Strategic Innovations for Next Generation Trucking

Presented by ATA’s Technology & Maintenance Council

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More than a century has gone by since the beginning of the trucking industry, yet the technological advances experienced in the last 50 years have been most astonishing. From six-volt electrical systems to electronic stability control, from bias plies to low-rolling resistance tires, and from square box designs to advanced aerodynamics, truck technology has made extraordinary advances in efficiency and productivity. Through the years, ATA’s Technology & Maintenance Council (TMC) has been at the vanguard of thought leadership in defining fleet user requirements regarding future truck technology.

By 2016, TMC’s Future Truck Committee will have developed more than 50 position papers and information reports, challenging industry to produce truck designs that are increasingly efficient and cost-effective. Each year, the Committee challenges its task forces to address genuine future technologies, as opposed to manufacturers’ developments that will be marketed within the next five years. Accordingly, TMC’s Future Truck Committee offers technical insights on the design and development of commercial vehicles 10-15 years into the future and beyond. These papers can be found here.

Future Truck’s primary objective is to define user expectations for equipment that improve safety, maximize payload, and minimize cost. In this role, TMC serves as the collective voice of the equipment user.

The following pages present projections by the Council’s Study Groups and Committees on the future of trucking technology and business practices. Each group defines recommended practices to assist end-users in the design, specification, maintenance and performance of commercial vehicle equipment.

These insights represent the consensus of the Council’s more than 2,500 members on what direction truck technology should take in the coming decades. I encourage you to review these pioneering ideas and join our Future Truck Initiative by becoming an active participant at ATA’s Technology & Maintenance Council. This is your opportunity to help us shape the strategic innovations for trucking’s next generation.

Duke Drinkard
TMC Future Truck Committee Chairman

“As the only industry association focused solely on truck technology and maintenance, TMC and its member companies work together with OEM’s to create the industry’s standards for future truck technology that will ensure the truck of the future is one that is efficient to operate and maintain.”

— TMC’s Future Truck Initiative
Future Electrical Innovations

TMC’s S.1 Electrical Study Group envisions the following innovations as playing a transformative role in the next generation of future trucks:

- **Higher Voltage Platform** — Manufacturers are looking for various means to meet the federal greenhouse gas emission requirements for 2020 and 2025 model year trucks. Today’s 12-volt vehicle electrical system can no longer accommodate the electrical loads that current vehicles demand. Any new addition to vehicle electrical loads will require an increase in capacity, so manufacturers are considering migrating to a dual-voltage system which will handle multiple voltage levels. The dual-voltage system also promises to reduce vehicle weight, thereby reducing fuel consumption and greenhouse gas emissions. Other vehicle systems (such as power steering, heating/air conditioning, starting/charging, etc.) also will benefit from higher system voltages.

- **Drive-By-Wire** — A vehicle with no steering column, air brake system, or throttle cable – is what drive-by-wire technology is bringing about. Electric steering is the first step to steer-by-wire – with an electrically actuated steering mechanism, the steering column can be eliminated. Similarly, brake-by-wire systems one day will replace air control valves and hoses with wires and electric actuators. Electronic throttle control is used today in many trucking applications and the same benefits are expanding with digital sensing and computerized control.

- **Electric Motor Transaxle** — Current powertrain designs involve an engine, transmission, driveshaft, and axles. These heavy, rotating, moving parts have significant maintenance, heat, weight and space considerations. Electric motor transaxles could replace these components, providing sufficient power and service life to meet fleet needs. Each axle would employ an electric motor, computerized and synchronized to produce appropriate speed, braking and recharging needs.

- **Wireless Powered Signals** — Wireless powered signals involve transferring power over-the-air from a source resonator to the load through a magnetic field. The source resonator, which is attached to the truck’s battery pack, distributes energy throughout the vehicle without the need for wires or other physical connection. Power distribution of all vehicle functions is managed by computer control with each receiving device communicating with the resonator by unique coded signal.
Future Tire & Wheel Innovations

TMC’s S.2 Tire & Wheel Study Group envisions the following innovations as playing a transformative role in the next generation of future trucks:

• **Airless Tires** — Checking and maintaining tire inflation pressure is a constant challenge. Failure to do so frequently places trucks out of service, leaves debris and hazards in highway lanes, and raises fleet maintenance costs. Airless tires have the potential to increase fuel efficiency, save weight, and improve driveability. This innovative design consists of a series of load bearing ribs/spokes which relay bead area forces to the tread. Impossible to rupture, but with same potential for retreading, the airless tire is a technology that relieves many added stress points for both fleet equipment and business operations.

• **Tire Dimensioning Biotechnology** — Tire dimensioning biotechnology has the potential to change traction performance, offering better handling, longevity of tread and casing life, rolling resistance, and road wear. Designed for wide-based single drive tires and steer positions, the tire dimensions adjust camber positioning and tread-sidewall shelf angle by use and feel of driving environment. The biotechnology in the soft rubber compounds are heat-activated during driving, morphing the tire shape of each individual position. Changing the tire diameter of the inner and outer sidewalls results in improvements in stability, ride quality, traction, endurance and safety.

• **Frictionless Wheel Ends** — Oil hubs and packed grease bearings have protected wheel ends for many years, but new magnetics are gaining manufacturers’ interest. Frictionless wheel ends employ a magnetic air gap formed at the circumference of the inner and outer wheel end, provided by opposing magnetic bearings capable of carrying the wide variety of loads. The rolling efficiency gain and reduced maintenance demands can be experienced at all wheel positions on the combination vehicle.

• **Electric Hub Motor** — With this innovation, electric motors are built into the wheel hub. Stationary windings, usually concentric with the wheel, generate electromagnetic fields which force the outer windings mounted on the wheel to rotate. From a designer’s standpoint, hub motors offer great flexibility. They can be used to power rear-, front- or all-wheel drive vehicles. They can replace or augment the internal combustion engine.
**Future Engine Innovations**

TMC’s S.3 Engine Study Group envisions the following innovations as playing a transformative role in the next generation of future trucks:

- **Government Regulations** — Government regulations are not themselves particularly innovative, but they will likely spawn a great deal of innovations from the manufacturers who must meet them. Advances in engine technology and design will proliferate as the latest round of greenhouse gas emission regulations transform truck design through 2027.

- **Waste Heat Recovery** — Recovering useful energy from engine exhaust waste heat would directly reduce system fuel consumption, increase available electric power and improve overall system efficiency by adding the power produced by the engine. Of all the energy wasted in operating a commercial vehicle, 36 percent is lost as exhaust heat. Different waste heat recovery systems for future applications in diesel engines include mechanical and electric turbo-compounding, thermoelectric power generation, and steam and organic Rankine Cycle developments.

- **Hydrogen Fuel Cell** — Hydrogen fuel cell technology replaces diesel fuel with hydrogen gas, which is injected into an electrochemical energy conversion device (fuel cell). Unlike power sources that use fossil fuels, the by-products of a fuel cell are simply heat and water. During the conversion, electricity is produced, generating battery power for the vehicle. Fuel cells generate electrical power quietly and efficiently, without pollution.

- **Microturbine Power** — Turbines are appealing because of their few moving parts, low maintenance requirements and lighter weight. Applied to trucks, they will employ a microturbine, generator, air intake, combustion chamber, and exhaust. Turbines, by their nature, are fuel neutral and produce very low emissions without the need for exhaust aftertreatment. With no reciprocating pistons or rods, turbines can spin smoothly and fast while their blades compress inlet air, mix it with fuel and charge the super-heated mix against another set of blades to turn the output shaft.

- **Low-Carbon Intensity Biofuels** — Although second-generation cellulosic biofuels have proved harder to make than many had hoped, innovative start-ups focused on cellulosic and algae-based biofuels are starting to create high-margin specialty chemicals and blendstocks at $2 a gallon or less by 2020. Biodegradable, non-toxic and potentially cheaper coolants, refrigerants, and lubricants will also come to market from these efforts.
**Future Cab & Control Innovations**

TMC’s S.4 Cab & Control Study Group envisions the following innovations as playing a transformative role in the next generation of future trucks:

- **Driver Collision Protection** — Commercial vehicles will incorporate driver collision protection features that have been standard in cars and light trucks for years. Cabs will include multi-directional emergency-deployed air bags, weight-sensing seat belt alarms and constraints, active seat belt tightening for collision preparedness, and more.

- **Drive-Dynamic Seats** — Future seats will employ smart nanofibers that adjust comfort levels (firmness, softness, cooled, heated) by the size and weight of the driver. Reciprocating motors are also expected to be designed in the seat to automatically adjust to driver pressure points for release of tension.

- **Cab Insulation, Surface and Comfort** — Reducing weight and increasing use of sustainable materials bring new challenges. Soy-based foam and carbon fiber materials combined with polycarbonate composite paneling offer possible solutions. These options are of equivalent strength but lighter weight, completely recyclable and biodegradable and may yield potential tax incentives through waste stream reductions.

- **Forward Lighting** — The ability to provide enhanced forward lighting will increase as variable focus designs become popular. Advanced solutions such as bi-xenon designs (originally designed for the military) will ensure infinitely variable intensity and direction. Navigation systems in future trucks will tip off LED lights to curves on the road ahead. The headlamps then shine more light in the direction of the turn. Additionally, high-beam lasers that autonomously switch off when cars are in sight and shine twice as far down the road than current available lights will be achieved by autonomous sensory.

- **360° Collision Avoidance** — Combinations of visual and ultrasonic forward speed control and 360° collision avoidance devices are nearly road ready. This new safety technology scans the environment around a truck, warns the driver when collisions are imminent and thereby prevents crashes. This will be enhanced even further by anticipated connected vehicle technologies.

- **Automated Driving and Platooning** — Automated driving and platooning technology will revolutionize the role of the driver, freeing them to do other tasks. New controls and alerts will need to be developed to ensure the driver can regain control of the vehicle should the need arise.
**Future Fleet Maintenance Management Innovations**

TMC’s S.5 Fleet Maintenance Management Study Group envisions the following innovations as playing a transformative role in the next generation of future trucks:

- **Vehicle-to-Shop Connectivity** — As vehicles get ‘smarter’, maintenance and repair diagnostics will be sent directly from the vehicle and — based on the diagnostic results — the vehicle’s interface screen will route the driver to the appropriate shop. The ability to sort mechanical condition data in real time affords opportunities to provide predictive analysis the industry has never seen before. The ability to manage large amounts of data creates the opportunity to predict component failure, provide real-time transactional repair cost intervention, provide best-in-class maintenance policies and procedures, and identify and provide economic equipment specifications and procurement.

- **Big Data to Support Predictive Analysis** — Increasingly complex fleets need to manage Big Data to support predictive analysis, downtime management, driver safety, productivity, and total cost of ownership. New technology means better communication, including connected equipment that provides mechanical self-diagnosis, increased driver behavior data, and driver support systems, among other things. The ability to access and manage the Big Data that fleets now return will fulfill future fleet needs in manufacturing, pricing, purchasing, and maintenance. This leads to the best alternatives with regard to total cost of ownership.

- **Condition-Based Maintenance** — On-board live streaming telematics is becoming commonplace. Until the trucking industry starts leaning heavily toward powertrain electronics and maintenance-free systems, extending maintenance intervals and concentrating on condition-based maintenance are future areas of opportunity. Condition-based maintenance has been successfully adopted by other industries, such as the airline industry, to improve safety, increase uptime and reduce cost. Adoption of condition-based maintenance practices within trucking has the potential to yield similar results for our industry.
**Future Chassis & Brake Systems Innovations**

TMC’s S.6 Chassis & Brake Systems Study Group envisions the following innovations as playing a transformative role in the next generation of future trucks:

- **Ferromagnetic Suspension Fluid** — Oil-based ferromagnetic fluids are being used by the automotive industry in shock absorbers, engine mounts, and clutches. In vehicle suspensions, for example, these fluids have replaced conventional oil in shock absorbers, allowing the amount of damping on a vehicle to be adjusted 1,000 times a second. It works when the fluid in the shock absorber piston coil core gets energized and creates a magnetic field, changing the state of the fluid to provide variable damping when it’s needed. This gives the driver, cargo, and motor equipment more control, longer life, and safer driveability.

- **Intelligent Transmissions** — Popular transmissions today range from dual-clutch and automated manuals to fluid automatics. Controlled variable to infinitely variable transmissions are the next generation of transmission technology, employing software-controlled motor synchronization instead of clutches. Future concepts of such transmissions will permit intelligent software, integrated GPS, and predictive powertrain control. This technology networks the three-dimensional GPS data of the route with the current vehicle data and powertrain, predictively regulating the gearshifts according to the topography. Furthermore, as electric motors become favorable in the powertrain market, it becomes possible to control the motor speed so precisely that the gears can be engaged without clashing.

- **Multi-Disc Carbon Brakes** — Widely used in the aerospace industry, multi-disc carbon brakes simulate like similarities that of a heavy-duty vehicle’s clutch. In the same location as current drum brakes are designed today, each wheel end will have a multiple layered disc brake pattern circulating the axle end and hub. The entire combination hub component will consist of an in-line sequence of pressure plates and disc plates that mesh in conjunction with brake actuators that are executed by the driver when activated by the brake pedal. Regular disc brakes use single discs with one brake pad on each side covering less than half of the entire disc. Multi-disc carbon brakes can cover up to 100% of the disc surfaces used depending on how many discs are used proportional to the weight of commercial vehicle allowed. Benefits from a long desired advanced switch from drum to multi-disc brakes include a much shorter braking distance, longer maintenance intervals, light weight savings, less downtime, and lower greenhouse gas emissions.
TMC’s S.7 Trailers, Bodies & Material Handling Study Group envisions the following innovations as playing a transformative role in the next generation of future trucks:

- **High Strength-to-Weight Structural Composites** — Structural composites offer strength, durability and design innovations with reduced weight. Fabricating lighter based structure materials with same strength standards required for load handling and equipment operation are a key reason to consider these materials. These composites have contributed toward higher hauling capacity in aviation for decades. Carbon fiber is one solution, but many others are possible with future plastics, alloys, vinyl, and Teflon materials.

- **Spoilers, Boat-Tails, Fairings and Skirts** — Offering fuel economy increases of more than seven percent, these aerodynamic devices show results only in over-the-road application. Primarily aftermarket items today, nearly all will soon be OEM options. Vehicle control in high winds and maximized spray suppression may be a major benefit of new approaches. Custom fairings that encapsulate the landing gear to reduce turbulence beneath the trailer are also in future design. Redesigning the entire mold of the trailer to eliminate some of these add-on features are forecasted as well. Wind tunneling percentages tell a lot about how roof and rear end curvature can gain in more fuel economy as long as cargo volume is sustained.

- **Solar-Powered Roofs** — Over 400 square feet of a 53’ trailer roof surface is exposed to sunlight during an entire day’s work, and they get hot. Reefer units, liftgates, and piggy-back forklifts can use that free energy for operation and charging availabilities as well as redirecting power back to the tractor. Solar panels have grown more flexible and cost-efficient and will continue to advance as used in future applications. Currently, solar-powered roof panels are used for liftgate applications but their applications will grow to yield less maintenance, less downtime, and greater fuel efficiency.

- **Auto-Weight Sensing Distribution** — A traditional trailer that is loaded without adjusting the tractor’s fifth wheel and trailer’s shifting tandem axles generally is loaded incorrectly. A driver’s responsibility is to make sure the axle spacing between tractor and trailer is at maximum load efficiency. Wireless weight control exists today but a tractor and trailer cannot tell the driver how and where to shift its axles. Future combination vehicles will allow this technology to not only warn the driver of pending rollover or loss of stability, but also correct itself before leaving the loading dock. Independent automatic systems will not only control individual axles by use of service but also transform length and weight dimensions for safe and road wear operability.
Future Sustainability & Environment Technology Innovations

TMC’s S.11 Sustainability & Environment Technology Study Group envisions the following innovations as playing a transformative role in the next generation of future trucks:

- **Thermo-depolymerization** — By adding sufficient heat and pressure, any carbon-based waste can be turned into oil through a process called thermo-depolymerization. This is very similar to how nature produces oil, but with this technology, the process is expedited by millions of years to achieve the same byproduct. Proponents of this technology claim that a ton of turkey waste can create approximately 600 pounds of petroleum.

- **Fuel-Cell Powered Shop and Fleet Facilities** — Hydrogen fuel cell usage has been pushed as a pollution-free alternative to fossil fuels. The process makes water by combining hydrogen and oxygen. In the process, they generate electricity. Fuel cells are being used today in power plants and small cities across the world for sustainable long-term power. A fleet’s terminal location requires a lot of energy from the grid and hydrogen power can be used to satisfy those power needs.

- **Green Roof Planting** — Roof gardens help absorb heat, reduce carbon dioxide impact, absorb storm water, and reduce summer air conditioning usage. For example, research published by the National Research Council of Canada found that an extensive green roof reduced the daily energy demand for air conditioning in the summer by more than 75 percent. Ultimately, the technique could lessen the “heat island” effect that occurs in urban centers. Plus, the less energy a company uses, the better its profitability. Tax incentives may also help offset the initial investment.

- **Organic Matter Fuel** — With more and more everyday items being made out of organic material, it is more practical to use those items as a fuel to burn in engines. Gasification is the use of heat to transform solid biomass, or other carbonaceous solids, into a synthetic “natural gas like” flammable fuel. Through gasification, nearly any solid dry organic matter can be converted into a clean burning, carbon neutral, gaseous fuel. Whether starting with wood chips or walnut shells, construction debris or agricultural waste, the end product is a flexible gaseous fuel capable of being burned in an internal combustion engine.

- **Vehicle-to-Infrastructure (V2I) Road Energy** — The cost of maintaining roads and bridges is skyrocketing. New materials and technologies have to be found to replace our current archaic system. V2I road energy provides clean renewable energy, while providing safer driving conditions and power and data delivery. Through the generation of electricity, the transportation infrastructure is able to recycle its energy lost by new roads implemented with technology that can harness and transfer power.
Future On-Board Vehicle Electronics Innovations

TMC’s S.12 On-Board Vehicle Electronics Study Group envisions the following innovations as playing a transformative role in the next generation of future trucks:

- **Advanced J1939 CAN Bus** — For approximately 20 years, CAN has been the dominant bus system in the trucking industry. The transition from 250K baud rate to 500K is underway, permitting an increase in data capacity and speed. Additional ECU’s and advanced ECU designs are being developed to leverage this increase in capability, but for how long will J1939 meet industry needs? Future demands may require even greater increases in speed and capacity — e.g., CAN FD (CAN with flexible data rate) with its 1-10M baud rate Ethernet speeds — and perhaps the need may arise for multiple databuses, as is case in the automotive sector.

- **Remote Wireless Diagnostics** — On-board vehicle intelligence combined with fleet maintenance management software working in concert with OEMs to bring remote wireless diagnostics is Future Truck. Processes are being developed to integrate telematic, fleet and OEM software. Standardized OEM communications for fleet management and fleet maintenance will be needed for security and flexibility. Accessing fleet equipment driving data and mechanical conditions from a mobile operating system (i.e., smartphone) is projected for trucking. Granular industry cybersecurity solutions will be vital in developing best practices across all fleet types.

- **Over-the-Air (OTA) Programming** — ECU updates via wireless communication to the vehicle’s embedded systems will be a great innovation. Just like an operating system upgrade to computer programs or a smartphone app alert when a new update is available, the same opportunity can be possible for the future truck. With the mixing of ECUs and increased vehicle software complexity, more than 50 percent of warranty claims are due to software glitches and electronic defects. It accounts for severe fleet costs in vehicle downtime. OTA is a framework-based internet compatible architecture that enables vehicle data management for effective and efficient software and firmware updates.

- **Vehicle-to-Everything (V2X) to Autonomous Driving** — This wireless communication channel lets vehicles communicate with other vehicles, traffic signals, construction equipment, toll gates, etc. It senses pedestrians and routes destinations and is the transportation sector’s answer to safe, clean and ultimately autonomous/self-driving vehicles. The expected light-duty V2X mandate will release huge potential for the installation of dedicated short range communication (DSRC) modules in new vehicles and will be the first step towards heavy-duty V2X adoption. The strong regulatory support coupled with OEM V2X technologies will increase the penetration of V2X component communications (V2V, V2I, V2P, V2H, IN-V, ITS) to materialize from 2016 onwards. Toward the end of the forecast, the integration of V2X sensors and advanced driver assistive systems (ADAS) will make autonomous driving a reality.
TMC’s S.14 Light & Medium Duty / Specialty Trucks Study Group envisions the following innovations as playing a transformative role in the next generation of future trucks:

• **Grid of Things** — Like the Internet of Things, which maximizes the benefits of billions of things connected to it, the “Grid of Things” will do the same for trucking energy technologies. The Grid is a “plug-and-play” platform that allows energy technologies to be interconnected with each other and integrated into the larger grid. Technology and innovation are moving faster and becoming so hyper-connected that it’s creating a whole new world of possibilities. For light- and medium-duty trucks, it’s growing an array of advanced energy technologies—from electric vehicles and rooftop solar to smart applications, battery storage and a host of energy-efficiency tools for their platooning fleet.

• **“Connected” Bucket Truck** — Combining next-generation electric power take-off (ePTO) technology and “vehicle-as-a-hub” communications technology, connected bucket trucks will improve operating efficiency while enhancing safety and productivity. The next-generation ePTO system featured on the connected bucket truck will allow crews to operate the bucket and auxiliary systems without having to idle the engine, reducing emissions and noise and enhancing worksite safety. Vehicle-as-a-hub combines the Grid of Things with the Internet of Things, features that encourage safe driving habits, improve productivity and allow for mobile management of fleet resources.

• **Digital Windshield Mapping w/ Incoming Object Detection** — In many weather-related driving situations, it is necessary to engage in slower or stopped driving with windshield wipers at maximum swipe, defrost on high and headlight highbeams on. But emergency vehicles and work trucks don’t have the luxury of stopping when needed, so, by the use of geographic information systems (GIS), compatible windshield heads-up display, and forward viewing intelligent robotics, a driver’s windshield becomes a digital screen with terrain and incoming object recognition. Spacecraft technology infused with existing studies used for military can be applied to trucking for safe and efficient driving abilities.

• **Electric-Over-Hydraulic Systems** — Reducing the complexity of add-on work devices is essential for ease of light - and medium-duty operation. Plug-in and hybrid vehicles are used more so in the light/medium duty sector than with heavy vehicles. These systems are proven technology, and should be realized to enhance electrical system capabilities over the hydraulic systems used throughout the industry. Proposing a higher voltage platform (i.e., 48 volts) on trucks reduces the hydraulic fluid support needed in diverse types of applications encountered in this sector. These systems replace the weight and maintenance of separately controlled systems.
**Future Service Provider Innovations**

TMC’s S.16 Service Provider Study Group envisions the following innovations as playing a transformative role in the next generation of future trucks:

- **OEM-Sponsored Training for Third Parties** — Organizations facing IT equipment and software maintenance challenges often feel more at ease with the support of an OEM maintenance provider than those of a third-party maintenance provider. While OEMs certainly claim their key advantages, third-party maintenance providers are able to give superior support and better value through customized, quality solutions that cater to each customer’s unique IT environment. Therefore, fleet customers will demand OEMs make allowances for the training of third parties. As ‘right to repair’ movements become more commonplace, third parties will be granted greater access to OEM-sponsored training.

- **Virtual Parts Inventory Across Brands** — Like many omni-channel brands, managing inventory levels in real-time to prevent out-of-stocks and overstocks is a challenge for most service providers. A lack of real-time sales data means buying decisions become delayed, which becomes a serious inhibitor for a service provider trying to keep up with consumer demand. Virtual parts inventory across brands will create a new business model for point-of-sale systems made possible through telematics and remote wireless diagnostics. Integrating storefront and e-commerce business will coordinate ease of transaction, returns, OEM warranty, and customer relations.

- **Standard Warranty Process Across Brands** — Standardized warranty management provides the opportunity to enhance the customer experience by automating the administration of terms and contracts. Also, warranty information is an important source of “on-the-ground” failure data, which is critical for future OEM product designs. Standard warranty process across brands can help service providers reduce the total cost of ownership in warranty claims, and utilize data that can be used by OEM product engineering teams to ensure the development of high-quality products. It will help customers understand how their products perform regarding competitive offerings, identify factors that affect warranty cost, and confirm the acceptability of products from a performance and serviceability point of view.
Future Technician and Educator Innovations

TMC’s Professional Technician Development and Educator Committee’s envision the following innovations as playing a transformative role in the next generation of future trucks:

- **New Approaches to Technician Recruitment** — According to the U.S. Bureau of Labor Statistics (BLS), there will be a 9.2 percent increase in the need for heavy truck service technicians by the year 2022 over 2012 levels. — 67,000 positions are anticipated in 2022 due to growth or replacements. For bus and truck mechanics/diesel engine specialists, the projected increase is 8.6 percent above 2012 levels for the year 2022 — 75,100 positions are anticipated in 2022 due to growth or replacements. The trucking industry needs to investigate and implement new approaches to recruiting the next generation of truck technicians. Greater efforts should be made at the elementary, middle and high school levels to grow interest among students in seeking a career in commercial vehicle maintenance, repair and engineering. Cutting-edge use of social media, outreach to parents and guidance counselors, and awareness campaigns to the general public will all need to be employed to help alleviate the growing shortage.

- **Greater Emphasis On Technician Matriculation** — Most fleets use a thoughtful approach in the hiring of technicians. However, many of these same companies take a minimalist approach to matriculation. This can lead to poor performance, unacceptable conduct issues and poor employee retention. Industry should encourage fleets to ensure all newly hired graduates of technical trade schools make a successful transition to the next level of their career objectives. Implementing TMC matriculation guidelines from orientation to assimilation will help both managers and new technicians during the transition process.

- **Improved Technician Training Methods** — There is a strong need for technicians because of industry growth as well as openings associated with turnover and retirement. This, coupled with the pace of changing truck technology, provides a challenge to managers in finding interested and qualified technicians to fill these positions. The trucking industry needs to establish a method to develop technicians with appropriate skills. One key resource to this end should be local and national career/technical programs. Standards from the National Automotive Technician Educational Foundation (NATEF) should provide task training that will meet most of the required skills. New training modules should be developed that are relevant to today’s fleet and service provider shop needs, using appropriate media and presentation methods that will be most applicable to the next generation of technicians. Virtual / simulator training on engine, transmission and vehicle system repair would help make technicians more productive on the shop floor, while gaming style training aids may reinforce lessons learned.

- **Wearable / Digital Tools and Technology** — Wearable technology and digital aids will transform technician productivity, giving them more powerful and efficient diagnostic tools to effect repairs more accurately and rapidly. Some of these will take the form of apps for smartphone and tablet devices; others will emerge as stand-alone enhancements.
TMC Study Group and Technical Committee Leadership

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S.3 ENGINE
Chairman: Randy Tumbarello, Trimac

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S.7 TRAILERS, BODIES & MATERIAL HANDLING
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Chairman: Guy Warpness, WyoTech

PROFESSIONAL TECHNICIAN DEVELOPMENT COMMITTEE
Chairman: Mike Meredith, FedEx Freight

FUTURE TRUCK COMMITTEE
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