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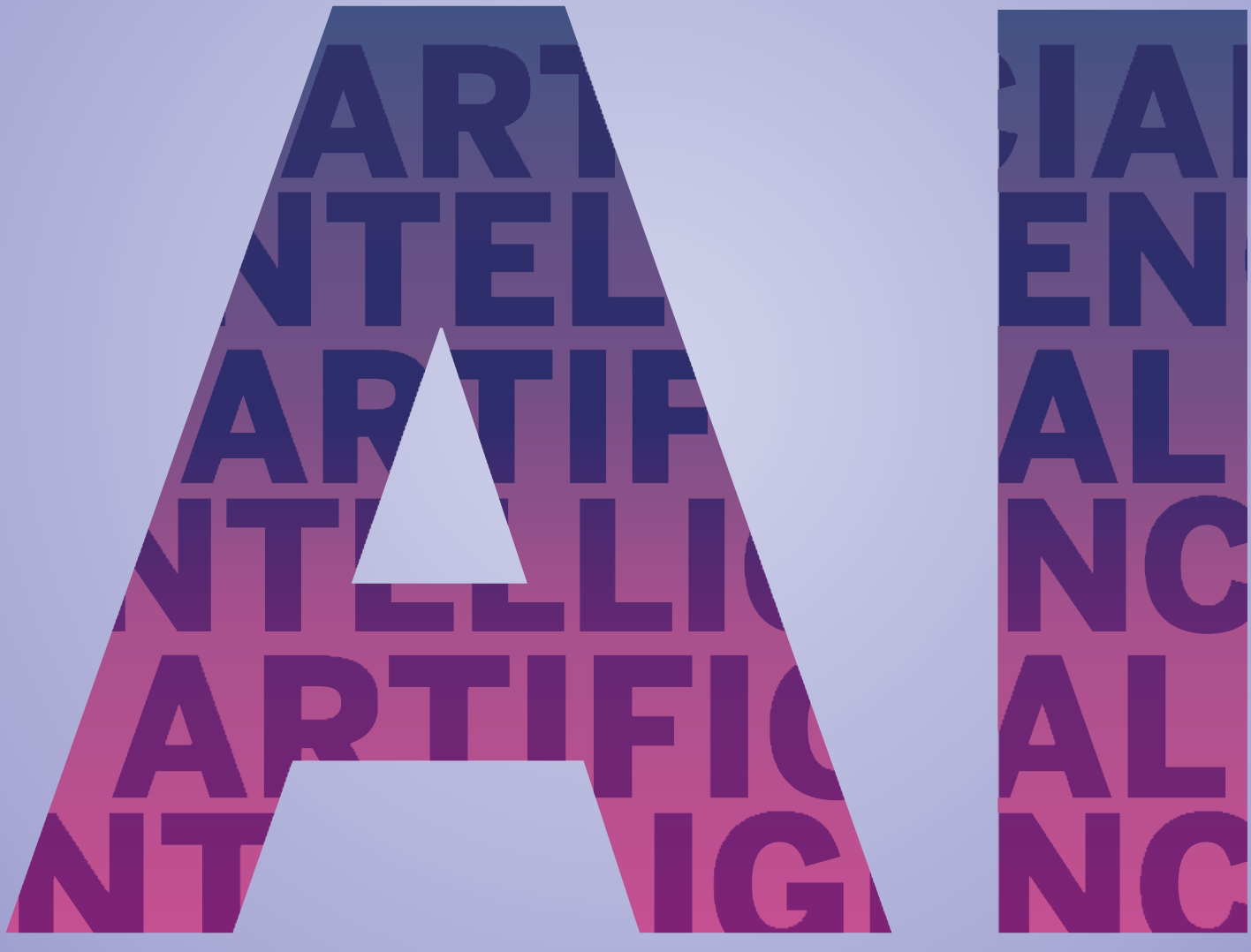

Artificial intelligence (AI) refers to the simulation of human intelligence in machines that are programmed to think like humans and mimic their actions. The term may also be applied to any machine that exhibits traits associated with a human mind such as learning and problem-solving.

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8.	Smart City Specialist
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10.	Distributed Control System (DCS) Specialist
11.	Home Automation Technician

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Editor's Desk

Dear Readers,

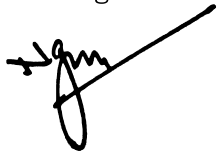
The world is changing at a very fast speed. The advent of Covid - 19 has forced us to think & work in a different mode. India is still in the midst of Industry 4.0, while the world is heading for Industry 5.0.
Industry 5.0 would be about bridging the gap between robots and highly-skilled workforces to produce and deliver the best-individualized products, services, and customer experiences possible. Here, human intervention would be intellectual rather than physical.

An example is a movement from 3G to 4G in the Telecom industry. While 4G has taken a lot of investment and time, the talks of 5G have already begun, and this would mean changing the systems, redefining the business processes, and retraining the staff.
With the improved human-machine interfaces, we can drastically heighten our own capabilities.

Our request to all readers is that they would share their views on this issue. We will be honoured to publish them.

Stay healthy, stay safe.

Warm regards



Nagendra Goel
Editor
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FEBRUARY 2022

73rd Republic Day Celebration at

Research Centre of Instrumentation, Automation, Surveillance & Communication Sector Skill Council at Bhagpat

Shri Nagendra Goel, Founder & Chairman IASC Sector Skill Council, hoisted the National Flag by great fanfare. Republic Day is one of the proudest occasions for every Indian.

In preparation for the Republic Day celebrations, the IASC Centre for Research initiated the plantation of trees in a big way. Under this initiative, lots of trees were planted within the entire premises. This initiative was lead by Shri Nagendra Goel accompanied by the students, staff & citizens.

Trees are literally the source of life on this earth. They help preserve our environment by reducing the amount of carbon dioxide and are also responsible for keeping the air fresh and clean. Trees greatly contribute to their environment by providing oxygen, supporting wildlife, improving air quality, conserving water, preserving soil, and climate amelioration.

A tree plantation campaign can only be successful when all people, especially the youth, participate wholeheartedly. We salute this absolutely novel way of celebrating Republic Day.

Welcome to The Ministry of Skill Development & Entrepreneurship and Ministry of Education

Instrumentation, Automation, Surveillance & Communication Sector Skill Council welcomes Shri Dharmendra Pradhan.

Shri Dharmendra Pradhan is the Cabinet Minister for Education and Skill Development and Entrepreneurship in the Government of India. As a Member of Parliament, Shri Pradhan represents Madhya Pradesh in the Rajya Sabha and was earlier a member of the 14th Lok Sabha. Born June 26th, 1969, he hails from the city of Talcher in Odisha.

Dharmendra Pradhan is an Indian politician serving as the Minister of Education and Minister of Skill Development and Entrepreneurship in the Government of India.

In his previous tenure as the Minister for Skill Development & Entrepreneurship (2017-19), Shri Pradhan launched many key initiatives focussing on skilling, reskilling and upskilling the manpower of India and emphasized on bridging the skills gap for the Indian youth.

As Minister of Skill Development and Entrepreneurship, Pradhan launched many key initiatives focussing on reskilling and upskilling the manpower of India and focusing on bridging the skill gap for the Indian youth. During his tenure, the total number of Industrial Training Institutes (ITIs) increased by over 40% and student enrolment increased by over 28% till 2019. He brought in new paradigms in the regulatory environment by mooting National Council for Vocational Education and Training (NCVET) as new unified national reg IBM, Adobe etc. to introduce new age skills related to Industry 4.0. He also launched one of the world's largest counselling program named Skill Saathi.

He has also been the Minister of Petroleum & Natural Gas and Minister of Steel.

Popularly called the "Ujjwala Man", Pradhan is credited with the success of Pradhan Mantri Ujjwala Yojana launched by the Ministry of Petroleum & Natural Gas under which over 8 million LPG connections have been provided to women from Below Poverty Line (BPL) families over the past 6 years.

https://en.wikipedia.org/

Our Heartiest Congratulations to Shri Rajeev Chandrasekhar !

Hon'ble Minister of State

Skill Development and Entrepreneurship & Minister of State for Electronics and Information Technology

Shri Rajeev Chandrasekhar (born 31 May 1964) is Minister of State for Skill Development and Entrepreneurship and Minister of State for Electronics and Information Technology. He is an Indian politician and entrepreneur, technocrat and a Member of Parliament in the upper house (Rajya Sabha) from Bharatiya Janata Party (BJP) representing Karnataka.

In Parliament, Rajeev Chandrasekhar is a vocal advocate of Governance, Technology and Economics. As a first-term MP, he was the first one to raise corruption like 2G Scam in parliament and is outspoken on issues that concern Governance.

Rajeev Chandrasekhar focuses on Reforms in Economy and Governance, Technology, and Internet, Issues related to youth, and issues concerning national security and sustainable city governance of Bengaluru.

Artificial Intelligence In Process Automation

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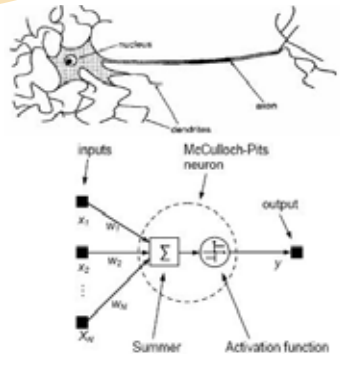
Just as a basic understanding, what IS intelligence? It is the totality of man's mental processes. Intelligence makes us capable of adapting to our environment. It is what a child uses to process the information received from the sensors of hearing, vision, touch and the observation of the relationships between the causes and consequences of outside events. Artificial intelligence (AI) refers to the simulation of human intelligence in machines that are programmed to think like humans and mimic their actions. The term may also be applied to any machine that exhibits traits associated with a human mind such as learning and problem-solving.

Here , we will find and discuss just how smart will controller's intelligence get a new concepts, and innovative methods in the use of artificial intelligence in controlling automated processes in PLCs & PACs / Systems Integration

Figure 1 below illustrates a neuron of the human brain, which allows us to relate a number of inputs (x) to an output (y). Human intelligence includes the capability of perceiving relationships and analogies, reasoning, storing and retrieving information, classifying, generalizing, predicting on the basis of the past and adjusting to new conditions.



A biological neuron model, which processes N inputs (xN) to arrive at the output (y). (McCulloch-Pitts neuron).

Over the years, through the efforts of control professionals, our process controllers have gradually become more and more intelligent. First we improved PID control by adding external reset, decoupling, dead time and dynamic compensation, gain scheduling, feed forward and auto-tuning. Than came the linear quadratic Gaussian (LPG) regulator, Kalman filter, model predictive control (MPC), adaptive control, repetitive control and optimization.

In the vocabulary of control engineers, artificial intelligence is a relatively new term. It was coined during a technical conference at Dartmouth University in 1956. This article will concentrate on the latest stage, the family of algorithms consisting of fuzzy logic, rule-based artificial intelligence and neural networks.

Today, our control tool, the computer, can handle 10 billion instructions per second and has memory densities exceeding 300 GB per square inch. Compared to human intelligence, machine intelligence is more reliable, because computers do not get tired, mad, drunk, jealous, angry, fall in love, become senile, etc. In addition, intelligent machines have no egos or emotions; they just follow orders of their programmers—who do have egos and emotions.

Naturally, the knowledge of machines cannot exceed that of their programmers. Therefore, the process control knowledge of the programmer is key because one must fully understand a process before one can control it.

Certain machines already approach or border on having intelligence and as such, can often replace or outperform human operators. For example, the computer "Deep Blue" beat the world chess champion, Gary Kasparov. Artificial intelligence (AI)-based computer systems are also the primary controllers of spacecraft. Similarly, industrial unit operations can be fully automated and can optimize the production rate, efficiency and safety (*1) of the processes they control. Other examples of AI include global positioning, autopilots in airplanes and the directing of driverless vehicles and military robots. AI has also been used in the field of medicine; for example a semi-automatic robot assisted the doctor when he replaced my heart valve.

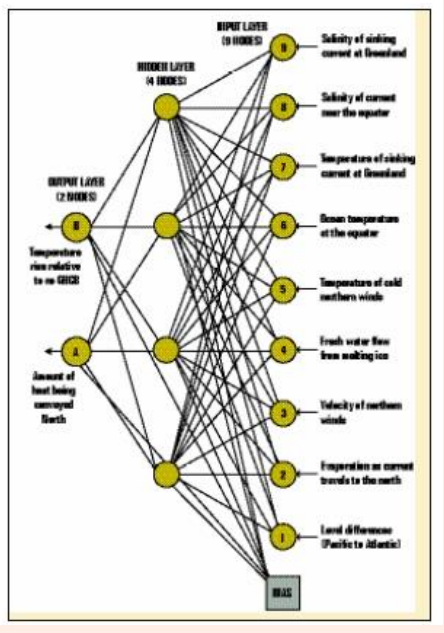
Some form of intelligence is incorporated in all of the following control strategies and control tools: artificial intelligence (*2), artificial neural networks (ANN) (*3), back propagation algorithms, business rules, case-based reasoning, common sense, cybernetics, data mining, data visualization, evolutionary software, expert systems (ES) (*4), face recognition, fuzzy logic (FL), genetic algorithms (GA), herding control, intelligent agents, intelligent controls, internal model control, knowledge-based systems (*5), language processing, machine learning, model-based controls, model-free controls, model-predictive control, neural networks forecasting, object-oriented networks, optimization, pattern matching and recognition, robotics, rule-based systems, speech recognition (*6), statistical process control, supervisory controls, text mining, unit operation control, vision—the list goes on.

Limitations of Intelligence

Human intelligence tends to focus on the short range and humans tend to assume that the future will be similar to the past. Our intelligence evolved to serve our individual survival and, therefore, its time scale is closely related to our life spans. Human intelligence is less concerned with the distant future, and it assumes that nature can affect humans, but not the other way around. This is because in the past, the scale of human influence was not large enough to have global consequences.

Yet, the facts are that during the last century, global population doubled, the carbon dioxide content of the atmosphere quadrupled, the consumption of resources increased five-fold, the consumption of water six-fold, consumption of oil seven-fold, not to mention the potential future consequences of global warming or of the proliferation of nuclear weapons, the number of which today exceeds 100,000.

FIGURE 2 : ARTIFICIAL NEURAL NETWORK



An artificial neural network (ANN) process control model—trained on historical data—can predict the scale and timing of future events.

For the above reasons, some might argue that for certain tasks, the scientific or artificial intelligence of machines is more likely to provide reliable results than does human intelligence. One of these tasks can be the model-based predictions of the longer range outcomes of present trends. One might argue that a process control model, such as the ANN of the global warming process shown in Figure 2, can be trained on historical data to predict future trends. (Later in this article I will show, how ANN can be used to determine the gains, time constants, dead times, inertias and interactions of various processes.)

By using ANN and other intelligent tools, we can obtain scientifically reliable predictions of the future consequences of present actions. Some might argue that these scientific predictions are based on incomplete sets of data or on biased facts. This can be a valid argument,

as no expert system knows what it does not know! Others believe that the past provides unbiased and reliable data and therefore, by "training" ANN models on historical data one can accurately predict the timing and size of future events. This debate is likely to continue for some time, and process control professionals can make major contributions, because they can point to the many AI applications already in successful use in a variety of industrial, transportation and other processes.

It is too early to say where the limits of AI applications are (*7). It seems reasonable that AI can predict the outputs of either industrial or nonindustrial processes on the basis of their inputs, as long as it is good enough to "train" the ANN relationship on past data.

Intelligence is seldom exact or mathematical. A tennis champion seldom understands Newton's laws or the principles of aerodynamics that determine the path of a tennis ball. Tennis is learned by a trial-and-error process (similarly to training an ANN model). This is done by observing the input variables involved in the process of hitting the ball and memorizing the consequences of those inputs. There might be 25 input variables, from spin to force and from direction to height, which all contribute to a perfect serve or a perfect return.

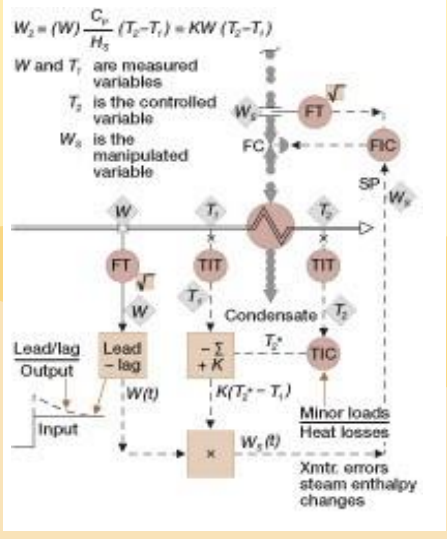
The "AI model" developed by years of training in the brain of the tennis player, is similar to the ANN model that is developed by training an AI controller on the past performance data of say a refinery. Once the ANN is trained, you "just use it," because, as Yogi Berra put it: "You can't think and hit at the same time!"

White, Gray and Black AI Boxes

AI is an attempt to reproduce human reasoning and learning. It is a relatively new field: The first meeting of the American Association of Artificial Intelligence was held only in 1980. Yet, in some areas of application, such as process control, substantial progress has been made. The various AI strategies can be grouped into white, grey and black box categories.

The models of well-understood processes are referred to as white-box or first-principle models, because they are constructed from a priori knowledge and physical insight. Here, the dynamic models of the process are derived mathematically from the mass, energy and momentum balances of the process. Good examples of the early white-box models are the various feed-forward control schemes.

FIGURE 3: FEED-FORWARD OPTIMIZATION



In feed-forward optimization of steam heaters, major load variations (T1 and W) are corrected by the feed-forward portion of the loop, leaving only the minor load variables for feedback correction.

In case of a water heater (See Figure 3), we know how much steam will be needed to heat the water to match a new demand, so that the temperature of the hot water will remain constant. Therefore, by "feed-forwarding" that quantity as the set point to the steam flow controller (FIC), we can prevent an upset.

For those processes that are not understood the so-called black-box or empirical models are used. Here, because no physical insight is available, the process models are developed on the basis of measurement data. This means that input-output data is collected for some extended period of operation for both the steady state and the dynamic responses of nonlinear processes. The tools of black-box modeling include mathematical approximation via estimation theory, nonparametric regression, wavelet algorithms, fuzzy models and artificial neural networks (ANNs).

Fuzzy logic (*8) and gray-box modeling are non-mathematical. They are linguistically interpretable formations of rule-based models developed on the basis of the available expert knowledge and the measured data for the process. ANN can be embedded within databases or expert-system applications, can act as preprocessors or postprocessors to other systems, or be linked in a distributed architecture. From the process-modeling point of view, two main integration approaches can be distinguished: bias modeling and semi-mechanistic modeling.

The bias or parallel modeling approach assumes that a first-principle (white-box) model of the process can be obtained, but it is not possible to identify all the sources and statistical characteristics of the disturbances. In this case, a neural network is trained to predict the difference (residual) between the process and its first-principles model.

The semi-mechanistic model is based on a first-principle model and the unknown parts of the white-box model, such as the otherwise difficult to calculate parameters are represented by black box elements.

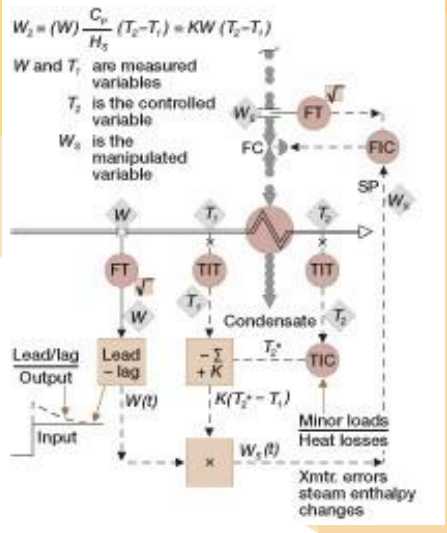
The Optimization of Unit Operations

Industrial unit operations (chemical reactors, distillation, drying, compressors, pumping, boilers, etc.) are well-understood processes. They can be described mathematically on the basis of their heat and material balances. In the past these processes were controlled by single PID loops, which maintained individual flows, pressures and temperatures, while

the production rate, efficiency or energy consumption of the process remained uncontrolled. Later, it was realized that when a controller changes a valve opening, this affects not only that loop, but—because it changed the heat and/or material balance of the process—it upset the other loops also.

Plants do not sell levels and temperatures, but products, and what determines the profitability of the plant is the unit cost and quantity of the production. Artificial- intelligence-based control recognizes that the purpose of industrial plants is to make a profit. As a consequence, in order to optimize a unit operation, one can treat the individual process variables as constraints, and so long as all the process variables are within their allowable safe limits, one can modulate the process to increase production.

FIGURE 4: CONSTRAINT CONTROL



Multivariable envelope-based constraint control can lower overall excess oxygen by monitoring carbon dioxide and water and performing constraint-limit checks on excess oxygen, hydrocarbons, stack temperature and opacity.

Figure 4 illustrates such a constraint envelope for a combustion process where the main goal is to increase boiler efficiency by minimizing excess oxygen. Here the envelope optimizer keeps lowering excess O2 until one of the envelope limits is reached. When a constraint is reached, excess O2 control is temporarily transferred to the limiting constraint (CO, HC, opacity, etc.). Thereby, the boiler operation stays within a safe envelope, which is defined by these constraints. The lower part of Figure 4 illustrates the performance of a gas-burning boiler under conventional and under optimized envelope control. The energy savings are shown by the dark area. This saving results because envelope control makes the controls more sensitive.

Constraint envelopes are also used to stabilize the control of fast processes. For example, to control the guidance of rockets, missiles and other projectiles, engineers keep them inside a "tunnel," which is defined by a safe envelope, and no correction is made so long as they are "inside the tunnel."

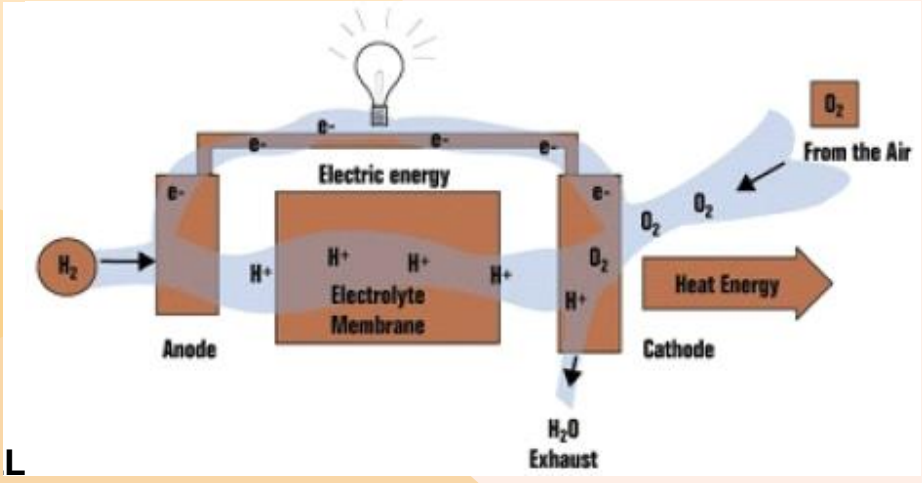
Another example of a fast process is fluidized-bed coal gasification in which the residence time of the coal particles within the gasifier is only a few seconds. In controlling that process, I also found that envelope-based control increases stability.

Figure 5 below illustrates operation of the fuel cell, another fast process, which can also be controlled by constraint envelopes.

Herding-based optimization is another method of intelligent control. A herding envelope can, for example, be used to "herd the heat" from the interior of self-heating buildings. The interior offices of large buildings generate heat even in the winter, while the offices that have windows require heating. Therefore, the building can heat itself by transferring the heat from where it is in excess to where it is needed.

One can herd thousands of dampers by doing what a sheep dog does in directing a large herd. The Hungarian Puli, for example, goes after only one sheep at a time, the one that is furthest from the desired direction of the herd. I successfully used this algorithm, when I made the IBM headquarters in New York City self-heating.

FIGURE 5: OPERATION OF THE FUEL CELL



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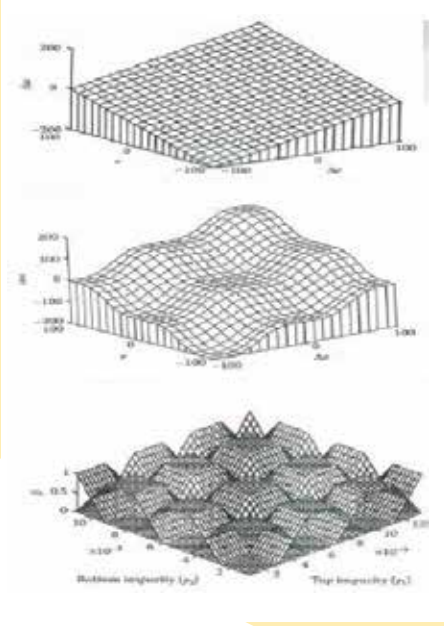
Gectricity is generated as hydrogen is oxidized into water. This is done by an anode, which, with the help of a catalyst removes an electron from the hydrogen to produce electricity, while the proton is combined with oxygen from the air, resulting in the exhausting of water.

Fuzzy Logic

The fuzzy controllerviii is a nonlinear controller with a linguistic nature that provides an extra set of tools to the process control engineer. It is used to control nonlinear processes that are not fully understood and cannot be controlled by conventional methods. FL can be described as controlling with sentences instead of equations by casting verbal knowledge into mathematical representation. For example, the term "hot" is not used as a temperature that exceeds some minimum value, but as a 0 to 1 membership function, where 0 means "absolutely no or total

absence," and 1 means "complete membership." The values of 0 and 1 can correspond to two values of temperature and "membership" describes the actual state of the process.

FIGURE 6: CONTROL RESPONSE



The flat surface at the top of the figure describes the error-output relationship of a linear PI controller. The middle surface can correspond to a nonlinear control surface of a fuzzy PI controller, while the bottom figure describes a fuzzy configuration that consists of 16 multivariable local models (*9).

One can visualize the response of a controller on a three-dimensional x/y/z plot. As shown in Figure 6, the x axis is the value of the measured error (e); the y axis is the change of the error (fje) during the last sample period; and on the z axis gives the corresponding output (y), which the particular controller generates.

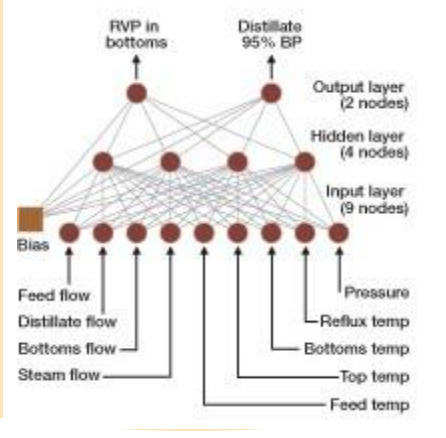
Artificial Neural Networks (ANN)

Neural networks, fuzzy logic and statistical process control are all "model free" or "black box" methods of control. They can be developed for processes, which are not defined theoretically and cannot be described by a mathematical model. The major difference between fuzzy logic and neural networks is that ANN is trained mostly by data and less so or not at all by reasoning. The fuzzy logic model is superior in this respect, because not only the gain (importance) of its inputs can be modified, but their functions can also be adjusted.

The main limitations of all model free expert systems is their long learning period, (which can be compared to the growing up of a child) and the fact that their knowledge is based only on past events. Consequently, they are less prepared to handle new situations, less suited for anticipation and therefore, if the process changes, they require re-training.

Figure 7 below shows a three-layer ANN model that on the basis of the detection of a number of measurable variables, predicts parameters that are not so easily measured, such as the boiling point of the distillate or the Reid vapor pressure of the bottoms product of a column. Such predictive ANN models can be valuable because they eliminate the need for analyzers (which can be unreliable or high-maintenance), and also minimize the dead time in obtaining the measurement.

FIGURE 7: THREE-LAYER ANN MODEL

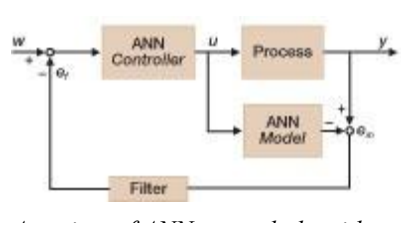


Three-layer ANN model used to predict the composition (quality) of overhead and bottom products in a distillation process.

The process model's "knowledge" is stored in the ANN by the way the processing elements (nodes) are connected to each other and by the importance assigned to each node (weight). The ANN model is "trained" by example and, therefore, it contains an adaptive mechanism for learning from examples and to adjust its parameters based on the knowledge gained through adaptation. During the "training" of these networks, the connections and weights are adjusted until the output of the ANN model matches that of the real process. The hidden layers of nodes between input and output layers help the network to generalize and even to memorize past performance.

It should be noted that the experience of the process control engineers in the plant being controlled is even more important when using ANN-based control than it was when PID control is used. As shown in Figure 8, the artificial neural networks can be used to construct plant models and their inverses, within an internal model control (IMC) structure. The controller in effect is the inverse model of the plant. The ANN-based control system determines the difference (error em) between the process output (y) and the ANN model output and, after filtering that error to remove noise, it is returned as the feedback to the ANN controller. This reduces the uncertainty of the model. The difference between the outputs of the actual plant and the internal model can be caused not only by the model uncertainty, but also by process disturbances. Therefore, internal model control can also reduce the disturbance effect on the system output.

FIGURE 8: APPLICATION OF ANNS IN THE INTERNAL MODEL CONTROL STRUCTURE



A variety of ANN control algorithm types (*10), are available to control nonlinear processes.

AI, ANN and FL Applications

Artificial intelligence has been used in controlling such nonlinear processes as the production of

FIGURE 6: CONTROLL RESPONSE

pulp and paper, cement, detergent powders or the control of electric kilns. ANN applications also include nonindustrial processes, such as oceanography, meteorology or the design of airfoil shapes. Successful industrial applications have also been reported in controlling the hot rolling of steel in strip-steel production.

The fusion of neural networks and fuzzy logic in the form of neuro-fuzzy techniques is seen by many as the most promising way ahead for advanced process control applications. Fuzzy logic has been used in applications from adjusting air conditioners to controlling rice cookers. FL has also been applied in such consumer products as washing machines and in the measurement of the temperature of molten glass. In one self-verifying temperature detection application, an optical (INEEL) and a thermocouple type (AIC) (sensor been combined into a single FL-based sensor that is more reliable than other detectors.

One advantage of FL-based sensors is that they can capture the knowledge of the operators in rule-based fuzzy logic statements. An example of such a statement might be, "I trust the newly installed sensors less than the old ones!" Soft sensors can also detect variables that are not measured, such as flow based on the rate of level change in a tank or on the basis of the opening of a control valve. Soft sensors are discussed in more detail chapter 7.18 in the first volume of my Instrument Engineer's Handbook.

The mass flow of a gas, for example, can be calculated on the basis of the measurements of absolute pressure, differential pressure and temperature. Similarly, the flow through an adjustable-speed centrifugal pump can be calculated from the shaft power equation based on the measurements of the pump's power consumption and speed. Another application is viscosity control in rubber blending, where the final hardness of the batch rubber product can be predicted on the basis of batch temperature, pressure, agitator speed and torque.

Smart sensors can also detect their own failure on the basis of signal observation. For example, if a signal is changing faster than the sensor is capable of, that can be interpreted as failure.

Manufacturers and users have both developed neural networks. For example Emerson Process Management offers an Intelligent Sensor Toolkit for creating virtual sensors for process analysis. Process Perfector from Pavilion Technologies combines neural networks with model-predictive control technology to develop its nonlinear model that is applicable to a wide range of processes (*11).

Neural networks can be installed in existing multivariable control applications and can calculate inferential properties while providing tighter control of nonlinear processes. NeuCOP II controller from Neural Ware incorporates nonlinear models into a model-predictive control strategy with an embedded optimizer that can compute optimal control actions without violating the operating constraints. This software package combines ANN, statistics and multivariable modeling techniques to create dynamic, nonlinear models from process data. The results can be implemented either manually or automatically.

User reports on successful ANN applications include municipal wastewater applications (*12), feed-forward control of refinery cookers (*13), soft sensors in acid plants (*14) and in steady-state modeling to improve chemical utilization (*15).

Conclusions :

The age of the single-loop PID controller is nearing its end. Process control engineers of the future will treat the variables of flows, pressures or temperatures only as constraints, and will control and maximize the efficiency of unit operations by multivariable unit operations' controllers. One of the tools that will be used to do that will be artificial intelligence. The fusion of fuzzy logic and neural networks seems to be the most promising advanced tool for future control applications.

What we all must remember is that no matter how advanced or intelligent the control algorithm is, it is still only a tool and the key to control remains to be the same what it was in the age of manual control, namely: One must fully understand a process, before one can control it!

Brief Ending:

1. AI's scientific goal is to understand intelligence by building computer programs that exhibit intelligent behavior. It is concerned with the concepts and methods of symbolic inference, or reasoning, by a computer, and how the knowledge used to make those inferences will be represented inside the machine. Artificial Intelligence (AI) is an umbrella term for a variety of methods, including fuzzy logic, artificial neural networks, statistical process control and others.
2. Neural networks are based on the way the biological nervous systems, such as the brain, function. The fundamental concept of neural networks is the structure, which is used in the information processing system. Their highly interconnected processing elements (neuron networks) use the human-like technique of learning by example. The neural network is configured for data classification or pattern recognition through training. Just as in biological systems, learning involves adjustments to the synaptic connections that exist between the neurons. Neural networks are being applied to an increasingly large number of real-world problems. Their primary advantage is that they can solve non-mathematical problems—problems that do not have mathematical solutions or for which an algorithmic solution is too complex to be defined. In general, neural networks are

well suited to problems that people are good at solving, but for which computers generally are not. These problems include pattern recognition and forecasting, which requires the recognition of trends in data.

3. Expert systems use human knowledge to solve problems that normally would require human intelligence. These represent expertise in the form of data and rules, which can be called upon when needed to solve problems. Computer programs use decision-making logic and the necessary boundary conditions. This program knowledge is often embedded as part of the programming code, so that as the knowledge changes, the program has to be changed and then rebuilt. Knowledge-based systems collect the small fragments of human know-how into a knowledge base, which is used to reason through a problem. The ability of these systems to explain the reasoning process through back-tracing and to handle levels of confidence and uncertainty provides an additional feature that conventional programming can't handle. Most expert systems are developed via specialized software tools called shells that are equipped with chaining mechanisms (backward, forward or both), and require knowledge to be entered according to a specified format. They come with tools for writing hypertext, for constructing user-friendly interfaces, for manipulating lists, strings and objects, and for interfacing with external programs and databases. These shells are like languages, but with a narrower range.
4. Often the term "expert system" is reserved for programs whose knowledge base contains the knowledge used by human experts, in contrast to knowledge gathered from textbooks or non-experts. More often than not, the two terms, expert systems and knowledge-based systems, are used synonymously. Taken together, they represent the most widespread type of AI application. The area of human intellectual endeavor to be captured in an expert system is called the task domain. "Task" refers to some goal-oriented, problem-solving activity. "Domain" refers to the area within which the task is being performed. Typical tasks are diagnosis, planning, scheduling, configuration and design. Building an expert system is known as knowledge engineering, and its practitioners are called knowledge engineers. The knowledge engineer must make sure that the computer has all the knowledge needed to solve a problem. The knowledge engineer must choose one or more forms in which to represent the required knowledge as symbol patterns in the memory of the computer; that is, he (or she) must choose a knowledge representation. He must also ensure that the computer can use the knowledge efficiently by selecting from a handful of reasoning methods. The practice of knowledge engineering is described later. We first describe the components of expert systems.
5. In automatic speech recognition, a computer maps an acoustic speech signal to text. In automatic speech understanding, a computer maps an acoustic speech signal to some form of abstract meaning of the speech. Speech synthesis is the task of transforming written input to spoken output. The input can be provided in a graphemic/ orthographic or a phonemic script, depending on its source.
6. One might ask that if the contents of a human brain were downloaded into a machine, would that machine become self-aware? For obvious reasons, I do not presume to get involved with such questions.
7. Fuzzy logic provides a means for finding crisp conclusions from vague and imprecise inputs similar to the way problems occur in everyday life. It offers a simpler method that can eliminate rigorous equations and the totally numeric logic flow of traditional computing. Fuzzy logic was introduced by Dr. Lotfi Zadeh of the University of California at Berkeley in the 1960s as a means to model the uncertainty of natural language. It is a superset of conventional (Boolean) logic that has been extended to handle the uncertainty in data. It is useful in process control, because it can handle relationships, which true/false type logic cannot. It lets a process control expert (or an operator) describe, in everyday language, how the process operates and how one can best control or operate a process. This is done without getting into the complex mathematical interrelationships or other theoretical aspects of the process.
8. Supervised (ANNs trained to mimic a human operator or another controller), Adaptive (ANN controllers of minimum cost), Reinforcement type (ANN controllers trained by means of reinforcement training), Predictive (ANN controllers trained to match the output of an optimization routine on a plant simulator), Optimal (ANN controllers which include the capability to minimize non-trivial cost functions), Model Reference (ANN controllers trained to track a reference model), Inverse (ANN controllers using the inverse model of the plant as their reference), Output Matching (ANN control serving to minimize the error between the output of the actual plant and a reference signal from its model), Indirect Output Matching (Controller errors are calculated from plant output error signals by back propagating them through plant models), Direct Input Matching (Calculating the ANN controller error by using the controller as inverse model of the process).

HIGH END VIDEO SECURITY SURVEILLANCE

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The top five key trends for the video security surveillance Industry during 2021, not only in Indian nation context, but also in global business environment context too.

(1) AI Edge Based Solutions.

(2) Open Platform

(3) The Cloud Computing Concept

(4) The Cyber Security

(5) The Data Protection and Privacy Issues.

Elaborating, all the above said five key trends in high end video security surveillance.

(1) Growth of AI edge based solutions, with unlimited applications potential. a key advantage of edge device is that they have the ability to run specialist software applications on board. This improves resources efficiency and saves processing time and minimizes network bandwidth requirements. With increased functionalities, now being included in edge based, deep

Growth of AI edge based solutions, with unlimited applications potential. a key advantage of edge device is that they have the ability to run specialist software applications on board. This improves resources efficiency and saves processing time and minimizes network bandwidth requirements.

learning, AI solutions, there is likely to be a large increase in the number of devices deployed which can process the data .

(2) Open Platform: Extended open platform will facilitate the development of a wider array of customized vertical market and end users specific solutions. With end users wishing to achieve maximum value from their high end video security solutions, software development cannot continue as a soloed processed by a single company's in house software engineering team.

The OPEN SECURITY AND SAFETY ALLIANCE (OSSA), an initiative which has brought likeminded video security surveillance organizations not only in India but also in global business environment context, together with the objective of outlining, specifications for a common platform for security and safety solutions.

During 2021, the business says it will work with other members of members of video security surveillance organization meant for safety and security in the global context. i.e., above mentioned, O.S.S.A. To other members of the O.S.S.A. to build a standardized and accessible frame work, which will provide the flexibilities for integrated solutions to be developed that will address regional or user specific requirements. In parallel to collaborations with other members of O.S.S.A., the said OSSA, members will intends to further improve the compatibility and also the interpretability of its open platform products as cited above platform, with in the video surveillance eco system.

(3) The Cloud Computing Concept: The cloud computing concept will be more widely adopted as a business insights tool under the formulation of one of the strategies of their enterprises mainly as business strategies, the cloud is widely used now as a way of updating the product features, as well as installing security patches. However, the increase in the number of edge devices, and handling a large amounts of data to provide business intelligence. So as a Subject Matter Expert of ESSCI, and being a certified lead trainer on the basis of accomplished electronics engineer,

With end users wishing to achieve maximum value from their high end video security solutions, software development cannot continue as a soloed processed by a single company's in house software engineering team.

In an environment, where, intelligent infrastructures such as smart cities, smart factories and small retail stores are expanding and data being secured at edge level, the exposure to cyber track is also increases, so cyber security will become crucial, in my view and opinion.

the corporate member of premiere professional body in the world I.E.T.E, with life membership- AM -236704, and more importantly ,the area of proficiency in the Video / Audio security surveillance and al the Industry.

Experience of more than thirty years, planning to introduce cloud solutions that will enable concerned users to more easily manage wise-net I.P. network products and monitor their status in real time.

Equally important the solution will generate reports which provide greater situational awareness and business intelligence based on the results of analyzed data that has been captured at each edge.

(4) The Cyber Security: In an environment, where, intelligent infrastructures such as smart cities, smart factories and small retail stores are expanding and data being secured at edge level, the exposure to cyber track is also increases, so cyber security will become crucial, in my view and opinion. With data increasingly being captured, stored

and secured at the edge as a part of smart factories, smart office, and smart retail stores or on a large scale, a smart city solution, the need for protection against cyber attacks arises simultaneously.

So I have aspired to establish a system that customers can trust. Verifying the trusted edge devices through mutual authentication of the point of data transmission to the server, while circulating the edge's open platform has become as essential feature. As on effort to go beyond the company's own security verification standards, keeping in this view for the future aspect. Then I have aspired to establish a system that concerned customers can trust by obtaining a cyber security certification from a well reputed, recognized and more over authorized, third party certifier.

(5) The Data Protection And Privacy Issues : The protection of personal data should be at the foundation of the business ethics of any security organization , as privacy protection regulations are being introduced around the world such as the General Data Protection Regulation (G.D.P.R.) In Europe And The California Consumer Privacy Act(CCPA)

The Video surveillance industry is adapting, privacy by design best practices and increasing its efforts to protect personal data from misuse and abuse.

Since organizations / Companies/ firms/ enterprises etc , are increasingly aware of the dangers of private data breaches and are becoming more discerning when evaluating security products and solutions they can trust .

By adapting privacy by design methodologies, manufacturers

(High end video security surveillance electronic products, manufacturers.) in total global can ensure, that the high end security video surveillance technology can be used to its fullest, without compromising the privacy of personal data.

India as a nation has skilled citizens with diversified expertise, availability of different and huge natural resources, and abundant opportunities, depending on the geographical locality, socio-economic profile and strong ease of doing business environment where SMEs contribute enormously for the growth of the nation economy. Micro, Small and Medium Enterprises (MSME) sector has emerged as a highly vibrant and dynamic sector of the Indian economy over the past five decades. India as a country has huge market potential for Industry 4.0. The essential technologies of industry 4.0 includes Internet of Things (IoT), Virtual Reality, Cyber-physical systems, Machine learning and collaborative robots. Industry 4.0 contributes enormously for the growth of Nation's economy.

India has seen proven track record of implementation of I4.0 in SMEs through various regional and National level initiatives by MSME and Government of India. MSME has been spearheading to implement the industry 4.0 through digital MSME schemes where the existing infrastructures are converted into digital cloud based technologies.

India has successfully launched the pilot project of Industry 4.0 through manufacturing smart digital railway coaches that inhouse cloud based technologies and Internet of Things (IoT) and several sensors. The smart coaches are manufactured in the state-of-the-art manufacturing plant at Modern Coach Factory, Raebareli. This implemented under the Technology mission by Ministry of Railways in collaboration with Department of Science & Technology, Government of India

Collaborative Robots (Cobots)

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with Indian Institute of Technology (IIT) Kanpur as academic partners. India has pioneered in fourth industrial revolution through Centre of Excellence in Industry 4.0 established by World Economic Forum in Maharashtra. The centre has placed India in the global map.

The Concept of "Ease of doing business" by Government of India has bagged India the 63rd position among 190 nations in the world bank's ease of doing business ranking. India has pioneered the innovation by scoring a position of 48 in the innovation index. India is on the threshold of major reforms and is poised to become the third-largest economy of the world by 2030. MSMEs plays an important role in the economic and social development of the country thereby creating the highest employment growth as well as accounting for a major share of industrial production and exports.

Government of India has been emerging in making India a self reliant nation through the successful implementation of Atmanirbhar Bharat that creates the localized products through Vocal for Local. This propels India to make its position in the global ranking. The Indian economy is likely to emerge as one of the leading economies in the world, with an envisioned GDP of USD five trillion economy by 2024.

One of the major technologies that evolved in Industry 4.0 is the collaborative robots that is called as Cobots. Cobots has paramount importance in contributing majorly for the Industry 4.0. Cobots has made major breakthrough by creating silent smart manufacturing in India.

India has successfully launched the pilot project of Industry 4.0 through manufacturing smart digital railway coaches that inhouse cloud based technologies and Internet of Things (IoT) and several sensors.

Cobots for Smart manufacturing

The challenges in the conventional manufacturing systems are precession, accuracy, connectivity of equipment, security of data. The inventory management and real time monitoring of equipment and maintenance are also of major concerns. The advent of fourth industrial revolution has provided tremendous opportunities for cobots for smart manufacturing system. The manufacturing system has changed from traditional system to smart manufacturing system with the birth of essential technologies of industry 4.0 such as Internet of Things (IoT), Artificial learning, Virtual Reality and Augmented reality, drones, machine learning and edge computing. The cobots plays a pivotal role by transforming the existing manufacturing system to smart manufacturing systems. The present article gives a blue print of the cobots technology and success stories of implementation of cobots in SME through case studies.

Cobots differs from traditional industrial robots as far as the safety is concerned. The other factors are short return of investments, shared workspace and payloads. Cobots reduces the downtime therefor the machine efficiency is improved and shared the workspace with human workforce. Cobots are safe to use and affordable and can be easily integrated with onboard computers and IoT. Cobots are able to perform difficult task by means of flexible approach. Cobots are easy to move around having flexible 360 degrees of freedom and easily deployable in existing system without changing the layout of the shop floor. Cobots finds application is packaging and palletizing, painting, coating, dipping, finishing, machine tending, material handling, visual tasks and assembly. Cobots are the boost engine for Make in India initiative. Cobots are going to reboost, rebuild, recreate and reinvent the existing manufacturing systems because of its flexible technology.

Government of India has been emerging in making India a self reliant nation through the successful implementation of Atmanirbhar Bharat that creates the localized products through Vocal for Local.

Cobots has been successfully deployed by Indian MSMEs. The article discuss about the successful implementation of cobots for different manufacturing applications.

Case study I: New Engineering Works, Jamshedpur, Jharkhand being a SME established in 1996 are pioneers in manufacturing of hydraulic, pneumatic, engine and brake components for commercial vehicles especially for automotive players such as Tata Motors, Ashok Leyland and Brakes India. The increase in demand for hydraulic and other components has made them to shift to cobots in the shop floor and by installing 6 cobots in the production line the company has witnessed increase in their production by 40% and increase the operational efficiency.

Case study II: Craft and Teknik Industries, Punemanufacturers of automotive components deployed cobots for automatic testing and CNC machine tending found 15-20% increase in production and also aiming for 30% increase in production.

Case III: SME Textile Machinery Pvt., Ahmedabad Ltd being in the textile machine business manufacturing more than 6 decades since 1958. In order to adopt to latest technologies and challenges in the competitive market, the SME has implemented cobots and witnessed 300% increase in production of machineries.

Cobots for Silent factory: A Case study

Cobots has been revolutionizing the Industry 4.0 because of its interesting features. The Indian manufacturing system has been transformed through the implementation of the silent factory created by Bajaj Auto. Bajaj Auto pioneers in the automobile manufactures has executed that silent factory in India to manufacture the electric vehicle scooters. The silent factory has made a major breakthrough and set benchmark in the manufacturing systems. The company has created the silent factory with the application of cobots majorily for the manufacturing system. The cobots share the work space and performs the automated tasks. The advent of cobots has transformed the traditional manufacturing to smart manufacturing. Baja auto has pioneered the workforce through successfully implementing 50% of women workforce in the assembly lines.

Reskilling and Upskilling

In order to meet the demands of skill requirement for the industry 4.0 various sector skill councils has been training the youth on the industry 4.0 skills. Additionally Government of India organization such as National Productivity Council and several industrial associations like National Productivity Council, PHD Chamber of Commerce & Industry, ASSOCHAM and Quality Council of India has been organizing various training programs on Industry 4.0 to train the manpower considering the promising future of the technologies. Reskilling and upskilling in the Industry 4.0 will create employment opportunities as this is the need of the hour. The Technical Training Centre at Modern Coach Factory (MCF), Raebareli has centre of excellence in Mechatronics, Robotics and Automation that provides training in the cutting edge technologies of fourth industrial revolution for the staff of MCF . The centre has in-house mechatronics lab, automation lab and power electronics lab.

Industry 4.0 Readiness Tool for SMEs

The primary requirement of SMEs to transform to industry 4.0 is the preparedness or readiness to implement the fourth industrial revolution technologies. In order to facilitate the SMEs to make this manufacturing transformation, the Centre of Excellence on Industry 4.0 of National Productivity Council, Ministry of Commerce & Industry, Govt. of India has developed a customized digitalized tool to assess the present level of digital readiness of the SMEs that is expressed as 5 maturity levels which is described as Starter, Managed, Adaptive, Realizer, Top-Notch (in short called as SMART). The tool is smarter and digitalized way to assess the SMEs readiness to industry 4.0 irrespective of the size, profile and manufacturing domain. The tool is categorized as 3 point drivers such as manufacturing strategy, digitization strategy and organizational strategy. The tool will provide additional inputs for the SMEs to identify the potential improvement areas as well.

Source: Data/Information taken from published online Sources

WEBINAR

As the current coronavirus pandemic forces more key business decision-makers to work from home, webinars are booming in popularity. During the lockdown of Covid in May & June, 2021, Instrumentation, Automation, Surveillance & Communication Sector Skill Council organized successful webinars with many organizations. Webinars have become the new normal. They are a great way to manage your professional activities while maintaining social distancing.

A webinar is an event which is held on the internet and attended exclusively by an online audience. Audience or participants can follow webinars via smart-phones, tablets, PC, and laptop at anywhere they are. They can see and hear the speaker or speakers. Webinar allows various interactive opportunities, such as asking a question, Chatting, Poll, Survey and Tests.

Webinar with MIET Meerut

In our mission to create an ecosystem for Innovation, Entrepreneurship and tinkering minds to support future Industries, MIET Meerut, ACIC MIET Meerut Foundation and IASC, Skill Council of India jointly organise the aforementioned awareness session on 26th July 2021 (Monday) at 3:00 PM.

Shri Ajay Bhushan, CEO, IASC, Skill Council of India was our distinguished speaker and subject matter expert for the occasion. The Awareness Session will encompass the following agenda(s):

1. Current Scenario of Skilling
2. Need for Industry Ready Skilling
3. Benefits of Upskilling

More than 500 candidates from school & college participated.

Webinar with Softcon India Pvt. Ltd.

The Council & Softcon India Pvt. Ltd. Organized a webinar on "Placement Opportunity in Industrial Automation Sector". It was attended by more than 300 students.

The outcome of the webinar was that 157 candidates were certified under the job roles of, Industrial Automation Specialist and Junior Instrumentation Technician.

IASC Sector Skill Council signed MoU with Directorate of Municipal Administration, Urban Development and Housing Department (UD&HD), Government of Jharkhand on 28th Nov'20 regarding Skill training programme for urban poor youth in state. 1096 candidates were successfully trained under this program.

Evolution of Automobiles

From Electrical Vehicles to Connected Autonomous Electrical Vehicles

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Background:

An electric vehicle (EV), is a vehicle that uses one or more electric motors or traction motors for propulsion as its main drive which may be powered through a collector system by electricity from off-vehicle sources, or may be self- contained with a battery, solar panels, fuel cells or an electric generator to convert fuel to electricity. EVs include, but are not limited to, road and rail vehicles, surface and underwater vessels, electric aircraft and electric spacecraft.

However, in common terminology EV is used for Automobiles which came into existence in the mid-19th century, when electricity was among the preferred methods for motor vehicle propulsion, providing a level of comfort and ease of operation that could not be achieved by the gasoline cars of the time. Rise of internal combustion engines due to rapid technological development in IC engine technology, manufacturing processed as well as its overall eco- system dominated the road transportation for almost 100 years now and electric power was pushed to other bigger kindly either heavy or lighter mobility applications, such as trains and smaller vehicles. Due to changes business scenario, technological developments in electrical traction, battery technology and power controls & charging systems and an increased focus on renewable energy and the potential reduction of transportation's impact on climate change and other environmental issues, post 2000, EVs have seen a resurgence. Project Drawdown describes electric vehicles as one of the 100 best contemporary solutions for addressing climate change (https://drawdown.org/solutions/electric-cars).

The Development & Growth of EVs

EVs has very long history, starting from 1834, 50 years earlier than first petrol powered Internal Combustion Engine Vehicle (ICEV), which was only built in 1879 by Carl Benz. In the early 1900s, mobile market was rules by EVs as they were better than the ICEVs. EVs had a number of advantages over their early 1900s competitors. They did not have the vibration, smell, and noise associated with ICEV vehicles. They also did not require gear changes. The cars were also preferred because they did not require a manual effort to start, as did gasoline cars which featured a hand crank to start the engine.

However, it was only after 1880 when Edison lit his first light bulb, the real interest in EVs started taking shape. However it had to wait for another 5 years till 1891, when A. L. Ryker built an electric tricycle and in the same year William Morrison built a six-passenger wagon. In 1895 more engineers began to devote their attention to EVs. Many innovations followed and the interest in EVs increased greatly in the late 1890s and early 1900s. In fact, William Morrison's design with a one passenger capacity is often considered the first real and practical EV. The last decade of the 19th century was a blooming period in the early development of EVs. The ''Electrobat'' was converted from a delivery wagon, and ran on the streets of Philadelphia, PA, in 1894. It is also interesting to note that the first vehicle running over the 100-km/h barrier was an EV, namely, the ''Jamais Contente'' (Never Satisfied), which was driven by Camille Jenatzy, a Belgian. It was a bullet-shaped electric racing car, and it captured the record of 110 km/h on May 1, 1899. In fact, before the preeminence of ICEVs, EVs had held many speed and distance records. In addition, electric trains were used to transport coal, as their motors did not use up precious oxygen. Also many of metropolitan cities including that of India's had electrical trams running as a public transport vehicles.

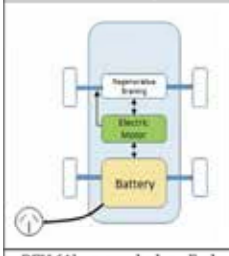
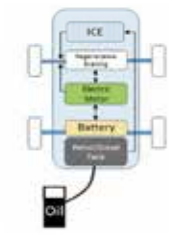
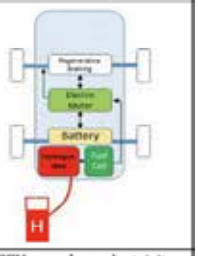
The Fall of EVs

However, in short span of 30 years, the fall of EVs had already began because of various prevailing factors e.g. development of improved & long road system in US demanding a need for vehicles which could travel longer distances, have ease of refueling, system of which was made available when crude oil was discovered in Texas in 1901 the oil boom followed, resulting in continuous fall of oil prices & forcing people to create the whole network of fuel transportation, handling storage & distribution system. The infrastructure needed for EVs growth could not match this pace of development which pushed market for ICEVs. At the same time, came very few fundamental innovations like invention of the electric starter by Charles Kettering in 1912, eliminating the need for the hand crank or kick starting.

There are many inherent advantages of EVs however the most critical ones are – 1) EVs have very low adverse impact on environment throughout their life cycle, 2) EVs have a much smaller carbon footprint & 3) EVs have much lower ownership cost over their whole life cycle.

But finally plugs for EVs were pulled out Henry Ford who had clearly focused on creating an affordable ICEV for the masses and in the process developed many innovative ideas including most famous innovation of Mass Production on the Moving Assembly Line, a process that dramatically kept on reducing the process time 514 minutes to 2.3 minutes and later to 1.19 minutes. This gigantic reduction in take time led to similar reduction in cost of Ford's ICEVs, which could be sold at affordable price range of $500 –$1000 price. The demand of his Model T ICEV was so high that in the year 1920 the Ford vehicles touched 2 million volumes sales. By contrast, the price of the EVs continued to rise and by the end of 1912, an EV was being for $1750. Milburns a leading EVs manufacturer during 1915 to 1923 had sold to GM, post which no new serious efforts were made at Detroit on EVs. In 1929, W. C. Anderson sold the company & in the same year the last Detroit EV under Anderson was shipped. ICEVs kept increasing their grip on automotive market & post WWII, "Lean Manufacturing" of Eiji Toyoda & Taiichi Ohno of Toyota Motor Company ensured that it tightened more. The ICEVs kept dominating the automobile market for next few decades adding on millions of ICAVs on roads every year. Slowly by 1936 the EVs disappeared from market. There were many other factors which contribute in this fall of EVs as mention above which were later immortalized in a documentary "Who Killed the Electric Car?" (Directed by Chris Paine, Produced By Electric Entertainment, Distributed By Sony Pictures Classics In 2006).

Diversified Electrical Vehicle Technologies

BEV	HEV	PHEV	FCEV
(Battery Electric Vehicles)	(Hybrid Electric Vehicle)	(Plug-in Hybrid Electric Vehicle)	(Fuel Cell Electric Vehicle)
			
BEV (Also popularly called EVs), are fully-electric vehicles with rechargeable high capacity batteries packs and have no gasoline engine. There are no harmful emissions.	HEVs & PHEVs are powered by a combination of IC engine and an electric motor, which uses energy from batteries. While, in HEV the battery can be charged through regenerative braking and by the internal combustion engine, it cannot be plugged in to an external power source for charging, PHEVs can be also charged from an external power source.		FCEVs produce electricity using fuel cell powered by hydrogen, rather than drawing electricity from only a battery.

However because of their inherent much better qualities and features, the EVs never died completely and most of the global companies kept on developing alternatives of EV technologies which led to the development HEVs, PHEVs which tried to combine best of ICEVs and then there was altogether FCEVs which used liquid hydrogen as its fuel and generated pure water in the process of combustion. These development are summarized below:

It was only a matter of the right time when EVs could bounce back.

Survival & Rise from Ashes...

Revival of EVs could be contributed to three unrelated incidents but contributed greatly in the comeback of EVs. First one was the oil crisis of 1970s, second was development of MOSFET (metal–oxide–semiconductor field-effect transistor) in 1959 which paved the path to the development of IGBT rectifier & inverters combination & third one came 1980s when John Goodenough, Rachid Yazami and Akira Yoshino developed lithium-ion battery.

Utilizing this innovations, Tesla invested heavily in EV technology between 2003~205 and in 2008 developed the cutting-edge battery technology and electric powertrain need for EVs. From there, Tesla designed the world's first ever premium all-electric sedan from the ground up – Model S – which became the best car in its class, combining safety, performance, and efficiency.

Future of EVs & Connected & Autonomous EVs (CAEVs)

There are many inherent advantages of EVs however the most critical ones are – 1) EVs have very low adverse impact on environment throughout their life cycle, 2) EVs have a much smaller carbon footprint & 3) EVs have much lower ownership cost over their whole life cycle. With success of Tesla cars as well as of many others, coupled with rise of internet/IoTs in last few decade, Connected and Autonomous Electric Vehicles (CAEVs) were the natural successors of EVs which can provide a well-controlled & coordinated transportation system which is self-governed, self-driven, self-controlled, self-corrected and which requires least human interference as far as mobility issues are concerned.

Such vehicles, which while on move, could access to a wide range of data as well integrate them with each other, would become more proactive, well-informed and coordinated in the future. A highly complex & interconnected future, in which these CAEVs would be able to "talk" with each other, their surroundings like smart roads, smart signals, smart parking lots, local terrain and geographical information, weather condition including many other such informations as well as with live traffic data. Coupled with their extremely high level of computation capacities, these CAEVs will be able autonomously work out the best, most comfortable & safest possible routes for the humans travelling in them without their intervention.

Thus these CAEVs in future would create more free time for people traveling in them, enhance traffic safety leading to accident prevention; improving accessibility, comfort and in-vehicle riding experience; potentially making it easier for policymakers to prioritize car-sharing and ride-sharing business models; and reducing road traffic congestion, environmental degradation, air pollution, noise nuisance and social exclusion for those currently unable to drive to name a few.

The new automotive industry in which EVs are the clear leader, is still evolving where old guards are falling while new ones are taking over, by reinventing the proven methodologies, like mass production/ lean manufacturing, which were master over almost a century during the rise of ICEVs.

These EVs manufactures are actively working on the development of CAEVs and conducting trials with various degrees of success is a mix of traditional car manufacturers, ride-hailing and intelligence companies. IT & electronics based companies like Google, Apple, Uber, Ola & Sony which are not presently in a mobility business, are investing heavily in EVs which will radically change the dynamics of the automotive industry, where ICT will be a difference-making competitive advantage.

With this dramatic shift in mobility arena, 150 years old conventional automotive industry will be forced to adopt new business models for sales as well after sales services. While sale will prioritize shared use over private ownership the after sales service network will also have to change drastically from current service setup which is more or less a mechanical process and many times can be found in nooks and corner of every city to a highly complex service setup. The new setup has to evolve where block replacement of units would be more prominent as compared to current trend of repairing & sub-component replacement.

Gigantic reduction in take time led to similar reduction in cost of Ford's ICEVs, which could be sold at affordable price range of $500 –$1000 price. The demand of his Model T ICEV was so high that in the year 1920 the Ford vehicles touched 2 million volumes sales.

It was only after 1880 when Edison lit his first light bulb, the real interest in EVs started taking shape. However it had to wait for another 5 years till 1891, when A. L. Ryker built an electric tricycle and in the same year William Morrison built a six-passenger wagon

In the context of smart cities which will promote sustainable growth and provide tremendous growth opportunities for these CAEV who will slowly become the epicenter of all transportation, providing smart mobility solutions by forming an interconnected vehicular network assessing & analyzing varied diversified live information. With this kind of complex networked & integrated future society in which CAEVs will always be dynamic, interacting & interfacing with human beings who will be using them for their all mobility solutions, it is expected that there will be many expected & many more unforeseen potential benefits & challenges to users & society as well as to CAEVs themselves. Some of them are listed below broadly categorized in three categories:

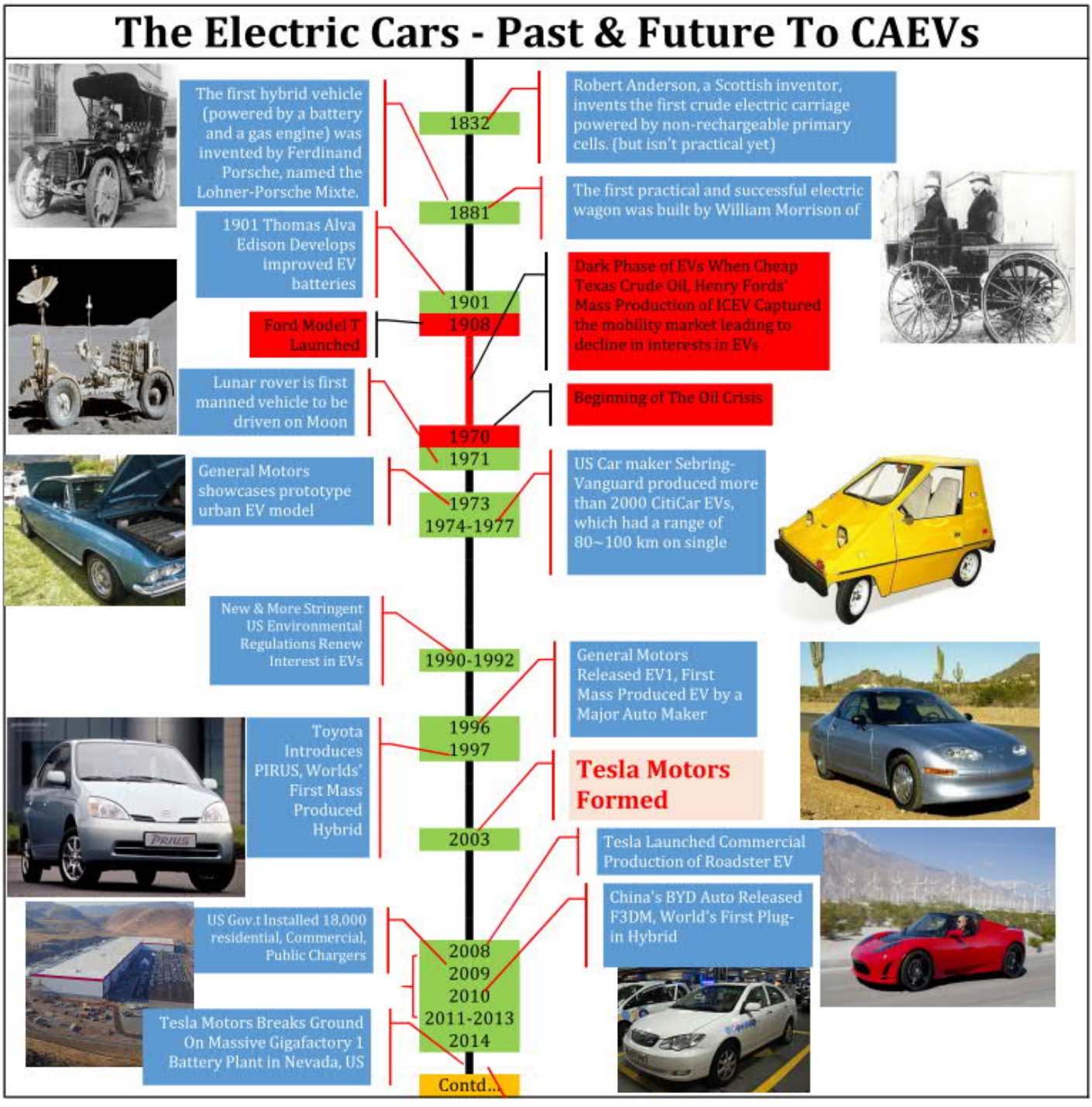
Potential Challenges For The EV/ CAEV Market

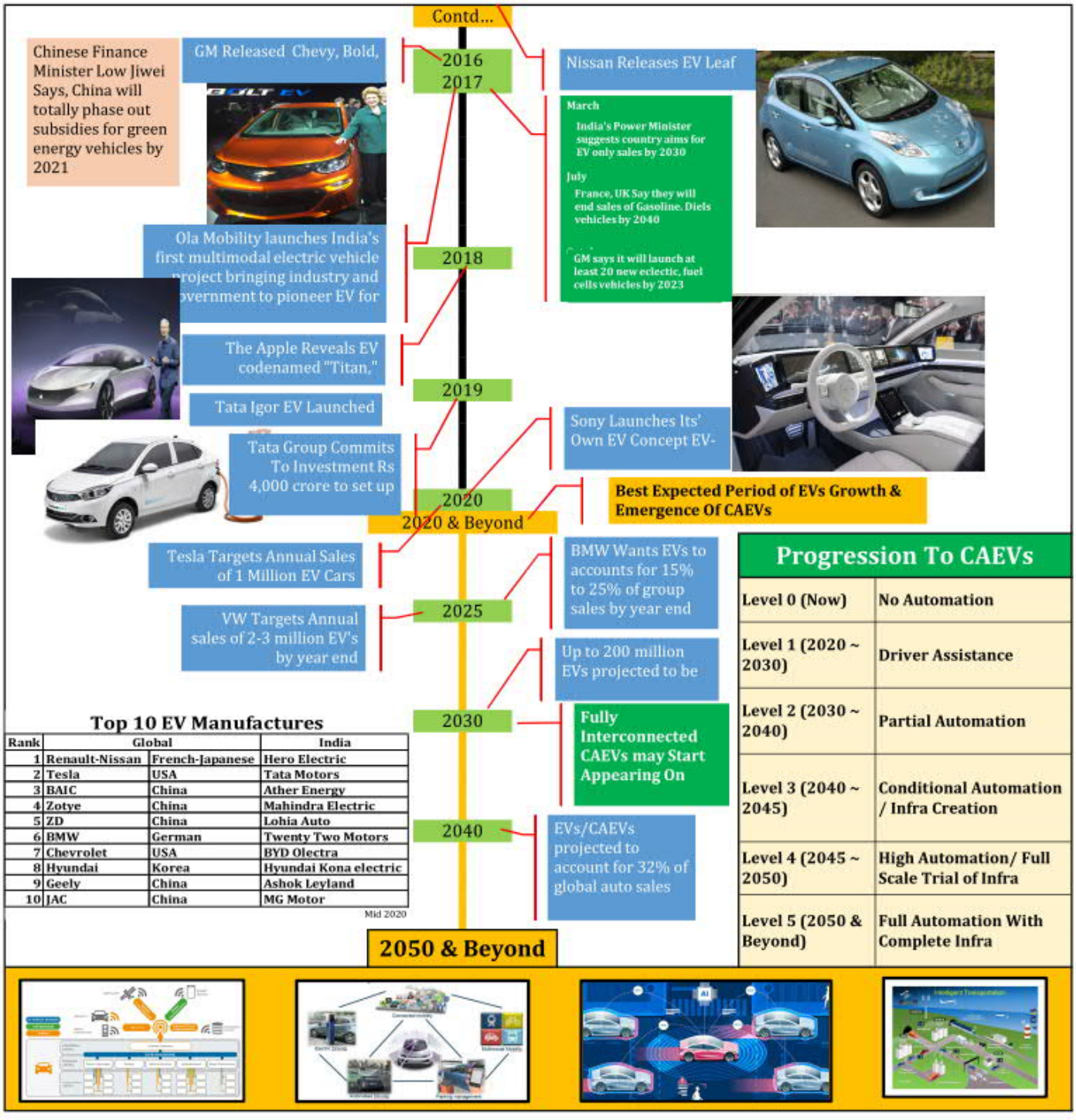
- Challenges Related In Handling Batteries During Their Life, Utilization And Their End Of Life.
- Long Term Battery Performance
- Charging Practices Which Might Affect Life Of Battery
- Availability Of Long Range & High-Performance Evs
- Lack Of Offsite Repairs
- Lack Of Quality Maintenance And Repair Options
- Recalibration And Reskilling Of Large Existing Maintenance Setup
- Lack Of Charging Network (Especially In Remote & Rural Areas)
- Battery Charging Time
- Possibility Of Loss Of Large Scale Secondly Market Of Automobile Components/ Accessories
- Increased Anxiety Among Consumers (During Transition Phase)

Potential Benefits To Society And Users

- Elimination The Human Error In Driving
- Lesser CAEVs For Same Traffic Due To Better Engagement
- Reduced Traffic On Road
- Efficient Traffic Management
- Decreased Noise Nuisance
- Reduced Dependence On Fossil Fuel

- Newer Yet Smaller Enforcing And Policing Requirements
- Increased Productivity & Less Stress
- Less Parking Space
- Improved Traffic Security
- Lesser Maintenance Cost
- Less Environmental Degradation
- Smoother Rides Due To Better Control
- More Cabin Space – No Steering Wheel/ No Driver





Potential Concerns For Society And Users

- Ambiguity Of Responsibility In Accidents/ Life Saving Situations
- Security, Safety Risks including Risk of Collapse Of Complete Mobility System Due To Cyber Treat
- Lack Of Trust Leading To Human Anxiety
- Employability Threats – Loss of Driving/ Regular Maintenance Jobs
- Increase Electricity Consumption/ Demand Management
- Privacy Issues And Loss Of Personal Space
- High Cost Of Developing New Skills Sets
- Likely Loss Of "Ownership" Rights
- High Cost Of New Traffic & Mobility Infrastructure
- Need For An Entirely New Traffic Regulations
- Issue In Changing of Century old Traffic Culture
- Loss Of Driving Skills And Situational Awareness
- Traffic Management During Transition Phase
- Battery Explosion in Case of Thermal Runaway

Epilogue

CAEVs are a certainty and it is only a matter of time when they become a part of human lives. They are going to lead a much bigger change in transforming the whole mobility system as we today, related energy network infrastructure, road, signaling, parking infrastructures, Rules related to traffic violation and insurance claims, vehicular ownership and travel habits of people.

Control and track of these CAEVs as well as changing human's behaviors while interacting with such autonomous mobile machines which will generate enormous amount of movement related information will require exponential large computational and AI capacities leading to next major boom in this field of Information Technology. CAEVs are projected to be the next gold standard of mobility, transforming automotive industry, city development, the whole gamut of infrastructure what we see today and probably the way current social interaction takes place. The rise of current trend in the EVs is certainly a step in bringing this dramatic change which has paced up in last decade since conventional ICEVs could not have provided this intelligent interface of an automobile despite having a highly sophisticated system with all their mechanical complexities. This would be an interesting transformation phase for both automotive industry as well as the whole society we live in.

However, it is very essential to note & remember that when Henry Ford developed the first ICEVs, they were not reliable, there were no gas stations, there was no precedence of many systems (like traffic singles, traffic regulations, expressways, highways, disposal eco-systems of these vehicles at end of their life) which are taken for granted currently, but he was still devoted to his creation (ICEV) by improving the quality & performance, reducing cost, and negotiating with oil companies to build the gas station infrastructure and to establish the maintenance service network. The philosophy of making & continually improving a product, backing up system to create good infrastructure, and focusing on a good business model of providing economical & affordable product for mass convenience of varied usage to reduce human burden and effort still remains valid. Most importantly, his philosophy of having an open mind and having courage to develop & continually improve a new technology with a focused business philosophy will continues to inspire EV/CAEV manufacturers across the globe.

CAEVs are a certainty and it is only a matter of time when they become a part of human lives. They are going to lead a much bigger change in transforming the whole mobility system.

supporting engineering documentation through digital technologies

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In the modern plant operation the adoption of digital technologies will play key role for plant productivity, safety and environment. Digitization, IoT, IIoT, digital twin, big data, artificial intelligence and virtual reality are rapidly developing technologies in future industrial process plants. For efficient industrial process plant operation and maintenance engineering documents, equipment data sheet, maintenance records and process reports should be made available in a real-time.

Processing plants usually operate for decades and therefore it becomes important and essential to modernize its systems. Carrying out the necessary activities during ongoing plant operations becomes difficult when the process control systems become old and thus should be modernized or completely replaced.

One requires an efficient documentation tool that is able to process a plant's data from various sources and, consequentially, offers the required information for modernization projects as well as practice-oriented use during operation. This is the key to success and will prove beneficial when supported by systematic planning and preparation.

Even if the process industry talking

Image Courtsey : Tech Republic

about topics relating to "Industry 4.0", imminent investment decisions must not be postponed or taken in a way that will subsequently prove to be a hindrance. Today, it has already long been clear that engineering needs to supply high quality data so that production can run as efficiently as possible – this applies both to process control and to the design of the production plant itself.

Understanding engineering documents in industrial process plants

In the modern process plant engineering document management system integrated with maintenance records, process reports, equipments data sheets, PFDs and instruments loop drawing.

In DCS/PLC automation close and open control loop (analog and discrete) signal flow processing.

Instrumentation/electrical signal wiring between the field and control room devices. The availability of wiring drawing for maintenance plays crucial role to reduce plant downtime.

In the older plants engineering documents are stored in multiple formats such as hard copies and soft copies.

Some of the challenges / key requirements for the running Process Plants

- Availability of right & up-to-date data / documents to reduce shut down / maintenance time with Efficient search facility for all the drawings / documents including scanned files.
- Have relational database of instrumentation and control(I&C) drawings/documents to facilitate "Change once- Update-All" I&C documents to keep it consistent and free from any mismatching information.
- Reduce re-engineering cost/DCS up gradation time
- Increase efficiency of Maintenance personnel
- Save engineering time/cost for the new projects

Processing plants usually operate for decades and therefore it becomes important and essential to modernize its systems. Carrying out the necessary activities during ongoing plant operations becomes difficult when the process control systems become old and thus should be modernized or completely replaced.


Image Courtsey : The Conversation

Problems in accessing engineering documentation:

- Documents are removed from files, modified and not or incorrectly replaced.
- Data and documents in multiple forms like word, excel etc. which makes it difficult to analyze. Some files in read only format like read only pdf or scanned copies changes can't be updated.
- Each document is different.Several files need to be updated manually for any modification.
- It is not unusual that several files must be examined when carrying out engineering and when searching for particular information.
- Efficient and intelligent search method is missing with paper documentation.
- Maintaining & updating - archives of Data in drives, directories, C.D.'s, scattered and non-intelligent.

Engineering documentation via digital technologies:

Software and consulting services provider designed

Even if the process industry talking about topics relating to "Industry 4.0", imminent investment decisions must not be postponed or taken in a way that will subsequently prove to be a hindrance.

solution that provides plant engineering documentation system that integrate all technical data and drawings like loop diagrams, interconnecting wiring diagrams, instruments specifications etc. in to a single database so that time and efforts in collecting the desired data during maintenance can be saved.

Digitization technologies feature:

- Technologies available have systematic and flexible document management structure.
- Software has a powerful Search feature which is capable of searching not only keywords but also within the contents of the documents and drawings such as Tag names, JB numbers, Cable numbers, Instrument Make & Model etc. It must present the search results in a simplified manner.
- Common CAE database of all instruments, equipment and signals for engineering / re-engineering of Plant Documentation. Any change / editing is based on the database rather than modifying individual documents and drawings.

Software also calculate/select instrument size based on process parameters available in the Instrument data sheet. For Earlier Detection of errors/problems (e.g. choking, flashing, mechanical damage or reliability) of each and every valve.etc.

Digitization solution adoption benefits:

- Enable all users to access consistent, current information from a single data source
- Enforce engineering standards
- Keep plant information up-to-date
- Plan plant expansions or DCS modernizations
- Better schedule plant shutdowns & maintenance operations
- Improve plant uptime, safety & compliance
- Exchange data with suppliers, saving time & increasing data quality
- Commercial software are non-proprietary.

आदर्श ग्राम के बाद अब डिजिटल विलेज

Digigaon का लक्ष्य हर ग्रामीण नागरिक को डीजिटल साक्षर बनाना प्रत्येक ग्रामीण नागरिक को डिजिटल रूप में मजबूत करना और भारत के प्रत्येक ग्रामीण नागरिक को डिजिटल सशक्त बनाना है

शहरों की तरह अब गांवों पर भी इस स्कीम के तहत फोकस किया जाएगा। गांव वालों को इंरटनेट से जोड़ा जाएगा। उन्हें इसके लिए जागरूक भी किया जाएगा।

डिजिटल विलेज स्कीम दरअसल डिजिटल इंडिया योजना का ही एक हिस्सा है।

डिजिटल विलेज स्कीम के ढेर सारे फायदे हैं। बड़े शहरों में तो लोग टेक्नोलॉजी से जुड़े हैं, लेकिन कज्बों और गांवों में लोगों के अंदर अभी भी इसका अभाव है। वे ऑनलाइन की बजाय ऑफलाइन काम करना पसंद करते हैं। ऐसे में डिजिटल विलेज स्कीम की वजह से बड़े शहरों के साथ ही छोटे शहरों, कज्बों और गांवों में भी लोग टेक्नोलॉजी से जुड़ेंगे। वे तेजी से ऑनलाइन यूजर बनेंगे। स्मार्ट फोन के साथ ही टैबलेट, लैपटॉप, कंप्यूटर फ्रेंडली भी हो जाएंगे।

ई-ग्राम डिजिटल

1. प्रधानमंत्री डिजिटल विलेज स्कीम के तहत 22 जिलों का चयन किया गया है।
2. प्रधानमंदत्री डिजिटल विलेज स्कीम के जरिए इनबेल्ड सेवाओं को और उपयोगी बनाने का काम किया जाएगा।
3. इस योजना के तहत वन टाइम फीस तीन हजार रुपये और विशेष डिवाइस की कीमत तीस हजार रुपये होगी।
4. इसके तहत गांव वालों को मिनी एटीएम, युटिलिटी रीचार्ज, मूवी टिकट, एयर बस, होटल बुकिंग, हेल्थ इंश्यारेंस, मोबाइल रेचरे, डीटीएच रीचार्ज जैसी तमाम तरह की सुविधाएं प्रदान की जाएंगी।
5. इस योजना के तहत सरकार ने एक वेब पोर्टल भी लांच किया है। यह स्कीम आने वाले समय में देश के सभी राज्यों में लागू कर दी जाएगी।

शिक्षा के क्षेत्र में डिजिटल इंडिया के तहत पूरी ग्राम पंचायत को शिक्षा के सभी साधन मुहैया कराए जाएंगे जिनमें से कंप्यूटर लैब फैसिलिटी और K-yan संलग्न है इसके तहत पूरी ग्राम पंचायत में बेसिक कंप्यूटर कोर्स की ट्रेनिंग कराई जाएगी और मुफ्त उनको कंप्यूटर की शिक्षा दी जाएगी जिससे उनको डिजिटलीकरण में जोड़ा जा सके।

हर गांव डिजिटल रूप से जुड़ा रहेगा। इसके माध्यम से मरीज और उनके परिजनों को डिजिटल तरीके से स्वास्थ्य सुविधा मुहैया कराई जाएगी। ऑनलाइन कंसलटेशन भी होगा।

एलईडी लाइट– डिजिटल विलेज में हाई मास्ट एलईडी लाइट ऐसी जगहों पर लगेगी, जो पूरी रात गांवों में रोशनी दे सके।

स्किल डिवेलपमेंट–हर गांव में स्किल डिवेलपमेंट की स्थायी टीम काम करेगी, जो गांव वालों को डिजिटल कामों में मदद करेगी।

देश में लगभग 1.5 लाख गांवों में ऑप्टिकल फाइबर बिछाने का काम पूरा किया गया है। अब बाकी बचे 4.5 लाख गांवों को ऑप्टीकल फाइबर केबल से जोड़ने का काम चल रहा है।

Shree Chintamani Parshwanath Digambar Jain Mandir Ji

On the auspicious occasion of our 73rd Republic Day Celebration, our temple at Bhagpat was open for everyone. Many citizens, students & staff participated in Flag hoisting ceremony & plantation of trees.

The visitors partook of the open langar held at the premises. The meals served at a langar are always vegetarian. These langars are volunteer-run charitable feeding and its is a very old in Indian tradition.

The concept of langar—which is designed to be upheld among all people, regardless of religion, caste, colour, creed, age, gender, or social status—is an innovative charity and symbol of equality.

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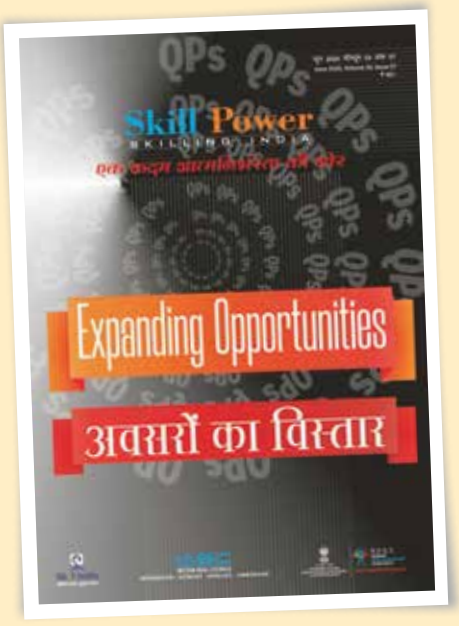

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