



MADE IN THE USA

Groschopp Case Studies



TOUGH JOBS

The Tough Jobs Case Studies Series capture actual engineered product solutions we've developed for our customers.

- Quiet Under Load
- Engineers Ensure Slam Dunk
- 50,000 Hours Life Specification
- Heavy Automotive
- Insulation Blower
- Commercial Construction
- Construction Pump
- Vapor Recovery Pump

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Integrated Motion Solutions

TOUGH JOBS

FOCUS ON:

ATHLETIC EQUIPMENT



Engineers Ensure Slam dunk

Up until the 2008 collegiate basketball championships, portable basketball backstops common to large sporting arenas were manually operated. One of the world's oldest and best-known sporting good brands, saw an opportunity. Under the pressure of the fast approaching Final Four, they stepped up to develop a motorized backstop that could do the job automatically—in less than a minute.

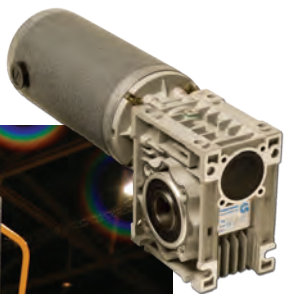
One of the company's design engineers did a lot of groundwork and brought "10 feet of spreadsheets" to the design table. In collaboration with the Groschopp engineering team, they set out to develop a motor for this 25 second raising and lowering requirement.

The primary design challenge was the torque requirement. The automated backstop operation called for a gearmotor to lift over 600 pounds. Because the weight was positioned at the end of an articulated arm, it magnified the impact of the weight and presented a calculated total torque requirement of over 700 in-lbs.

"Putting enough torque into the gearbox was one of the tougher challenges. We had to operate the motor on a standard 110 VAC, 20 amp circuit, which limited options," said Loren Kamstra, Groschopp's Commercial Project Manager. "We also had to calculate the exact torque requirement at each of the lift points, making it an even more complex engineering problem."

The scissors-like action of the lift mechanism, coupled with a load on the end of the articulated arm, meant that the torque varied at different points throughout the operation cycle. "In our test setup at a local college, we monitored amperage throughout the cycle," added Kamstra. "Then we used the amperage data and the torque based on the

The gearmotor chosen



after extensive calculations and testing was a [permanent magnet DC \(PMDC\) motor](#) with a speed of 4250 RPM, and a high-torque [right angle gearbox](#) with a 30:1 output ratio. Using 115 VAC with a transformer boost to 230 VAC and a rectifier produced 180 volts DC—and enough torque to lift the hoop and shot-clock smoothly and quietly within the 25 second limit. Testing included a five year life test (2000 cycles) and current draw tests, to rule out circuit overload.

Meeting the Final Four deadline, the sporting good's company is now selling their portable backstop with the Auto Lift Mechanism (ALM) to both college and professional teams, allowing for one step set-up without tools.

Explore our Product Lines

Loren Kamstra
Commercial Project Manager,
Groschopp



The Challenge

- High torque to lift a heavy glass basketball backboard and shot clock positioned on the end of a pivoting boom - weighing 600 pounds
- 25 seconds to raise and lower the backboard to ten feet (to regulation hoop height)
- Total calculated torque requirement of 702 in-lbs
- Power supply of 110 VAC on a 20 amp circuit

The Solution

- DC motor operating at 180 VDC matched with a high-torque right angle reducer (30:1), coupled to a massive 1½" diameter lead screw
- Lifts 600 lb. backstop in 25 seconds
- Transformer and rectifier converting 110 VAC to 180 VDC for added power
- Life tested to 2000 cycles, or 5 years

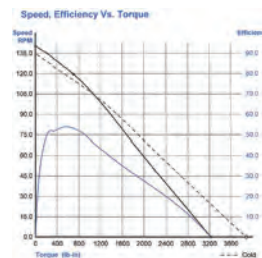
Download this powerful tool
for design engineers
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TOUGH JOB Design Checklist

Torque Requirements

It's important to take position into consideration when calculating torque requirements. In an application such as this one, with the variable (moving) position of the load, the torque will also vary—it's NOT linear. In testing, be sure to take current draw measurements on the motor, then use that data to calculate torque. Determining the maximum torque point (from the highest current reading) allows you to ensure that the gearmotor is properly sized for reliable operation throughout the entire range of motion.



For complete gearmotor specifications,
visit www.groschopp.com

TOUGH JOBS

FOCUS ON:
AGRICULTURE



Matt Decker, Mechanical Engineer, Groschopp
Loren Kamstra, Project Manager, Groschopp

Hopper Motor Gets Cranking

This OEM developed a new product design for an automated hopper motor assembly retrofits commercial duty grain trailers and wagons, replacing the mechanical hand crank system. With this tough environmental challenge, they came to Groschopp for OEM gearmotor design expertise in executing their product concept.



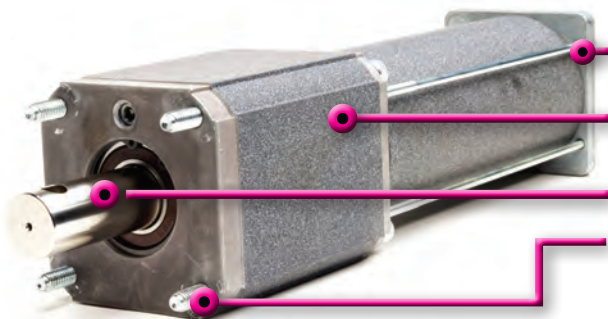
“We started by performing a complete MOTORTEC™ analysis to determine the exact speed/torque parameters,” said Matt Decker, Groschopp Mechanical Engineer. The OEM’s engineering team knows agricultural environment well, and required a rugged-duty gearmotor for the extremes. “The overall physical design was equally critical to success as the performance,” added Decker.

Tight space requirements and cost objectives led the team to first turn to a Right Angle (RA) DC gearmotor, which fit the application’s 12 VDC power supply, but exceeded the 100A available current – another tough design constraint. High starting torque and the DC power source made the PMDC a good motor choice, but the RA gearbox needed more power to provide the needed torque output. “Power loss relates to torque loss,” said Decker. “There wasn’t enough power available to compensate for the gearbox efficiency loss.”

“The final design gave them everything they wanted, plus a lot more,” said Decker. “We used a higher efficiency planetary speed reducer with special material enhancements for the overall strength of the output gears.” Separate testing of the motor and speed reducer is a technique used by Groschopp to ‘push’ the limits of the components and prove out high torque performance.

Once the gearmotor performance ‘fit’ was determined, the harsh environmental specifications were tackled. “We drew from our experience with heavy automotive motor assemblies to quickly apply environmental protection techniques,” said Loren Kamstra, Commercial Product Manager. “The gearmotors are built to IP66 standards, and withstand submersion testing at 1 meter—not a test requirement, but we felt important given this harsh agricultural environment.”

Explore our Product Lines



Chromate finish on custom end bells

Entire assembly designed and tested to IP66 standards

Nickel-plated output shaft

End bell and mounting hardware modified for high vibration and secure fastening

(Brake and wiring enclosed and sealed for IP66 washdown duty)

“We kept going back to our experience with assemblies for trucks and buses. Designing for commercial agricultural equipment is not unlike extremely demanding automotive specifications—which allowed us to deliver a higher value solution.”

The Challenge

This OEM, a premier supplier to the agricultural equipment industry, had a new product design for an automated hopper motor assembly to retrofit grain trailers and wagons. The gearmotor specs included:

- Ingress protection against dust and particulates (meet or exceed IP66)
- High vibration, harsh environment package
- High torque output for intermittent loads
- 12 VDC, 100 A power supply limitation

The Solution

- Permanent Magnet DC Motor operating at 12 Volts, 100 Amp Current Limit
- High efficiency planetary speed reducer with strengthened output gears
- Special corrosion protection features and rugged duty package enhancements

TOUGH JOB Design Checklist

IP66 Requirement

IP66 products continue to perform reliably even when splashed with salt spray, water, harmful chemicals, dirt, mud and dust. They are engineered to endure extreme hot and cold temperatures.

Placed in a grain hopper, this gearmotor would be subjected to heat, cold, dust and mud. With these extreme factors in mind the Groschopp engineering team customized the gearmotor to meet IP66 standards.

Modifications include: seals between endbells and motor housing, sealed bearings and bearing pockets and sealed through-bolts.

IP66

- Protected against strong jets of water
- Totally protected against dust
- Ingress Protection

TOUGH JOBS

FOCUS ON:
MEDICAL EQUIPMENT



Quiet, Synchronized Motion Dual Output Gearmotor Delivers

Highly specialized surgical procedures such as spinal, joint replacement and orthopedic trauma surgery require automated operating room tables that can be positioned with extreme accuracy. Just as important as positional accuracy are high torque output and quiet operation, in a compact gearmotor solution that can drive up to 500 lbs. load. When one of the world's leading designers and manufacturers of such innovative medical products was faced with such a challenge, they partnered with Groschopp to tackle this *tough job*. With this particular surgical table, two hinged arms had to be driven so that their positional alignment and movement would be completely synchronized at all times. "The traditional solution of link chains, belts and pulleys has greater margins of operational error, making it more difficult to synchronize the movement and alignment of the two arms," said Engineering Manager, Seth Hulst. "A typical solution would be to have one motor for each hinged arm, but we felt that a single motor with two outputs would provide greater accuracy, and be more cost effective."



Compounding the design challenge was the 24 volt power supply specification. Groschopp's design team chose to use a 24V [permanent magnet DC](#) Gearmotor, which could provide the needed output given the intermittent operation. The motor was customized for high torque, and its one common motor shaft drives two [planetary speed](#)



[reducer](#) outputs. Because the same motor drives both outputs, there is both mechanical and electrical 'linkage.' "If two separate motors were used, a more complex, and more expensive, common control scheme would be required to provide this linkage," added Hulst. The high efficiency of the planetary reducers made it possible to achieve the needed torque while staying below the 20A current limit.

Once the Dual Planetary DC Gearmotor solution was proved out, the team went into extensive prototyping and [testing to reduce noise](#). "We have many medical OEM applications that require minimal noise, and have developed a number of techniques and product customizations to minimize noise," said Ed Tullar, Sales Manager. "We analyze all of the potential sources of noise – motor, gearbox, gearmotor assembly – and then work to minimize noise in each component."

Pictured Above: Precise, synchronized dual output planetary DC gearmotor quietly drives surgical table hinged arms

Explore our Product Lines



Seth Hulst

Ed Tullar

The Challenge

- Gearmotor to drive two positionally synchronized arms on a surgical table
- High torque output, intermittent duty for loads up to 500 lbs.
- Quiet operation for medical/OR environment
- 20 VDC power supply limitation

The Solution

- Permanent Magnet DC Motor customized for high torque and low noise
- Two Planetary Speed Reducers driven by one common motor shaft
- Special speed reducer component configuration and alignment to minimize noise

TOUGH JOBS Design Guide

Quiet Gearmotors

With a strategic combination of manufacturing techniques and technology choices, quiet operation in motors, gearboxes and gearmotors can be achieved:

- Using high resolution imaging techniques to characterize the motor commutator, special manufacturing processes can be employed to reduce brush noise.
- Using low-noise planetary speed reducers, and a thoughtful combination of non-metallic and metallic gears, sound can be minimized while still achieving high torque.
- By critically evaluating the alignment of the two speed reducers, and engineering special mounting/hardware, noise that could result from sub-optimal gear teeth engagement with the motor shaft can be minimized. Misalignment would also degrade operational efficiency.



MOTOR MATCH™ Use Motor Match™ Search online tool to find 'best fit' motor and gearmotor matches to your application specifications.

TOUGH JOBS

FOCUS ON:
MEDICAL EQUIPMENT



Arlo Heynen, Regional Account Manager,
Groschopp Inc.

50,000 Hours Life Specification

Achieving tough specifications such as 50,000 hours of continuous operation requires a quality product and a detailed understanding of the application. When this OEM faced expensive product recalls and field retrofits with another vendor's motor, he stepped back from his application and with the classic engineer's approach, asked the objective question "what affects the life of the motor?"

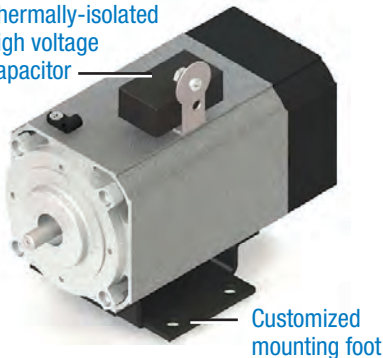
A manufacturer of positive displacement pumps and leak testing equipment, this OEM prides themselves in performance, flexible and innovative design, and gear pump engineering excellence. After failures with the other manufacturer's motor that prompted recalls, they came to Groschopp to determine what could be done to extend motor life and achieve higher reliability.

The design team had a simple response to that question—"temperature". Starting with their standard motor design, they identified three areas that could lead to failure in this particular application before 50,000 hours.

One problem that could be contributing to premature bearing failure related to the fit between the steel bearing and aluminum bearing pocket. Since the bearing and pocket materials have different rates of thermal expansion, the fit is different at various operating temperatures. Even a few thousandths of an inch of movement could damage the bearing over time. To address the problem, they inserted a rubber o-ring between the bearing and bearing pocket.

The analysis also resulted in adjustments to the bearing grease and capacitor used in the motor. "The key to long life is the analysis of the application and looking in detail at the motor design and making fine adjustments to the motor," said Arlo Heynen, Regional Account Manager at Groschopp.

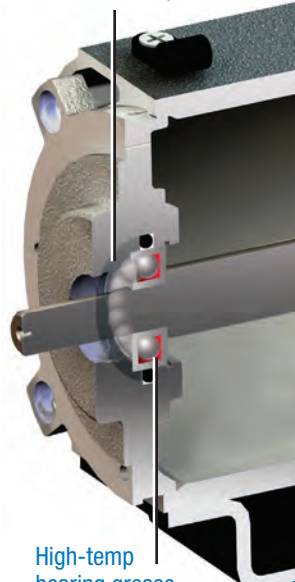
Thermally-isolated
high voltage
capacitor



A life testing scheme was devised to meet the rigorous temperature and continuous operation specifications, and yielded excellent results. Theoretical calculations of test results suggested well over 70,000 hours continuous performance.

Explore our Product Lines

O-Ring to compensate
for thermal expansion



The Challenge

An OEM making cooling pumps for medical diagnostic imaging machines needed:

- Highly reliable, long-life motor
- Product design and testing support
- Dependable vendor as critical link in supply chain

The Solution

- Single Phase [AC Motor](#)
- 50,000 Hour Life Testing in high temperature, continuous duty environment
- Custom designed mounting foot, capacitor bracket, end bell and shaft

The Groschopp solution resulted from extensive qualification of components, operating temperature tests, sampling of various materials and lubricants, and ultimately predicting potential operating issues that the customer hadn't yet experienced.

TOUGH JOB Design Checklist

Temperature: For every 10°C above rated temperature that the motor operates, its life is reduced by ONE HALF. Temperature ratings should always be taken seriously.

Electrical: The electrical components must be rated for not only the operating temperature, but the ambient temperature. Take BOTH into consideration.

Mechanical: LOAD is the watchword. Evaluate the application for radial, axial or overhung loads. Loads impact choices of bearings, lubrication and clearances.

Test, Test, Test: Even the most detailed, well-designed solutions can deliver surprising results when tested in a simulated operating environment.

For complete OEM design checklists
and an application data worksheet:
www.groschopp.com

TOUGH JOBS

FOCUS ON: AUTOMATED DOORS



Detention Doors Test Limits

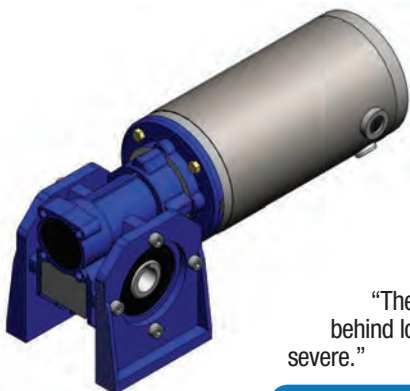
Imagine the sound “lock down” as a series of automated prison doors close in orchestrated succession. Critical applications like these get intense attention Groschopp. Think about it—automated doors in elevators, hospitals, prisons and the like must open and close without fail—hundreds of times a day, week after week.



Reliability in a secure setting like prisons couldn't be much more critical, and such was the case with this OEM. They needed robust gearmotors with a high enough starting torque to move heavy prison doors weighing from 200 to 1200 pounds, but still fit into a very tight envelope. Designing a solution for this OEM challenged the team with a space issue, along with the need to supply power at a right angle (RA) to the motor placement.

An often overlooked “design advantage” of an application such as automatic doors is the intermittent nature of their operation. This usually allows a smaller (and less expensive) motor to be specified and is an important factor in motor sizing, particularly when dealing with a tight envelope. Since cooling is often not a primary concern with intermittent duty, it eliminated the need for cooling fins on the gearbox.

The team was able to apply a customized PMDC ([permanent magnet DC](#)) motor, since brush wear would be minimal, which provided the needed high starting torque and smooth continuous operation. Back-driveability was also required so the doors could be manually operated in the event of a power outage. A 5:1 ratio [RA gearbox](#) was matched to the motor, and allowed for custom mounting feet.



The resulting gearmotor fit neatly into the available space, and provided necessary torque to move heavy doors, while operating smoothly and reliably. The OEM's test door setup has performed with this gearmotor for 1.6 million cycles without failure, and has proven to be highly reliable in the prisons.

The OEM has used Groschopp's motors exclusively. Their service representative said, “These gearmotors help keep dangerous criminals behind locked doors. The consequences of failure are severe.”

[Explore our Product Lines](#)

Travis Feekes
Regional Account Manager,
Groschopp Inc.



The Challenge

- An OEM making automated prison doors needed:
- Gearmotor with sufficient torque to smoothly operate doors weighing 200 - 1200 pounds
- Exceptional reliability for high security application
- Power output at right angle to the motor
- Back-driveability for potential manual operation
- Small package for tight installation

The Solution

- PMDC motor with high starting torque
- Right-angle speed reducer without heatsink
- Compact, optimized gearmotor package
- Rigorous testing to 1.6 million operations

The Groschopp solution resulted from extensive specification development with the OEM to determine the motor's power to size ratio, minimizing the package size by optimizing the motor selection. Testing under demanding load conditions proved the design.

TOUGH JOB

Design Checklist

Motor/Gearbox Torque

With door applications, starting torque is critical to initiate door movement. PMDC motors characteristically have high initial torque, with a linear speed torque curve, making it a perfect option.

Noise

Noise is especially important in residential and institutional applications, so be sure to determine both the acceptable frequency range of the sound, as well as decibel range.

Duty Cycle

To optimally size a gearmotor, understand the application duty cycle. Intermittent duty applications allow for a smaller package, as the gearmotor mass correlates directly to dissipated heat.

Each automated door application presents different challenges, such as noise, size, and cooling.

[Read more about other applications](#)

TOUGH JOBS

FOCUS ON:

AUTOMOTIVE



Matt Decker, Mechanical Engineer
Arlo Heynen, Regional Account Manager

Groschopp Motor Ramps up ADA Vehicle

This innovative automotive manufacturer of an ADA (American Disabilities Act) compliant vehicle ramp needed a motor to enable someone in a wheelchair to quickly and smoothly enter and exit. The deployable ramp is capable of holding up to 1,200 lbs and is stored under the floor of the vehicle so no interior space is lost. The vehicle has a unique side-entry ramp system allowing passengers to enter and exit away from street traffic. The vehicles are sold for personal and commercial use.

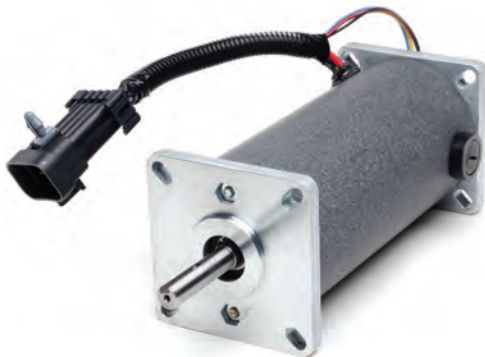


Because the Groschopp motor had to mate to an existing gearbox the motor needed a [custom bolt-hole pattern](#) and a custom machined 11 cm output shaft, about .5 in. longer than standard and ground for a tighter tolerance.

In order to survive the rigors of the road it was necessary to outfit the motor with cold-temperature bearings and a watertight cord connector with custom crimping to meet automotive requirements. Even though the motor is located within the chassis of the vehicle cold-temperature bearings were necessary so the motor would function properly at a temperature range of -40 - 60°C. As a precaution, the manufacturer requested an [IP54 ingress rating](#) for the motor, meaning the motor is protected from road dust and splashing water. The connector is watertight and the lead wires run through a conduit to prevent any water from entering. The use of sealed bearings and o-rings around the endbells serve as further precaution against the ingress of elements.

It was critical that the ramp have a zero-failure rate. There was no room for issues since the ramp comes out of the floor and lowers to the ground, allowing those with wheelchairs and scooters to position themselves on the ramp and be lifted into the vehicle. Because of the complex process the driver needs to know the ramp's position at all times and have the ability to manually over-ride the automatic mechanisms. With this in mind,

Groschopp installed an encoder that sends out one pulse per revolution and counts the pulses so the control can always identify the position of the ramp. This two channel encoder sends feedback regarding the direction (forward/reverse) and rotation (clockwise/counter-clockwise) of the motor shaft.



Later on in the project the brush holder design was altered and an exterior "collar" was added to the exterior housing around the brush caps to avoid stress on the brush holders during operation.

The motor was rigorously "live tested" in ten different vehicles for several months and subjected to some of the most brutal conditions possible. All of the vehicles were deployed for months at a time ensuring the motor would withstand constant abuse. Testing went smoothly and the customer was delighted with the motor's performance.

[Explore our Product Lines](#)

The Challenge

- Needed to drive a steel ramp with a 1,200 lb. capacity
- Ability to function at -20° temperatures was crucial
- Able to withstand vibrational shock loads
- Secondary custom output shaft to integrate with the encoder

The Solution

- [PM8018 12V motor](#)
- Closed loop control to provide information on the position of the ramp
- Tight tolerances on output shaft and pilot to mate to provided gearbox
- Cold temperature bearings
- Custom bolt-hole pattern
- IP54 rated ingress protection

TOUGH JOB Design Checklist

Pilot Endbell Customization

- Specific width/diameter to mate to existing gearbox
- Tight tolerances
- Custom bolt hole pattern
- Water-tight connector

IP54

- └ Protected against splashing water
- └ Protected against large particulates of dust
- └ Ingress Protection

CASE STUDY

Bus Transmission Shifter

Enhancing Product Performance and Functionality

The Challenge

The customer required a high performance, unique design gearmotor assembly for its heavy automotive (bus) shifter. Their vision was a motor with a “back up” winding inside the armature that could be engaged in the event of a primary winding failure.

The Solution

- PM 6034 Right Angle Gearmotor Assembly
- Redundant motor winding for emergency backup
- Unique dual-commutator design
- IP66 rating for harsh environment
- Custom design aluminum die-cast gear housing to bolt directly on to the transmission
- Rigorous 25,000 cycle performance testing

“ The customer knew what they wanted – a backup. When they asked why they couldn’t have a “two-commutator” gearmotor we said we’d never done it before, and we’d never seen it done.... but we figured it out - and we did it! ”

Loren Kamstra, Design Engineer – Groschopp

This customer is a world leader in the design, development and manufacturing of a wide range of electronic transmission and drive train control components and systems. Their controls and systems are designed for use in a variety of vehicles with applications that include drive train controls for medium and heavy-duty vehicles.

Just like their customers depend on them to enhance the performance and functionality of their products, this customer trusted Groschopp to



enhance the performance and reliability of their transmission product. They wanted a motor with a back-up winding inside the armature, so that if the primary winding failed – which could ultimately cause the bus to be stuck in one gear (including Park and Reverse) – the secondary winding would engage.

Their interest started a design cycle that resulted in the prototyping of Groschopp’s first 2-commutator armature, and ultimately a proprietary process for creating it. This including engineering the manufacturing processes to still meet cost objectives even with this unique design.

“There was a domino effect to this design,” said Kamstra. “It required 2 sets of brushes, and the control had to be modified for this redundancy. We also had to engineer a way to mount a strong, non-conductive brush card on to the gear housing. The resulting design was exactly what the customer was looking for, and because it was designed to bolt directly on to the transmission, no design modifications were required on their end.”



[Explore our Product Lines](#)

GROSCHOPP®

CASE STUDY

Construction Pump

Partnering for “Portable Power” for over 25 Years

The Challenge

This application required not only a motor, but a partner to assist them with production of the special cast metal housing for the motor and control. They wanted strong engineering support, expertise and higher levels of integration.

The Solution

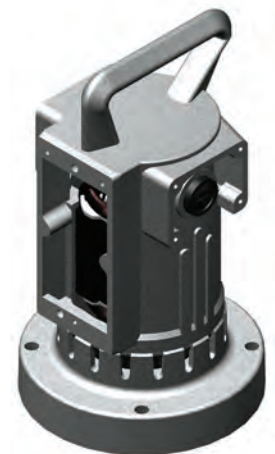
- Two-Pole Universal Motor (UM) with custom winding and high torque requirements
- Design optimization for rugged operating environment and portability
- Special cast housing sourced and supplied by Groschopp as a value-added service to the customer
- High power-to-weight ratio inherent to UM motors

“ This customer produces very high quality products, and with their portable tools, unflinching operation is critical. They’ve trusted us to not only supply them with a great product, but have come to rely on us more and more for engineering and overall system support. ”

Loren Kamstra, Commercial Project Manager – Groschopp

This customer is a global manufacturer of high performance fluid power and railway integrity products and systems with a number of well-respected product brands. Their hydraulic pumps feature heavy-duty construction and time-proven design, and are portable, lightweight and feature excellent weight to performance ratio.

“There’s actually nothing about the motor alone that is particularly ‘magical’ in this application, it’s really about the whole product,” said Kamstra, in describing this application. “We have been happy to supply them for over 25 years and throughout that time, we have grown more and more involved with their custom housing – including tooling, production, and vendor selection. That proves to me that they trust us as engineers and business



partners, to make sure the entire job gets done right.”

Unique to the application is its rugged removable cast metal motor housing, which can be supplied in 4 different colors and is produced by the Groschopp-selected vendor to exacting specifications.

The newest design is a 2 hp custom UM gear motor with a custom winding, high performance gear set, and custom motor castings. These have all been mated together to meet tough requirements for a new lighter and higher capacity pump.



“Our people have the expertise and commitment that our customer values – and it’s great to know they are so pleased with our products. We seldom have any quality problems or returns, and our delivery is excellent” added Kamstra.

Pictured Above: Customized Performance Universal Motor in Special Cast Housing

Explore our Product Lines

GROSCHOPP®

FOCUS ON:

COMMERCIAL CLEANING

CASE STUDY

Floor Cleaning Machine

Doubling Product Life & Performance through Testing

The Challenge

This application had a high torque requirement in a harsh commercial cleaning application that involved heat, water, dirt and physical handling. The armature shafts were failing, and the overall product life was not optimum.

The Solution

- PM motor components kit and UM parts designed to fit the existing gearbox design
- A “clean” DC control for more efficiency operation
- Resolution of the customer-supplied gear failure issues solved by testing, design recommendations and materials replacements
- A quieter operating system with twice the life

had designed their own gearbox, but had started to experience some failures on the motor’s armature shaft.

Groschopp went to work on the design, changing the armature shaft steel composition, and applying heat-treating. This change alone began to double the motor life during testing, which gave Groschopp the needed performance data to prove the design.

“We were also able to improve the gearbox design,” added Vander Zwaag. “We tested the existing gearbox to failure, and then optimized it in redesign and performed life testing with a hardened shaft.” Groschopp also recommended replacing grease with a synthetic oil for improved performance and life.



“ We solved not only the identified shaft problem this OEM originally brought to us, but also controlled the overheating problems that they didn’t even realize they had. In the end, we were able to help this company improve the performance, durability and life of their product. I’m proud to say that we continued to help them improve their product design even after they purchased our product. ”

Mike Vander Zwaag, Regional Account Manager – Groschopp

This is an excellent tool for carpet, tile and grout cleaning in one effortless, self propelled motion. The company promotes their high torque DC motor, and the products adjustable 100 to 200 RPM rotation.

There was a high torque requirement for a motor to be used in this harsh scrubber environment of hot water, high speeds, dirt, detergent and physical handling. They



Explore our Product Lines

GROSCHOPP®

CASE STUDY

Hospital Lift

Powerfully Quiet, Proven Performance

The Challenge

This application required a “super quiet” DC motor with proven reliability. It took five prototypes and ongoing design iterations to achieve the exacting specification requirements.

The Solution

- Noise levels averaging 68 DB
- Customized DC motor
- Modifications to the brushes and commutator construction
- Selection and evaluation of various brush constructions and varnish materials to minimize noise

of this motor. A standard DC motor with the desired performance specifications would operate around 78 DB. Over a period of one year and five different prototypes, Groschopp engineers tried a variety of schemes to reduce the noise while still maintaining performance specs.

“ We spent many hours on this design to meet their exacting noise specifications. The motor normally operates around 78 DB, but after five prototypes we were operating in the mid-high 60’s. The customer was delighted. This application shows that with the right know how and patience, we can meet some really tough specs. ”

Arlo Heynen, Regional Account Manager – Groschopp

This application involved North America’s pioneer and leader in the design, manufacture and installation of ceiling lifts for patient transfer. They are dedicated advocates of “zero-lift”, to provide the mobility-impaired and their caregivers with today’s most advanced lift, positioning and transfer solutions.

“Reliability was a given,” said Heynen. It was their desire to have the quietest possible motor for their mobility-impaired end users that was the driving force behind the engineering



It was ultimately a combination of adapting existing technology, selecting and testing a variety of materials, and adjusting manufacturing techniques that delivered the final product. The brushes, brush materials, varnishing process, and commutator construction were all customized to guarantee the low noise operation.

“Our partnership with this customer is a prime example of the challenging obstacles that can be overcome when two companies are willing to work together to meet a specific goal,” said Heynen. “This relationship has been a benefit for both companies and we will do everything possible to continue it well into the future.”

Pictured Above: Permanent Magnet DC motor customized for ultra-quiet operation

Explore our Product Lines

GROSCHOPP®

CASE STUDY

Commercial Construction Delivering Quality on a Short Lead-time

The Challenge

This customer was experiencing failures with motors in their insulation blowers after less than 20 hours of operation. Groschopp was charged with not only refining the motor specification and coming up with a completely new design, but designing to an existing installation limitation and tight deadlines

The Solution

- PQ Frame UM Motor with a special housing
- Re-use of proven steel core commutator technology designed for another OEM
- Special-design extruded housing and vendor collaboration to retrofit new design motor to existing system design

“ With minimal lead time, we designed a Groschopp motor as a direct replacement for the failing motor they had been purchasing, so that the replacement would be as simple as possible. ”

Arlo Heynen, Sales Application Engineer - Groschopp

This customer is a quality-conscious provider of insulation, fire and sound products. Their product is sold through major home centers, building supply retailers and lumberyards in the US and Canada to the “do-it-yourselfer.” They are also sold to residential and commercial contractors as well as to the manufactured housing industry.

The customer and Groschopp began working together as they were experiencing commutator failures in the field due to motor quality issues. As soon as this company contacted Groschopp



we quickly got to work evaluating the application and re-specifying the motor.

“We very quickly designed a new motor, produced prototypes, conducted life testing, and then did actual application testing. In less than six months we were well into production with a completely new design,” said Heynen.



“While the product design is unique and will give them the life and reliability that this application demands, it was ultimately our ability to communicate and coordinate with engineering, the customer and the other vendors to make sure the project was completed on time,” he added. “In the end, it all comes down to trusting your supplier, and I believe we’ve earned their trust.”

Pictured Above: Universal Motor (UM) in Customized Housing

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GROSCHOPP®

CASE STUDY

Medical Equipment

Improving Lives with Innovative, Quality Products

The Challenge

The customer required a very quiet, high-torque motor with special gearing to accommodate braking schemes, manual operation options and high reliability

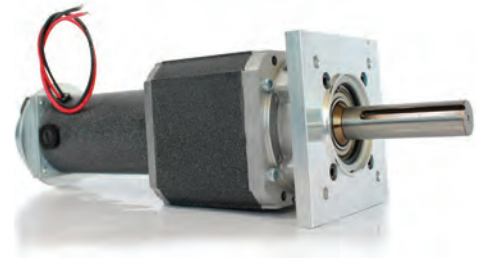
The Solution

- PM6000 with a Planetary Gearbox for high torque and quiet operation
- Motor shaft made to work with a special brake for ultimate patient safety and to allow for manual operation
- Reconfiguration of the gearbox to adapt to the customer's special mounting plate
- Complete back-driveability for patient safety

“ This is a high torque, low noise application with some special issues. It took a lot of time and thought to come up with the perfect solution because of all the nuances of a “patient” product, but I really liked working on this project because it's relevant to people, their safety and their well-being.”

Arlo Heynen, Regional Account Manager – Groschopp

This customer's products are designed to promote independent and involved lifestyles for people with limited mobility. They are dedicated to quality of design in their products, and the impact of their products and designs on the quality of life. They looked for this same innovation of design when coming to Groschopp for a gearmotor solution for a patient lift.



A planetary gearbox was chosen for its high torque and quiet operation. But this application required that the gearbox be reconfigured “nose

out” to adapt to a special mounting plate, because the mounting plate mounted directly to the planetary gear housing. “This was unique because typically when manufacturing a planetary gearbox, the bearing pocket and output shaft have to be reoriented to accommodate the mounting configuration,” added Heynen.



Modifications for special braking requirements were essential. The motor shaft was modified to work with a special brake, and could be manually operated with a hex drive if needed. This shaft attached to the bracket and provided the ability to manually actuate the system.

Likewise, the brake prevented back-driveability for patient safety. The brake uses the reduction on the gearbox in conjunction with the force of the brake on the brake rotor to lock the system, and prevent backwards movement.

“The resulting product provided all of the safety and quiet operation that they wanted, in a very high-powered package,” concluded Heynen.

Pictured Above: Permanent Magnet DC Planetary Gearmotor

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GROSCHOPP®

CASE STUDY

Truck Cab Ventilation

Ensuring Product Performance with Premiere Motors

The Challenge

This application called for the replacement of an existing motor that is used to pressurize service truck body cabinets. The original motors were failing prematurely due to the brush life and electrical wire connections. To maximize the brush life, and achieve optimum balanced pressurization, the application called for a 2100 RPM motor.

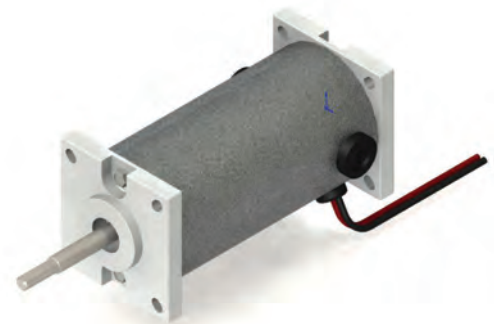
The Solution

- Replaceable brush PM motor
- Optimization of the overall ventilation system life through testing of multiple brush grades
- Extended system life with improved wire crimping schemes to eliminate field failures in long-duty cycle operation
- Replaceable brush motor provides 200-300% longer life expectancy.

“Knowing the customer and their needs is the key to a successful partnership. They manufacture superior quality products for their customers, and they look for that same level of quality in their suppliers. This is why they are so successful in their market, and why our motor is such a great fit for their product.”

Ed Tullar, Sales Manager – Groschopp

This customer is a premier builder of service truck equipment. They manufacture utility, service and lube bodies, as well as the Tiger crane line, with electric and hydraulic cranes from 2,000 to 10,000 lbs. For them, everything is about quality, reliability and the ultimate in performance of their products, which are used by customers in rugged applications such as Agriculture, Utilities, Mining, Forestry, and Road Construction.



Groschopp's fractional horsepower motors provide the pressurization and ventilation in the truck body cabinets, to keep the contents clean and properly ventilated. The customer was experiencing an unacceptable failure rate with its original motor supplier, most likely due to the intense vibration, dust and extreme climates inherent in the typical operating environments, which was causing the wiring connections to fail.

“We felt that a replaceable brush motor would be their best option,” said Tullar. “Just like our customer, who sells a quality product that can withstand a rugged environment, we knew that our motors could exceed their expectations.” The Groschopp motor featured a solid wire crimp connection internal to the motor, to ensure solid connections, a primary cause of failure with the original motors.



The replaceable brush design helped improve the serviceability of the customer's system, as well.

“These motors run continually and have an exceptionally long duty cycle, which wears the brushes out at fairly high rates,” said Tullar. “They have designed a complete ventilation system – comprised of a filter system, fan assembly and Groschopp motor in a special housing. They now have almost no failures and the overall product quality issues have been resolved.”

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GROSCHOPP®

CASE STUDY

Vapor Recovery Pump

Vapor Recovery Application Initiates New Product

The Challenge

This customer wanted to replace the 3-phase motors in the system design with a 2-phase motor, but wanted to avoid major redesign of their own product. The motor also needed to fit their existing installed base of systems, so that during routine refurbishments, the new motor could be easily installed.

The Solution

- Custom-designed 2-phase AC90 motor
- Size and mounting configuration to fit customer's existing system design, without special tooling or setup costs
- Reduced operating costs for system users by switching from 3-phase to 2-phase motor

“ We had been talking about designing a 90 mm frame AC motor (AC90). For this customer's needs, the AC90 looked like it would fit perfectly. We tooled up to make it because we believed in it so much. Now they have a motor that fits both - their new systems, as well as retrofitting existing installations – and we have engineered the AC90, which is now one of our best selling products. ”

Travis Feekes, Regional Account Manager – Groschopp

This customer designs, develops, manufactures, and markets Stage 2 Vapor Recovery Systems and Components. Their Stage 2 vapor recovery systems are designed to collect gasoline vapors that would otherwise escape into the atmosphere as vehicles are being refueled. A properly installed system should reduce harmful vapor emissions by at least 95%.



“This was a particularly fun and interesting application,” said Travis Feekes, the manager of this project. “Just down the street from their manufacturing facility in New Hampshire is the state's largest gasoline station. They use that gas station for testing their products, and when we visited, I realized that this was the first gas station I'd been to - where I couldn't smell gasoline!”

The customer had been manufacturing their Vapor Recovery system using a

3-phase stator and rotor from a different supplier. When they engaged with Groschopp, the goal was to replace the 3-phase components with a 2-phase motor and control. Special challenges of the application were making sure that the motor would drop into their existing end bells. Not only did they want to keep their existing end bells, they wanted to be able to retrofit their installed base when doing routine system refurbishments.

“This experience just goes to show that it pays to do the right thing,” concluded Feekes. “We could see that an AC90 would be the perfect solution, so without any tooling costs to the customer, we were able to supply the motor that fit the application exactly – and the new Groschopp AC90 was ‘born’.”

Pictured Above: [AC Stator and Rotor](#) with Customized Housing



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GROSCHOPP®

CASE STUDY

Medical X-ray Tubes

Enhancing Product Performance and Functionality

The Challenge

Everything about this application is extreme – high operating temperatures, immersion in hot oil, operating voltage spikes and high starting torques. Combine these operating and environmental challenges with a tight installation space, and this is a truly demanding application.

The Solution

- AC stator with custom winding and forming of the coils to meet dimensional requirements
- Durable wire varnish to protect winding in a hostile operating environment
- High temperature insulation materials for submersion into hot oil without contamination or compromised performance
- Rigorous testing for component qualification to extreme reliability specifications
- Integration into the customer's supply chain, with flexibility to deliver against their forecast

“ There aren't many motor manufacturers who specialize in making stators for x-ray tubes, and those who do are dependent on a high-labor, manual process. We have been able to reliably automate this process and provide an exceptional product, superb delivery and exceptional value to our customer. ”

Mike Vander Zwaag, Regional Account Manager – Groschopp

This manufacturer is a premier independent supplier of X-ray tubes and flat panel detectors, serving the leading manufacturers of imaging equipment for medical diagnostics, as well as industrial inspection and security products.

“The customer has very high expectations and a demanding application, but they have to be this way to meet their customer's demands,” described Vander Zwaag. The motor parts that Groschopp supplies go into their



diagnostic medical x-ray machines, and downtime or failures are simply not

tolerated. The machines have to be working perfectly, always available for patient diagnostics. Add to that the revenue-generating expectations, and a failed motor is simply unacceptable.

“From an environmental aspect, this is an ‘extreme’ application,” Vander Zwaag added. “The stators are immersed in hot transformer oil, which is used for both cooling, and insulation from high voltage. There are also steep voltage spikes and a high starting torque, in addition to the hot operating environment. Add to that the tight dimensional requirements, and this makes for one challenging application!”

With dedicated engineering, prototyping and endless testing, Groschopp has successfully designed a stator with the wire varnish, insulation materials, and special coil configuration to meet the demands of this application. Meeting the customer's requirements goes beyond engineering design – to the manufacturing process which has been developed specifically for this product, to maintain consistently on-time deliveries and exceptional quality.



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