



Let's Solve



Point of view

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# Technology helping **Process Industries** achieve **Health & Safety Goals**



A Larsen & Toubro  
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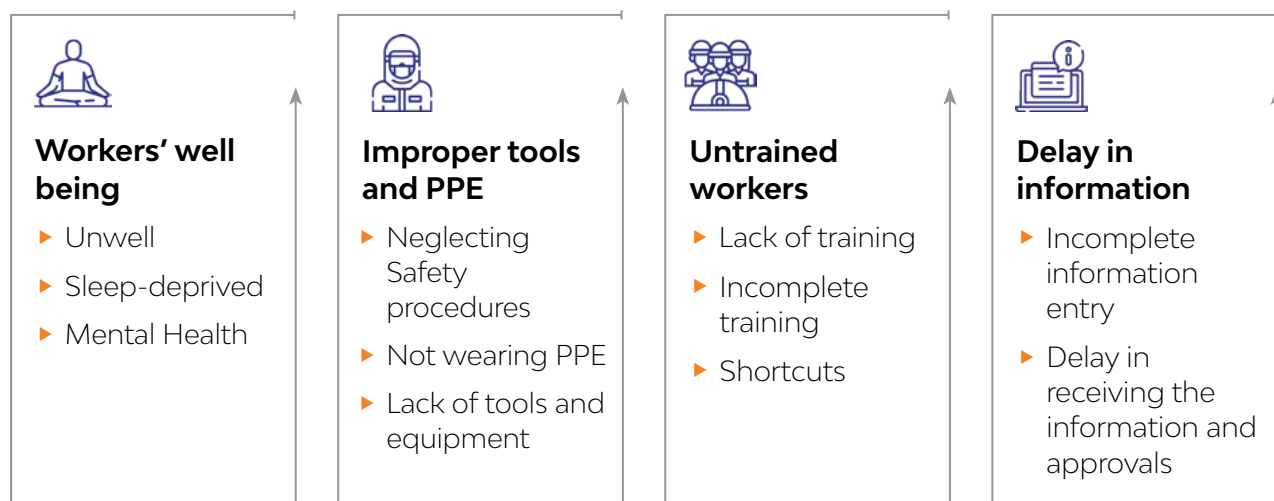
## Introduction

Workplace safety is essential to every organization, and every employee has the right to a safe and protected environment. It plays a crucial role in promoting and improving the wellness of both employees and employers across all industries. This, in turn, improves productivity as it has a positive impact on the mindset of employees. This paper will focus on the potential role of Industry 4.0 revolution in creating a safer work environment specifically for an asset-intensive industry such as Oil and Gas, Process, etc. Experts believe that new-age technology will play a vital role in expediting the revolution's use cases.

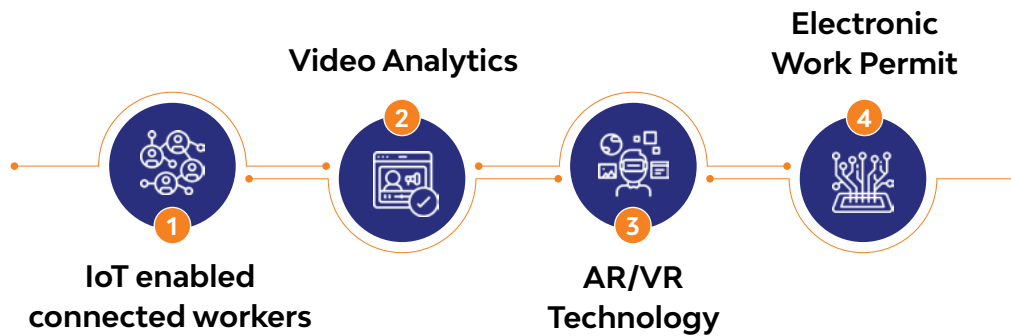
Safety risks are present across industries, and management must devote time to ensure worker safety and comfort. And in specific, risk management has become a critical challenge in asset intensive industries because of the extent of risk involved.

The best approach to ensuring safety is prevention. However, to find solutions to prevent accidents from occurring, the first step is to find out why these accidents occur in the first place.

Some of the reasons include:



To prevent accidents, we need to address the fundamental tenets of Health, Safety, and Environment. New-age technology can help keep workers and their work environment safe. Some of these technologies are listed below -



We will go through each of the points mentioned above to see how they help create a safer environment.

## 1. IoT Enabled Connected Workers

Internet of Things (IoT) can be beneficial in understanding a work environment and is one of the best ways to keep an eye on everything. Sensors can help monitor factory equipment's condition, as well as human well-being, thus making it a great tool to monitor a potentially hazardous environment.

When it comes to monitoring the factors mentioned as the cause of accidents earlier, these sensors could be incorporated into wearables such as helmets, jackets, watches, and shoes. Additional sensor locations include equipment surfaces, where real-time data can be gathered and monitored for any risk alerts. This works in two ways -

- 1) **Monitoring the well-being of the workers** - by tracking physical fitness parameters such as heartbeat, skin temperature, alertness in working etc. will help keep a check on workers who are starting to show stress or other signs of potential problems ensuring preventive action to be taken.
- 2) **Monitoring the suitability of the working environment** - by tracking working condition parameters such as temperature, leaks, air quality - CO and CO2 levels, excess machine vibrations, etc., we can sense potential danger and prevent any mishaps.

Many companies invest heavily in IoT technology. The globally connected worker market will grow to \$4.3 billion in 2026 from \$ 1.93 billion in 2020 <sup>[1]</sup>. This growth will be primarily led by the Oil & Gas industry, followed by chemical and mining.

## 2. Computer vision for Video Analytics

The second source of accidents is the use of improper tools or safety equipment. It is imperative to monitor how workers work in plants or remote sites. Generally, all production sites are installed with CCTV cameras providing crucial information on security violations identified to take corrective actions. Video-based analytics achieve constant human surveillance. These techniques can be used to identify unsafe acts, improper tools, and non-compliances with the mandatory Personal Protect Equipment (PPE) requirements. If a problematic situation is detected, an immediate alert will be sent to the supervisor about the violation.

The Computer vision market is projected to grow to \$ 17.4 billion by 2024 from \$ 10.9 billion in 2019 <sup>[2]</sup>. Businesses have started investing heavily to create a safe environment and reach zero safety-related incidents. Dow Inc., a leader in material science, is leveraging computer vision solutions on Azure platform to monitor scenarios, such as Personal Protective Equipment (PPE) detection and entrance gate monitoring, to further promote safety in the workplace <sup>[3]</sup>. The solution uses AI Vision algorithms and Deep Learning models to detect if an operator is wearing the appropriate PPE (a hard hat, a safety vest, goggles and a mask) within the vicinity of sensitive areas. If the system senses that some part of the operator's required PPE is missing, an alarm (LED light) is triggered.



### 3. AR/VR Technology with IoT

With new technology at work, workers need to be regularly trained with improved working methods. With the old workforce retiring and high attrition rates in today's ever-changing workspace, it has become a challenge for manufacturers to train new employees to work with the same on-field efficiency. Training is a costly and time-consuming affair, the absence of which can potentially lead to a hazardous situation and create an unsafe work environment. AR/VR technology combined with IoT can be used for assisted maintenance and training to effectively transfer knowledge.

VR and AR can be utilized to promote an environment where training is safe and free of consequences. Employers can create accurate simulations of operations and any equipment they use. These simulations and experiments can help new employees gain the expertise and knowledge needed to function well once they start work. Since potentially hazardous mistakes will only be felt within the virtual world of training within a 3D assembly line, it is a far better, practical, and safer learning experience.



It is critical for companies to train their employees in the processes and operations of asset-intensive industries before they take on full responsibility. For example, unless workforces at manufacturing sites or power plants know how to operate machinery correctly, they cannot join the active workforce.

This technology has tremendous potential and is projected to account for a revenue of \$1,274.4 billion in 2030, up from \$37.0 billion in 2019 <sup>[4]</sup>. Many companies have already invested in AR/VR technology with IoT solutions and reaped benefits. Leveraging AR helmets and other digital tools, workforce-intensive industries can ensure compliance to safety norms, along with better workforce productivity tracking. The by-product of this solution, is an increased quality of safety and procedural training while simultaneously reducing training costs and, boosting knowledge retention through immersive methods of learning.

To see how LTI has done this for one of its customers, please read [The LTI Case Study](#) <sup>[5]</sup>.

## **4. Electronic work Permit**

The last concern is the lack of information and delay in processing. When an unsafe situation is identified, it is imperative to capture the information immediately and ensure corrective measures are taken or put in place as soon as possible.

The “permit to work” or “plant clearance” is the best practice accepted to ensure that non-routine dangerous work takes place safely. It is the control document that manages the process. It involves informing people about the potential risks associated with identified non-conformity. It ensures precautions are taken into consideration before starting work and that only authorized and certified individuals supervise the work.

But due to the non-digitized nature of the work process, multiple checks are required before issuing a work permit. This paper-based permit-to-work system has many challenges, such as traceability, execution delays, poor management, etc. Delay in the issuance of work permits could cause an accident leading to injury, loss of life, environmental damage, etc.

Electronic Work Permits can be of great help. Typically, a permit is requested, then prepared, approved, managed, and closed off at the end of the job during the standard permit preparation. At each step, the responsible people must capture the relevant information and sign off. EWP helps ensure that hazards are correctly identified when maintenance takes place and that the necessary safety precautions are understood and adhered to. Authorization of permits is controlled and audited to ensure compliance with procedures and increase individuals' accountability.

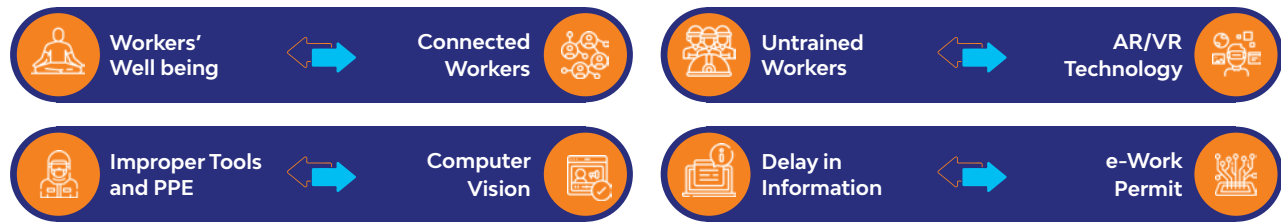


E-Permit to work (ePTW) is becoming the new norm nowadays, with many companies investing to reap benefits. There can be a significant reduction in cycle time for preparation and issue of work permits, along with 100% adherence to all safety norms.

This system can overcome inconsistencies, establish and ensure process standardization, and meet compliance requirements to provide enterprise-wide visibility on safety compliance adherence.

To see how LTI has done this for one of its customers, please read [LTI Case Study](#) <sup>[6]</sup>.

Eventually, we have seen how new-age technology can address potential causes of accidents to prevent them and how many firms are adopting these to improve safety at workplaces.



To summarize, creating a safe working environment is the responsibility of everyone. While the IoT and other technologies cannot control all the factors impacting worker safety and be 100% effective in preventing all the incidents, they can be handy tools to help keep companies better prepared and positioned to reduce risks.

## What's Next/the future?

Things are fast changing in this VUCA world (volatile, uncertain, complex and ambiguous). In this situation of constant and unpredictable changes, one cannot be sure if the technologies that are relevant and trending today would be the same ten years down the line. We have been witnessing this over the years of evolution in the past. New trends will take over, which would even provide more efficient operations from a safety point of view. But one thing that can be predicted is that the key driver for workplace safety in future would be - New regulatory compliance, as new forms of working environment will make current safety and security measures and regulations obsolete.

New technologies are rapidly changing the nature of production, and with that come new challenges for industrial safety and security. The production environment in intelligent factories is far more complex than in traditional factories. It is characterized by a convergence of the digital and the physical (manufacturing) environments. With an increase in human-machine cooperation, the attendant security and safety implications need to be addressed. For example, 3D printers, which enable rapid, customizable production, also emit mini particles that have the potential of penetrating deep into the lungs, causing irritation, respiratory distress and changes in blood chemistry that may have detrimental cardiovascular effects. The impact of new materials created by convergent technologies on health is still not well researched. Hence the uncertainty in the solutions.

The future is betting on highly autonomous and remote operations, with most workers going into monitoring mode. With this kind of environment, the stability of mental health will be of prime importance. A future health and safety regulation will give equal priority to physical and mental health.



## About the Author



### Rahul Singh Bist

Specialist – Business Analysis, LTI

Rahul has nine years of rich experience in Automotive Manufacturing and After-Sales value chains. He is currently engaged in delivering business solutions across manufacturing, supply chains, sales & services for global clients, successfully driving their digital transformation initiatives. He holds an MBA from IIM Bangalore.

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