



ABB Power Quality Solution

# Arora Iron & Steel, Ludhiana, Punjab

## STATCON & MV TUNED FILTER BANK

### PF & PQ improvement

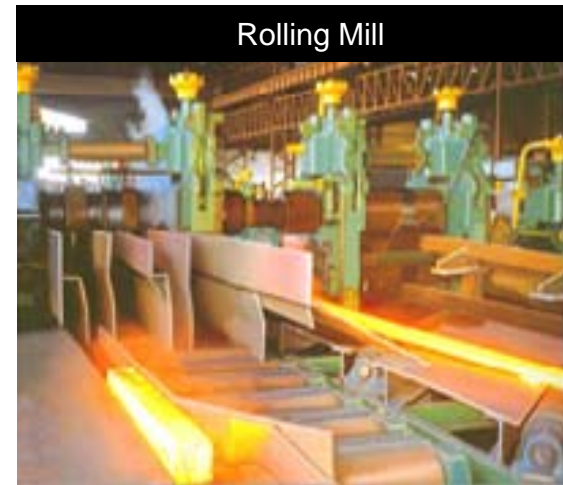
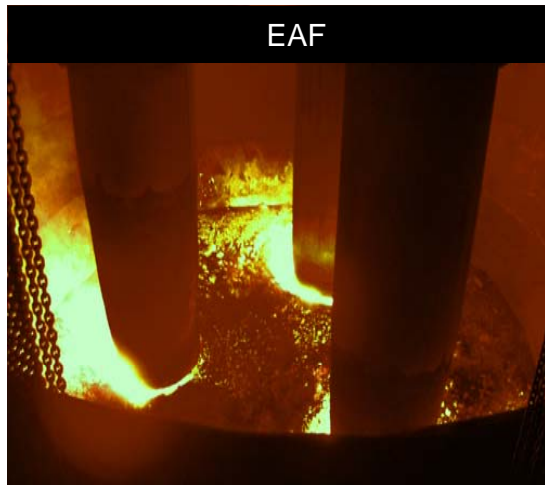
# Introduction

## Arora Iron & Steel

- Located in North India with installed capacity of producing over 2 lakh metric tons per annum
- Manufacturers & exporters of wide range of special & alloy steels as per national & international standards
- ISO 9001:2008 certified company
- EAF, LRF & Steel rolling mills operation
- Application of manufactured steels:
  - Auto components
  - Fasteners
  - Building systems

# Power Quality Issues

## EAF, LRF & Steel Rolling Mills



Reactive Power  
and  
Harmonics

# Expectation

## Arora Iron & Steel

- **EB billing** : **KVAH basis Monthly**
- **Average monthly PF** : **>0.99**
- **Arora needs to maintain 1.00 PF to have equal consumption of KWH & KVAH**

# ABB Recommendation

## Arora-System Details & Recommendation

### System Details & Recommendation

#### KVAR calculation

EAF : 25 MVA  
LRF : 7 MVA  
Active power for EAF : 17500 KW  
Active power for LRF : 5250 KW

Total KVAR required : 16800 KVAR

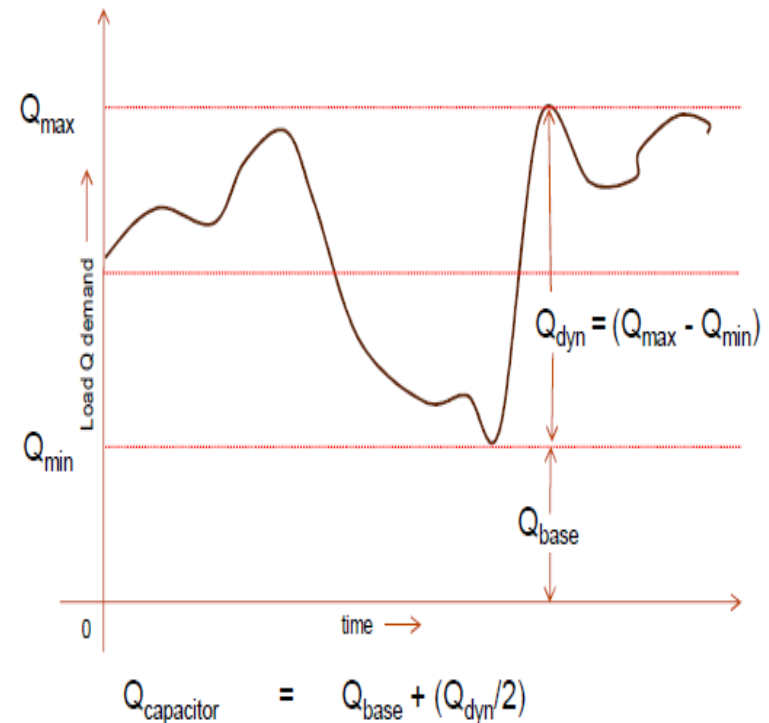
Our recommendation:

STATCON : +/-2400 KVAR  
MV Tuned Filter Bank : 14.4 MVAR

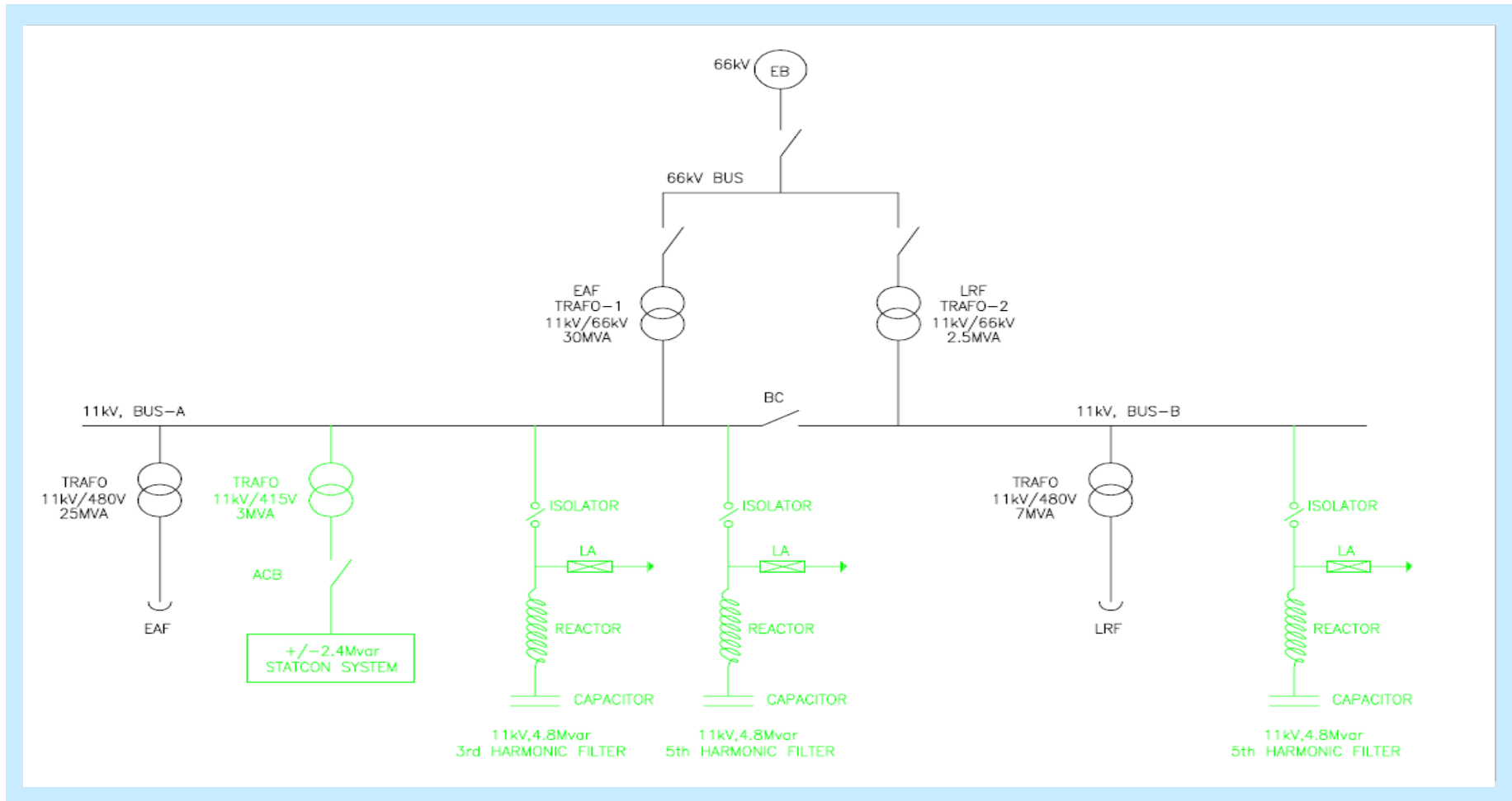
(Combination of 3<sup>rd</sup> & 5<sup>th</sup> Tuned HF bank)

Overall Variable compensation 12 to 16.8 MVAR

### Optimized STATCON selection



# Arora Steel & Iron SLD

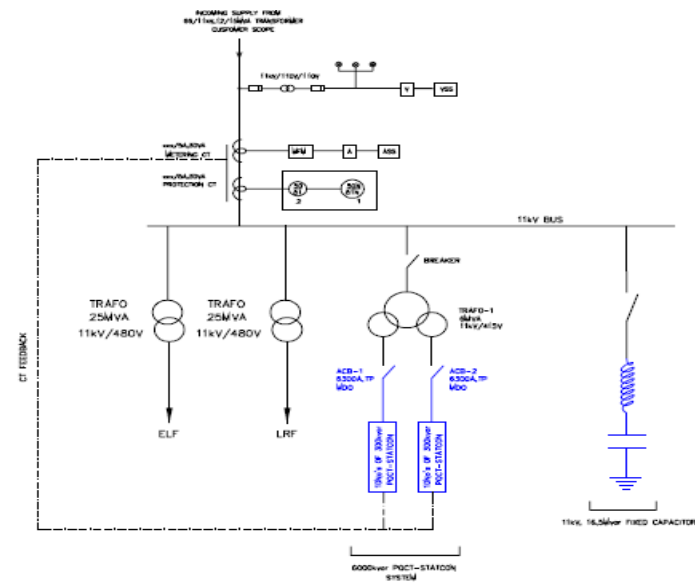


# Arora Iron & Steel Installation & SLD representation

## Installation



## SLD



**STATCON+ MV FILTER : PF improvement, Harmonic suppression & Voltage stability**

# ABB Scope of Supply

## Arora Iron & Steel

**STATCON RATING** : +/- 2400 KVAR STATCON

8 nos of 300 KVAR STATCON's are operating in parallel connected through coupling transformer.

### **MV FILTER BANK**

#### **EAF**

11 kV 4.8 MVAR 3<sup>rd</sup> Harmonic Tuned Filter bank- 1 set

11 kV 4.8 MVAR 5<sup>th</sup> Harmonic Tuned Filter bank- 1 set

#### **LRF**

11 kV 4.8 MVAR 5<sup>th</sup> Harmonic Tuned Filter bank- 1 set

### **Variable compensation**

12000-16800 KVAR variable compensation for average load condition



# STATCON & MV Filter – PQ Solution

## Savings Calculation

SI No	Savings calculation	
1	With conventional system	
	kvah consumption	9,940,480
	kwh consumption	9,442,480
	PF	0.95
2	After our proposed solution	
	kvah consumption	9,537,859
	kwh consumption	9,442,480
	PF	0.99
3	Reduction in KVAH	402,621
4	Monthly Reduction in charges in INR @ Rs 6 /KVA	<b>2,415,726.00</b>
5	Yearly reduction in charges in INR @ Rs 6 /KVA	<b>28,988,712.00</b>

# Arora Iron & Steel

## Harmonic spectrum & Proposed Filter rating

### System details, Harmonic spectrum

Network			
U <sub>filter</sub> =	11	kV	
+dU=	10%		
-dU=	10%		
f <sub>nom</sub> =	50	Hz	
+df=	0.5%		
-df=	1.0%		
S <sub>sc</sub> =	250	300	MVA

Order	F	Gen In
1	50	1180.98
2	100	79.7
3	150	141.7
4	200	42.5
5	250	106.3
6	300	32.9
7	350	30.8

### Proposed Filter design

Predominant Harmonics

3<sup>rd</sup> & 5<sup>th</sup> Harmonic Band pass Filter

	BP1	BP2
Tuning	2.95	4.08
Frequency	147.5	204
Generation	4.8	4.8
Quality fac	100	100
C1 Qinst	8.477	6.774
L Qinst	302.206	131.872

# Arora Iron & Steel

## Performance Achieved & Appreciation certificate

### Performance achieved

#### STATCON ( Dynamic reactive power compensation)

- PF is maintaining  $> 0.995$
- Voltage support for productivity improvement.
- Return on Investment  $< 1$  year

#### MV Filter Bank

- Fixed reactive power supply
- Harmonic suppression for predominant harmonics
- V THD  $< 5\%$  , I TDD  $< 8\%$  as per IEEE 519 norms



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