INNOVATIVE PMAC MOTOR SOLUTIONS THAT ADDRESS TRENDING MARKET NEEDS
Andy Kuester
**Vice President Marketing/Sales**

Andy has been instrumental in the VOC, development, commercial launch and sales of innovative electromechanical products in the HVAC-R, Life Safety and Motor industries. He has held various positions in Marketing, Sales and Engineering throughout his career. Andy holds a Bachelors degree in Mechanical Engineering from Western Michigan University and an MBA from Lake Forest Graduate School of Management.

Matt Hanson
**General Manager – Industrial Markets**

Matt Hanson has been helping customers integrate motors and gearmotors into their equipment for over thirty years. Matt is a graduate of Southern Illinois University with a B.S. in Mechanical Engineering and holds 5 patents. He is an active member of the Motion Control & Motor Association.
Innovative PMAC Motor Solutions That Address Trending Market Needs

ABOUT BISON GEAR & ENGINEERING

DC Gearmotor
AC Gearmotor
Washdown Gearmotor
Hypoid Gearmotor
IHP Reducer
PMAC Motor
Located in St. Charles, IL

115,000 Square Foot Facility

300+ Employees • 3 Shifts

50+ Accredited Engineers

More than 600 standard catalog products included in the Bison Quick Ship (BQS) program available for immediate shipment.

Bison Gear & Engineering can provide custom solutions for specific OEM applications. We have a full team of application engineers ready to help.
TOPICS COVERED TODAY

- Market Needs Influencing Development
- PMAC Technology Overview
- PMAC Motor Features
- A Look Inside The Motor
- Applications That Benefit from PMAC Motors
- Details About Bison’s VFsync PMAC Motors
Innovative PMAC Motor Solutions That Address Trending Market Needs

MARKET NEEDS INFLUENCING DEVELOPMENT

- Improved and Predicted Performance
- Run at the Speed You Specify
- High Torque to Inertia Ratio
- Cost Savings Vs. Servo Motor
- Improved Efficiency
- Power Density
PMAC MOTOR TECHNOLOGY

Electric Motors

AC Motors
- Asynchronous Motors
  - Induction Motors
    - Polyphase
      - 3Ph Motors
    - Single Phase
      - PSC Motors
  - Synchronous Motors
    - BLDC (Trapezoidal) Motors
    - Servo & PMAC (Sinusoidal) Motors
- Stepper Motors

DC Motors
- Commutator Motors
  - Permanent Magnet Motors
  - Wound Field Motors

Definitions:
- **PSC**: Permanent Split Capacitor
- **BLDC**: Brushless Direct Current
- **PMAC**: Permanent Magnet Alternating Current
Sinusoidal back-emf is desired, promoting optimum efficiency, as the generated waveform matches the power delivered by the VFD.

**Definitions:**

- **EMF**: Electromotive Force (volts)
- **VFD**: Variable Frequency Drive
- **FEA**: Finite Element Analysis
- **IPM**: Interior Permanent Magnet
PMAC Performance Curves

Torque, In-Lbs vs RPM

Innovative PMAC Motor Solutions That Address Trending Market Needs
A LOOK INSIDE THE MOTOR

Bison’s AC Motor Department, St. Charles, Illinois

Innovative PMAC Motor Solutions That Address Trending Market Needs
Innovative PMAC Motor Solutions That Address Trending Market Needs

A LOOK INSIDE THE MOTOR

- Inverter duty wire
- Premium Class F slot liners and wedges
- External Tie Bolts
- Shell inside diameter is precision machined
- Stator is held in position by a shrink fit of the shell for optimum heat transfer
- T-slots for mounting
A LOOK INSIDE THE MOTOR

Rotor laminations are stamped and pressed together with interlocking cleat features, forming rotor segments.

Premium ball bearings are pressed to a shoulder on shaft.

Neo magnets are pre-magnetized and inserted into the rotor segments.

Slots reduce inertia, aid cooling and focus magnetic flux.

Rotor segments are skewed, creating a magnetic pole shape that reduces cogging.

Rotor segments are keyed onto shaft.
Innovative PMAC Motor Solutions That Address Trending Market Needs

- Variable Frequency Drives with capability to operate permanent magnet style motors

- VFD’s input voltages:
  - 115/230V single phase
  - 230/460 three phase

- Network Ready
  - CANopen
  - Modbus RTU
Innovative PMAC Motor Solutions That Address Trending Market Needs

PMAC MOTOR TECHNOLOGY

Commissioning: Easy as 1..2..3

1. No PC Required

2. Minimal Parameters for Operation
   - Motor Rated Current
   - Motor Rated Frequency
   - Motor Rated Speed
   - Motor Back EMF Constant
   Plus (without auto-tune)
   - Motor Resistance Line-Line
   - Motor Lq
   - Motor Ld

3. ✔ Completed!

IP 20
IP 66
Applications & Markets

- Medical
- Energy
- Transportation
- Agriculture
- Industrial Machinery
- Material Handling
- Food & Beverage

Innovative PMAC Motor Solutions That Address Trending Market Needs
Screw Feed Conveyor Drive

- Conveyors provide synchronized separation
- Network connected, competitor VFD
- Engineering team saved $800 per axis
APPLICATIONS THAT BENEFIT FROM PMAC MOTORS

Batch Mixer

- Weight critical
- 0.5Hp comparison
APPLICATIONS THAT BENEFIT FROM PMAC MOTORS

Opposing Conveyor Belt Drive

- Synchronized belt speeds required
- Improved power density
- Performance versus temperature
Peristaltic Pump
Dispensing Sodium Hypochlorite Sanitizing Operation

- Constant Flow Rate Critical
- Network Connected
APPLICATIONS THAT BENEFIT FROM PMAC MOTORS

IP69 304 Stainless Steel Conveyor Drive

- Constant velocity requirement
- 1/3 the price of a servo system
- Stainless steel for washdown
Custom OEM Dyno

- Machine optimization tool
- Operating current identifies required torque
Maximum Horsepower. Minimum Size.

Innovative PMAC Motor Technology from Bison Gear & Engineering
Full System Solutions

- PMAC Motors
- Gear Reducers
- Drives
- Cables
## Configuration Options

<table>
<thead>
<tr>
<th>Horsepower</th>
<th>Mounting</th>
<th>Enclosure</th>
<th>Voltage</th>
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Multi-position IP66 connectors and cables are shielded for trouble free installation.

Encoders with prewired internal cables are enclosed in rugged aluminum enclosure, available as a standard option.
Velocity Control

Designed with high-tech automated machines in mind. PMAC motors provide the velocity control previously only found in much more expensive servo motors.
Network Connectivity

Compatible with many PLC systems and drives. Able to run open-loop or closed-loop with encoders.
Smaller Size
- 1 HP Induction Motor 398 in³
- 1 HP PMAC Motor 176 in³

Lighter Weight
- 1 HP Induction Motor 26 lbs.
- 1 HP PMAC Motor 16 lbs.
Visit www.BisonVFsync.com For the Following:

- 42 Standard Configurations
- Full Product Specifications
- Dimensional Drawings
- 3D CAD Files
- Product Data Sheets
- Drive Compatibility Listing
Our Engineering Team is Ready to Be Challenged With Your Custom OEM Needs.

We Work With You From Design to Delivery.

Contact A Bison Application Engineer Today
We Make Your Products Go®

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