



TRANSPORTATION IS STEM



CONTENTS

03	INTRODUCTION
04	ALL THE WAYS WE MOVE
08	THE STEM IN TRANSPORTATION
10	SUPPLY CHAIN MANAGEMENT <ul style="list-style-type: none">▪ P&G▪ Pepsico
18	LOGISTICS <ul style="list-style-type: none">▪ Kenco
20	ALTERNATIVE FUELS <ul style="list-style-type: none">▪ First Energy
22	ENGINEERING <ul style="list-style-type: none">▪ Thompson Engineering
24	TRANSPORT <ul style="list-style-type: none">▪ CSX
31	RESOURCES/CONTRIBUTORS

INTRODUCTION

From the food in the grocery store, to products on retail shelves, to global travel, our way of life is highly dependent on transportation to get people and products where they need to be. Across most industries and within most companies, transportation is a key component of daily operations and critical to business success. Science and technology are rapidly evolving the way we move things around the world, creating an abundance of new career opportunities in transportation including logistics, supply chain management, data science, science and technology.

The U.S. transportation industry was worth \$1.36

trillion in 2022 and is expected to grow at a compound annual growth rate (CAGR) of 38.5% through 2027. Over 10 million Americans work in the transportation industry where trucking alone accounts for over 72% of the freight transported by the industry.

If you haven't considered the transportation industry as a potential STEM career path, it's time to take another look. In this ebook we will explore the many opportunities and career paths in the transportation industry that are fueled by science, technology, engineering and math (STEM). Join us as we take a trip through the transportation industry. We hope you enjoy the ride!

SPACE TRAVEL

The logistics of space missions require a large team of workers with a variety of skills including designers, engineers, and scientists. Pursuing a degree in a relevant field, such as aerospace engineering or physics, is a common route into the space sector. Advanced degrees, such as a Master's or Ph. D., may also be required for certain positions.



THE WAYS WE MOVE

MASS TRANSIT

Subways/rapid transit Rapid transit or mass rapid transit, also known as heavy rail or metro, is a type of high-capacity public transport that is generally found in urban areas. A rapid transit system that primarily or traditionally runs below the surface may be called a subway, tube, or underground. There are 15 heavy rail rapid transit systems in the United States. The New York City Subway has the greatest number of stations with 472. STEM careers in mass transit include logistics, engineering, software development, accounting and more.



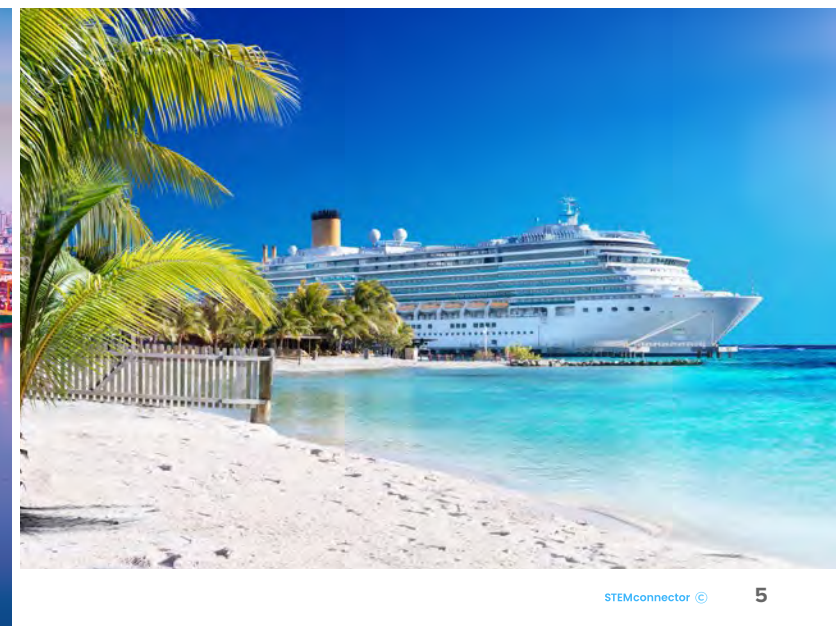
Buses The bus industry relies on STEM professionals for the most effective ways of transporting people safely and efficiently to their destinations. With almost every major city in the United States having some form of public bus transportation, be it conventional buses, bus rapid transit (BRT), or intercity buses, individuals with skills in data analysis, technology and logistics are in high demand.



MARITIME (WATER) TRANSPORT

Cargo Shipping Cargo shipping is typically used to refer to the transportation of commodities by large ships from seaports. As shipping is the cheapest mode of transportation of goods per ton, it is widely preferred for long distance transportation and causes less environmental pollution. In 2020, the global cargo shipping market was 10.85 billion tons and is expected to rise to 13.19 billion tons by 2028.

Travel and leisure Prior to the pandemic, the cruising industry transported on average over 19 million people worldwide per year. Today, the industry is expected to exceed that number by the end of 2023 and continue to increase with the coming years. With the goal of reaching carbon neutrality by 2050, the need for a skilled STEM workforce is greater than ever, providing an abundance of career opportunities in renewable and alternative energy, environmental sustainability, and more.



AIR TRAVEL

Commercial Airlines The US airlines employ 784,310 total employees and transport over 740 million passengers per year. Airlines have an ongoing need for technicians, engineers, air traffic controllers, meteorologists and pilots in addition to customer facing roles. Relevant fields of study for a pathway to the aviation industry include a Bachelor Degrees in Aviation, Aeronautical Science, Aerospace, Air Traffic Management, Meteorology and Aviation Business Administration.



Aircraft Manufacturing Lockheed Martin Corporation and The Boeing Company are two of the biggest airplane manufacturers in the world. The aircraft industry is extensive and includes companies that build and manufacture aircraft parts. The job outlook for careers in aerospace is strong—the aerospace industry has traditionally been a significant contributor to the global economy and a consistent source of high-paying jobs. According to the U.S. Bureau of Labor Statistics, aerospace engineer employment is projected to grow 6% from 2021 to 2031.



Air Freight Top 10 air freight companies include DHL Aviation, FedEx Express, UPS Airlines, Emirates SkyCargo, Cargolux Airlines & Cathay Pacific Cargo. Career pathways with a freight company include engineering, logistics, aviation and more.

GROUND TRANSPORT



Heavy Equipment and Agriculture

Modern agriculture utilizes a wide variety of heavy equipment on a daily basis both in the production and transportation of animal products and produce. Innovations in electrical engines and alternative fuel sources have opened up new career pathways in development and manufacturing. With a growing market and labor shortages the Heavy Equipment industry provides a plethora of career opportunities in a wide variety of STEM fields.

Fleet-freight Fleet operations are a division of the trucking industry where multiple trucks are operated by the same business entity. The majority of the trucking industry comprises many small businesses, each usually operating a fleet of 20 or less trucks at a time.



Automobiles **ELECTRIC, AUTONOMOUS, ALTERNATIVE FUELS**

The adoption of new technologies such as electric engines, alternative fuels, and autonomous driving is changing the face of the automobile industry. 2023 vehicle sales are expected to increase by 6% from 2022, estimating a total of 12.4 million vehicles sold by the end of the year. The automotive industry employs nearly 14 million people worldwide and offers career opportunities in STEM from engineering and computer science, to finance and so much more.



Railway—people transport

Compared to other forms of transportation, the railway provides safer passage and requires significantly less energy to operate. Railways are capable of transporting very high numbers of passengers at a time and some bullet trains can travel at speeds of up to 200 mph. As one of the most energy efficient modes of transportation, passenger utilization of the railway is expected to more than double by 2050. The rail industry has career opportunities ranging from engineering, urban design and manufacturing to so much more.



Trucking—freight The transportation industry employs over 14 million people in the United States alone and is expected to continue to grow over the next decade. The vast majority of products purchased online or in store were transported to their destinations via trucks. The industry offers career pathways in engineering, manufacturing, logistics, product development, and more.

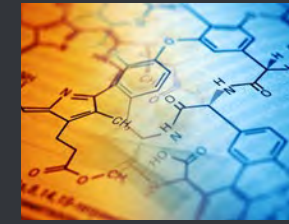
THE STEM IN TRANSPORTATION



If you are pursuing a STEM education or career path, there are many opportunities to leverage your STEM knowledge and skills in the transportation industry. Engineers, product designers, data scientists and physicists alike all have huge roles to play in infrastructure planning, vehicle design and operation, and much more. No matter what your passion is, there likely a career pathway in transportation!

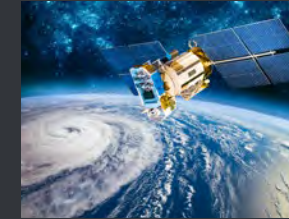
Chemistry

Degrees in chemistry or microbiology can lead to a future in the development of alternative fuels such as hydrogen and biodiesel, paving the way for the future by helping eliminate the need for fossil fuels and lowering carbon emissions.



Meteorology

Professionals with backgrounds in meteorology are able to report weather that might impact visibility, driving and vehicle performance. Meteorologists are able to improve transportation safety by detecting changes in weather that impact maritime and aviation travel as well.



Robotics

Robots are commonly used to transport goods within facilities, assist in loading and unloading freight, move parts in production lines, and even the delivery of packages. Because robots are able to perform tasks more quickly and accurately than humans they can reduce labor costs, improve fuel economy, and improve the overall efficiency of the transportation industry.



Logistics

Logistics in transportation is centered around managing freight as it moves through the supplychain. The primary goal of transportation logistics is to ensure that all goods are being transported as safely and efficiently as possible.



Supply Chain Management

Supply Chain Management goes hand in hand with logistics, focusing on the lifecycle of freight from beginning to end. Supply chain managers are tasked with the shipping of raw materials to different manufacturing sites during production to final delivery of goods to the consumer.



Data Science

Data Science helps the transportation industry provide the most efficient means of transportation from start to finish. Data Scientists are able to forecast traffic conditions, product demand, and help ensure that goods are being delivered on time through use of predictive analytics.



Artificial Intelligence (AI)

With the help of Artificial Intelligence, data scientists can keep track of traffic patterns and accidents to help improve shipping safety and reduce travel time. AI route planning and congestion forecasts have also contributed greatly to GPS by making real time travel updates and route adjustments possible, allowing for faster and more efficient transportation.

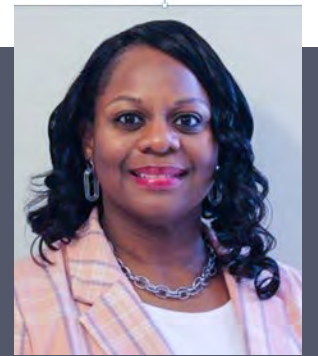




Meet the Women that Power P&G's Transportation Operations



SENIOR TRANSPORTATION INNOVATION MANAGER



Artisha Casey

Senior Transportation Innovation Manager at Procter & Gamble

As a Transportation Innovation Manager at Procter & Gamble, Artisha collaborates with her transportation team, IT team & systems developers to develop innovative solutions for the company's Transportation systems. These solutions ensure the company can efficiently fill trucks with products and deliver on time. Her efforts work to prevent empty retailer shelves and a positive consumer shopping experience.

“I enjoy the ability to team up with my co-workers & our business partners to find creative and unique ways to solve our transportation systems challenges. There are always a variety of new IT capabilities such as artificial intelligence (AI), being developed for our team to research and utilize. It is exciting to always be learning. The possibilities are endless!”



TRANSPORTATION OPERATIONS MANAGER



Lauren Elliott

Transportation Operations Manager at Procter & Gamble

Lauren Elliott is a Transportation Operations Leader as well as the Sustainability Pillar Owner for North American Transportation at Procter and Gamble. Her primary role is to manage synchronized transportation solutions for the P&G Customer Distribution Centers. Some of her key responsibilities include facilitating daily engagement between P&G internal warehousing and external carrier partners, utilizing analytics to ensure a strong balance between cost and service, and generating new ideas to transport products more sustainably.

“My favorite part about working in STEM is that every day presents a new challenge. To overcome these challenges, I collaborate with many different parts of the business. Through these relationships, we work together to make a positive impact on the company and the environment”

FROM SHIP TO SHELF

COMPANY SPOTLIGHT PROCTER & GAMBLE



The Procter & Gamble Company (P&G) is a global multinational consumer goods corporation headquartered in Cincinnati, Ohio with operations in 36 countries and over 100,000 employees worldwide. Founded in 1837 by William Procter and James Gamble as a soap and candle company, today's P&G specializes in a wide range of personal health, consumer health, personal care and hygiene products including well-known brands like Tide, Bounty, Old Spice and Olay.

P&G is reliant on a skilled STEM workforce. Engineers, scientists, IT experts and innovators are needed to drive the innovation that powers their brands and drives their business of providing products and services that improve the lives of the world's consumers for generations to come.

Transportation is a key component of P&G's operations. It includes strategic carrier sourcing, lane design, transit time, and weight optimization, supporting site flow by enabling just in time inventory management, and service as a core value to ensure products are always available to consumers. This requires fact-based problem solving, creativity, and data and analytics to deliver the best products and the best value to consumers, customers, and shareholders.



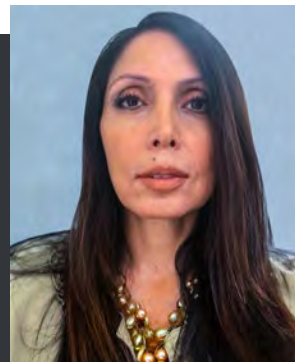
TRANSPORTATION CAPABILITY SENIOR MANAGER

Dina Burke

Transportation Capability Senior Manager at Procter and Gamble

Dina leads the Transportation Business Process Experts team, which develops systems capability within the organization and ensures the systems and processes used by North America P&G to move products and materials domestically and globally are executed with excellence. She uses her mastery of the supply chain and transportation systems to manage teams that lead and significantly contribute to the delivery of innovative solutions and “first-ever” capabilities and technologies within Transportation at P&G.

“In my pre-P&G career in Latin America and in my P&G career in North America, I have had several roles across various spaces. Each role has allowed me to develop new skills and proficiencies that have helped me to grow my expertise and given me the opportunity to help others develop their capabilities to excel in their work. Being flexible, driving change, and being bold in the face of new challenges has been key to my professional success.”



NORTH AMERICA FLEET OPERATIONS DIRECTOR

Kelsey Lanier

North America Fleet Operations Director at Procter & Gamble

In her position leading daily operations for P&G’s first dedicated fleet of trucks and trailers, Kelsey leads a team of people to deliver safety, compliance, service and cost excellence for the P&G Fleet. Kelsey’s role is focused on optimizing the flow of product from manufacturing to the consumer via the P&G fleet and maximizing the agility and resiliency of transportation operations.

“No two days are the same in our North America fleet, I enjoy growing, learning, experimenting and disrupting, in my transportation role. From automation and digitization to autonomous and electric vehicles, it’s an exciting time to work in transportation!”

What is a Fleet?

Fleet vehicles are groups of motor vehicles comprising all transport vehicles owned by the company, government or agency or other business. Sometimes, the vehicles are leased to transport companies for the movement of goods to customers.



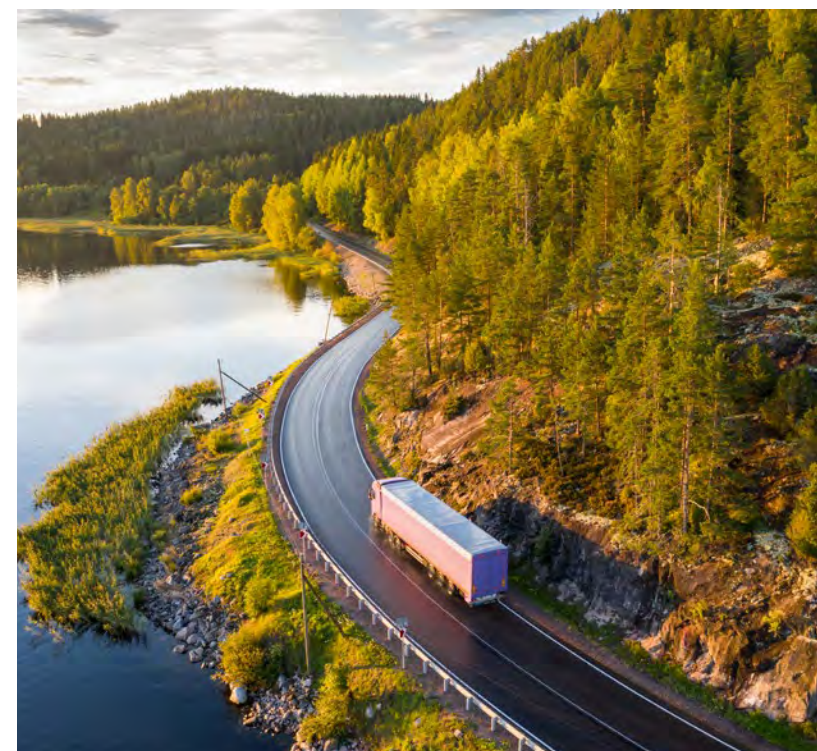
NORTH AMERICAN TRANSPORTATION PLANNER

Katia Milon

North American Transportation Planner at Procter & Gamble

Katia Milon is a North American Transportation Planner at Procter and Gamble. Her responsibilities are focused on creating shipments for finished products from P&G supply warehouses to our interplant sites and fulfillment centers. Katia also maintains daily communication with our ship sites to resolve capacity and timing issues, and communicates back with our transportation leadership team to ensure our full “end to end” operation is seamless.

“My position offers a diverse range of opportunities that allow me to use various skills throughout the day, including executing business transactions for P&G and leading value-driven projects that involve collaborating with multiple teams. For any college student pursuing a degree with STEM studies, the transportation sector offers many opportunities for growth.”





COMPANY SPOTLIGHT

PEPSICO

PepsiCo products are enjoyed by consumers more than one billion times a day in more than 200 countries and territories around the world. PepsiCo generated more than \$86 billion in net revenue in 2022, driven by a complementary beverage and convenient foods portfolio that includes Lay's, Doritos, Cheetos, Gatorade, Pepsi-Cola, Mountain Dew, Quaker, and SodaStream. PepsiCo's product portfolio includes a wide range of enjoyable foods and beverages, including many iconic brands that generate more than \$1 billion each in estimated annual retail sales.

Guiding PepsiCo is a vision to be the Global Leader in Beverages and Convenient Foods by winning with pep+ (PepsiCo Positive). pep+ is the strategic end-to-end transformation that puts sustainability and human capital at the center of how the company will create value and growth by operating within planetary boundaries and inspiring positive change for the planet and people.

SC How is your company or organization fueled by STEM?

PepsiCo is a founding member of the Million Women Mentors initiative. Our employees have participated in MWM across 11 chapters globally, pledging more than 23,000 volunteer hours since 2014. Our focus is on mentoring women and girls in STEM, particularly in underserved communities. Our commitment to MWM aligns well with PepsiCo's Diversity, Equity & Inclusion initiatives, including goals to achieve 50% of women in management roles globally by 2025, ensuring pay equity across employee

groups and helping to uplift historically marginalized groups around the world.

SC What types of STEM skill sets are most important to your organization?

PepsiCo's STEM professionals span across functions, including Accounting & Finance, Agriculture, Information Technology, Sustainability, Research & Development, Supply Chain, Engineering, Strategy & Transformation and Data & Analytics.

SC What career pathways does your company offer to individuals interested in pursuing a career in the transportation industry?

PepsiCo Transportation operates one of the largest private fleets in North America, moving product across its regions as well as transporting raw materials, such as potatoes, corn and oil, to our manufacturing facilities. Once the product has been made, Transportation is then responsible for moving the finished goods from the manufacturing facilities into PepsiCo's distribution network, and finally, into the market and onto store shelves for consumers to enjoy. In 2021, PepsiCo's company-owned fleet traveled approximately 1.2 billion miles worldwide to bring PepsiCo products to consumers. Without Transportation keeping the supply

chain moving, PepsiCo's manufacturing facilities, warehouses and distribution centers would become backed up with inventory and unable to operate – and consumers across the globe would not receive the products they enjoy.

SC What impact will your company, products or services have on the future of the planet?

PepsiCo is on a journey to achieve a variety of goals through our PepsiCo Positive (pep+) transformation, including an overarching goal of net-zero emissions by 2040. Reaching this goal, and others, means tackling the





COMPANY SPOTLIGHT

PEPSICO

environmental impacts of our operations and value chain head-on.

PepsiCo products reach store shelves across North America through a complex network of fleet and transportation operations. Because of our size and scale, Transportation has a direct impact on reaching our sustainability goals, with the adoption of zero- and near-zero emission vehicles playing an important role in this.

In December 2022, PepsiCo and Frito-Lay took delivery of the first all-electric Tesla Semi trucks in production. Future fleet announcements followed across the organization, including Frito-Lay's plans to deploy more than 700 electric vehicles by the end of 2023 and the completion of PepsiCo's first-ever third-party shipment on an electric vehicle.

As a leader in the trucking industry, PepsiCo division Frito-Lay is also committed to truck driver retention and comprehensive well-being. In May 2022, the company announced enhanced benefits for its network of nearly 20,000 Commercial Driver's License (CDL) and non-CDL drivers.

“You don't have to be an expert in transportation. There are many resources available at PepsiCo to get you started.**”**

-Mari Roberts,
CTP, Vice President of
Transportation, Frito-Lay



INDIVIDUAL SPOTLIGHT

Mari Roberts
CTP, Vice President of
Transportation, Frito-Lay

Mari Roberts' work is deeply rooted in numbers, data, and logistics. She is responsible for leading a team of 3,000 Frito-Lay employees, located both in the field and within the headquarters organization, and oversee safety, cost, operations, and the service performance of 31 Traffic Centers in the U.S. In addition to this, she manages all inbound raw materials and outbound third-party carrier operations.

SC Describe your pathway to the transportation industry.

MR I received my degree in Supply Chain Management from Arizona State University and naturally gravitated towards the Logistics and Distribution side of Supply Chain. My first role with Frito-Lay was in Transportation and I absolutely fell in love with it, including the dedicated Drivers who make so much of it possible. As I continued to expand my career and engage externally with the National Private Truck Council, I knew this is where I wanted to be.

SC What do you like most about the transportation industry?

MR I love the fast-paced, dynamic nature of the transportation industry. There are so many variables and challenges to overcome, and I learn something new every day. I appreciate the collaboration, benchmarking and camaraderie shared amongst my peers and friends in the industry as we continue to make our businesses more efficient and

our collective highways safer.

SC What do you like most about your current role?

MR As the Head Coach of this amazing team, I love the combination of developing the future strategy and mobilizing my team towards a common goal. The ability to establish the tone and create the organizational structure and operating model to support the 2,300 OTR Drivers is extremely gratifying. I also love spending time with our Drivers and recognizing them for their unique skill sets, including Regional and National Truck "Rodeos." Our Annual Million Miler Celebration is another exciting event for us, highlighting the men and women who reach one, two, or four million miles without a preventable accident. The talent and commitment of our Drivers literally keeps our business moving, and I'm proud to play a role in supporting them.

SC What impact will transportation have on

the future?

MR Without trucks, America stops – over 70% of all goods in the U.S. are moved by the trucking industry. Following COVID, there was an increased appreciation for the critical role our Drivers and the trucking industry play in keeping America's supply chains moving. I have no doubt that transportation will continue to play a significant role in the future as an essential part of our economy and livelihoods.

SC What is your advice for someone wanting to pursue a career in transportation?

MR Come join us!! You don't have to be an expert in Transportation to get started. There are plenty of us and resources available to support the learning curve; if you like solving problems, putting puzzles together, working with others, and want to feel like your work has purpose, you'll find the challenge so rewarding.



LOGISTICS



COMPANY SPOTLIGHT



Kenco Group supplies integrated logistics solutions that include distribution, eCommerce fulfillment, comprehensive transportation management and material handling equipment services, and customized supply chain solutions.

A key transportation solution created by Kenco is its Control Tower, an AI-enabled software solution for managing an entire trucking network. The comprehensive solution offers complete visibility with added intelligence, including smart exception management that proactively monitors for potential issues. A Market Rate module also quickly shows users how their trucking network is doing compared to the rest of the market. Additionally, when it is time to schedule truck loads, AI guides the carrier of choice to ensure the best result.

SC How is your company or organization fueled by STEM?

Kenco strives to deliver innovative logistics solutions that are customized for each customer, whether they come to us for transportation, distribution, material handling or a combination of logistics services. In order to deliver the best results, Kenco must thoroughly understand our customers' businesses, analyze where tech-enabled optimization can benefit them and design an operational plan. STEM skill sets are crucial for every step in this process.

SC What types of STEM skill sets are most important to your organization?

KEvery STEM skill set is necessary for Kenco's team. Not only do we need employees who specialize in specific types of science, technology, engineering, and mathematics, but we also need leaders who are successful problem solvers and critical thinkers across all levels of our organization. Creativity and curiosity also lead to advancements in logistics, and we encourage these attributes among all employees. We employ nuclear, mechanical, design, and industrial engineers who help us design new solutions, deliver customer automation, and continuously improve our various operations. Our IT group spans skills

such as cybersecurity, software engineering, product ownership, robotic process automation, network engineering, support and maintenance, hardware procurement and deployment, etc.

SC What career pathways does your company offer to individuals interested in pursuing a career in the transportation industry?

KOur transportation business unit has three major functions – brokerage, transportation management, and asset-based transportation. From entry-level account owners to drivers and freight brokers, we have numerous job opportunities. We have dedicated customer account managers, parcel managers, brokerage pod leads, transportation managers to business directors and Vice Presidents of Transportation.



INDIVIDUAL SPOTLIGHT

Kristi Montgomery
Vice President, Innovation, Research & Development

Kristi Montgomery is the executive leader of Kenco Innovation Labs, a dedicated team focused on industry digital transformation and innovation, identifying over \$60M in cost-saving opportunities in the previous five years. She has more than 30 years of logistics and supply chain experience within the technology realm, her responsibility focusing primarily on applied innovation and partnering with entrepreneurs, startups, and emerging technology

companies to pilot solutions and deliver business value for the 200+ customers that Kenco serves in North America.

SC Describe your pathway to the transportation industry.

KM I hold a BS in Organizational Management from Covenant College, and I am Certified Specialist in Design Thinking and Innovation as awarded by the Darden School of Business, University of Virginia. I have been fascinated by logistics and transportation for decades, so I have built my career at Kenco Group, first holding various IT roles and then growing my industry knowledge and skill sets to take on new roles as vice president of information technology and my role today as vice president of innovation, research & development.

SC What do you like about the transportation industry?

KM The ever-evolving nature of the industry opens so many doors of opportunity for careers and for every door, STEM plays a key role. Data is at the core of successful transportation companies, and the ability to analyze that data and draw insights is exciting to see.

SC What do you like most about your current role?

KM I am an innovator and futurist at heart - I love finding and building new solutions for our customers that deliver new insights, help them solve their big challenges, and overcome seemingly insurmountable issues. When that solution is delivered and the customer is highly satisfied, there is an incredible feeling of accomplishment.

SC What impact will transportation have on the future?

KM There will always be a need for the transportation of goods, so the future will continue to be dependent on the

transportation of freight. The increasing consumer demand for faster delivery and more online shopping will continue to drive the growth of this industry. New innovations around driverless trucking, platooning, electric vehicles, high speed trains, etc., will lead the way to changing legislation, new regulations, higher economic growth, and new jobs created.

SC What is your advice for someone wanting to pursue a career in transportation?

KM Go for it! Whether we are moving freight cross-country, over the ocean, or into space in the future, this industry is always growing, and it is at the very heart of commerce around the world. Every country has a need for transportation, and the recent pandemic proved the reliance we all have on this industry. There are so many career options within this space that there is certainly a place for you! [Learn more about Kenco here.](#)



EV CHARGING OFF THE GRID



FIRSTENERGY



Headquartered in Akron, Ohio, FirstEnergy includes one of the nation's largest investor-owned electric systems, approximately 24,000 miles of transmission lines that connect the Midwest and Mid-Atlantic regions, and a regulated generating fleet with a total capacity of more than 3,500 megawatts.

The 10 distribution companies form one of the nation's largest investor-owned electric systems, based on serving 6 million customers in the Midwest and Mid-Atlantic regions. Stretching from the Ohio-Indiana border to the New Jersey shore, the companies operate a vast infrastructure of more than 269,000 miles of distribution lines and are dedicated to providing customers with safe, reliable and responsive service.

FirstEnergy's electric company, Mon Power, is now powering an electric vehicle charger with renewable energy generated by an array of solar panels outside of Mon Power's headquarters building in West Virginia. The project includes 28 solar panels and a battery to store the electricity generated by the micro solar site. The battery supplies a Level Two EV charger capable of accommodating a vehicle for charging, which delivers eight to 24 miles of range per hour of charging.

Aside from a small cost to the company to maintain the site going forward, the installation will be a self-sufficient, standalone renewable power generator. Most other EV chargers in the state pull power from the electric grid where the energy source is a mix of nuclear, hydro, gas, coal and other power resources.



INDIVIDUAL SPOTLIGHT

Stephanie Ivey
Associate Dean for Research at the Herff College of Engineering
Director of the Southeast Transportation Workforce Center at the University of Memphis

Stephanie has an academic background in civil engineering and currently teaches courses related to transportation systems and transformative technologies. Stephanie's research focuses on the connections between transportation and livability of communities as well as transportation workforce development and the numerous STEM

career pathways into the transportation industry.

SC Can you describe your pathway to the transportation industry?

SI I had no idea I would be interested in transportation when I was in high school, and actually, even in college. I thought I wanted to pursue an environmental engineering career pathway, but ended up with an opportunity in transportation, decided to try it, and loved it! I do have to say that my earliest career interest as a toddler was in truck driving, so maybe everything came full circle!

SC What do you like most about the transportation industry?

SI My favorite thing about the transportation industry is how it is continuously evolving. There is always something new

and exciting to learn. I also love the fact that through the transportation industry, you can make a huge positive impact on people's daily lives.

SC What do you like most about your current role?

SI While I certainly enjoy the research, my favorite part of my current role is working with students and helping them better understand the transportation industry and the diverse career opportunities it provides. I love seeing students get excited when they learn something new, find a new interest, or find their fit in the industry.

SC What impact will transportation have on the future?

SI The impact is immeasurable. Transportation literally affects everything you can think of,

including our environment, safety, how we access jobs, school, medical care, how we support our communities, our economy, and how every single business conducts business and people receive food and other goods through the supply chain. Technology is transforming how transportation systems operate – this means that people choosing transportation careers will be at the forefront of this evolution – working each day to build the transportation system of our future.

SC What is your advice for someone wanting to pursue a career in transportation?

SI Learn as much as you can about the industry. You can literally do anything you are interested in within the transportation industry. Explore career paths and ask questions.



THOMPSON ENGINEERING

COMPANY SPOTLIGHT



Thompson Engineering is known for leadership on projects defining skylines, coastlines, and transportation lines. They are one of the first companies on project sites conducting environmental assessments, land surveys, and geotechnical studies. Design teams deliver buildable solutions to complex infrastructure and building requirements. Thompson Engineering also provides project management and construction management services, often making them one of the last teams to leave a project site. From start to finish, Thompson Engineering works together with clients in the planning, design, and construction of major transportation, economic development, and waterfront projects.

SC How is your company or organization fueled by STEM?

TE STEM is the heart of what we do at Thompson Engineering. We provide solutions,

innovations, critical thinking, and responsible design and oversight for our clients. This means STEM fuels our business at every level. Our success creates interesting and well-paying jobs in our communities.

SC What types of STEM skill sets are most important to your organization?

TE Science, technology, engineering, and math skill sets play a role in every service line Thompson Engineering provides. Science: geologists, for example, study soils, groundwater, and building materials for hazardous materials. Technology: our surveying teams are constantly improving the efficiency and safety of their work with drone technology and we're advancing our design practices with new digital platforms that eliminate the need to print plans. Engineering: from structural engineers to transportation engineers,

these professionals assist municipalities, economic developers, and private businesses in finding solutions that determine how our communities function. Math: is essential in design calculations, field testing, survey control, and even project management – you actually will use algebra here.

SC What career pathways does your company offer to individuals interested in pursuing a career in the transportation industry?

TE Thompson has opportunities for individuals at all levels – from entry-level to principal. Our transportation teams offer a variety of job

pathways: field inspectors to construction managers, drafters to Principal Bridge Designers, drillers to Geotechnical Engineers, and rodperson to survey party chief. Each technical specialty in our company has a defined path for career advancement. The diversity of our business allows our employees to explore multiple paths as they grow.

SC What impact will your company, products or services have on the future of the planet?

TE Our projects improve the quality of life in our communities. We build greenways and bike lanes that help reduce traffic congestion (which improves air quality). We design projects that improve the resiliency of our infrastructure and make us less vulnerable to flooding and storm damage. We restore natural habitats. We remediate contaminated sites. All of these provide for a healthier and sustainable future for our planet.



INDIVIDUAL SPOTLIGHT

Jennifer Stone

*Principal Engineer,
Thompson Engineering, Inc.*

As the Principal Engineer of Thompson Engineering, Jennifer Stone is responsible for building safe roads, bridges and buildings. Upholding a high standard of ethics to ensure that facilities are constructed in accordance with the plans and industry standards is critical. This requires her to study and learn many details in order to understand how things work – utilizing strong math skills and scientific reasoning.

SC What do you like most about the transportation industry?

JS You get to witness how your efforts improve the quality of life in your community. Safer roads, less traffic congestion, proper maintenance of our bridges, new greenways and bike trails. Everywhere



you go you can see your contributions. And I value the collaborative spirit that we have in the transportation industry in Tennessee – engineering consultants, contractors and owners all working together to deliver the best transportation system we can create.

SC What impact will transportation have on the future?

JS Life orbits around our transportation system. It's how we get to everywhere we need and want to go and how

everything gets to us. Doing this with the least possible impact on our environment and in the most cost-effective way is our greatest challenge for the future.

SC What is your advice for someone wanting to pursue a career in transportation?

JS There really are no limits. Find what inspires you and challenges you just enough then make a step in that direction. There are so many career paths that can fuel almost any passion. [Learn more about Thompson Engineering here.](#)



COMPANY SPOTLIGHT

CSX: A RAILROAD WITH PURPOSE, DRIVEN BY STEM

CSX Corporation is one of the leading Class I railroads in North America, operating a 20,000-mile rail network that connects major markets, ports, and industrial areas in 26 states, the District of Columbia, and the Canadian provinces of Ontario and Quebec.

CSX specializes in providing rail-based freight transportation services that contribute to economic growth, support a wide range of industries and facilitate the movement of goods across North America. The company plays a vital role in the supply chains of agriculture, automotive, chemicals, energy, intermodal (containerized freight), metals, and minerals industries. CSX transports raw materials that support industrial production as well as finished products and goods to supply consumer markets.

In addition to rail freight transportation, CSX offers intermodal services, which involve the transportation of goods using a combination of rail and truck. This integrated approach allows for efficient and flexible transportation solutions, combining the benefits of rail's medium- and long-haul advantages with trucks' accessibility for last-mile delivery.

CSX operates a large fleet of locomotives and diverse railcar types to meet the specific needs of different cargo. The company utilizes advanced technologies and systems to enhance efficiency, track shipments,

and provide real-time information to customers.

CSX is committed to corporate responsibility through safety, sustainability and community investment. The company focuses on reducing its environmental footprint by investing in technology and infrastructure to improve efficiency and reduce greenhouse gas emissions. It promotes safety through employee training and community engagement as well as safety-enhancing technologies. CSX also actively invests in communities along its rail lines, striving to be a

good corporate citizen and supporting local initiatives.

STEM FUELED OPERATIONS

CSX leverages STEM (science, technology, engineering, and mathematics) in several ways to enhance its business operations and maintain a competitive edge. By leveraging STEM, CSX harnesses the power of technology, innovation, and scientific knowledge to improve efficiency, safety, and sustainability in its operations. This allows the company to adapt to changing market demands,

optimize its resources, and deliver reliable transportation services to its customers. CSX relies on STEM to support its mission in the following areas:

- **Innovation and Supply-Chain Logistics:** CSX integrates advanced technologies and innovative solutions into its operations. This includes leveraging data analytics, machine learning, and artificial intelligence to optimize train scheduling,

route planning, and asset utilization. STEM professionals play a crucial role in developing and implementing these technologies, improving efficiency, and reducing costs.

- **Railroad Infrastructure:** CSX relies on engineering expertise to design, construct, and maintain its extensive rail infrastructure. Civil engineers, structural engineers, and other STEM professionals contribute to the planning, inspection, and maintenance of rail lines, bridges, tunnels, and related structures. They ensure the safety and reliability of the network, while also exploring new ways to enhance infrastructure resilience.
- **Safety and Security:** CSX prioritizes safety in its operations, and STEM plays a significant role in achieving this goal. The company employs safety engineers, data analysts,

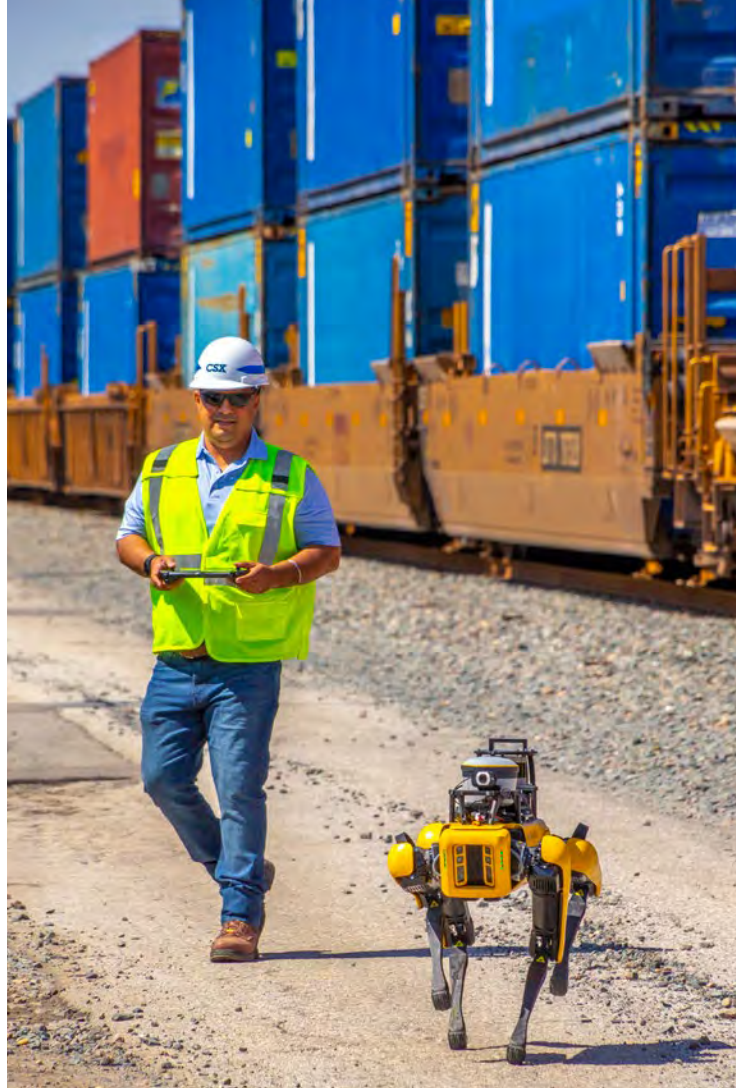
and researchers who use statistical analysis and modeling to identify risks, develop safety protocols, and implement measures to prevent accidents. They also work on improving the security of the rail network against potential threats.

- **Environmental Sustainability:** CSX focuses on reducing its environmental impact and promoting sustainability. STEM professionals, including environmental scientists and engineers, contribute to the development and implementation of eco-friendly practices. They explore ways to minimize emissions, optimize fuel efficiency, manage waste, and conserve natural resources. CSX also invests in alternative energy sources and explores new technologies for sustainable locomotion.

- **Technological Infrastructure:** CSX relies on robust information technology (IT) infrastructure to manage its operations effectively. STEM experts in computer science, software engineering, and cybersecurity ensure the reliability, security, and efficiency of CSX's IT systems. They develop and maintain software applications, network infrastructure, and cybersecurity protocols to support various aspects of the business, such as logistics, inventory management, and customer service.

- **Workforce Development:** CSX recognizes the importance of nurturing a skilled STEM workforce. The company collaborates with educational institutions, vocational programs, and industry organizations to promote STEM education and training. CSX provides internships and career development opportunities to encourage young talent to pursue careers in STEM fields, ensuring a pipeline of skilled professionals for the company's future.





- **Supply Chain and Logistics:** CSX operates within a complex supply chain ecosystem. Skill sets related to supply chain management, logistics optimization, and inventory management are important. Understanding of logistics software systems, transportation planning, and optimization algorithms can contribute to streamlining operations and improving efficiency.
- **Engineering (Civil, Mechanical, Electrical, and others):** Various engineering disciplines play a vital role at CSX. Civil engineers

are essential for the design, construction, and maintenance of railroad infrastructure, including tracks, bridges, and tunnels. Mechanical engineers contribute to the maintenance and optimization of locomotives and railcars. Electrical engineers support the electrical and signaling systems. Proficiency in engineering principles, relevant software tools, and project management is valuable.

SKILL SETS

- **Environmental Science and Sustainability:** As a company committed to environmental

sustainability, CSX values skill sets related to environmental science, sustainability practices, and regulatory compliance. Knowledge of environmental impact assessment, waste management, emissions reduction, and conservation strategies is beneficial, as is familiarity with sustainable technologies and alternative energy sources.

- **Data Analysis and Modeling:** CSX relies on data analysis and modeling to optimize its operations. Skill sets related to data analytics, statistical analysis, and predictive modeling are highly valuable. Proficiency in tools and programming languages such as Python, R, SQL, and data visualization software is beneficial for extracting insights from

large datasets and making informed decisions.

- **Information Technology (IT):** CSX's IT infrastructure is essential for managing its operations efficiently. Skill sets related to network administration, software development, database management, cybersecurity, and IT project management are important. Proficiency in programming languages, system administration, cybersecurity protocols, and knowledge of IT best practices are valuable in ensuring the reliability and security of CSX's technological systems.
- **Robotics and Automation:** CSX leverages robotics and automation in various aspects of its operations, such as train inspections and maintenance processes. Skill sets related to



robotics, automation technologies, and control systems are valuable. Proficiency in programming languages, sensor technologies, and knowledge of robotics applications in the transportation industry can be advantageous.

CAREER TRACKS FOR GROWTH

CSX offers a variety of career pathways for individuals interested in pursuing a career in the transportation industry. These pathways include internships, leadership development programs, and direct hire opportunities. Here's a brief overview of each:

- **Internships:** CSX provides internships that

allow students to gain hands-on experience and insight into the transportation industry. Internship opportunities are available in various fields, including engineering, operations, supply chain, information technology, finance, and marketing. These internships offer valuable learning experiences and the chance to work on real-world projects, contributing to personal and professional growth.

- **Leadership Development Programs:** CSX offers leadership development programs designed to nurture talent and prepare individuals for leadership roles within the company. These programs provide

structured training, mentoring, and rotational assignments across different departments and functions. Participants have the opportunity to develop a broad understanding of the business while honing their leadership skills. Leadership development programs at CSX are typically tailored to specific areas such as operations, engineering, technology, and finance.

- **Direct Hire Opportunities:** CSX provides direct hire opportunities for individuals with varying levels of experience and qualifications. The company seeks candidates for positions in areas

such as engineering, operations, technology, supply chain, finance, marketing, human resources, and more. Direct hires join the company full-time and have the chance to contribute to CSX's operations and growth from the onset of their careers.

Regardless of the entry point, CSX offers ongoing professional development and growth opportunities to its employees. The company provides training programs, mentorship, and continuous learning initiatives to support career advancement within the organization. Employees are encouraged to expand their skills, take on new challenges, and pursue long-term career goals within the transportation industry.



INDIVIDUAL SPOTLIGHT

Judy Covington Poole

Technical Director, CSX

As a Technical Director at CSX, Judy Covington Poole works with a talented team of individuals in the Product Engineering organization. Leveraging her technical expertise, Judy guides teams in solving complex problems and overcoming technical challenges. In addition, she plays a key role in the planning and execution of projects. Judy contributes to the design and implementation of technical strategies, ensuring alignment with organizational goals and establishes project timelines, milestones, and deliverables, all while considering the technical

feasibility and resource requirements. Throughout the project lifecycle, she monitors progress, identifies potential risks, and implements appropriate measures to mitigate them.

SC Describe your pathway to the transportation industry.

JC My pathway in the transportation industry was motivated by growing up in a city with a large logistics framework. I was drawn to the railroad. My family played various roles in the transportation industry. Learning to navigate products from point (a) to (b) intrigued me and it was a natural progression to apply my analytical and technical skills to the transportation industry.

SC What has been the biggest challenge for you professionally?

JC The biggest challenge for me professionally has been valuing myself and

knowing my worth. In STEM and transportation, you must recognize your unique talents and know you have a voice which brings value to conversations. Everyone should be heard and play a part in the success of an organization. Diversity of thoughts produces innovative ideas and solves complicated problems. We should never feel intimidated and afraid to share our thoughts. I learned to overcome my fears, take risks, and use my voice.

SC What do you like most about the transportation industry?

JC For the railroading industry, what I like most is the simplicity of the engineering of the rail and how it has stood the test of time and continues to evolve with innovative technologies. It is extremely exciting.

SC What do you like most about your current role?

JC What I like most about my role is the mentorship I receive and the mentorship I provide to others. The mentorship produces new learnings for me, and it helps to shift my paradigm. Having others share their experiences and life lessons gives me new perspectives and viewpoints. I enjoy listening to others and I hope my viewpoints are intriguing to them as well.

SC What is your advice for someone wanting to pursue a career in transportation?

JC My advice to anyone pursuing a career in transportation is to educate yourself in all the opportunities available in transportation. I would advise directing your attention to the wonderful things happening in the rail industry, specifically at CSX, and investigating how STEM is driving innovation in the transportation industry.



INDIVIDUAL SPOTLIGHT

Ashley Monroe

Sr. Financial Analyst, CSX Transportation

As Sr. Financial Analyst at CSX Transportation, Ashley Monroe uses math every day to help manage budgets totaling over \$2 billion dollars. Her job requires her to evaluate large amounts of data, build expense models, and run calculations to determine if the company is making good financial decisions; whether that's where to spend money or when to save money.

SC Describe your pathway to the transportation industry.

AM After graduating from Michigan Technological University with a BS in Mechanical Engineering Technology, I started in the Locomotive department working in our repair facilities to ensure that we

had reliable locomotives to run our trains (trains can't go anywhere if they don't have the power to pull them). From there, I joined our Locomotive Engineering group where I led our road fleet (the locomotives that pull our trains from one destination to the next) where I had to look at the big picture of reliability.

I went back to school to get my MBA so that I could learn about what it takes to run a business. I am currently on the Finance team where I have held roles supporting both Sales & Marketing as well as Operations. My next career transition will be moving to our Technology department, working with the various communications and data systems on our locomotives.

SC What do you like most about the transportation industry?

AM We make a difference. We have a phrase at CSX that goes something like "If it's in your life, it's been on our rails," and literally we touch everything in this country whether it's from the cereal you ate

for breakfast, the car you ride in, the paper and pen you used to take notes, or chemicals needed to keep drinking water clean; we have probably moved at least some component of every product you use and that's something very unique for any business to get to say.

Q What do you like most about your current role?

A I like working with my business partners (people in other departments) and helping them come up with creative solutions to either get something that they need to do their job or to do something that will help CSX or one of our many customers.

Q What impact will transportation have on the future?

A Transportation is how we as humans and all of our stuff get around so the choices we make on what we use today will shape tomorrow. Freight rail specifically will have a positive impact on the future because we are

very efficient in moving big and heavy things which translates to not only keeping costs down but also keeping carbon emissions down and protecting the environment for future generations.

Q What is your advice for someone wanting to pursue a career in transportation?

A I would suggest studying something you are interested in first and then figure out how it can be applied to transportation. There's no "railroading" degree that I know of so you can study anything and apply it to a piece of the railroad; if you like fixing or building things study engineering, if you like money study finance or accounting, if you like coding study computer science, if you like selling things study marketing, we literally have departments for all of these areas and more as do most transportation companies. Figure out what interests you and the rest will fall into place.





INDIVIDUAL SPOTLIGHT

Farah Ramadan

Lab Scientist, Aramco Research Center-Detroit, Aramco Americas
While I am a lab scientist, very little of my work takes place in the lab. As a member of the Climate and Sustainability Group, my focus is primarily on conducting life cycle analyses (LCA). This involves modeling and visualizing emissions from various stages of oil and gas processes. My work overlaps with all four STEM fields, most notably science and engineering.

SC Describe your pathway to the transportation industry.

FR My undergraduate and graduate level education are both in chemical engineering, so I was well equipped to join Aramco Americas and conduct LCA work, and in the process take on transportation-related projects. For example, when quantifying cradle-to-wheel emissions of a fuel, we modeled vehicle emissions based on variables like the year, country, vehicle, and fuel type.

SC What has been the biggest challenge for you professionally?

FR I started working in the industry just last year, so I still feel new to a lot of this. On one hand, that makes my job feel even more exciting, but on the other hand, it can feel intimidating at times to be seated at a table with experts. I like to challenge myself, in these situations, to actively contribute to the conversation and ask questions whenever I can.

SC What do you like most about the transportation industry?

FR The transportation industry is constantly growing, and new technology and improvements are introduced regularly. A few months ago, I was studying marine engine propulsion for liquefied natural gas (LNG) shipping. I was initially considering 2018 data but when I updated my data to 2022, I saw dramatic changes in the propulsion technology used.

SC What do you like most about your current role?

FR In my role at Aramco, I can take on several different projects at once and showcase my work at conferences and seminars. Today, I am working on a dashboard to visualize vehicle fuel emissions but yesterday I was modeling midstream natural gas transport. This keeps my job interesting and challenges me to grow professionally.

SC What impact will transportation have on the future?

FR Transportation emissions make up 15% of global greenhouse gas emissions and 23% of energy-related CO2 emissions. This has environmental implications. The world continues to invest in cleaner and more sustainable modes of transportation, and it is satisfying to know that my work at the Aramco Research Center-Detroit contributes to this.

SC What is your advice for someone wanting to pursue a career in transportation?

FR Be comfortable with change. The transportation industry is evolving very quickly. If you're open to adapting to continuous technological innovations, you'll find transportation to be an exciting industry.

RESOURCES & CONTRIBUTORS

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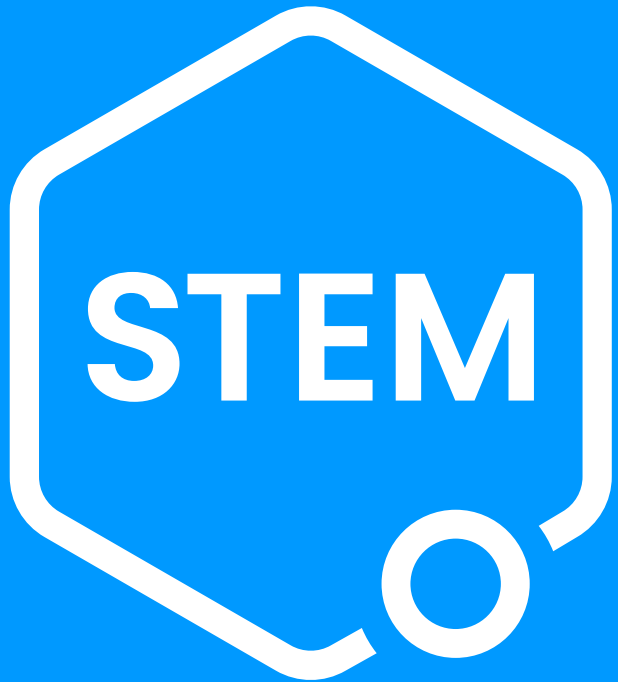
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