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Editorial

Mechanical Engineering Needs to Pursue Excellence

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E D I T O R I A L

That 'Mechanical Engineering must Pursue Excellence' is not a new need. But in the light of new disruption, Current Technological Revolution (CTR) imbibed by newer intelligence, Integration of Technologies, including that of the information and communication technology advancements, including that of materials; which all demand a better understanding of the newer challenges further challenge Mechanical Engineers' competencies. All this once again enlivens the realization that 'Mechanical Engineering needs to pursue excellence', now, far more intelligently and vigorously. The markets too are changing -involving more of glocal (global + local) customers with a newer definition of customer focus. The global purpose is to add value to achieve targeted objectives, which do not preclude society's overall interests[1], which revolves around SHEQ-PDCL*. To reiterate from my previous published tutorial 'In this new glocal scenario, the Customer is at full liberty to cause 'manufactures and countries' to collaborate for fully addressing 'her' whims and fancies to supply at lowest costs and delightful responses to unprecedented requirements[2]'. This causes a predominance of 'delimiters' of various types in terms competencies, designs, resources, digitization, technologies, of newer digital space and so on.

The first step to this new disruption was initially viewed by Mechanical Engineering researchers at Germany in early 2011 as one in which machines are augmented with cyber space technologies facilitated by wireless connectivity and sensors and are intelligent, being connected to a system that can visualize the entire production line and make decisions on its own. This paradigm was quipped as 'Industry 4.0'[3]. A paradigm, in science and philosophy, is defined as a distinct set of concepts or thought patterns, including theories, research methods, postulates and standards which all contribute to the achievement of such mission, which started for the objectivized levels of 'Industry 4.0' and are quickly broadening, to effectively integrate new Mechanical Engineering competencies around SHEQ-PDCL.

The expectation from 'Industry 4.0' , reapproving the class of a paradigm, has since come a long way and stops not merely at newer

integrations of Industrial Internet of Things (IIOT), cloud computing, cognitive computing and better Robotic automations with superior artificial intelligence in a 5G environment, but also unprecedented conceptual re-evaluation of governing principles. Viz Aircraft will in future see sees as the landing and takeoff destinations and cars would look at hybrid vertical and horizontal distances to improve effectiveness. The point to point distribution will be handled by drones, which will automate the dispensation of day to day inventories without the tensions of carry bags and plastics.

The principal changes in technology seek to underwrite unprecedented benefits in materials, energy, manpower, process dimensions, process variability, their technology, resources, qualities, controls, Life Cycle and so on. Viz when aircrafts shall use water as the landing and takeoff media, these not only put to rest the infrastructural requirements of costly runways, but repetitively deploy the buoyancy of water to pervasively lower the weight of the flying machine during the period of rest to that of airborne state, at which it takes care of both the lift and drag as ardent part of mechanics and flying dynamics. This decrease in the perceived weight of the flying machine can enable lowering the engine power, making design process less strenuous for a flying machine which will be more and more spacious.

In contrast when we recall the historical perspective quoted in 'Excellence Paradigms in the 20th Century'[4] which had visualized the "Powered flight, the automobile, the commercial light bulb, radio and the mechanized factory [that] all reshaped the economic landscape in the first decade of the 20th Century as components of excellence". We now tend to see the quick obsolescence of these developments. Say, the assembly line model of Henry Ford's automobile factory, that gave rise to mass production and big business, is back to square one. Consequently, many of the yesteryear's technologies have assumed newer definitions. Some changes viz that of a light bulb, or a radio are dead horse and the erstwhile definition of a 'mechanized factory' is not directly visible. The change is still happening, all at the speed of 'Disruption'. Variously, many of such visualizations that sound very basic today, formed a higher level of abstraction years before[5] and call for a need to reinvent and revitalize yourself with knowledge of Mechanical Engineering, of new customer requirements in terms of SHEQ-PDCL and of the impending disruption. Will the level of knowledge of Mechanical Engineering not require a life saver - mandating Excellence?

For example, when it is envisaged, that the tomorrow's factory, "will have only two employees, a man and a dog (as quoted by Warren Bennis),[6] the new roles of excellence need be redefined. He envisaged that the man will be there to feed the dog. And the dog will be there to keep the man from touching the equipment". But the question is, what will other men at backstage do? Possibly, they would now be planning how those robots involved in that factory get further reprogrammed to solve the new customer need(s) in view of the changed customer's paradigm of SHEQ-PDCL. For this the planners and designers (Mechanical Engineers) at the back stage need to pursue excellence @ newer levels of excellence. It is to determine, plan and execute the effectiveness in the choices[7] that we perceive will be important for the society in future and align w.r.t resources, materials etc. of today, in line with objectives and the life cycle requirements. As previously expected, by "Integrating over manufacturing knowledge, with quality for sustenance, organizations (or nations) [still] cannot help but face a competition at global scales with due cognizance to glocal customers"[8].

The process must go on. May be through many smaller steps enhancing the knowledge and sustaining the impetus. The current issue of *Journal of Advanced Research in Mechanical Engineering & Technology*, Volume 6, Issue 1 & 2 - 2019 is a step in this direction. It has 5 papers. One that analyses the governmental initiative of make in India and two sets of 2 papers each in areas of composite materials; and use of tools and techniques like ANN and neural computing in prediction and evaluation respectively.

The first paper by this author explores the impacts of "Make in India" policy initiative was instituted in 2014 towards its effectiveness in promoting manufacturing in India. This Initiative is an apt response to the erstwhile observation that Manufacturing still remains as the Achilles heel of the Indian economy. As detailed in the beginning of this editorial note, the various initiatives and innovations need to be suitably applied to manufacturing process for the necessary excellence to the level of Manufacturing as per the requirements of future factories. However, this paper titled Casting a New Manufacturing Gameplan Thru 'Make in India' makes on observe the neglect of Foundry technology in the list of various manufacturing options, while this is seen to affect the later in the "Make in India" initiative the most. The paper concludes that the exquisite competence of founding need be accented as well as a case of "Cast in India" appears to be a component of manufacturing improvement.

The second and third papers evaluate the Wear behaviour of aluminium matrixhybrid composites, using one of the manufacturing processes, predominantly founding. The authors Shivdev Singh, Ajay Gupta and Vishal S Sharma jointly present a review titled "Wear behaviour of aluminium matrix hybrid composites: A review". They report the crucial issue is the selection of sizes of the matrix and reinforcement powders, with challenges in liquid metallurgy being wettability between the reinforcement particles and

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molten alloy. The authors note hybrid composites possessed superior mechanical properties with ceramic reinforcement and also wear properties are enhanced due to presence of solid lubricants as compared to plain composites and pure aluminium materials.

Continuing the evaluation of Wear resistance the third paper Venktesh Sharma, Shalom Akhai evaluate the 'Mechanical Behaviour of Fly Ash Reinforced Aluminum Composite Prepared by Casting' adding it from 0 % to 20 % as replacement by weight of aluminum. They find that the values of compressive strength, tensile strength, hardness and wear resistance are improved with fly ash addition and thus contribute towards the handling of a waste residual material - an environmental menace.

The fourth paper is towards the evaluation of accuracy and prediction of properties using modern tools like neural computing and Artificial Neural Networks (ANN) respectively. Akshansh Mishra deploys sigmoid activation function, Rectified Linear Unit (ReLU) activation function and hyperbolic tangent activation function towards evaluation of accuracy in Ultimate Tensile Strength values. As the author uses a complicated and Non-linear complex functional mapping between the inputs namely Tool Rotational Speed (rpm) and Welding speed (mm/ min) in paper titled "Neural Computing for determining the accuracy of Ultimate Tensile Strength of Friction Stir Welded joints by using various activation functions", the work will go a long way in improving quality and processing knowledge of Friction Stir Welding.

The fifth paper authored by Nithyananda BS, Anand A and GV Naveen Prakash is "A Review on Application of ANN Model for the Prediction of Fuel Properties of Biodiesel", which are methyl esters of vegetable oils. These non-edible oil feed stocks, because of different Chemical structures in terms of chain length, degree of unsaturation, double bond configuration and number of double bond svary in their potential for substitution. The blends behaviour of various types is subject to their characteristics, that requires significant amount of sample, standardized equipment's and time. To predict and to estimate fuel properties of biodiesel, the authors use an ANN basedPrediction modeling tool, which will go a long way towards maximization of output from the resources and as well as performance of the alternative to the diesel.

It may be recalled that the blending up to 25 % of alternative fuel in ATF (Aircraft's Turbine Fuel) has recently been attempted successfully by Spice Jet, one of the private airlines in India. Most research towards improvement of Technology, Tools and Techniques, Quality competence, especially when they are in their green form will go a long way towards furthering the objectives of Mechanical Engineers.

Hope this issue makes an interesting reading for the Mechanical Engineers.

*SHEQ-PDCL Safety, Health, Environment, Quality-Productivity, Delivery, Cost, Learning (continual).

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