Q-ine™
Q Sine - Sign of Quality Power

CASE STUDY

CUSTOMER

Chatrapati Sambhaji Nagar, Maharashtra
(Application - Special Purpose Steel)

Introduction / Overview about steel Industry:

The steel industry is a fundamental sector of the global economy, producing steel for applications in construction, automotive, and manufacturing. Major players like China, India, and the United States dominate production. Utilizing processes like basic oxygen furnaces and electric arc furnaces, the industry creates various types of steel, including carbon, alloy, and stainless steels. Steel is crucial for infrastructure and economic growth, with ongoing innovations focusing on sustainability and reducing environmental impact. As the demand for durable and versatile materials increases, the steel industry continues to adapt and expand, driving technological advancements and contributing to sustainable development worldwide.

Electricity costs form a significant portion of operational expenses in energy-intensive industries like steel manufacturing. For a steel company, managing and optimizing energy consumption is crucial for enhancing cost-efficiency and operational sustainability. Understanding the difference between kilovolt-amperehours (kVAh) and kilowatt-hours (kWh) is vital for identifying areas where energy savings can be achieved, ultimately leading to reductions in electricity bills, and releasing the extra energy units to use to generate extra production.

Challenge/ Problem statement (BEFORE):

a. Power factor is less than 0.985
b. I-THDi is >11%,
c. Average Difference between KWH and KVAH is about 1,50,000 units

Objective Set:

a. Power Factor to be achieved >0.995
b. I THDi to be achieved as per IEEE 519:2014 standard
c. ROI shall be less than 18 months.

Strategies for Reducing kVAh and Improving Power Factor

1. **Power Factor Correction (PFC):** Installing PF correction equipment, such as capacitors or synchronous condensers, can offset the inductive reactive power. This improves the power factor, reducing the kVAh consumed.

2. **Load Management:** Properly scheduling and managing the operation of heavy machinery to ensure even distribution of Load which can minimize peak demand charges and reduce kVAh consumption.

3. **Efficient Equipment Use:** Upgrading to energy-efficient motors and machinery that consume less reactive power can significantly reduce kVAh consumption.

4. **Regular Maintenance:** Ensuring all electrical equipment is well-maintained.

BEFORE:

October, 2023 MSEDCL Bill:

CURRENT CONSUMPTION DETAILS						
Reading Date	KWH	KVAH	RKVAH (LAG)	RKVAH (LEAD)	KW (MD)	KVA (MD)
Current 31/10/2023	250837.900	254532.700	16390.550	14779.900	15.860	15.896
Previous 30/09/2023	239627.650	243151.450	15490.850	14208.950		
Difference	11210.250	11375.450	899.700	570.950		
Multiplying Factor	900.000	900.000	900.000	900.000	900.000	900.000
Consumption	10089225.000	10237905.000	809730.000	513855.000	14274.000	14306.400
L.T. Metering	0.000	0.000	0.000	0.000	0.000	0.000
Adustment	0.000	0.000	0.000	0.000	0.000	0.000
Assessed Consumption	0.000	0.000	0.000	0.000	0.000	0.000
Total Consumption	10089225.000	10237905.000	809730.000	513855.000	14274.000	14306.000

BILLING DETAILS					Amount in Rs.
Billed Demand (KVA)	14306	@ Rs.	499.00	Demand Charges	53,54,020.50
Assessed P.F		Avg. P.F.	0.985	Wheeling Charge @ 0.00 Rs./U	0.00
Billed P.F	0.985	L.F.	94	Energy Charges	8,31,31,788.60
Consumption Types	Units	Rate	Charges Rs.	TOD Tariff EC	-22,02,345.00
Industrial	1,02,37,905	8.12	8,31,31,788.60	FAC @ 20.00	20,47,581.00
Residential	0	6.95	0.00		
Commercial	0	12.83	0.00	Electricity Duty	0.00
E.D. on (Rs.)	Rate %	Amount Rs.		Bulk Consumption Rebate	-10,84,753.70
8,83,31,045.10	0.00	0.00		Tax on Sale @ 18.00 Ps./U	18,15,180.48
0.00	16.00	0.00		Incremental Consumption Rebate $$	-17,30,687.25
0.00	21.00	0.00			0.00

AFTER SOLUTION is implemented:

April, 2024 MSEDCL Bill:

CURRENT CONSUMPTION DETAILS						
Reading Date	KWH	KVAH	RKVAH (LAG)	RKVAH (LEAD)	KW (MD)	KVA (MD)
Current 30/04/2024	316739.100	321457.050	21613.300	17857.850	16.720	16.732
Previous 31/03/2024	305377.250	310064.850	21256.850	17736.300		
Difference	11361.850	11392.200	356.450	121.550		
Multiplying Factor	900.00	9000.000	900.000	900.000	900.000	900.000
Consumption	10225665.00	10252980.00	320805.000	109395.000	15048.000	15085.800
L.T. Metering	0.000	0.000	0.000	0.000	0.000	0.000
Adustment	0.000	0.000	0.000	0.000	0.000	0.000
Assessed Consumption	0.000	0.000	0.000	0.000	0.000	0.000
Total Consumption	10225665.00	10252980.00	320805.000	109395.000	15048.000	15059.000

BILLING DETAILS					Amount in Rs.
Billed Demand (KVA)	15059	@ Rs.	549.00	Demand Charges	62,00,543.25
Assessed P.F		Avg. P.F.	0.997	Wheeling Charge @ 0.00 Rs./U	0.00
Billed P.F	0.997	L.F.	92	Energy Charges	8,57,14,912.80
Consumption Types	Units	Rate	Charges Rs.	TOD Tariff EC	-21,88,935.00
Industrial	1,02,37,905	8.36	8,57,14,912.80	FAC @ 55.00	56,39,139.00
Residential	0	7.16	0.00		
Commercial	0	13.21	0.00	Electricity Duty	71,52,424.50
E.D. on (Rs.)	Rate %	Amount Rs.		Bulk Consumption Rebate	-11,63,020.52
9,53,65,660.05	7.50	71,52,424.50		Tax on Sale @ 18.00 Ps./U	18,39,999.78
0.00	16.00	0.00		Incremental Consumption Rebate $$	-18,12,494.25
0.00	21.00	0.00			0.00

RESULT AND CONCLUSION:

- ✓ Power factor improved from **0.985 to 0.997.**
- ✓ Current Harmonics reduced to **< 6%.**
- ✓ KWH and KVAH difference reduced from **1,48,640 to 27,315 units.**
- ✓ KW MD and KVA MD difference reduced from **32 to 11 KVA.**
- ✓ Reduction in Demand charges and improved infrastructure cost.
- ✓ Electrical Bill savings achieved about **INR 12 Lakhs** per month.

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