



Technical Academy

# Gearbox System Design

## The Rest of the Story...Everything but the Gears and Bearings!



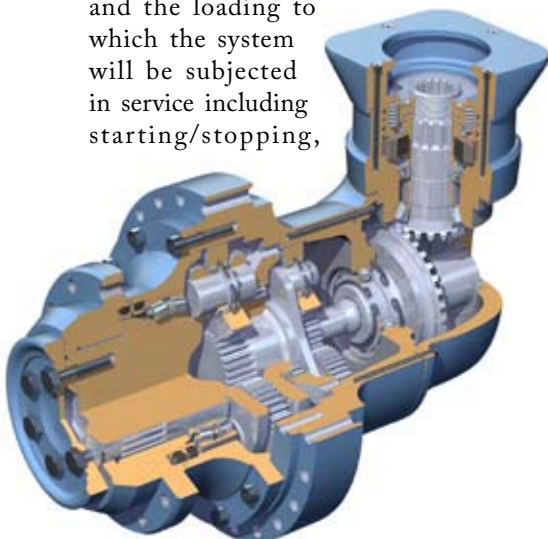
**Instructors: Raymond J. Drago, P.E. & Steve Cymbala, Drive Systems Technology, Inc.**

April 13-15, 2010

Concordville, Pennsylvania (Near Philadelphia)

In some ways, the design of a gearbox system is much like a Hollywood movie production in that the “Stars” seem to get all of the recognition while the “Supporting Cast” gets barely a mention. In a gearbox system, the stars are the gears and bearings while the supporting cast is everything else in the system, including seals, lubrication, lubricants, housings, breathers, and a myriad of other details that allow and in fact facilitate the proper operation of the “Star” gears and bearings. In this seminar, we will address this gearbox system supporting cast of characters.

The treatment starts with the basics including some history of design, the environment in which the gearbox must “live” and the loading to which the system will be subjected in service including starting/stopping,



continuous, reversing, cyclic, and possible errant loads conditions.

The concept of a detailed design layout “Bible” will be introduced and explained as the basis for the overall design and analysis. The specific elemental topics to be treated, weighing their individual pros and cons, include:

- Types of housing construction
- Drawing practices for housings and related components
- Housing elements (covers, inspection ports, sump, mounting, etc.)
- Bearing mounting, retention and sealing
- Selection and role of gearbox accessories such as breathers, filters, screens, sight gages and other level indication devices
- Appropriate lubricant selection
- Application of the lubricant to the rotating elements
- Selection criteria concerning the basic lubricant chemistry

Since the best design is only as good as its implementation, drawing practices and tolerancing will also be addressed from the designer’s perspective. This includes the translation of the general design from the “Design Bible” to the individual component drawings required to produce an optimized operating gearbox.

### Registration Information

**Cost:**

\$1,895 AGMA Members  
\$2,395 Nonmembers

**Class Size:**

Limited to the first 40 participants. Don’t delay!

**To Register:**

Register Online, at [www.agma.org](http://www.agma.org), or return the registration form to AGMA by fax to 703.684.0242.

**Hotel Information:**

Concordville Hotel & Conference Center  
(Near Philadelphia)  
Route 322 & U.S. Route 1  
Concordville, PA 19331

**Reservations:**

610-358-9400 (Mention AGMA)

**Room Rate:**

\$102 single/double



### 1. History

- 1.1. Types of Gear boxes

### 2. Gearbox Function and Layout

- 2.1. Location of gearbox
- 2.2. Power transmission requirements
- 2.3. Environmental operating conditions
- 2.4. Preparation of DETAILED DESIGN LAYOUT
  - 2.4.1. It will serve as a “**Design Bible**”
  - 2.4.2. All changes resulting from design of various components must be coordinated with the Layout and it must be changed accordingly to reflect the changes
  - 2.4.3. Checking of Detail drawings shall confirm that they are in agreement with the definitions in the Design Bible.
  - 2.4.4. It must address all applicable gearbox features defined below

### 3. Gearbox Style

- 3.1. Open Gearbox
  - 3.1.1. Arrangement
  - 3.1.2. Type of gearing
  - 3.1.3. Type of support
  - 3.1.4. Lubrication
- 3.2. Enclosed Gearbox
  - 3.2.1. Arrangement
  - 3.2.2. Type of gearing

### 4. Lubrication

- 4.1. Type of Lubricant
  - 4.1.1. Oil
  - 4.1.2. Grease
  - 4.1.3. Method of application of lubricant to gear meshes, bearings and shaft seals
  - 4.1.4. Maintaining cleanliness of lubricant
  - 4.1.5. Gearbox Breathers
  - 4.1.6. Oil level indicators
  - 4.1.7. Heat Exchangers
  - 4.1.8. Operation Monitoring Instrumentation
  - 4.1.9. Health Monitoring and Instrumentation
  - 4.1.10. Oil analysis
  - 4.1.11. Vibration sensors, etc.

### 5. Gearbox Housing, Cover and Sump Design

- 5.1. Drawings
  - 5.1.1. Separate drawings should be prepared for Machining, Casting, Weldment, etc.
  - 5.1.2. Drawings should always utilize Geometric Dimensioning & Tolerancing system
  - 5.1.3. Detail drawings should indicate the Next Assembly level for the part

### 5.2. Gearbox Housing, Cover & Sump

- 5.2.1. Stress Analyses should be performed as soon as definition is established to ensure adequacy of the proposed design and provide ability to make necessary changes, if required

#### 5.2.2. Housing types

### 5.3. Shaft Seals

- 5.3.1. Lip seals
- 5.3.2. Packing
- 5.3.3. Split seals

### 5.4. Pressure Lubrication of Gear meshes and Bearings

- 5.4.1. Cast oil passages integral with housing

### 5.5. Inspection Ports

### 6. Gearbox Marking/Identification

- 6.1. Nameplates and Markings

### 7. Gearbox Accessories

- 7.1. Breathers
- 7.2. Caps
- 7.3. Vibration Monitoring
- 7.4. Lube Sample Ports
- 7.5. Drain Ports

### 8. Provisions for Preservation

- 8.1. Provisions for Shipping
- 8.2. Crates, Packaging, Preservation coatings, etc.



Technical Academy

Registration Form

Program Details

Dates & Times:

Tuesday, April 13 - Thursday, April 15 8:00 am-4:30 pm daily

Cost:

AGMA Members \$1,895 for 1st registrant \$1,695 each additional registrant.

Nonmembers \$2,395 for 1st registrant

\$2,195 each additional registrant.

Price includes all educational materials, daily continental breakfast and luncheon and an opening evening networking reception. A certificate will be awarded upon completion of the seminar.

Hotel Information:

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\$102 single/double

To Register

Online: www.agma.org

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To Register:

Please fill out the information below and return this form by fax to 703.684.0242. Space is limited. Registration is on a first-come, first-served basis.

Name: \_\_\_\_\_

Company: \_\_\_\_\_

Informal Name/Nickname: \_\_\_\_\_

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Street Address/P.O. Box: \_\_\_\_\_

City: \_\_\_\_\_ State/Province: \_\_\_\_\_

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Dietary Restrictions? \_\_\_\_\_

Special Accommodations or Arrangements Needed? \_\_\_\_\_

Fees

I want to join AGMA by March 12th to attend at the member discount. \*Offer is available to new corporate members only.

1st Registrant — AGMA Member \$1,895

Additional Registrant — AGMA Member \$1,695

1st Registrant — Nonmember \$2,395

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\$ \_\_\_\_\_

Payment Method

Fees include all educational materials, scheduled meal functions and an opening evening networking reception. A certificate will be awarded upon completion of the seminar.

Check Enclosed Credit Card (AMEX, Discover, Master Card or Visa)

Credit Card No.: \_\_\_\_\_

Exp. Date: \_\_\_\_\_

Name on Card: \_\_\_\_\_

Signature: \_\_\_\_\_

Conditions of Sale: Payment must accompany this form. All cancellations must be received, in writing, by AGMA prior to March 12, 2010. A \$50 processing fee will be assessed for each cancelled registration that results in a refund. Refunds will not be issued after March 12.