

**PRUDENT USE OF
QUALITY POWER**



...THROUGH
SUBODHAN

SUBODHAN CAPACITOR

About Us

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Subodhan is an enterprise with a strong sense of self-respect; having commitment for freedom of experimentation in finding new ways to build the nation.

SUBODHAN ENGINEERS (PUNE) PVT. LTD.

A leading capacitor manufacturing company incorporated on **14th January 1993**. The company is promoted by technocrats having experience over two decades in design, Manufacturing & Application engineering of power factor improvement capacitors.

Most modern manufacturing machinery full fledge testing laboratory, support on application engineering and strong R&D are the core strength of **Subodhan** This is turn reflects in low field failures, high reliability and wide range of satisfied customer base.

Registered Office & Works

Subodhan Engineers (Pune) Pvt. Ltd.

B-9, Co-Op. Industrial Estate, Baramati, Pune 413 102.

Administrative & Sales Office

Subodhan Engineers (Pune) Pvt. Ltd.

27 Marble House, 473, Sadashiv Peth, Pune 411 030

Name of Bankers

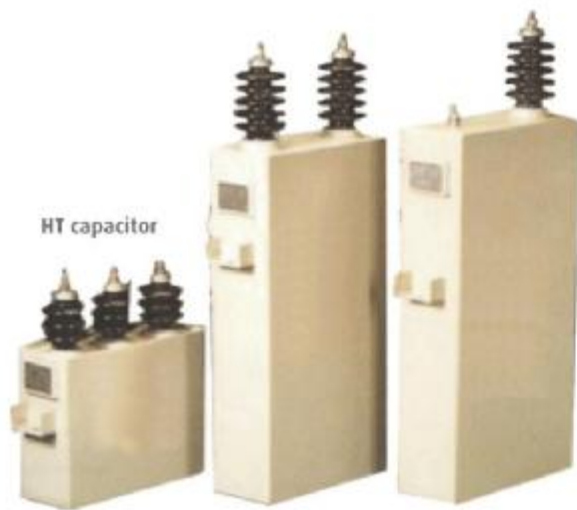
Bank of Maharashtra

SSI Branch, Pune 411 037



Subodhan is amongst a first few companies, in its category to be accredited with **ISO 9001:2000 certification.**

Get edge over HT network with SUBODHAN wide range of HT capacitor's.



General description :

Subodhan's high voltage capacitors are manufactured using latest design i.e. film foil design ,extended foil construction with edge soldering and edge end folding of electrode foil. Large units up to 300 kvar in single container can be offered giving the benefits of kvar to volume ratio thereby reducing installation cost and space.

Each capacitor unit consists of number of elements in series/parallel combination with or without internal fuses. Each element wound with high quality Hazy BOPP film as dielectric and high purity Aluminium foil as electrode. We adopt extended foil construction which enhances life expectancy & current handling capability of capacitor. To overcome phenomenon of partial Discharge at sharp points, the edge of aluminium foil is folded such that no sharp points are left over. Non-PCB, synthetic fluid used for impregnation is non toxic, bio gradable, environment friendly.

Technical Specification:

Rated Output	Individual units upto 300kvar	Protection	Internal/External Fuse
Rated Voltage	3.3kv to 12kv	Mounting	Vertical/Horizontal
Frequency	50/60 HZ	Installation	Indoor/Outdoor
Connection	3 phases, Delta or Star	Ref. Standars	ISS 13925, IEC 871

Advantages of HT capacitors

- ▶ **Very low dielectric losses (<0.14w/kvar)**
- ▶ **Low capacitance change with respect to temperature**
- ▶ **High current handling capability**
- ▶ **Superior electrical performance and reliability**
- ▶ **Environment friendly capacitor fluid**
- ▶ **High inrush and discharge inception voltage level**
- ▶ **Longer electro-chemical life**
- ▶ **High thermal stability**





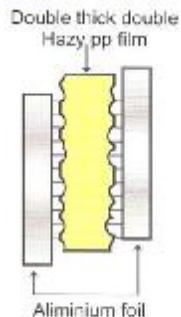
NON-SELF HEALING CAPACITORS



WIDE RANGE OF LT CAPACITORS

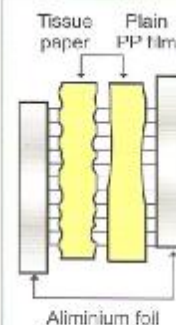


Type	APP (SL)	APP (DL)	Mixed-Di-Electric
Rated Voltage (UN)*	Up to 1000 VAC	Up to 1000 VAC	Up to 1000 VAC
Frequency	50 HZ / 60 HZ	50 HZ / 60 HZ	50 HZ / 60 HZ
Max. Permissible Overvoltage	1.15 x U _n	1.3 X U _n	1.15 x U _n
Max. Permissible Overcurrent	1.7 x I _n	1.9 X I _n	1.7 x I _n
Temperature Category	50°C	50°C	50°C
Electrode Thickness	5 to 6 micron Al	5 to 6 micron Al	5 to 6 micron Al
Dielectric	Polypropylene	Double Polypropylene	Polypropylene & Paper
Dielectric Loss	<0.2 watt / Kvar	<0.2 watt / Kvar	<1.0 watt / Kvar
Capacitor Loss	<0.5 watt / Kvar	<0.5 watt / Kvar	<2.0 watt / Kvar
Impregnant	Non PCB, PXE Oil	Non PCB, PXE Oil	Non PCB, PXE Oil
Cooling	Oil & Air Cooled	Oil & Air Cooled	Oil & Air Cooled
Protection	Internal Fuse	Internal Fuse	Internal Fuse
Connection	Delta	Delta	Delta
Life Expectancy	1,50,000 Hrs	2,00,000 Hrs	2,00,000 Hrs
Referring Standard	IS 13585 (P1)/IEC 60931	IS 13585 (P1)/IEC 60931	IS 13585 (P1)/IEC 60931



ALL PP CAPACITORS
(Ref. IS 13585: 1994 P 1)

Non Self Healing all PP capacitors are manufactured using Double Hazy and Double Thick polypropylene films between two electrodes of thick aluminium Foil and have extended foil construction to ensure low watt losses.



MIXED - DIELECTRIC
(Ref. IS 13585: 1994 P 1)

Non Self Healing manufactured using and one layer of tissue of plain aluminium fo ensure low watt loss.



SELF HEALING CAPACITORS

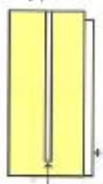


SUN (Circular)	SUH (Circular)	SHN (Rectangle)	SHH (Rectangle)
Up to 650 VAC	Up to 650 VAC	Up to 650 VAC	Up to 650 VAC
50 HZ / 60 HZ	50 HZ / 60 HZ	50 HZ / 60 HZ	50 HZ / 60 HZ
1.3 x U _n	1.4 x U _n	1.3 x U _n	1.4 x U _n
1.3 x I _n	1.4 x I _n	1.3 x I _n	1.5 x I _n
50°C	50°C	50°C	50°C
0.02 to 0.03 micron	0.02 to 0.03 micron	0.02 to 0.03 micron	0.02 to 0.03 micron
Polypropylene	Polypropylene	Polypropylene	Polypropylene
<0.2 watt / Kvar	<0.2 watt / Kvar	<0.2 watt / Kvar	<0.2 watt / Kvar
<0.5 watt / Kvar max.	<0.5 watt / Kvar max.	<0.5 watt / Kvar max.	<0.5 watt / Kvar max.
Non PCB, Silicon Oil & Wax / Dry	Non PCB, Silicon Oil & Wax / Dry	Non PCB Oil	Non PCB Oil
Natural- Air Cooled	Natural- Air Cooled	Oil And Air Cooled	Oil And Air Cooled
Pressure Disconnecter	Pressure Disconnecter	Pressure Disconnecter/Release	Pressure Disconnecter/Release
Delta	Delta	Delta	Delta
80,000 Hrs	1,25,000 Hrs	1,00,000 Hrs	1,25,000 Hrs
IS13340 / IEC 60831	IS13340 / IEC 60831	IS13340 / IEC 60831	IS13340 / IEC 60831

CAPACITORS (P1)

Mixed-dielectric capacitors are one layer of plain polypropylene dielectric paper between two electrodes and have extended foil design to

Heavy Edge Zn - Al Alloy
Mpp Film



0.02 to 0.03 Micron thick
metallised layer

METALLISED POLYPROPELENE (MPP) CAPACITORS (Ref. IS 13340:1993)

MPP Capacitors are manufactured using Zn-Al Metallised polypropylene Film. These modules have pressure interrupter.

arrangement for safety against bursting. The modules are assembled in CRCA container.

Note: Up to 25 kvar single unit & above 25 kvar banking arrangement

Be Energy Efficient & get competent Edge with SUBODHAN Automatic Power Factor Correction Panels.

Subodhan Thyristorised and Contactor based APFC panels are specially designed with maximum efficiency to provide complete solutions on Reactive power management. Power factor improvement is need of the various industries with changing loads and **Subodhan** is trusted capacitor manufacture having expertise to provide right solution to achieve unity power factor to get the guaranteed returns on investments.

Contactor Based APFC Panel



Features of RTPFC & CONTRACTOR Base APFC panels

With Capacitor

- ▶ Very low dielectric losses ($<0.14\text{w/kvar}$)
- ▶ Low capacitance change with respect to temperature
- ▶ High current handling capability
- ▶ Superior electrical performance and reliability
- ▶ Environment friendly capacitor fluid
- ▶ High inrush and discharge inception voltage level
- ▶ Longer electro-chemical life
- ▶ High thermal stability

With Switching Device

- ▶ Real time PF Correction with use of intelligent Microproccer based APFC relay with fast switching time.
- ▶ Use of zero cross-over voltage switching techniques for thyristor based panels.

RTPFC Panel



Benefit of Power factor correction

- ▶ Saving in kva(demand) charges
- ▶ Elimination of power factor penalties &securing incentives
- ▶ Release of system capacity by which additional loads can be easily added.
- ▶ Reduction in current drawn
- ▶ Reduced Transformer/Switchgear/Cable losses
- ▶ Improved Voltage Regulation
- ▶ Increased life of switchgear/cables due to reduced operating temperatures.

Is your industries suffering from POWER QUALITY PROBLEMS?

Such AS,

- ▶ Overheating of conductor, transformer at moderate load
- ▶ Damage to data processing equipments
- ▶ Capacitor & neutral overloading
- ▶ Computer lockups, interference with telecommunication line
- ▶ Overheating of neutral
- ▶ Nuisance tripping
- ▶ Flickering of lights equipment damage at partial load (Induction motor, Synchronous motors etc.)
- ▶ Utility metering claims
- ▶ Problem when switching heavy loads

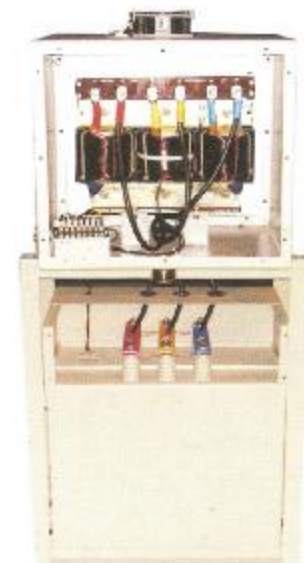
Then your organization should adopt POWER Quality (PQ) improvement programme to get rid of all above.

Power quality analysis & solution

Subodhan provides complete solution to your problem through power quality and Harmonic Analysis. We use modern measuring instruments for data collection & provide optimum solution with our strong expertise & technical back up in the field.

Harmonic Filter

Harmonics are one of the major cause of poor power quality generated due to presence of non linear load. **Subodhan's** special design harmonic filter reduces harmonics to acceptable level as per IEEE 519-1992. **Subodhan** has successfully installed these types of harmonic filters in many reputed industries and proved the performance by improving the quality of power.



Harmonic Filter Unit

Take one step forward and make your industry work at 100% efficiency.

Multiplying Factor

(For calculating the sizes of capacitor for power factor improvement)

INITIAL POWER FACTOR	REQUIRED POWER FACTOR												
	0.80	0.85	0.90	0.91	0.92	0.93	0.94	0.95	0.96	0.97	0.98	0.99	UNITY
0.65	0.419	0.549	0.685	0.713	0.740	0.774	0.806	0.840	0.877	0.918	0.997	1.026	1.169
0.66	0.338	0.518	0.654	0.682	0.709	0.743	0.775	0.809	0.846	0.887	0.935	0.995	1.108
0.67	0.358	0.488	0.624	0.652	0.679	0.713	0.745	0.779	0.816	0.857	0.905	0.965	1.108
0.68	0.328	0.458	0.595	0.623	0.650	0.684	0.716	0.740	0.786	0.827	0.875	0.935	1.078
0.69	0.299	0.429	0.565	0.593	0.620	0.654	0.686	0.720	0.757	0.798	0.845	0.906	1.049
0.70	0.270	0.400	0.536	0.564	0.591	0.625	0.657	0.691	0.728	0.769	0.817	0.877	1.020
0.71	0.242	0.372	0.508	0.536	0.563	0.597	0.629	0.663	0.700	0.741	0.789	0.840	0.992
0.72	0.214	0.344	0.480	0.507	0.534	0.568	0.600	0.635	0.672	0.713	0.761	0.821	0.964
0.73	0.186	0.316	0.452	0.480	0.507	0.541	0.573	0.607	0.644	0.685	0.733	0.793	0.936
0.74	0.159	0.289	0.425	0.453	0.480	0.514	0.546	0.580	0.617	0.658	0.706	0.766	0.909
0.75	0.132	0.262	0.398	0.426	0.453	0.487	0.519	0.553	0.590	0.631	0.679	0.739	0.882
0.76	0.105	0.235	0.370	0.399	0.426	0.460	0.492	0.526	0.563	0.604	0.652	0.712	0.855
0.77	0.079	0.209	0.345	0.373	0.400	0.434	0.466	0.500	0.537	0.578	0.626	0.686	0.829
0.78	0.052	0.182	0.318	0.347	0.374	0.408	0.440	0.473	0.510	0.551	0.599	0.659	0.802
0.79	0.026	0.156	0.292	0.320	0.347	0.381	0.413	0.447	0.484	0.525	0.573	0.633	0.776
0.80	--	0.130	0.226	0.294	0.321	0.355	0.387	0.421	0.458	0.499	0.547	0.607	0.750
0.81	--	0.104	0.240	0.268	0.295	0.329	0.361	0.395	0.432	0.473	0.521	0.581	0.724
0.82	--	0.078	0.214	0.242	0.269	0.303	0.335	0.369	0.406	0.447	0.495	0.555	0.698
0.83	--	0.052	0.188	0.216	0.243	0.277	0.309	0.343	0.380	0.421	0.469	0.529	0.672
0.84	--	0.026	0.162	0.190	0.217	0.251	0.283	0.317	0.354	0.396	0.443	0.503	0.646
0.85	--	--	0.136	0.164	0.191	0.225	0.257	0.291	0.328	0.369	0.417	0.477	0.620
0.86	--	--	0.109	0.140	0.167	0.198	0.230	0.264	0.301	0.342	0.390	0.450	0.593
0.87	--	--	0.083	0.114	0.141	0.172	0.204	0.238	0.275	0.316	0.364	0.424	0.567
0.88	--	--	0.056	0.085	0.112	0.143	0.175	0.211	0.248	0.289	0.337	0.397	0.540
0.89	--	--	0.028	0.059	0.086	0.117	0.149	0.183	0.220	0.261	0.309	0.369	0.512
0.90	--	--	--	0.031	0.058	0.089	0.121	0.155	0.192	0.233	0.281	0.341	0.484
0.91	--	--	--	--	0.027	0.058	0.090	0.127	0.164	0.205	0.253	0.313	0.456
0.92	--	--	--	--	--	0.031	0.063	0.097	0.134	0.175	0.223	0.283	0.428
0.93	--	--	--	--	--	--	0.032	0.066	0.108	0.144	0.192	0.252	0.395
0.94	--	--	--	--	--	--	--	0.034	0.071	0.112	0.160	0.220	0.363
0.95	--	--	--	--	--	--	--	--	0.037	0.078	0.126	0.186	0.329
0.96	--	--	--	--	--	--	--	--	--	0.041	0.089	0.149	0.292
0.97	--	--	--	--	--	--	--	--	--	--	0.048	0.108	0.251
0.98	--	--	--	--	--	--	--	--	--	--	--	0.060	0.203
0.99	--	--	--	--	--	--	--	--	--	--	--	--	0.143

EXAMPLE	Load: 500KW	Initial P. F.: 0.80 To Be Improved To 0.95	Factor From Table: 0.421
Capacitor required = 500 X 0.421 = 210.5KVAR SAY 200KVAR			

Our Commitment : A part of our annual profit is donated to social & educational institutions



ISO 9001 : 2000
Reg. No. : R 91/1240



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Note: Product and specifications in this brochure are indicative and do not represent full range.