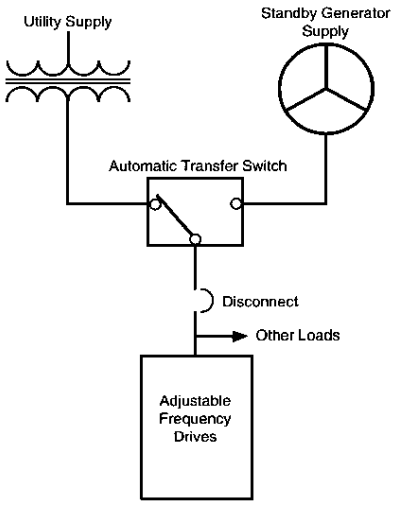
8803
ALTIVAR® 56 & 66 AC Drives
Application Note



Emergency/standby Generators:

The coordination of AFDs and emergency standby generators is necessary to determine acceptable operation. The generator set is an inherently high reactance system as compared to a utility. Excessive voltage distortion on the output of the generator terminals could lead to generator overheating, excitation system instability or miss-operation of equipment connected to the generator. The generator must have sufficient KVA capacity to absorb the harmonics from the AFD's. Generator manufacturers will commonly oversize the engine/alternator set to accommodate for nonlinear loads such as AFD's. To assure the voltage regulator of the generator can distinguish the fundamental line voltage, special circuitry is required in the voltage regulator package. This package must be requested in the generator specifications. The selection of generator set to drive AFD's requires good communications between the various equipment suppliers, facilitated by the consultant.

Power System Harmonics & AFD's "Rules of Thumb"

Industrial and commercial users are commonly specifying the latest IEEE 519 guidelines. These guidelines exist to help define acceptable levels of system voltage distortion. In the engineering and planning stages of an Adjustable Frequency Drive installation, the user is typically concerned about the harmonics that will be produced by the AFD. Below a certain power level, the harmonics become insignificant to the distribution system. When the AFD load is large compared to the distribution system, a harmonic study should be made to determine the AC voltage distortion. The amount of voltage distortion determines if there is a concern for harmonic effects on other connected loads. Voltage distortion is the key issue associated with interference of other equipment on systems without resonating devices such as power factor correction capacitors. The building electrical distribution network determines the harmonic levels at the user/utility interface.

An approximation method for evaluating voltage distortion on distribution transformers:

As a first hand approximation for ATV56 and ATV66 drives, use the following table which limits the ratio of AFD horsepower ratings (HP_{AFD}) to utility supply transformer (KVA supply) to a harmonic voltage distortion level of 5% or less:

$$\text{Load Ratio} = \frac{HP_{AFD}}{\text{KVA supply}} X100$$

THD (Voltage) of 5% or Less

• Utility Transformer KVA rating(s)	Load Ratio
112.5	≤44
150	≤40
225	≤35
300-750	≤40
1000	≤37
1500	≤28
2000	≤24
2500	≤22

•X/R values based on IEEE 242-1986 values and 5.75% Z assumptions

This approximation applies if the distribution system does not include resonating devices such as power factor correction capacitors and application of auxiliary power quality equipment.

Power System Harmonics and AFD's "Rules of Thumb"

DETAILS REQUIRED TO PERFORM A HARMONIC ANALYSIS:

A. Power Distribution One-Line diagram

B. Transformer Source Data:

1. KVA rating _____
2. Configuration (i.e. Delta, Delta/Wye) _____
3. Percent Impedance (%Z) _____
4. X/R ratio (per recommended IEEE 242-1986 guidelines if available) _____
5. Primary and secondary voltage ratings of transformer _____

C. Available Fault Current:

1. KVA or Amps _____
2. X/R ratio of source current _____

D. Emergency Generator (if used):

1. Negative sequence reactance (X2) in milliohms or per unit with base values _____
2. Alternator KW, PF and subtranscient reactance (Xd" in percent or per unit) _____
3. Generator supplier cut sheet with constants

E. Feeder Information: *From source to the input of the AFD's*

Cable Data:

1. Number of conductors per phase (i.e., 1/C or 3/C) _____
2. Cable size and type of insulation (i.e., 500MCM, THHN, etc.) _____
3. Cable length per run in feet _____
4. Conductor material: Copper or aluminum _____

Power Bus Data:

5. Ampacity ratings _____
6. Conductor Material: Copper or Aluminum _____
7. Length of Bus in feet _____

F. Raceway:

1. Conduit Data: Steel, Aluminum, Plastic or PVC _____
2. Cable Tray _____

G. Power Factor Correction Capacitors (if used):

1. KVAR rating on low voltage side _____

H. Mechanically Driven Load:

1. Type of Load: Variable Torque Duty, Constant Torque Duty _____
2. Maximum mechanical brake horsepower of each driven load (based on mechanical design) _____

I. An existing Short Circuit Analysis report (if available).

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