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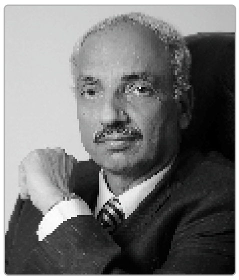

Dear Friends,

As I address my message to you, I wish you the best for new Financial Year 2017-18 and highlight opportunities for the manufacturing sector, which will pave the way for near future.

India's manufacturing sector has the potential to touch $1 trillion by 2025. It is likely that the sector will account for 25-30 per cent of the country's GDP, and create up to 90 million domestic jobs by 2025.

According to McKinsey report, India could capture a significant share in petroleum and coal products sector, machinery, fabricated metal products, and leadership in power transmission and distribution equipment so as to secure an average ranking of top 3 low cost country exporters.

It is quite evident that sector is improving and has recovered from the demonetization setback as we observe a sharp rise in orders and production, leading to an increase in PMI from 50.7 to 52.5. Furthermore, the manufacturing sector has witnessed increased in effort to expand capacities.

Similarly, the introduction of Hydrocarbon Exploration Licensing Policy is bound to make India a business and investor friendly destination. The policy aims to achieve l investment in the energy and petroleum sector and provide operational flexibility to the investors. The objective is to double India's existing oil production from current 80 million metric tonnes to about 150-155 million metric tonnes by 2022.

The manufacturing sector stands to benefit significantly. The introduction of GST will reduce the cascading effect of taxes, especially on the post-manufacture stage of the supply and support cost reduction in terms of manufacturing, movement of goods, and lead to increase in exports. This will further add to improvement in the economic growth.

Business performance has accelerated with increase in PMI and companies are scaling up capacities anticipating increase in production volumes.

The Make in India initiative has widened prospects for the manufacturing industry and highlighted the significance of the quality of goods manufactured creating a positive impact on the economy.

Anil Rairikar

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contents

India's growth to accelerate to 7.4 percent in 2017-18

The Asian Development Bank (ADB) said that India's growth rate will improve to 7.4 percent during 2017-18 and go up further to 7.6 percent in the next fiscal, remaining ahead of China.

"The impact of the demonetization of high-value banknotes is dissipating as the replacement banknotes enter circulation. Stronger consumption and fiscal reforms are also expected to improve business confidence and investment prospects in the country," said the Asian Development Outlook, ADB's flagship economic publication.

India recorded a growth rate of 7.1 percent during 2016-17, not with standing the fears that demonetisation of high-value currency notes of Rs 500/1,000 in November last year would adversely impact the economic growth.

"In India, the sub-region's largest economy, growth is expected to pick up to 7.4 percent in fiscal year (2017-18) and 7.6 percent in 2018-19, following the 7.1 percent registered last FY,"

With regard to China, the report said, the overall output is expected to slow to 6.5 percent in 2017 and 6.2 percent in 2018, down from 2016's 6.7 percent.

Efforts of the Chinese government to maintain financial and fiscal stability would continue to be a modest drag on growth going forward, it said, adding the continued structural reform would help in maintain growth in the government's target range.

Over the last few years, India has taken a host of economic reforms initiative, including the Goods and Services Tax (GST) and liberalisation of the FDI regime, with a view to improve business climate and promote growth. The GST is expected to roll out from July.

The report further said that South Asia would remain the fastest growing of all sub regions, with growth reaching 7 percent in 2017 and 7.2 percent in 2018.

Commenting on the future prospects, it said that in two-thirds of economies in developing Asia, the growth is being supported by higher external demand, rebounding global commodity prices, and domestic reforms, making the region the largest single contributor to global growth at 60 percent.

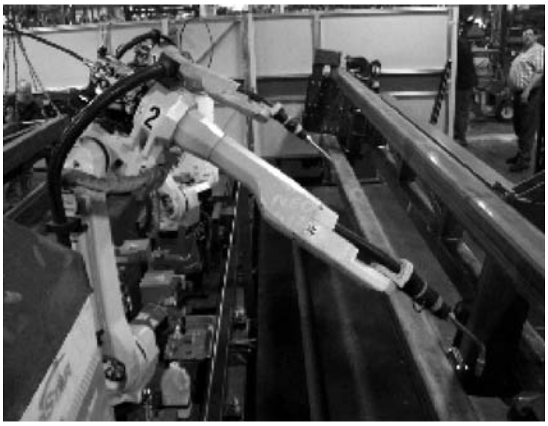
Manufacturing Engineering

Manufacturing engineering is a discipline of engineering dealing with various manufacturing sciences and practices including the research, design and development of systems, processes, machines, tools, and equipment. The manufacturing engineer's primary focus is to turn raw materials into a new or updated product in the most economic, efficient, and effective way possible.

Overview

This field also deals with the integration of different facilities and systems for producing quality products (with optimal expenditure) by applying the principles of physics and the results of manufacturing systems studies, such as the following:

- Craft or Guild
- Putting-out system
- British factory system
- American system of manufacturing
- Soviet collectivism in manufacturing
- Mass production
- Computer integrated manufacturing
- Computer-aided technologies in manufacturing
- Just in time manufacturing
- Lean manufacturing
- Flexible manufacturing
- Mass customization
- Agile manufacturing
- Rapid manufacturing
- Prefabrication
- Ownership
- Fabrication
- Publication



A set of six-axis robots used for welding.

Manufacturing engineers develop and create physical artifacts, production processes, and technology. It is a very broad area which includes the design and development of products. Manufacturing engineering is considered to be a subdiscipline of industrial engineering/systems engineering and has very strong overlaps with mechanical engineering. Manufacturing engineers' success or failure directly impacts the advancement of technology and the spread of innovation. This field of manufacturing engineering emerged from tool and die discipline in the early 20th century. It expanded greatly from the 1960s when industrialized countries introduced factories with:

1. Numerical control machine tools and automated systems of production.

2. Advanced statistical methods of quality control: These factories were pioneered by the American electrical engineer William Edwards Deming, who was initially ignored by his home country. The same methods of quality control later turned Japanese factories into world leaders in cost-effectiveness and production quality.

3. Industrial robots on the factory floor, introduced in the late 1970s: These computer-controlled welding arms and grippers could perform simple tasks such as attaching a car door quickly and flawlessly 24 hours a day. This cut costs and improved production speed.

History

The history of manufacturing engineering can be traced to factories in the mid 19th century USA and 18th century UK. Although large home production sites and workshops were established in China, ancient Rome and the Middle East, the Venice Arsenal provides one of the first examples of a factory in the modern sense of the word. Founded in 1104 in the Republic of Venice several hundred years before the Industrial Revolution, this factory mass-produced ships on assembly lines using manufactured parts. The Venice Arsenal apparently produced nearly one ship every day and, at its height, employed 16,000 people.

Many historians regard Matthew Boulton's Soho Manufactory (established in 1761 in Birmingham) as the first modern factory. Similar claims can be made for John Lombe's silk mill in Derby (1721), or Richard Arkwright's Cromford Mill (1771). The Cromford Mill was purpose-built to accommodate the equipment it held and to take the material through the various manufacturing processes.

Ford assembly line, 1913.

One historian, Murno Gladst, contends that the first factory was in Potosí. The Potosi factory took advantage of the abundant silver that was mined nearby and processed silver ingot slugs into coins.

British colonies in the 19th century built factories simply as buildings where a large number of workers gathered to perform hand labor, usually in textile production. This proved more efficient for the administration and distribution of materials to individual workers than earlier methods of manufacturing, such as cottage industries or the putting-out system.

Cotton mills used inventions such as the steam engine and the power loom to pioneer the industrial factories of the 19th century, where precision machine tools and replaceable parts allowed greater efficiency and less waste. This experience formed the basis for the later studies of manufacturing engineering. Between 1820 and 1850, non-mechanized factories supplanted traditional artisan shops as the predominant form of manufacturing institution.

Henry Ford further revolutionized the factory concept and thus manufacturing engineering in the early 20th century with the innovation of mass production. Highly specialized workers situated alongside a series of rolling ramps would build up a product such as (in Ford's case) an automobile. This concept dramatically decreased production costs for virtually all manufactured goods and brought about the age of consumerism.

Modern developments

Modern manufacturing engineering studies include all intermediate processes required for the production and integration of a product's components.

Main article: Semiconductor manufacturing

Some industries, such as semiconductor and steel manufacturers use the term "fabrication" for these processes.

KUKA industrial robots being used at a bakery for food production

Automation is used in different processes of manufacturing such as machining and welding. Automated manufacturing refers to the application of automation to produce goods in a factory. The main advantages of automated manufacturing for the manufacturing process are realized with effective implementation of automation and include: higher consistency and quality, reduction of lead times, simplification of production, reduced handling, improved work flow, and improved worker morale.

Robotics is the application of mechatronics and automation to create robots, which are often used in manufacturing to perform tasks that are dangerous, unpleasant, or repetitive. These robots may be of any shape and size, but all are preprogrammed and interact physically with the world. To create a robot, an engineer typically employs kinematics (to determine the robot's range of motion) and mechanics (to determine the stresses within the robot). Robots are used extensively in manufacturing engineering.

Robots allow businesses to save money on labor, perform tasks that are either too dangerous or too precise for humans to perform economically, and to ensure better quality. Many companies employ assembly lines of robots, and some factories are so robotized that they can run by themselves. Outside the factory, robots have been employed in bomb disposal, space exploration, and many other fields. Robots are also sold for various residential applications..

Education

Certification programs

Manufacturing engineers possess a bachelor's degree in engineering with a major in manufacturing engineering. The length of study for such a degree is usually four to five years followed by five more years of professional practice to qualify as a professional engineer. Working as a manufacturing engineering technologist involves a more applications-oriented qualification path.

Academic degrees for manufacturing engineers are usually the Bachelor of Engineering, [BE] or [Beng], and the Bachelor of Science, [BS] or [BSc]. For manufacturing technologists the required degrees are Bachelor of Technology [B.TECH] or Bachelor of Applied Science [BASc] in Manufacturing, depending upon the university. Master's degrees in engineering manufacturing include Master of Engineering [ME] or [MEng] in Manufacturing, Master of Science [M.Sc] in Manufacturing Management, Master of Science [M.Sc] in Industrial and Production Management, and Master of Science [M.Sc] as well as Master of Engineering [ME] in Design, which is a subdiscipline of manufacturing. Doctoral [PhD] or [DEng] level courses in manufacturing are also available depending on the university.

The undergraduate degree curriculum generally includes courses in physics, mathematics, computer science, project management, and specific topics in mechanical and manufacturing engineering. Initially such topics cover most, if not all, of the subdisciplines of manufacturing engineering. Students then choose to specialize in one or more subdisciplines towards the end of their degree work.

Syllabus

The foundational curriculum for a bachelor's degree in manufacturing engineering is very similar to that for mechanical engineering but it places more emphasis on the manufacturing sciences, and includes:

- Statics and dynamics
- Strength of materials and solid mechanics
- Instrumentation and measurement
- Applied thermodynamics, heat transfer, energy conversion, and HVAC
- Fluid mechanics and fluid dynamics
- Mechanism design (including kinematics and dynamics)
- Manufacturing processes
- Production Engineering
- Hydraulics and pneumatics
- Mathematics - in particular, calculus, differential equations, statistics, and linear algebra.
- Engineering design and graphics
- Circuit Analysis
- Lean manufacturing
- Mechatronics and control theory
- Automation and reverse engineering
- Quality assurance and control
- Material science
- Drafting, CAD (including solid modeling), and CAM, etc.

A bachelor's degree in manufacturing versus mechanical engineering will typically differ only by a few specialized classes, although the mechanical engineering degree focuses more on the product design process and in complex products requires more mathematics expertise.

Manufacturing engineering certification

Certification and licensure:

In some countries, "professional engineer" is the term for registered or licensed engineers who are permitted to offer their professional services directly to the public. Professional Engineer, abbreviated (PE - USA) or (PEng - Canada), is the designation for licensure in North America. In order to qualify for this license, a candidate needs a bachelor's degree from an ABET recognized university in the USA, a passing score on a state examination, and four years of work experience usually gained via a structured internship. In the USA, more recent graduates have the option of dividing this licensure process into two segments. The Fundamentals of Engineering (FE) exam is often taken immediately after graduation and the Principles and Practice of Engineering exam is taken after four years of working in a chosen engineering field.

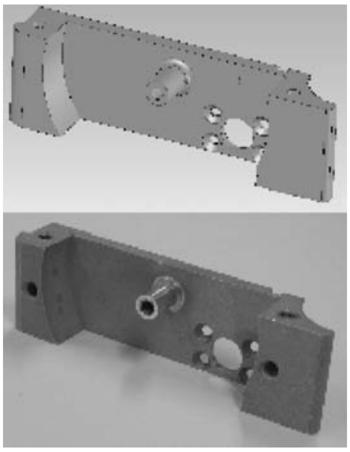
Society of Manufacturing Engineers (SME) certifications (USA):

The SME administers qualifications specifically for the manufacturing industry. These are not degree level qualifications and are not recognized at the professional engineering level. The following discussion deals with qualifications in the USA only. Qualified candidates for the Certified Manufacturing Technologist Certificate (CMfgT) must pass a three-hour, 130-question multiple-choice exam. The exam covers math, manufacturing processes, manufacturing management, automation, and related subjects. Additionally, a candidate must have at least four years of combined education and manufacturing-related work experience.

Certified Manufacturing Engineer (CMfgE) is an engineering qualification administered by the Society of Manufacturing Engineers, Dearborn, Michigan, USA. Candidates qualifying for a Certified Manufacturing Engineer credential must pass a four-hour, 180 question multiple-choice exam which covers more in-depth topics than does the CMfgT exam. CMfgE candidates must also have eight years of combined education and manufacturing-related work experience, with a minimum of four years of work experience.

Certified Engineering Manager (CEM). The Certified Engineering Manager Certificate is also designed for engineers with eight years of combined education and manufacturing experience. The test is four hours long and has 160 multiple-choice questions. The CEM certification exam covers business processes, teamwork, responsibility, and other management-related categories.

Modern tools



CAD model and CNC machined part

Many manufacturing companies, especially those in industrialized nations, have begun to incorporate computer-aided engineering (CAE) programs into their existing design and analysis processes, including 2D and 3D solid modeling computer-aided design (CAD). This method has many benefits, including easier and more exhaustive visualization of products, the ability to create virtual assemblies of parts, and ease of use in designing mating interfaces and tolerances.

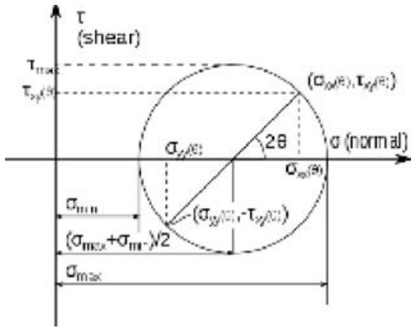
Other CAE programs commonly used by product manufactures include product life cycle management (PLM) tools and analysis tools used to perform complex simulations. Analysis tools may be used to predict product response to expected loads, including fatigue life and manufacturability. These tools include finite element analysis (FEA), computational fluid dynamics (CFD), and computer-aided manufacturing (CAM).

Using CAE programs, a mechanical design team can quickly and cheaply iterate the design process to develop a product that better meets cost, performance, and other constraints. No physical prototype need be created until the design nears completion, allowing hundreds or thousands of designs to be evaluated, instead of relatively few. In addition, CAE analysis programs can model complicated physical phenomena which cannot be solved by hand, such as viscoelasticity, complex contact between mating parts, or non-Newtonian flows.

Just as manufacturing engineering is linked with other disciplines, such as mechatronics, multidisciplinary design optimization (MDO) is also being used with other CAE programs to automate and improve the iterative design process. MDO tools wrap around existing CAE processes, allowing product evaluation to continue even after the analyst goes home for the day. They also utilize sophisticated optimization algorithms to more intelligently explore possible designs, often finding better, innovative solutions to difficult multidisciplinary design problems.

Subdisciplines

Mechanics



Mohr's circle, a common tool to study stresses in a mechanical element

Mechanics, in the most general sense, is the study of forces and their effects on matter. Typically, engineering mechanics is used to analyze and predict the acceleration and deformation (both elastic and plastic) of objects under known forces (also called loads) or stresses. Subdisciplines of mechanics include:

- Statics, the study of non-moving bodies under known loads
- Dynamics (or kinetics), the study of how forces affect moving bodies
- Mechanics of materials, the study of how different materials deform under various types of stress
- Fluid mechanics, the study of how fluids react to forces
- Continuum mechanics, a method of applying mechanics that assumes that objects are continuous (rather than discrete)

If the engineering project were to design a vehicle, statics might be employed to design the frame of the vehicle in order to evaluate where the stresses will be most intense. Dynamics might be used when designing the car's engine to evaluate the forces in the pistons and cams as the engine cycles. Mechanics of materials might be used to choose appropriate materials for the manufacture of the frame and engine. Fluid mechanics might be used to design a ventilation system for the vehicle or to design the intake system for the engine.

Kinematics

Kinematics is the study of the motion of bodies (objects) and systems (groups of objects), while ignoring the forces that cause the motion. The movement of a crane and the oscillations of a piston in an engine are both simple kinematic systems. The crane is a type of open kinematic chain, while the piston is part of a closed four-bar linkage. Engineers typically use kinematics in the design and analysis of mechanisms. Kinematics can be used to find the possible range of motion for a given mechanism, or, working in reverse, can be used to design a mechanism that has a desired range of motion.

Drafting

A CAD model of a mechanical double seal

Drafting or technical drawing is the means by which manufacturers create instructions for manufacturing parts. A technical drawing can be a computer model or hand-drawn schematic showing all the dimensions necessary to manufacture a part, as well as assembly notes, a list of required materials, and other pertinent information. A U.S engineer or skilled worker who creates technical drawings may be referred to as a drafter or draftsman. Drafting has historically been a two-dimensional process, but computer-aided design (CAD) programs now allow the designer to create in three dimensions.

Instructions for manufacturing a part must be fed to the necessary machinery, either manually, through programmed instructions, or through the use of a computer-aided manufacturing (CAM) or combined CAD/CAM program. Optionally, an engineer may also manually manufacture a part using the technical drawings, but this is becoming an increasing rarity with the advent of computer numerically controlled (CNC) manufacturing. Engineers primarily manufacture parts manually in the areas of applied spray coatings, finishes, and other processes that cannot economically or practically be done by a machine.

Drafting is used in nearly every subdiscipline of mechanical and manufacturing engineering, and by many other branches of engineering and architecture. Three-dimensional models created using CAD software are also commonly used in finite element analysis (FEA) and computational fluid dynamics (CFD).

Machine Tools and Metal Fabrication

Machine tools employ some sort of tool that does the cutting or shaping. All machine tools have some means of constraining the workpiece and provide a guided movement of the parts of the machine. Metal fabrication is the building of metal structures by cutting, bending, and assembling processes.

Computer Integrated Manufacturing

Computer-integrated manufacturing (CIM) is the manufacturing approach of using computers to control the entire production process. Computer-integrated manufacturing is used in automotive, aviation, space, and ship building industries.

Mechatronics

Training FMS with learning robot SCORBOT-ER 4u, workbench CNC mill and CNC lathe

Mechatronics is an engineering discipline that deals with the convergence of electrical, mechanical and manufacturing systems. Such combined systems are known as electromechanical systems and are widespread. Examples include automated manufacturing systems, heating, ventilation and air-conditioning systems, and various aircraft and automobile subsystems.

The term mechatronics is typically used to refer to macroscopic systems, but futurists have predicted the emergence of very small electromechanical devices. Already such small devices, known as Microelectromechanical systems (MEMS), are used in automobiles to initiate the deployment of airbags, in digital projectors to create sharper images, and in inkjet printers to create nozzles for high-definition printing. In future it is hoped that such devices will be used in tiny implantable medical devices and to improve optical communication.

Textile engineering

Textile engineering courses deal with the application of scientific and engineering principles to the design and control of all aspects of fiber, textile, and apparel processes, products, and machinery. These include natural and man-made materials, interaction of materials with machines, safety and health, energy conservation, and waste and pollution control. Additionally, students are given experience in plant design and layout, machine and wet process design and improvement, and designing and creating textile products. Throughout the textile engineering curriculum, students take classes from other engineering and disciplines including: mechanical, chemical, materials and industrial engineering.

Advanced composite materials

Advanced composite materials (engineering) (ACMs) are also known as advanced polymer matrix composites. These are generally characterized or determined by unusually high strength fibres with unusually high stiffness, or modulus of elasticity characteristics, compared to other materials, while bound together by weaker matrices. Advanced composite materials have broad, proven applications, in the aircraft, aerospace, and sports equipment sectors. Even more specifically ACMs are very attractive for aircraft and aerospace structural parts. Manufacturing ACMs is a multibillion-dollar industry worldwide. Composite products range from skateboards to components of the space shuttle. The industry can be generally divided into two basic segments, industrial composites and advanced composites.

Employment

Manufacturing engineering is just one facet of the engineering manufacturing industry. Manufacturing engineers enjoy improving the production process from start to finish. They have the ability to keep the whole production process in mind as they focus on a particular portion of the process. Successful students in manufacturing engineering degree programs are inspired by the notion of starting with a natural resource, such as a block of wood, and ending with a usable, valuable product, such as a desk, produced efficiently and economically.

Manufacturing engineers are closely connected with engineering and industrial design efforts. Examples of major companies that employ manufacturing engineers in the United States include General Motors Corporation, Ford Motor Company, Chrysler, Boeing, Gates Corporation and Pfizer.

Examples in Europe include Airbus, Daimler, BMW, Fiat, Navistar International, and Michelin Tyre.

Industries where manufacturing engineers are generally employed include:

- Aerospace industry
- Automotive industry
- Chemical industry
- Computer industry
- Food processing industry
- Garment industry
- Pharmaceutical industry
- Pulp and paper industry
- Toy industry

Frontiers of research

Flexible manufacturing systems

A typical FMS system

A flexible manufacturing system (FMS) is a manufacturing system in which there is some amount of flexibility that allows the system to react to changes, whether predicted or unpredicted. This flexibility is generally considered to fall into two categories, both of which have numerous subcategories. The first category, machine flexibility, covers the system's ability to be changed to produce new product types and the ability to change the order of operations executed on a part. The second category, called routing flexibility, consists of the ability to use multiple machines to perform the same operation on a part, as well as the system's ability to absorb large-scale changes, such as in volume, capacity, or capability.

Most FMS systems comprise three main systems. The work machines, which are often automated CNC machines, are connected by a material handling system to optimize parts flow, and to a central control computer, which controls material movements and machine flow. The main advantages of an FMS is its high flexibility in managing manufacturing resources like time and effort in order to manufacture a new product. The best application of an FMS is found in the production of small sets of products from a mass production.

Computer integrated manufacturing

Computer-integrated manufacturing (CIM) in engineering is a method of manufacturing in which the entire production process is controlled by computer. Traditionally separated process methods are joined through a computer by CIM. This integration allows the processes to exchange information and to initiate actions. Through this integration, manufacturing can be faster and less error-prone, although the main advantage is the ability to create automated manufacturing processes. Typically CIM relies on closed-loop control processes based on real-time input from sensors. It is also known as flexible design and manufacturing.

Friction stir welding

Close-up view of a friction stir weld tack tool

Friction stir welding was discovered in 1991 by The Welding Institute (TWI). This innovative steady state (non-fusion) welding technique joins previously un-weldable materials, including several aluminum alloys. It may play an important role in the future construction of airplanes, potentially replacing rivets. Current uses of this technology to date include: welding the seams of the aluminum main space shuttle external tank, the Orion Crew Vehicle test article, Boeing Delta II and Delta IV Expendable Launch Vehicles and the SpaceX Falcon 1 rocket; armor plating for amphibious assault ships; and welding the wings and fuselage panels of the new Eclipse 500 aircraft from Eclipse Aviation, among an increasingly growing range of uses.

Other areas of research are Product Design, MEMS (Micro-Electro-Mechanical Systems), Lean Manufacturing, Intelligent Manufacturing Systems, Green Manufacturing, Precision Engineering, Smart Materials, etc.

Control Engineering

Control systems play a critical role in space flight

Control engineering or **control systems engineering** is the engineering discipline that applies control theory to design systems with desired behaviors. The practice uses sensors to measure the output performance of the device being controlled and those measurements can be used to give feedback to the input actuators that can make corrections toward desired performance. When a device is designed to perform without the need of human inputs for correction it is called automatic control (such as cruise control for regulating the speed of a car). Multi-disciplinary in nature, control systems engineering activities focus on implementation of control systems mainly derived by mathematical modeling of systems of a diverse range.

Overview

Modern day control engineering is a relatively new field of study that gained significant attention during the 20th century with the advancement of technology. It can be broadly defined or classified as practical application of control theory. Control engineering has an essential role in a wide range of control systems, from simple household washing machines to high-performance F-16 fighter aircraft. It seeks to understand physical systems, using mathematical modeling, in terms of inputs, outputs and various components with different behaviors, use control systems design tools to develop controllers for those systems and implement controllers in physical systems employing available technology. A system can be mechanical, electrical, fluid, chemical, financial and even biological, and the mathematical modeling, analysis and controller design uses control theory in one or many of the time, frequency and complex-s domains, depending on the nature of the design problem.

History

Automatic control systems were first developed over two thousand years ago. The first feedback control device on record is thought to be the ancient Ktesibios's water clock in Alexandria, Egypt around the third century B.C. It kept time by regulating the water level in a vessel and, therefore, the water flow from that vessel. This certainly was a successful device as water clocks of similar design were still being made in Baghdad when the Mongols captured the city in 1258 A.D. A variety of automatic devices have been used over the centuries to accomplish useful tasks or simply to just entertain. The latter includes the automata, popular in Europe in the 17th and 18th centuries, featuring dancing figures that would repeat the same task over and over again; these automata are examples of open-loop control. Milestones among feedback, or "closed-loop" automatic control devices, include the temperature regulator of a furnace attributed to Drebbel, circa 1620, and the centrifugal flyball governor used for regulating the speed of steam engines by James Watt in 1788.

In his 1868 paper "On Governors", James Clerk Maxwell was able to explain instabilities exhibited by the flyball governor using differential equations to describe the control system. This demonstrated the importance and usefulness of mathematical models and methods in understanding complex phenomena, and it signaled the beginning of mathematical control and systems theory. Elements of control theory had appeared earlier but not as dramatically and convincingly as in Maxwell's analysis.

Control theory made significant strides over the next century. New mathematical techniques, as well as advancements in electronic and computer technologies, made it possible to control significantly more complex dynamical systems than the original flyball governor could stabilize. New mathematical techniques included developments in optimal control in the 1950s and 1960s followed by progress in stochastic, robust, adaptive, nonlinear, and azid-based control methods in the 1970s and 1980s. Applications of control methodology have helped to make possible space travel and communication satellites, safer and more efficient aircraft, cleaner automobile engines, and cleaner and more efficient chemical processes.

Before it emerged as a unique discipline, control engineering was practiced as a part of mechanical engineering and control theory was studied as a part of electrical engineering since electrical circuits can often be easily described using control theory techniques. In the very first control relationships, a current output was represented by a voltage control input. However, not having adequate technology to implement electrical control systems, designers were left with the option of less efficient and slow responding mechanical systems. A very effective mechanical controller that is still widely used in some hydro plants is the governor. Later on, previous to modern power electronics, process control systems for industrial applications were devised by mechanical engineers using pneumatic and hydraulic control devices, many of which are still in use today.

Control theory

There are two major divisions in control theory, namely, classical and modern, which have direct implications for the control engineering applications. The scope of classical control theory is limited to single-input and single-output (SISO) system design, except when analyzing for disturbance rejection using a second input. The system analysis is carried out in the time domain using differential equations, in the complex-s domain with the Laplace transform, or in the frequency domain by transforming from the complex-s domain. Many systems may be assumed to have a second order and single variable system response in the time domain. A controller designed using classical theory often requires on-site tuning due to incorrect design approximations. Yet, due to the easier physical implementation of classical controller designs as compared to systems designed using modern control theory, these controllers are preferred in most industrial applications. The most common controllers designed using classical control theory are PID controllers. A less common implementation may include either or both a Lead or Lag filter. The ultimate end goal is to meet requirements typically provided in the time-domain called the step response, or at times in the frequency domain called the open-loop response. The step response characteristics applied in a specification are typically percent overshoot, settling time, etc. The open-loop response characteristics applied in a specification are typically Gain and Phase margin and bandwidth. These characteristics may be evaluated through simulation including a dynamic model of the system under control coupled with the compensation model.

In contrast, modern control theory is carried out in the state space, and can deal with multiple-input and multiple-output (MIMO) systems. This overcomes the limitations of classical control theory in more sophisticated design problems, such as fighter aircraft control, with the limitation that no frequency domain analysis is possible. In modern design, a system is represented to the greatest advantage as a set of decoupled first order differential equations defined using state variables. Nonlinear, multivariable, adaptive and robust control theories come under this division. Matrix methods are significantly limited for MIMO systems where linear independence cannot be assured in the relationship between inputs and outputs. Being fairly new, modern control theory has many areas yet to be explored. Scholars like Rudolf E. Kalman and Aleksandr Lyapunov are well-known among the people who have shaped modern control theory.

Control systems

Control engineering is the engineering discipline that focuses on the modeling of a diverse range of dynamic systems (e.g. mechanical systems) and the design of controllers that will cause these systems to behave in the desired manner. Although such controllers need not be electrical many are and hence control engineering is often viewed as a subfield of electrical engineering. However, the falling price of microprocessors is making the actual implementation of a control system essentially trivial. As a result, focus is shifting back to the mechanical and process engineering discipline, as intimate knowledge of the physical system being controlled is often desired.

Electrical circuits, digital signal processors and microcontrollers can all be used to implement control systems. Control engineering has a wide range of applications from the flight and propulsion systems of commercial airliners to the cruise control present in many modern automobiles.

In most of the cases, control engineers utilize feedback when designing control systems. This is often accomplished using a PID controller system. For example, in an automobile with cruise control the vehicle's speed is continuously monitored and fed back to the system, which adjusts the motor's torque accordingly. Where there is regular feedback, control theory can be used to determine how the system responds to such feedback. In practically all such systems stability is important and control theory can help ensure stability is achieved.

Although feedback is an important aspect of control engineering, control engineers may also work on the control of systems without feedback. This is known as open loop control. A classic example of open loop control is a washing machine that runs through a pre-determined cycle without the use of sensors.

Control engineering education

At many universities, control engineering courses are taught in electrical and electronic engineering, mechatronics engineering, mechanical engineering, and aerospace engineering. In others, control engineering is connected to computer science, as most control techniques today are implemented through computers, often as embedded systems (as in the automotive field). The field of control within chemical engineering is often known as process control. It deals primarily with the control of variables in a chemical process in a plant. It is taught as part of the undergraduate curriculum of any chemical engineering program and employs many of the same principles in control engineering. Other engineering disciplines also overlap with control engineering as it can be applied to any system for which a suitable model can be derived. However, specialised control engineering departments do exist, for example, the Department of Automatic Control and Systems Engineering at the University of Sheffield [1] and the Department of Systems Engineering at the United States Naval Academy.

Control engineering has diversified applications that include science, finance management, and even human behavior. Students of control engineering may start with a linear control system course dealing with the time and complex-s domain, which requires a thorough background in elementary mathematics and Laplace transform, called classical control theory. In linear control, the student does frequency and time domain analysis. Digital control and nonlinear control courses require Z transformation and algebra respectively, and could be said to complete a basic control education.

Recent advancement

Originally, control engineering was all about continuous systems. Development of computer control tools posed a requirement of discrete control system engineering because the communications between the computer-based digital controller and the physical system are governed by a computer clock. The equivalent to Laplace transform in the discrete domain is the Z-transform. Today, many of the control systems are computer controlled and they consist of both digital and analog components.

Therefore, at the design stage either digital components are mapped into the continuous domain and the design is carried out in the continuous domain, or analog components are mapped into discrete domain and design is carried out there. The first of these two methods is more commonly encountered in practice because many industrial systems have many continuous systems components, including mechanical, fluid, biological and analog electrical components, with a few digital controllers.

Similarly, the design technique has progressed from paper-and-ruler based manual design to computer-aided design and now to computer-automated design or CAutoD which has been made possible by evolutionary computation. CAutoD can be applied not just to tuning a predefined control scheme, but also to controller structure optimisation, system identification and invention of novel control systems, based purely upon a performance requirement, independent of any specific control scheme.

Resilient control systems extend the traditional focus of addressing only planned disturbances to frameworks and attempt to address multiple types of unexpected disturbance; in particular, adapting and transforming behaviors of the control system in response to malicious actors, abnormal failure modes, undesirable human action, etc.

Offshore oil spill prevention and response

Inspector on offshore oil drilling rig

Offshore oil spill prevention and response is the study and practice of reducing the number of offshore incidents that release oil or hazardous substances into the environment and limiting the amount released during those incidents.

Important aspects of prevention include technological assessment of equipment and procedures, and protocols for training, inspection, and contingency plans for the avoidance, control, and shutdown of offshore operations. Response includes technological assessment of equipment and procedures for cleaning up oil spills, and protocols for the detection, monitoring, containment, and removal of oil spills, and the restoration of affected wildlife and habitat.

In the United States, offshore oil spill prevention contingency plans and emergency response plans are federally mandated requirements for all offshore oil facilities in U.S. Federal waters. Currently administered by the Minerals Management Service (MMS), these regulatory functions were ordered on May 19, 2010 to be transferred to the United States Department of the Interior's newly created Bureau of Safety and Environmental Enforcement. Oil spills in inland waters are the responsibility of the Environmental Protection Agency (EPA), while oil spills in coastal waters and deepwater ports are the responsibility of the U.S. Coast Guard.

Unlike the Best Available Technology (BAT) criteria stipulated by the Clean Air Act and the Clean Water Act, the Outer Continental Shelf Lands Act amendments of 1978 stipulated that offshore drilling and oil spill response practices incorporate the use of Best Available and Safest Technologies (BAST). While the Technology Assessment and Research (TAR) Program is tasked with research and development of such technologies through contract projects, human factors are also highly relevant in preventing oil spills. As William Cook, former chief of the Performance and Safety Branch of Offshore Minerals Management for the MMS, expressed it: "Technology is not enough. Sooner or later, it comes face to face with a human being. What that human being does or does not do, often ensures that the technology works as it was intended--or does not. Technology -- in particular -- new, innovative, cutting edge technology must be integrated with human and organizational factors (HOF) into a system safety management approach."

Top 10 largest oil spills in history

Rank	Date	Cause	Source	Location	Spill Volume
1.	Jan. 23–27, 1991	Deliberate act by Iraq	Oil Tankers	10 miles out of Kuwait	240–460 million gallons
2.	April 20, 2010	Explosion	Drilling rig Deepwater Horizon	Gulf of Mexico, 50 miles off the coast of Louisiana	210 million gallons
3.	June 3, 1979	Well blowout	Oil well Ixtoc 1	Gulf of Mexico	140 million gallons
4.	March 2, 1992	Leak	Oil well	Fergana Valley, Uzbekistan	88 million gallons
5.	July 19, 1979	Collision of tankers	Atlantic Empress and the Aegean Captain	Trinidad & Tobago	87 million gallons
6.	Sept. 8, 1994	Dam burst	Oil Reservoir	Russia	84 million gallons
7.	April, 1977	Well blowout	Ekofisk oil field	North Sea	81 million gallons
8.	Feb. 4, 1983	Collision	Nowruz Field Platform	Persian Gulf, Iran	80 million gallons
9.	May 28, 1991	Explosion	Tanker ABT Summer	Offshore of Angola	78 million gallons
10.	Aug. 6, 1983	Fire on tanker	Tanker Castillo de Bellver	Cape Town, South Africa	78 million gallons

Regulations and consequences

Because of treatment and disposal requirements for drilling and production, wastes are likely to become ever more stringent. Bans on land disposal will pose even greater challenges, especially for remote oil and gas operations. The significant costs to oil and gas producers complying with this new wave of regulation will be outweighed only by the even more significant costs of non-compliance. The federal Environmental Protection Agency (EPA) and many state and local agencies have greatly increased both their enforcement capabilities and activities. Most environmental laws carry criminal charges. Because of this many operations personnel and members of senior management of large companies have found themselves on the wrong side of environmental enforcement actions through ignorance to the increasingly complex requirements and the severe consequences of violating environmental laws.

Technologies

Hydrocarbon producing wells are designed and managed on the basis of the 'barriers' in place to maintain containment. A 'dual barrier' philosophy is typically used whereby two independently verified barriers to the hydrocarbon reservoir and the environment are required at all times. The failure of a single barrier would not lead to a hydrocarbon release. During the different phases of drilling, production, work over and abandonments, many different pieces of equipment will be used to maintain control of the well fluids and pressures.

Drilling blowout preventers

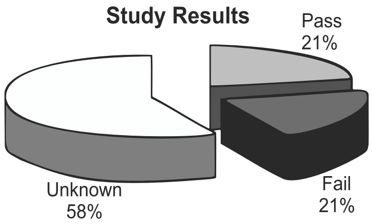


Figure 1. Of the shear rams tested, 50% failed under pressures expected in deep sea drilling.

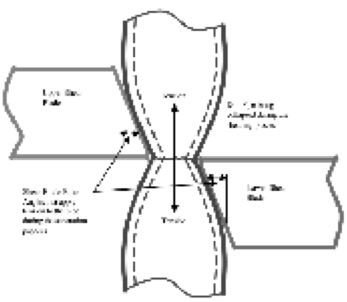


Figure 2. In a shear ram, the two blades are driven hydraulically to cut the thick steel drill pipe.

Figure 3. Sheared end of a drill pipe.

The primary safety control devices for well drilling are blowout preventers (BOPs), which have been used for nearly a century in control of oil well drilling on land. The BOP equipment technology has been adapted and used in offshore wells since the 1960s. The inspection and repair of subsea BOPs are much more costly, and the consequences of failure potentially much worse. There are two variations of offshore BOP in use; the sub-sea blowout preventer which sits on the ocean floor, and the surface blowout preventer which sits between the riser pipe and the drilling platform. The surface unit is smaller, lighter, less costly, and more easily accessed for routine tests and maintenance. However, it does not prevent blowouts involving a broken riser pipe.

Blowout Preventers often contain a stack of independently-operated cutoff mechanisms, so there is redundancy in case of failure, and the ability to work in all normal circumstances with the drill pipe in or out of the well bore. The BOP used in the Deepwater Horizon, for example, had five "rams" and two "annular" blowout preventers. The rams were of two types: "pipe rams" and "shear rams". If the drill pipe is in the well, the pipe rams slide perpendicular to the pipe, closing around it to form a tight seal. The annular preventers also close around the pipe, but have more of a vertical motion, so they loosen slightly if the drill pipe is being pushed downward, as might be necessary in a "snubbing" or "well kill" operation. Shear rams may be used as a last resort to cut through the drill pipe and shut off everything, including whatever might be coming up inside the drill pipe.

Studies done for the Minerals Management Service have questioned the reliability of shear rams in deep-water drilling. Figure 1 shows the result of a 2002 study on offshore oil rigs. This study was designed to answer the question “Can a given rig’s BOP equipment shear the pipe to be used in a given drilling program at the most demanding condition to be expected?” Seven of the fourteen cases in this study opted not to test, another had insufficient data to draw a definitive conclusion, and three failed to shear the pipe under realistic conditions of expected well bore and seawater pressure. In each case of failure, increasing the pressure on the rams above its design value, successfully sheared the pipe. A follow-up study in 2004 confirmed these results with a much larger sample of drill pipes and typical blowout preventers from three different manufacturers.

In addition to insufficient ram pressure, a New York Times investigation of the Deepwater Horizon oil spill listed other problem areas for deepwater blowout preventers. If one of the threaded joints between pipe sections is positioned within a shear ram, the ram would probably not cut through it, because the joints are "nearly indestructable". Requiring two shear rams in every blowout preventer may help to avoid this problem and to avoid some types of "single-point failure". Other technologies that might improve the reliability of BOPs include backup systems for sending commands to the BOP and more powerful submersibles that connect to the BOP's hydraulics system.

Well casings

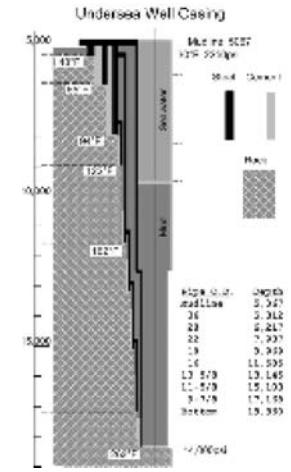


Figure 4. Typical well casings during the final tests before shut in.

Casing of offshore oil wells is done with a set of nested steel pipes, cemented to the rock walls of the borehole as in Figure 4. Each section is suspended by a threaded adapter inside the bottom end of the section above. Failure of either the casings or the cement can lead to injection of oil into groundwater layers, flow to the surface far from the well, or a blowout at the wellhead.

In addition to casings, oil wells usually contain a "production liner" or "production tubing", which is another set of steel pipes suspended inside the casing. The "annulus" between the casing and the production liner is filled with "mud" of a specific density to "balance" the pressure inside the casing with the "pore pressure" of fluids in the surrounding rock "formations".

To ensure that the cement forms a strong, continuous, 360-degree seal between the casing and the borehole, "centralizers" are placed around the casing sections before they are lowered into the borehole. Cement is then injected in the space between the bottom of the new casing section and the bottom of the borehole. The cement flows up around the outside of the casing, replacing the mud in that space with pure, uncontaminated cement. Then the cement is held perfectly still for several hours while it solidifies.

Without centralizers, there is a high risk that a channel of drilling mud or contaminated cement will be left where the casing contacts the borehole. These channels can provide a path for a later blowout. Even a thin crack can be pushed open by the enormous pressure of oil from below. Then erosion of the cement can occur from high-velocity sand particles in the oil. A hairline crack can thus become a wide-open gushing channel.

Another cause of cement failure is not waiting long enough for the cement to solidify. This can be the result of a rushed drilling schedule, or it could happen if there is a leak causing the cement to creep during the time it is supposed to be setting. A "cement evaluation log" can be run after each cement job to provide a detailed, 360-degree check of the integrity of the entire seal. Sometimes these logs are skipped due to schedule pressures.

Cement is also used to form permanent barriers in the annulus outside the production liner, and temporary barriers inside the liner. The temporary barriers are used to "shut in" the well after drilling and before the start of production. Figure 4 shows a barrier being tested by replacing the heavy mud above it with lighter seawater. If the cement plug is able to contain the pressure from the mud below, there will be no upward flow of seawater, and it can be replaced with mud for the final shut in.

There are no cement barriers in the annulus in Figure 4. While there is no requirement for such barriers, adding them can minimize the risk of a blowout through a direct wide-open channel from the reservoir to the surface.

forthcoming programs

- Goods & Service Tax (GST)
- Pressure Vessel Design & Heat Exchanger Design
- Managing Risks in International Trade with L/C and Standby LC & Bank Payment Obligation (BPO)
- Stainless Steel Welding
- Metallurgy for Non-Metallurgists
- Tower Internals

ThyssenKrupp Industrial Solutions (India) Pvt. Ltd.

Press release
Industrial Solutions
March 30, 2017

Andhra Sugars Limited (ASL) reaffirms trust in thyssenkrupp's membrane cell technology with new expansion order

The Andhra Sugars Limited has entrusted thyssenkrupp with an order to expand its 436 tons per day membrane cell caustic soda facilities in Saggonda, Andhra Pradesh. thyssenkrupp Industrial Solutions (India) – the former Uhde India – will provide engineering services and supply proprietary equipment to expand the plant's production capacity to a total of 600 tons per day in two phases.

The expansion project will deploy the latest generation of membrane cell technology from thyssenkrupp Uhde Chlorine Engineers, a worldwide supplier of leading technologies and comprehensive solutions for high-efficiency electrolysis plants.

The scope of services includes basic and detail engineering, project management services including technical procurement, proprietary supplies, supervision during civil and structural erection work as well as supervision services during start-up, commissioning and performance test run.

Thyssenkrupp Industrial Solutions' association with the caustic soda major began in 2001, and was followed by a number of expansion orders. thyssenkrupp is well recognized for plants for the production of caustic soda, chlorine and chlorine derivatives. Over 70 percent of the caustic soda-chlorine membrane cell capacities in India are based on the company's proprietary bipolar single vessel design membrane cells that are environment-friendly, long-lasting, energy-efficient and cost-effective.

Contract Signing :

Mr Narendranath Chowdary, Managing Director, The Andhra Sugars Limited with Mr RY Katre, Head of Group Sales and Proposals, thyssenkrupp Industrial Solutions (India) at the Contract Signing Ceremony for the Caustic Soda expansion project in the former's offices

About thyssenkrupp Industrial Solutions:

The Industrial Solutions business area at thyssenkrupp is a leading partner for the engineering, construction and service of industrial plants and systems. Based on more than 200 years of experience we supply tailored, turnkey plants and components for customers in the chemical, fertilizer, cement, mining and steel industries. As a system partner to the automotive, aerospace and naval sectors we develop highly specialized solutions to meet the individual requirements of our customers. Around 19,000 employees at over 70 locations form a global network with a technology portfolio that guarantees maximum productivity and cost-efficiency.

For more information visit:
www.thyssenkrupp-industrial-solutions.com

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Goods and Service Tax Explained In Lucid Terms

By Mr. Mr. Aniket Kulkarni
Chartered Accountant, Aniket Kulkarni & Associates

The Goods and Services Tax (GST), the biggest reform in India's indirect tax structure since the economy began to be opened up 25 years ago, at last looks set to become reality. The Constitution (122nd) Amendment Bill comes up in Rajya Sabha today, on the back of a broad political consensus and boosted by the 'good wishes' of the Congress, which holds the crucial cards on its passage. Here's how GST differs from the current regimes, how it will work, and what will happen if Parliament clears the Bill.

Salient Features of GST

- GST is stage wise destination based consumption tax.
- Broad based and a single comprehensive tax levied on goods and services consumed in an economy.
- Levied and collected on value addition at each stage of sale or purchase of goods or supply of services based on input credit method but without state boundaries.
- Uniform single tax across the supply chain.
- Improvement in international cost competitiveness of indigenous goods and services.
- Enhancement in efficiency in manufacture and distribution due to economies of scale.
- GST encourages an unbiased tax structure that is neutral to business processes, business models, organization structure, product substitutes and geographical locations.
- The prices of commodities are expected to come down in the long run as dealers pass on the benefits of reduced tax incidence to consumers by slashing the prices of goods.

How a Full GST works:

Stage 1

Imagine a manufacturer of, say, shirts. He buys raw material or inputs - cloth, thread, buttons, tailoring equipment - worth Rs 100, a sum that includes a tax of Rs 10. With these raw materials, he manufactures a shirt.

In the process of creating the shirt, the manufacturer adds value to the materials he started out with. Let us take this value added by him to be Rs 30. The gross value of his good would, then, be Rs 100 + 30, or Rs 130.

At a tax rate of 10%, the tax on output (this shirt) will then be Rs 13. But under GST, he can set off this tax (Rs 13) against the tax he has already paid on raw material/inputs (Rs 10). Therefore, the effective GST incidence on the manufacturer is only Rs 3 (13 – 10).

Stage 2

The next stage is that of the good passing from the manufacturer to the wholesaler. The wholesaler purchases it for Rs 130, and adds on value (which is basically his 'margin') of, say, Rs 20. The gross value of the good he sells would then be Rs 130 + 20 — or a total of Rs 150.

A 10% tax on this amount will be Rs 15. But again, under GST, he can set off the tax on his output (Rs 15) against the tax on his purchased good from the manufacturer (Rs 13). Thus, the effective GST incidence on the wholesaler is only Rs 2 (15 – 13).

Stage 3

In the final stage, a retailer buys the shirt from the wholesaler. To his purchase price of Rs 150, he adds value, or margin, of, say, Rs 10. The gross value of what he sells, therefore, goes up to Rs 150 + 10, or Rs 160. The tax on this, at 10%, will be Rs 16. But by setting off this tax (Rs 16) against the tax on his purchase from the wholesaler (Rs 15), the retailer brings down the effective GST incidence on himself to Re 1 (16 –15).

Thus, the total GST on the entire value chain from the raw material/input suppliers (who can claim no tax credit since they haven't purchased anything themselves) through the manufacturer, wholesaler and retailer is, Rs 10 + 3 +2 + 1, or Rs 16.

WHAT GOES?

Central taxes That The GST will replace

- Central Excise Duty
- Duties of Excise (medicinal and toilet preparations)
- Additional Duties of Excise (goods of special importance)
- Additional Duties of Excise (textiles and textile products)
- Additional Duties of Customs (commonly known as CVD)
- Special Additional Duty of Customs (SAD)
- Service Tax
- Cesses and surcharges in so far as they relate to supply of goods or services

State taxes That The GST will Subsume

- State VAT
- Central Sales Tax
- Purchase Tax
- Luxury Tax
- Entry Tax (all forms)
- Entertainment Tax (not levied by local bodies)
- Taxes on advertisements
- Taxes on lotteries, betting and gambling
- State cesses and surcharges

Goods and Service Tax Explained In Lucid Terms - Continued to page no. 22

Operation Clean Money By It Authorities Post Demonetization

By Mr. Aniket Kulkarni
Chartered Accountant, Aniket Kulkarni & Associates

A) SEARCH AND SURVEY UNDER OPERATION CLEAN MONEY

Income tax officials assessing taxpayers flagged under Operation Clean Money have been told to ensure they use "polite language, without an element of threat or warning" in their communications.

At the same time, these officials have been given the power to undertake survey operations and even check CCTV footage from banks in case of suspected back-dating or fictitious cash transactions.

Assessing officers have also been directed not to probe a case further if the cash deposited by an individual having no business income and attributed to earlier income or savings does not exceed Rs. 2.5 lakh. For taxpayers above 70 years of age, this ceiling has been kept at Rs. 5 lakh.

These were part of the standard operating procedure set out by the income tax (I-T) department on 28-2-2017, to be followed by assessing officers verifying cash deposits following the demonetisation of high-value currency.

As part of Operation Clean Money, the tax department has sent out emails and messages to 1.8 million taxpayers whose cash deposits exceed Rs. 5 lakh and in case of suspicious deposits between Rs. 3 lakh and Rs. 5 lakh. The taxpayers are required to file their responses on the e-filing website of the tax department and explain the source of the deposits. More than 1 million taxpayers have failed to respond to the tax department's queries.

The tax department is expected to start the next phase of scrutinizing deposits below Rs. 5 lakh from next month.

It has identified 10.9 million accounts where deposits ranging from Rs. 2-80 lakh were made and around 148,000 accounts where the deposits were more than Rs. 80 lakh.

The tax department has asked the assessing officer to treat this exercise as a preliminary verification of information and not in the nature of scrutiny or in-depth authentication. It has also asked the assessing officer to collect information from the taxpayer only through the online platform and avoid telephone queries. However, in cases where there has been no response, the department has asked the assessing officer to scrutinize the taxpayer's earlier returns. In case the details do not match the taxpayer's profile, the assessing officer has been given the power to seek information under Section 133 (6) of the Income Tax Act.

Further, the assessing officer has been given the power of survey in specific cases and asked to refer the case to the investigative wing when required. "During survey, where there is a suspicion of back-dating or fictitious cash transactions, CCTV recording of the cash counter at relevant banks may also be checked, if necessary," said the document.

The Economic Times reported on 28-2-2017 that the tax department could initiate surveys on taxpayers who have not responded to the tax department's queries.

B) Cash Deposit Verification Guidelines given by the CBDT to Assessing Officers [Instruction No. 3/2017 dated 21/02/2017]

1. In case of an individual (other than minors) not having any business income, no further verification is required to be made if total cash deposit is up to Rs. 2.5 lakh.
2. In case of taxpayers above 70 years of age, the limit is Rs. 5.0 lakh per person.
3. In non business cases, where the person under verification has filed return of Income, a reasonable quantum can be considered as explained while quantifying the undisclosed amount, if any
4. In case of persons engaged in business or requirement to maintain books of accounts, no additional information is required to be submitted by the person under verification if total cash out of earlier income or savings (sum of responses for all cash transactions) is not more than the closing cash balance as on 31st March 2016 in the return for AY 2016-17
5. However, if the AO has reason to believe that the closing cash balance as on 31st March 2016 has been increased by revising the return or backdating transactions in the books of account, further verification may be carried out.
6. For cash received from identifiable persons without PAN, The AO needs to verify if the cash receipts are not in line with the normal practices of concerned business as mentioned in the earlier returns of Income after considering the remarks

provided by the taxpayer, nature of business and earlier history before seeking additional information.

7. For Cash received from Unidentifiable persons, normal practice of business to be verified

8. AO may seek relevant information e.g. monthly sales summary (with breakup of cash sales and credit sales), relevant stock register entries, bank statement etc. to identify cases with preliminary suspicion of back-dating of cash sales or fictitious sales

9. Some indicators for suspicion of back dating of cash sales or fictitious sales could be :

   i) Abnormal jump in the cash sales during the period Nov to Dec 2016 as compared to earlier history.

   ii) Abnormal jump in percentage of cash sales to unidentifi able persons as compared to earlier history.

   iii) More than one deposit of specified bank notes in the bank account late in the demonetization period

   iv) Non-availability of stock or attempts to inflate stock by introducing fictitious purchases.

   v) Transfer of deposited cash to another account/entity which is not in line with earlier history.

10. In cases where online response has not been submitted, AO shall generate a letter from the Verification portal on ITBA to the person under verification for submission of online response on the e-filing portal and ensure its service. This process should be completed within 7 days of availability of information on the portal.

11. The person under verification is not required to attend the Income-tax office personally under any circumstance and at any stage during the verification exercise.

12. The Assessing Officer will also be able to send a request for additional information, if required.

13. No independent enquiry or third party verifications are required to be made by the Assessing Officer outside the online portal. Whatever information is necessary during verification, the same has to be collected through the person under verification using online platform only

14. Even telephonic queries are to be avoided.

15. It should be ensured that the communications made online with the persons under verification should be in very polite language without containing any element of threat or warning. No show cause of any kind should be given.

16. In cases of non compliance to cash verification window, if the cash deposit is not in line with the earlier return or information profile of the person under verification, necessary facts may be collected inter-alia by exercising the powers under section 133(6) with the approval of prescribed authority.

17. In appropriate cases depending upon the online response or otherwise, survey action u/s. 133A can be considered. During survey, where there is suspicion of back dating or fictitious cash transactions, CCTV recording of the cash counter at relevant banks may also be checked, if necessary. Reference can also be sent to the Investigation wing in appropriate cases.

C) Income tax notice after demonetization – what to do?..

The 50 days of demonetization are behind us and so is the deadline to deposit and convert the demonetized currencies of Rs. 500 and Rs 1000. If you have deposited cash up to Rs. 2.5 lakh in your account, there is no cause for worry as per the government directive. However, if your deposit amount exceeds Rs 2.5 lakh, you may get a notice from the Income Tax Department.

Most of the people get queasy when it comes to deal with income tax department. This article is an effort towards discussing how to handle the income tax notice after November 8.

Who may get an IT notice?

As per government's directive, banks have been asked to furnish details of all individuals who have deposited more than Rs. 2.5 lakh in their savings account or opened fixed deposits. It has also asked banks for information on deposits of more than Rs. 12.5 lakh in current accounts. Banks send these details to tax authorities, which in turn may issue a notice if necessary.

At the same time, if you have bought big-ticket items such as gold or a car, you may get a notice from tax authorities. The government has asked all car dealers to furnish details of their transactions if there is a spike in the volume of business after the demonetization announcement. Similarly, jewellers have been asked to provide details of business transactions that transpired after November 8.

What tax payers should do in such cases

An "Income Tax notice" may sound scary to the layman, but taxpayers need not panic as these are not normal times. The tax authorities may send a notice to anyone who has deposited more than 2.5 lakh in their accounts as explained above.

Hence, the notice by itself is not an implication nor the beginning of an investigation. In most cases, the Income Tax notice could be just a request for disclosing the source of cash. Usually, the notice should come to only those people whose deposit may not match their income prima facie as per tax authorities' assessment.

If you have relevant documents to explain the deposit and its source, you have no cause for worry. Moreover, if you haven't done anything illegal and all your money is 'white', you don't have to worry at all irrespective of how much you earn or deposit.

If you get an I-T notice, read it carefully. This could be simply asking you to provide the source of income for the cash deposited in the bank. The source of income should be supported by documentary proof. If the tax authorities are satisfied by your response, you get a clean chit and the matter gets closed.

If you are not able to explain the source of income or the answer is not satisfactory, there will be further proceedings. The outcome of this will depend on your responses and how valid they are found by the investigating authorities.

In the recent demonetization drive, the government has also made it mandatory to quote PAN number in case the deposit exceeds Rs. 50,000. If you haven't filed returns for years and your deposit exceeds Rs 2.5 lakh, you may get a notice asking to explain the source and subsequent demand to file the returns. This will require detailed investigation.

What happens when you don't respond?

Ideally, you should not abstain from responding. However, if you don't respond, you may get a follow-up communication from the I-T Department. Additionally, the tax authorities will assess your income based on the deposit data and other available details and come out with the tax liability, and you may have to pay the difference.

Remember that a lack of response from your side may lead the tax authorities to believe or assume that you have no explanation for the source of your deposit or income, and you do have illicit wealth in your possession.

If required or in doubt, consult a practising chartered accountant or tax consultant for the optimal course of action. In addition, use oodles of practical sense in order to take a decision and make it a habit to preserve all documentation related to your finances. Also, follow up with the case officer or the I-T team until the matter is resolved. Do not allow any pending issue to fester.

PRIME MINISTER GARIB KALYAN YOJANA

The government offered a "last window" to people with unaccounted wealth to come clean or face stringent penalties while inviting others to blow the whistle on those suspected to be holding black money as it launched the scheme that had been announced earlier.

Pradhan Mantri Garib Kalyan Yojana (PMGKY), 2016, started on December 17th and shall remain open until March 31 next year. Those who declare cash deposits under this will be levied a charge of 50%, which breaks down into 30% tax, 33% surcharge and 10% penalty. In addition to this, 25% of the amount declared will go into the noninterest-bearing Pradhan Mantri Garib Kalyan Deposit Scheme, 2016, for four years. Declarations under PMGKY will be confidential and those taking advantage of it will escape prosecution.

CONCLUSION

Finally, cooperate with the tax authorities if you get a notice. Avoiding it, concealing relevant information, or trying to give wrong details in order to misdirect the authorities will only go against you. If you have played it by the book, you have nothing to worry. If you haven't, it would be wise to get on the straight and narrow, pay your dues, and clear yourself.

Goods and Service Tax Explained In Lucid Terms - Continued from page no. 19

The GST Council

WILL CONSIST of the union Finance Minister (chairman) and MoS in charge of Revenue; Minister in charge of Finance or Taxation, or any other Minister, nominated by each state

DECISIONS WILL be made by three-fourths majority of votes cast; Centre shall have a third of votes cast, states shall together have two-thirds

MECHANISM for resolving disputes arising out of its recommendations may be decided by the Council itself

The levy of GST

BOTH Parliament, state Houses will have the power to make laws on the taxation of goods and services

PARLIAMENT'S LAW will not override a state law on GST

EXCLUSIVE POWER to Centre to levy, collect GST in the course of interstate trade or commerce, or imports. This will be known as Integrated GST (IGST)

CENTRAL LAW will prescribe manner of sharing of IGST between Centre and states, based on GST Council's views

What's Out of GST…

Alcoholic liquor for human consumption

Petroleum crude, high speed diesel, motor spirit (petrol), natural gas and aviation turbine fuel — GST Council will decide until when

..AND What's In

Tobacco, tobacco products. Centre may impose excise duty on tobacco

In Conclusion:

The key imperatives for companies are:

- Understand key areas of impact in their business.
- Prepare different scenarios for the design and application of GST.
- Continually track policy development regarding GST and update prepared scenarios.
- Identify any areas of adverse impact and prepare contingency measures.
- Identify issues and concerns needing representations to the authorities and develop a strategy for effective advocacy.

Welcome NEW MEMBER

PPMAI welcome the following member/s who newly joined the Association and look forward to their prolonged association and active participation in all our programmes.

Sr. No.	Name of the company	Name of the company	Activity
1.	**GDP Engineering Company** No.7, Swamimalai Nagar Ettn. (Thoraipakkam – Pallavaram) 200 Feet Road, Keelkatalai, Chennai – 600 117. Tel: 044-2247 2826 Cell: 98840 79571 Email: gdpengg@gmail.com	Mr. K. Periasamy Partner Cell: 98400 96858	Manufacturer of: Tube Sheets and Baffles Flanges for Bellows. Tube sheets and Baffles Drilling and machining for Heat Exchangers and Boilers.

Words of wisdom

- Let us look behind us with understanding, before us with faith, and around us with love.
- Those who tell you it can't be done have always been around, but throughout history, progress has always come from those who said it could be done.
- Be part of the solution, not part of the problem.
- It does not take great men to do great things, just those who are greatly dedicated to doing them.
- Kindness and courtesy can make an average person superior, indifference and lack of concern can make a superior person average.
- Acquiring knowledge is not an end in itself, but only a means to an end. Knowledge without purpose can be a destructive tool.
- Every disappointment in life can be a stepping stone to greater things.
- You will never know what can be done until you try to do it.
- Every experience you have is designed to make you stronger.
- Try to replace with critical thoughts with positive ones, and you will be amazed what a difference it will make in your day, your spirit, and your life.
- Don't look at the circumstances, look above and beyond them.
- If you want a share of the fame, you have got to be willing to take a share of the blame.

ADVERTISEMENT **TARIFF**

PPMAI Speak Bi-Monthly Bulletin

Full Page Colour	Amount
Back Cover Outside / Inside	₹ 25,000.00
Inside Front Cover	₹ 25,000.00
Inside Full Page	₹ 20,000.00

Specification of our publication is as follows:

Period : Bi-monthly
Print Size : A-4
Print Process : Offset 4 colour
Paper used for cover : 170 gsm Sinarmass Coated Art Paper with matte lamination
Paper used for inside : 130 gsm Sinarmass Coated Art Paper

Advt. Size Artwork should be A/4 size for full page advt. (210 mm width x 297 mm height). All advertisement will be in 4+4 cmyk Colours.

Payment:

- Payment for banner advertisement should be made in advance by Cheque / DD in the favour of, "Process Plant and Machinery Association of India" payable at Mumbai along with release order

PPMAI Website

Internet today has made the world small place and easily reachable nay it is the best and fastest medium to reach and access global markets. Airing advertisements on website is definitely an economical way to propagate your company and publicize your products world-over. Keeping this in mind, we have earmarked seven strips for advertisements on our website.

www.ppmai.org
gives you an opportunity to advertise worldwide

We are pleased to inform you that PPMAI website www.ppmai.org is now fully revamped with new look and features.

₹ 10,000/- per annum
(exclusive of service tax)

Advertisers may modify their advertisement matter every quarter.

- The rate includes free link to your existing website
- The banner will be designed and provided by the advertiser as per specified size
- The banner will be in the form of JPEG or GIF file and its size will not exceed 20kB

Payment:

- Payment for banner advertisement should be made in advance by Cheque / DD in the favour of, "Process Plant and Machinery Association of India" payable at Mumbai along with release order

PPMAI eSpeak Journal | soft copy (Published twice in a month)

₹ 10,000/- per annum
(Rupees : Ten Thousand per annum)

- Advertisers may change their advertisement matter every quarter
- The rates quoted are exclusive of service tax
- The size of the ad should be around 40 kb max. Logos or Images will not be entertained
- A format will be provided by PPMAI wherein the advertiser can furnish the advertisement matter

Payment:

- Payment for banner advertisement should be made in advance by Cheque / DD in the favour of, "Process Plant and Machinery Association of India" payable at Mumbai along with release order

PPMAI Newsletter | soft copy (Published twice in a month)

₹ 10,000/- per annum
(Rupees : Ten Thousand per annum)

- Advertisers may change their advertisement matter every quarter
- The rates quoted are exclusive of service tax.
- The size of the ad should be around 40 kb max. Logos or Images will not be entertained.
- A format will be provided by PPMAI wherein the advertiser can furnish the advertisement matter.

Payment:

- Payment for banner advertisement should be made in advance by Cheque / DD in the favour of, "Process Plant and Machinery Association of India" payable at Mumbai along with release order

For enquiries and queries contact :

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