

Engineering Education in Nigeria: A Case Study of Mechanical Engineering

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ABSTRACT

The paper examined the function of engineering education in Nigeria, with special focus on mechanical engineering. Engineering in our institutions of higher learning have been designed at training engineering manpower with theoretical and practical knowledge and skill, for national development: it highlighted the major function of engineering education in nation building, the role of mechanical engineers in developing nations, current situations and problems of Engineering in Nigeria, Mechanical Engineering components and systems and its reliability. It is therefore deduced that engineering education is a vital tool to national development in Nigeria. It therefore recommended that Engineering education should be effectively and efficiently encourage by the government.

Keywords: Engineering, Engineering Education, Mechanical Engineering, Nation Building, Engineering training.

I. INTRODUCTION

Engineering education is an education of training engineers most especially in our institutions of higher learning. It has been generally acknowledged that education at every level is essential and critical for economic development and national building in many countries around the globe. Today, the ability of a nation to access, comprehend and select practical knowledge largely determines the quality of life of its citizenry, and depend on the engineering works by engineers. The overall affirmation is that the nation that commits more money in education will own higher growth rates because an educated population is a more productive population (Fagerberg, 1994).

Undoubtedly, human capital formation and development is the key in promoting economic

development in all economies. However, university education has been widely recognized and specifically mentioned as a leading instrument for promoting economic growth and development (Bloom et al, 2006). The engineering education is part of the university education where Mechanical Engineers are professionally trained to design and develop systems, which primarily convert energy to useful mechanical forms. This includes both power – generating machines that transform or consume the power in the completion of their particular functions. Mechanical engineers deal with such items turbines, motor control mechanisms, transportation systems (automobile trains; space vehicles etc). refrigerators, air-conditioners, propulsion systems (steam, gas, nuclear) and cryogenic system.

Mechanical Engineering as a field of study that produces Mechanical Engineers, who are also nation builders of both developing and developed countries. The paper considers the function of engineering education in national development, the role of mechanical engineers in developing nations, current situations and problems of engineering in Nigeria.

The Role of Engineering Education in Nigerian

Engineering is the discipline and profession of applying technical and scientific knowledge and utilizing natural rules and physical wealth in a way to design and accomplish, structures, materials, machines, systems, devices and processes that achieve a desired objective and meet specified criteria.

The engineering education is a kind of education especially, in the university all forms of engineers or engineering manpower are highly trained with scientific and technical knowledge and skills. In fact, the engineering education assists in

training and producing professional engineers of all kinds such as mechanical engineers, civil engineers, electrical/electronic engineers, production /metallurgy engineers, aerospace engineers, biomedical engineers, chemical engineers, environmental engineers, industrial engineers, materials engineers, nuclear engineers, acoustical engineers, agricultural engineers, computer engineers, petroleum engineers, textile engineers, transportation engineers, structural engineers etc for the impressive and effective nation building of any nation in the world.

Secondly, it is through engineering education engineers construct roads and bridges as well as manufacture transport vehicles and planes as a means of transportation in every nation even in Nigeria, which makes movement of man easy in the 21st Century.

Another function of engineering education is industrial development through which industrial engineers are scientifically and technically inclined to produce every industrial tools and equipment, thereby provides all required industrial instruments and machines.

All civil construction works are acts of civil engineers such as water supply systems, residential buildings, airports, irrigation and drainage system, sewage systems, strong and safe structures, pipelines and railroads and other construction equipment which made the human environment becomes more habitable and comfortable.

Chemical engineers on the other hand, building nations by a way of processing of chemicals and chemical products for industrial and consumer uses. Chemical engineers work in industries concerned with the chemical processes that change raw resources into useful products. They plan, design, and construct chemical plants and equipment and produce efficient and economical production methods. It is through chemical engineering, a nation's health sector has the manufactured drugs, soaps, detergents and other things such as plastics, explosives, food products,

The application of engineering practical knowledge (ie scientific and technical stability) the aerospace engineers played an essential role in building wind funnels and testing equipment with which they carry out experiments on proposed craft to determine their performance, stability and control under flight conditions. They construct and build calmer and more fuel-efficient commercial aircrafts.

Biomedical engineers through engineering education came on board, helps to develop aids for the deaf and blind, that is, they design artificial ways and organs and other devices and machines that disordered or damaged parts of human body.

THE ROLE OF MECHANICAL ENGINEERING IN DEVELOPING NATIONS.

The concept "Mechanical Engineering" involves the production, transmission and use of mechanical power. The mechanical Engineers are also nation builders as they do the following things towards nation building:

- a. Mechanical Engineers design, produce, handle and try all kinds of machines to be used by manufacturing companies for developing of nations.
- b. They develop and built engines, that produce power from steam, gasoline, nuclear fuels and other sources of energy within nations.
- c. They also develop and build a wide variety of machines that use power including air-conditioning, heating, ventilation equipment, automobiles, machine tools, and industrial processing equipment.
- d. Mechanical engineers are concerned in every phase in the developmental model to the installation of the completed machine and the training of the workers who will use it.
- e. Mechanical engineers work in many industries such as power generation, public utilities, transportation and types of manufacturing. Most mechanical engineers focus on research and development due to new types of machines are in demand continually.

THE CURRENTS SITUATION/PROBLEMS OF ENGINEERING IN NIGERIA

Engineering is one of the noble professions in Nigeria. Students of Engineering are caught in Applied Mechanics, Mechanics of Machine/theory of Machines, Engineering Drawing and Engineering Design. These courses are designed and planned to expose students (especially those in mechanical Engineering to the various principles associated with designing different types of machine components or elements. Engineering drawing in particular is meant to help the students have a broad knowledge of the outlook and assemblage of various machine components.

Quite unfortunate that there are two major problems these courses have not been able to solve; the approach to teaching these courses is basically theoretical with little or no relevant field experience or concepts. Thus, practical grasp of

how machine elements or components are intercalated and interconnected to form different varieties of possible machines and equipment is not gained. The second problem is that a practical to trouble shoot an equipment for causes of breakdown and hence track faulty machine element for replacement or repair is left with little or no practical analytical approach to solving problems of equipment maintenance.

Meanwhile, Mechanical engineering is essentially a sequence of activities that follow design by analysis. Consequently, the essentials of Mechanical Engineering seem to be lacking in the training of the Engineering graduate.

The major problem is what steps is the Engineer/Technologist expected to take when there is equipment failure. To most fresh graduates, there appears to be no concrete answer to this question. This is as a result of deficiency in training in the area of maintenance engineering. Can the fresh Nigerian Mechanical engineer in Nigeria look at industrial equipment as relatively complex entities, not seeing the relationship between the equipment and the various machine elements they have drawn in class or equations of which they have applied in solving theoretical problems. The same is true to varying extent in other fields of Engineering. Of course, their predicament is clear, one cannot solve a problem that one does not understand. A systematic teaching of equipment maintenance principles to engineering students will enable them see the relationship between the theoretical undertone and practical relevance of machine elements/components of different machinery/equipment.

MECHANICAL ENGINEERING COMPONENTS, SUBSYSTEMS AND RELIABILITY OF COMPONENTS AND EQUIPMENTS.

Mechanical engineering components found in most industrial machines include the following:

- (i) Interconnecting rods
- (ii) Flat plates
- (iii) Shafts
- (iv) Pulleys
- (v) Bearings
- (vi) Bolts and Nuts
- (vii) Belts
- (viii) Beams
- (ix) Pins
- (x) Chains and sprockets
- (xi) Gears
- (xii) Cams
- (xiii) Guide rods/plates

- (xiv) Straight and curved guide ways
- (xv) Pipes and tubes
- (xvi) Vessels and cylinders
- (xvii) seals
- (xviii) Flanges
- (xix) Welded joints
- (xx) Cranks
- (xxi) Springs
- (xxii) Wheel
- (xxiii) Wheel
- (xxiv) Piston
- (xxv) sleeves

Precisely, a subsystem in form of one of the following can be obtained as;

- (1) Engine basement
- (2) Fluid flowlines
- (3) Valves
- (4) Pumps
- (5) Rotating mechanisms
- (6) Reciprocating mechanism
- (7) Cam Mechanisms
- (8) Gear boxes
- (9) Power transmission systems
- (10) Engine combustion system
- (11) Tanks

Most of these machine elements and subsystems can be easily made available for demonstration classes.

Reliability is usually defined as the probability that a given component in equipment or the equipment itself performs its function for a given period of time under a specified operating condition (Pillay A and Wang J, 2003). Failure signifies a point where a component or system ceases to be reliable. The reliability of components affects the overall systems reliability to varying degree. Equipment reliability is improved by making arrangement for parallel elements (for elements that are critical so that in the event of failure, other elements in parallel take up the functions of the failed ones).

II. CONCLUSION

The paper so far discussed the function of Engineering education in nation building/development with focus on mechanical engineers roles and functions towards national development. It is therefore deduced that engineering education with the case of mechanical engineering is one of the vital tools to national development in Nigeria.

III. RECOMMENDATIONS

In order to properly activate engineering education for national development, then the following recommendations, are made;

- (1) Engineering education especially mechanical engineering should be properly encouraged by the stakeholders e.g Government, Higher Institutes of Learning, Parents and Engineering Associations etc.
- (2) Mechanical Engineers should be granted research grant for advanced technology development in Nigeria.
- (3) Possible Mechanical Engineering equipment, tools and systems should be adequately provided by the higher institutes of learning for mechanical engineering department students.
- (4) Vast science laboratory and mechanic workshop should be adequately equipped for the demonstration classes.
- (5) Best Mechanical Engineering graduating students should be sent abroad for further studies at least from B. Eng in Mechanical Engineering to Masters or PhD degrees in the same course of study

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