



# Market Segment Report: Sustainable Commercial Buildings



# Sustainable Motors:

## VFD driven systems in commercial construction

### ❖ Market Segment Report

- Educational Construction
- Government Projects
- Medical Facilities
- Class A Office Buildings

### ❖ Survey of Bid Specifications

- 1500 projects in May and June 2009
- \$20 million to \$250 Million

### ❖ Types of Projects

- New construction
- Additions
- Renovations

Source: Reed Construction Data

# The Future of Electric Motor Technology

## Must Support

- ✓ Energy Savings
- ✓ Sustainable design
- ✓ Suitable for VFD
- ✓ For “Green” High Performance Buildings
- ✓ Green Manufacturing



2009



*Sustainable Technology  
for  
True Inverter Duty Motors*



*Bearing Protection For Life!*

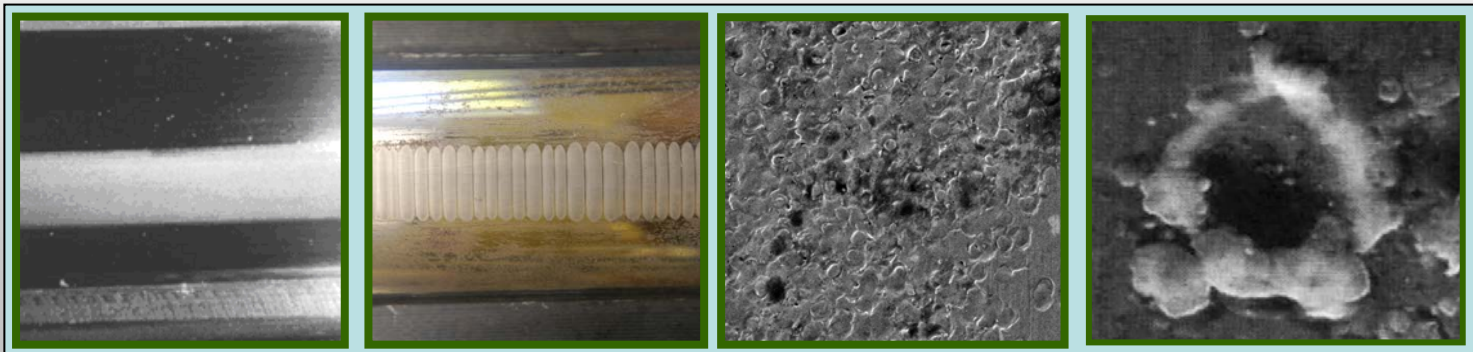
# Sustainable Motor Design

1. VFD (inverter) driven motors have destructive currents and voltages which can damage the windings and motor bearings.
2. Motors rated “Inverter Duty” only address one of these failure modes – the windings – meeting NEMA MG1 specifications.
3. VFD induced bearing damage is largely ignored and are now the main cause of bearing failure in VFD driven motors.
4. AEGIS™ SGR Bearing Protection Ring™ is the only maintenance-free shaft grounding technology that lasts for the service life of the motor.

Sustainable Motors must have AEGIS™ Bearing protection and “inverter Duty” wiring and to be considered **“True Inverter Duty”** construction.

# Bearing Failure

- March 2005 Journal of Electrostatics “*Statistical model of electrostatic discharge hazard in bearings of induction motor fed by inverter*” by Adam Kempinski et. al. “*Electrical Discharge Machining (EDM) bearing currents have been found as the main cause of premature bearing damages in Pulse Width Modulation (PWM) inverter fed drives.*”
- February 2007: Pump and Systems Magazine “*How to Prevent Electrical Erosion in Bearings*” by Daniel R. Snyder, P.E., SKF USA Inc. “*An estimated 50 percent of all electric motor failures are attributed to bearings, but the bearings themselves are not usually the root cause. Other forces are at work, such as the increasingly common problem of stray currents.*”



# What does it mean to be green?



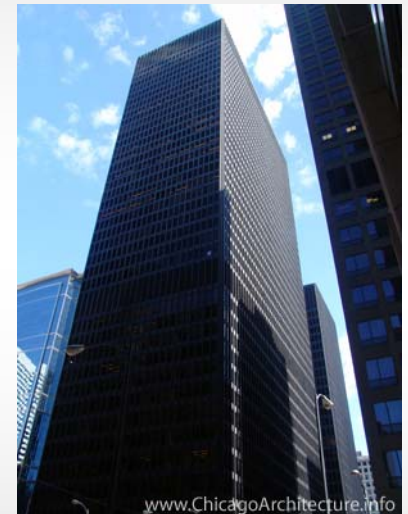
**Energy  
Savings  
With VFD**

+



**Sustainability  
With  
AEGIS**

=



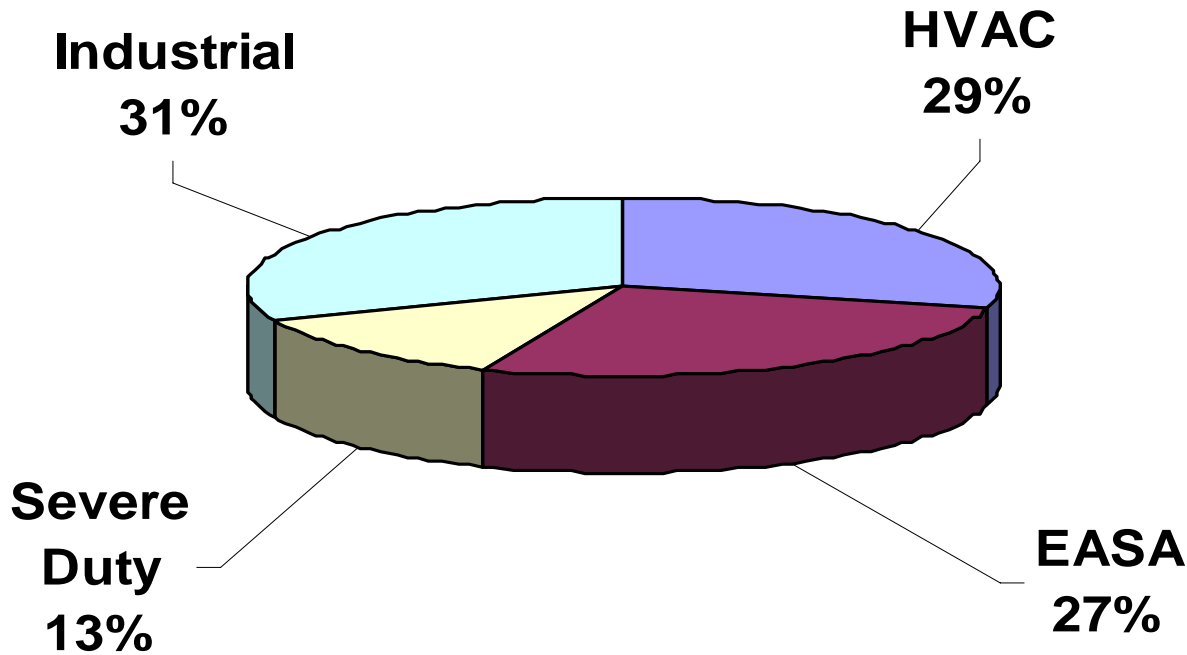
**Green  
Design**

# US Construction Project Data

- **Projects \$5.892 Trillion**
  - Pre-Bid Phase: \$1.873 Trillion
  - Bid Phase: \$25.4 Billion
  - Post-Bid Phase: \$3.994 Trillion
- **Over 418,900 total projects**

Source: Reed Construction Data

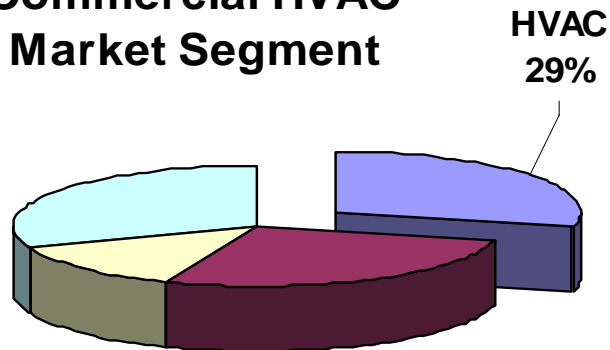
## Where AEGIS is Used Market Segment



More than 150,000 AEGIS™ rings installed  
world wide since June 2005.

# Segment Analysis: HVAC/Pumps

## Commercial HVAC Market Segment



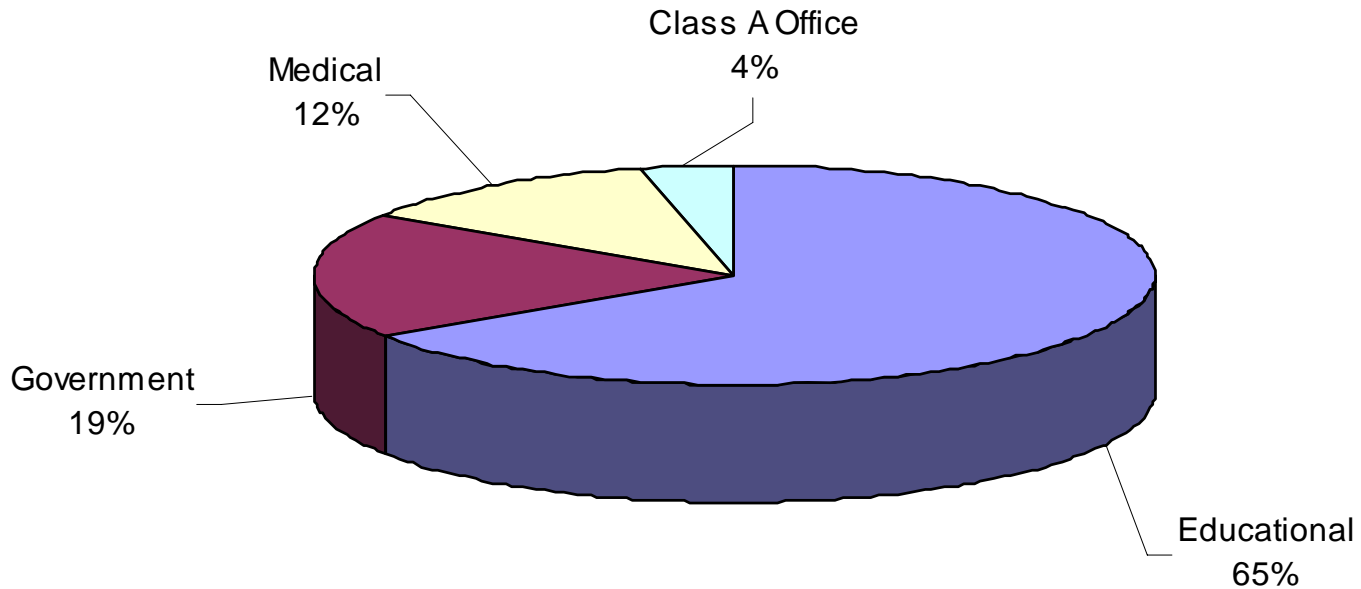
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From a survey of 1500 commercial projects in U.S., \$20 million to \$250 million in value:

- 66% specified VFD throughout project
- Shaft Grounding required per CSI specifications
- AEGIS SGR specified on 41% of motors requiring shaft grounding – By brand
- 97,500 Estimated # of VFD driven Motors

- Air Conditioning
- Intake and Exhaust Fans
- Vane Axial Fans
- Cooling Towers
- Chillers
- Condensers
- Pumps
- Compressors

### Percent by Segment Projects Specifying VFD driven Motors



# Example of Specification

- ✓ Specified by Perkins & Will for Hospital
- ✓ Awarded to Michigan manufacturer of custom air handlers
- ✓ 450 motors in this project on intake and exhaust fans
- ✓ **AEGIS equipped motors required in specification**

RUSH UNIVERSITY MEDICAL CENTER  
MEP SHELL & CORE

PERKINS+WILL  
P+W #22006.002  
09/26/2008

signal for use in the E

H. Motors and drives shall

2.15 LIGHTING AND ELECTRICAL

A. Fluorescent type main  
located in each access  
each access section of

D. Variable speed drives to be provided by AHU manufacturers, and shall comply with requirements of Division 26. Supply AHU's shall each have a single VFD, no by-passes. Return AHU's shall each have one primary and one redundant VFD, no by-passes. Drives shall be remote from the air handling unit, each in an individual, floor mounted free-standing enclosure.

1. Where distance and filtering is an issue, provide output line reactors. Size output filter per manufactures recommendations

2. Provide an AEGIS SGR shaft grounding system for each AC motor to prevent electrical damage to motor bearings and to extend motor life by safely channeling harmful shaft currents to ground.

E. Motor Control

an individual, floor mounted free-standing enclosure.

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Motor Circuit Protection:

## Market Segment Summary: HVAC for New Construction

- **VFD's are in 66%** of projects.
- End users want motors that last – that means sustainable bearing protection for a **“true inverter duty motor.”**
- Contractors and Equipment OEMs want “true” inverter duty motors with AEGIS Bearing Protection Ring for **sustainable “green” design.**
- Customers see value in adding bearing protection to **make motors VFD ready for future upgrades.**
- Any motor capable of operating on a drive must be sustainable with AEGIS Shaft Grounding Ring™ for bearing protection and NEMA MG1 inverter rated wire.