



Lubrication



Collaboration



Innovation





E-Mobility

With [policies in place](#) to ban the sale of new vehicles with internal combustion engines and as consumers push for smarter, energy efficient mobility solutions, design engineers are faced with complicated engineering challenges. High temperatures, noise abatement, and electrical integrity are all common challenges in e-mobility design. [Electric vehicles](#), passenger cars, busses, trucks, [e-bikes](#) and scooters, e-motorcycles, drones, and other next generation technologies require lubrication to:

- Extend driving range
- Extend component life
- Avoid costly recalls and warranty claims
- Improve motor efficiency
- Improve quality perception



Lubricants for E-Mobility Applications can:

- Reduce temperatures in motors, gearboxes and drivetrains
- Improve reliability
- Minimize risk of failure of electronic control systems
- Minimize noise and vibration

Lubrication Solutions for E-Mobility Applications

Electric & Autonomous Vehicle Components

The increased technical requirements of EV designs can no longer be met with conventional, general-purpose lubricants. They require specialized synthetic lubricants to improve safety, reliability, comfort, and efficiency. Everything from [electric braking](#) and [steering](#) to [interior components](#) and [seat assemblies](#) can benefit from the use of perfectly matched lubricants for the specific application and requirements.

Electrical Connectors

The amount of electronic controls used in electric vehicles is growing exponentially, and with that, the number of electrical connectors in these vehicles. If an electrical connector loses signal, critical safety features such as braking, steering, ADAS or emerging autonomous systems could fail, with potentially fatal consequences. Nye's industry leading [connector grease](#) acts as a protective barrier to prevent common causes of connector failure including wear, electrical short circuits, fretting and corrosion. To improve the reliability of electric and electronic systems, Nye's long-lasting connector grease is a proven solution that withstands the demanding operating conditions of your application.

Gears

In addition to traditional metal gear boxes, material advances have allowed the use of lighter weight plastic gears for many applications. Plastic housings have also become more prevalent to support lighter weight design initiatives. Nye Lubricants has a complete line of synthetic [gear greases that have excellent plastics compatibility and are](#) specifically formulated to minimize wear under high-loads.

Application & Validation Test Services

Next-generation technologies all face unique engineering challenges that may require custom testing to ensure a lubricant meets design specifications. Nye's wide range of [testing capabilities](#) includes a [custom electric power steering \(EPS\) test system](#), a [Terminal Fretting Test Rig](#) for connector lubricants, an electric motor efficiency test rig, and many more.

Want to learn more about lubrication solutions for your design or discuss a custom project? [Contact Us](#).



The Design Engineer's Guide to Selecting a Connector Grease

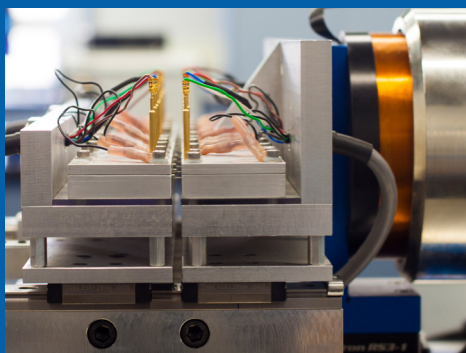
The number of electrical connectors and electronic circuits in devices such as cars, planes, appliances, industrial machinery, trucks and boats are continuously growing. Failure of these components, from short circuit to continuity loss, present a major concern as issues can vary from nuisance to increased warranty costs to critical safety problems. The constant exposure to moisture, corrosive environments, and vibration can accelerate the failure or malfunction of the electrical system and electronic controls of the vehicle.

Nye Lubricants has a comprehensive line of dielectric greases formulated specifically to address application requirements for arcing, high temperature, environmental protection, [fretting wear](#), and insertion force. We work directly with design engineers to form a partnership and assist with proper grease selection to ensure performance, avoid warranty claims and costly recalls.

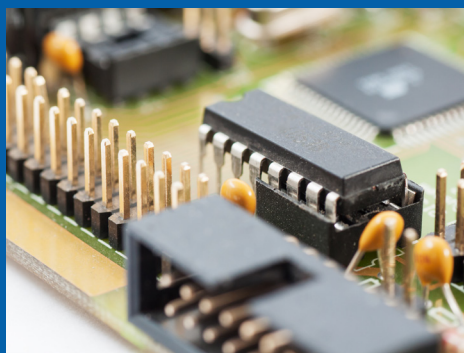
The advantages of lubricating electrical components

- Extend functional life of components
- Improves reliability of connections
- Seals & protect from environmental elements
- Reduce insertion force
- Prevent fretting wear & corrosion
- Insulate against electrical short circuits

Additional Resources



[Application & Validation Test Data](#)



[Case Studies](#)



[How to Select a Connector Grease](#)



Case Study: Protect USB Connectors From Fretting Corrosion

Background

Commercial truck fleets are becoming more electrified and digitally connected as the demand for added safety, tracking, and comfort features increases. When working properly, electronic logging systems can help companies manage fleet logistics and minimize downtime. But when connectors fail, these systems stop functioning and cause costly downtime for repairs. A supplier of electronic data logging systems approached Nye after they noticed a high failure rate of their USB connectors due to fretting corrosion caused by micro movements from vibrations. They needed a grease that could protect their connectors against fretting corrosion to prevent future electrical failures and restore connectivity to connectors affected in the field.



Challenge

- Can this solution be rolled out in the field?
- Can the lubricant prevent fretting corrosion?
- Can the lubricant ensure connectivity after 10 insertions over a five-year lifecycle?

Solution

NyoGel® 760G Connector Grease

A silica thickened, medium viscosity, synthetic hydrocarbon grease.

- Protects against fretting corrosion and ensures connectivity
- Provides lifetime lubrication for lasting connections
- Reduces insertion force
- Compatible with most plastics and elastomers

Product	Chemistry	Temperature Range	Water Washout (1 h @ 80°C)	Salt Spray Resistance (48 h, MIL-G-81827A)
NyoGel® 760G	PAO/Silica	-40 to 135 °C	2%	No Corrosion

Results

After completing third-party validation testing to verify fretting and insertion force properties, the supplier determined that NyoGel® 760G successfully prevented fretting corrosion and extended the life of their USB connectors. Nye helped the supplier determine the appropriate amount of grease for each USB connector to ensure that the connector received the proper coverage without overfilling the socket. Nye also helped the supplier select different packaging options suitable for field servicing and mass production.



Advanced Validation Testing for Emerging Technologies

Engineers designing e-mobility solutions and next generation technologies are all tasked with doing more with less. Advanced lubricants are often required to reduce temperatures, weight, torque or other factors that could interfere with achieving high-performance standards. Additionally, as these designs become increasingly electrified, protecting [connectors](#) against electrical failure is also a growing concern. Existing solutions need to be validated to new operating extremes or new products may need to be developed to accommodate these demanding operating requirements.



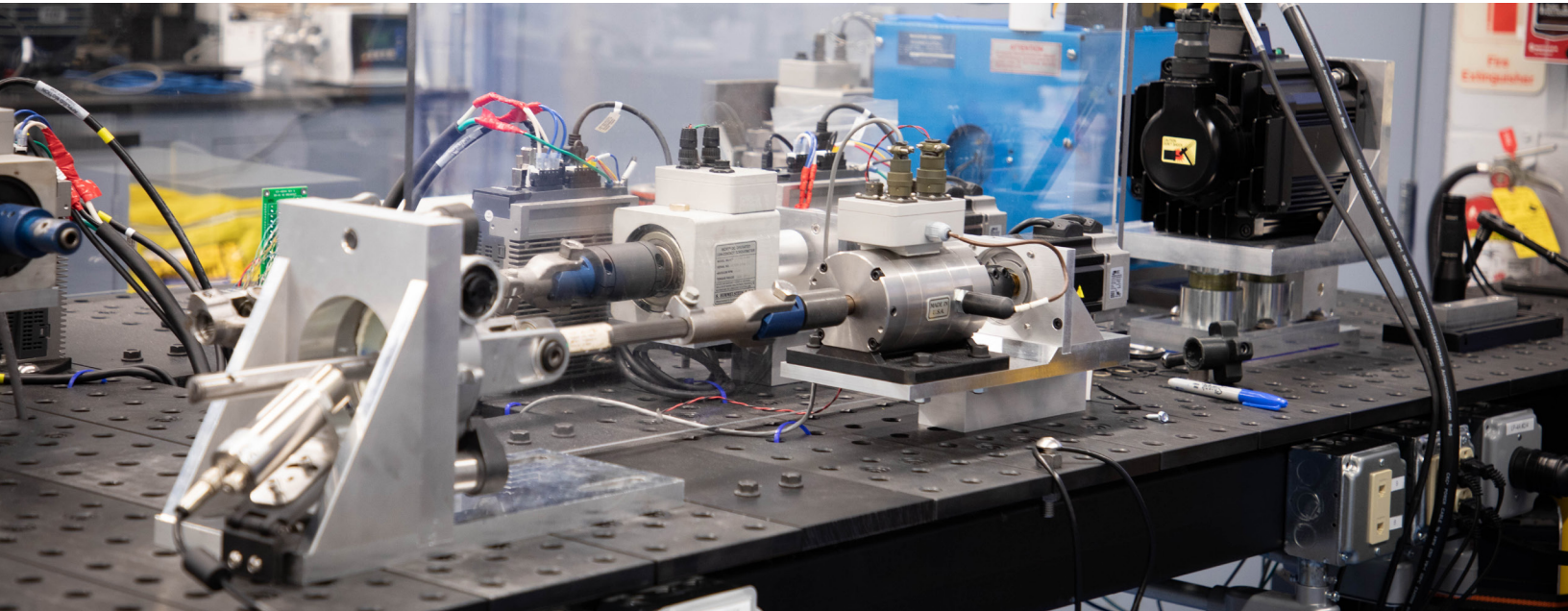
Developing new technologies often means going where no one has gone before. Nye's engineers work in tandem with our chemists to provide application-specific information that informs the development and validation of our products. With Nye's modular test rigs, environmental chambers, and even custom test rigs, we can simulate our customers applications and ensure our lubricants meet their performance standards. At Nye, we can test from a conceptual level all the way up to the actual customer's components. Some of our advanced test rigs include:

- [Terminal Fretting Test Rig for Connectors](#)
- [Electric Power Steering Suite](#)
- [Electric Motor Efficiency Rig](#)
- [ROF+ Bearing Tester](#)

Lubrication Solutions for E-Mobility Applications

As Electric Power Steering systems become more common and advanced, test data plays an important role in ensuring the lubricant selected for these systems will protect components, reduce risk, and improve safety.

The capabilities within this testing suite allow Nye's Application engineers to test various designs and geometries of customer EPS systems in a variety of loading and environmental scenarios. Data generation consists of, but is not limited to: efficiency, torque stability, gear mesh interface temperature, and wear analysis. Our EPS Test Suite is composed of three separate rigs that accurately simulate EPS operations: a Magnetic Brake System, On-Road Conditions, and a Parking Check.



Magnetic Brake System

Our magnetic brake system simulates an OEMs 'run-in' process. This is a high load, high speed, test entirely dedicated to removing high spots—or residual imperfections from the manufacturing process. When high spots are removed, it allows our engineers to understand how our lubricants will perform in an aged EPS system.

Parking Check

This rig is a non-loaded Parking Check, also known as a Backdrive Check. This uses a high-resolution torque transducer to assess gear-to-torque distribution when a wheel is turned all the way in one direction. With this information, our engineers can remove the peaks and valleys of that distribution data to obtain the average gear-to-torque distribution for the system.

This test allows us to understand frictional characteristics in EPS systems and how they affect the "feel" of steering

On-Road Conditions

This rig simulates routine operations. It uses a feedback loop with two server motors that rotate from 0-540 degrees at 30 rotations per minute. Engineers can then use the feedback loop to simulate specific loads at different wheel rotations. OEMs are constantly trying to create systems that operate at higher loads. Our rig can simulate loads of up to 120 newton-meters to simulate the different EPS load requirements. Using the rig's infrared camera, our engineers can see the temperature distribution of the entire gear assembly. This allows us to assess how well our lubricants are reducing the amount of heat generated by the motor under specific loads and wheel rotations.

Terminal Fretting Test Rig

Fretting wear is one of the major forms of electrical deterioration and failure in a variety of industries, including Automotive, Aerospace, and Consumer Electronics. Fretting wear refers to a mechanical and chemical wear mechanism where the sliding contact between two surfaces creates wear, which becomes oxidized. This process continues at an exponentially higher rate once oxidized wear particles are created. The failure mechanism occurs when enough oxidized wear debris has been created and the contact resistance increases to a level where continuity in the contact is lost. The good news? Fretting wear is preventable with the right lubricant!

With Nye's fretting test methodology and apparatus, we can determine the durability and reliability of our lubricants in a real-world fretting environment. Through the testing of lubricants to their ultimate fretting failure point, we can look forward to helping our customers design systems that are optimized with a lubricant to reduce or eliminate fretting failures. This can lead to a reduction in the warranty and safety issues.

Our modular fretting test rig, or multi-terminal fretter, allows us to test a variety of components and geometries to ensure our lubricant will outlast your component life requirements. Standard geometries include: cylinder on cylinder, ball on disc, and electrical terminals, but we can accept a wide variety of geometries and supplied components.

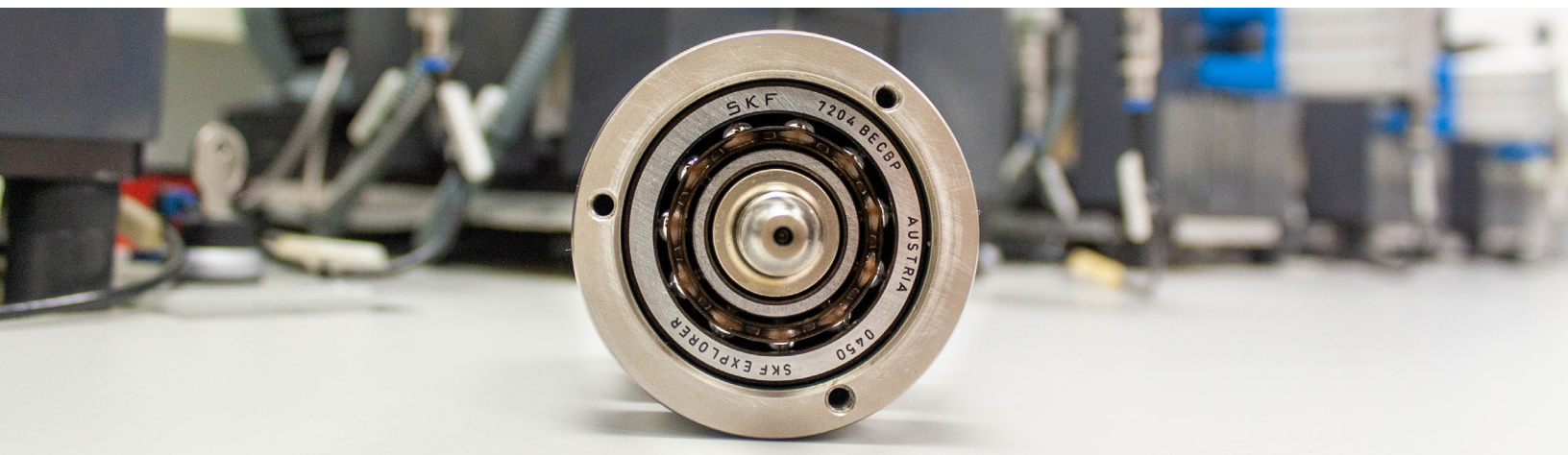
Electric Motor Efficiency Rig

The ADVT Lab has developed an Electric Motor Efficiency Rig (EMER) aimed at optimizing the efficiency of Nye products intended for small electrical motors, actuators, and servos. Reducing power consumption while providing extended life performance in these applications is critical in the success of Electric Vehicle platforms.

ROF+ Bearing Tester

As bearings are pushed to higher speeds at higher temperatures, lubricant degradation is a concern to many bearing manufacturers. A way to measure bearing life, therefore, is critical. The ROF+ Bearing Tester tests the functionality and life of lubricating greases in rolling bearing applications at various conditions. The ROF+ tests lubricating greases at speeds up to 25,000 RPM, temperatures up to 230 °C, radial loads of 50 to 900 N, and axial loads of 100 to 1,100 N.

The standard bearings are 6204 deep groove ball bearings or 7204 angular contact ball bearings, but other geometries including customer supplied bearings can be utilized. Using this test, we estimate the grease life, temperature limits, and speed factor (NDm) for our products that are to be used in bearing applications.



Custom Solutions

Nye's Application Engineers work with you to design and build custom test equipment that validates our lubricant for your application. Our custom modifications and a collaborative partnership ensure that the test rig meets your application requirements. Nye engineers currently use the data collected by our test rigs to formulate next-generation greases for our customers designing emerging technologies.

Want to learn more about lubrication solutions for your design or discuss a custom project? [Contact Us.](#)



Future of E-Mobility with Lubrication Expert Jeff Wheeler

Jeff Wheeler has been with Nye for five years as a part of our automotive team working out of the Detroit office. Within the automotive team, Jeff helps customers find lubrication solutions for their electrified systems and components. Prior to working for Nye, Jeff worked as an engineer for the United States Steel Corporation. Jeff holds a Bachelor of Science degree in Chemical Engineering from Michigan State University.



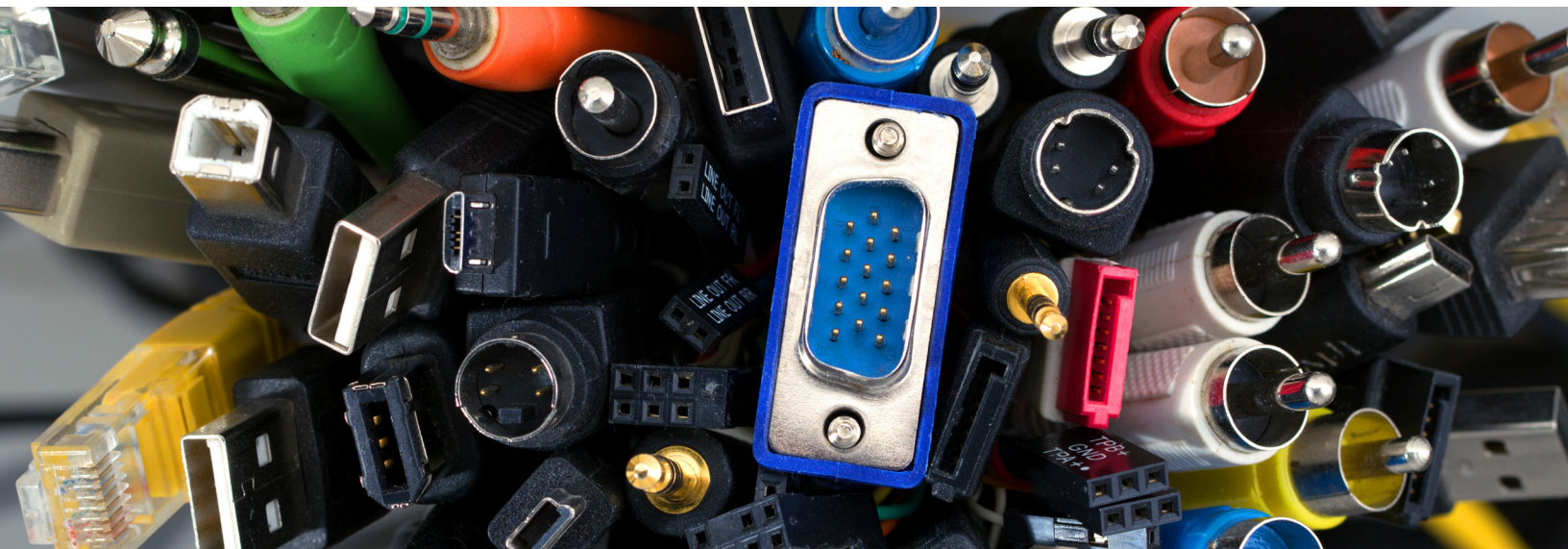
Jeff Wheeler
Regional Engineering Manager

◆ **What are some of the challenges design engineers may face when designing electric vehicles?**

The electrification of the automotive world has changed everything – from how we look at the lubrication of propulsion systems to the sounds the occupants hear while they are driving to even the overall customer experience. Noise, vibration, and harshness (NVH) and buzz, squeak, and rattle (BSR), will become a major concern as some of these sounds were masked by the noisy 'ICE' engine. Battery development will need to address range anxiety and charging speeds. Thermal management will be critical as well as improving efficiencies in all systems to use the available power most effectively. The design and protection of electrical and ADAS systems will be more important than ever as everything will now be connected. Multiple redundancies may be required, particularly for autonomous driving functions. Higher levels of connectivity will require more connectors and a greater opportunity for continuity issues and connector failures.

◆ **How can specialty lubricants be used to solve these design challenges?**

The increased demands and unique systems of EVs will require advanced lubricant solutions. We are paying close attention to the evolution of the industry and looking to develop next generation products that will meet and exceed our industry partners' requirements. The real challenge is providing solutions that not only reduce noise and solve increased wear, efficiency, and thermal requirements, but also enhance the driver experience.



Driveline components will need lighter viscosities, better anti-wear & efficiency, and reduced friction to help increase range. Thermal management systems will need products that will help control and dissipate heat. Corrosion protection will become more important than ever as EVs are expected to last longer than current ICE vehicles. Electrical systems will be critical to the operation of the vehicle and will need to survive longer and operate at higher temperatures.

NVH and BSR solutions will be very important as concerns in these areas are a perception of quality. Damping, motion control and the feel of the operation of knobs, switches and controls will be looked at more closely by customers. To meet the needs of the market, we are continually developing new products like our [NyoGel® 975F](#) – a silicone-free mid-level damping grease with consistent performance over a wide temperature range. This new player in the market will give OEMs another option if silicone migration is a concern. Adding this to our already impressive lineup of [motion control products](#) puts Nye in a great position to help the industry.

In short, greases may need to operate over wider temperatures while focusing on reducing noise and lowering torque. I believe Nye is prepared to tackle all these challenges with our highly advanced lubrication solutions. The specialized lubricants Nye is developing today will not only meet but exceed the demands of the future.

◆ **What are the benefits of using a connector grease from Nye?**

As the industry leader in connector lubricant technology, I feel Nye is uniquely positioned to help all our connector manufacturing partners develop and provide robust connection systems that will ensure all the components of an electrified application operate flawlessly. Our mantra of ‘Lube for Life’ does not just apply to your typical driveline, [interior](#) and [chassis](#) components. We expect that a connector that is protected with one of our connector lubricants will fulfil the manufacturer’s lifetime requirement for the system it serves. Applying a [grease](#) will help prevent fretting corrosion, guard against oxidation, reduce wear, provide environmental protection and a barrier against water intrusion; and reduce mating force. All the elements necessary for a robust connection system that avoids costly warranty issues and dreaded recalls

◆ **Outside of traditional vehicles, what kinds of e-mobility solutions should we expect within the next five years? What lubrication challenges do these applications pose?**

The sky is the limit with e-mobility. Literally. I think we are going to see every form of transportation move to electrification. We are already seeing [e-bikes](#), e-scooters, e-motorcycles, drones and toys like hoverboards, in addition to passenger cars, semi-trucks and industrial and commercial vehicles. In the near future there will be more common forms of mass transportation going electric like private carpools, taxis, buses and trains. Airplanes and helicopters are even moving in this direction. What I see evolving to mainstream very quickly is shared mobility like ridesharing, e-hailing, robo-taxis and shuttles, rapid increases in micro-mobility and of course higher levels of autonomous functions.

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As the market moves to full electrification, autonomous driving and shared mobility; lubricants will be required to help increase the lifespan of components, increase efficiencies of systems and provide a richer passenger experience. Some segments of micro-mobility will see constant operation and will need more robust lubricant solutions. This really means providing the comfort, sound and feel the customer desires while helping manufactures provide components that will last the lifetime of the vehicle. Systems need to be more efficient and require less power drain as more and more systems will be drawing from the same sources. Lubricants will need to be a part of this solution.

◆ **What is your favorite part about working at Nye?**

Personal relationships. I love helping my customers find solutions to their problems and working with the people in our company that help make that happen. An added bonus is working directly in the future of mobility – electrification and autonomous functionality. It's exciting to be riding the wave of the future.



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more updates
next month!**

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