

SH&E Practices in India: A Conversation

To learn more about current safety, health and environmental (SH&E) practices in India, the American Society of Safety Engineers (ASSE) spoke to four of its members who reside there. In this conversation, Mohammed Abdul Mannan, Sandip Mukherjee, Sunil Pandey and Ravi Tammanur share their perspectives on what drives SH&E practices and implementation in India and how SH&E practices factor into their own occupations. They also discuss SH&E management approaches and training methods and offer suggestions for improving SH&E practices in India in light of the country's economic growth.

Please describe your occupation and the company for which you work.

Mannan: I work as a General Environmental Health and Safety (EH&S) Manager, Asia Pacific Operations, for Carrier Corporation (a United Technologies Company).

Mukherjee: I work as a Health, Safety and Environment (HS&E) training manager for ABB Lummus Global at the Fujian Refining and Petrochemicals Project in China.

Pandey: I am the Head of Safety and Environment at M/s HV Axles Limited, a subsidiary company of M/s Tata Motors in Jamshedpur, India.

Tammanur: I work as a Quality, Health, Safety, Environment and Training (QHSE&T) Manager at Chennai Container Terminal Limited, which is a division of P&O Ports Private Limited, United Kingdom.

Please describe your company's current safety, health and environmental (SH&E) staffing and resources.

Mannan: We have one full-time EH&S Manager at each facility.

Pandey: At M/s HV Axles Limited, there are three staff members in the Safety and Environment department. I work under the chief operating officer (COO), and two employees report to me. Funds and other resources are made available through the company's annual budgetary allotment.

Tammanur: There are two personnel below me. I report to the chief executive officer (CEO) of the terminal. Resources are available from the terminal, the regional office in Mumbai and also from Australia and the United Kingdom.

What is your company's general attitude toward SH&E practices in the workplace?

Mannan: Our company believes that providing a safe workplace is the right thing to do regardless of the financial return. A safe workplace protects employees, increases professionalism and elevates morale.

Pandey: Our management is very serious about safety and environmental issues. We are ISO 14001-certified, and we are pursuing OSHA 18001 certification.

Tammanur: Our company is very positive and proactive toward SH&E practices in the workplace.

India is growing at a significant rate, and it will become a great economic power in the coming future. As an SH&E professional, how do you strike a balance between this type of growth and SH&E practices?

Mannan: SH&E practices receive better recognition in light of India's rapid industrial growth and the increased presence of global Fortune 500 companies. SH&E professionals must strike a balance between workplace organization and SH&E practices, enable productive and cost-efficient energy and water conservation programs, reduce process waste and packaging and decrease operational SH&E costs.

Mukherjee: India may be growing at a significant rate, but the growth is not equal. The urban population benefits from the growth, but the rural population does not benefit at the same rate.

Organized sectors such as large factories and construction companies are slowly adopting SH&E practices into their system, but the unorganized sector like small entrepreneurs (engineering workshops or consumable goods producers) and builders do not have any clue about SH&E. These workers are only temporary, and they are earning their daily bread.

In a small workshop, you will often find three to four machines in a small room with no proper illumination, no personal protective equipment (PPE) for the workers, no stipulated work hours (normally, they work on a contract basis—more production, more money, no wages), no proper welfare facilities, no social security, no ergonomics concept and poor ventilation. Millions of people work this way. To reduce production costs, large factories or plants give their work to small entrepreneurs on a unit-price basis. The main company handles only quality control and assembly.

As per the definition of a factory, if more than seven workers are engaged in a production process and if power is used, only then will it be called a factory and will it come under the Inspectorate of Factories' purview. These small entrepreneurs never disclose their manpower, and they never follow any rules or regulations. Sometimes they pollute the environment, and you will even find child labor working in this sector.

However, as organized sectors grow, they are trying to improve their SH&E standards.

Pandey: In order to sustain the pace of India's growth, we must comply with SH&E provisions in every stage of our industrial operations. To help achieve this, the government, voluntary organization and management must review the progress made during the implementation of SH&E provisions and take corrective action if necessary.

Tammanur: There is a growing awareness about best SH&E practices and the need to be competitive in terms of SH&E performance as well. It is not very difficult to achieve a balance between the two.

Where is most of this growth taking place? It appears that the petrochemical and manufacturing industries in India have experienced considerable growth along with the services industry, specifically in management information systems (MIS) and financial management. How does this growth impact SH&E professionals in India and where do you think the use of resources should be focused?

Mannan: Growth is found in the automobile and information technology (IT) sectors and in the durable goods, manufacturing and healthcare industries. From a legal standpoint, more SH&E professionals will be required to promote SH&E awareness in India in the future.

Mukherjee: The manufacturing and petrochemical industries are booming, but communication industries, road and rail transportation and infrastructure development are experiencing growth as well. For example, a \$30 billion national highway project is currently in development.

The construction industry has created a huge need for SH&E professionals. Many foreign companies are also involved in this business. To complete important projects on time without any trouble, project management personnel are trying to take care of SH&E. The main problem industries experience though is an unskilled or semi-skilled workforce that does not have enough education and training. It can be difficult to convince them that in a first-track project in which modern machinery is used, the hazards are different, and safety measures are a must.

I think that more vocational training institutes are required in addition to formal education so that people will enter the industry with at least some prior knowledge.

Pandey: It is true that petrochemical and manufacturing industries in India have experienced considerable growth along with the service industries in eastern India, particularly in Orissa and Jharkhand. Naturally, SH&E professionals need to be updated and to share their experience with each other to cope with the rapid growth of manufacturing industries.

Tammanur: Growth is definitely taking place in the oil and gas sector. In addition, the services sector like our export/import trade is experiencing voluminous growth, and international SH&E standards must be replicated on an urgent basis. The growth far exceeds the pace at which SH&E culture could be changed here in India.

From your perspective as an SH&E professional in India, how does one enter the profession? Is it generally through specific SH&E degree programs at universities or is it the result of a job assignment? It seems that most of the SH&E professionals in India hold degrees in one of the hard engineering sciences and then enter the profession through a job assignment.

Mannan: Those with an engineering background are preferred, but the best way to enter the SH&E profession is to start out as an SH&E apprentice and then to progress into SH&E specialist programs.

Mukherjee: About 12 to 15 years ago, no degree course was available in India. There was only a diploma course in industrial safety or in industrial hygiene. The regulations only required a factory to have one nominated safety officer if there were more than 500 workers. Companies would usually nominate someone from their human resources department, and this person would handle regulatory requirements such as the Minimum Wages Act, the Workers' Compensation Act, the Factories Act (1948) and so forth. The nominated person would also liaison with factory inspectors and help the company to settle workers' compensation in case any accidents occurred. Everything was reactive.

Now the revised Factories Act states that there must be a designated and qualified safety officer in a factory with more than 500 employees. As a result, companies are employing qualified safety officers. All factories must submit their safety officer's profile to the local inspectorate of the factory office.

Several universities now offer degree courses in industrial safety, and different state councils provide diploma courses in safety. If students meet the minimum qualification requirement, they can take an entrance examination or apply for direct admission.

Requirements for qualified safety personnel are still new, so there is plenty of opportunity for the job. Engineers with degrees or diplomas from other disciplines and recent science graduates will study safety courses for better job options.

Pandey: In India, as per the Factories Act and State Factories Rules and apart from a degree in science or engineering, a diploma in safety management is a must—only then does one become eligible to enter the profession.

Tammanur: Most SH&E professionals do have a hard engineering science degree and then acquire additional qualifications by working on an SH&E job. They also enter the profession once they acquire SH&E qualifications after receiving their degree.

What has influenced SH&E system development in India?

Mannan: I believe that multinational companies in India have influenced SH&E system development.

Mukherjee: The following factors have influenced SH&E system development in India:

1. **Improved Mass Media Coverage.** Daily incidents are reported through television, radio and newspapers, which help everyone to stay informed. People can easily access information about traffic accidents, food poisonings, industrial accidents, environmental concerns, investigation outcomes and photographs. This increases public awareness.
2. **Government Participation.** As the world gets smaller because of the media's prompt reporting, the government is compelled to impose more stringent acts and monitoring. For example, in 1998, a fatality occurred in a well-known steel manufacturing company. A rack carrying coal for the steel plant hit a railway shunting crew at its siding. The local court ordered the penalty and imprisonment of the company's managing director, and the news was published in all of India's leading newspapers.
3. **Public Awareness.** As people become more aware and as compensation acts become stricter, companies are forced to settle those compensations, which can sometimes be costly. To avoid hassle, companies are trying to maintain some standard.
4. **Open Market Policy.** Since the market is open for foreign investments, many large Western companies are working on projects in India. These companies have their own safety standards, and they will not compromise their standards or their reputation. So local companies and employees are also encouraged to follow good safety standards, and in this way, they are learning more.
5. **Education and the Availability of Tools.** Today the common workforce has at least some level of education, so it is easier for them to understand the value of safety. Nominal safety equipment is also readily available on the market. Workers who return from overseas assignments, especially those in Gulf countries, are already trained in safety, and they help to spread the safety culture here.

Pandey: The rapid socioeconomic growth has greatly influenced the SH&E system in India by way of government legislation such as the Factories Act, the State Factories Rules and Environment Protection Act.

Tammanur: The phenomenal growth of the oil and gas and allied services sectors has influenced SH&E system development. This is in turn reflected in the services sector since there is a migration of SH&E professionals from oil and gas to services, as in my case.

Do SH&E practices and implementation vary from region to region in India?

Mannan: Yes, they do vary depending on the industrial area and location of the plants. However, SH&E practices and implementation at Carrier Corporation will remain the same.

Mukherjee: Yes. There are several factors for this variation.

There is a single factory act in India, and most recently, a separate construction act has been in place. Now each state government prepares rules based on the minimum requirements stated in those acts. So per the rules, standards and their implementation may vary from state to state. This applies to other acts as well.

Different bodies in each state monitor the implementation of SH&E acts and rules. For example, the Inspectorate of Factories (for the Factories Act), the Pollution Control Board (for the Pollution Control Act) and the Commissioner of Labor monitor workers' compensation and minimum wages. Sometimes these agencies need to cover large areas or a large number of factories, which sometimes makes it impossible for them to perform proper monitoring. For example, factory inspectors are supposed to visit all factories in their specific area at least once a year. But sometimes, inspectors need to cover so many factories that visiting once a year is unfeasible. They then have to rely on the return that factories submit, and factories sometimes take advantage of this. This is a problem for the Pollution Control Board as well. Since they lack manpower, they cannot properly monitor their areas. They must rely on the samplings and reports that factories provide.

Pandey: I believe that government rules and regulations apply equally in our country, and therefore, SH&E practices do not vary from region to region.

Tammanur: I feel that SH&E practices and implementation in India do not vary much. The underlying culture is the same towards SH&E best practices, and whatever practices are followed in daily life are reflected in the job as well.

Does your company view SH&E practices as an investment or as an expense?

Mannan: Carrier Corporation views SH&E practices purely as an investment. SH&E practices are part of the business, not add-ons.

Pandey: Our company is one of the most enlightened in the country, so SH&E practices are viewed as an investment.

Tammanur: My company definitely views SH&E practices as an investment. There is a separate budget for QHSE&T, and so many audits from all over the world make management view SH&E as an integral part of the job.

SH&E programs in the United States are usually driven by regulation, workers' compensation and litigation. Are these issues also important in India or do you face a different set of challenges?

Mannan: United Technologies Company (UTC) believes that SH&E issues should become and remain a priority for management throughout the business. SH&E programs are driven by top management commitment, positive behavior and by making SH&E practices a core business value. Regulations alone can never achieve full compliance.

Mukherjee: SH&E programs in India are also driven by regulations such as the Factories Act, the Pollution Control Act, the Workers' Compensation Act and the Construction Act. These acts are implemented by rules of the state governments. Legally, these are important, but because of a lack of close monitoring (and staffing), a different bureaucracy and a lengthy legal process, things are not monitored effectively, especially in unorganized sectors like small private construction activities, public utilities, distribution, construction or maintenance.

The implementation of the Construction Act also comes under the purview of the factory inspector. They are already overloaded with existing factories, so how they will monitor construction activities? SH&E practitioners in construction industries are still struggling to get it right. It ultimately depends on the principal employer's willingness.

Pandey: In India, SH&E programs are usually driven by regulations and workers' compensation, and there are very few cases of litigation.

Tammanur: Regulation, workers' compensation and litigation do not impact the SH&E scenario much here. Workers' compensation premiums generally do not have any impact on a company's SH&E practices because there is no system like class rating or experience modification.

The challenges are more toward changing people's behavior and the way SH&E is viewed as a part of business.

How does your company ensure that it complies with local, state, federal and international regulations?

Mannan: UTC undergoes third-party compliance audits, sustains ISO 14001 and OHSAS 18001 certifications and adheres to its own SH&E practices, which are more stringent than international regulations.

Pandey: Compliance with local, state, federal and international regulations is ensured by internal periodic audits at different levels. Besides internal audits, government agencies and departments conduct periodic audits of our machines, equipment and other SH&E arrangements. To ensure compliance, periodic audits are also conducted by an outside independent agency such as Price Water Cooper House.

Tammanur: We have Web-based access to all required regulations, and there are frequent audits and inspections by the regional office, the head office in the United Kingdom and local regulatory

authorities. P&O Ports Private Limited's policy is to comply with all legal regulations as part of our business.

What is your view of SH&E inspections in India? Do you feel that they are effective in addressing and correcting SH&E violations?

Mannan: Generally, the regulatory inspections are non-value-added, and there is no follow-up on inspection findings.

Mukherjee: Inspection by law enforcement authorities is minimal. Companies usually take care of those issues highlighted by the authorities, but they fail to maintain standards because of a lack of follow-up inspection. Things are still not 100% self-driven for most of the factories. Sometimes you will find cat-and-mouse games. For example, factories equipped with pollution control devices will not operate those systems to save on running costs. But on the day of a scheduled inspection, the enforcing authority will find all of the equipment in working order.

This statement does not apply to all companies. There are some well-known companies that always try to follow the right system.

Pandey: In my opinion, SH&E inspections in India are satisfactory and effective.

Tammanur: Unless there is a commitment from top management, mere inspections never play a part in compliance.

In addition to safety and health concerns, SH&E professionals in India must work with environmental challenges not faced by your colleagues in other countries. How do you address these exposures?

Mannan: Since UTC has extensive global operations, technology transfers and "Virtual University" sessions are used to keep everything up-to-date.

Mukherjee: Today, before a factory is set up, an environmental study is conducted and submitted to the concerned law enforcement agency for approval. In addition to that, onsite and offsite emergency plans must be compiled and submitted to the Inspectorate of Factories, the Pollution Control Board and to the Fire Department for approval. Once the authorities approve the plans and perform a physical inspection, construction can begin.

But of course, more awareness is required. People still laugh when SH&E professionals ask them to put a drip tray under engine-driven equipment to avoid soil contamination. Management still does not properly address the segregation and proper disposal of hazardous waste. However, established factories and hospitals do make an effort to follow the procedures. Large cities are monitoring motor vehicle exhaust, and that is going well. But in small towns and villages, nothing is being done.

Pandey: Environmental challenges in our country are relatively new, but environmental concerns have gained momentum since 1974. Much government legislation regarding the environment has been developed. Environmental topics have also been introduced into the school curriculum. As SH&E professionals, we have worked to improve environmental conditions based on government regulations and guidelines.

Tammanur: Environmental awareness is very high in India, and we are definitely moving in the right direction. U.S. Environmental Protection Agency (EPA) and United Nations Environment Program (UNEP) directives and guidelines are viewed seriously here, and there is a conscious effort to address them among industries.

How does India's approach to SH&E management differ from that of other nations with which you have worked?

Mannan: Indian business leadership must understand that appointing an SH&E professional will not solve all SH&E issues. Top leadership should set "SH&E Rules of Engagement," hold operating managers accountable and incorporate SH&E performance as part of performance pay.

UTC's safety practices reduce injuries and fatalities, which result in lower workers' compensation costs. It considers its reputation as an extremely ethical company to be its most valuable asset. Working conditions that might compromise that reputation are not tolerated or accepted.

Mukherjee: In India, the main issue is monitoring for implementation. As far as laws are concerned, they are well-defined, and they cover all of the aspects.

Management at new companies, especially process industries, is becoming more influenced by SH&E concepts and is taking more interest in hazard and operability (HAZOP) and other feasibility studies. Silo organization concepts are also changing even though just 12 years ago, engineers felt it insulting to wear safety helmets.

But the bottom line is cost. Nobody wants to spend extra money for effective SH&E implementation unless they have to. In my opinion, the pace of improvement in SH&E management is still far slower than the pace of industrialization. Some improvement has been made in the mining industry, but I cannot compare SH&E standards to those of other countries in which I have worked.

I have worked in both Gulf and North African countries. Most of the main companies working there are from the Western world, so standards are automatically maintained and implemented. But at local companies in North African countries, there is no SH&E implementation by management. In the Gulf countries, you will always find a certain standard level because of the availability of good equipment and funds.

In India, some companies are voluntarily trying to improve their safety standards, and they have sound management systems in SH&E. For example, during civil work in construction, laborers generally carry the load (soil or concrete) on their heads. The buckets that contain the load are oval-shaped at the bottom, so it is nearly impossible to carry a head load while wearing a safety helmet. In response to this, a leading construction company's SH&E department designed a helmet with a projected round band so that the head load can rest on it. This type of helmet is now widely used in India. It is in this way that professionals are seeking new alternatives. The initiatives are there, but we need more reciprocation.

Pandey: Except for a few isolated cases, the general approach to SH&E management in India is broadly the same as that of other nations.

Tammanur: I have worked in Kuwait, and the basic difference I found there is related to the expatriate manpower in the Gulf states, which have to comply with local regulations. Otherwise, the approach of the local populations in India and in Kuwait is the same toward SH&E.

What kinds of training methods does your company use to train its SH&E employees, managers and supervisors?

Mannan: We use classroom training, training led by SH&E professionals, seminars and cross-functional audits.

Pandey: From time to time, SH&E employees will attend short-term training programs, seminars and conferences on various SH&E aspects, which the National Safety Council of India, the Central and Regional Labor Institutes and other professional organizations provide. SH&E employees, along with the help of outside professionals, will organize and conduct in-house training for supervisors and line managers.

Tammanur: Training needs are assessed, standard training programs and packages are shared, and trainers are taught to deliver compulsory assessments and feedback. P&O Ports Private Limited in Chennai has facilities to conduct computer-based training and a simulator for rubber-tired gantry and quay cranes. In addition, we provide access to online programs that our Australia office offers.

How do SH&E professionals in India view security?

Mukherjee: There may be some exceptions, but most companies have separate security establishments. Government factories have separate centralized security systems that are not related to factory management. The commanding officers may attend a coordination meeting with factory management, but they act independently. However, they do coordinate with both the SH&E and administration departments. Their safety scope is limited to onsite or offsite emergency response and rescue support teams.

Within private organizations, security is the same. Separate officers manage security, and they normally report to the administration department. Of course, there may be some coordination with the SH&E department.

My general observation is that SH&E professionals in India hardly think about their security systems because separate security service specialists normally take care of this.

Pandey: In India, SH&E professionals do not manage security. It is viewed as a separate function.

Tammanur: Security is not considered a part of SH&E in India. At our company, however, security is the responsibility of QHSE&T since we are a signatory to the Safety of Life at Sea (SOLAS) convention and must comply with ISPS requirements.

Do you feel that organizations like the Occupational Health and Safety Center in Mumbai have helped to improve workplace safety in India? What is your opinion of similar organizations in India? Do you find them helpful?

Mannan: I believe that safety and health organizations should be required in India's major cities and upcountry. Universities should also establish an accredited SH&E course.

Mukherjee: Yes, there are a few organizations in India that promote SH&E awareness. The most prominent organizations are:

1. **The National Safety Council in Mumbai.** They have chapters in almost all of the Indian states. It is a government-aided voluntary organization formed by the Indian Parliament. Most SH&E professionals and organizations are members or patrons of this council. To promote SH&E awareness, they arrange seminars and publish safety posters, planners and calendars with SH&E slogans. Upon request, they provide expertise via audits, inspections or other means.
2. **Central Labor Institute (CLI).** This is a government organization. Their branches are located in different regions in India where they are known as the Regional Labor Institute (RLI). They used to offer certificate and diploma courses on SH&E, but one interesting thing they have are mobile exhibition vans. Upon request, they take these mobile SH&E museums to factories, construction sites or to a prominent location during a festival or program. Upon invitation, they will show a film or arrange other training on SH&E topics for workers.
3. **Institution of Fire Engineers India (IFE).** The institute offers a degree in fire engineering, and it communicates the latest developments in fire engineering to its associates and members via subscription.

Pandey: Organizations like the National Safety Council of India, the Central and Regional Labor Institutes and the Loss Prevention Association of India are of great help to safety professionals as well as to management. They organize training programs, seminars and conferences on different aspects of SH&E. They supply materials, banners and posters to promote SH&E awareness, and they also conduct plant audits by special request.

Tammanur: These organizations are helpful to some extent, but as a member of the American Society of Safety Engineers (ASSE), I know that we have a long way to go before we can achieve the ASSE's level of networking and sharing of information.

How do you believe SH&E practices can be improved in India?

Mannan: SH&E practices in India can be improved through training, seminars, inspections and audits and by sharing best practices. Most importantly, India and all Indians should be ethical in all business matters.

Mukherjee: SH&E practices need more encouragement from the government, and the workforce needs more education, both formal and vocational.

In construction, technicians like fitters, welders or riggers used to work from experience. They would first start out as a helper or as a common laborer, and then after a few years, they would learn some expertise from their senior workers and become a technician. So any incorrect procedures that the senior worker may have followed were passed along to the new worker.

There is a formal tread apprentice education system available in India, but it is more theoretical and less practical. Students who complete an apprentice education do not always have the same opportunities because they lack hands-on experience. However, since they are formally educated, they seem to fare well. I think a small change in our teaching system to combine hands-on experience with formal education can make a big difference.

Senior management also needs to change its attitude toward SH&E. Safety starts at the top of the company. If senior management is serious about SH&E, then things will change. I feel that SH&E should be a subject in management studies. Today's management students are tomorrow's managers. If they realize the importance of SH&E practices during their studies, then things will be easier at the ground level later on.

Pandey: I believe that SH&E practices in India can be further improved by:

1. Incorporating SH&E provisions at the design and layout stage.
2. Having trade unions contribute through their positive role.
3. Recognizing the outstanding achievements of SH&E workers and management.

Tammanur: My suggestions for improving SH&E practices in India are as follows:

1. Individual companies must realize that SH&E best practices will only help their business.
2. The government must ensure that legal compliance is enforced at all levels.
3. Professional societies must engage industries on a regular basis.

Biographies

Mohammed Abdul Mannan

As a General Environmental Health and Safety (EH&S) Manager, Asia Pacific Operations, for Carrier Corporation (a United Technologies Company), Mohammed Abdul Mannan provides direction and consultation to plan and implement the company's EH&S program using systemic evaluation and a continual improvement process.

Mannan has experience in the petrochemical and process industries, marine operations, offshore installations, shipbuilding, steel work fabrication, electromechanical installations, service operations and building construction. His industrial EH&S experience includes work with EH&S management systems and procedures, EH&S audits, occupational health and hygiene, environmental control, risk assessment and hazard identification.

Mannan holds a bachelor of science degree in chemistry from Osmania University and diplomas in industrial safety and in environmental and pollution control.

Sandip Mukherjee

Sandip Mukherjee is an Environmental Health and Safety (EH&S) Professional and a Certified Safety Specialist (WSO/CSS) who has risk and safety management experience in oil and gas production, petrochemicals, power plant construction, commissioning and turnaround. An accomplished organizer and administrator, Mukherjee is knowledgeable in the coordination and control of multinational workforces, and he has achieved a high standard of recognized safety awareness through training, motivation and leadership.

Mukherjee currently works as a Health, Safety and Environment (HS&E) Training Manager for ABB Lummus Global at the Fujian Refining and Petrochemicals Project in China. He holds a diploma in mechanical engineering from the State Council for Engineering and Technical Education and a diploma in industrial safety from Annamalai University.

Sunil Pandey

Sunil Pandey is the Head of Safety and Environment at M/s HV Axles Limited, a subsidiary company of M/s Tata Motors in Jamshedpur, India. Pandey has over nine years of experience in Tata Motors' safety department, and he is also skilled in ISO 14000 and TS 16949 systems. Prior to his position at M/s Tata Motors, Pandey worked as a sales representative for M/s Banco Products (I) Ltd. in Baroda, Gujrat.

He holds a bachelor of science degree in physics, chemistry and mathematics from Ranchi University and a diploma in industrial safety management from Patna University.

Ravi Tammanur

Ravi Tammanur is a Fire Prevention and Protection Engineer and a Certified Safety Professional (CSP) with 16 years of safety, health and environmental (SH&E) experience. He worked in a petroleum refinery for ten and a half years, and he has five years of experience in petroleum construction. He has also worked in container terminal operations.

Tammanur has served as Secretary of the American Society of Safety Engineers' (ASSE) Kuwait Chapter for four consecutive years. He is also an accredited U.S. National Safety Council (NSC) trainer and an ISO 9001/14001 auditor.