
		23	27	43				TL-AC-2					1	20
		30	3	44									1	20
	FEBRUARY	6	10	45	A&T-8								1	20
		13	17	46									1	20
		20	24	47					TRS&TRO-1				1	20
		27	3	48							RE-2		1	20
	MARC	6	10	49	A&T-9								1	20
		13	17	50									1	20
		20	24	51									0	0

INDIAN RAILWAY INSTITUTE OF ELECTRICAL ENGINEERING NASIK

COURSE CALENDAR 2016-2017 (As on 17.03.2016)

2016

	APRIL				MAY					JUNE				JULY				AUGUST					SEPTEMBER				OCTOBER				NOVEMBER				DECEMBER					**2017** JANUARY					FEBRUARY				MARCH				
	4	11	18	25	2	9	16	23	30	6	13	20	27	4	11	18	25	1	8	15	22	29	5	12	19	26	3	10	17	24	31	7	14	21	28	5	12	19	26	2	9	16	23	30	6	13	20	27	6	13	20	27
	8	15	22	29	6	13	20	27	3	10	17	24	1	8	15	22	29	5	12	19	26	2	9	16	23	30	7	14	21	28	4	11	18	25	2	9	16	23	30	6	13	20	27	3	10	17	24	3	10	17	24	31
Week No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52
IRSEE BATCH 2013	PHASE -II			POSTING eX AM	EA-2(F-K) FV-A-K		Proj ,viva & Passing Out																																														
IRSEE BATCH 2014	Fondation course at NAIR									Field Training							EA-1(A-E) and Field Trg - F-K	Proj Rev (A-E)	Proj Rev (F-K)	Field Training		J&K /NE (A-	Field Training				INDUCTION at NAIR				FIELD / ZONAL Trainiig	ZONAL Trainiig												J&K/ NE	PHASE -						
IRSEE BATCH 2015																																					Join	Phase -I						Field Training				At NAIR						
CourseFOR SAG OFFICERS	TARE-4 (old)						ASM-1								TARE-1								ASM-2							TARE-2								ASM-3							TARE-3						
IC					IC-1														IC-2										IC-3														IC-4								
SPDP					SPDP-1														SPDP-2											SPDP-3													SPDP-4								
Appreciation courses											IRPS	IRSE	IRSSE		IRTS						IRSS	IRSME																																
SPL COURSE TRS																TRS-1								TRS-2								TRS-3													TRS-4						
SPL COURSE TRD												TRD-1										RE-1										RE-2														TRD-2						
SPL COURSE GS-EC & IT																					IRSOD-1																		IRSOD-2														
SPL COURSE LHB& TL-AC																	LHB AC &TL-1													LHB AC &TL-2												LHB AC &TL-3										
ENERGY AUDIT	EAP-1 POSTPONDED		ECBT-1		EA-1						ECBT-2						EA-2				ECBT-3			EAP-2						ECBT-4	EAP-3								EAP-4														
ELECRIC ENERGY COST REDUCTION		EECR-1					EECR-2					EECR-3				EECR-4						EECR-5			EECR-6			EECR-7				EECR-8			EECR-9							EECR-10			EECR-11					EECR-12		
SPL Technical COURSE					EMU-1														EMU-2						Audit-1													EMU-3														
			IT-1																IT-2																IT-3																				
OTHER SPL COURSE		PAM-1 (5 DAYS)				NRE-1	PERS-1				METRO-1					PERS-2	DTMP-1				DTMP-2						NRE-2							DTMP-3			PERS-3					NRE-3				METRO-2			PAM-2 (5 DAYS)				
	TOT-1			ETO-1	C&A-1	GRIHA & ECBC-1							QTP-1									PD-2(3 Days)			QTP-2	C&A-2	GRIHA & ECBC-2		ETO-2							C&A-3		9 (5 days)		PD-2(3 Days)		GRIHA & ECBC-3					TOT-2		C&A-4		ETO-3	
Classrooms	4	4	4	4	4	5	3	3	2	2	3	3	4	1	3	3	5	3	5	2	5	5	4	1	4	4	3	1	4	1	0	4	4	8	5	3	4	3	1	4	3	4	2	4	4	4	4	3	4	2	2	2
Total No. of Trainees expect	80	80	80	80	55	65	75	75	60	60	50	70	40	10	60	30	65	45	65	35	50	85	75	10	40	40	30	10	40	10	0	40	40	30	50	30	85	75	55	85	75	85	65	85	85	85	85	30	40	65	65	65

30.10.2016- Deepawqli 25.12.2016 - Christmas 13.03.2017 -- Holi

	TRAINING CALENDAR OF IRIEEN FOR 2016-2017 (As on dated 17.03.2016)						
	COURSE NUMBER	COURSE TITLE	DURATION			CD	GRADE
			WEEKS	FROM	TO		
1	IRSEE-2013	IRSEE-2013 BATCH OF IRSEE PROBATIONERS				SPTL	IRSEE PROB
2	IRSEE-2014	IRSEE-2014 BATCH OF IRSEE PROBATIONERS				SPTL	IRSEE PROB
3	IRSEE-2015	IRSEE-2015 BATCH OF IRSEE PROBATIONERS				SPTL	IRSEE PROB
4	TOT-1	TRAINING OF TRAINERS	1	04-Apr-16	08-Apr-16	LC	Gazetted Principal/vice
5	EAP-1	ENERGY AUDIT PRACTICAL FOR OFFICERS	1	POSTPONDED			
6	IC1	INTEGRATED COURSE	10	04-Apr-16	10-Jun-16	PL	GR.B. AEE/DEE
7	PAM1	PASSENGER AMENITIES & MODERNISATION	3 Days	11-Apr-16	13-Apr-16	AP	JS/SS/JAG
8	EECR-1	ELECTRICAL ENERGY COST REDUCTION	1	11-Apr-16	15-Apr-16	SPG	JS/SS/JAG/SG
9	ECBT-1	ENERGY COMPUTER BASED TRAINING	1	18-Apr-16	22-Apr-16	SPG	JS/SS/JAG
10	IT- 1	SPL. COURSE ON INFORAMTION TECHNOLOGY	1	18-Apr-16	22-Apr-16	LC	[illegible]
11	ETO-1	ELECTRIC TRACTION OPERATIONS	1	25-Apr-16	29-Apr-16	LC	JAG/SAG
12	C&A-1	CONTRACTS & ARBITRATION	1	02-May-16	06-May-16	SPTL	JS/SS/JAG/SG
13	EMU/MEMU-1	SPL. COURSE ON EMU/MEMU	1	02-May-16	06-May-16	AP	JS/SS
14	SPDP-1	SR.PROFESSIONAL DEVELOPMENT COURSE	2	02-May-16	13-May-16	PTR	JAG/SG
15	EAUDIT-1	ENERGY AUDIT	2	02-May-16	13-May-16	SPTL	[illegible]
16	N&RE-1	NEW & RENEWABLE ENERGY CONSERVATION	1	09-May-16	13-May-16	SPG	ALL ELECTRICAL OFFICERS
17	GRIHA &ECBC -1	GREEN RATING FOR INTEGRATED HABITED ASSESSMENT &	1	09-May-16	13-May-16	SPG	ALL ELECTRICAL OFFICERS
18	ASM-1	ADVANCE STRATEGIC MANAGEMENT FOR SAG OFFICERS	8	09-May-16	01-Jul-16	SPA	SAG
19	PERS-1	SPL. COURSE ON POWER ELECTRONICS FOR RAILWAY	1	16-May-16	20-May-16	PE	JS/SS
20	EECR-2	ELECTRICAL ENERGY COST REDUCTION	1	16-May-16	20-May-16	SPG	JS/SS/JAG/SG
21	METRO 1	METRO TECHNOLOGY	1	13-Jun-16	17-Jun-16	PE	JS/SS/JAG/SAG
22	IRPS	APPRECIATION COURSE FOR IRPS PROBATIONERS	1	13-Jun-16	17-Jun-16	SPG	Probationers
23	EECR-3	ELECTRICAL ENERGY COST REDUCTION	1	20-Jun-16	24-Jun-16	SPG	JS/SS/JAG/SG
24	IRSE	APPRECIATION COURSE FOR IRSE PROBATIONERS	1	20-Jun-16	24-Jun-16	SPG	Probationers
25	TRD-1	SPL. COURSE ON TRD	2	20-Jun-16	01-Jul-16	PTR	JS/SS
26	IRSSE	APPRECIATION COURSE FOR IRSSE PROBATIONERS	1	27-Jun-16	01-Jul-16	SPG	Probationers
27	QITP1	QUALITY OF INSPECTION & TESTING PRINCIPLES	1	27-Jun-16	01-Jul-16	SPG	JS/SS/JAG
28	TARE-1	TECHNOLOGICAL ADVANCES IN RAILWAY ELECTRICAL	8	04-Jul-16	26-Aug-16	SPA	SAG
29	EECR-4	ELECTRICAL ENERGY COST REDUCTION	1	11-Jul-16	15-Jul-16	SPG	JS/SS/JAG/SG
30	IRTS	APPRECIATION COURSE FOR IRTS PROBATIONERS	1	11-Jul-16	15-Jul-16	SPG	IRTS Probationers
31	IC-2	INTEGRATED COURSE	10	11-Jul-16	16-Sep-16	PL	GR.B. AEE/DEE
32	PERS-2	SPL. COURSE ON POWER ELECTRONICS FOR RAILWAY	1	18-Jul-16	22-Jul-16	PE	JS/SS

Page No. 1

TRAINING CALENDAR OF IRIEEN FOR 2016-2017 (As on dated 17.03.2016)

	COURSE NUMBER	COURSE TITLE	DURATION			CD	GRADE
			WEEKS	FROM	TO		
33	TRS-1	SPL. COURSE ON TRS	2	18-Jul-16	29-Jul-16	PL	JS/SS
34	DTMP1	DEVELOPMENT IN TECHNOLOGIES FOR MOTIVE POWER	1	25-Jul-16	29-Jul-16	PE	JAG/SAG
35	EAUDIT-2	ENERGY AUDIT	2	25-Jul-16	05-Aug-16	SPTL	IRSEE Probationers
36	LHB&TL-AC-1	SPL. COURSE ON LHB & TRAIN LIGHTING - AIR CONDITIONING	2	25-Jul-16	05-Aug-16	SPTL	JS/SS/JAG/SG
37	IT- 2	SPL. COURSE ON INFORAMTION TECHNOLOGY	1	08-Aug-16	12-Aug-16	LC	OFFICERS OF ALL ELECTRICAL OFFICER
38	EMU/MEMU-2	SPL. COURSE ON EMU/MEMU	1	08-Aug-16	12-Aug-16	AP	JS/SS
39	SPDP-2	SR.PROFESSIONAL DEVELOPMENT COURSE	2	08-Aug-16	19-Aug-16	PTR	JAG/SG
40	ECBT-3	ENERGY COMPUTER BASED TRAINING	1	22-Aug-16	26-Aug-16	SPG	JS/SS/JAG
41	DTMP2	DEVELOPMENT IN TECHNOLOGIES FOR MOTIVE POWER	1	22-Aug-16	26-Aug-16	PE	JAG/SAG
42	IRSOD-1	INDAIN RAILWAY SCHEDULE OF DIMENSION	1	22-Aug-16	26-Aug-16	PTR	JS/SS/JAG/SG
43	EECR-5	ELECTRICAL ENERGY COST REDUCTION	1	29-Aug-16	02-Sep-16	SPG	JS/SS/JAG/SG
44	IRSS	APPRECIATION COURSE FOR IRSS PROBATIONERS	1	29-Aug-16	02-Sep-16	SPG	Probationers
45	ASM-2	ADVANCE STRATEGIC MANAGEMENT FOR SAG OFFICERS	8	29-Aug-16	21-Oct-16	SPA	SAG
46	RE1	SPL. COURSE ON RAILWAY ELECTRCIFICATION	2	29-Aug-16	09-Sep-16	SPTRD	JS/SS
47	PD-1	PERSONALITY DEVELOPMENT	3 Days	07-Sep-16	09-Sep-16	SPA	ALL ELECTRICAL OFFICERS
48	IRSME1	APPRECIATION COURSE FOR IRSME PROBATIONERS	1	05-Sep-16	09-Sep-16	SPG	Probationers
49	QITP2	QUALITY OF INSPECTION & TESTING PRINCIPLES	1	19-Sep-16	23-Sep-16	SPG	JS/SS/JAG
50	EAP-2	ENERGY AUDIT PRACTICAL COURSE FOR OFFICERS	1	19-Sep-16	21-Sep-16	SPG	JS/SS
51	AUDIT-1	AUDIT FOR AUDITOR	3 Days	19-Sep-16	21-Sep-16	SPA	Auditors
52	TRS-2	SPL. COURSE ON TRS	2	19-Sep-16	30-Sep-16	PL	JS/SS
53	EECR-6	ELECTRICAL ENERGY COST REDUCTION	1	26-Sep-16	30-Sep-16	SPG	JS/SS/JAG/SG
54	C&A-2	CONTRACTS & ARBITRATION	1	26-Sep-16	30-Sep-16	SPTL	JS/SS/JAG/SG
55	IC3	INTEGRATED COURSE	10	26-Sep-16	02-Dec-16	PL	GR.B. AEE/DEE
56	N&RE-2	NEW & RENEWABLE ENERGY CONSERVATION	1	03-Oct-16	07-Oct-16	SPG	ALL ELECTRICAL OFFICERS
57	GRIHA &ECBC -2	GREEN RATING FOR INTEGRATED HABITED ASSESSMENT &	1	03-Oct-16	07-Oct-16	SPG	ALL ELECTRICAL OFFICERS
58	ETO2	ELECTRIC TRACTION OPERATIONS	1	17-Oct-16	21-Oct-16	LC	JAG/SAG
59	EECR-7	ELECTRICAL ENERGY COST REDUCTION	1	17-Oct-16	21-Oct-16	SPG	JS/SS/JAG/SG
60	TARE-2	TECHNOLOGICAL ADVANCES IN RAILWAY ELECTRICAL	8	24-Oct-16	16-Dec-16	SPA	SAG
61	ECBT-3	ENERGY COMPUTER BASED TRAINING	1	07-Nov-16	11-Nov-16	SPG	JS/SS/JAG
62	SPDP3	SR.PROFESSIONAL DEVELOPMENT COURSE	2	07-Nov-16	18-Nov-16	PTR	JAG/SG
63	LHB&TL-AC-2	SPL. COURSE ON LHB & TRAIN LIGHTING - AIR	2	07-Nov-16	18-Nov-16	SPTL	JS/SS/JAG/SG
64	EECR-8	ELECTRICAL ENERGY COST REDUCTION	1	21-Nov-16	25-Nov-16	SPG	JS/SS/JAG/SG

TRAINING CALENDAR OF IRIEEN FOR 2016-2017 (As on dated 17.03.2016)

	COURSE NUMBER	COURSE TITLE	DURATION			CD	GRADE
			WEEKS	FROM	TO		
65	RE2	SPL. COURSE ON RAILWAY ELECTRCIFICATION	2	21-Nov-16	02-Dec-16	PTRD	JS/SS
66	IT 3	SPL. COURSE ON INFORAMTION TECHNOLOGY	1	28-Nov-16	02-Dec-16	LC	OFFICERS OF ALL DEPARTMENTS
67	DTMP3	DEVELOPMENT IN TECHNOLOGIES FOR MOTIVE POWER	1	28-Nov-16	02-Dec-16	PE	JAG/SAG
68	TRS-3	SPL. COURSE ON TRS	2	28-Nov-16	09-Dec-16	PL	JS/SS
69	C&A-3	CONTRACTS & ARBITRATION	1	05-Dec-16	09-Dec-16	SPTL	JS/SS/JAG/SG
70	PERS3	SPL. COURSE ON POWER ELECTRONICS FOR RAILWAY	1	12-Dec-16	16-Dec-16	PE	JS/SS
71	EECR-9	ELECTRICAL ENERGY COST REDUCTION	1	12-Dec-16	16-Dec-16	SPG	JS/SS/JAG/SG
72	SJ	SPL. COURSE FOR 1990 BATCH OFFICERS	3 DAYS	21-Dec-16	23-Dec-16	SPA	SAG
73	ASM-3	ADVANCE STRATEGIC MANAGEMENT FOR SAG OFFICERS	8	19-Dec-16	10-Feb-17	SPA	SAG
74	IRSOD-2	INDAIN RAILWAY SCHEDULE OF DIMENSION	1	02-Jan-17	06-Jan-17	PT	JS/SS/JAG/SG
75	PD-2	PERSONALITY DEVELOPMENT	3 Days	04-Jan-17	06-Jan-17	SPA	ALL ELECTRICAL OFFICERS
76	EMU/MEMU3	SPL. COURSE ON EMU/MEMU	1	02-Jan-17	06-Jan-17	AP	JS/SS
77	EAP-4	ENERGY AUDIT PRACTICAL COURSE FOR OFFICERS	1	09-Jan-17	13-Jan-17	SPG	JS/SS
78	IC4	INTEGRATED COURSE	10	09-Jan-17	17-Mar-17	PL	GR.B. AEE/DEE
79	N&RE-3	NEW & RENEWABLE ENERGY CONSERVATION	1	16-Jan-17	20-Jan-17	SPG	ALL ELECTRICAL OFFICERS
80	GRIHA &ECBC -3	GREEN RATING FOR INTEGRATED HABITED ASSESSMENT &	1	16-Jan-17	20-Jan-17	SPG	ALL ELECTRICAL OFFICERS
81	EECR-10	ELECTRICAL ENERGY COST REDUCTION	1	30-Jan-17	03-Feb-17	SPG	JS/SS/JAG/SG
82	LHB&TL-AC-3	SPL. COURSE ON LHB & TRAIN LIGHTING - AIR	2	30-Jan-17	10-Feb-17	SPTL	JS/SS/JAG/SG
83	SPDP4	SR.PROFESSIONAL DEVELOPMENT COURSE	2	06-Feb-17	17-Feb-17	PTRD	JAG/SG
84	METRO 2	METRO TECHNOLOGY	1	13-Feb-17	17-Feb-17	PE	JS/SS/JAG/SAG
85	TARE-3	TECHNOLOGICAL ADVANCES IN RAILWAY ELECTRICAL	8	13-Feb-17	07-Apr-17	SPA	SAG
86	TOT-2	TRAINING OF TRAINERS	1	20-Feb-17	24-Feb-17	LC	Non- Gazetted Instructors
87	EECR-11	ELECTRICAL ENERGY COST REDUCTION	1	20-Feb-17	24-Feb-17	SPG	JS/SS/JAG/SG
88	TRS4	SPL. COURSE ON TRS	2	20-Feb-17	03-Mar-17	PL	JS/SS
89	TRD2	SPL. COURSE ON TRD	2	27-Feb-17	10-Mar-17	PTR	JS/SS
90	PAM2	PASSENGER AMENITIES & MODERNISATION	3 Days	06-Mar-17	08-Mar-17	AP	JS/SS/JAG
91	C&A-4	CONTRACTS & ARBITRATION	1	06-Mar-17	10-Mar-17	SPTL	JS/SS/JAG/SG
92	ETO-3	ELECTRIC TRACTION OPERATIONS	1	20-Mar-17	24-Mar-17	LC	JAG/SAG
93	EECR-12	ELECTRICAL ENERGY COST REDUCTION	1	27-Mar-17	31-Mar-17	SPG	JS/SS/JAG/SG

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Republic Day Celebration (Jan 2016) & Hindi Meeting at IRIEEN















Some Glimpses Of
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