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Analysis of the Network Parameters for Inspection of Harmonics and Solutions

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ABSTRACT: In a power system network the power generated, transmitted and distributed and in the whole process there are different kind of losses like constant loss, variable loss and few other losses. To differentiate the losses and for the process of reduction it is necessary to find out the parameters at various stages. In this paper a power analyser has been planted in the high tension and low tension side of the distribution transformer to find out the parameters of the system. In this work reactive power and harmonic analysis has been done and discuss the solutions for the enhancement in the system. As the nonlinear loads are increasing day by day along with other electronic devices that generate harmonics causes severe loss in the system. Now a days various research is going on to make this loss in a permissible limit and to make system stable with the reduced losses as much as possible.

KEYWORDS: Total harmonic distortion, non-linear loads, distribution transformer, passive power filter, active power filter, facts devices.

I.INTRODUCTION

Due to the non-linear characteristics of several devices such as power converters, Fluorescent lamps, personal computers, variable drives used in various industrial pumps, fans and compressors and also in air conditioning equipment have made the harmonic distortion occurrence in the electrical system network. As the harmonics currents injected by these loads have a very small impact on the system but all these equipment used in the large numbers will make a severe impact. Commercial and industrial consumers make a huge impact at the point of common coupling. Various teams of industrial electronics studied the impacts of harmonics in the power system and gave certain guidelines to maintain harmonics in within acceptable level. Maximum permissible harmonic limits in the system and their control laid down by IEEE.

The Harmonic disturbances were principally less in the earlier period as the designs of power systems were very easy and conformist. However, these days with using of compound devices in the industry and traditional harmonic disturbances has too enlarged. So the Harmonics are one of the highest worries in a power system investigates.

There are numerous resolves aimed at the standards which are taking from the power quality. One of the highest details is the consumers are well informed about the power quality subjects like interruptions, sagging and switching transients.

Besides, many power organizations are internally joined to low voltage network. The component of electrical power (current and voltage) distortion waveforms caused by harmonics are realizing to weaken of the power systems analyses [1].

Various Facts devices and filters has been used to neutralise the effects of harmonics and the values to be reduced in the set limit by IEEE for the commercial and industrial consumers as they used large number of devices causes disturbance.

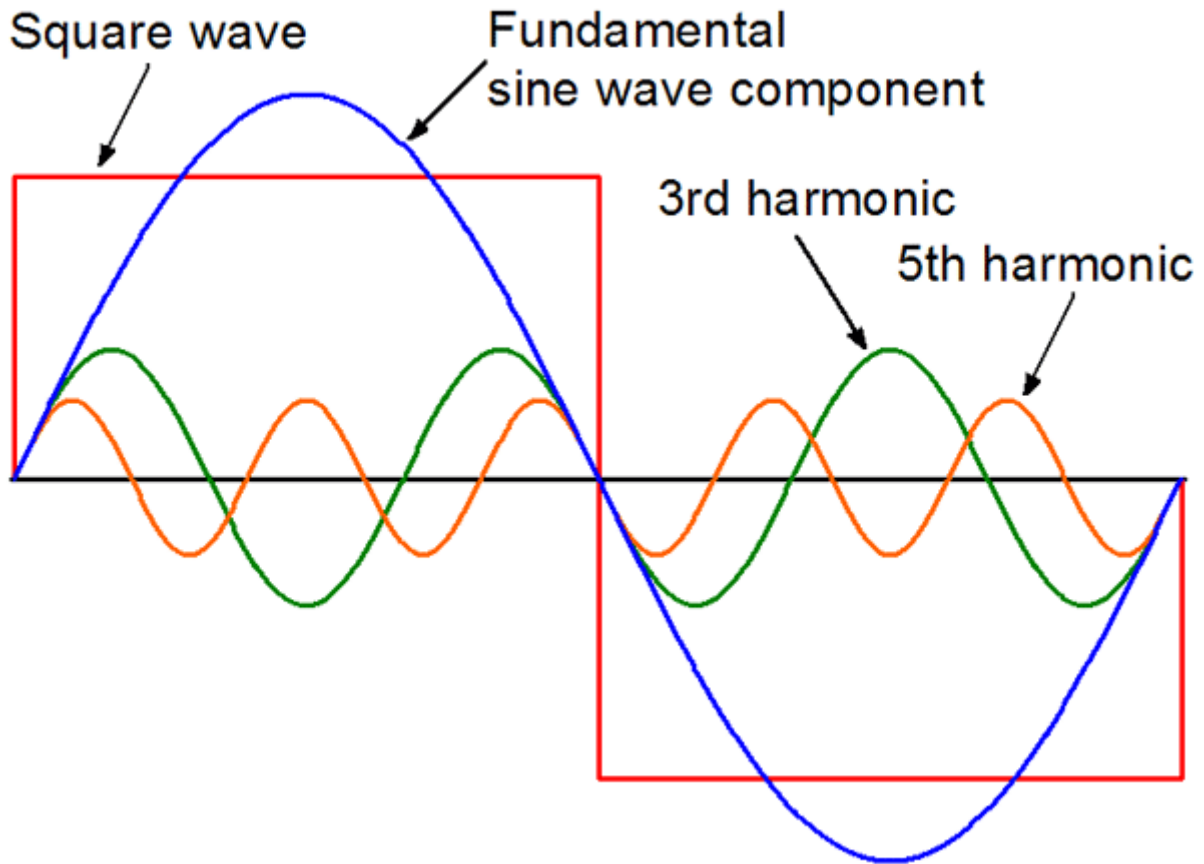


Fig 1 Harmonic effects on waveforms

II. PARAMETERS FROM THE ANALYSER

Table 1 Voltage and currents HT side

V1 (5 min)	V2 (5 min)	V3 (5 min)	I1 (5 min)	I2 (5 min)	I3 (5 min)
6585.3	6534.1	6552.5	8.3213	7.6416	7.6216
6584.9	6535.9	6553.9	10.0405	8.7391	9.361
6591.9	6546.1	6566	11.8258	10.5301	11.1848
6595.2	6549.8	6567	12.5721	11.2169	11.8271
6607.5	6560.2	6578	12.4008	11.0101	11.6729
6599.7	6553.4	6570.7	11.7701	10.3867	11.068
6592.5	6543.9	6562.2	11.5935	10.1708	10.9217
6591	6538.1	6561.5	11.0994	9.5883	10.3718
6595.5	6541.8	6564.6	10.8415	9.4957	10.2591
6606.3	6557	6577.3	10.7272	9.3035	10.0288
6607.9	6559.1	6576.7	10.7858	9.4664	10.1673
6594.4	6544.3	6565	10.8777	9.4163	10.0907
6591	6540.1	6562.1	11.021	9.7286	10.4402



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6590	6538.1	6560.9	10.9642	9.5145	10.2041
6595.6	6544.5	6565.4	10.9952	9.6246	10.3431
6601.7	6551.7	6570.6	10.9358	9.6296	10.2374
6608.4	6557.1	6573.6	11.011	9.7141	10.4172
6604.5	6552.5	6570.2	10.9831	9.5778	10.3397
6606.1	6553.9	6571.4	10.9466	9.5518	10.3696
6603	6552.2	6567	10.7296	9.2062	9.9817
6603.3	6554.6	6568	10.7753	9.4323	10.1266
6587.8	6539	6554.5	10.6739	9.2517	9.9548
6606.4	6559.4	6571	10.5955	9.2989	9.9093
6607	6559.3	6570.8	10.6508	9.3767	9.9377
6479.8	6417.6	6442.4	10.5878	9.3068	9.9242
6473.8	6411.5	6437.5	10.7842	9.4087	10.0389
6470.2	6408	6431.3	10.7716	9.432	10.0843

Table 2 Active, reactive power and power factor HT side

P1+ (5 min)	P2+ (5 min)	P3+ (5 min)	Q1 (5 min)	Q2 (5 min)	Q3 (5 min)	PFT+ (5 min)
W	W	W	var	var	var	
51564	47010	47859	12000	11969	7295	0.97
65186	56521	60956	10271	7173	-3250	0.992
76871	68296	73242	12667	8938	3286	0.992
81852	72807	77481	13095	9668	3991	0.992
80851	71582	76558	13083	9349	4286	0.992
76671	67499	72533	12365	8637	814	0.992
75380	66001	71451	12436	8380	-1317	0.992
72169	62150	67849	11876	8072	-3837	0.992
70568	61673	67132	11448	7260	-2831	0.992
69938	60506	65755	11348	7668	-4189	0.992
70350	61644	66631	11242	7305	-4270	0.992
70743	61010	66026	11720	8459	-1155	0.991
71590	63100	68299	12196	8056	1970	0.992
71240	61608	66747	11907	8474	-1577	0.991
71491	62462	67700	11926	8054	33	0.992
71240	62532	67065	11528	8281	1003	0.992
71642	63105	68239	12513	8417	2334	0.991
71390	62149	67689	12606	8523	2356	0.991
71261	62112	67923	12123	7636	-1269	0.992
69885	59767	65321	11547	7867	-3069	0.992
70195	61311	66322	11555	7833	-642	0.992
69408	59985	65062	11221	7805	-4205	0.992
69122	60492	64933	10948	7743	-1522	0.992
69537	61001	65107	10693	7743	-3148	0.993



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67826	59287	63742	10101	7105	-419	0.993
68849	59714	64436	11412	8383	865	0.991
68718	59866	64669	11489	8220	2286	0.991

Table 3 Voltage, current, active power LT side

V1 rms	V2 rms	V3 rms	A1 rms	A2 rms	A3 rms	P1 (W)	P2 (W)	P3 (W)
V	V	V	A	A	A	W	W	W
248.5	246.8	249.6	173.44	172.33	173.37	42639	41962	42802
248.5	246.8	249.6	173.44	172.43	173.6	42621	41977	42877
248.5	246.9	249.7	173.25	172.54	173.74	42575	42023	42918
248.5	246.9	249.6	173.27	172.65	173.81	42576	42064	42929
248.4	246.9	249.6	173.39	172.76	173.9	42580	42081	42947
248.3	247	249.7	173.46	172.85	173.95	42569	42129	42969
248.3	247.1	249.7	173.49	172.78	173.99	42577	42124	42985
248.5	247	249.7	173.69	173.1	174.05	42652	42186	42994
246.7	244.6	247.9	176.74	177.33	179.1	39150	39590	40040
247.2	245.5	248.3	177.52	178.51	179.83	38873	39338	39655
247.2	245.5	248.2	177.7	178.72	180.05	38964	39399	39761
247.1	245.4	248.1	177.43	178.48	179.6	38813	39298	39609
247.1	245.3	248.1	177.34	178.41	179.53	38820	39330	39614
247.2	245.4	248.2	177.67	178.62	179.74	38888	39375	39666
247.1	245.6	248.2	178.62	179.45	180.3	39220	39631	39837
247.1	245.7	248.3	178.68	179.72	180.34	39326	39724	39873
247.1	245.6	248.2	178.69	179.55	180.27	39265	39628	39806
247.1	245.6	248.2	178.5	179.34	180.16	39224	39571	39789
247	245.6	248.2	178.41	179.28	180.02	39216	39566	39731
247	245.7	248.2	178.38	179.31	179.92	39191	39537	39657
247.1	245.6	248.2	177.63	178.98	179.56	39013	39455	39574
247.1	245.6	248.3	177.41	178.83	179.58	38901	39395	39565
247.1	245.5	248.2	178.18	179.44	180.36	39124	39594	39826
247	245.6	248.2	179.13	180.4	181.18	39522	39919	40127
246.9	245.8	248.2	178.71	180.4	180.84	39431	39853	39925
246.8	246.1	248.2	178.08	179.69	179.87	39291	39614	39574
246.8	246.2	248.3	177.62	179.52	179.53	39205	39539	39450
246.8	246.2	248.2	177.66	179.45	179.29	39200	39501	39332



Table 4 Voltage and current Total harmonic distortion

V1 THDf	V2 THDf	V3 THDf	A1 THDf	A2 THDf	A3 THDf
% f	% f	% f	% f	% f	% f
1	1.2	1.4	11.9	10.6	13
1	1.2	1.4	11.9	10.6	12.2
1	1.2	1.3	11.9	10.6	12.4
1	1.2	1.4	11.6	10.8	12.4
1	1.2	1.4	11.9	11	12.4
1	1.1	1.3	12	10.8	12.6
1	1.2	1.3	12	10.8	12.4
1.1	1.2	1.3	12	11	12.7
1.1	1.3	1.4	11.5	14.7	15.5
1.1	1.2	1.4	14.6	14.8	15.9
1.1	1.3	1.4	14.8	15.1	16
1.1	1.2	1.4	14.6	14.8	15.6
1.1	1.3	1.3	14.4	14.8	15.6
1.1	1.3	1.4	14.6	14.6	15.6
1.1	1.3	1.4	15.3	15.4	16.3
1.1	1.2	1.4	15.6	15.7	16.3
1.1	1.2	1.4	15.7	15.8	16.2
1.1	1.2	1.4	15.5	15.6	16.1
1.1	1.2	1.4	15.4	15.5	16.2
1.1	1.2	1.4	15.4	15.5	15.8
1.2	1.3	1.4	15.2	15.3	15.8
1.1	1.3	1.3	14.6	15.1	15.6
1.1	1.3	1.4	14.9	15.4	16.2
1.2	1.4	1.4	16	16.3	17.1
1.2	1.3	1.4	16.1	16.5	16.9
1.1	1.2	1.4	15.4	15.9	16.1
1.1	1.3	1.4	14.7	15.6	15.8
1.1	1.2	1.5	14.8	15.6	15.4



III. RESULT AND DISCUSSION

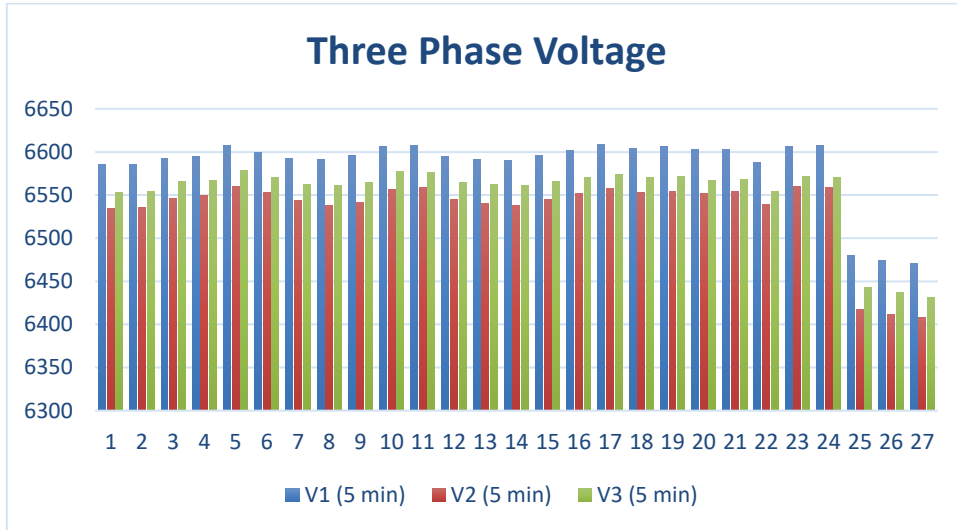


Fig 2 Three phase voltage HT side

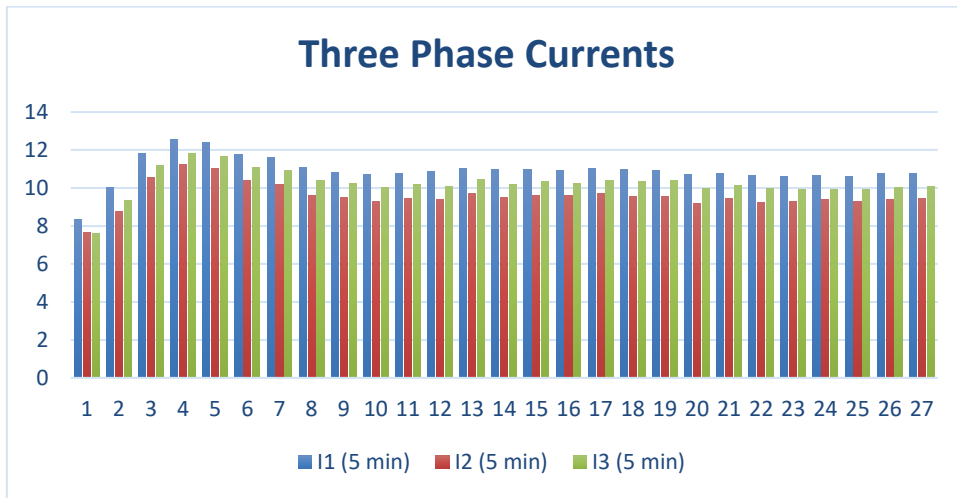


Fig 3 Three phase currents HT side

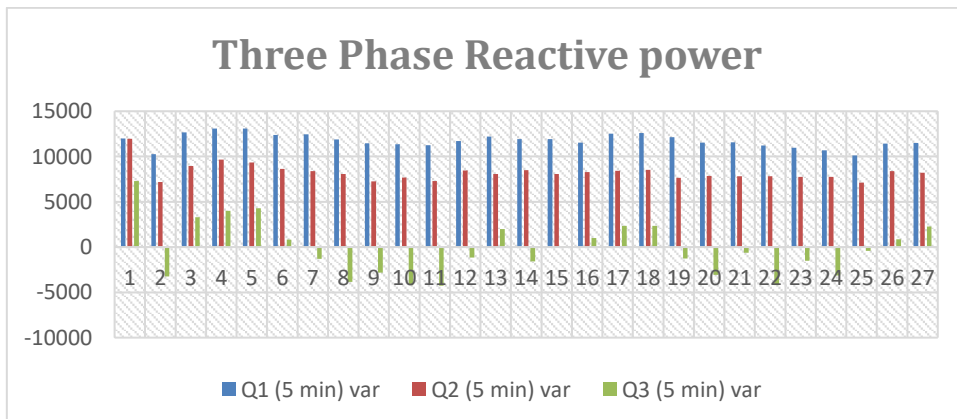


Fig 4 Three phase reactive power HT side

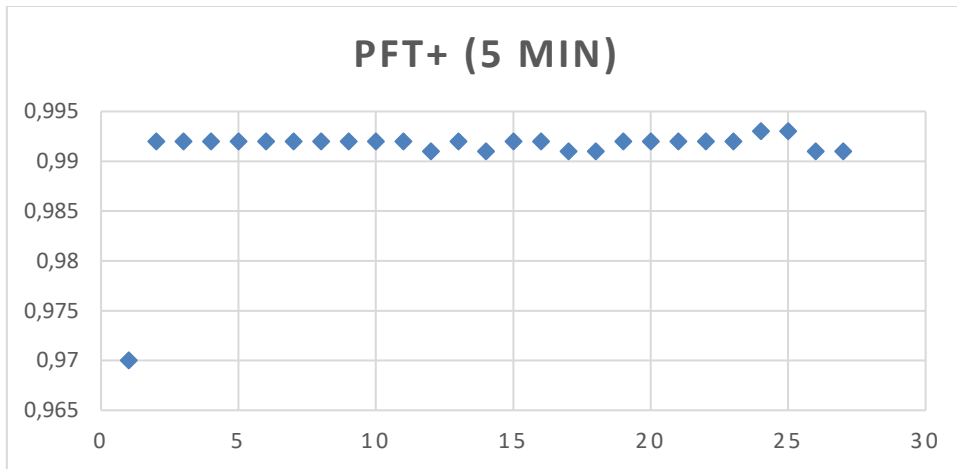


Fig 5 Power factor HT side

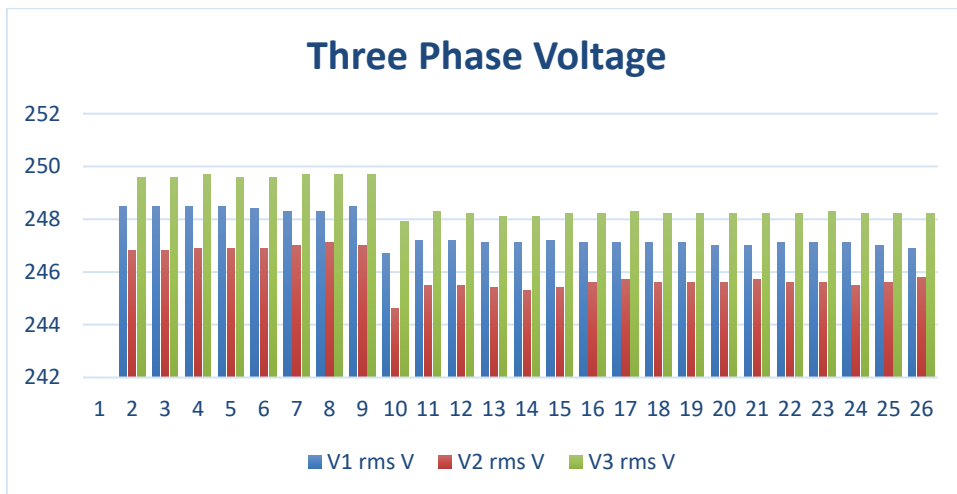


Fig 6 Three phase voltage LT side

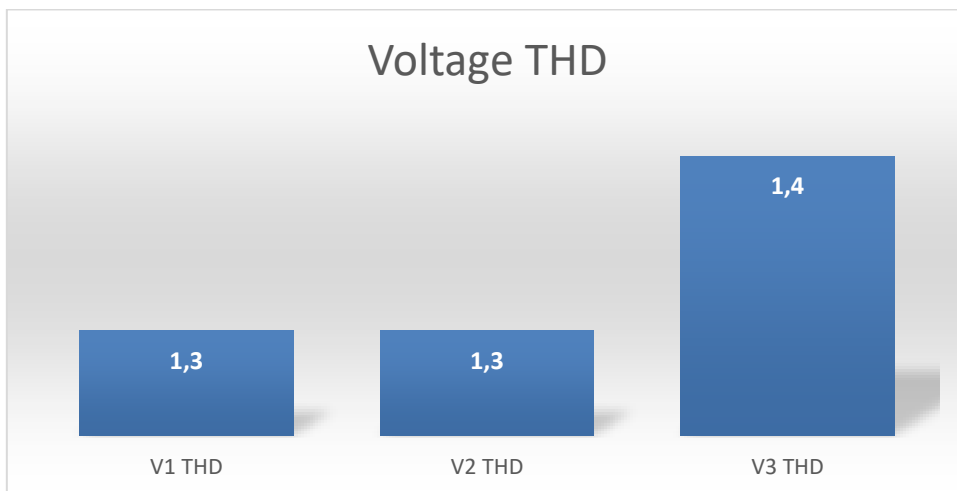


Fig 7 Voltage THD



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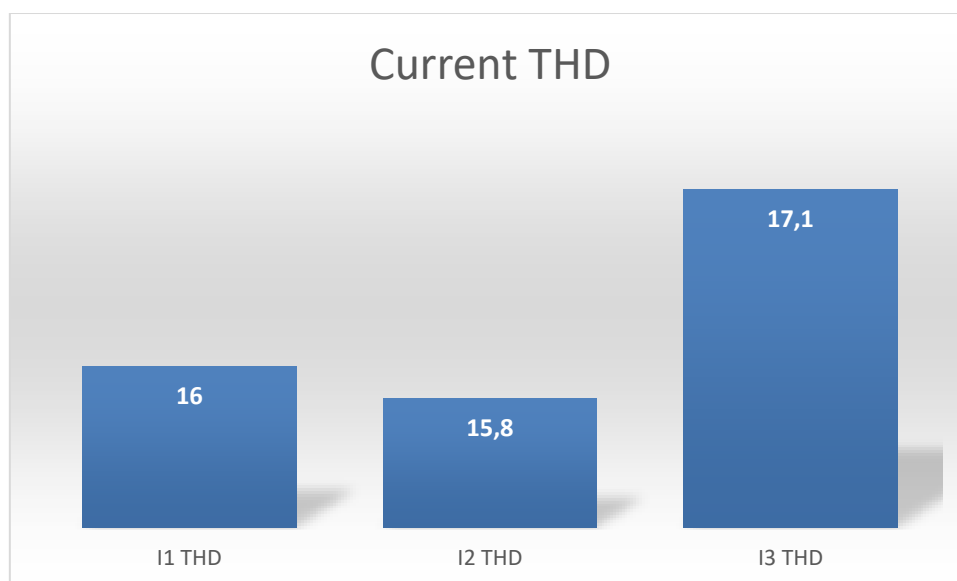


Fig 8 Current THD

IV.CONCLUSION

A power analyser has been placed in a power system network to find out the various parameters, From the above observation the HT side three phase voltage and currents are at desirable value similarly LT side voltage current, power factor are also at eligible values and reactive power variations are bit higher side. The voltage THD is in a permissible range and current THD values are little bit higher side. A solution is required for the higher current harmonics like some filter is required to attach in the LT side. Analysis required for the filter configuration for the reduction of harmonics in currents.

V.FUTURE WORKS

In the future work we can model the whole system in some simulation software and try to find out the best possible solutions and by making same network system model with similar configurations and we can make some filters and attach with our model to look the possible reduction in harmonics and by such experiments we can also see the filters response with different situations.

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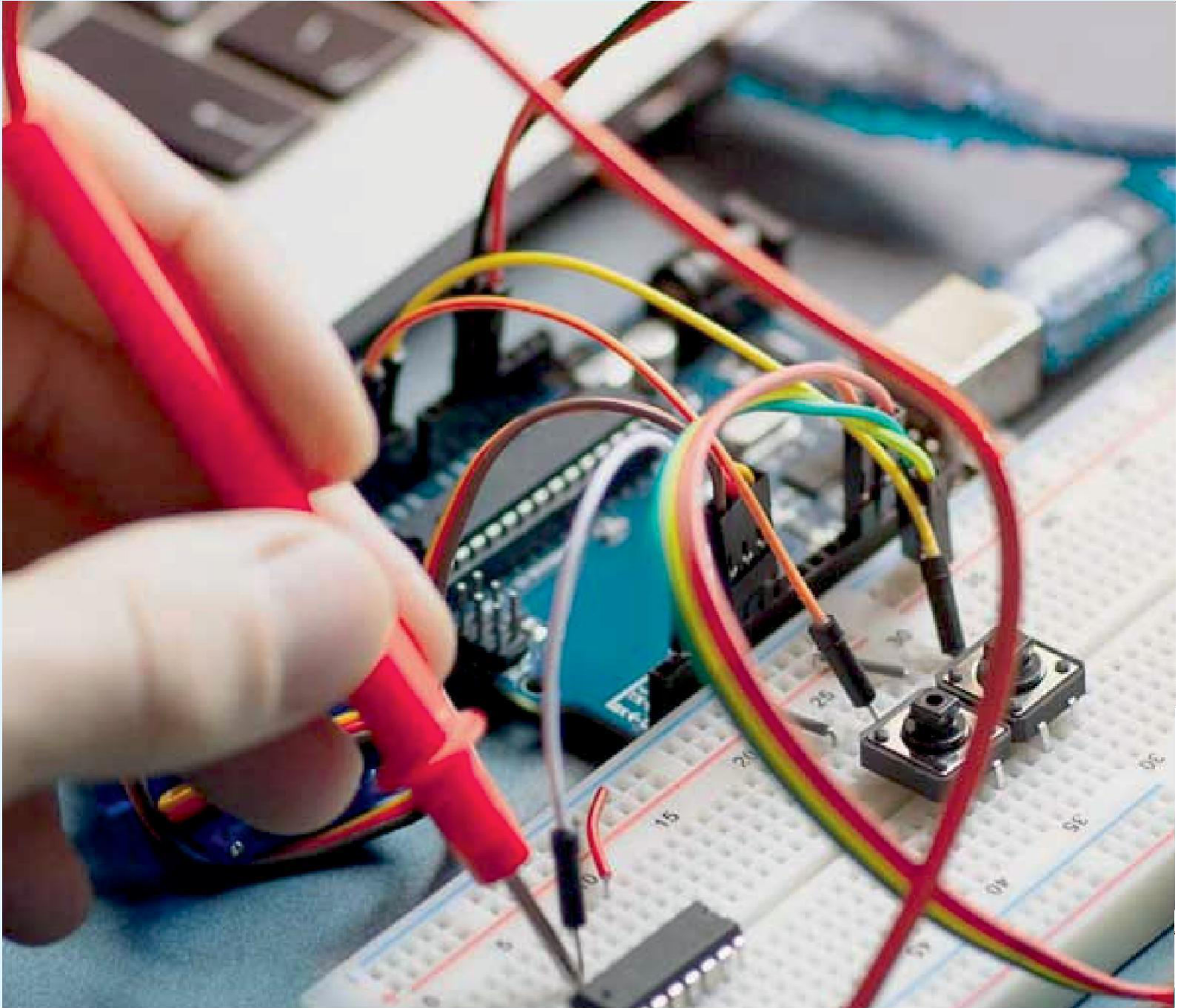
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