ACHIEVING DIESEL SAVINGS BY REDUCING DG SET VOLTAGE IN A FASHION INDUSTRY

***Abstract*-This paper discusses in detail about the diesel savings achieved in real by reducing the feeder voltage from 425 V to 410 V in a diesel generator.**

I. Introduction

The study was carried for 2 days with the Extech-382095 Power and Harmonic Analyzer with 3000 Amps Flexible CT's. The analyses were done from morning 10.30 am to night 10 pm. The study was carried on 1000 kVA DG-1.

The Plant operates with DG from morning 9 am to 12 p.m and 3 pm to 10 pm. But during the day of measurement, DG was also operated from 12 pm to 3 pm in sharing mode & so for calculations all the parameters are taken from 3 pm to 10 pm only.

Design Details of the DG-1 in which study was conducted:-

Description	DG-1
Capacity	1000 kVA
Current	1391 A
Voltage	425 V
RPM	1500 rpm
Make	Cummins
Model	KTA-38-G5

II. Test analysis before reducing the voltage-set 425

During this study the output voltage of DG is set to 425 V (normal condition) in the AVR.

- Power analyzer recording period 10.50 am to 10 pm.
- Period taken for analyzes purposes is 3 pm to 10 pm.
- Graphs are shown for a period of 3 pm to 10 pm.

Voltage trend:

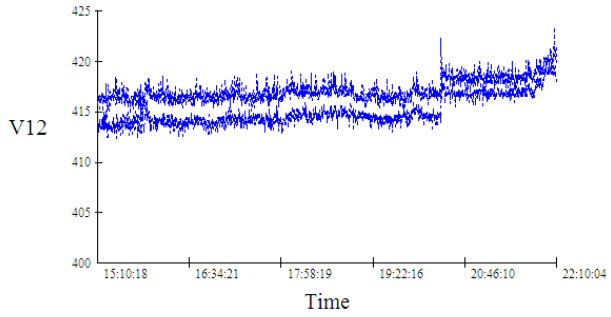

Fig 1-(voltage Vs time)

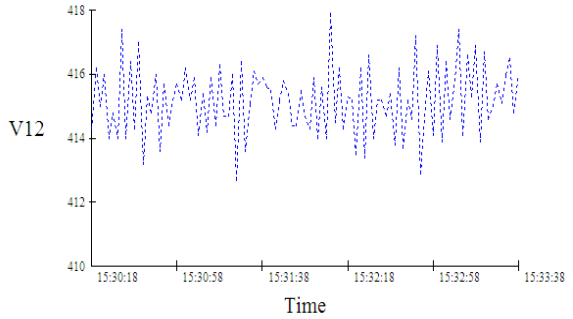

Fig 2-(Scaled picture)

Fig .1 represents the line to line voltage (RY). The voltage Varies between 413 V to 418 V (see fig 2) .

Current trend:

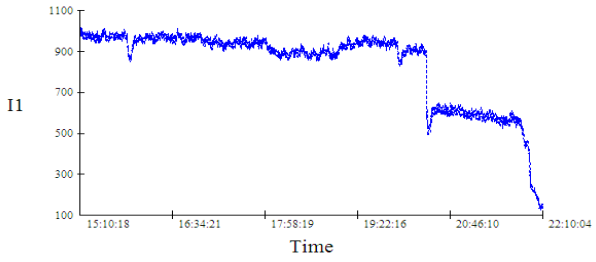

Fig 3-Current Vs Time

Apparent power (KVA):

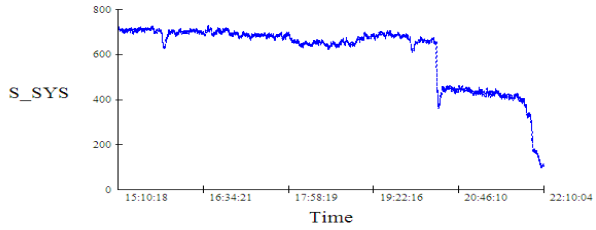

Fig 4-Apparent power vs time

Maximum demand (KVA):-

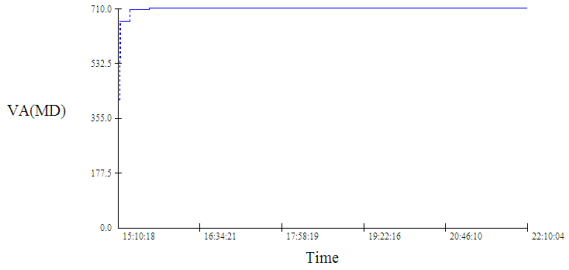

Fig 5-Demand Vs time

- The maximum demand reached during the test period is 710 kVA before reducing the voltage.

Summary:-

Description	Unit	Value
Overall total units consumed (3 pm to 10 pm)	Kwh	3923
One day total production	pieces	18104
Average production per hour	pieces	1132
Total production during test hour(3 to 10 pm)	pieces	7921
Diesel consumed	litres	996
Specific energy generation ratio	kWh/litre	3.94
Specific energy consumption	kwh/piece	0.4953

Table-1

III. Test analysis after reduction of voltage from 425 to 410 V

- Power analyzer recording period 10 .50 am to 10 pm.
- Period taken for analyzes purposes 3 pm to 10 pm
- Graphs are shown for a period of 3 pm to 10 pmVoltage (V12)

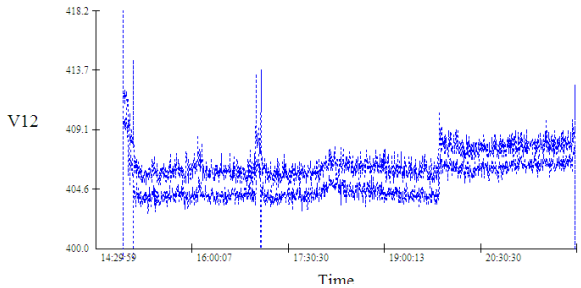

Fig 6- Voltage trend-after reducing to 415 V

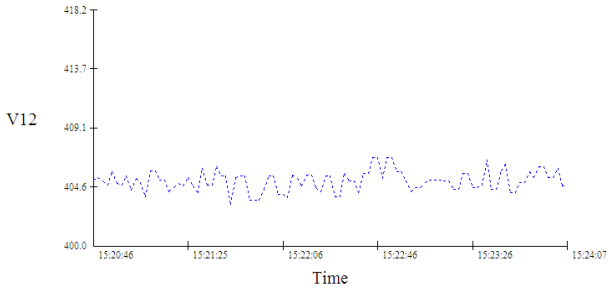

Fig 7:-Scaled picture

After the reduction in the set voltage in AVR from 425 to 410 the voltage varies between 402 to 407 V.(see fig 7)

Current (A):-

I1:-

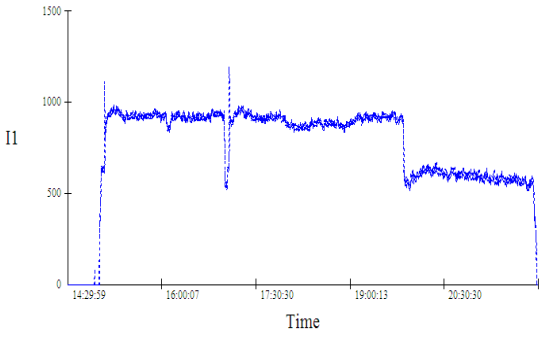

Fig 8: overall current variation trend

Overall apparent power(kVA):-

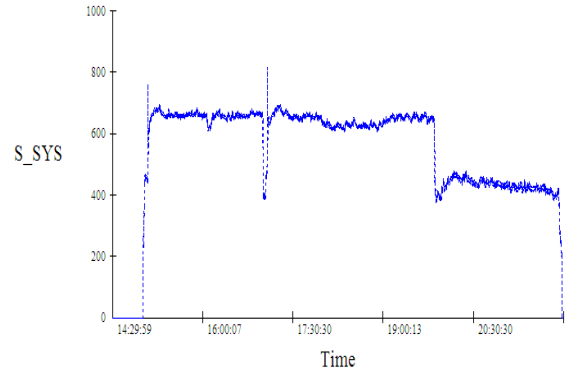

Fig 9: kVA vs time

Maximum demand (VA):-

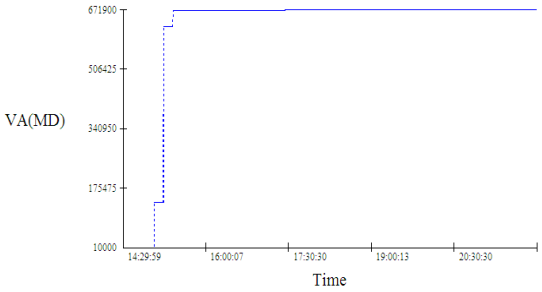

Fig 10: Maximum demand reached

The maximum demand reached is 671 KVA after the reduction in voltage.

Summary (set voltage 410 V):-

Description	Unit	Value
Overall total units consumed (3 pm to 10 pm)	Kwh	3723
One day total production	Pieces	18563
Average production per hour	Pieces	1160
Total production during test hour(3 to 10 pm)	Pieces	8121
Diesel consumed	Liters	980
Specific energy consumption	Kwh /piece	0.4584

Table 3: After reducing the voltage to 410

IV. Results & Inferences

Overall Summary:-

Description	Unit	Set 425 V	set 410 V
		Value	Value
Overall total units consumed (3 pm to 10 pm)	Kwh	3923	3723
One day total production	pieces	18104	18563
Average production per hour	pieces	1132	1160
Total production during DG-test hour(3 to 10 pm)	pieces	7921	8121
Diesel consumed	Liters	996	980
Specific energy generation ratio(SEGR)	kWh/liter	3.94	3.80
Specific energy consumption	kWh/piece	0.495	0.458

Table 4: overall summary

IV Results arrived after reducing the Voltage from 425 V to 410 V.

- The production is slightly varies and also the climatic conditions are not much varying so the chiller operations is almost the same for both the days.
- Around 200 kWh is reduced which leads to reduction in the diesel consumption.
- It is clear from the above table 4 that the specific energy consumption (kWh/piece) reduced after the reduction in voltage from 0.495 to 0.456.
- The plant may consider operating at the reduced voltage to reap the benefits if no problem is caused at the load side operation.
- By reducing the voltage the overall kW and KVA consumed reduces .So the loading percentage in the DG is reduced leading to a slight reduction in SEGR.