Artificial Intelligence and Safety for the Manufacturing Industry

— Pradeep Chaturvedi*

There are positive sides and negative sides. We have focused on a behavior -based safety as an important tool. However, as the digital platform has become more important and the analytic tools are available for the manufacturing sector there is greater scope to widen analysis beyond just a few of the most critical processes. It is expected that further reduction in the costs of storing vast quantities of data will allow final-tune performance management to reach across entire plant and even across companies.

The idea of improving safety in manufacturing is of making 'more from less' or making resources more productive. This will be pushing manufacturing productivity to the maximum and thereby improving the competitiveness of companies. Advance analytics and lower-cost of computing give companies a powerful tool for managing profitability even on an hourly basis. Many companies do their best to optimize production processes using established rules of thumb or incomplete data. But at the end of the month or reporting period, they often discover sizeable gaps between actual profits and what they had expected. This, very often also leads to unpredictable actions and unsafe practices being introduced to cover up the poor performance. However, the experience shows that situation arises because the operational staff typically lack precise-enough measures to understand the small, real-time variations in process flows and manufacturing steps that cumulatively erode returns at facilities such as mines, steel mills, or other manufacturing plants. This information, moreover, is rarely shared quickly enough for managers to respond in the tight time-frames required to ensure effective dealing with safety concerns.

International experience shows that across a number of industries companies can eliminate these unsafe and profit-draining variations, as well as speed up reaction times by using advance data analytics combined with upward cascades of data to manage performance.

Manufacturing machines that will interface with the national network of digital world needs more safety and security features to be built into so as to ensure that the digital economy lays its roots effectively. Manufacturing processes have to be looked at from that angle.

Until recently, companies lacked the useable data, advanced sensors, and processing capabilities to gauge the performance of operations with real-time precisions. But increases in lower-cost sensors, wireless connectivity, cloud data storage and computing power have changed the equation, with the development of smarter analytic tools that analyse continuous process flows and complement advanced - process - control systems.

The Challenge : Maximum Safety for the Manufacturing Industry

Maximum safety is one of the key factors in ensuring that a company's production is efficient. Reliable systems that are simple to operate and maintain reduce the probability of accidents as well as the susceptibility of the equipment to fault.

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Plant safety can only be achieved if existing risks are recognized in advance, and where necessary, reduce as quickly as possible. The manufacturing industries also faces the challenge of conforming to current standards and legislations such as IEC 62061, ISO 13849-1, ISO 14121, and MRL 2006/42/EG.

Safety systems must fulfill very high standards. The probability of a fault, for example, must be calculated for every protection function. On the other hand the companies can gain flexibility with new standards which, for instance, allow complex safety functions to be assessed. Functions such as these allow the design of dynamic protection zone - dependent on the tool used - as well as the possibility of selectively disconnecting danger zones. This means that you can optimally adapt the safety systems to your production processes.

To determine the risk potential arising from your plants and systems, one needs an effective and systematic risk assessment process. This is the only way to reliably define suitable measures and implement them quickly. The challenge here is to develop a "functional safety management" system in which safety technology is defined for every phase of the plant life- cycle. This enables to avoid systematic faults from the outside.

There are a number of service providers of automation solutions who have significant expertise and a wealth of experience, built up over many years in the manufacturing industry. With Systems Functional Safety Services, they support throughout the entire life-cycle of the plant, allowing to achieve the highest safety standard possible.

Functional safety services can only be provided by a experienced service provider. Siemens is one such example. Siemens functional safety services support with a comprehensive package of services that cover everything from risk identification and verification to plant start-up and modernization. The individual service module allows you to selectively enhance your development, modification and maintenance processes. Thus, a package offers effective means of preventing, right from the start, faults inherent in processes and of keeping an efficient, verified records of functional safety and operational plant safety. Important parts of the process are carried out and documented.

Importance of AI and Availability of Technical Manpower

The whole world is moving towards attaining sustainable development goals by 2030 in a most efficient manner in a carbon neutral environment. The digitalization has shown the path for speedy growth for many economies including India. Probing the kind of experience and skill building that augments human capital can open up a much broader pool of candidates. Hiring manager with a regional bank has been searching fruitlessly for a software developer to create a better digital customer experience. Yet no one among the 100 of applicants checks off more than a few of the items on the long list of required technical skills, including knowledge of the obscure programming language the bank uses. A hospital system needs to build a network that will seamlessly link patient record across its locations. Similarly in a car manufacturing company where man-machine interface is more common due to automation, when a company identifies a seasoned engineer who has done somewhat similar work, he turns the offer down and takes a more senior position with a cloud services firm.

With every company needing to harness the full power of technology to remain competitive, there is now a perpetual stampede to hire technical talent. Demand is growing exponentially for skills such as software engineering, data management, platform design, analytics-based automation, customer

experience design, and cyber security. 87% of global senior executives surveyed by McKinsey said their companies were unprepared to address the gap in digital skills.

The recent pandemic resulted into rush towards digitalized working; and in industries the changeover has been reported to be swift and people are working with 4G and moving towards 5G and also from web 2.0 to web 3.0 to bring in competitiveness and efficiency through automation and artificial intelligence. Man-machine interface is increasing at a rapid pace facilitating new approaches but at the same time new threats that requires more efficient business analytics and information systems to save lives in the industry.

It has been reported that between May and July 2020, there had been 30 recorded industrial incidents in India, that killed at least 75 workers. These figures, along with regular reports of similar incidents around the country and the world, bring into sharp focus the need to enhance industrial safety onsite.

While safety has always been a primary concern for manufacturing and logistics organizations, forward-looking companies have, in recent years, tried to leverage emerging technologies to monitor and improve safety protocol and training methods onsite with the possibility of using machine learning to detect and flag violations. Artificial Intelligence (AI) can help organizations around the world make strides in reducing the incidents of injuries and fatalities at work.

One crucial aspect of industrial safety is need of people on the site for personal protective equipment (PPE). At a typical construction site on industrial shop floor, a large number of people work in shifts, necessitating round-the-clock safety monitoring to avoid accidents. The current monitoring system involves a combination of direct human supervision and human monitoring of CCTV footage to detect breaches in safety protocols. The use of AI under these circumstances could enable automated scanning of CCTV footage in real-time, triggering alerts for instance of safety protocol breach.

Automation is an attractive proposition, but how do we make it work? The two most pressing demands AI safety solutions are a high degree of accuracy in detecting every violation and the speed to detect violations in real-time. A typical solution for such problem uses an object-detection along with them to detect both people and PPE in the video footage and then map them against safety compliance mandates.

These executional imperatives pose challenges on multiple fronts. For instance, an AI system that needs to monitor PPE compliance among workers on-site. Despite challenges, it is possible to build a deep learning solution to detect personnel without PPE at construction sites and the shop floors.

While PPE compliance is widespread and critical, it is not the only aspect of industrial safety that is monitored. The advent of AI and machine learning has enabled the creation of new ways to solve traditional business problems that can significantly enhance the quality of work life. Progressive organizations would do well to closely watch these developments to understand how technology can benefit their systems and processes.

Conclusion

The Safety Convention 2023 is being held a very crucial time when 'Made in India' has made India Global Manufacturing Hub. Safe process and safe products will be crucial. The climate resilience make relevant to focus on ESG issues alongwith safety concerns.