

Harmonic Filter Calculations

Harmonic Filter Calculations:		Enter Title Here...																									
SYSTEM INFORMATION:																											
Filter Specification (e.g., 5):	<input style="width: 80%;" type="text" value="5"/> th	Power System Frequency:	<input style="width: 80%;" type="text" value="60"/> Hz																								
Three-Phase Capacitor Bank Rating:	<input style="width: 80%;" type="text" value="500"/> kVAr	Capacitor Voltage Rating:	<input style="width: 80%;" type="text" value="600"/> Volts																								
Rated Capacitor Bank Current:	481 Amps	Capacitor Frequency Rating:	<input style="width: 80%;" type="text" value="60"/> Hz																								
Nominal Bus Voltage:	<input style="width: 80%;" type="text" value="480"/> Volts	Derated Capacitor Size:	320 kVAr																								
Capacitor Bank Current (actual):	384.9 Amps	Total Harmonic Load:	<input style="width: 80%;" type="text" value="500"/> kVA																								
Filter Tuning Harmonic (e.g., 4.7):	<input style="width: 80%;" type="text" value="4.7"/> th	Filter Tuning Frequency:	282 Hz																								
Capacitor Impedance (wye):	0.7200 Ω	Capacitor Rating (wye):	3684.15 μ F																								
Capacitor Impedance (delta):	2.1600 Ω	Capacitor Rating (delta):	1228.05 μ F																								
Filter Reactor Impedance:	0.0326 Ω	Filter Reactor Rating:	0.0865 mH																								
Filter Full Load Current (actual):	403.2 Amps	Fundamental Frequency Compensation:	335 kVAr																								
Filter Full Load Current (rated):	503.9 Amps	Utility Side Voltage Distortion (Vh):	<input style="width: 80%;" type="text" value="1.00"/> %																								
Transformer Nameplate Rating:	<input style="width: 80%;" type="text" value="1500"/> kVA	<i>(Utility Harmonic Voltage Source)</i>																									
Transformer Nameplate Impedance:	<input style="width: 80%;" type="text" value="6.00"/> %	Load Harmonic Current:	180.4 Amps																								
Load Harmonic Current:	<input style="width: 80%;" type="text" value="30.00"/> % Fund	Maximum Total Harmonic Current:	223.1 Amps																								
Utility Harmonic Current:	42.7 Amps																										
CAPACITOR DUTY CALCULATIONS:																											
Harmonic Filter RMS Current:	460.8 Amps	Fund. Freq. Capacitor Voltage:	502.8 Volts																								
Harmonic Capacitor Voltage:	55.6 Volts	Maximum Peak Voltage:	558.4 Volts																								
RMS Capacitor Voltage:	505.8 Volts	Maximum Peak Current:	626.2 Amps																								
CAPACITOR LIMITS: (IEEE Standard 18-2002)		FILTER CONFIGURATION:																									
	<table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th style="width: 15%;"></th> <th style="width: 15%;">Limit</th> <th style="width: 15%;">Contingency</th> <th style="width: 15%;">Actual</th> <th style="width: 15%;">Value</th> </tr> </thead> <tbody> <tr> <td style="text-align: left;">Peak Voltage:</td> <td>100%</td> <td>120%</td> <td>93%</td> <td>558</td> </tr> <tr> <td style="text-align: left;">RMS Current:</td> <td>100%</td> <td>135%</td> <td>96%</td> <td>461</td> </tr> <tr> <td style="text-align: left;">KVAr:</td> <td>100%</td> <td>135%</td> <td>81%</td> <td>404</td> </tr> <tr> <td style="text-align: left;">RMS Voltage:</td> <td>100%</td> <td>110%</td> <td>84%</td> <td>506</td> </tr> </tbody> </table>		Limit	Contingency	Actual	Value	Peak Voltage:	100%	120%	93%	558	RMS Current:	100%	135%	96%	461	KVAr:	100%	135%	81%	404	RMS Voltage:	100%	110%	84%	506	
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FILTER REACTOR DESIGN SPECIFICATIONS:																											
Reactor Impedance:	0.0326 Ω	Reactor Rating:	0.0865 mH																								
Fundamental Current:	403.2 Amps	Harmonic Current:	223.1 Amps																								
RMS Current Requirement:	460.8 Amps	Voltage Requirement:	277.1 Volts																								
TOLERANCE EVALUATION:																											
Capacitor Tolerance:	<table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <tr> <td style="width: 50%;">-</td> <td style="width: 50%;">+</td> </tr> <tr> <td><input style="width: 80%;" type="text" value="0.00"/></td> <td><input style="width: 80%;" type="text" value="10.00"/></td> </tr> </table>	-	+	<input style="width: 80%;" type="text" value="0.00"/>	<input style="width: 80%;" type="text" value="10.00"/>	$f_{tuned} = f_{nominal} \times \frac{1}{\sqrt{(1+t_r)(1+t_c)}}$	Tuning Range																				
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