

Amrutvahini Sheti and Shikshan Vikas Sansth's

AMRUTVAHINI POLYTECHNIC

SANGAMNER



TECH MEDHA

2019- 20

AMRUTVAHINI POLYTECHNIC

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TECH MEDHA (Volume 4)

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Prof. V. B. Dhumal Principal

It gives me great pleasure to know that **‘TECH MEDHA’**, Amrutvahini Polytechnic magazine 2019-20 is ready for publication. True to its name, this magazine gives an insight into the range and scope of the imagination and creativity of our students and faculty members. I applaud the editorial team for the hard work and dedication they have invested in realizing this goal, and wish my dear students success in all future endeavors. The highly qualified and dedicated members of staff have always stood shoulder with the management and have carried out their duties with a level of commitment.

I wish the management, staff and students of the college success in their future endeavors.

Vice-Principal's Message



Prof. G. B. Kale

Vice - Principal

Providing ample opportunities in engineering education is one of the most fundamental obligations we owe to our students because in Amrutvahini Polytechnic we are driven by the belief that every student deserves a high quality education. **TECH MEDHA** provides an intersection of great challenge and great opportunity for the students to review their efforts and to analyze their achievements in research and development. Technology is evolving at a dizzying rate and our classrooms may not be designed to keep pace with it. There may be a lot wrong in the style of education but the pages of TECH MEDHA tell the tale of all that have been a part of what is right about the education they get in Amrutvahini Polytechnic.

I congratulate the team of students and the faculty for their tireless efforts that have come to fruition in the form of this magazine. I wish it all success and hope that this tradition that has been set by the current students will be carried through by the following generation of students to come.

Editor's Note

Dear Readers

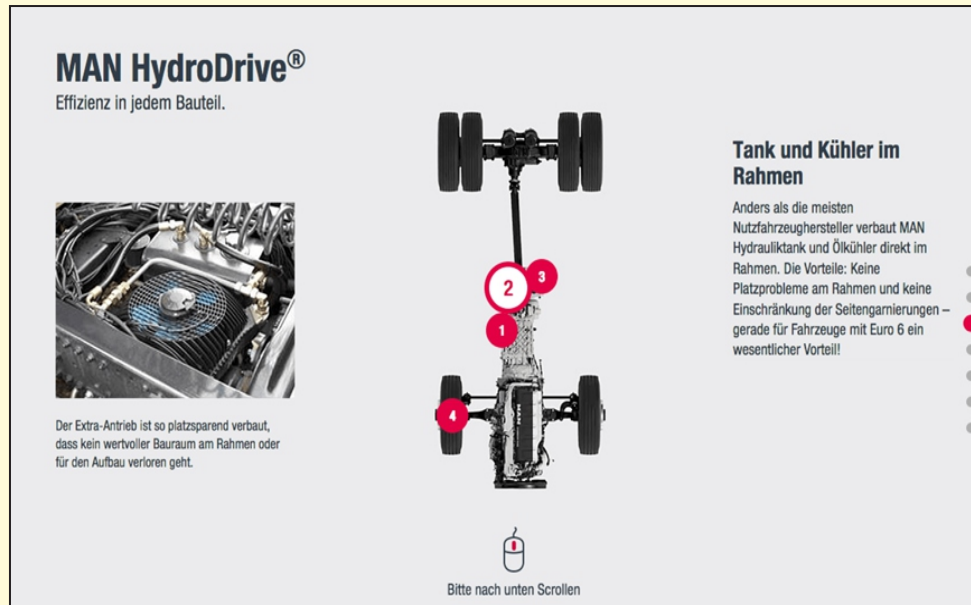
It gives us great pleasure to bring you the fourth issue of TECH MEDHA, the college magazine of AVP. The name and fame of an institute depends on the caliber and achievements of the students and teachers. The role of a teacher is to be a facilitator in nurturing the skills and talents of students. This magazine is a platform to exhibit the literary skills and innovative ideas of teachers and students. TECH-MEDHA presents the achievements of students and contributions of teachers. We would like to place on record our gratitude and heartfelt thanks to all those who have contributed to make this effort a success. We profusely thank the management for giving support and encouragement and a free hand in this endeavor. Last but not the least we are thankful to all the authors who have sent their articles. We truly hope that the pages that follow will make an interesting read.

Prof. Shepal S. D.
Civil Dept.

AHIRAO UDAY NARENDRA

ME2I REGULAR SHIFT

Hydro Drive



Hydro Forming uses water pressure to form complex shapes from sheet or tube material. The pressure may go up about 60,000 psi depending on the component.

As the automobile industry strives to make car lighter, stronger and more fuel efficient, it will continue to drive hydro forming applications. Some automobile parts such as structural chassis, instrument panel beam, engine cradles and radiator closures are becoming standard hydro formed parts.

The capability of hydro forming can be more fully used to create complicated parts. Using a single hydro formed item to replace several individual parts eliminate welding or hole punching, simplifies assembly and reduce inventory.

Taking Advantage Of Hydro Forming

When considering hydro forming, companies need to ask whether this technology will make a part cheaper to produce. The real question is whether you can refine the entire manufacturing process to take advantage of hydroforming that is when it really makes.

Instead of looking at a single competent to determine whether it can be hydro formed , companied need to look at a product through whole process, from material to assembly , to determine what savings can be achieved . For e.g. Hydro forming often reduces number of pieces or the amount of floor space used or eliminates the need for welding stations.

GAWANDE PRATIK SAKHARAM

ME6I REGULAR SHIFT

Re-entry of Space Vehicle



The successful exploration of space requires a system that will reliably transport payload such as personnel and instrumental etc. into space and return them back to earth without subjecting them an uncomfortable or hazardous environment. In other words, the spacecraft and its payloads have to be recovered safely into the earth. We have seen the re-entry capsules and winged space vehicles approach the earth followed by safe landing. However, this could be accomplished only after considerable research in high speed aerodynamics and after many parametric studies to select the optimum design concept.

Re-entry systems were among the first technologies developed in 1960s for military photo-reconnaissance, life science and manned space flights. By 1970s, it led to the development of new refurbish able space shuttles. Today space technology has developed to space planes which intend to go and come back regularly from earth to space stations. USA?s HERMS and Japan?s HOPE is designed to land at conventional airports. Few significant advances in current proposed re-entry capsules are ballistic designs to reduce development and refurbishable cost, to simplify operations.

MAHAJAN SANSKRUTI RAJENDRA

ME4I REGULAR SHIFT

Sensotronic Brake Control



Sensotronic Brake Control (SBC?) works electronically, and thus faster and more precisely, than a conventional hydraulic braking system. As soon as you press the brake pedal and the sensors identify the driving situation in hand, the computer makes an exact calculation of the brake force necessary and distributes it between the wheels as required. This allows SBC? to critically reduce stopping distances. SBC? also helps to optimise safety functions such as ESP?, ASR, ABS and BAS.

With Sensotronic Brake Control, electric impulses are used to pass the driver's braking commands onto a microcomputer which processes various sensor signals simultaneously and, depending on the particular driving situation, calculates the optimum brake pressure for each wheel. As a result, SBC offers even greater active safety than conventional brake systems when braking in a corner or on a slippery surface. A high-pressure reservoir and electronically controllable valves ensure that maximum brake pressure is available much sooner. Moreover, the system offers innovative additional functions to reduce the driver's workload. These include Traffic Jam Assist, which brakes the vehicle automatically in stop-and-go traffic once the driver takes his or her foot off the accelerator. The Soft-Stop function - another first - allows particularly soft and smooth stopping in town traffic

SANAP SAKHARAM MADHAV

ME2I SECOND SHIFT

Skid Steer Loader and Multiterrain Loader



Skid-steer loaders began catching on in the construction field in the 1980s because they offered contractors a way to automate functions that had previously been performed by manual labor.

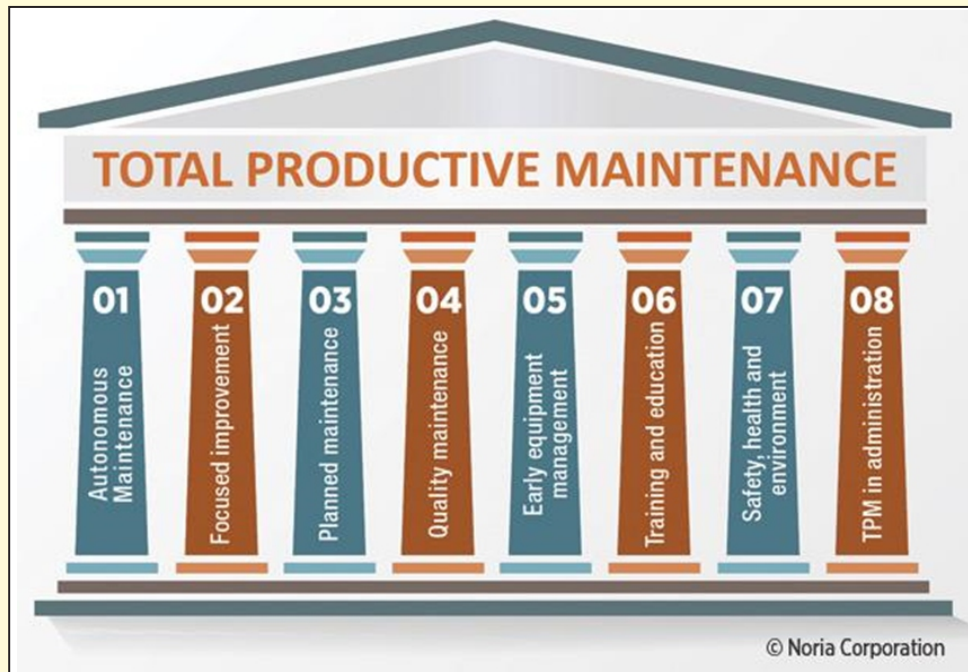
Those were small, inexpensive machines that improved labor productivity and reduced work-related injuries. Their small size and maneuverability allows them to operate in tight spaces. Their light weight allows them to be towed behind a full-size pickup truck, and the wide array of work-tools makes them very flexible. They were utility machines, used for odd jobs ranging from work site clean up to small scale digging, lifting, and loading. In most cases, they logged far fewer hours of usage each year than backhoe loaders and wheel loaders, but they were cheap, and so easy to operate that anyone on a job site could deploy them with very little training.

Since then, the category has become wildly popular in all avenues of construction. They are the best-selling type of construction equipment in North America, with annual sales exceeding 50,000 units. They still tend to be low-hour machines, but, thanks to a virtually unlimited variety of attachments, skid-steer loaders can handle a huge array of small-scale jobs, from general earthmoving and material handling to post hole digging and landscaping to pavement milling and demolition.

DANVE PRATIK BABAJI

ME61 SECOND SHIFT

Total Productive Maintenance

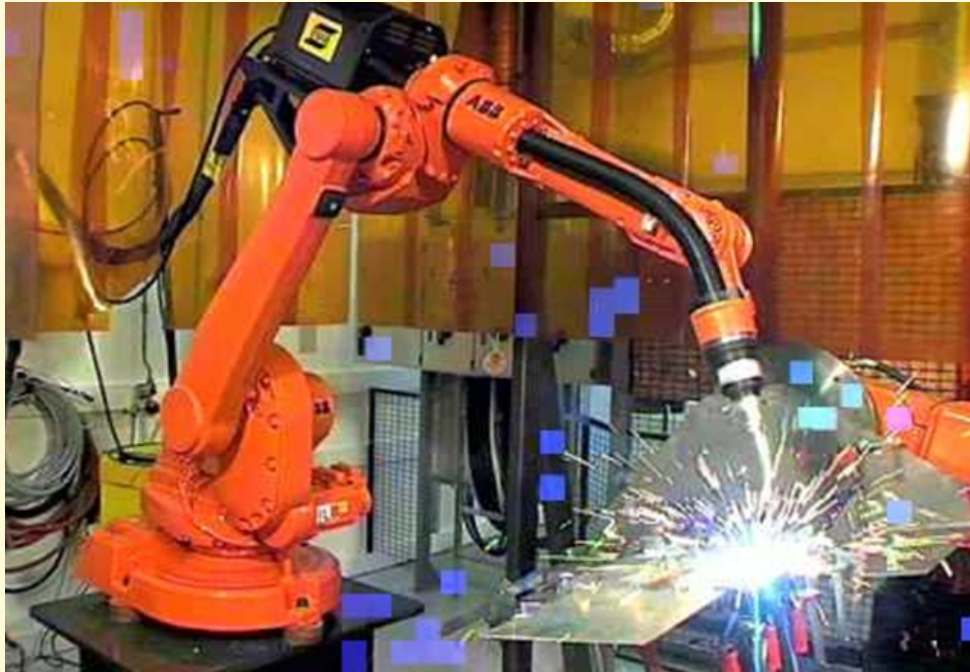


Maintenance has a far greater impact on corporate profitability than most managers are willing to consider, much less admit. And, as the competitive environment in the world continues to increase the pace, companies are looking for new strategies to save on costs, develop employees to face future challenges and bring about a new culture at work place. This has become imperative to stay in business and have an edge over the competition. In this situation, a number of strategies like Total Quality Management, Kaizen, quality circles, ISO certification, six sigma and Total productive Maintenance are available and it is the management choice to selectively implement these in their workplace.

GANDHE SAURABH SHASHANK

LECTURER IN MECHANICAL ENGINEERING

Welding Robots



Welding technology has obtained access virtually to every branch of manufacturing; to name a few bridges, ships, rail road equipments, building constructions, boilers, pressure vessels, pipe lines, automobiles, aircrafts, launch vehicles, and nuclear power plants. Especially in India, welding technology needs constant upgrading, particularly in field of industrial and power generation boilers, high voltage generation equipment and transformers and in nuclear aero-space industry.

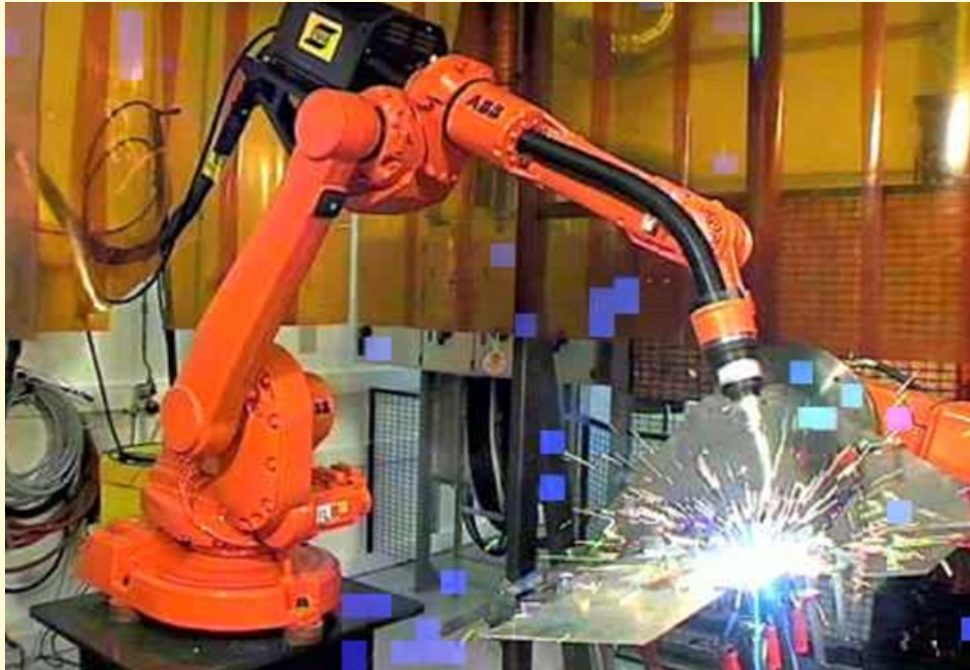
Computers have already entered the field of welding and the situation today is that the welding engineer who has little or no computer skills will soon be hard-pressed to meet the welding challenges of our technological times. In order for the computer solution to be implemented, educational institutions cannot escape their share of responsibilities.

Automation and robotics are two closely related technologies. In an industrial context, we can define automation as a technology that is concerned with the use of mechanical, electronics and computer-based systems in the operation and control of production. Examples of this technology include transfer lines, mechanized assembly machines, feed back control systems, numerically controlled machine tools, and robots. Accordingly, robotics is a form of industrial automation.

KANDURE VIVEK DASHRATH

LECTURER IN MECHANICAL ENGINEERING

Valvetronic Engine Technology



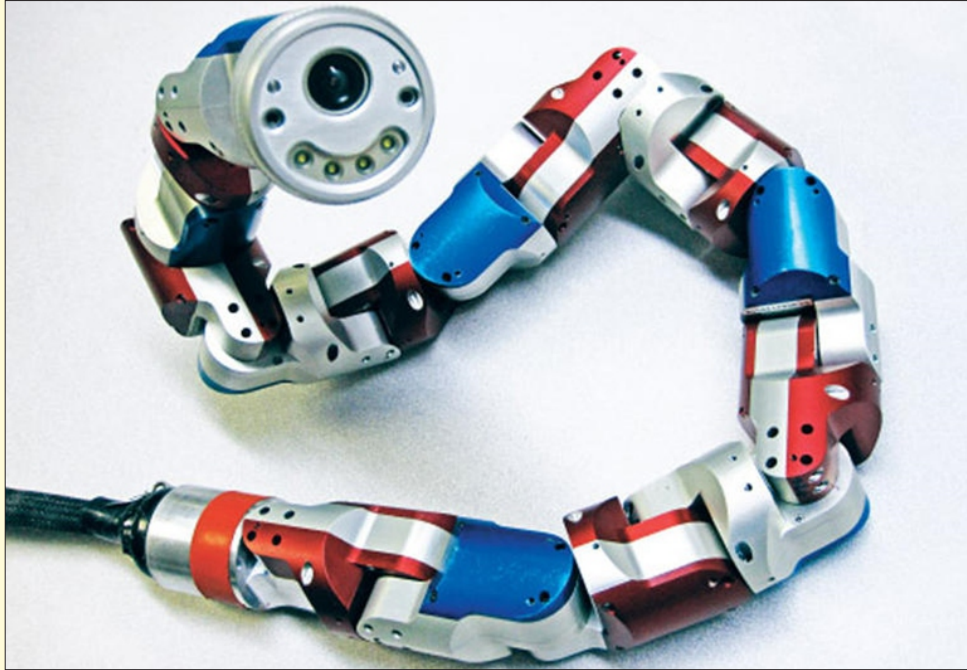
The automobile has been providing individual mobility for more than 100 years. This mobility is made possible first and foremost by combustion engines drawing their power from fossil energy carriers, which, even today, provide the foundation in generating mechanical drive power in the automobile. The primary objectives in developing drive systems are? to curb fuel consumption and reduce CO₂ emissions. In an effort to meet this challenge, the automotive industry is developing suitable new engines. The voluntary commitment assumed by the European Automobile Manufacturers Association (ACEA) is to reduce the fleet emission average of all newly introduced cars to 140g of CO₂ per kilometer by 2008 .

The first objective is to minimise emission components such as hydrocarbon, CO₂ and nitrogen oxides (NO_x) subject to specific limits. At the same time, manufacturers are seeking to minimise fuel consumption and, accordingly, CO₂ emissions. All of this should be achieved with a maximum standard of comfort and safety on the road. In the homologation of motor vehicles, Europe, Japan and the US apply different driving cycles to determine emissions and fuel consumption. However, it is the individual customer who ultimately decides on his/her particular style of motoring and up to 30% of a car's fuel consumption depends on how it is driven and the style of motoring that is preferred by the driver. Clearly, the development engineer is unable to influence these external parameters ? all that he/she can do is change the basic functions and control factors in the car and its drivetrain.

HIRE DIPAK RAMDAS

LECTURER IN MECHANICAL ENGINEERING

Snake Robots



In the past two decades it is estimated that disasters are responsible for about 3 million deaths worldwide, 800million people adversely affected, and property damage exceeding US\$50 billion. The recent earthquake in Turkey in November of 1999 left 700 dead and 5000 injured. Many of these deaths were from structural collapse as buildings fell down onto people. Urban Search and Rescue involves the location, rescue (extrication), and initial medical stabilization of victims trapped in confined spaces. Voids formed when a buildings collapse is one instance of a confined space. Urban Search and Rescue may be needed for a variety of situations, including earthquakes, hurricanes, tornadoes floods, fires, terrorist activities, and hazardous materials (hazmat) accidents. Currently, a typical search and rescue team is composed of about ten people, including canine handlers and dogs, a paramedic, a structural engineer, and various specialists in handling special equipment to find and extract a victim. Current state of the art search equipment includes search cameras and listening devices. Search cameras are usually video cameras mounted on some device like a pole that can be inserted into gaps and holes to look for signs of people. Often a hole is bored into the obstructing walls if a void is suspected to exist on the other side. Thermal imaging is also used.

DHOMSE UDAY JAYRAM

LECTURER IN MECHANICAL ENGINEERING

Tidal Energy



Tidal energy is one of the oldest forms of energy used by humans. Indeed, tide mills, in use on the Spanish, French and British coasts, date back to 787 A.D.. Tide mills consisted of a storage pond, filled by the incoming (flood) tide through a sluice and emptied during the outgoing (ebb) tide through a water wheel. The tides turned waterwheels, producing mechanical power to mill grain. We even have one remaining in New York- which worked well into the 20th century. Tidal power is non-polluting, reliable and predictable. Tidal barrages, undersea tidal turbines - like wind turbines but driven by the sea - and a variety of machines harnessing undersea currents are under development. Unlike wind and waves, tidal currents are entirely predictable.

Tidal energy can be exploited in two ways:

- * By building semi-permeable barrages across estuaries with a high tidal range.
- * By harnessing offshore tidal streams.

Barrages allow tidal waters to fill an estuary via sluices and to empty through turbines. Tidal streams can be harnessed using offshore underwater devices similar to wind turbines.

SURVE SHEKHAR MANOHAR

LECTURER IN MECHANICAL ENGINEERING

Cyborg



(CYBernetic ORGanism) A being that is part human and part machine. The term was coined in 1960 by Manfred Clynes and Nathan Kline in an article they wrote about how humans can survive in space. For centuries, various cultures have fantasized about half human-half artificial beings; however, in the 20th century this concept materialized in the form of artificial limbs, pacemakers and other bionic devices.

A cybernetic organism, or cyborg, is the melding of man and machine and ranges in scope from creating computers that have human attributes, such as independent thinking or the ability to learn, to the artificial heart, pacemaker, and a variety of synthetic implants. Cyborg advocates hypothesize that in the future mankind will use science and technology to transform into a virtually immortal being?still human, but with machine parts that perfect natural organs, muscle fiber, and bone. In modern society, cyborgs have taken on a new meaning, particularly as computers have become more powerful and ubiquitous. While religious and ethical questions about cyborgs remain, people no longer fear machines that outthink, outperform, and are physically more powerful than humans. Science fiction, movies, and television shows portraying the cyborg-driven future have not only dispelled fear, but actually set expectations for further advances in providing computers with human attributes and vice versa for the betterment of both.

Article by
GAIKWAD KUSUM YUVRAJ (FY ETC)

SPC and ES energy storage systems – EVE Battery

Electronics devices which are designed for applications that require short term operation and stay long be in stand-by mode usually need huge energy impulse immediately after wake-up command. These can be emergency alarm systems, RFID transponders, GPS tracking devices, smart meters' read-out electronics or the recently obliged E-CALL systems of passenger vehicles. A stabile voltage, low leakage current battery is required, that can pump huge momentary charge in a short time into the system. These requirements are often realized by integrating different super-capacitors, that have ten or even hundred times higher energy density than normal electrolytic capacitors, their charge and discharge times are also shorter, and tolerate much more cycles that e.g. rechargeable batteries. Supercap's operation is usually based on electrostatic principle, however there are some special devices, like EVE Energy's own patented SPC devices, that are featured by chemical working principle They usually do not operate alone, but as a part of one of EVE's energy storage systems, which is in fact a special battery pack. This paper introduces the advantages of such system.

Article by
NEHE YASH ASHOK (SY ETC)

Giga Device 32 bit ARM Cortex microcontrollers (1.)

ARM (Advanced Reduced Instruction Set Machine) is the industry's leading microprocessor technology, offering the widest range of microprocessor cores to address the performance, power and cost requirements for almost all application markets. With more than 90 billion processors manufactured, the ARM technology is motor of the embedded computers' World helping solutions to be born and businesses to operate. There are many licensed silicon vendors, software solution providers on this market, but a cost effective fareastern licensed player with its own cost optimized solution helps to keep Worldwide prices on a reasonable lower level. Giga Device, the well know manufacturer of Flash memories also takes a piece of the cake of ARM® Cortex®M3 technology. Their GD32® family integrates features to simplify system design and provide customers with wide range of comprehensive and superior cost effective MCU portfolios with proven technology and great innovation. In the first part of the series of articles we review the microcontroller architecture, later we show some examples based on evaluation board available for the device

Article by

ADAMANE RUTUJA SANJAY (SY ETC)

Development of ABC coil families – the new QS series for automotive industry

The arising demand for SMD power inductors is mostly driven by requests arising consumer applications like camera, mobile phone, notebook PCs, however standard industrial applications have also special requirements, that has to be fulfilled. To design quality equipments engineers must use quality components, so very important measures in case of inductors are the maximum power can be concentrated into the given volume, the high saturation current, and in order to keep losses minimized and efficiency high, the low DC resistance of the coil. In addition to the technical properties also the economical issues has to be considered, like the production costs, that are continuously increasing in China due to the fact the hand made parts involve more and more human resources, while wages are increasing. This trend affects all manufacturers, who does not have fully automated production. This paper is about to introduce the various technological steps done by leading taiwanese manufacturer of inductors ABC to answer challenges of today's trends.

Article by

BHAND PRIYANKA NANA (TY ETC)

Directly on mains voltage - alternative to PSUs

Suitable circuits allow LEDs to be operated directly on mains voltage without a power supply unit. The solution is scalable and space saving. Its also allows LEDs to be dimmed evenly and without flickering. The electric light bulb served us well for over 100 years since it was invented by Edison in 1879. Light emitting diodes were discovered as luminescent crystals about 60 years ago and have made triumphant progress since then. Power supply units for operating LEDs have also been available for many years. But since the invention of ICs which can be operated directly with 230 V AC while supplying LEDs with direct current, the question arises whether conventional power supply units are still required. LED lights operated with alternating current have been successfully sold as series produced items for many years. In the beginning these were Retrofit GU10 lamps with 8 to 10 W, followed by built in spotlights and floodlights with 120W and more.

Article by
SATPUTE AKSHADA VASANT (TY ETC)

Movement detection in practice – PIR, WaveEye and GridEye sensors

Engineers of general lighting area are focused on designing compact, intelligent and energy efficient systems, which could be realized by adding the feature of automatic switching off, when no human presence is detected. Today these intelligent sensors are mainly based on passive infrared (PIR) technology, that is perfect for detecting human motion with huge amplitude on a large detection area, however not effective with tiny movements, and also unable to distinguish between approaching and leaving of objects. Radar sensors are capable to fulfill many of the tasks PIR sensors cannot solve, but their working principle is also based on movement, and although tiny movements can usually be detected, stationary objects cannot be. As direction sensing is limited to approaching and leaving, special tasks, like counting people entering and leaving a room is not easy possible. People sitting in an office, making no remarkable movement will be considered not present with these devices. Panasonic's GridEye sensor is based on a thermopile matrix, and acts like a low resolution thermo camera, therefore perfectly suits for presence detection. Evaluating the thermo image by microprocessor based host system more complex observations can be done. Integrating into an intelligent lighting or building automation system, the problems encountered with PIR or radar sensors can be eliminated. This tech paper compares above mentioned technologies.

Article by
PROF. GAIKWAD R. S. (ETC DEPT.)

Industrial TFT displays with the new iSi50® interface from Endrich

Suitable circuits allow LEDs to be operated directly on mains voltage without a power supply unit. The solution is scalable and space saving. Its also allows LEDs to be dimmed evenly and without flickering. The electric light bulb served us well for over 100 years since it was invented by Edison in 1879. Light emitting diodes were discovered as luminescent crystals about 60 years ago and have made triumphant progress since then. Power supply units for operating LEDs have also been available for many years. But since the invention of ICs which can be operated directly with 230 V AC while supplying LEDs with direct current, the question arises whether conventional power supply units are still required. LED lights operated with alternating current have been successfully sold as series produced items for many years. In the beginning these were Retrofit GU10 lamps with 8 to 10 W, followed by built in spotlights and floodlights with 120W and more.

Article by
PROF. GAIKWAD S. V. (ETC DEPT.)

Faytech docking station PCs in the Endrich line

Today there is a new trend to use smart displays, where the PC is embedded into the housing of the display, and the HMI can be realized by software solution, therefore, the time-to-market can be very short. When however, there is a requirement for a large size and robust display, and in the same time enough hardware resources to serve the required control functions, it is worth to think of using a combo of a modular industrial PC and an industrial touch display. To complete this challenge Endrich offers a new family of HMI hardware, the Faytech “Docking Station PC” series. Endrich Bauelemente GmbH as one of the strong display providers on the industrial TFT market focuses to offer solutions for advanced human machine interfaces. Today’s HMI design trends no longer accept to interact using push buttons, mechanical switches or keyboards, or getting feedback through status lamps, seven segment or simple monochrome LCD displays, or via acoustics ways. Today it is basic expectation to have high resolution, even sunlight readable color TFT touch displays, with rugged, robust, but slim and professional industrial design. The applied way of solution is determined by the serial quantity, the human resources available for hardware design and the available time to market the product. One can decide to develop an HMI based on own drivers and TFT modules, which is the economic way in case of high numbers of serial production, or use embedded PCs, where the hardware interfacing of the TFT panel is solved

Article by
PROF. OHAL R. D. (ETC DEPT.)

Industrial TFT displays with the new iSi50® interface from Endrich

Since many years one can experience fight on the smart television market for our movie and living rooms, manufacturers offer wider and wider, high resolution, bright, specially shaped, elegant, and of course more and more expensive products featuring outstanding audiovisual properties. The thinner, the more curved, the less framed the set is, the higher the price consumers are ready to pay for them. The situation however is completely different at the area of high-end industrial displays. For most of the applications it is enough to have a 7"-10" screen size, much more important properties are the robust, rugged design, the ability to withstand extreme environmental circumstances, the presence of the embedded PC and the touch panel, the good outdoor visibility and readability and the industrial operating temperature range. It is also important to be able to purchase the devices for a long time in the same form factors. Sometimes there is also demand in this area for special and extreme designs, thinking of kiosk applications such as interactive information counters, shop displays, information displays at production halls or community area. Here the size of the panel as well as its thickness and weight also matter. There are many special manufacturers out there offering solutions for these market niches, but those products are not widely advertised, we may source them through solution providers, or ourselves on exhibitions, shows and via special Web shops. This article browses through the Faytech high-end industrial display solutions presented by Endrich Bauelemente Vertriebs GmbH on industrial expos such as Electronica and Embedded World exhibitions.

Article by

PROF. DHARNE J. A. (ETC DEPT.)

GNSS (Global Navigation Satellite system) receivers

Global navigation is becoming more and more standard in the traffic, cars are equipped with ex-factory or aftermarket receivers, aircrafts, ships and boats are using GNSS to navigate and also the precision agriculture requires this technology to navigate the heavy equipments like harvesters in order to define the yield map of the area being harvested. GNSS is the generic name of SAT based navigation systems that are providing autonomous geo-spatial positioning. There are number of networks that use their own satellites in combination with the associated earth stations in order to transmit correct positioning and timing data. All these systems that are global are collected under the name of GNSS. We would like to shortly show them in this article as well as some special devices, that could be used in receiver applications, like smart antennas, complete GNSS/TMC modules and receivers, being able to use the advantage of interoperability between different systems in order to maximize the performance of the navigation.

Article by

PROF. TAMBE K.S. (ETC DEPT.)

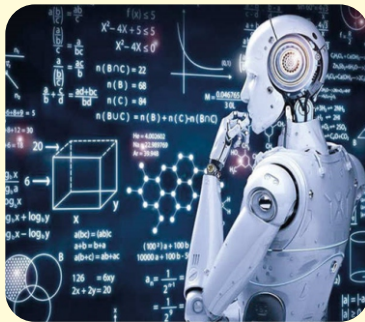
Ripple cancellation with low ESR polymer capacitors

To produce different voltage levels out of the battery voltage could be done on several ways, like using resistor based voltage dividers, or linear regulators, but these solutions can only provide lower level of voltages and the efficiency is low, as “ if the voltage drop is high and the current is large “ , the excess power will be lost by dissipating remarkable heat. Better to use today switching mode DC/DC converters, which temporarily storing energy in magnetic or electric storage components and releasing this energy to result different voltage level on the output. The efficiency will be remarkable higher resulting better battery lifetime at the end. The high frequency switching however causes voltage ripple on the output, that has to be minimized in order to avoid malfunctioning of the supplied device. Most obvious solution is to use a filter capacitor for smoothing ripple voltage on output, which is possible by using e.g. polymer capacitors.

GODASE ONKAR RAMDAS

CM-4-I II SHIFT 19-20

ARTIFICIAL INTELLIGENCE



Artificial intelligence is the simulation of human intelligence processes by machines, especially computer systems. Specific applications of AI include expert systems, natural language processing, speech recognition and machine vision.

As the hype around AI has accelerated, vendors have been scrambling to promote how their products and services use AI. Often what they refer to as AI is simply one component of AI, such as machine learning. AI requires a foundation of specialized hardware and software for writing and training machine learning algorithms. No one programming language is synonymous with AI, but a few, including Python, R and Java, are popular.

In general, AI systems work by ingesting large amounts of labeled training data, analyzing the data for correlations and patterns, and using these patterns to make predictions about future states. In this way, a chatbot that is fed examples of text chats can learn to produce lifelike exchanges with people, or an image recognition tool can learn to identify and describe objects in images by reviewing millions of examples. AI programming focuses on three cognitive skills: learning, reasoning and self-correction.

Learning processes. This aspect of AI programming focuses on acquiring data and creating rules for how to turn the data into actionable information. The rules, which are called algorithms, provide computing devices with step-by-step instructions for how to complete a specific task.

Why is artificial intelligence important?

AI is important because it can give enterprises insights into their operations that they may not have been aware of previously and because, in some cases, AI can perform tasks better than humans. Particularly when it comes to repetitive, detail-oriented tasks like analyzing large numbers of legal documents to ensure relevant fields are filled in properly, AI tools often complete jobs quickly and with relatively few errors.

This has helped fuel an explosion in efficiency and opened the door to entirely new business opportunities for some larger enterprises. Prior to the current wave of AI, it would have been hard to imagine using computer software to connect riders to taxis, but today Uber has become one of the largest companies in the world by doing just that. It utilizes sophisticated machine learning algorithms to predict when people are likely to need rides in certain areas, which helps proactively get drivers on the road before they're needed. As another example, Google has become one of the largest players for a range of online services by using machine learning to understand how people use their services and then improving them. In 2017, the company's CEO, Sundar Pichai, pronounced that Google would operate as an "AI first" company.

Advantages

- 1) Good at detail-oriented jobs;
- 2) Reduced time for data-heavy tasks;
- 3) Delivers consistent results; and
- 4) AI-powered virtual agents are always available.

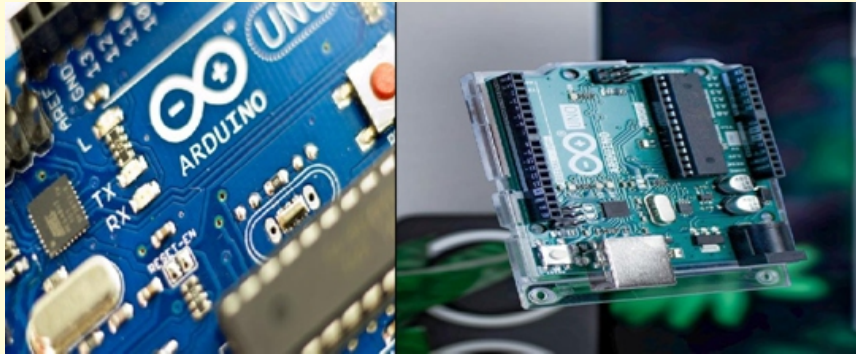
Disadvantages

- 1) Expensive;
- 2) Requires deep technical expertise;
- 3) Limited supply of qualified workers to build AI tools;
- 4) Only knows what it's been shown; and
- 5) Lack of ability to generalize from one task to another.

JADHAV ANURAG SANJAY

CM4I SHIFT I 21-22

ARDUINO UNO



Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino boards are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, publishing something online. You can tell your board what to do by sending a set of instructions to the microcontroller on the board. To do so you use the Arduino programming language (based on Wiring), and the Arduino Software (IDE), based on Processing.

Over the years Arduino has been the brain of thousands of projects, from everyday objects to complex scientific instruments. A worldwide community of makers - students, hobbyists, artists, programmers, and professionals - has gathered around this open-source platform, their contributions have added up to an incredible amount of accessible knowledge that can be of great help to novices and experts alike.

Arduino was born at the Ivrea Interaction Design Institute as an easy tool for fast prototyping, aimed at students without a background in electronics and programming. As soon as it reached a wider community, the Arduino board started changing to adapt to new needs and challenges, differentiating its offer from simple 8-bit boards to products for IoT applications, wearable, 3D printing, and embedded environments.

Haptic Technology

Dnyandeve Musale, Lecturer, Department of Computer Technology,
Amrutvahini Polytechnic, Sangamner

Haptic technology, or haptics, is a tactile feedback technology which takes advantage of the sense of touch by applying forces, vibrations, or motions to the user. This mechanical stimulation can be used to assist in the creation of virtual objects in a computer simulation, to control such virtual objects, and to enhance the remote control of machines and devices (Telerobotics). It has been described as “doing for the sense of touch what computer graphics does for vision. Haptic devices may incorporate tactile sensors that measure forces exerted by the user on the interface.

Haptic technology has made it possible to investigate how the human sense of touch works by allowing the creation of carefully controlled haptic virtual objects. These objects are used to systematically probe human haptic capabilities, which would otherwise be difficult to

achieve. These research tools contribute to the understanding of how touch and its underlying brain functions work. The word haptic, from the Greek means pertaining to the sense of touch and comes from the Greek verb meaning to contact or to touch.

Haptic technology, or haptics, is a tactile feedback technology which takes advantage of the sense of touch by applying forces, vibrations, or motions to the user. One of the earliest applications of haptic technology was in large aircraft that use servomechanism systems to operate control surfaces. Such systems tend to be - one-way], meaning external forces applied aerodynamically to the control surfaces are simulated with springs and weights.

Article by

Er. JADHAV R. B.

The use of Composite Materials in Automotive Industry

The automotive industry's use of structural composite materials began in the 1950s. Since those early days, it has been demonstrated that composites are lightweight, fatigue resistant and easily moulded to shape in other words, a seemingly attractive alternative to metals. However, there has been no widespread switch from metal s to composites in the automotive sector. This is because there are a number of technical issues relating to the use of composite materials that still need to be resolved including accurate material characterization, manufacturing and joining. This article reports composite materials determining by Ashby's material selection technique usage in automotive industry. Especially bus exterior and interior components manufacturing by fiber reinforced polymers (FRP) are used in this master thesis.

The requirement for energy saving in the automotive industry has risen dramatically over the years. One of the options to reduce energy consumption is weight reduction. However, the designer should be aware that in order to reduce the weight, the safety of the car passenger must not be sacrificed. A new invention in technology material was introduced with polymeric based composite materials, which offer high specific stiffness, low weight, corrosion free, and ability to produce complex shapes, high specific strength, and high impact energy absorption. Substitution of polymeric based composite material in automotive components was successfully implemented for fuel and weight reduction.

Material selection in the automobile industry is an artful balance among market, societal, and corporate demands, and is made during a complex and lengthy product development process. Actual selection of a particular material for a specific application is primarily driven by the trade-off between the material's cost (purchase price and processing costs) and its performance attributes (such as strength, durability, surface finish properties, and flexibility) (Andrea and Brown, 1993).

The selection of the correct materials for a design is a key in the process because it is the crucial decision that links computer calculations and lines on an engineering drawing with a working design. Partly, this is due to the complexity of the comparisons and trade-offs that must be made. Often the properties compared cannot be placed on comparable terms so clear decision can be made. Partly it is due to the fact that little research and scholarly effort has been devoted to the problem.

Article by
Er. GODASE R. B.
Automotive safety and security

The ever increasing complexity of automotive vehicular systems, their connection to external networks, to the internet of things as well as their greater internal networking opens doors to hacking and malicious attacks. Security and privacy risks in modern automotive vehicular systems are well publicized by now. That violation of security could lead to safety violations - is a well-argued and accepted argument. The safety discipline has matured over decades, but the security discipline is much younger. There are arguments and rightfully so, that the security engineering process is similar to the functional safety engineering process (formalized by the norm ISO 26262) and that they could be laid side-by-side and could be performed together - but, by a different set of experts. There are moves to define a security engineering process along the lines of a functional safety engineering process for automotive vehicular systems. But, are these efforts at formalizing safety-security sufficient to produce safe and secure systems? When one sets out on this path with the idea of building safe and secure systems, one realizes that there are quite a few challenges, contradictions, dissimilarities, concerns to be addressed before safe and secure systems started coming out of production lines. The effort of this paper is to bring some such challenge areas to the notice of the community and to suggest a way forward. Note

- The term “Functional Safety” relates to ISO 26262
- The term “Security” is used to mean Automotive Embedded Information Security
- All examples used in this paper are fictitious and do not necessarily reflect either concrete requirements or solutions.

Article by
Er. AVHAD RAJ VITTHAL
ADVANCED BATTERY DEVELOPMENT

To develop better lithium-ion (Li-ion) batteries for plug-in electric vehicles, researchers must integrate the advances made in exploratory battery materials and applied battery research into full battery systems. The Vehicle Technologies Office's (VTO) Advanced Battery Development, System Analysis, and Testing activity focuses on developing battery cells and modules that result in significantly lower battery cost, longer life, and better performance. VTO coordinates activities with the U.S. Advanced Battery Consortium (USABC), a group run by the industry organization the United States Council for Automotive Research (USCAR). It also works directly with industry battery and material suppliers through competitive research and development awards. To learn how batteries are used in plug-in electric vehicles, visit the Alternative Fuels Data Center's page on batteries..

VTO has also supported work to develop models that help researchers design and calculate potential costs of batteries. One major model is the bottom-up Battery Performance and Cost Model at Argonne National Laboratory, which includes cost

assumptions for materials chemistry, design, and manufacturing processes. The free, public domain model is designed for policy makers and researchers to estimate costs in a scenario that Li-ion batteries have reached a mature state of development and manufacturers are producing them at high volume. BatPaC has more accurate predictions than previous models and allows vehicle manufacturers to choose the best and smallest battery for the needed application. Based on expert recommendations of this model, the U.S. Environmental Protection Agency used BatPaC to develop its most recent round of fuel economy standards.

Article by

TAJANE HARSHAL KAILAS

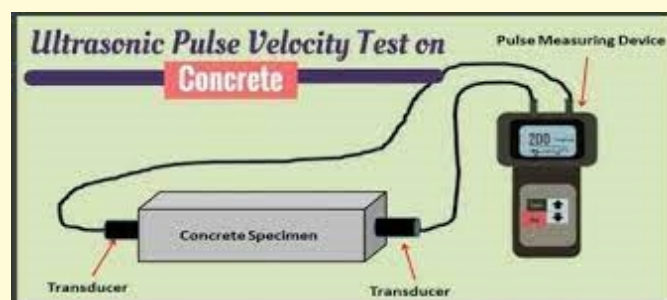
Leaf Spring Using Composite Materials

The objective of this article is to estimate the deflection, stress and mode frequency induced in the leaf spring of a sumo design by the ordinance factory. The emphasis in this project is on the experimental and computer aided analysis using finite element concept. The component chosen for analysis is a leaf spring which is an automotive component used to absorb vibrations induced during the motion of vehicle. It also acts as a structure to support vertical loading due to the weight of the vehicle and payload. Under operating conditions, the behaviour of the leaf spring is complicated due to its clamping effects and interleaf contact, hence its analysis is essential to predict the displacement, mode frequency and stresses. The leaf spring, which we are analyzing, is a specially designed leaf spring used in sumo. A model of such sumo has been shown in this project report. In analysis part the finite element of leaf spring is created using solid tetrahedron elements, appropriate boundary conditions are applied, material properties are given and loads are applied as per its design, the resultant deformation, mode frequencies and stresses obtained are reported and discussed. There are 3 different sample 40% epoxy-60% E-fiberglass and 60% epoxy - 40% Fiberglass, 70% epoxy - 30% E- fiberglass.

Article by

ABHALE R. B.

Ultrasonic pulse velocity test



ultrasonic pulse velocity (UPV) test is an in-situ, nondestructive test to check the quality of concrete and natural rocks. In this test, the strength and quality of concrete or rock is assessed by measuring the velocity of an ultrasonic pulse passing through a concrete structure or natural rock formation.

This test is conducted by passing a pulse of ultrasonic through concrete to be tested and measuring the time taken by pulse to get through the structure. Higher velocities indicate good quality and continuity of the material, while slower velocities may indicate concrete with many cracks or voids.

Ultrasonic testing equipment includes a pulse generation circuit, consisting of electronic circuit for generating pulses and a transducer for transforming electronic pulse into mechanical pulse having an oscillation frequency in range of 40 kHz to 50 kHz, and a pulse reception circuit that receives the signal.

The transducer, clock, oscillation circuit, and power source are assembled for use. After calibration to a standard sample of material with known properties, the transducers are placed on opposite sides of the material. Pulse velocity is measured by a simple formula:

- 1 Applications
- 2 Regulation and standards
- 3 Usage
- 4 References

Applications [\[edit\]](#)

Ultrasonic Pulse Velocity can be used to :

- Evaluate the quality and homogeneity of concrete materials
- Predict the strength of concrete
- Evaluate dynamic modulus of elasticity of concrete,
- Estimate the depth of cracks in concrete.
- Detect internal flaws, cracks, honeycombing, and poor patches.

The test can also be used to evaluate the effectiveness of crack repair. Ultrasonic testing is an indicative and other tests such as destructive testing must be conducted to find the structural and mechanical properties of the material.^[8]

Regulation and standards

A procedure for ultrasonic testing is outlined in ASTM C597 - 09.

In India, till 2018 ultrasonic testing was conducted according to IS 13311-1992. From 2018, procedure and specification for Ultrasonic pulse velocity test is outlined in IS 516 Part 5: Non destructive testing of concrete Section 1: Ultrasonic Pulse Velocity Testing. This test indicates the quality of workmanship and to find the cracks and defects in concrete.

Usage

This test is recommended in some of testing done by the Indian government to certify and check construction of residential buildings.

Article by

CHITALKAR S. G.

Rebound Hammer Test

Rebound Hammer test is a Non-destructive testing method of concrete which provide a convenient and rapid indication of the compressive strength of the concrete. The rebound hammer is also called as Schmidt hammer that consist of a spring controlled mass that slides on a plunger within a tubular housing. The operation of rebound hammer is shown in the fig.1. When the plunger of rebound hammer is pressed against the surface of concrete, a spring controlled mass with a constant energy is made to hit concrete surface to rebound back. The extent of rebound, which is a measure of surface hardness, is measured on a graduated scale. This measured value is designated as Rebound Number (rebound index). A concrete with low strength and low stiffness will absorb more energy to yield in a lower rebound value.

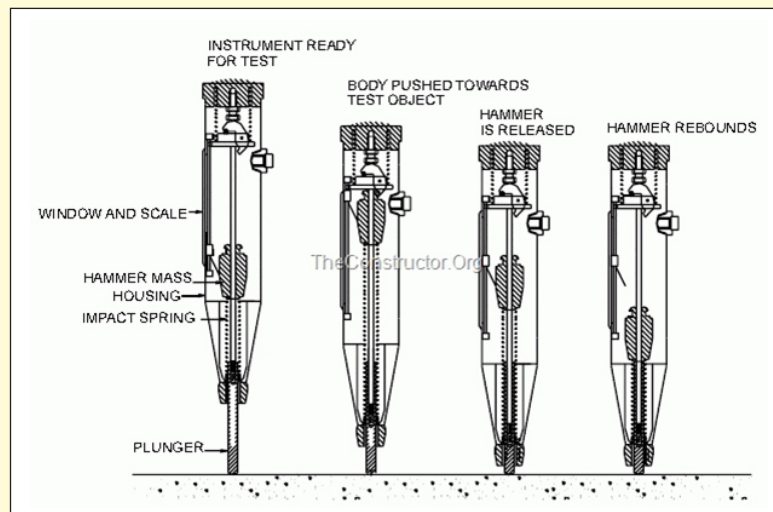


Fig.1.Operation of the rebound hammer

Objective of Rebound Hammer Test

As per the Indian code IS: 13311(2)-1992, the rebound hammer test have the following objectives:

1. To determine the compressive strength of the concrete by relating the rebound index and the compressive strength
 2. To assess the uniformity of the concrete
 3. To assess the quality of the concrete based on the standard specifications
 4. To relate one concrete element with other in terms of quality
- Rebound hammer test method can be used to differentiate the acceptable and questionable parts of the structure or to compare two different structures based on strength.

Principle of Rebound Hammer Test

Rebound hammer test method is based on the principle that the rebound of an elastic mass depends on the hardness of the concrete surface against which the mass strikes. The operation of the rebound hammer is shown in figure-1. When the plunger of rebound hammer is pressed against the concrete surface, the spring controlled mass in the hammer rebounds. The amount of rebound of the mass depends on the hardness of concrete surface. Thus, the hardness of concrete and rebound hammer reading can be correlated with compressive strength of concrete. The rebound value is read off along a graduated scale and is designated as the rebound number or rebound index. The compressive strength can be read directly from the graph provided on the body of the hammer.

Procedure for Rebound Hammer Test

Procedure for rebound hammer test on concrete structure starts with calibration of the rebound hammer. For this, the rebound hammer is tested against the test anvil made of steel having Brinell hardness number of about 5000 N/mm². After the rebound hammer is tested for accuracy on the test anvil, the rebound hammer is held at right angles to the surface of the concrete structure for taking the readings. The test thus can be conducted horizontally on vertical surface and vertically upwards or downwards on horizontal surfaces as shown in figure below. If the rebound hammer is held at intermediate angle, the rebound number will be different for the same concrete.



Article by
THORAT S. N.

Aggregate Impact value Test Apparatus, Procedure and uses

Theory and Concept on aggregate Impact value

In physical meaning toughness is property of a material to *resist impact*.

Due to movement of vehicle on the road the aggregates are subjected to impact resulting in their breaking down into smaller pieces. The aggregates should therefore have sufficient toughness to resist their disintegration on due to impact. This characteristics is measured by impact value test.

The aggregate impact value is a determining measure of resistance to sudden impact or shock, which may differ from its resistance to gradually applied *compressive load*.

New for You :- What is Shoring? Types and Uses

Uses of the test

1. To determine the impact value of the aggregates used in pavement construction(Road);
2. To assess their suitability in road layers (base course, surface course) construction on the basis of impact value.

Apparatus used in Impact test

The apparatus of the aggregate impact value test consists of:

1. A testing machine weighing 45 to 60 kg and having a metal base with a plane lower surface of not less than 30 cm in diameter. Level and plane concrete floor of minimum 45 cm thickness are used to support it. The base of the machine should also have provisions for fixing its base.
2. A cylindrical steel cup of internal diameter 102 mm, depth 50 mm and minimum thickness 6.3 mm.
3. A metal hammer or tup weighting 13.5 to 14.0 kg the lower end is cylindrical in shape, is 50 mm long, 100.0 mm in diameter, with a 2 mm chamfer at the lower edge and case hardened. The hammer is arranged in such a way that it should slide freely between vertical guides and be concentric with the cup. It is arranged that the free fall of the hammer should be within 380 ± 5 mm.
4. A cylindrical metal measure having an internal diameter of 75 mm and depth 50 mm for measuring aggregates.
5. One end rounded tamping rod 10 mm in diameter and 230 mm long.
6. A balance of capacity not less than 500 g, and readable and accurate up to 0.1 g.

Procedure of Aggregate Impact value test

The test sample: normally aggregates sized 10.0 mm to 12.5 mm. the aggregates should be dried by heating at 100-110 °C for a period of 4 hours and cooled.

1. Sieve the material through 12.5mm and 10.0 mm IS sieves. The aggregates passing through 12.5 mm sieve comprises the test material.
2. Then, just 1/3 rd depth of measuring cylinder is filled by aggregate by pouring.
3. Compact the material by giving 25 gentle blows with the rounded end of the tamping rod in the cylinder.
4. Two more layers are added in a similar manner, to make cylinder full.
5. Strike off the surplus aggregates.
6. Determine the net weight of the aggregates to the nearest gram (W1).
7. Bring the impact machine to rest without wedging or packing upon the level plate, block or floor, so that it is rigid and hammer guide columns are vertical.
8. 25 gentle strokes with tamping rod are used to compact the test sample by fixing the cup firmly in position on the base of the machine with placing the whole of the test sample in it.
9. After that raise the hammer until its lower face is 380 mm above the surface of the aggregate in the cup and allow it to fall freely on the aggregate sample. 15 such blows at an interval of not less than one second between successive falls are acted on it.
10. Remove the crushed aggregate from the cup and sieve it through 2.36 mm IS sieves until no further significant amount passes in one minute. Weight the fraction passing the sieve to an accuracy of 1 gm (W2). The fraction retained in the sieve is weighted.
11. Note down the observations in the proforma and compute the aggregate impact value. The '**Aggregate Impact Value**' is the mean of two observations, rounded to a nearest whole number.

Precautions

1. Place the plunger centrally so that it falls directly on the aggregate sample and does not touch the wall of the cylinder in order to ensure that the entire load is transmitted on the aggregates.
2. In the operation of sieving the aggregates through 2.36 mm sieve, the sum of weights of fractions retained and passing the sieve should not differ from the original weight of the specimen by more than 1 gm.
3. The tamping is to be done properly by gently dropping the tamping rod and not by hammering action. Also, the tamping should be uniform over the surface of the aggregate taking care that the tamping rod does not frequently strike against the wall of the mold.

Article by
KOLHE K. K.

Aggregate Crushing Value Test – Procedure and Result

Aggregate Crushing Value Test is important test to be performed on aggregate. The strength of aggregate parent rock is determined by preparing cylindrical shape specimens of size 25 mm diameter and 25 mm height.

This cylinder is subjected to compressive stress. Depending on the type of parent rock gives the different crushing value of aggregate as a compressive strength varying from a minimum of about **45 MPa to a maximum of 545 MPa**.

It is a fact that parent rock compressive strength does not exactly indicate the strength of aggregate in concrete. For this reason assessment of the strength of the aggregate is made by using a sample of bulk aggregate in a standardized manner. This testing method is known as an aggregate crushing value test.

The **crushing value test of aggregate** provides the resistance of an aggregate sample to crushing under gradually applied compressive load. Generally, the test is conducted on aggregate passing **12.5 mm and retained on a 10 mm sieve**. The aggregate sample is filled in a cylindrical mold and a load of 40 tons is applied through a plunger in a compression testing machine.

The crushed aggregate sample which is **finer than 2.36 mm** is separated and expressed as a percentage of the original weight taken in the mould. The percentage of weight passed through the 2.36mm IS sieve is known as **Aggregate crushing value**.

In situations, when the aggregate value **30 or higher** the result may be a mistake and in such cases, the “ten percent fines value” should be determined and used instead.

Read More : [Abrasion Test On Aggregate \(Los Angeles Test\)](#)

Aggregate Crushing Value Test (ACV Test)

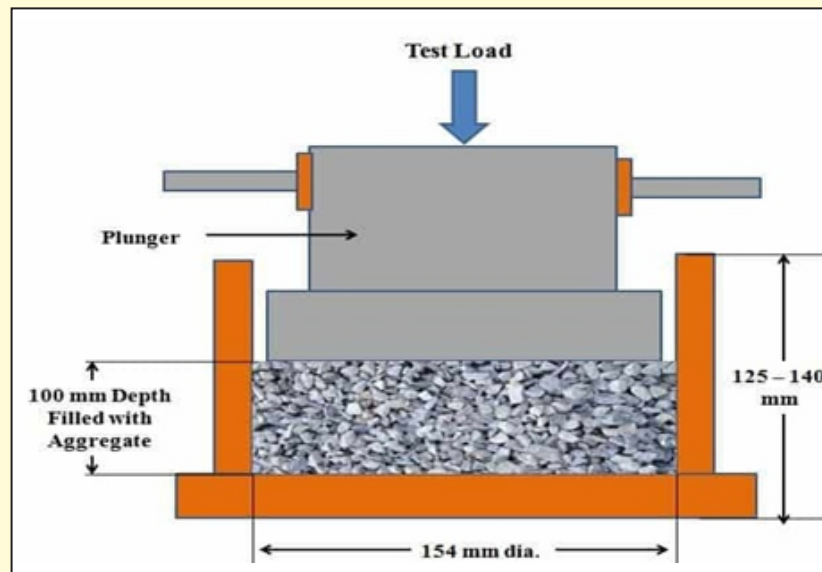
AIM: Determination of **Aggregate Crushing Value** **Crushing Strength of Coarse Aggregate**.

Aggregate Crushing value test IS Code is **2386-4 (1963): Methods of Test for Aggregates for Concrete**

Aggregate Crushing Value Apparatus



1. A 15 cm dia. Steel cylinder with plunger and base plate.
2. A straight metal tamping rod 16mm diameter and 45 to 60cm long rounded at one end.
3. A Weigh balance of accuracy up to 1 gam.
4. IS sieves of sizes 12.5mm, 10mm, and 2.36mm
5. A compression testing machine.
6. Cylindrical measure having a diameter of 11.5 cm and 18cm height.
7. A compression testing machine having a loading capacity of 40 tones and which can be operated to give a uniform rate of loading so that the maximum load is reached in 10 minutes.



1. Take the Empty weight of cylindrical measure as **W1**.
2. Fill aggregate sample passing through 12.5 mm and retained on 10 mm IS sieve in measuring cylinder in 3 equal layers such that each layer is subjected to 25 strokes using the tamping rod. Take the weight of aggregate with measuring cylinder as **W2**.
3. **Find out the weight of aggregate sample $W = W2 - W1$**
4. Now, fill the aggregate sample in 15 cm dia. and 13 cm height steel cylinder and level the surface of aggregate carefully and insert the plunger so that it rests horizontally on the surface.
5. Place a steel cylinder with a plunger on the loading plate of the compression testing machine.
6. Operate Compression machine such that 40 tonnes of the load is applied on aggregate in approximately 10 min.
7. Release load and remove the steel cylinder from the machine.
8. Take out the crushed aggregate sample and sieve on with 2.36mm IS sieve, care being taken to avoid loss of fines.
9. Take off the weight of fraction passing through 2.36 mm IS sieve as (**W3**).

Article by
NEWALE S. L.

Abrasion Test on Aggregate | Los Angeles Abrasion Test

What Is Abrasion Test?

Abrasion Test is the measure of aggregate toughness and abrasion resistance such as crushing, degradation and disintegration. This test is suggested by AASHTO T 96 or ASTM C 131: Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in Los Angeles Machine.

The aggregates are used for the surface course of the highway pavements and they are subjected to wearing due to movement of traffic. **(Los Angeles abrasion test ASTM c131)**

When vehicles travel on the road, the soil particles present between the pneumatic tyres of vehicle and road surface creates the abrasion effect on aggregates. The steel plate wheels of animal-driven vehicles also cause significant abrasion of the road surface.

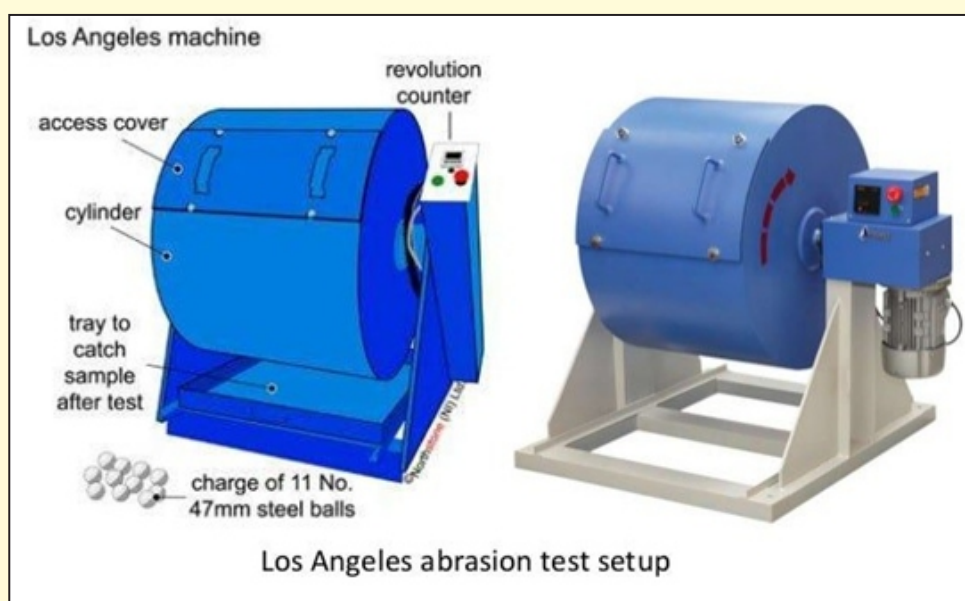
Therefore, the aggregates used in road construction must be hard enough to resist abrasion. The resistance offered by aggregate to abrasion is determined in the laboratory by the Los Angeles test machine.

The Working principle of the Los Angeles abrasion test is to produce abrasive action by use of standard steel balls, which when mixed with aggregates and rotated in a drum for some specified time for a specific number of revolutions also causes an impact on aggregates.

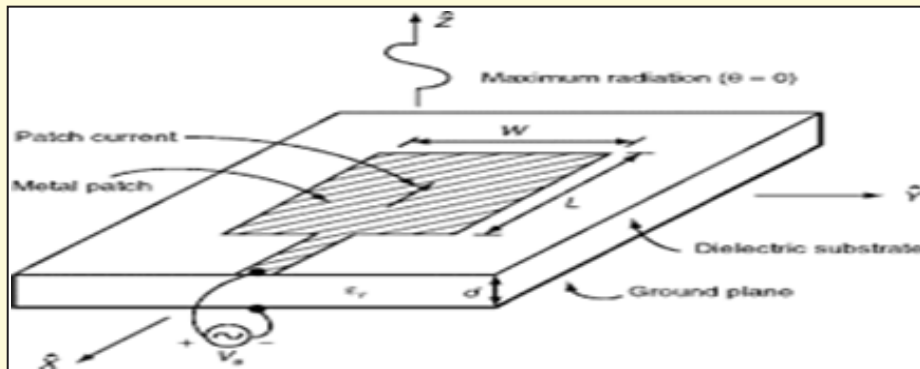
Los Angeles Abrasion Test of Aggregate

The Los Angeles abrasion test on aggregates is done for the following purposes:

1. To find out the Los Angeles abrasion value of aggregate.
2. To find the suitability of aggregates for use in road construction projects.



Article by
NILIMA CHAUDHARY
Microstrip antenna



The **microstrip antenna** is a relatively modern invention. It was invented to allow convenient integration of an antenna and other driving circuitry of a communication system on a common printed-circuit board or a semiconductor chip (Carver and Mink, 1981; Pozar, 1992). Besides other resulting advantages, the integrated-circuit technology for the antenna fabrication allowed high dimensional accuracy, which was otherwise difficult to achieve in traditional fabrication methods. The geometry of a microstrip antenna consists of a dielectric substrate of certain thickness d , having a complete metalization on one of its surfaces and of a metal “patch” on the other side. The substrate is usually thin ($d \ll \lambda$). The metal patch on the front surface can have various shapes, although a rectangular shape, as shown in Figure 6.17, is commonly used. The antenna may be excited using various methods (Pozar, 1992; Pozar and Schawbert, 1995). One common approach is to feed from a microstrip line, connecting the microstrip antenna at the center of one of its edges. The microstrip line may be connected to a feeding circuitry or directly fed by connecting a signal source across the microstrip line and the ground plane. The microstrip antenna produces maximum radiation in the broadside (perpendicular to the substrate) direction and ideally no radiation in the end-fire (along the surface of the substrate) direction. The size of the antenna is usually designed such that the antenna resonates at the operating frequency, producing a real input impedance. For a rectangular microstrip antenna, this requires the length of the antenna, L , to be about half a wavelength in the dielectric medium. The width of the antenna, W , on the other hand, determines the level of the input impedance. The microstrip antenna can be thought of as a rectangular cavity with open sidewalls. The fringing fields through the open sidewalls are responsible for the radiation. However, the structure is principally a resonant cavity, with only limited fringing radiation. Therefore, the bandwidth of the radiation is poor compared to the bandwidth of antennas discussed earlier. The small bandwidth, however, is adequate in a large class of communication applications. Readers may refer to Balanis (1997) and Carver and Mink (1981) for some analytical modeling of a microstrip antenna. Simple and approximate expressions for the radiated electric field components of a microstrip antenna are given by Carver and Mink (1981)