

An MCE Technical Publication

Drive System Considerations

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Motion Control Engineering, Incorporated

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Purpose

This Technical Publication discusses drive system considerations for selection of elevator drives and possible side effects associated with static drives.

Motion Control Engineering, Inc. manufactures elevator control systems using motor generator and DC-SCR or AC static drives. MCE's experience as a control system supplier suggests the need to improve industry understanding regarding the application of elevator control drive systems.

Overview

Many modernization projects use static drives successfully (either DC-SCR or AC inverter type). On the other hand, a few projects have presented significant difficulties from which much can be learned.

As an elevator control system supplier, **MCE** has become aware of **problems** that **result from the use of static drives**. These situations *underscore* the need to share experiences and maintain an **open dialogue** between elevator control suppliers, consultants, contractors and other interested parties.

Communication is Vital

Sometimes, neither consultants, contractors or control suppliers recognize a potential problem. Communication is vital to the successful installation of static drives and it is, of course, preferable to address as many issues as possible up front. Mutual recognition of potential issues is the key to a successful project. This is **particularly true for modernization**.

Occasionally, a problem comes as a total surprise. The **result is chaos** -- especially for the **end user**, who cannot understand how knowledgeable elevator industry people could have failed to foresee the difficulty. Some specification writers have attempted to address issues in advance by specifying that, "The contractor and/or control supplier shall be responsible for everything that may occur as the result of the application of static drives". This is not a reasonable solution.

To best serve the customer and the industry, it is necessary to establish a continuous dialogue. There are issues that can be recognized up front and potential difficulties prevented. Consultants, contractors and control suppliers working as a team can research, evaluate and resolve issues.

An example of an issue not properly identified and adequately addressed is the case where elevators were converted to DC-SCR static drives. During the completion stages of the project it was discovered that the existing building power supply was inadequate. What can an owner or, for that matter, a supplier do when they have no prior knowledge of this type of job specific condition?

The contractor, consultants and others directly familiar with a project should **recognize** the need for power system evaluation. Everyone involved with a modernization project should remember that **existing elevators frequently do not run at contract speed**. Further, static drives may **affect AC power distribution systems differently** than original DC or AC elevator controls.

Drive Technology

Modern drive technology includes motor generator drives using static field control, DC-SCR static drives and AC static drives. These **state-of-the-art drives raise additional issues** for consideration.

Old relay technology had **little or no effect** on the AC line. This equipment generated little or no noise, and operated well with emergency power generators.

Static drives present issues for new construction and retrofitting (modernization) of existing systems. **Static drives are preferred**, in most cases, over motor generator drives. For new construction, the static drive option can be evaluated and used as the basis for design of the elevator machine room and the AC power distribution system. For modernization projects, it is important to recognize **the potential for damaging effects from static drives, including:**

- Degraded performance of emergency power generators
- Additional heating and induction motor power losses
- Audible noise
- Interference with sensitive medical equipment
- Interference with computers
- Interference with radio and television equipment

Noise is generated as a result of static drive switching and the way these devices draw current from the AC line. Static drives use switching devices, including SCRs, transistors, and IGBTs, that switch very rapidly producing **Radio Frequency Interference (RFI)**. Static drives also produce current distortion on the AC line, called **Harmonic Distortion**.

Types of noise include:

- Audible Noise - Airborne
- Physical Noise - Structure conducted
- Electrical Noise - Radiated or conducted
 - Radiated **Noise** from wires connected to a drive becomes an issue when the magnitude creates RFI that interferes with radio receivers and other devices.
 - **Conducted Noise** transmitted from the drive through electrical conductors can result in harmonic distortion, line notching, and other disturbances.

While static drives have some unfriendly characteristics, their overall performance makes them highly desirable. When the implications are understood, **static drives frequently provide the best total solution** for elevator control.

Summary - Drive System Considerations publications

Below is a summary of MCE Technical Publications that review pertinent issues of elevator control conversion to static control systems. Topics include:

Harmonic Analysis and Comparison

A discussion of harmonic analysis and comparison of DC and AC static drives.

Motor Generator vs Static Drives

A look at when it might be appropriate to stay with motor generator drives rather than switching to static drives.

AC Static Drives & RFI

A review of the generation of electrical noise and effects of RFI in AC static drives.

AC Motor Controls for Elevators

A review of pertinent issues regarding proper application and installation of AC motors and drives.

The reader is encouraged to review these publications in their entirety, and to use them for future reference. Additionally, it is highly desirable for the reader to engage in dialogue with the publisher to promote further industry understanding of the effects of static devices.

Conclusion

MCE's Technical Publication series is intended to be an informative catalyst for ongoing dialogue and sharing of information between consultants, elevator contractors, owners and other interested parties. MCE Technical Publications are available on our website at www.mceinc.com.

*Don Alley, MCE Vice President, Research and Development
MCE R&D Staff
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