ADVANCESIN MANUFACTURING ENGINEERING

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ABSTRACT

Manufacturing engineers are involved with the process ofmanufacturing from planning to packaging of the finishedproduct. They work with tools such as robots, programmableand numerical controllers, and vision system to fine tuneassembly, packaging, and shipping facilities. They examineflow and the process of manufacturing, looking for ways tostreamline production, improve turnaround, and reduce costs.Often, a manufacturing engineer will work with a prototype,usually created electronically with computers, to plan the finalmanufacturing process. In a globally competitive marketplace,it is the job of the manufacturing engineer to figure outmethods and systems to produce a product in an efficient,cost-effective way to provide a marketing edge for the final product.

Mechanical engineering is one of the largest, broadest, and oldestengineering disciplines. Mechanical engineers use the principles ofenergy, materials, and mechanics to design and manufacturemachines and devices of all types. They create the processes andsystems that drive technology and industry.In contemporary manufacturing companies, mechanical engineers play a key role in the"realization" of products, working closely with other engineers and specialists in corporatemanagement, finance, marketing, and packaging. ME's design products, select materials andprocesses, and convert them to finished products. They design and manufacture machinetools -- literally the machines that make machines and design entire manufacturing processes,aided by the latest technologies in automation and robotics. Finally, the finished products aretransported in equipment designed by mechanical engineers. This is the largest area ofemployment for mechanical engineers, especially when the process and textile industries areincluded. A finished product requires the right materials, a viable plant and equipment, and amanufacturing system. This all comes within the purview of mechanical, manufacturing andindustrial engineers.

About half of all M.E.'s work in companies thatmanufacture "something," such as consumer goods, transportation, or industrialequipment. Another 16% work in the process industries, like petrochemical orpharmaceutical. The challenges are as diverse as the products -- from miniaturedevices used by surgeons, to disk drives, or massive pieces of industrial equipment.This work calls for a knowledge of materials, manufacturing processes, thermalprocesses, controls, electronics, and, as in all of engineering --- teamwork skills.The impact of these developments is seen by all of us, and many experience them in daily life. The impact has been felt in all walks of life- social, economic, political, climatic environments. It has had a great effect on personal, family, and community life style a great deal. The rigour in life is eased today. Although these technological developments have made the life comfortable and more enjoyable.there are some unintended outcomes which need to be addressed.

Keywords: Advanced Technologies, Innovation and Utilization

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I. INRTODUCTION

It is the production of complex machines through the application of advancements in science in manufacturing processes and product design It is the application of advanced technologies and processes at any stage of the value chain(1)

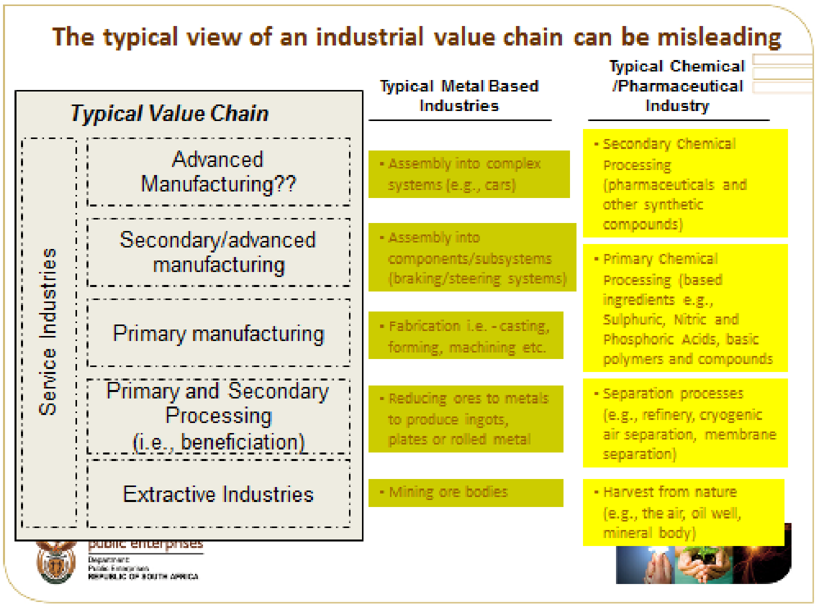
A. Technologies refers to productive equipment and knowledge

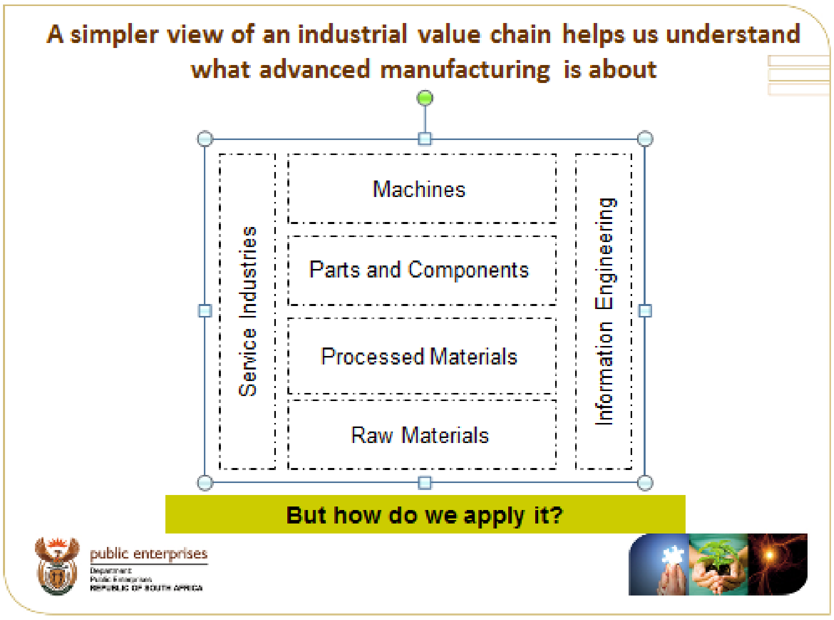
B. Processes also include managerial practices (e.g., lean, supply chain management, e-commerce etc.)

In a nut shell building advanced manufacturing is

A. Relative to where an economies' productive capacity are at

B. Is simply about process and technology upgrading





Engineering is the application of scientific, economic, social, and practical knowledge in order to design, build, and maintain structures, machines, devices, systemsmaterials and processes. It may encompass using insights to conceive, model, scale an appropriate solution to a problem and achieve an objective. The discipline of engineering is extremely broad, and encompasses a range of more specialized fields of engineering, each with a more specific emphasis on particular areas of technology and types of application.The unintended outcomes of past engineering solutions to the problems have adversely affected environment. Environmental sustainability, health, reducing our vulnerability adding to the joy of living is essential for humanity to flourish. This forms challenges not only for engineers but also to others.The increasing dependence on technology of our standard of living requires a more technologically trained work-force with right kind of skills and attitude.

The technological challenges before India at present include the following:

- In energy area - alternative/advanced electricity generation technologies need to be made viable. There is the move to hydrogen economy. There is need ofexpanding energy availability with access globally, while minimizing the adverse environmental and social impacts. (2)
- In medicine, there will continue to be new medical testing and treatment equipment, such as prosthesis integration with the human neural system and medical application of nanotechnology to limit invasive treatments.
- In the environmental area, there is the challenge of limiting or reversing the adverse impact due to human existence at comfortable level and yet in an economically viable way. In addition to globalization, economical sound environmental protection, and rapid technological advancement, challenges pertain to
- National security needs,
- An aging infrastructure, and
- Aging population

Climate, Energy and the Environment, Education, Materials, Biomedical, Communications, Water Practices and Management, Digital Divide, Transportation (personal-use vehicles), Agriculture and the Environment, Robotics, Reuse and Recycling and the Environment, Sustainable Development, Security, Water Supply, Public Transportation and the Environment are the priorities in India. Examples of engineering challenges for India would include- agriculture technologies, new designs for railways, highways and urban transport, more efficient energy form coal, water conservation, less energy consuming housing technology with more efficient cooling systems, and affordable effluent treatment techniques, improving productivity in manufacturing, etc. As far as health, education and "terrorism" are concerned, we should think of focusing on a more equitable, corruption-free and fair society instead of depending on only engineering solutions for our nirvana.

The role of Mechanical engineers in future development will be to

- Develop sustainably through new technologies and techniques, and respond to the global environmental pressures brought about by economic growth;
- Be at the forefront of implementing a system design approach across large and small-scale systems;
- Engage in international collaboration around our critical knowledge and competencies;
- Work in the emerging Bio-Nano technologies to provide solutions in such diverse fields as healthcare, energy, water management, the environment and agriculture management, and

- Create affordable engineering solutions for the poor and deprived.

And there are aspirations of the Third World moving toward a First World standard of living in a sustainable, environmentally sensitive manner.

Mechanical engineering will evolve and collaborate as a global profession in the near future through a shared vision to develop engineering solutions that foster a cleaner, healthier, safer and sustainable world. This will need to create greater publicawareness of the essential contributions of engineering to quality of life consistent witha sustainable world.Mechanical engineering will be challenged to develop new technologies and techniques that support economic growth and promote sustainability. Large and growing population will need access to food and clean water, effective sanitation, energy, education, healthcare and affordable transportation. There will be global challenges to help improve the quality of life for a growing population while preserving the environment. The needs of the underserved for engineering solutions are likely to increase as population grows.

II.LITERATURE REVIEW

Change is not easily predictable in any dynamic system. Mechanical engineering will need to monitor the rate of change across key systems such as education, industry and society. The 21st century will be defined not by conflict but by the integration of competitive markets with new methods of collaboration. The dominant players in all industries in future will be those organizations that are successful at working collaboratively. Globalization is future source of opportunity for engineers.

Technology innovation clusters around leading research universities will develop. While technologies may move at a faster rate of change, institutions, cultures and economies can be slower to change. The challenges of energy, water and food are great at the global scale and they must now be addressed.

A key challenge facing every nation is balancing incentives for innovation with diffusing the benefits of innovation as largely as possible. Open innovation is a key trend as companies go for innovation wherever it can be found. Innovation, within the framework of a global economy, will remain a complex affair in future. Fundamental restructuring of the regulation and protection of intellectual property on a global basis is unlikely. As more complex technologies require greater collaboration and sharing of patents, incremental changes will occur to produce equitable and beneficial results for the innovators and those that adopt and commercialize innovations. Demand for new technologies will sustain global demand for adequately skilled and innovative mechanical engineers in future. Prospective employers will seek and promote people with unique and varied backgrounds to maximize their potential for success in diverse cultures and situations.

Nanotechnology and biotechnology will dominate technological development in the next 20 years and will be incorporated into all aspects of technology that affect our lives on a daily basis.

Nano - Bio will provide the building blocks that future engineers will use to solve pressing problems in diverse fields including medicine, energy, water management, aeronautics, agriculture and environmental management. In future, advances in computer aided design, materials, robotics, nanotechnology and biotechnology will customize the process of designing and creating new devices. Engineers will be able to design solutions to local problems. Individual engineers will have more latitude to design and build their devices using indigenous materials and labor – creating a renaissance for engineering entrepreneurs. The engineering workforce will change as more engineers work at home as part of larger decentralized engineering companies or as independent entrepreneurs.

III.SUMMARY

Manufacturing engineers work wherever products aremanufactured -- in industry, government, research, service,and consulting.

Manufacturing activities contribute more than 25% of the U.S.GDP, and according to the Federal Bureau of Labor Statistics,more than 60% of engineers employed in the United Statesare involved in manufacturing.(3)

The national average starting salary for new manufacturing engineering graduates ranges from $45,000 to $59,000. According to the Society of Manufacturing Engineers, the average startingsalary for a manufacturing engineering graduate (BS) is $44,837. The group estimates thatthe average salary of all manufacturing engineers is $57,683.

Manufacturing Engineers work on products from design todistribution. They work in almost every industry and on a widerange of products from autos, to toys, to sports equipment, tofood, to computer chips. They start with raw materials,determine the most efficient manufacturing system to createthe product, evaluate staffing needs, project costs, andcoordinate the entire manufacturing process. Manufacturingengineers incorporate their knowledge of current techniquesand equipment into their work, including computer-aideddesign, robotics, statistical process control, and computer-integrated manufacturing systems.

We are leaving the industrial economy and entering the innovation economy, where manufacturing is a commodity and the idea – intellectual property (IP) – trumps all.

Those ideas won't be limited to the products or services that you sell, either. Amazon's 1-Click idea (now patented) has nothing to do with the products that Amazon sells, only with how they are purchased. Indeed, managing innovation throughout the value chain – from research and design to delivery and aftermarket service – has become the key to corporate success.

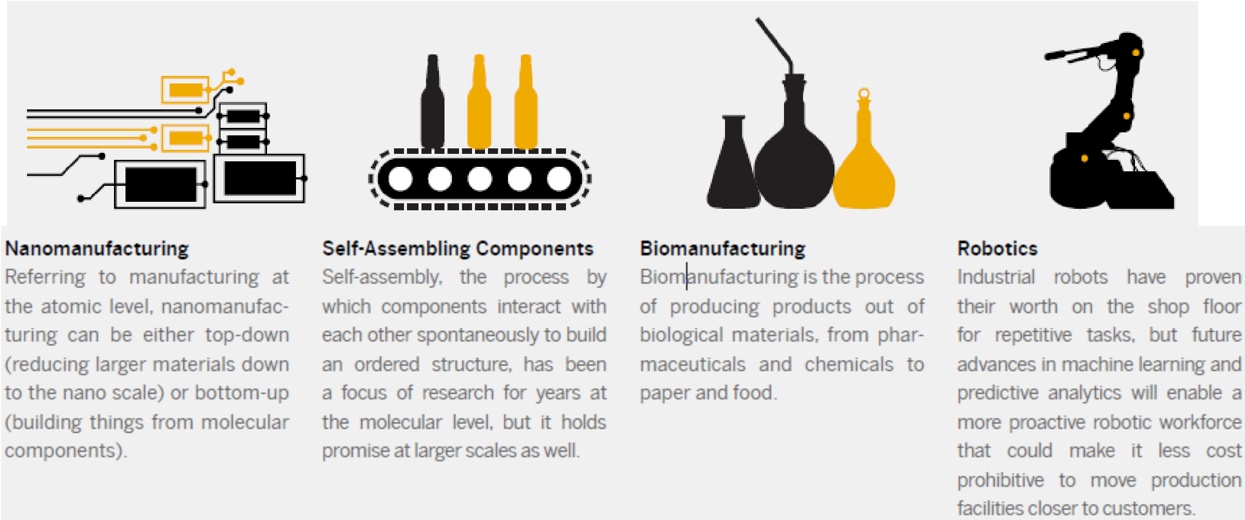
Companies that own and leverage the rights to products and services – rather than those that manufacture, sell, or distribute them – will be the most highly valued. Calling cards such as "Designed by Apple in California," will become much more common as the value shifts from making things to dreaming them up (see "What Became of the Factorsof Production?").

Instead of designing, manufacturing, and delivering products, companies will design, manufacture, and deliver IP. Current and emerging production technologies, including mass customization, nanotechnology, and 3D printing, are already letting manufacturers rethink their traditional approach of producing enormous quantities of highly standardized products.

Customers will be at the center of this new economy. Today manufacturing is designed for manufacturers. In the innovation economy, manufacturing will be designed for – and in part by – customers.

The customer relationship will no longer be simply about better customer service or more targeted marketing initiatives. In the innovation economy, companies will have to incorporate customer feedback directly into the value chain. No matter what the channel, whether in-person, social media, or apps and devices, customers will become active participants in all parts of the value chain, from development to delivery.

Additive manufacturing is the method of making products and components by depositing thin layers of material using a digital blueprint (as opposed to traditional subtractive manufacturing, which uses machine tools such as lathes or milling machines to remove material to produce an object). Examples include 3D printing, laser sintering, and cold spray coating.(4)



IV.CONCLUSION

The developments in technology are a continuous process in human existence. The technological advancements have provided comfort and joy to life. But unintended outcomes of this process pose threat and need be addressed as challenge. Mechanical engineers can play an important role to meet these challenges.

Define Instant Manufacturing and give some of its features.Explain indirect manufacturing and provide some examples of its use.Describe Selective Laser Sintering (SLS) and list its benefits Describe Multi-Jet-Modeling (MJM) and list its benefits

Tradition method used conventional machine tools and processes until age of computersComputer-aided design (CAD) replaced draftingCAD generated prints for Computer-Assisted Manufacturing (CAM). Introduced Rapid Prototyping and Manufacturing (RP&M) for design and production

Tradition method used conventional machine tools and processes until age of computers. Computer-aided design (CAD) replaced drafting. CAD generated prints for Computer-Assisted Manufacturing (CAM). Introduced Rapid Prototyping and Manufacturing (RP&M) for design and production Software, equipment produced by Rapid Prototyping manufactures. Used to speed production of customized specialized end-use parts. Allows existing design to be manufactured without costs and lead-time associated with hard tooling. (5)

Comprehensive technology, relatively new

A. Production of part starting at design stage

B. Progresses through prototype development

C. Ends with manufacturing stage

- Uses solid-imaging technology to produce end-use components or product
- Also called mass customization
- Reliable and cost-effective

Method for creating end-use products directly on solid-imaging system

Advancements in Laser Sintering, and Stereolithography made solid imaging systems alternative to conventional

Fundamental benefits:

- No tooling required
- Design for function
- Significant cost savings
- Design changes quickly at very low cost

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