



KRAFTPOWERCON INDIA PVT LTD



....Your Partner in Rectifier Equipment

THE DIRECTORS



CHAIRMAN EMERITUS

Mr. VIJAY JAKKLI founded **Associated Powercon Equipment Pvt. Ltd** in **1971**, to function as a Small Scale Industry in the field of Power Electronic equipment. Under his able guidance, M/s. Powercon invoked the building of **customized DC Power supplies**, which synchronized well the dynamically changing needs of the Power Electronic market.

Manufacture of **Static Drives** and **Static Inverters** for **Slip Ring Drive applications** enabled the company to be sought by the customers of the need, from time to time.

Mr. RANJIT JAKKLI completed his Masters Degree from the Texas University, USA, and worked for a couple of years in the industry, before joining his Father's business, during **1991-92**.

With his deep insight into the Technology, coupled with meticulous planning, a decent number of **niche products were regularly added to the manufacturing line** of M/s. Powercon, resulting in a consistent rise in the revenue of the company.

In **August 2008**, he carried out the acquisition of M/s. **Kraftelektronik AB** of **Sweden**, thereby bringing the companies of both the nations under one unified roof of M/s. **KRAFTPOWERCON**, and rendering a **Global Status** to the company of **Indian origin**.



MANAGING DIRECTOR

OUR PRESENCE... ON THE WORLD MAP



MANUFACTURING FACILITY

SURTE, SWEDEN (K)

VAXJO, SWEDEN (K)

SHANGHAI, CHINA (K)

PUNE, INDIA (K)

RESEARCH & DEVELOPMENT

VAXJO, SWEDEN (K)

PUNE, INDIA (K)

SALES & SERVICES

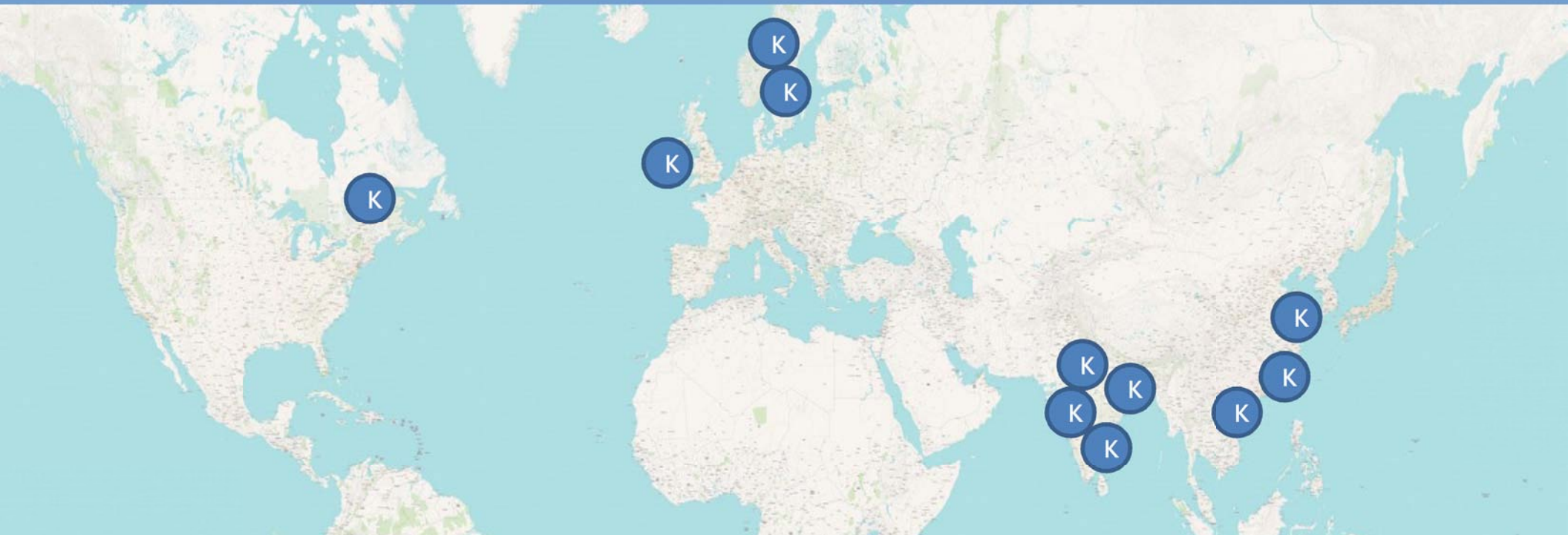
GUANGHO, SHANGHAI, HONGKONG (CHINA)

PUNE, MUMBAI, DELHI, CHENNAI, KOLKATA (INDIA)

TAIPEI (TAIWAN)

PORTSMOUTH (UK)

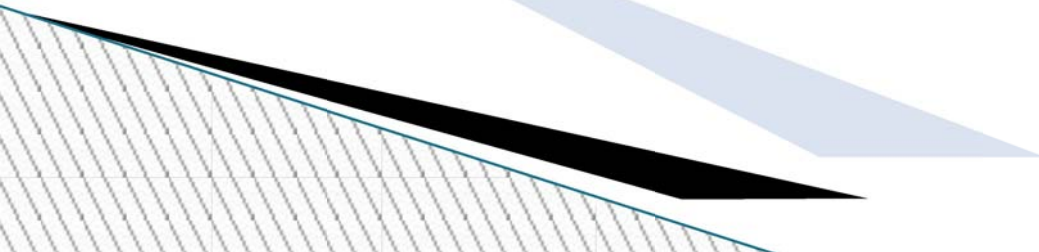
HOUSTON, TEXAS (USA)



OUR COMPANY TIMELINE

- **1971** : Began with **Static Drives & Static Inverters** for Slip-ring drive applications
- **1980** : Added **Medium Current-Low Voltage Rectifier** to the line, for Magnetization & De-magnetization applications in Ferrite industries.
- **1995** : Introduced **High Current Controlled Rectifiers** for Electro-plating, Anodizing, Chlorination, and mission critical systems for MoD and Indian Navy
- **2000** : **Began exporting** Rectifiers various countries viz; New Zealand, Indonesia, Middle East and the UK.
- **2004** : **Full-fledged R&D set-up established** at Pune office
- **2007** : Turn-over **crossed the INR 25 Crore** mark with **38% share under Exports**.
- **2008** : **Acquired** business of **M/s. Kraftelektronik AB, Sweden** on the 15th of August, added **High voltage Rectifiers and Switch Mode Power Supplies** to the line and got established as **M/s. KRAFTPOWERCON** ever since.

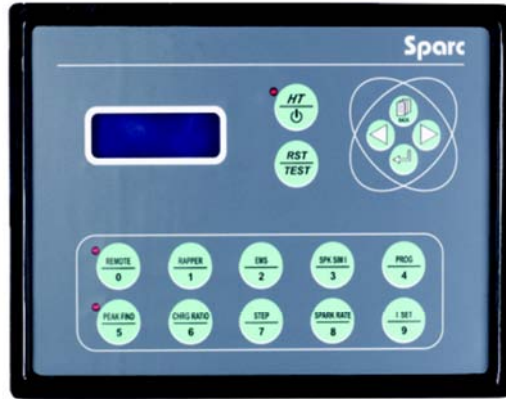
**WORK FORCE @
KRAFTPOWERCON**



SINGLE PHASE TR SETS (POWERSPARC), TRCC (SPARC)



SINGLE PHASE
CONTROLLER BOARD
(SPARC)



SINGLE PHASE TR
CONTROL CABINET
(TRCC)



SINGLE PHASE
CONVENTIONAL TR-SET
(WITH CONSERVATOR)



SINGLE PHASE
HERMETICALLY SEALED TR-SET
(WITH EXPANDABLE FINS)



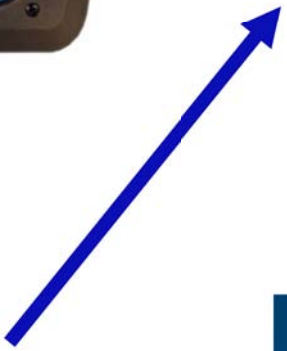
THREE PHASE TR SETS (POWERSPARC+), TRCC (MK-III)



THREE PHASE
CONTROLLER BOARD
(MK-III)



THREE PHASE TR
CONTROL CABINET
(TRCC)



THREE PHASE
CONVENTIONAL TR-SET
(WITH CONSERVATOR)



THREE PHASE
HERMETICALLY SEALED TR-SET
(WITH EXPANDABLE FINS)



FOCUS MARKET OF KRAFTPOWERCON HIGH VOLTAGE RECTIFIERS



DUE TO GLOBAL WARMING, THE ENVIRONMENTAL CONSTRAINTS & POLLUTION NORMS OFF-LATE HAVE LIMITED THE INDUSTRIAL EMISSIONS TO : APPROX. < 30mg/nm³.

WE COMPLETELY CONFIDE IN OUR TECHNOLOGY, THAT WE CAN HELP THE ADJACENT INDUSTRIES ACHIEVE THE NECESSARY EMISSION LEVELS AS PER THE NORMS LAID DOWN BY THE POLLUTION BOARD.

WE CAN PROVIDE THEM WITH THE BEST POWER SUPPLIES FOR THEIR ELECTROSTATIC PRECIPITATORS.

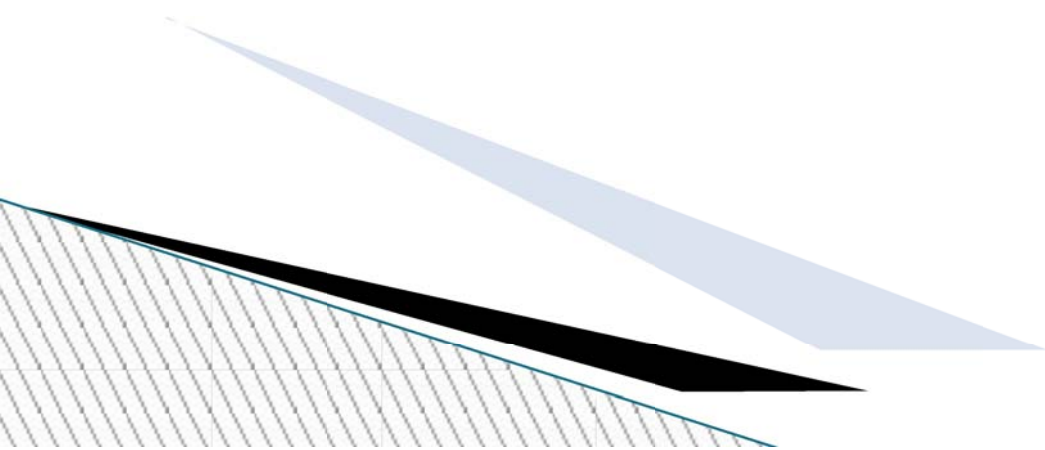
EFFECTS OF AIR POLLUTION



- Reduced lung functioning.
- Irritation of Eyes, Nose, Mouth and Throat.
- Asthma attacks.
- Respiratory symptoms such as Coughing and Wheezing.
- Increased respiratory disease such as Bronchitis.
- Reduced energy levels in the body.
- Headache and dizziness.
- Disruption of Endocrine, Reproductive and Immune systems.
- Neuro-behavioural disorders.
- Cardio-vascular problems.
- Cancer.
- Premature death.

POLLUTION CONTROL NORMS

- Pollution norms have been reduced to **less than 30 mg/nm³** in most of the regions.
- These norms can be easily achieved in **Greenfield Projects** by using **larger sized ESPs, advanced Power Sources** and a **variety of Fuel**.
- It will be **difficult to achieve the latest Pollution Norms**, in the currently existing and operational ESPs in various plants, as the technology prior used was old and also it stands a **bit obsolete in the present scenario**.
- Now with advanced **Products**, new **Technology** and also **improvements in ESP's internal configuration**, considerable reduction in the Emissions can be achieved, very much in the **Existing ESP's**.



FACTORS AFFECTING ESP PERFORMANCE



❖ **Gas Temperature**

Gas Temperature is to be maintained within the permissible range of ESP design

❖ **Gas composition**

Gas composition analysis is to be carried out as per the Design Specifications of ESP.

If any change is noticed, then necessary & corrective action needs to be taken.

❖ **Moisture**

Presence of Moisture in the ESP affects the performance efficiency Considerably. Ambient Air Leakage; i.e. through various openings like Hopper door & ESP door have to be checked thoroughly and an Air-tight structure is to be maintained.

❖ **Gas distribution**

Gas distribution is to be ensured to be as per the design norms, as it affects the collection efficiency heavily.

FACTORS AFFECTING ESP PERFORMANCE (CONTD.)



❖ **Gas velocity**

Gas velocity must be as per the design norms of ESP.

❖ **ESP field Alignment**

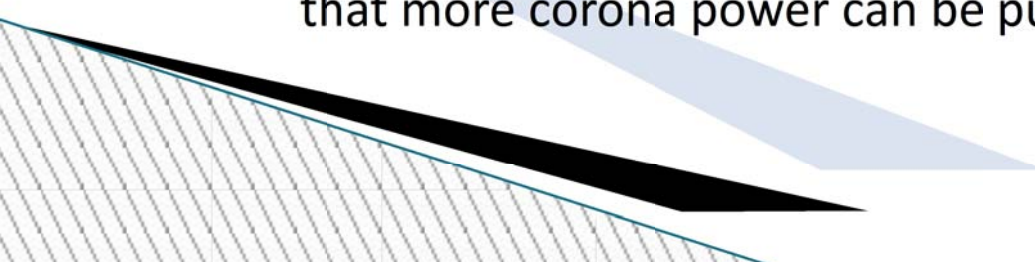
ESP field Internals like CE plate & DE plate shall be intact in good condition. Damaged plates shall be replaced with new plate for optimum running efficiency.

❖ **Rapping Mechanism**

Rapping mechanism shall be effective so that dust accumulated on Electrodes is removed properly, and Rapping Sequence shall be as per the design norms.

❖ **ESP Power supplies**

Modern ESP power supplies like 3-Phase or High Frequency type to be used so that more corona power can be pushed to achieve better collection efficiency.



NEW TECHNOLOGY FOR EMISSION REDUCTION : “THREE PHASE TR SET”



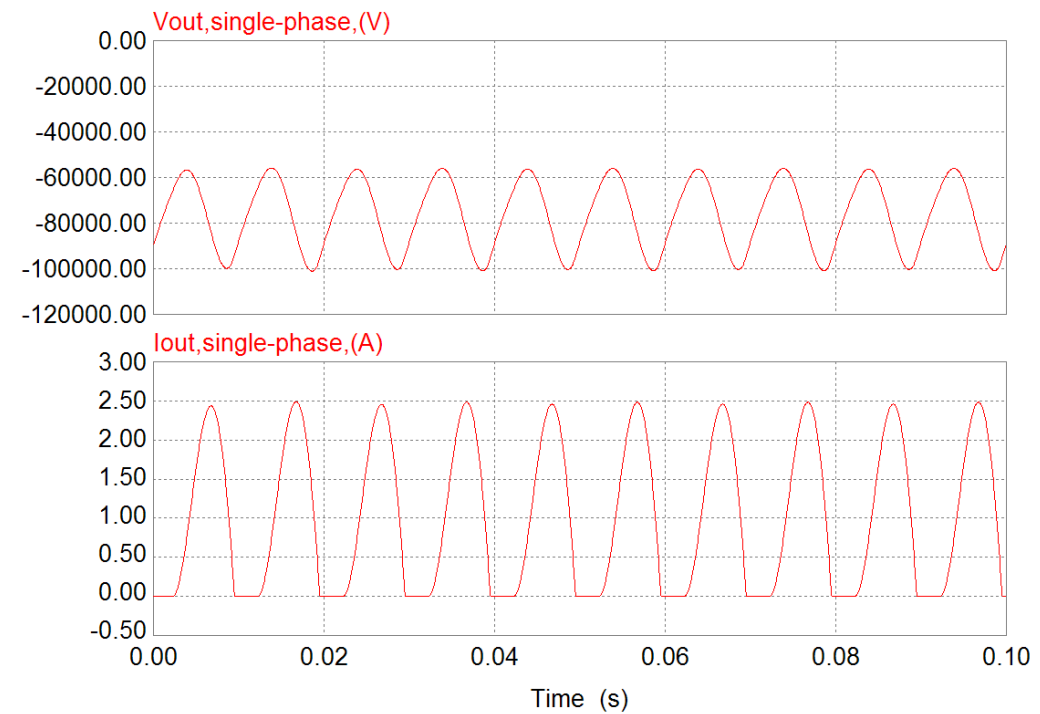
- Balanced Load on mains power supply
- Lower line current resulting into Lower rating of cabling & input switchgear cost
- Higher Average DC voltage due to lower ripple resulting into higher corona Current and higher dust collection.
- Lower sparking resulting into higher average power across ESP hence higher collection efficiency.
- Lower ripple results into lower harmonic current resulting into less cable heating & increase in cable life.
- Lower pulsewidth results into fast response to spark / arc increases the life of electrode.
- 3 Phase TR Rating can be considered as 95 KV as compare to 110 KV for Single Phase TR

KRAFT CLASSIC : SINGLE-PHASE TR-SET + TRCC UNIT



Output characteristics

- | High voltage ripple $\approx 40 - 47 \%$
- | Average voltage $\approx 60 - 65 \%$ of peak voltage
- | Ripple frequency = 100 Hz



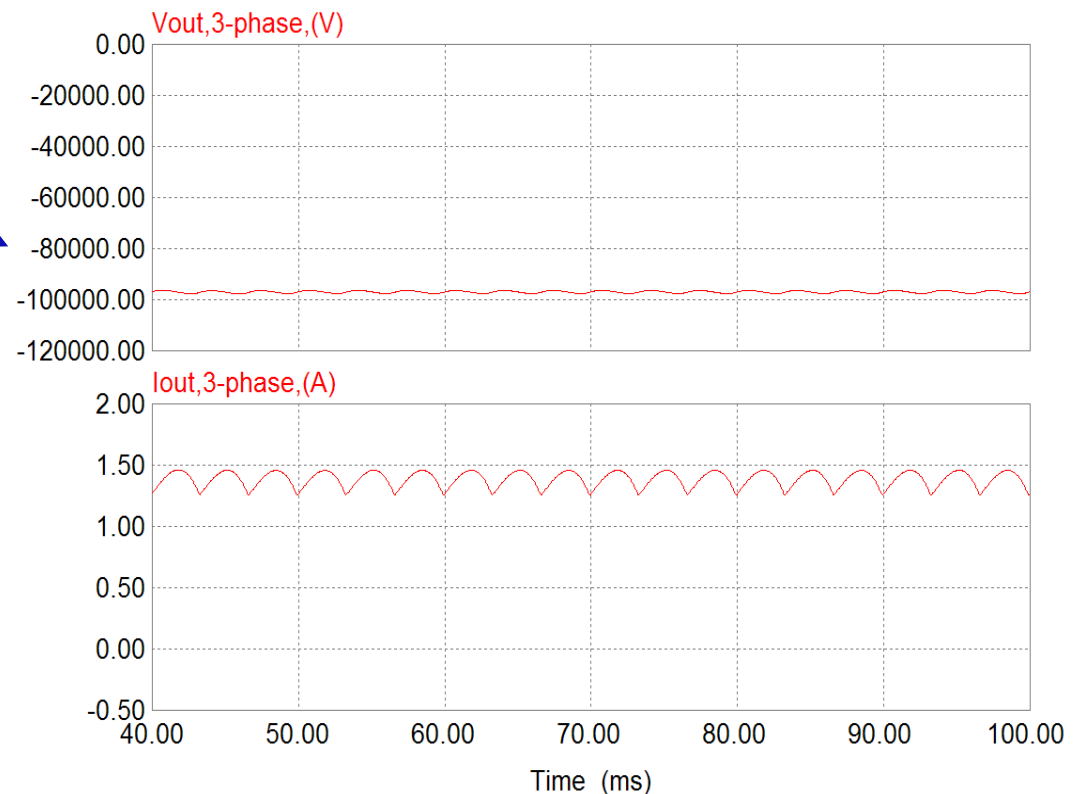
- | From 50 KV-150kV and 100mA-4000mA
- | Two units CC + TR

KRAFT CLASSIC : 3-PHASE TR-SET + TRCC UNIT



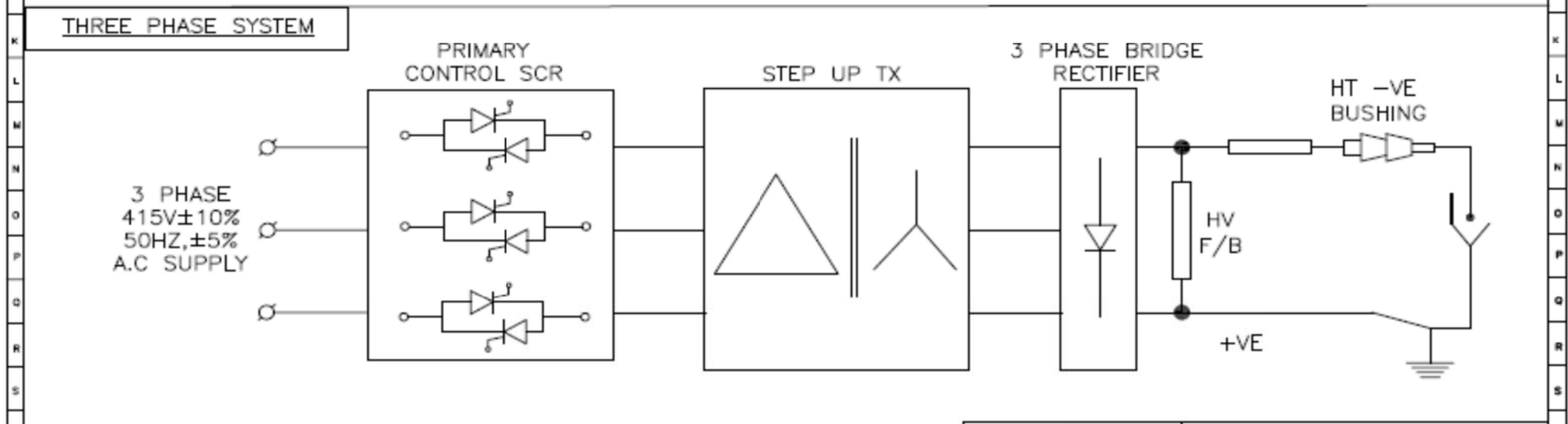
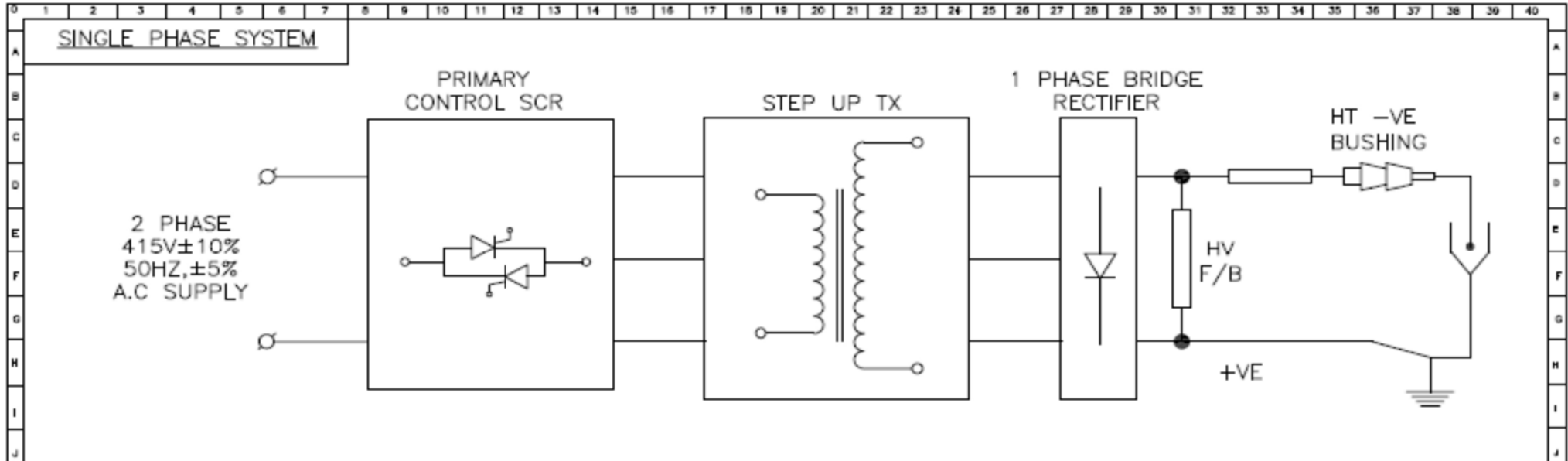
Output characteristics

- | Low voltage ripple $\approx 2\%$
- | Average voltage $\approx 90 - 95\%$ of peak voltage
- | Ripple frequency = 300 Hz



- Up to 150 kV and 4000mA
- Two units CC + TR
- Lower ripple on the output compared to the Single-phase TR

SLD OF SINGLE & THREE PHASE TR SET

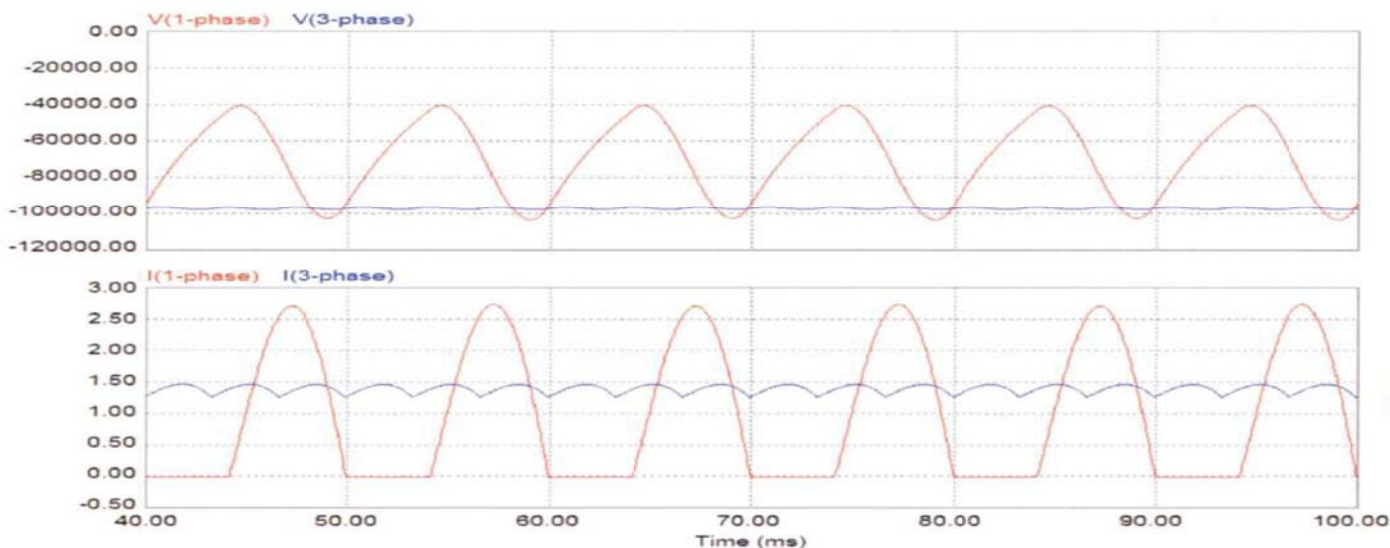


REV.NO	DATE	REVISION DETAILS	Δ MARK IS USED FOR REVISION.	DRN. BY.	CKD. BY.	APD. BY.		TITLE: SINGLE LINE DIGRAM OF 1PHASE & 3 PHASE SYSTEM
								DRG.NO. XXXX-XXXXXX-XXXXX-01

WAVE FORM COMPARISON: 1-PHASE (Vs) 3-PHASE

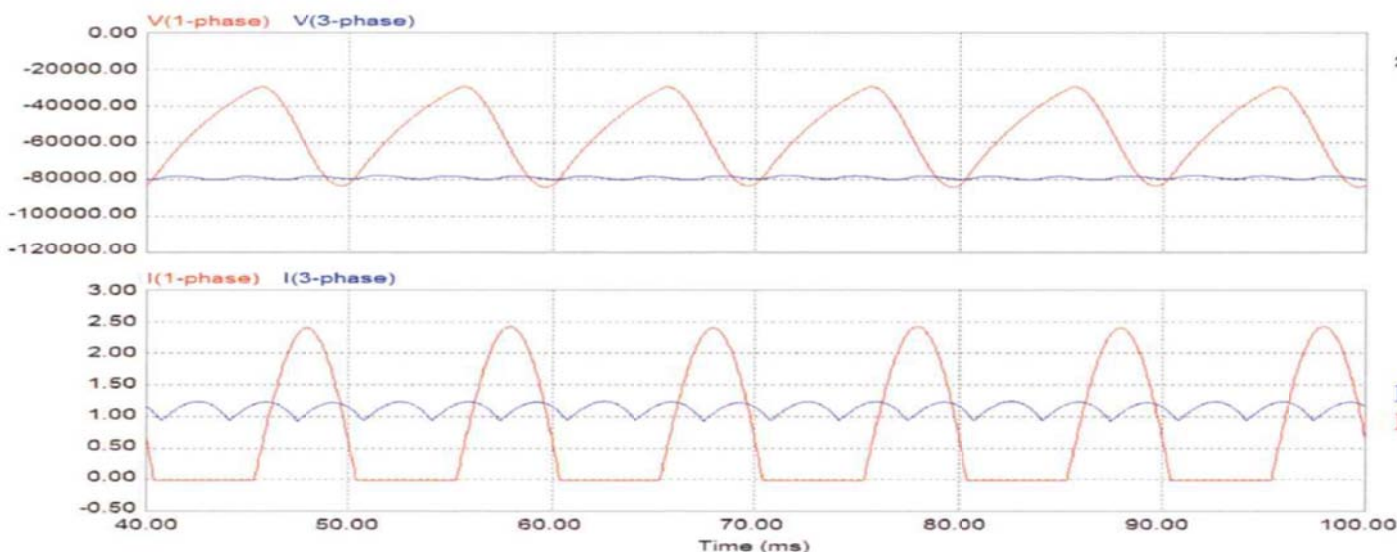


*Waveform comparison between
single and 3-phase ESP-rectifiers*



≈100 kV peak

**$i_{avg}(3-phase)=1350mA$
 $i_{avg}(1-phase)=1000mA$**



≈80 kV peak

**$i_{avg}(3-phase)=1120mA$
 $i_{avg}(1-phase)=780mA$**

COMPARISON BETWEEN SINGLE & THREE PHASE TR SET



Comparison of 1 Phase & 3 Phase HV TR SET

SR NO	PARAMETER	1 PHASE	3 PHASE	3 PHASE
1	PRIMARY VOLTAGE(V)	415 V, 2 PHASE OF 3 PHASE	415 V, 3 PHASE	415 V, 3 PHASE
2	FUNDAMENTAL FREQUENCY (Hz)	50 Hz	50 Hz	50 Hz
3	TOPOLOGY	SINGLE PHASE	DELTA : STAR	DELTA : STAR
4	KV(P) RATING	110 KV(P)	110 KV(P)	95 KV(P)
5	KV(avg) RATING	68KV	104 KV	90 KV
6	mA (ar) RATING	600 mA	600 mA	600 mA
7	PULSEWIDTH of DC O/P	10 msec	3.3 msec	3.3 msec
8	PRIMARY CURRENT (A)	147	94	82
9	RIPPLE CONTENT (%)	47.20%	4.00%	4.00%
10	OPERATING FREQUENCY (Hz)	100 Hz	300 Hz	300 Hz
11	TYPE OF RECTIFIER	1 PHASE FULL WAVE BRIDGE	3 PHASE FULL WAVE BRIDGE	3 PHASE FULL WAVE BRIDGE
12	NO OF RECTIFIER ARM	2	3	3

TRCC SPECIFICATION

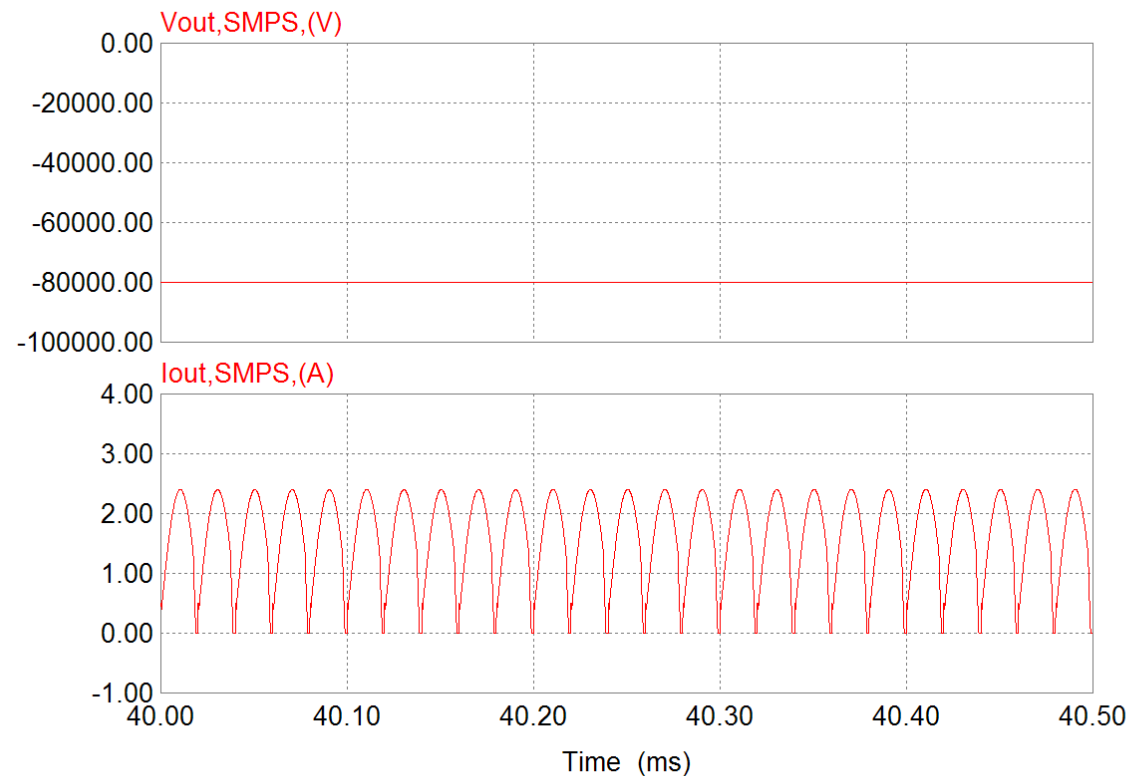
SR NO	PARAMETER	1 PHASE	3 PHASE	3 PHASE
1	PRIMARY VOLTAGE(V)	415 V, 2 PHASE OF 3 PHASE	415 V, 3 PHASE	415 V, 3 PHASE
2	FUNDAMENTAL FREQUENCY (Hz)	50 Hz	50 Hz	50 Hz
3	TOPOLOGY	SINGLE PHASE	THREE PHASE	THREE PHASE
4	KV(P) RATING	110 KV(P)	110 KV(P)	95 KV(P)
5	mA (ar) RATING	600 mA	600 mA	600 mA
6	PRIMARY CURRENT (A)	147	94	82
7	SIZE OF TRCC	700 (W) X 650 (D) X 2000 (H)	700 (W) X 650 (D) X 2000 (H)	700 (W) X 650 (D) X 2000 (H)

HIGH FREQUENCY SMPS UNIT : "SMARTKRAFT"



Output characteristics

- | Very low voltage ripple = $< 1\%$
- | Average voltage \approx peak voltage
- | Ripple frequency = 24 kHz
- | High Power Factor



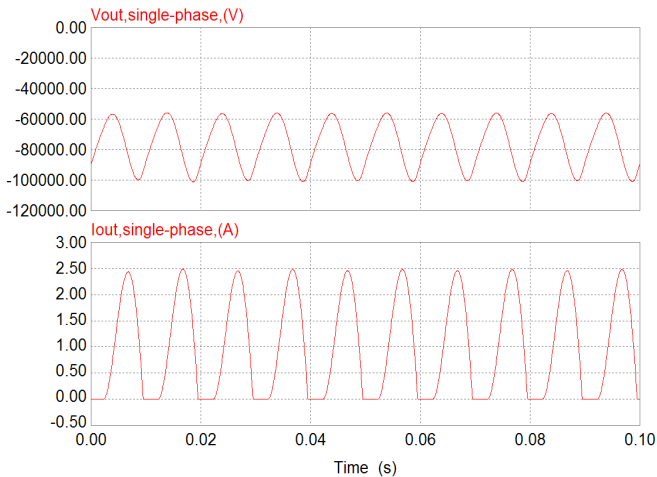
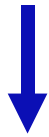
- Primary switched HF technology
- Up to 80 kV and 1600mA (= 128kW)
- One unit => Control Cubicle integrated into the Rectifier unit
- Low weight = 25% of conventional unit

SUMMARY WAVEFORM COMPARISON



SINGLE-PHASE TR UNIT

- 100 Hz Current Ripple
- Results in $\approx 40-50\%$ ripple voltage on an ESP load
- Voltage peaks limits the current into the ESP



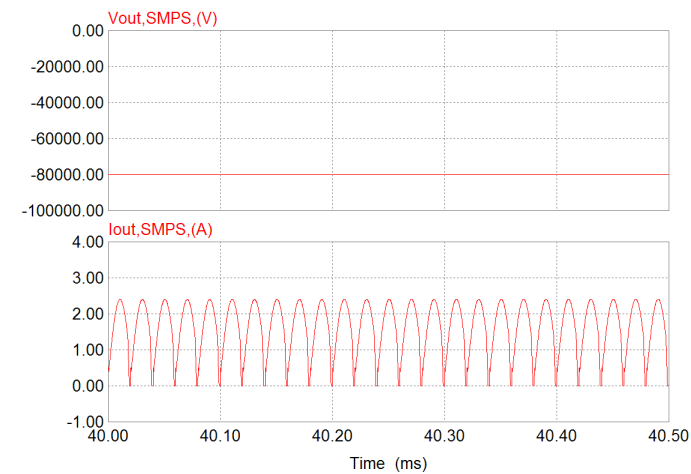
3-PHASE TR UNIT

- 300 Hz Current Ripple
- Results in $\approx 1-2\%$ ripple voltage on an ESP load
- 35-45 % higher current into the ESP compared to Single-phase TR



HIGH FREQUENCY SMPS

- 24kHz Current Ripple
- Results in $< 1\%$ ripple voltage on an ESP load
- 35-45 % higher current into the ESP compared to Single-phase TR

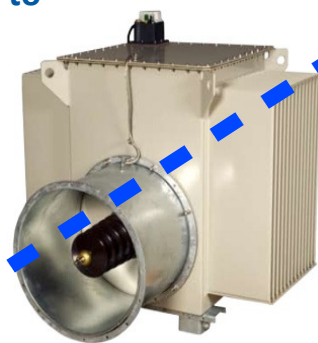


PRODUCT MATRIX : ESP POWER SUPPLIES

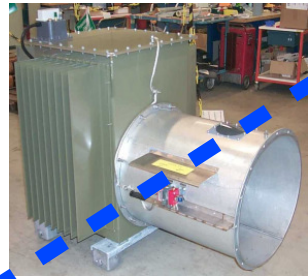


COST
↑

THREE PHASE DC OUTPUT
(Improvement in emission of Existing ESP up to 30 - 40%*)



SINGLE PHASE PULSATING DC OUTPUT
(No Significant ESP Performance Improvement)



SMARTKRAFT DC SMPS
(Improvement in emission of Existing ESP up to 40 - 50%*)



SMARTKRAFT CLASSIC
(Improvement in emission of Existing ESP up to 60%*)



"KRAFTPOWERCON IS THE ONLY COMPANY IN THE WORLD HAVING COMPLETE RANGE OF TRANSFORMER RECTIFIERS FOR ESPs"

→ **PROCESS PERFORMANCE**

* Terms & Conditions Apply.

CLIENTELE OF OUR PRODUCTS



AND MANY MORE...



Some of the case studies of 3 phase TR sets are as follows :

1. Grasim Inds, Nagda : It is a three field ESP of **30 MW** unit with emission of **340 mg**. By replacing the 2 TR sets on inlet side by 3 Phase, the **emission was reduced** to less than **100 mg**
2. Balco Inds, Korba : It is a ESP of **67.5 MW** unit with emission level of **260 mg**. 50% of TR sets has been replaced by 3 Phase & the **emission was brought down** to the level of less than **90 mg**.
3. ESSAR Steel, Vizag : It is a three field ESP of Pelletization Plant with emission of **125 mg**. By replacing only one TR (Out of Three), the **emission has been reduced** to less than **54 mg**.
4. Orient Cement, Devapur : It is a three field ESP of Clinker Cooler with Emission of **39.70 mg**. By replacing Two Three Phase TR Sets , the **emission was reduced** to **15 mg**
5. Hindalco Inds, Renukut : It was Two pass ESP with 5 fields per Pass for a **75MW** Power Plant with emission **144mg** . By replacing First Field in each Pass and replacing EXISTING Controller with **MK III Controller**, the **emission was reduced** to **96.7 mg**.

Orders Executed / Under execution



Some of the orders for 3 phase TR sets are as follows :

1. Orient Cement Ltd. - Devapur . For all Cement Plant ESPs and CPP ESPs Under commissioning.
2. Kesoram Cement – Mancherial – Supplied. Commissioning is in July 2016. .
3. Vasavadatta Cement – Sedam – For all Cement Plant ESPs and CPP ESPs. First lot for Cooler 4 will be supplied during first week of July.
4. Ultratech Cement – Naramada Cement Jafrabad . Order under under execution.
5. Ultratech Cement – Rajashree Cement – Malkhed Order under execution.
6. Prism Sement – Satna . Order Under execution. .



PARAMETERS	OLD TR SET	EXISTING TR SET
TR SET (TYPE)	SINGLE PHASE	THREE PHASE
RATING	80 KV (P) / 800 MA	80 KV (P) / 800 MA
CONTROLLER	BHA	VOLTA
EMISSION LEVEL	340 mg / Nm ³	73 mg / Nm ³

DUST TYPE: HIGH RESISTIVITY DUST

CASE STUDY-1: GRASIM INDS, NAGDA

Data Courtesy: Kraftpowercon, Pune

ON LOAD RESULTS OF FIRST FIELD

I Set (mA)	SINGLE PH TR SET & TRCC					THREE PH TR SET & TRCC					
	KV	mA	VP	IP	SPM	I Set (mA)	KV	mA	VP	IP	SPM
100	25	92	81	24	10	100	42	100	208	13	5
200	28	170	124	42	14	200	43	201	234	24	8
300	32	260	160	55	18	300	45	302	260	35	10
400						400	48	399	295	41	14



PARAMETERS	OLD TR SET	EXISTING TR SET
TR SET (TYPE)	SINGLE PHASE	THREE PHASE
RATING	80 KV (P) / 800 MA	80 KV (P) / 800 MA
CONTROLLER	BHA	VOLTA
EMISSION LEVEL	340 mg / Nm ³	73 mg / Nm ³
DUST TYPE: HIGH RESISTIVITY DUST		

CASE STUDY-1: GRASIM, NAGDA (contd.)

Data Courtesy: Kraftpowercon, Pune

ON
LOAD
RESULTS
OF
**SECOND
FIELD**

I Set (mA)	SINGLE PH TR SET & TRCC					THREE PH TR SET & TRCC					
	KV	mA	VP	IP	SPM	I Set (mA)	KV	mA	VP	IP	SPM
100	28	41	87	41	5	100	41	100	202	17	2
200						200	45	197	240	26	2
300						300	48	299	294	38	3



PARAMETERS	OLD TR SET	EXISTING TR SET
TR SET (TYPE)	SINGLE PHASE	THREE PHASE
RATING	80 KV (P) / 800 MA	80 KV (P) / 800 MA
CONTROLLER	BHA	VOLTA
EMISSION LEVEL	340 mg / Nm ³	73 mg / Nm ³
DUST TYPE: HIGH RESISTIVITY DUST		

CASE STUDY-1: GRASIM, NAGDA (contd.)

Data Courtesy: Kraftpowercon, Pune

ON LOAD RESULTS OF THIRD FIELD

SINGLE PH TR SET & TRCC	THREE PH TR SET & TRCC					I Set (mA)	THREE PH TR SET & TRCC					
	KV	mA	VP	IP	SPM		KV	mA	VP	IP	SPM	
I Set (mA)												
100	23	60	47	44	5	100	38	100	202	19	0	
200						200	42	197	240	28	0	
300						300	47	299	294	40	1	
400						400	50	401	328	47	3	

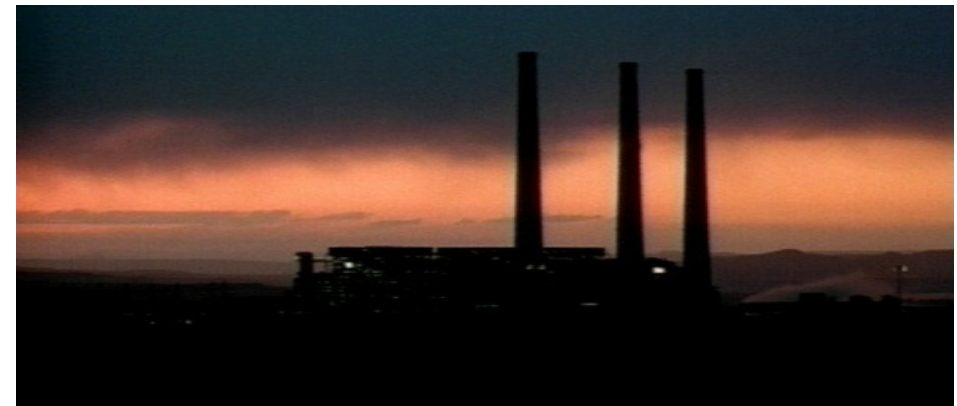
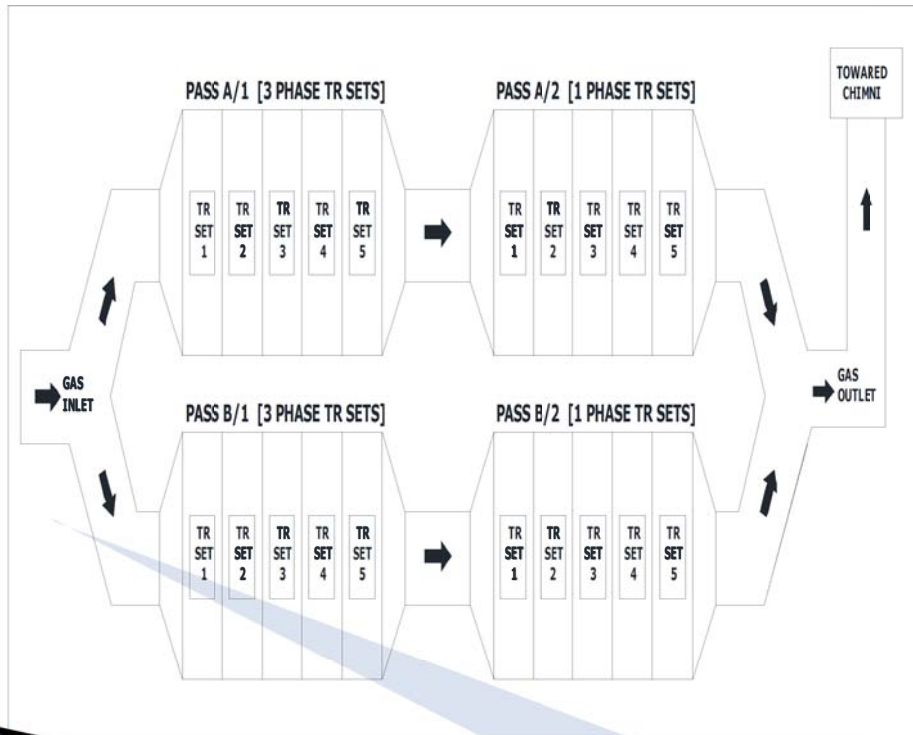
PARAMETERS	OLD TR SET	EXISTING TR SET
TR SET (TYPE)	SINGLE PHASE	THREE PHASE
RATING	110 KV (P) / 400 MA	90 KV (P) / 400 MA
CONTROLLER	BHA	VOLTA
EMISSION LEVEL	260 mg / Nm ³	90 mg / Nm ³



CASE STUDY-2 : BALCO, KORBA

DUST TYPE: HIGH RESISTIVITY DUST

ESP LAYOUT



TR SET CONFIGURA TION DETAILS

PASS A/1	3 PHASE TR SET	QTY : 5
PASS B/1	3 PHASE TR SET	QTY : 5
PASS A/2	1 PHASE TR SET	QTY : 5
PASS B/2	1 PHASE TR SET	QTY : 5

Data Courtesy: Kraftpowercon, Pune

ON LOAD RESULTS:- PASS A

FIELD - I

I SET (mA)	KV	mA	VP	IP	SPM
50	23	50	130	7	2
100	28	100	175	15	8
200	36	200	243	25	18
300	46	300	295	39	21
400	50	400	330	52	28

FIELD - II

I SET (mA)	KV	mA	VP	IP	SPM
50	24	50	145	8	2
100	29	100	198	16	6
200	38	200	255	26	12
300	44	300	305	39	18
400	51	400	345	51	26

FIELD - III

I SET (mA)	KV	mA	VP	IP	SPM
50	25	50	140	9	1
100	30	100	180	15	2
200	38	200	250	28	4
300	44	300	395	43	12
400	50	400	330	52	16

FIELD -IV

I SET (mA)	KV	mA	VP	IP	SPM
50	25	50	135	11	1
100	31	100	185	14	2
200	40	200	250	26	2
300	47	300	305	42	6
400	54	400	345	52	8

FIELD - V

I SET (mA)	KV	mA	VP	IP	SPM
50	24	50	140	8	0
100	30	100	185	15	1
200	38	200	250	27	1
300	43	300	300	40	1
400	50	400	335	52	1

ON LOAD RESULTS:- PASS B

FIELD - I

I SET (mA)	KV	mA	VP	IP	SPM
50	25	50	140	10	4
100	31	100	190	14	9
200	40	200	255	28	22
300	47	300	308	40	27
400	53	400	345	52	32

FIELD - II

I SET (mA)	KV	IP	VP	IP	SPM
50	25	50	132	11	2
100	32	100	180	17	7
200	41	200	250	28	16
300	48	300	300	42	21
400	55	400	340	52	29

FIELD - III

I SET (mA)	KV	IP	VP	IP	SPM
50	25	50	145	12	2
100	31	100	190	16	4
200	40	200	260	30	15
300	47	300	310	40	18
400	53	400	345	52	18

FIELD -IV

I SET (mA)	KV	IP	VP	IP	SPM
50	25	50	140	12	0
100	30	100	185	18	1
200	42	200	245	28	2
300	46	300	300	42	2
400	53	400	345	52	8

FIELD - V

I SET (mA)	KV	IP	VP	IP	SPM
50	23	50	135	8	0
100	28	100	170	14	0
200	35	200	245	26	1
300	41	300	295	39	2
400	45	400	325	52	2



**CASE STUDY-2 :
BALCO, KORBA (contd.)**

Data Courtesy: Kraftpowercon, Pune



PARAMETERS	OLD TR SET	EXISTING TR SET
TR SET (TYPE)	SINGLE PHASE	THREE PHASE
RATING	95 KV (P) / 1200 MA	90 KV (P) / 1200 MA
CONTROLLER	PRECICON- III (ADOR)	VOLTA
EMISSION LEVEL	125 mg / Nm ³	54 mg / Nm ³

CASE STUDY-3 : ESSAR STEEL, VIZAG



ON-LOAD RESULTS (1-PHASE TR SET)	ON-LOAD RESULTS (3-PHASE TR SET)	FIELD - III						FIELD - III					
		I Set (mA)	kV	mA	VP	IP	SPM	I Set (mA)	kV	mA	VP	IP	SPM
		100	24	100	120	15	3	100	32	100	130	20	0
		200	28	200	150	30	7	200	40	200	170	40	0
		300	30	300	180	39	9	300	46	300	200	45	0
		400	34	400	200	52	14	400	48	400	225	55	0

A FEW CUSTOMER FEEDBACKS

- **3 no's of 3-Phase TR Sets** were established in **2009** and **Emissions** are observed to be **drastically reduced**, performance has also been consistent.

- Umesh Rai, DGM -



E&I

Godavari Power & Ispat Ltd.

(Chattisgarh)

- For the first time in India, we used **6 no's of 3-phase TR sets** from **KraftPowercon** for our **67.5MW project at BALCO, Chattisgarh**; Performance has been **excellent** and the Emissions have come down from **290 mg to 50 mg**.

- Ananda



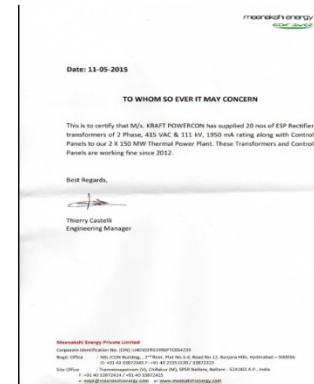
Chattopadhyay

Soil & Enviro Industries Pvt. Ltd.

(Kolkata)

- KraftPowercon has supplied **20 no's of ESP Rectifier Transformers** of 2-Phase, 415VAC & **111kV/1950mA** rating along with **Control Panels** to our **2 X 150MW Thermal Power Plant**. These transformers and Control Panels have been **working fine since 2012**.

Thierry Costelli, Engg



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