Engineer in society

Society

Engineers work to develop economic and safe solutions to practical problems, by applyingmathematics, scientific knowledge and ingenuity while considering technical constraints. The term is derived from the Latin root " ingenium," meaning " cleverness". The industrial revolution and continuing technological developments of the last few centuries have changed the connotation of the term slightly, resulting in the perception of engineers as applied scientists. The work of engineers is the link between perceived needs of society and commercial applications.

As for engineering definition it is a discipline, art and profession of acquiring and applying technical, scientific, and mathematical knowledge to design and implement materials, structures, machines, devices, systems, and processes that safely realize a desired objective or invention. The broad discipline of engineering encompasses a range of more specialized sub disciplines, each with a more specific emphasis on certain fields of application and particular areas oftechnology. The concept of engineering has existed since ancient times as humans devised fundamental inventions such as the pulley, lever, and wheel.

Each of these inventions is consistent with the modern definition of engineering, exploiting basic mechanical principles to develop useful tools and objects. The term engineering itself has a much more recent etymology, deriving from the word engineer, which itself dates back to 1325, when an engine'er (literally, one who operates an engine) originally referred to " a constructor of military engines. " In this context, now obsolete, an " engine" referred to a military machine, i. e. , a mechanical contraption used in war (for example, a catapult). The word " engine" itself is of even older origin, ultimately deriving from the Latin ingenium (c. 250), and meaning “ innate quality, especially mental power, hence a clever invention. ” Later, as the design of civilian structures such as bridges and buildings matured as a technical discipline, the term civil engineering entered the lexicon as a way to distinguish between those specializing in the construction of such non-military projects and those involved in the older discipline of military engineering (the original meaning of the word “ engineering,” now largely obsolete, with notable exceptions that have survived to the present day such as military engineering corps, e. g. the U. S. Army Corps of Engineers. Engineering, much like otherscience, is a broad discipline which is often broken down into several sub-disciplines. With the rapid advancement of technology many new fields are gaining prominence and new branches are developing such as materials engineering, computer engineering, software engineering, nanotechnology, tribology, molecular engineering, mechatronics, etc. These new specialties sometimes combine with the traditional fields and form new branches such as mechanical engineering and mechatronics and electrical and computer engineering.

A new or emerging area of application will commonly be defined temporarily as a permutation or subset of existing disciplines; there is often gray area as to when a given sub-field becomes large and/or prominent enough to warrant classification as a new " branch. " One key indicator of such emergence is when major universities start establishing departments and programs in the new field. For each of these fields there exists considerable overlap, especially in the areas of the application of sciences to their disciplines such as physics, chemistry and mathematics.

Engineering is a subject that ranges from large collaborations to small individual projects. Almost all engineering projects are beholden to some sort of financing agency: a company, a set of investors, or a government. The few types of engineering that are minimally constrained by such issues are pro bono engineering and open design engineering. By its very nature engineering is bound up with society and human behaviour. Every product or construction used by modern society will have been influenced by engineering design.

Engineering design is a very powerful tool to make changes toenvironment, society and economies, and its application brings with it a greatresponsibility. Many lists of engineering societies have established codes of practice and codes of ethics to guide members and inform the public at large. Engineering projects can be subject to controversy. Examples from different engineering disciplines include the development of nuclear weapons, the Three Gorges Dam, the design and use of Sport utility vehicles and the extraction of oil.

In response, some western engineering companies have enacted serious corporate and social responsibility policies. Engineering is a key driver of human development. Sub-Saharan Africa in particular has a very small engineering capacity which results in many African nations being unable to develop crucial infrastructure without outside aid. The attainment of many of the Millennium DevelopmentGoalsrequires the achievement of sufficient engineering capacity to develop infrastructure and sustainable technological development.

Safety is the state of being " safe" (from French sauf), the condition of being protected against physical, social, spiritual, financial, political, emotional, occupational, psychological, educational or other types or consequences offailure, damage, error, accidents, harm or any other event which could be considered non-desirable. This can take the form of being protected from the event or from exposure to something that causeshealthor economical losses. It can include protection of people or of possessions.

Safety engineering is an applied science strongly related to systems engineering and the subset System Safety Engineering. Safety engineering assures that a life-critical system behaves as needed even when pieces fail. Continuous changes in technology, environmental regulation and public safety concerns make the analysis of complex safety-critical systems more and more demanding. Safety is often seen as one of a group of related disciplines: quality, reliability, availability, maintainability and safety.

These issues tend to determine the value of any work, and deficits in any of these areas are considered to result in a cost, beyond the cost of addressing the area in the first place; good management is then expected to minimize total cost. Theoretically, safety-engineers take an early design of a system, analyze it to find what faults can occur, and then propose safety requirements in design specifications up front and changes to existing systems to make the system safer.

But actually, safety engineers are assigned to prove that an existing, completed design is safe. If a safety engineer then discovers significant safety problems late in the design process, correcting them can be very expensive. This type of error has the potential to waste large sums ofmoney. The exception to this conventional approach is the way some large government agencies approach safety engineering from a more proactive and proven process perspective, known as " system safety".

The system safetyphilosophyis to be applied to complex and critical systems, such as commercial airliners, complex weapon systems, spacecraft, rail and transportation systems, air traffic control system and other complex and safety-critical industrial systems. The proven system safety methods and techniques are to prevent, eliminate and control hazards and risks through designed influences by a collaboration of key engineering disciplines and product teams. Software safety is a fast growing ield since modern systems functionality are increasingly being put under control of software. The whole concept of system safety and software safety, as a subset of systems engineering, is to influence safety-critical systems designs by conducting several types of hazard analyses to identify risks and to specify design safety features and procedures to strategically mitigate risk to acceptable levels before the system is certified. Additionally, failure mitigation can go beyond design recommendations, particularly in the area of maintenance.

There is an entire realm of safety and reliability engineering known as Reliability Centered Maintenance (RCM), which is a discipline that is a direct result of analyzing potential failures within a system and determining maintenance actions that can mitigate the risk of failure. This methodology is used extensively on aircraft and involves understanding the failure modes of the serviceable replaceable assemblies in addition to the means to detect or predict an impending failure.

Every automobile owner is familiar with this concept when they take in their car to have the oil changed or brakes checked. Even filling up one's car with fuel is a simple example of a failure mode (failure due to fuel exhaustion), a means of detection (fuel gauge), and a maintenance action (filling the car's fuel tank). For large scale complex systems, hundreds if not thousands of maintenance actions can result from the failure analysis. These maintenance actions are based on conditions (e. g. , gauge reading or leaky valve), hard conditions (e. . , a component is known to fail after 100 hrs of operation with 95% certainty), or require inspection to determine the maintenance action (e. g. , metal fatigue). The RCM concept then analyzes each individual maintenance item for its risk contribution to safety, mission, operational readiness, or cost to repair if a failure does occur. Then the sum total of all the maintenance actions are bundled into maintenance intervals so that maintenance is not occurring around the clock, but rather, at regular intervals.

This bundling process introduces further complexity, as it might stretch some maintenance cycles, thereby increasing risk, but reduce others, thereby potentially reducing risk, with the end result being a comprehensive maintenance schedule, purpose built to reduce operational risk and ensure acceptable levels of operational readiness and availability. The two most common fault modelling techniques are called failure mode and effects analysis and fault tree analysis. These techniques are just ways of inding problems and of making plans to cope with failures, as in probabilistic risk assessment. One of the earliest complete studies using this technique on a commercial nuclear plant was the WASH-1400 study, also known as the

Reactor Safety Study or the Rasmussen Report. Once a failure mode is identified, it can usually be prevented entirely by adding extra equipment to the system. For example, nuclear reactors contain dangerous radiation, and nuclear reactions can cause so much heat that no substance might contain them.

Therefore reactors have emergency core cooling systems to keep the temperature down, shielding to contain the radiation, and engineered barriers (usually several, nested, surmounted by a containment building) to prevent accidental leakage. Most biological organisms have a certain amount of redundancy: multiple organs, multiple limbs, etc. For any given failure, a fail-over or redundancy can almost always be designed and incorporated into a system. Health is the general condition of a person in all aspects.

It is also a level of functional and/or metabolic efficiency of an organism, often implicitly human. At the time of the creation of the World Health Organization (WHO), in 1948, health was defined as being " a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity". Only a handful of publications have focused specifically on the definition of health and its evolution in the first 6 decades. Some of them highlight its lack of operational value and the problem created by use of the word " complete. Others declare the definition, which has not been modified since 1948, " simply a bad one. " In 1986, the WHO, in the Ottawa Charter for Health Promotion, said that health is " a resource for everyday life, not the objective of living. Health is a positive concept emphasizing social and personal resources, as well as physical capacities. " Classification systems such as the WHOFamilyof International Classifications

(WHO-FIC), which is composed of the International Classification of Functioning, Disability, and Health (ICF) and the International Classification of Diseases (ICD) also define health.

Overall health is achieved through a combination of physical, mental, emotional, and social well-being, which, together is commonly referred to as the Health Triangle. Health and working together safety engineers plan, implement, and coordinate safety programs to prevent or correct unsafe environmental working conditions. They promote workplace and product safety by identifying and monitoring potential hazards to people or property.

They then apply an advanced knowledge of industrial processes and human performance principles to reduce or eliminate the risk of injury or damage. To create a safe and environmentally sound workplace, engineers coordinate with outside organizations, such as fire departments or the Occupational Health and Safety Administration (OSHA); design and install safety devices on machinery or clothing; and investigate causes of industrial accidents to prevent further incidents. They also conduct tests to ascertain air quality, noise level, temperature, or radiation.

Once the analysis is complete, they then consult with governmental organizations on how to handle such problems in compliance with safety regulations. Health and safety engineers then coordinate the training of workers on safety procedures using safety equipment, devices, and clothing. Working under the Health Department and the work involves is the planning, administration and performance of public health engineering duties concerned with the execution of one or more phases of the environmental health program.

The work entails advising public officials or individuals on problems requiring professional public health engineering expertise, including measures for improvement and compliance with legal requirements, assisting in the promotion of public health through application of environmental health practices, assisting in the enforcement of the provisions of local and State health matters and investigations of related conditions and problems. The work is performed under general supervision of a Senior Public Health Engineer with leeway allowed for exercise of independent judgment in carrying out details of the work.

Engineers also played a relatively indirect role in medicine until the last 40 to 50 years. They produced instruments and articles specified by doctors and medical practitioners. There was however an interesting contribution made by Isambard Kingdom Brunel in 1855. He responded to the scandal of the appalling conditions of the Crimean War military hospital, publicised by Florence Nightingale, by designing the first portable hospital of one thousand beds within six days of receiving a request for help from the War Office. The project was completed in five months from design to admission of the first wounded soldier.

The introduction of anaesthetics in 1846 fundamentally changed surgery by suppressing pain. This gave surgeons more time and allowed for the developments of new techniques which made surgery more constructive. However modern medical developments really began in 1876 when Robert

Koch, a Germandoctor, proved for the first time that microorganisms could cause disease. The first chemical agent to attack infection, salvarsan or ‘ 606’ (arsenobenzene) was developed by Paul Ehrlich in 1910 and although it had many side effects, remained the only means of curing acute infection until the second world war when penicillin was introduced.

Although penicillin was originally discovered by Sir Alexander Fleming in 1928, it was the innovation and ingenuity of chemists and engineers such as Ernst Chain, who built for Beechams the fermenter which enabled bulk semi-synthetic penicillins to be produced. Whilst chemists and engineers were involved in delivering the benefits of microorganisms such as antibiotics and vaccines, electrical engineers were advancing and applying technology to the benefit of healthcare.

Of special merit was Godfrey Hounsfield’s singular contribution in the 1960s of the development of three dimensional reconstructions from two dimensional (2D) X-rays, namely the brain scanner, later to be developed into the body scanner. Engineering in medicine has been an important and it’s believed that the role of the engineer in many areas of healthcare will grow. Constant innovation and development is needed to avoid the generations of the 21st century looking back at our surgical and medical techniques with the same appalled fascination in the 19th century.

The ever-expanding array of medical technologies includes artificial hips and organs, endoscopy (enabling minimally invasive surgery), intelligent prosthetic devices (artificial limbs, hearing aids) and implantable devices (pacemaker, defibrillator), novel technologies used in cardiac catheterization, patient monitoring, and medical imaging. These developments have had a tremendous impact on the medical industry and have led to numerous technologies and medical devices without which modern medicine would be unthinkable.

Today’s activities range from nano- to information technology and involve such diverse applications as microsensors, artificial organs, physiological modelling, genomics, molecular imaging, home care monitoring, ergonomics, information processing, data management, and patient safety. Environment in this case is natural environment, commonly referred to simply as the environment, encompasses all living and non-living things occurring naturally on Earth or some region thereof. The concept of the natural environment can be distinguished by two components.

Complete ecological units that function as natural systems without massive human intervention, including all vegetation, animals, microorganisms, soil, rocks, atmosphere and natural phenomena that occur within their boundaries. Others is universal natural resources and physical phenomena that lack clear-cut boundaries, such as air, water, and climate, as well as energy, radiation, electric charge, and magnetism, not originating from human activity. The natural environment is contrasted with the built environment, which comprises the areas and components that are strongly influenced by humans.

A geographical area is regarded as a natural environment (with an indefinite article), if the human impact on it is kept under a certain limited level. In engineering, is more related with environmental engineering whereas define as the application of science and engineering principles to improve the environment (air, water, and/or land resources), to provide healthy water, air, and land for human habitation and for other organisms, and to remediate polluted sites. Environmental engineering involves water andair pollutioncontrol, recycling, waste disposal, and public health issues as well as knowledge of environmental engineering law.

It also includes studies on the environmental impact of proposed construction projects. Environmental engineers conduct hazardous-waste management studies to evaluate the significance of such hazards, advice on treatment and containment, and develop regulations to prevent mishaps. Environmental engineers also design municipal water supply and industrial wastewater treatment systems as well as address local and worldwide environmental issues such as the effects of acid rain, ozone depletion, water pollutionand airpollutionfrom automobile exhausts and industrial sources.

At many universities, Environmental Engineering programs follow either the Department of Civil Engineering or The Department of Chemical Engineering at engineering faculties. Environmental " civil" engineers focus on hydrology, water resources management, bioremediation, and water treatment plant design. Environmental " chemical" engineers, on the other hand, focus on environmental chemistry, advanced air and water treatment technologies and separation processes. Additionally, engineers are more frequently obtaining specialized training in law (J.

D.) and are utilizing their technical expertise in the practices of Environmental engineering law. Most jurisdictions also impose licensing and registration requirements. Modern environmental engineering began in London in the mid-19th century when Joseph Bazalgette designed the first major sewerage system that reduced the incidence of waterborne diseases such as cholera. The introduction of drinking water treatment and sewage treatment in industrialized countries reduced waterborne diseases from leading causes of death to rarities.

In many cases, as societies grew, actions that were intended to achieve benefits for those societies had longer-term impacts which reduced other environmental qualities. One example is the widespread application of DDT to control agricultural pests in the years following World War II. While the agricultural benefits were outstanding and crop yields increased dramatically, thus reducing world hunger substantially, and malaria was controlled better than it ever had been, numerous species were brought to the verge of extinction due to the impact of the DDT on their reproductive cycles.

The story of DDT as vividly told in Rachel Carson's " Silent Spring" is considered to be the birth of the modern environmental movement and the development of the modern field of " environmental engineering. " Conservation movements and laws restricting public actions that would harm the environment have been developed by various societies for millennia. Notable examples are the laws decreeing the construction of sewers in London and Paris in the 19th century and the creation of the U. S. national park system in the early 20th century.

Briefly speaking, the main task of environmental engineering is to protect public health by protecting (from further degradation), preserving (the present condition of), and enhancing the environment. Pollutants may be chemical, biological, thermal, radioactive, or even mechanical. Environmental engineering emphasizes several areas: process engineering, environmental chemistry, water and sewage treatment (sanitary engineering), waste reduction/management, and pollution prevention/cleanup.

Contribution to society is engineers and scientists assess the impacts of a proposed project on environmental conditions. They apply scientific and engineering principles to evaluate if there are likely to be any adverse impacts to water quality, air quality, habitat quality, flora and fauna, agricultural capacity, traffic impacts, social impacts, ecological impacts, noise impacts, visual (landscape) impacts, etc. If impacts are expected, they then develop mitigation measures to limit or prevent such impacts.

An example of a mitigation measure would be the creation of wetlands in a nearby location to mitigate the filling in of wetlands necessary for a road development if it is not possible to reroute the road. Engineers and scientists also work to secure water supplies for potable and agricultural use. They evaluate the water balance within a watershed and determine the available water supply, the water needed for various needs in that watershed, the seasonal cycles of water movement through the watershed and they develop systems to store, treat, and convey water for various uses.

Water is treated to achieve water quality objectives for the end uses. In the case of potable water supply, water is treated to minimize risk of infectious disease transmittal, risk of non-infectious illness, and create a palatable water flavour. Water distribution systems are designed and built to provide adequate water pressure and flow rates to meet various end-user needs such as domestic use, fire suppression, and irrigation.

Most urban and many rural areas no longer discharge human waste directly to the land through outhouse, septic, and/or honey bucket systems, but rather deposit such waste into water and convey it from households via sewer systems. Engineers and scientists develop collection and treatment systems to carry this waste material away from where people live and produce the waste and discharge it into the environment. In developed countries, substantial resources are applied to the treatment and detoxification of this waste before it is discharged into a river, lake, or ocean system.

Developing nations are striving to obtain the resources to develop such systems so that they can improve water quality in their surface waters and reduce the risk of water-borne infectious disease. There are numerous wastewater treatment technologies. A wastewater treatment train can consist of a primary clarifier system to remove solid and floating materials, a secondary treatment system consisting of an aeration basin followed by flocculation and sedimentation or an activated sludge system and a secondary clarifier, a tertiary biological nitrogen removal system, and a final disinfection process.

The aeration basin/activated sludge system removes organic material by growing bacteria (activated sludge). The secondary clarifier removes the activated sludge from the water. The tertiary system, although not always included due to costs, is becoming more prevalent to remove nitrogen and phosphorus and to disinfect the water before discharge to a surface water stream or ocean outfall. Engineers apply scientific and engineering principles to the design of manufacturing and combustion processes to reduce air pollutant emissions to acceptable levels.

Scrubbers, electrostatic precipitators, catalytic converters, and various other processes are utilized to remove particulate matter, nitrogen oxides, sulphur oxides, volatile organic compounds (VOC), reactive organic gases (ROG) and other air pollutants from flue gases and other sources prior to allowing their emission to the atmosphere. Scientists also have developed air pollution dispersion models to evaluate the concentration of a pollutant at a receptor or the impact on overall air quality from vehicle exhausts and industrial flue gas stack emissions.

To some extent, this field overlaps the desire to decrease carbon dioxide and other greenhouse gas emissions from combustion processes. Technology is an application of knowledge to the practical aims of human life or to changing and manipulating the human environment. Technology includes the use of materials, tools, techniques, and sources of power to make life easier or more pleasant and work more productive. Whereas science is concerned with how and why things happen, technology focuses on making things happen.

Technology began to influence human endeavour as soon as people began using tools. It accelerated with the Industrial Revolution and the substitution of machines for animal and human labour. Accelerated technological development has also had costs, in terms of air and water pollution and other undesirable environmental effects. Technologies significantly affect human as well as other animal species' ability to control and adapt to their natural environments. The human species' use of technology began with the conversion of natural resources into simple tools.

Engineering is the goal-oriented process of designing and making tools and systems to exploit natural phenomena for practical human means, often (but not always) using results and techniques from science. The development of technology may draw upon many fields of knowledge, including scientific, engineering, mathematical, linguistic, and historical knowledge, to achieve some practical result. Technology is often a consequence of science and engineering — although technology as a human activity precedes the two fields.

For example, science might study the flow of electrons in electrical conductors, by using already-existing tools and knowledge. This new-found knowledge may then be used by engineers to create new tools and machines, such as semiconductors, computers, and other forms of advanced technology. In this sense, scientists and engineers may both be considered technologists; the three fields are often considered as one for the purposes of research and reference.

As for conclusion, engineer and engineering plays vital role in our life. Engineer has contribute a lot with the careful research and development using all the mathematical and science related in creating, solving and also improve our daily life. In existent of engineer also we are aware in the safety, health and environment. In ways, engineers identify what is safe and what not. Engineer create something in aided the medical profession thus improving the quality of life.

Engineer also contributes in preventing pollution to occur and also find alternative for not destroying the environment. With more technological advancement, engineer have unlimited to what they can do in contribution to the society. Engineer must bear in mind, that everything must have it weakness and consequences. As such, engineer with obligation to serve the society must have good research and have think all the effect that could have happen before doing anything.