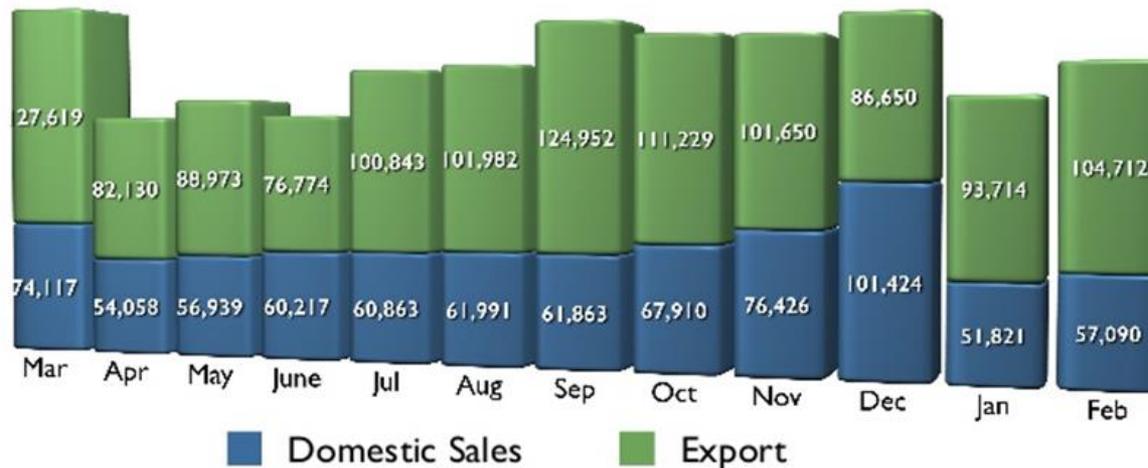


Harmonic in the Modern Industry: Auto Parts Industry and Harmonics

Thailand automotive sales and productions in 2016^[2] and ^[3]



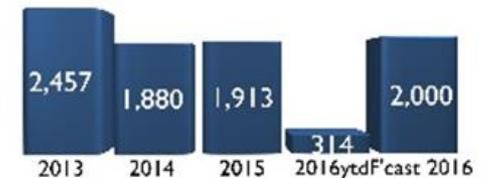
Sales 2015 in 1,000 units



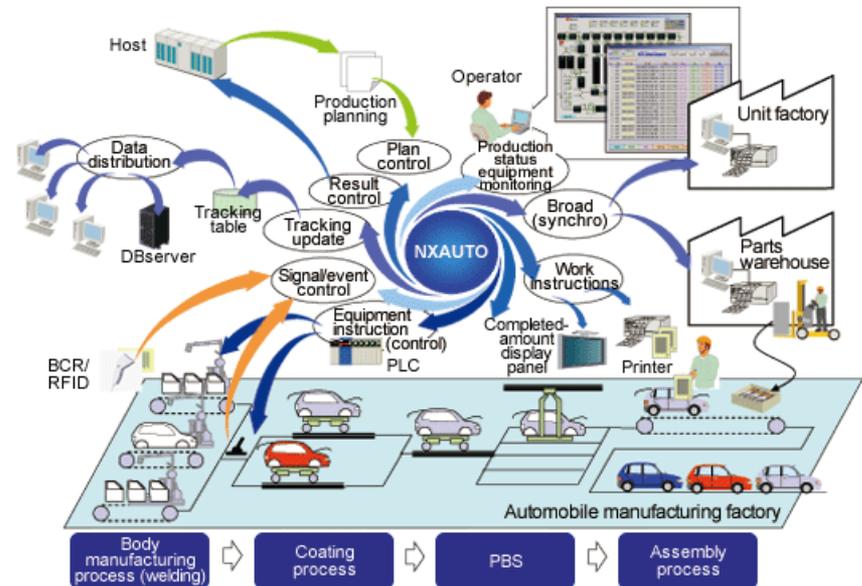
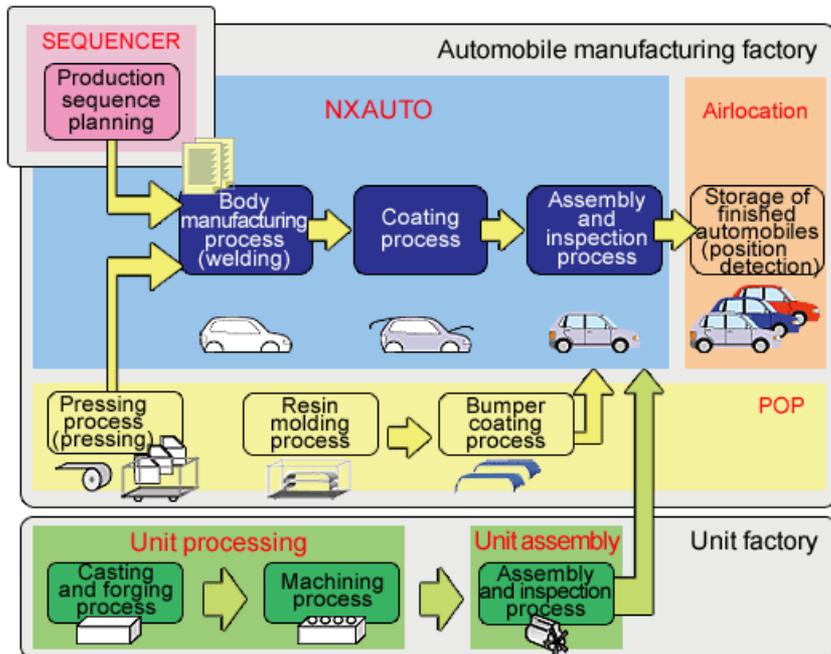
Sales 2016 Forecast in 1,000 units



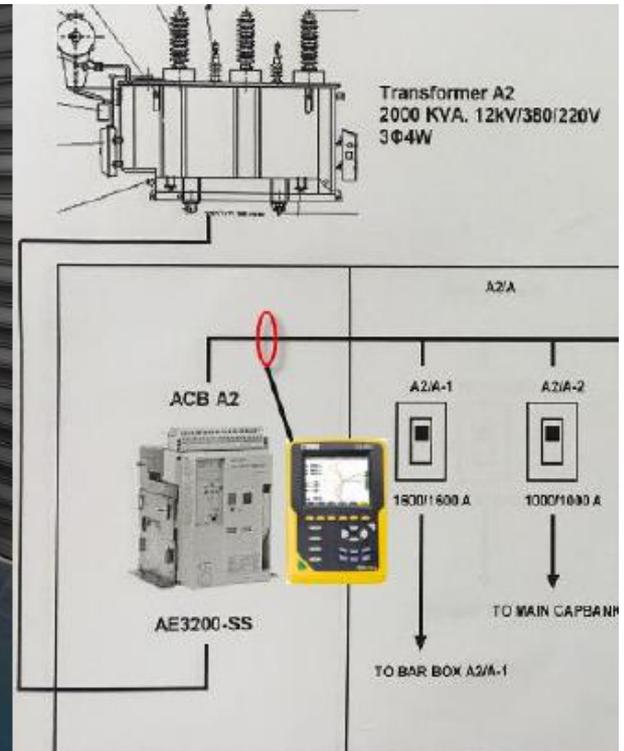
Production in 1,000 units



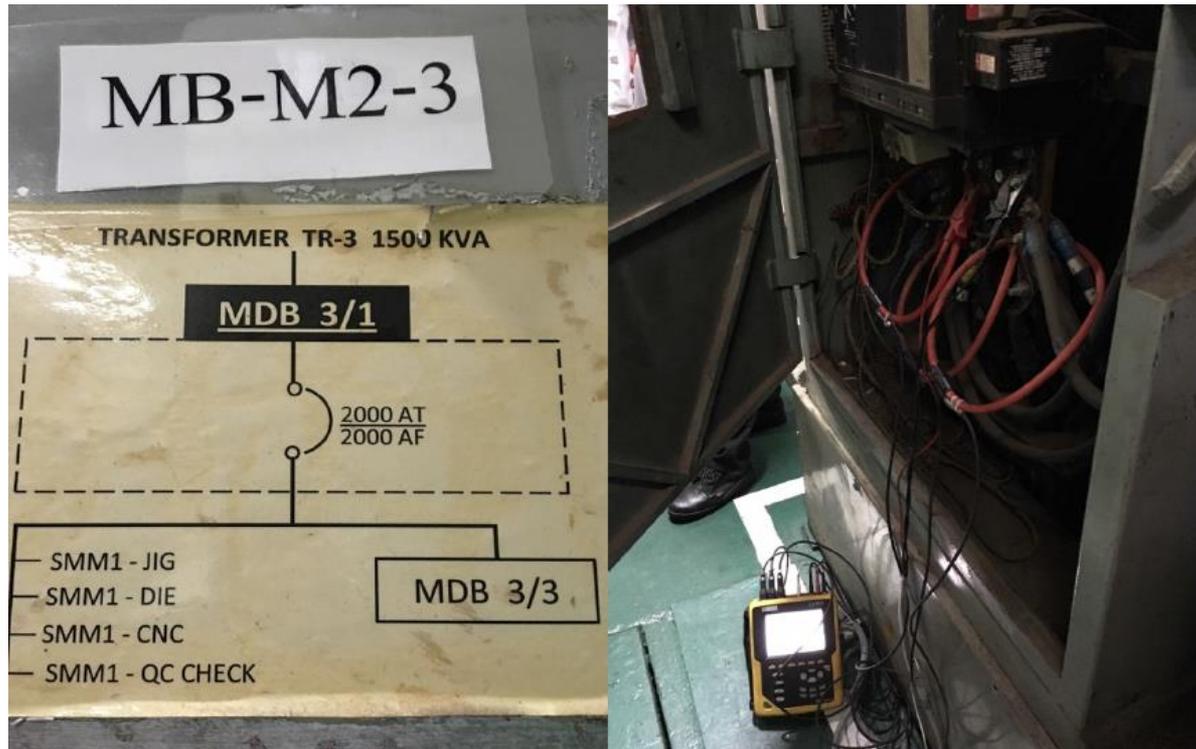
Production processes of the automotive manufacturer[4]



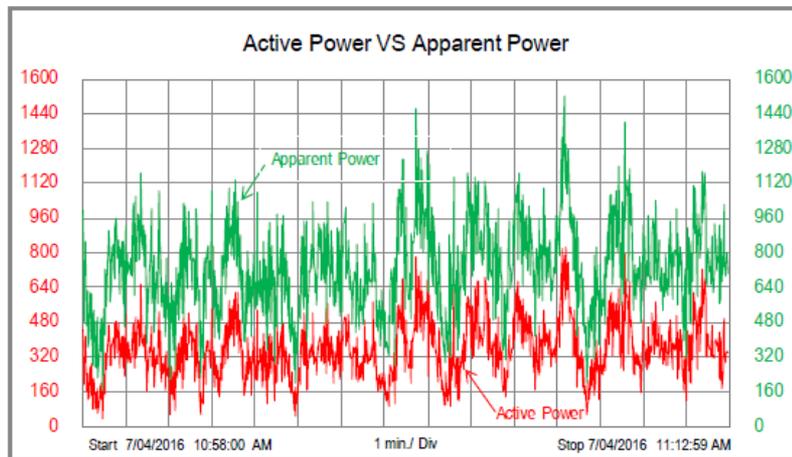
Measurement point at automotive factory in Samutprakarn



Measurement point at automotive factory in Samutsakhon

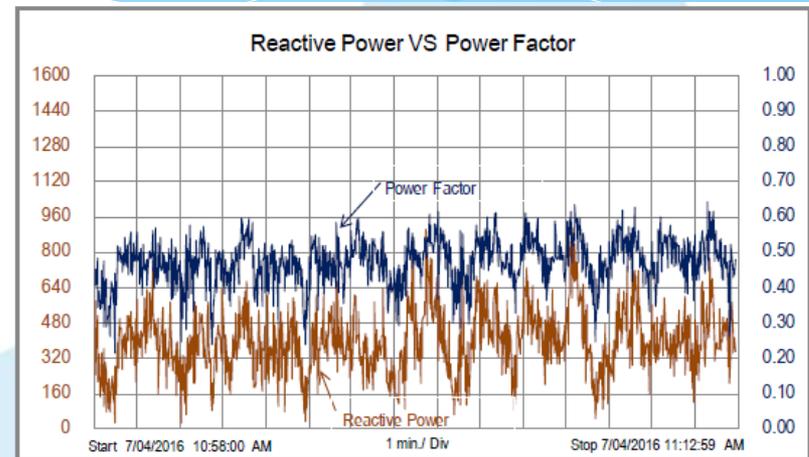


Active power and reactive power profiles at automotive factory in Samutprakarn



Active Power (kW)	Phase	Min	Avg	Max
	A (R)	4.16	122.65	364.41
B (S)	0.00	97.86	271.77	
C (T)	-4.18	133.92	366.84	
Total	37.17	354.42	823.53	

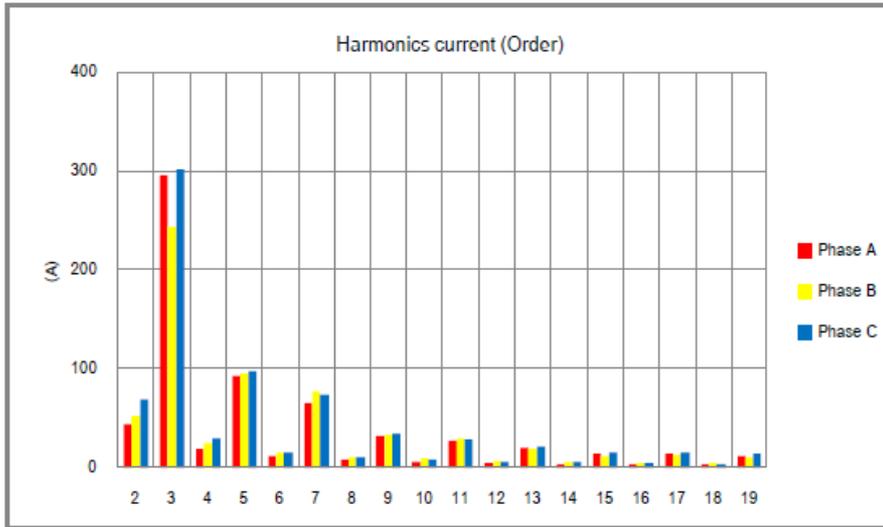
Apparent Power (kVA)	Phase	Min	Avg	Max
	A (R)	51.67	263.44	600.17
B (S)	0.00	218.49	483.97	
C (T)	27.51	248.24	538.07	
Total	171.73	730.17	1,523.08	



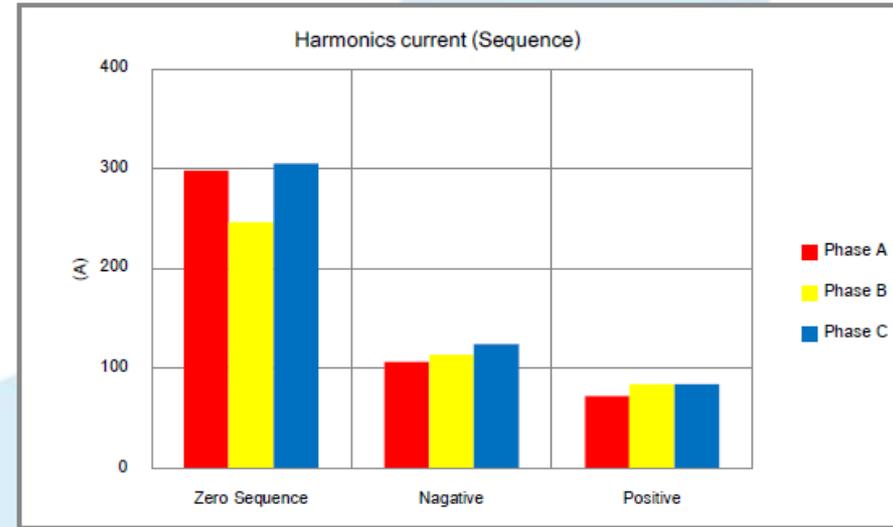
Reactive Power (kVAR)	Phase	Min.	Avg.	Max.
	A (R)	-0.62	151.04	404.85
B (S)	-0.80	125.93	385.69	
C (T)	-9.33	117.58	290.53	
Total	27.44	394.55	908.10	

Power Factor (PF)	Phase	Min.	Avg.	Max.
	A (R)	0.037	0.456	0.852
B (S)	0.015	0.434	0.770	
C (T)	-0.152	0.509	0.825	
Mean	0.216	0.473	0.644	

Harmonic order and harmonic sequence power profiles at automotive factory in Samutprakarn



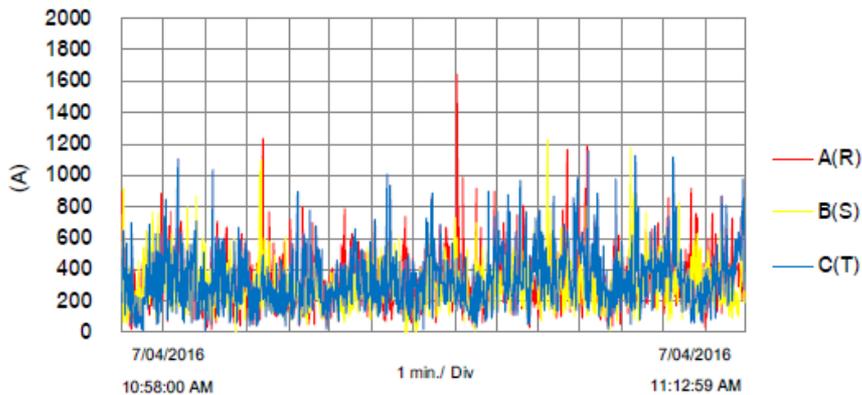
Order	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Phase A	44.0	296	19.4	91.9	11.1	64.9	7.6	31.9	5.7	26.7	4.3	20.2	3.6	13.6	3.1	13.7	2.8	12.0
Phase B	52.5	243	25.3	94.5	15.7	76.5	11.1	32.6	8.7	29.1	7.0	19.0	5.9	12.2	4.7	12.9	4.3	10.2
Phase C	68.4	302	29.7	97.4	15.5	73.0	10.2	34.2	8.4	28.2	5.9	21.6	5.1	15.2	4.2	15.4	3.8	14.0



	Zero Sequence	Negative	Positive
Phase A	298.35	106.54	72.03
Phase B	246.08	113.37	84.01
Phase C	304.40	123.82	83.42

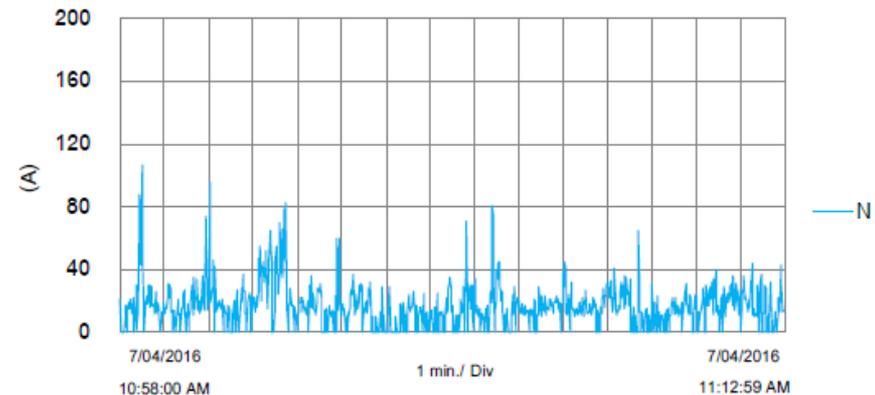
Harmonic current and neutral current profiles at automotive factory in Samutprakarn

Harmonics current



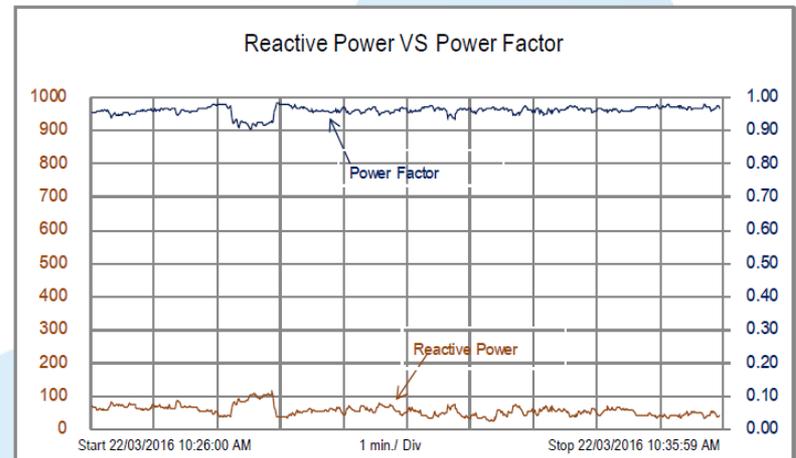
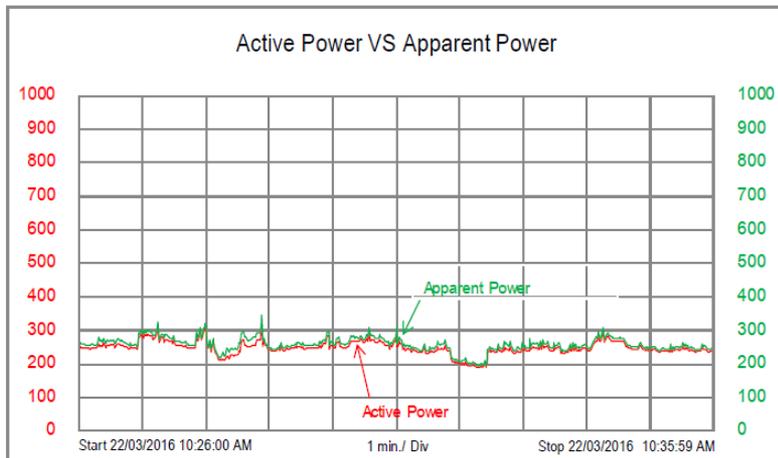
Phase	lh min.(A)	lh avg.(A)	lh max. (A)
A (R)	21.55	333.76	1647.62
B (S)	0.00	295.19	1229.13
C (T)	10.87	340.56	1151.86

Neutral current



Phase	lh min.(A)	lh avg.(A)	lh max. (A)
N	0.00	16.93	107.10

Active power and reactive power profiles at automotive factory in Samutsakhon



Active Power (kW)	Phase	Min	Avg	Max
	A (R)	56.29	78.90	105.83
	B (S)	67.75	87.71	113.30
	C (T)	63.58	81.70	105.04
	Total	189.40	248.31	321.42

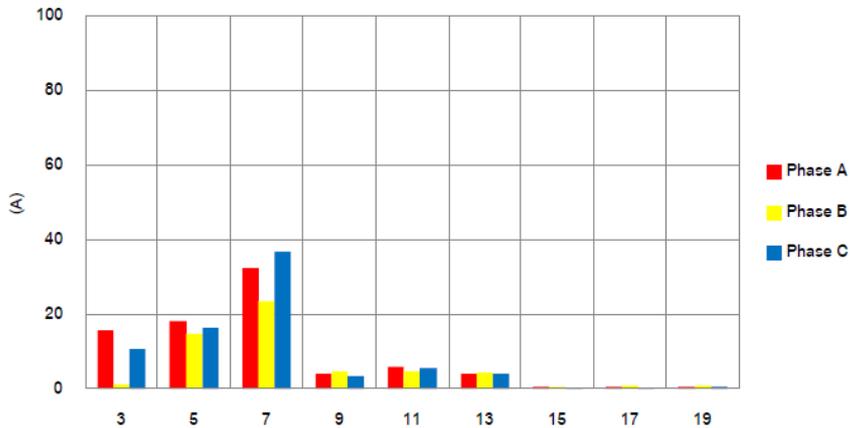
Reactive Power (kVAR)	Phase	Min.	Avg.	Max.
	A (R)	-3.87	7.03	26.96
	B (S)	9.53	22.49	41.49
	C (T)	15.26	28.65	50.74
	Total	26.56	58.17	117.45

Apparent Power (kVA)	Phase	Min	Avg	Max
	A (R)	57.22	80.07	109.72
	B (S)	69.73	91.07	121.63
	C (T)	66.57	87.39	115.20
	Total	195.65	258.52	346.55

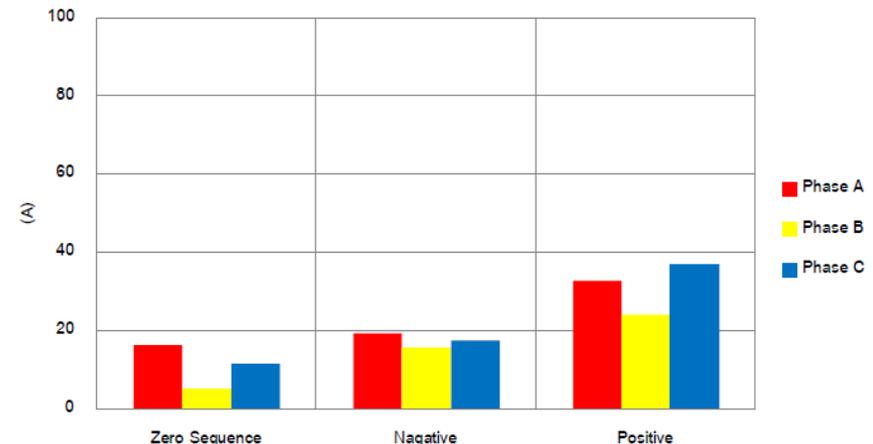
Power Factor (PF)	Phase	Min.	Avg.	Max.
	A (R)	0.935	0.986	0.995
	B (S)	0.905	0.964	0.991
	C (T)	0.853	0.935	0.970
	Mean	0.903	0.961	0.983

Harmonic order and harmonic sequence power profiles at automotive factory in Samutsakhon

Hamronics current (Order)



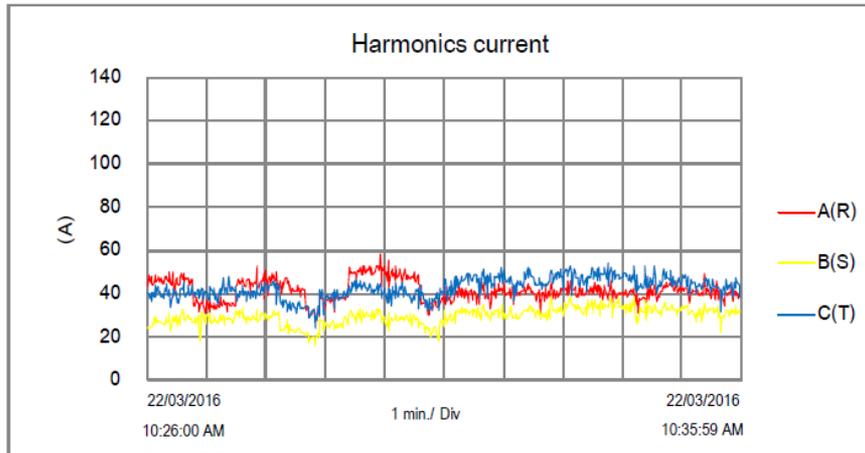
Hamronics current (Sequence)



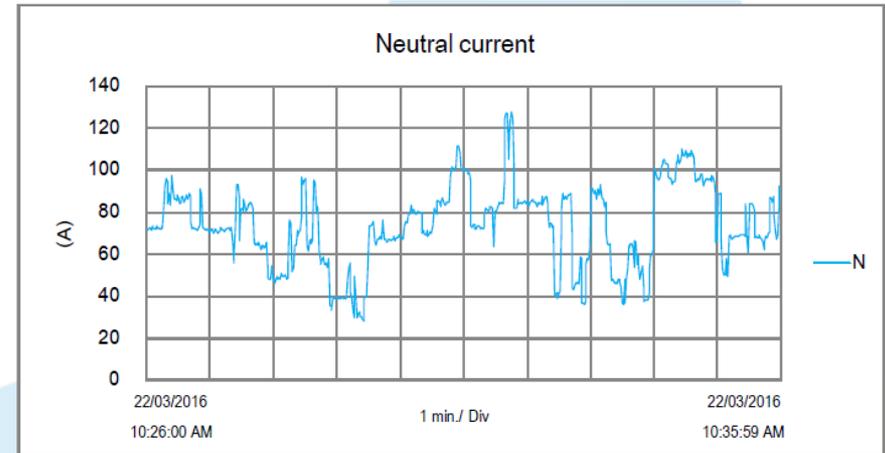
Order	3	5	7	9	11	13	15	17	19
Phase A	15.69	18.25	32.37	4.02	6.08	4.14	0.45	0.56	0.68
Phase B	1.23	14.84	23.53	4.85	4.59	4.42	0.63	0.90	0.84
Phase C	10.79	16.45	36.67	3.48	5.59	4.21	0.40	0.23	0.72

	Zero Sequence	Negative	Positive
Phase A	16.20	19.24	32.64
Phase B	5.04	15.56	23.96
Phase C	11.35	17.38	36.91

Harmonic current and neutral current profiles at automotive factory in Samutsakhon



Phase	Ih min.(A)	Ih avg.(A)	Ih max.(A)
A (R)	27.37	41.49	58.23
B (S)	15.70	29.63	38.91
C (T)	24.01	42.70	54.10



Phase	Ih min.(A)	Ih avg.(A)	Ih max.(A)
N	28.60	73.66	127.90



Thank you
for attention