
INFINITY
2018
The Gears of Tomorrow
Department of Mechanical Engineering
Christ College of Engineering, IJK

OUR PATRON

CMI FOUNDER

Executive Director's Letter

It is heartening to see that our Department of Mechanical Engineering is coming out with the 2nd edition of their digital magazine. I appreciate their zeal and creativity in incorporating innovative ideas in each of their endeavours. I wish them God's continued blessings & guidance in all their Departmental Activities. May this Digital Magazine "INFINITY 2018" be a catalyst in bringing out the best from its readers.

Fr. John Paliakara, CMI

Joint Director's Letter

I write this with immense pride as the Department of Mechanical Engineering brings out the second edition of their digital magazine "INFINITY". Their earlier magazine was a huge success. May this magazine too, like its predecessor, be a canvas of creativity and a source of inspiration. My best wishes for the success of this venture.

Fr. Joy Payyappilly, CMI

Principal's Letter

It gives me immense pleasure to pen a few words for the second edition of the digital magazine "Infinity 2018". The Mechanical Engineering Department, being the largest department in terms of students at Christ College of Engineering, is also a forerunner in this field. May this departmental magazine be able to fulfill all its intended objectives. All the best to all those who contributed to the gazette.

Dr Sajeev John, Principal

HOD's Letter

I am pleased to know that the students of Mechanical Engineering Department of Christ College of Enngineering, IJK are succesful in the publishing of the second edition of the technical magazine Infinity 2018. This magazine is a testament which showcases the skills and achievements of our young engineers. I express my compliments to the editors, faculty members and the student community for the valuable contributions in bringing out this issue. God Bless.

Mr Sijo M.T, HOD
Department of Mechanical Engineering

Editor's Letter

It gives me immense pleasure to present the second edition of the mechanical department technical magazine – "Infinity 2018". I would like to place my sincere gratitude on record to the management, Principal and the faculty, Staff and students of the mechanical engineering department for the support extended in making this digital magazine a reality. May this digital magazine succeed in providing the readers, renewed inspiration to positively channelize their creativity.

Mr Jackwin Vincent
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Principal

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HOD

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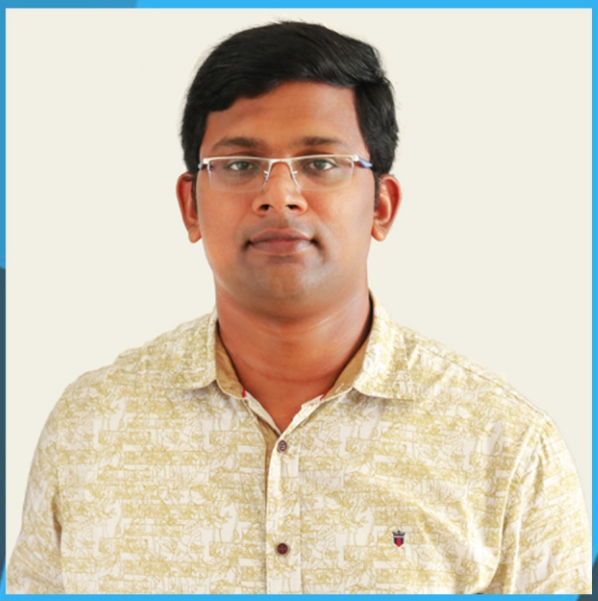

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Editor's Letter

Edwin Varghese
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"Infinity 2018", the 2nd edition of the Digital Magazine by the Mechanical Engineering Department of Christ College of Engineering, Irinjalakuda, is a souvenir which is intended as a platform in which the students are able to polish their talent for technical article creation through which the morale and technical experience of the students are improved in a considerable manner. In the crystallization of this souvenir, all the committee members have taken a concerted effort, in a systematic manner. I am taking this opportunity to thank our Principal, Executive Director, Joint Director, Head of the Department who gave us a green light for moving on with this second edition of the previously published magazine- "Infinity"

I am using this opportunity to thank all the authors who were willing to contribute to this digital magazine.We are greatly obliged to them.

We have provided liberty for the selection of topics for the articles by not constraining the authors to just the mechanical field but to any other technical fields for their article.

Over 25 gifted authors have been contributed to the success of this magazine and we are optimistic that the readers will give a warm welcome to Infinity 2018 and will be generous enough to condone its shortcomings.

The various activities which were held during the academic year 2018-2019 have been uploaded to this magazine and we can ensure that this digital magazine will be a visual treat to all the readers.

With a heart filled with hope, we invite all to each page of this gazette to bury yourself in the information gathered by the minds of Mechanical Engineering Department.

We wish that this may be a source of inspiration for the rest of the student body.

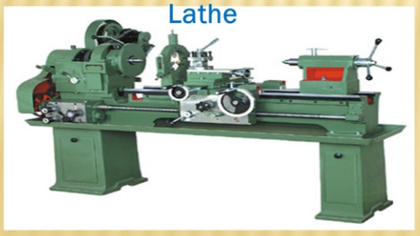
With a great deal of pleasure, We the "Gears of Tomorrow", proudly presents Ïnfinty 2018".

Enjoy!

DEPARTMENT OF MECHANICAL ENGINEERING,
Christ College of Engineering, Irinjalakuda

CENTRE FOR DESIGN, PRECISION MACHINING AND MATERIAL TESTING (CDMT)

CNC Vertical Machining Centre



Lathe

WE UNDERTAKE

- **Design & Analysis**
  - 3D Modelling
  - Assembly
  - Bill of Materials
  - 2D Drafting
  - Finite Element Analysis and CFD
- **Precision Engineering Works**
  - Turning
  - Milling
  - Drilling
  - Slotting
- **Material Testing**
  - Tensile Test
  - Hardness Measurement
  - Impact Test
  - Microstructural Analysis

Universal Testing Machine

Optical Microscope

Slotting Machine

Center for Design, Precision Machining and Material Testing (CDMT)

Christ College of Engineering has an industry institute interaction cell known as CDMT (Center for Design, Precision Machining and Material Testing) which is presently run by Mechanical Engineering Department. CDMT is mainly undertaking consultancy works and R&D projects from industries across vary domains. The main motto behind the formation of CDMT is to make a close relationship between industries and students of CCE by taking the industrial problems and projects. The centre is equipped to handle the consultancy works related to design of consumer products and machine components by using the softwares like CATIA, SOLIDWORKS and Auto CAD. The machining jobs like turning, milling, drilling, slotting etc. are done by conventional as well as CNC machine tools. The testing of the materials is carried out using tensile test, hardness measurement, impact test and microstructural analysis. We also providing ANSYS software analysis for works related to engineering services.

Our major clients are

1. KLF Nirmal Industries (P) Ltd, irinjalakuda
2. KPL Oil Mills (P) Ltd. Irinjalakuda
3. Eddy Current Controls (india) Limited,Chalakkudy
4. Soura Natural Energy Solution India Pvt Ltd, Chalakkudy

Quit Studying Start Learning

Anirudh S Menon
S7 ME

Why India is still a developing country and what is stopping it from being a developed country? This particular question strikes me every time I read about Indian education system. Indian education system is a stumbling block towards its objectives of achieving inclusive growth. The issues in the Indian Education System have been well debated over the years.

Pointing out various glitches and fixing those in the past century, the contemporary education system in India has come a long way with the makeover of the time worn methods to provide an environment to students that keeps evolving on a daily basis.

In a tech savvy world like ours, where every single person is kowtowing over technology, the Indian education system, though it has evolved to smart classes and projectors, isn't enough to instill the true essence of concepts. Virtual Reality is one of the hottest technology trends of 2018. Although gaming is probably the most popular commercial application of VR at the moment, VR has found fast and deep adoption in the fields of aviation and flight training, health care education, law enforcement and military training and training engineers of tomorrow.

To say VR is trending in education might be giving the technology too little credit. It is now entering the mass-adoption phase, where the terms “transformation” and even “disruption” describe its impact more accurately.

VR technology is being so well embraced by the educators and trainers since virtual training allows students to experience richer and more engaging learning experiences than can be provided through books, websites, or even videos. VR immerses the user in a 3D interactive experience that allows interactive learning in a controlled and safe environment.

This might be the future of education, R&D wing of various companies and startups based on this technology is booming these days. The most successful educational experiences are the ones that capture the attention of those being taught. By engaging with students on a visceral level, VR motivates them to learn, and improve content understanding and retention.

This is what VIRTUAL TRANSIT EDUMATE (VTED) would like to introduce in to the education system. Vision of our company is to trigger a shift from studying for marks to learning the concept that is conceptual learning. Our experiences are our best teacher in life, so experience what you are learning!

Master Mech

Social media is a powerful tool for sharing knowledge. "Master mech” is a youtube channel born from the initiative of mechanical engineering department of Christ College of Engineering, Irinjalakuda. The channel mainly stands for providing technical education to the students, specially for diploma colleges and ITI institutes.

This is the 1st youtube channel which is explaining the working of different machining tools like lathe, drilling machine, milling machine, shaper, slotter etc. in the native language of keralites. In this channel mechanical students of B.Tech programme and faculties have given tutorial videos regarding the working principle, parts and application of different machine tools.

The "master mech"channel is completely run by the department of mechanical engineering. The channel nucleated as a part of social commitment and as an exchange of knowledge to the society.

url:http//www.youtube.com/mastermech

A Review on Application of Artificial Intelligence in Gear Failure Analysis

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Abstract: The machines which show learning and problem solving skills are called intelligent machines. The intelligence demonstrated by machines are called artificial intelligence. In this paper an attempt is made to review the application of artificial algorithm (AI) for the failure analysis of gears.AI has got wide range of applications like mechanical, civil, electrical, computer fields etc.

Introduction: AI is a subset of computer science which uses algorithms to execute various programs of complex systems. By the aid AI mechanical engineer's successfully added intelligence to machines. The automation of machines are the latest area where lot of research is being carried out. Incorporation of AI to machines, the output of the engineering industry has been increased. The mechanical application of AI are in CNC machines, automobiles, wind turbines, missiles etc. Majority of mechanical systems are equipped with gears for power transmission. Any failure to these gears may cause damage to entire system. So continuous monitoring of these gears are important. So many techniques are used to monitor gear failure analysis.

Literature survey: Carter I M (1990) discussed about the scope and application of Al in mechanical engineering design field. Dixon J R (1986) discussed about the research in design of mechanical engineering parts by the aid of AI concept. Shaonak et al. (2017) explained about various Al algorithms like artificial neural network, fuzzy logic systems etc. These algorithms provide a real time solution to various engineering problems. They also discussed about the application of Al in gear failure analysis. Mdlaxi L(2007) proposed two models for estimating the time domain average of a gear vibration signal, which is widely used for analysis of gear failure. They used artificial neural network and support vector machines to reduce the amount of vibration data required to estimate the time domain average of a gear vibration signal. Sasmal J K (2015) used condition monitoring of wind turbine gearbox by vibration analysis. They were able to tackle unnecessary breakdown maintenance of turbines.

Research methodology: Artificial neural network and support vector machines are used for estimating the time domain analysis of gear vibration signal.

(a)Basis of Artificial neural network (ANN): A neural network consists of an interconnected cluster of artificial neurons and it processes data, flows through the network required for the computation. A mechanical model of ANN is shown in Figure 1, which consists of input, weights which the strength of signals, transfer function, and the activation function which controls amplitude of the output neuron.

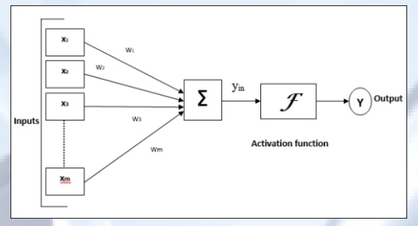

Figure 1. General model of artificial neural network

(b) Basics of Support vector machines (SVM): Neural networks are empirical risk minimization (ERM) but a superior technique of structural risk minimization (SRM) is used in support vector machines. SRM minimizes the upper limit on the expected risk, but ERM minimizes the error on the data. Thus SVM are superior over ANN. SVM are applied to regression problems, loss function etc.

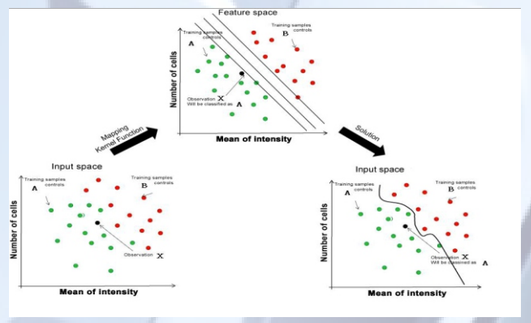

Figure 2. General model of support vector machines

(c)Working: For the analysis purpose each gear state is represented by a set of vibration signals. These signals must be processed. In order to be replaced by a vector, some features are to be chosen that include most important information contained in the signal and then extracted them to prepare the matrices of learning and testing. Analysis is based on the Fourier transform; it allows the variation of power of the signal. Thus it can detect the pressure of faulty gear by generating a periodic shock.

Scope for future work:

(a) The present review can be extended to study the use of Al tools to another mechanical system.
(b) The present research work is carried out in experimental setup, which can be extended to real time industrial setup.
(c) The use of latest Al algorithm can be checked for gear failure analysis.

Conclusion: The recent work on application of Al to study the gear fare analysis has been narrated in this paper. From the literature survey it is found that ANN and SVM are very important tools used for the fear failure analysis. Moreover researchers found that use of Al reduced the data needed of the analysis. It also reduces the unnecessary shout downs of the plant.

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Simulation and Optimization of Cooling Tubes of Transformer for Efficient Heat Transfer

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Abstract— Temperature variation with in the transformer affects the life and efficiency of the distribution transformer. The top oil temperature in the transformer depends on the type of cooling and cooling ducts/fins design and their layout. The present project investigates methods of onan transformer cooling system by means of increasing heat transfer rate by implanting the axial groves along with fins and porous region within in the cooling tubes and further optimization of the cooling process by adjusting the gravity by orienting the tube. This study is carried out by means of numerical analysis by simulating Transformer geometry in Ansys Fluent .Real case geometry of distribution transformer is used in this simulation

Keywords— Ansys Fluent, CFD, Distribution transformer cooling, numerical Analysis, Optimization

I. INTRODUCTION

There are several factors contributing to power losses in transformers. These are copper losses, which represent the major source of losses in a transformer, and core losses; namely hysteresis and eddy current losses. These losses components are produced in the form of heat energy which should be dissipated in a quick and rather efficient manner. If the transformer has otherwise failed to get rid of such heat generated, many problems could arise and in some cases severe consequences may occur.

In fact, the improperly dissipated heat would further accumulate and thus cause the transformer temperature to increase. This process may lead to failure of paper insulation and liquid insulation medium of the transformer. Furthermore, excessive heat may result in damage of the transformer windings, the matter which, in particular, is considered as a catastrophe for expensive high power rating transformers. Therefore, numerous ways are introduced to keep the temperature within acceptable limits which in turn would help to maintain a long lifetime of the transformer. One such way is onan cooling of transformer which means oil natural air natural which is in distribution transformer. This method makes use of natural convection of transformer oil and air.

The present project investigates methods of transformer cooling system by means of increasing heat transfer rate by implanting the axial groves along with fins and porous region within in the cooling tubes. And further optimization of the cooling process by adjusting the gravity by orienting the tube. Five optimization cases is studied This study is carried out by means of numerical analysis by simulating Transformer geometry in Ansys Fluent.

II. IMPROVEMENT OF TRANSFORMER COOLING SYSTEM

The transformer consists of a closed magnetic circuit (the core) with two coils, or windings, of insulated conductors wound around the core. The current in the input, or primary, coil creates a magnetic field. This field induces a voltage across the output, or secondary coil. The secondary coil of a distribution transformer is designed to deliver energy at a lower level of voltage relative to the input voltage. For a distribution transformer, the high voltage winding is the primary coil and the low voltage winding is the secondary coil.

As the current passes through the copper or Aluminum windings, energy is lost because of electrical resistance power losses (Power = current2 x Resistance). The energy losses raise the temperature of the windings. Various methods of dissipating energy to the surroundings are employed to cool the windings. The temperature rise is controlled by transferring energy generated from the transformer to a cooling fluid, such as oil or air. Excess heating accelerates the aging of the transformer insulation.

When the oil paper insulation is subjected to thermal stress, the oil and paper components of the insulation may be irreversibly damaged. The thermal stress reduces the mechanical and dielectric performance of the insulation .There is a need to optimize the design and application of transformers. Manufacturers and utilities try to reduce the capital and operational costs of transformers.

The main objectives of this Project are:

Numerical simulation of natural convection process in a onan distribution transformer and find out maximum hot spot temperature at the core and windings

To carry out design optimization in cooling tubes to increase heat transfer and to reduce hot spot temperature of core.

Comparative study of five optimization cases for efficient heat transfer

Case 1: normal case without any modification

Case 2: Implanting axial grooves with fins in cooling tubes

Case 3: With porous media inside cooling tubes

Case 4: With porous media and axial grooves with fins inside tubes.

Case 5: With inclination of cooling tubes

III. NUMERICAL SIMULATION AND OPTIMIZATION

The fluid flow and heat transfer in a transformer is modeled in this work using the Navier-Stokes equations for incompressible flow, and the conservation of energy equation. The mathematical mode1 used in the thesis consists of four equations: energy conservation, momentum conservation, and mass conservation. The solution of the energy equation produces the temperature field, and the momentum equations determine the velocities in the fluid. The mass conservation equation ensures that fluid entering a control volume also leaves the control volume and is used as the constraint on pressure. The energy conservation equation is given by Equation (1). The first term on the left hand side of the energy conservation equation represents the energy storage. The second and third terms represent the advection of energy by the moving fluid. On the right hand side of the equation, the first three terms are the energy diffusion term and the last term represents the energy generation per unit volume.

‘Cp ∂)/∂t (ρT) +Cp ∂/∂x (ρUT)+Cp ∂/∂y (ρVT)+Cp ∂/∂z (ρWT)=∂/∂x Kx ∂T/∂x+∂/∂y Ky ∂T/∂y+∂/∂z Kz ∂T/∂z+Q' (1)

The momentum conservation equations in three dimensions, Equations (2) (3), (4) are used to calculate the velocity fields. The first term in each equation represents the change in momentum over the time. The second, third and fourth terms on the left hand side of the equations represent the advection of momentum. The first three terms on the right-hand side of the equations account for the net viscous forces, and the fourth term represents the pressure forces. The last term of the y direction momentum equation represents the buoyancy force used when solving a natural convection problem.

∂/∂t (ρU) +∂/∂x (ρUU) +∂/∂y (ρVU)+∂/∂z (ρWU)=∂/∂x μ ∂U/∂x+∂/∂y μ ∂U/∂y+∂/∂z μ ∂U/∂z-∂P/∂x (2)

∂/∂t (ρV) +∂/∂x (ρUV) +∂/∂y (ρVV)+∂/∂z (ρWV)=∂/∂x μ ∂V/∂x+∂/∂y μ ∂V/∂y+∂/∂z μ ∂W/∂z-∂P/∂y+(3)

∂/∂t (ρW)+∂/∂x (ρUW)+∂/∂y (ρVW)+∂/∂z (ρWW)=∂/∂x μ ∂W/∂x+∂/∂y μ ∂W/∂y+∂/∂z μ ∂W/∂z-∂P/∂z (4)

Natural convection is the body force driving fluid flow within a naturally oil cooled transformer. A buoyancy force is the net effect of body forces acting on a fluid in which there are density gradients. For this model, the density gradient is induced by a temperature gradient in the fluid, and the body force is due to the gravitational field, g, acting in the negative x direction.

The buoyancy force in the momentum equation is modeled by using the Boussinesq approximation .In that term, ρ_∞, is the average fluid density, β is the thermal coefficient of volume expansion, and T_∞, is the average fluid temperature. Equation (5) is the continuity equation. In that equation the first term accounts for the mass storage, and the other three terms describe the change of mass flow in both x, y and z directions, respectively.

$$(\partial)/\partial t\,(\rho) + \partial/\partial x\,(\rho U) + \partial/\partial y\,(\rho V) + \partial/\partial z\,(\rho W) = 0 \qquad (5)$$

The mathematical model consists of a set of differential equations expressing conservation of mass, momentum, and energy, over a Cartesian domain. The fluid was assumed to have Newtonian and laminar –Turbulent flow characteristics. The energy equation was modified to allow for conjugate heat transfer between a solid and the surrounding fluid. A method for modeling the windings as a homogeneous material was also introduced. The transport equations were discretized using a finite volume approach, and the pressure-velocity coupling was handled using the SIMPLE algorithm.

3.1 CFD analysis using Ansys Fluent

As Transformer is oil immersed to provide cooling by natural convection, major heat transfer is occurred by

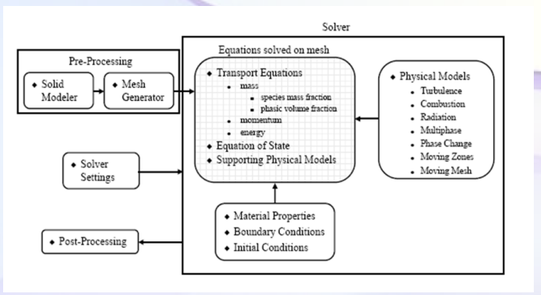

Fig 1: General process of CFD

convection, so heat transfer by conduction and radiation is negligible and neglected from Analysis. Geometry is created using CatiaV5 R20., now Ansys acquired Fluent and is within the Ansys workbench module .Open the Setup option of Ansys fluent project

- Select Solver setup > General > among solver settings choose the pressure based solver. CFD fluent consist of two solvers for solving the CFD process i.e. pressure based and density based. Here we choose pressure based; this is because the fluid is incompressible. Choose the velocity formulation as absolute and time option as steady state. This is because flow is considered to have constant properties with respect to time.

Select Solver setup > Models > Choose energy equation on.. To solve the heat transfer problems the basic energy equation has to be used and this can be used by switching on the energy equation. Transition K-KL-omega model is one of the most commonly used turbulence models to model Transition flow. It is a three equation model that means, it includes three extra transport equations to represent the turbulent properties of flow. The K-KL-omega transition model is used to predict boundary layer development and calculate transition onset. This model can be used to effectively address the transition of the boundary layer from a laminar to a turbulent regime. The K -KL -omega model is considered to be a three-equation eddy-viscosity type, which includes transport equations for turbulent kinetic energy (K_T), laminar kinetic energy (K_L), and the inverse turbulent time scale (ω).

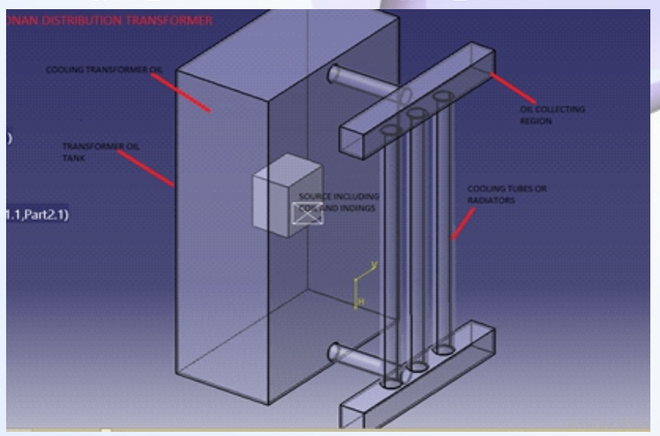

Fig 2: Catia model used in the analysis

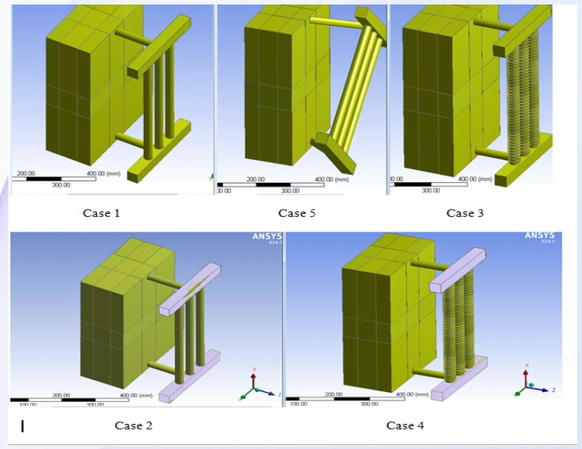

Fig: 4 Geometry of different cases used in the analysis

IV. RESULTS AND OBSERVATIONS

Case	Maximum & Minimum Values Of Output Variables (Location: Cut Plane at 0.148 m from zx plane of Transformer model, Domain: All domains)			
	Temperature (k)	Velocity m/s	Turbulence kinetic energy j/kg	Turbulence eddy frequency s^{-1}
Case 1	Max: 390.1 Min: 300	Max: .04852 Min: .004852	Max: 1 Min: .0007049	Max: 0.989 Min: 0.8206
Case 2	Max: 356.6 Min: 300	Max: .04874 Min: .004874	Max: 1 Min: .001847	Max: 0.9955 Min: 0.9144
Case 3	Max: 364.1 Min: 300	Max: .06413 Min: .006413	Max: 1 Min .002217	Max: 0.9922 Min: 0.8509
Case 4	Max: 386.5 Min: 300	Max: .06882 Min: .006882	Max: 1 Min: $8.881e^{-14}$	Max: 0.9838 Min: .005237
Case 5	Max: 431.5 Min: 300	Max: .07958 Min: .007958	Max: 1 Min: $2.537e^{-13}$	Max: 0.9800 Min: .05237

Table 3: Values of output variables for all cases

5. Conclusion

Numerical simulation of free convection in onan distribution transformer is done and a mixed laminar and turbulent flow is found to be occurred, also design modification in cooling tubes provides better turbulent generation and increased heat transfer. Cooling tube with axial grooves and fins are found to be most effective by decreasing hot spot temperature by 34 degree Celsius .Also from the simulation it is found that natural convection flow of transfer oil due to density difference with increase in temperature can be effectively simulated using computational fluid dynamics. .

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2) Vol. 3 Issue 4, April – 2014 International Journal of Engineering Research & Technology (IJERT) ISSN: 2278-0181 Investigation of the Temperature Variation in Distribution Transformer Cooling System by A.Satyanarayana.Reddy, Suresh Akella, AMK. Prasad

Six Stroke Engine with Precooler System

Jithin John
S5 ME

The quest for an engine which having the same or more power with higher fuel efficiency than existing ones had started many years before. As a result of the research a new engine concept was formed, which is a six stroke engine. A six stroke engine is an IC engine that completes the process cycle in three revolutions of crank shaft. During every cycle of a six stroke engine, piston moves up and down thrice in the chamber, resulting in six total strokes in which there are two power strokes.

Working of six stroke engine

A 3 valve , 4 stroke engine was made under consideration and out of three valves, one is exhaust and two are used as inlet valves for supplying air-fuel mixture. Two inlet valves are splitted into 2 separate inlet valves. One inlet valve is used for suction of air fuel mixture during first stroke. The second inlet valve is used for sucking fresh air during 5th stroke.

First stroke : Air fuel mixture from carburetor is sucked through the first inlet valves.

Second stroke : Piston moves from BDC to TDC, both inlet and exhaust valves are closed, air fuel mixture is compressed

Third stroke : Power is obtained from the ignition of air fuel mixture using a spark plug. All the valves remain closed and piston moves from TDC to BDC.

Forth stroke : Exhaust valves opens to remove the burnt gases, piston moves from BDC to TDC Fifth and sixth stroke; the second inlet valves opens and fresh air flows through the secondary inlet manifold, piston moves from TDC to BDC. In 6th, the exhaust valve opens, 2nd inlet valve closes. The air sucked during 5th stroke and unburned gases are removed to atmosphere, piston moves from BDC to TDC.

What is pre-cooler?

Pre cooler is a shell and tube type heat exchanger. This is used to cool the air given to the carburetor from the filter during the 5th stroke. Water is used for cooling the air. The air from the filter is passed through Cu tubes circulating water. When temperature increases density of air decreases, then the air sucked to the carburetor will not attain exact air fuel ratio, resulting in improper combustion. So to give exact mass of air to the carburetor, air is cooled using pre-cooler.

Augmented Reality - The Future

Edwin Varghese
S5 ME

Augmented reality has been a hot topic in software development circles for a number of years, but it's getting renewed focus and attention with the release of products like Google Glass. Augmented reality is a technology that works on computer vision based recognition algorithms to augment sound, video, graphics and other sensor based inputs on real world objects using the camera of your device. It is a good way to render real world information and present it in an interactive way so that virtual elements become part of the real world.

Augmented reality displays superimposed information in your field of view and can take you into a new world where the real and virtual worlds are tightly coupled. It is not just limited to desktop or mobile devices. A simple augmented reality use case is: a user

captures the image of a real-world object, and the underlying platform detects a marker, which triggers it to add a virtual object on top of the real-world image and displays on your camera screen.

The current state of AR

Augmented reality is achieved through a variety of technological innovations; these can be implemented on their own or in conjunction with each other to create augmented reality. They include:

General hardware components – the processor, the display, the sensors and input devices. Typically a smartphone contains a processor, a display, accelerometers, GPS, camera, microphone etc. and contains all the hardware required to be a an AR device.

Displays – while a monitor is perfectly capable of displaying AR data there are other systems such as optical projection systems, head-mounted displays, eyeglasses, contact lenses, the

HUD (heads up display), virtual retinal displays, Eye Tap (a device which changes the rays of light captured from the environment and substitutes them with computer generated ones),Spatial Augmented Reality (SAR – which uses ordinary projection techniques as a substitute for a display of any kind) and handheld displays.

Sensors and input devices include – GPS, gyroscopes, accelerometers, compasses, RFID, wireless sensors, touch recognition, speech recognition, eye tracking and peripherals.

Software – the majority of development for AR will be in developing further software to take advantage of the hardware capabilities. There is already an Augmented Reality Markup Language (ARML) which is being used to standardize XML grammar for virtual reality. There are several software development kits (SDK) which also offer simple environments for AR development.

There are apps available for or being researched for AR in nearly every industrial sector including:

Archaeology, Art, Architecture, Commerce, Office, Construction, Industrial Design, Education, Translation, Emergency Management, Disaster Recovery, Medical and Search and Rescue Games, Sports, Entertainment, Tourism, Military, Navigation.

The Future

We all know that mobile phones are such an integral part of our lives that they might well be extensions of our bodies; as technology can be further integrated into our lives without being intrusive- it is certain that augmented reality provides opportunities to enhance user experiences beyond measure.

AR in mechanical engineering

AR can be used for displaying visual 3D info about mechanical load, heating distribution etc. on parts or a complex structure. It can be used in case of automated HVAC system control, support factory layout planning etc.

In education, AR can be used for teaching hand drawn mechanical drawings by replacing actual educational materials with virtual ones on an AR based supporting system.

In car industry, AR can be used as a solution for technical visualization that will provide the inspectors with a step by step visual guide for determining and accessing the engine on the specific vehicles.

Real-World Examples

AR applications can become the backbone of the education industry. Apps are being developed which embed text, images, and videos, as well as real–world curriculums.

Printing and advertising industries are developing apps to display digital content on top of real world magazines.

With help of AR, travellers can access real-time information of historical places just by pointing their camera viewfinder to subjects.

AR is helpful in development of translation apps that can interpret text in other languages for you.

Location based AR apps are major forms of AR apps. Users can access information about nearest places, relative to current location. They can get information about places and choose based on user reviews.

With the help of Unity 3d Engine, AR is being used to develop real-time 3D Games.

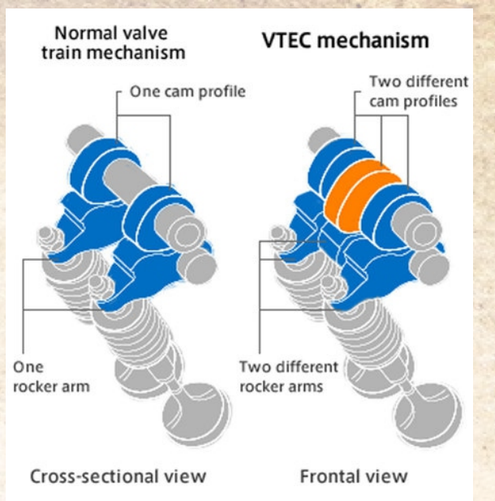
The Future of VTEC

Mohammed Faris
S5 ME

VTEC

Four letters that practically started a revolution. To Honda's engineers, it means Variable Valve Timing and Lift Electronic Control. But for some of us it sparks thoughts of many other things: space age-sounding technology, the unmistakable sound of a VTEC motor revving up, the innovation that yielded naturally aspirated engines 100 hp/litre before any other manufacturer--the very technology that arguably could have launched the sport compact scene in the early-'90s. But there's quite a bit more to it than that. VTEC innovations are evolving and constantly leaving their mark in the automotive world.

So how did it all begin? Variable valve timing, a technology adapted by many different automobile manufacturers, was a spin-off of another Honda project back in the early-'80s. At the time Honda's main goal was to create motors with decent power and excellent fuel economy. With the technology of the time, Honda engineers had already hit 17 kmpl with the company's ultralow emissions CVCC technology, but Honda wanted more. By January 1983 a group of engineers were studying varying valve timing to improve mileage, but in October 1983 that team was split, with one group moving on to study more efficient fuel delivery systems and the other working on valve train technology.



From spending sleepless nights to the implementation of VTEC in Integra XSi in 1989, Honda has come a long way in engine types. By 2003, VTEC was a standard in most Honda automobiles. Honda then went from VTEC to i-VTEC, Intelligent Variable Timing (and lift) Electronically Controlled, which combined both VTEC and VTC in a single engine. It was introduced in 2002 and debuted on the Honda CR-V. The technology produced about 10 HP more than VTEC alone.

So what's in the future for this pedigree of power and efficiency? Honda is working toward incorporating i-VTEC technology into most of its line-up. In addition, an advanced VTEC engine (AVTEC) is slated to be released, sporting continuously variable-valve lift control and phasing of valve switchover timing. In conjunction with a variable-length intake manifold, the advanced VTEC engine anticipates having a 13-percent increase in combustion efficiency over current i-VTEC power plants. We can hardly wait.

HALO : Next generation of safety in Formula 1

Thomas Alvin
S5 ME

Formula 1 racing is always on edge and accidents are an ever-present risk. The FIA (Federation Internationale de l'Automobile) conducted a multi-year study into improving cockpit protection where the Mercedes proposed the Halo concept in 2015. Halo was made mandatory on all cars in 2018 F1 season.

The Halo is a titanium structure that sits above the car's cockpit to protect the driver's head from flying debris. A single vertical pylon supports the structure in front of the driver and the hoop above the cockpit is mounted to the car's survival cell and cockpit surround.

Made of sculpted titanium, it weighs around 7 kg and can withstand approximately 12 tonnes making it the strongest part of an F1 car allowing the drivers to push the limits even further.

In 17 case studies of serious accidents carried out by the FIA, Halo would have resulted in a beneficial outcome in 15 while the other two would have proved neutral. The structure is designed to stop cockpit intrusion from large objects, such as wheels, another car or track side barriers.

As impressive as the statistics are of the Halo withstanding the weight of a London bus on top of it is an astonishing feat.It's not just Formula 1 that is adopting head protection systems, Halos are now raced in Formula 2 and have been integrated into Formula Es Season 5 car.

TheFormula1Haloisastandard specification, with every detail and dimension defined by the Technical Regulations. Teams have had to choose from three homologated Halos from either CP Autosport, SS Tube Technology or V System

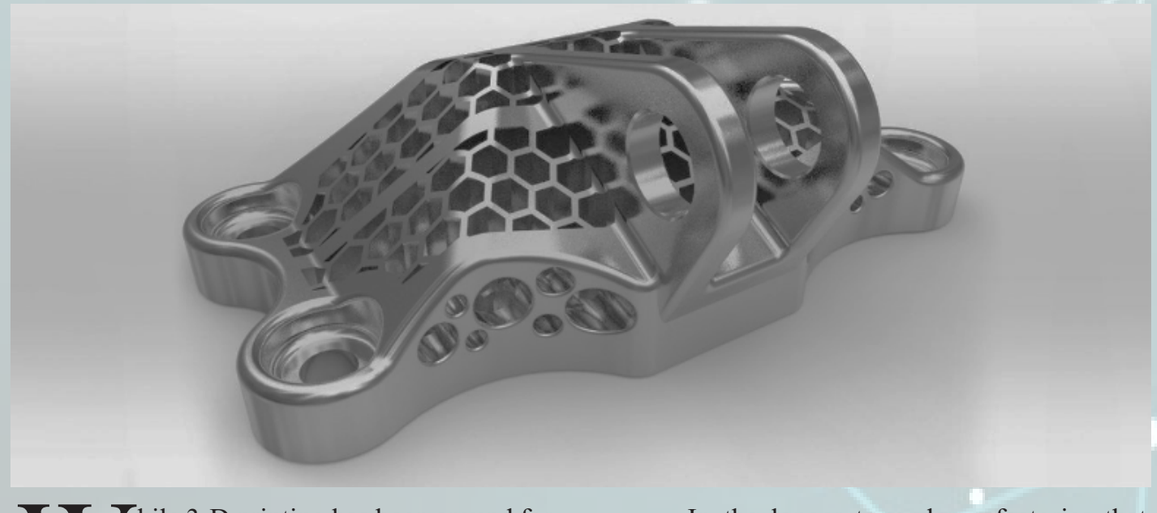
The structure is made from a Titanium alloy Ti6AI4V Grade 5, specified by the

regulations and mounts to the chassis at three locations.

Halo came into action in the Belgian grand prix at Spa International Circuit. Crash involving Charles Leclerc and Fernando Alonso saw that Leclerc's Halo deflect a 56 kN force..

The future of manufacturing with 3D metal printing

Fristo Denni
S1 ME



While 3-D printing has been around for decades, it has remained largely in the domain of hobbyists and designers producing one-off prototypes. And printing objects with anything other than plastics—in particular, metal—has been expensive and painfully slow. Now, however, it's becoming cheap and easy enough to be a potentially practical way of manufacturing parts. If widely adopted, it could change the way we mass-produce many products.

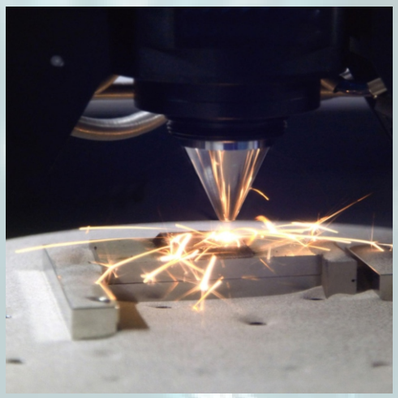
A breakthrough has been made now printers can make metal objects quickly and cheaply. Why It Matters?The ability to make large and complex metal objects on demand could transform manufacturing.

In short, manufacturers wouldn't need to maintain large inventories—they could simply print an object, such as a replacement part for an aging car, whenever someone needs it.

In the longer term, large factories that mass-produce a limited range of parts might be replaced by smaller ones that make a wider variety, adapting to customers' changing needs.

The technology can create lighter, stronger parts, and complex shapes that aren't possible with conventional metal fabrication methods. It can also provide more precise control of the microstructure of metals.

Also in 2017, 3-D printing company released the first 3-D metal printer for under $100,000. It plans to begin selling larger machines, designed for manufacturing, that are 100 times faster than older metal printing methods.



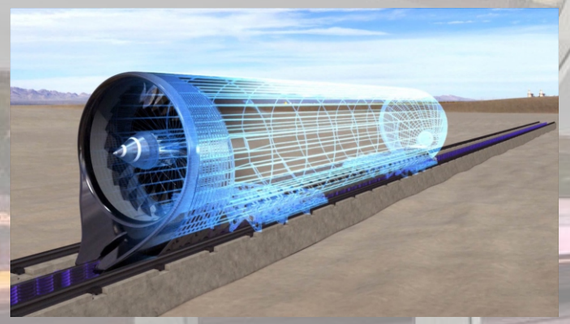
The printing of metal parts is also getting easier. Desktop Metal now offers software that generates designs ready for 3-D printing. Users tell the program the specs of the object they want to print, and the software produces a computer model suitable for printing.

This project of 3-D printing, which has long been a proponent of using 3-D printing in its aviation products has a test version of its new metal printer that is fast enough to make large parts.

Hyperloop

Anson V Antochan
S5 ME

Hyper loop is a developing mode of transportation which can carry People or cargo filled pods over long distance through steel tubes. Its speed is about 700 miles in an hour. In 2012 concept of hyperloop was introduced by Elon musk in which partial vacuum is created in steel tube to reduce air resistance. There are two big differences between hyperloop and traditional rail. The pods carrying passengers travel through tunnel or tubes from which most of the air has been removed, this allows the pods to travel up to 700 miles per hour. Rather than wheels used in train or car the pods are designed to float on air skins which use magnetic levitation to reduce friction.



Benefits of hyperloop

Hyperloop is cheaper and faster than ground travel and cheaper and less polluting than air travel. Supporters claim that building hyperloop is quicker and cheaper than building traditional high speed rail. Hyper loop could take the pressure off gridlocked roads, making travel between cities easier and economical. Since it is covered in a steel tube it can operate in any whether conditions.

Working of hyperloop

Overcoming air resistance is one of the biggest uses of Energy in high speed travel. Airliners climb to high altitude to travel through less dense air. In order to create similar effect at ground level, hyperloop encloses the capsule in a reduced pressure tube, effectively allowing train to travel at high speed. Magnetic levitation and big vacuum pumps are used to reduce air resistance and friction .Magnetic levitation uses two sets of magnet one to power and lift the train upward and other to move train. Virgin hyperloop-one are on the track of bringing their hyperloop system into operation in 2021. It is controlled by advanced software's using which acceleration and deceleration are unnoticed by passengers.

How hyperloop is powerd?

The pods will get velocity from an external linear electric motor, which would accelerate to a high subsonic velocity then give it a boost every 70 miles or so ; in between, the pod would cost along in near vacuum. Under musk model, the hyperloop was powered by solar panels placed on the top of the tube which would allow it to generate more energy than it needed for operation.

How is it different from high speed train?

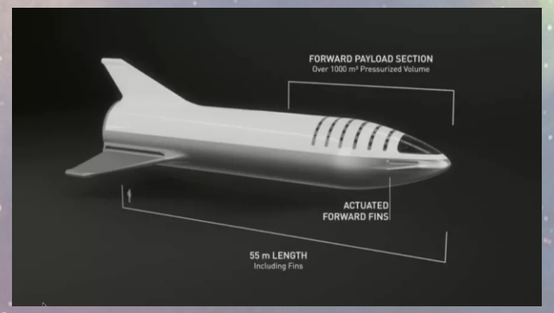
Hyperloop is significantly better than high sped steel because it is lower cost and more energy efficient. In hyperloop, the track does not need to provide power to pods continuously and, because the pods can leave every 30 seconds.. It is potentially three times faster than every high-speed rail and ten times faster than regular rail service.

One thing is certain that our transportation infrastructure is badly flawed now, whether it is planes, trains, automobiles .Here it is hopping that hyperloop can lead a new brave age of transportation that is cheap, fast, and

The New BFR : How SpaceX's Giant Rocket-Spaceship Combo for Mars Has Changed

Kannan Ramachandran
S5 ME

SpaceX's Mars-colonizing Big Falcon Rocket (BFR) spaceflight system just went through a growth spurt. The reusable rocket-spaceship duo will stand 387 feet (118 meters) tall at launch, SpaceX founder and CEO Elon Musk said Monday (Sept. 17) during a webcast event at the company's headquarters in Hawthorne, California. That's 11 percent taller than the previous design iteration, which the billionaire entrepreneur laid out in September 2017.



Most of that increase comes courtesy of the BFR spaceship, whose length jumped from 157.5 feet to 180 feet (48 to 55 m). And the spaceship has changed in other important ways as well. For example, the 2017 iteration featured six Raptor engines, four of which were big-nozzled vacuum versions optimized for in-space use. But now, SpaceX envisions placing seven Raptors on the ship, all of which will be the same "sea-level" engines that power the huge BFR rocket.

In addition, the 100-passenger BFR ship will now feature two movable fins near its nose and two larger ones near its tail — changes that will help the vehicle maneuver its way to safe landings on worlds with atmospheres, such as Earth and Mars. The ship will fall like a skydiver rather than fly like an airplane during its landings, however. It will touch down vertically after slowing its descent via engine firings, as the first stages of SpaceX Falcon 9 rockets do now.

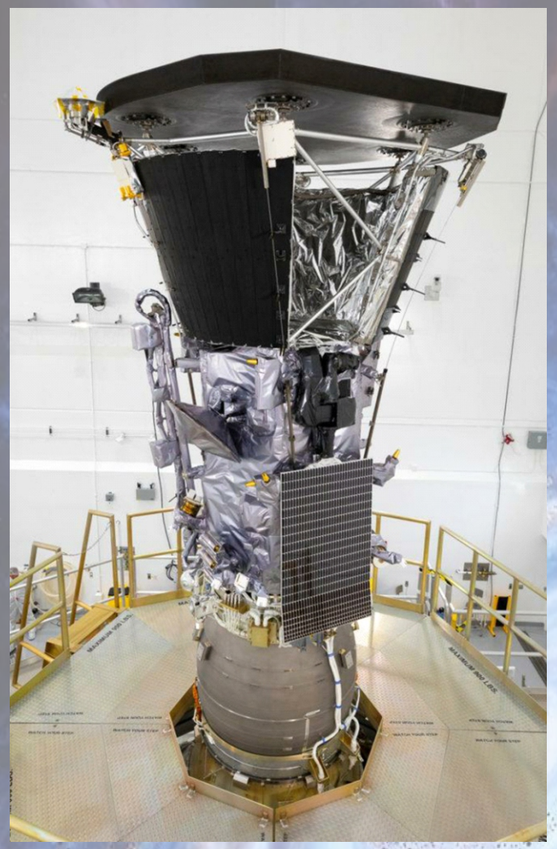
Such propulsion-based systems are needed for spacecraft to land on airless bodies like the moon. Those two rear "actuated" fins will also serve as landing pads, as will a leg back there that's styled to look like a fin for symmetry and aesthetic purposes. Despite its recent growth, the BFR is still smaller than it was at birth, when it was known as the Interplanetary Transport System (ITS). Musk unveiled the ITS architecture at a conference in Mexico in September 2016, announcing that the vehicle would stand 400 feet tall (122 m) and be 40 feet (12 m) wide.

That girth was scaled down to 30 feet (9 m) in the 2017 update and remains the same today. Indeed, there shouldn't be many big changes to the booster or spaceship going forward. "I feel like this is the final iteration in terms of broad architectural decisions for BFR, BFS [Big Falcon Spaceship]," Musk said (though he did later add that the next version of the spaceship will probably also feature some Vacuum Raptors).

Musk really likes the rocket and he is proud about it. He also cited the new design's resemblance to the rocket used by the comic-book character Tintin in the 1954 adventure "Explorers on the Moon". The BFR is really intended as an interplanetary transport system that's capable of getting from Earth to anywhere in the solar system, as you establish propellant depots along the way.

Parker Solar Probe : Humanity's First Visit to a Star

Easwara Iyer
S5 ME



NASA's historic Parker Solar Probe mission will revolutionize our understanding of the Sun, where changing conditions can propagate out into the solar system, affecting Earth and other worlds. Parker Solar Probe will travel through the Sun's atmosphere, closer to the surface than any spacecraft before it, facing brutal heat and radiation conditions — and ultimately providing humanity with the closest-ever observations of a star.

Journey to the Sun

In order to unlock the mysteries of the Sun's atmosphere, Parker Solar Probe will use Venus' gravity during seven flybys over nearly seven years to gradually bring its orbit closer to the Sun. The spacecraft will fly through the Sun's atmosphere as close as 3.8 million miles to our star's surface, well within the orbit of Mercury and more than seven times closer than any spacecraft has come before. (Earth's average distance to the Sun is 93 million miles.)

Flying into the outermost part of the Sun's atmosphere, known as the corona, for the first time, Parker Solar Probe will employ a combination of in situ measurements and imaging to revolutionize our understanding of the corona and expand our knowledge of the origin and evolution of the solar wind. It will also make critical contributions to our ability to forecast changes in Earth's space environment that affect life and technology on Earth.

It was launched on 12th August 2018 from Cape Canaveral Air Force Station, Florida with Delta IV- Heavy.Parker Solar Probe will perform its scientific investigations in a hazardous region of intense heat and solar radiation. The spacecraft will fly close enough to the Sun to watch the solar wind speed up from subsonic to supersonic, and it will fly though the birthplace of the highest-energy solar particles.

Extreme Exploration

To perform these unprecedented investigations, the spacecraft and instruments will be protected from the Sun's heat by a 4.5-inch-thick (11.43 cm) carbon-composite shield, which will need to withstand temperatures outside the spacecraft that reach nearly 2500°F (1300°C).

The Science of the Sun

The primary science goals for the mission are to trace how energy and heat move through the solar corona and to explore what accelerates the solar wind as well as solar energetic 1371°C particles. Scientists have sought these answers for more than 60 years, but the investigation requires sending a probe right through the heat of the corona. Today, this is finally possible with cutting-edge thermal engineering advances that can protect the mission on its dangerous journey.

Parker Solar Probe will carry four instrument suites designed to study magnetic fields, plasma and energetic particles, and image the solar wind.

Why do we study the Sun and the solar wind?

- The Sun is the only star we can study up close. By studying this star we live with, we learn more about stars throughout the universe.
- The Sun is a source of light and heat for life on Earth. The more we know about it, the more we can understand how life on Earth developed.
- The Sun also affects Earth in less familiar ways. It is the source of the solar wind; a flow of ionized gases from the Sun that streams past Earth at speeds of more than 500 km per second.
- Disturbances in the solar wind shake Earth's magnetic field and pump energy into the radiation belts, part of a set of changes in near-Earth space known as space weather.
- Space weather can change the orbits of satellites, shorten their lifetimes, or interfere with onboard electronics. The more we learn about what causes space weather – and how to predict it – the more we can protect the satellites we depend on.
- The solar wind also fills up much of the solar system, dominating the space environment far past Earth. As we send spacecraft and astronauts further and further from home, we must understand this space environment just as early seafarers needed to understand the ocean.

Hydrogen IC Engine

Shonedas
S5 ME

A hydrogen internal combustion engine vehicle (HICEV) is a type of hydrogen vehicle using an internal combustion engine. Hydrogen internal combustion engine vehicles are different from hydrogen fuel cell which use electrochemical conversion of hydrogen rather than combustion, the hydrogen internal combustion engine is simply a modified version of the traditional gasoline-powered internal combustion engine.

The combustion of hydrogen with oxygen produces water as its only product:

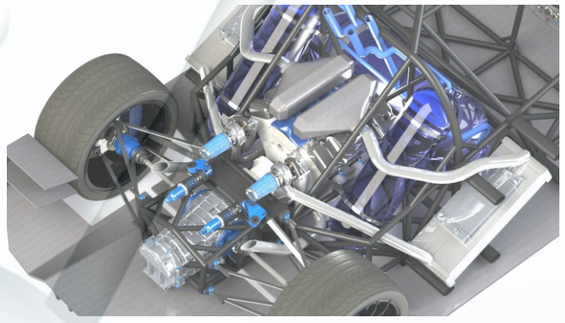
$$2H_2 + O_2 \rightarrow 2H_2O$$

In contrast, combustion of high temperature combustion fuels, such as kerosene, gasoline, or natural gas, with air can produce oxides of nitrogen, known as NO_x Tuning a hydrogen engine in 1976 to produce the greatest amount of emissions possible resulted in emissions comparable with consumer operated gasoline engines from 1976.

$$H_2 + O_2 + N_2 \rightarrow H_2O + No_x$$

The differences between a hydrogen ICE and a traditional gasoline engine include hardened valves and valve seats, stronger connecting rods, non-platinum tipped spark plugs, a higher voltage ignition coil, fuel injectors designed for a gas instead of a liquid, larger crankshaft damper, stronger head gasket material, modified for supercharger intake manifold, positive pressure supercharger, and a high temperature engine oil. All modifications would amount to about one point five times (1.5) the current cost of a gasoline engine. These hydrogen engines burn fuel in the same manner that gasoline engines do.

The theoretical maximum power output from a hydrogen engine depends on the air/fuel ratio and fuel injection method used. The stoichiometric air/ air ratio for hydrogen is 34:1. At this air/fuel ratio, hydrogen will displace 29% of the combustion chamber leaving only 71% for the air. As a result, the energy content of this mixture will be less than it would be if the fuel were gasoline. Since both the carburated and port injection methods mix the fuel and air prior to it entering the combustion chamber, these systems limit the maximum theoretical power obtainable to approximately 85% of that of gasoline engines. For direct injection systems, which mix the fuel with the air after the intake valve has closed and thus the combustion chamber has 100% air, the maximum output of the engine can be approximately 15% higher than that for gasoline engines.

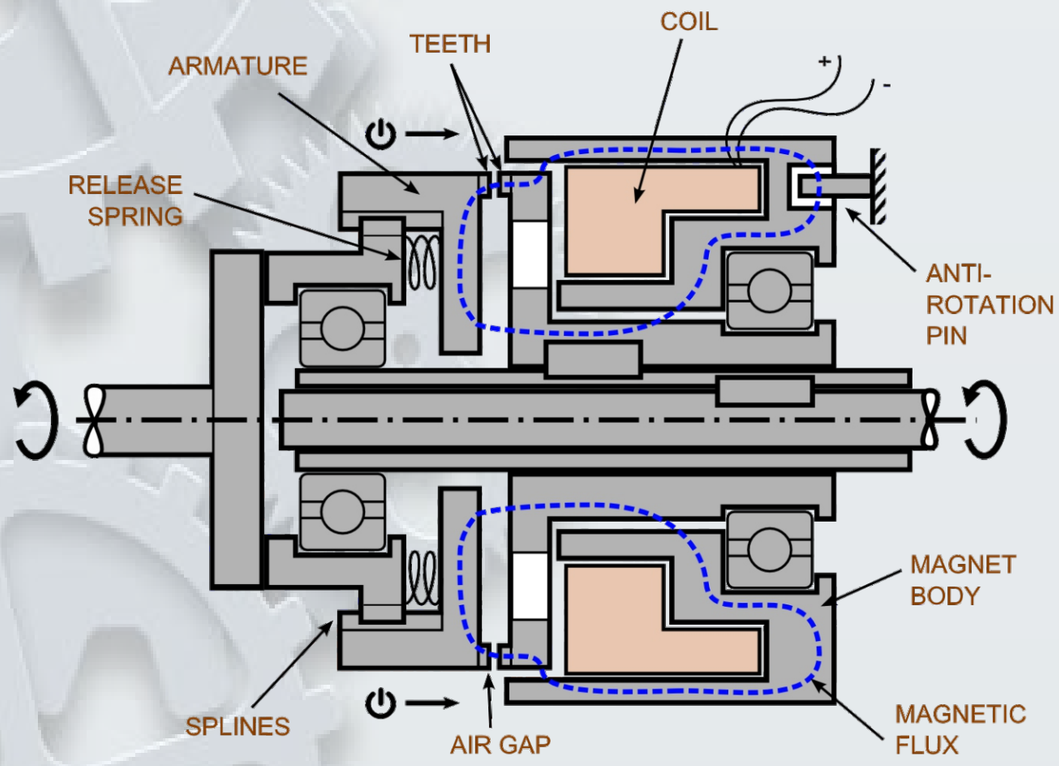


Therefore, depending on how the fuel is metered, the maximum output for a hydrogen engine can be either 15% higher or 15% less than that of gasoline if a stoichiometric air/fuel ratio is used. However, at a stoichiometric air/fuel ratio, the combustion temperature is very high and as a result it will form a large amount of nitrogen oxides (NOx), which is a criteria pollutant. Since one of the reasons for using hydrogen is low exhaust emissions, hydrogen engines are not normally designed to run at a stoichiometric air/fuel ratio.

Typically hydrogen engines are designed to use about twice as much air as theoretically required for complete combustion. At this air/fuel ratio, the formation of NOx is reduced to near zero. Unfortunately, this also reduces the power output to about half that of a similarly sized gasoline engine. To make up for the power loss, hydrogen engines are usually larger than gasoline engines, and/or are equipped with turbochargers or superchargers.

Electromagnetic Clutch

Akash
S3 Me



Electromagnetic clutches operates electrically, torque is mechanically produced. This is why they are significant. Since the clutches started becoming popular over 60 – Years ago, the variety of application and clutch designs has increased dramatically ,but the basic operations are remain same. Electromagnetic clutches are more suitable for remote operation since no mechanical linkage are required to control their engagement, smooth operations and also providing good fast. There is some limitations and risks are involving in the mechanism. The first and important limitation is over heating consequently, initial cost is also one of the disadvantage. Electromagnetic tooth clutches operate via an electric activation but transmit torque mechanically. When current flows through the clutch coil, the coil becomes electromagnetic and produce magnetic line of flux. This is then transferred through the small gap between field and the rotor

Gearless Power Transmission System

Haris Thomas

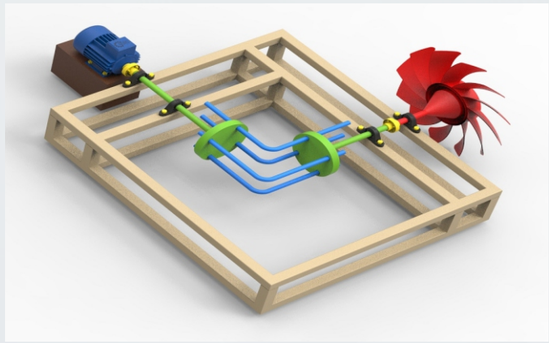
Earlier, power transmission for skew shafts was with the help of crossed helical gear or worm gear or hypoid gears in a machine. Skew shafts are shafts which are non-parallel and non-intersecting. These types of gears are very complex and are very costly to manufacture. The manufacturing process is time consuming.

Considering these difficulties, there emerged a concept of "Gearless Power Transmission System". This system is used to transmit power between two perpendicular shafts (whose axes are at 90°). In this system, rotational motion of input shaft is converted into sliding motion of links which is then converted into rotational motion of output shaft. Bent links, input shaft, output shaft and flanges are used for construction.

The links are used instead of gears. The number of links used should be odd. That is, 3, 5, 7, 9, etc. Also, the centres of any two links must not be on that line which represent diameter of shaft. The links are free to slide inside the flange hole. The gearless transmission is also called El-bow mechanism. It transmits power at any angle without utilizing gears. The El-bow Mechanism transmits the input power towards the output side such a way that the angular forces produced in the slacks are transmitted with the help of rods which takes up the input power and the right angle drive is transferred towards the output slack and rod assembly. Hence very little friction plays while the power is being transmitted. Gearless transmission is an ingenious link mechanism of slider and kinematic chain principle.

The advantages of gearless transmission include- complete freedom of interchangeability, more efficient than gear, simpler cooling system, require no maintenance and low cost of manufacturing. The applications of gearless transmission system include- Tower clocks, Gang drilling(Multi spindle drilling), Lubrication pump for CNC lathe, Angular drilling between 0 to 90°, Movement of periscope in submarines, Automobiles and Hand driven machines like juice makers, sheet folding machines etc.

With future development in this system, torque bearing capacity can be improved, efficiency of this mechanism can be improved and flexible links can be used. Also, this system has a bright future in automation and robotics. In conclusion, the Gearless transmission mechanism is mainly applicable to low cost applications where torque is low to medium. It can transmit at any angle from 0 to 180°.



ABS (Anti-lock Braking System)

Joel Joe Pious
S5 ME

What is ABS?

Anti-lock Braking System (ABS) is a type of an active safety system of a vehicle. It is also known as the anti-skid braking system. This system comes into action when the driver suddenly applies the brakes during an emergency. Employing the anti-lock braking system on cars and bikes is now mandatory in most parts of the world.

Need for ABS

Whenever the driver suddenly applies the brakes to a high-speed vehicle, there is always a chance of the 'wheel-lock'. The wheel-lock means that the respective wheel stops suddenly instead of coming to a halt slowly. Due to the wheel-lock, the driver loses control over the vehicle and the vehicle skids off the road. Thus, a fatal accident takes place. In order to avoid such situations, the manufacturers employ the ABS system.

Components of ABS

The ABS has the following components:

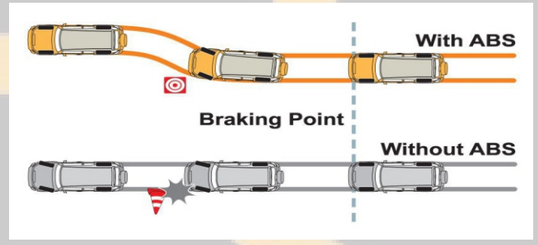
1. Wheel speed sensor
2. ABS control module
3. Brake control unit
4. Valves
5. Pump

Wheel speed sensors continuously monitor the speed of each wheel. As long as all the wheels have comparable speed, the system does not interfere with their operation. However, if the speed sensors find that the speed of any of the wheels is reducing drastically, then it means that the particular wheel is going to lock.

However, the locked wheel hampers the vehicle stability. Thus, the vehicle stops responding to the steering input given by the driver. At this moment, the vehicle also starts to skid; thereby causing a fatal accident. To avoid such a mishap, the ABS comes into action

How ABS detects an instant of emergency braking

After receiving the signal of very low speed from the wheel speed sensor, ABS module orders the brake control unit to reduce the braking force of that wheel. Reducing the braking force means reducing the hydraulic pressure in the brake line acting on that wheel. The Brake Control Unit reduces the line pressure with the help of valves in the system. When the braking force reduces, the wheel starts rotating at a higher speed;



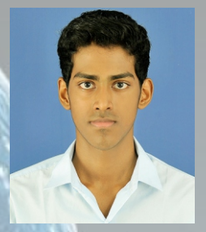
thereby avoiding the wheel-lock. As the wheel doesn't lock, movement of the vehicle remains intact which means that vehicle moves according to driver's input without skidding. Once the normal condition is restored, the Brake Control Unit restores the hydraulic pressure in the brake line with the help of a pump.

The only disadvantage of ABS is its pricing but it gives you safety in turn which is why ABS is worth buying.

Bikes and cars come with ABS preinstalled which is much better than installing ABS in non-ABS model as it may not function properly and may cost you more than the ABS model.

In whatever terrain except while off road ABS is a boon while off road ABS can cause locking of wheel so off road vehicles come with switchable ABS.

Floating Bags



Joyal
S1 ME

Floating bags are the recently improvised bags which helps to lessen the strain forced upon our backs due to heavy backpacks.These are equipped with revolutionary Suspended Load Technology (SLT), which greatly reduces the stress of the weight load on your back, neck, knees, and ankles as you walk or run. It's THE most significant innovation in backpacks in the last 30-40 years!

Reduction of impact forces by 86%
Studies in the journal, 'Nature' showed an 82% reduction in force while walking and an 86% reduction while running.

Decreases potential for injury
These bags helps you hike longer with less stress on your body -- also reducing your chance of injury from too much strain on your back, neck or knees.

More endurance reduces metabolic rate and exertion
With these, your hikes will require less metabolic energy (also in the journal, 'Nature') as the pack easily glides up and down while you walk or run. Just by changing your backpack, you can now hike farther with more gear.

Perfect for hiking, traveling, commuting and training
With 4 styles ranging from 28 liters to 55 liters, these packs offer a variety of options no matter what you're looking for in a backpack. Our 20" frame fits all three smaller packs (28-30L) so you can switch out packs to fit your needs.

Suspended load technology (SLT)
These bags use the new technology called suspended load technology (SLT).Using a patented double-frame and pulley system design, dramatically reduces the dynamic forces impacting your pack. The SLT design and functionality have been field-tested and are currently undergoing operational testing by the US Army and the US Marine Corps. The SLT helps the carried load to seamlessly move up and down according to our movement like while running or walking.

Agriculture robot (Agribot)

Adarsh V.M
S5 ME

Agriculture is a source of livelihood and food security for Indians. In recent times, there is a shortage of labor in the agriculture fields and this led us to do some innovation (Agribot) to reduce this problem (Southall et al. 2002) (McIntosh.2015). It can utilize energy resources efficiently. And it monitors the entire farming field round the clock. It can also remove the pests using pesticides. A dedicated mechanical arm is fitted with the robot to harvest the rhizomes (Dorhout, 2011). The entire design is automated with the help of GSM. The growth of agriculture is decreasing rapidly day by day mainly due to the shortage of labor. Even though the shortage of rainfall, monsoon failure, extended summer seasons and greenhouse effect have its part in destroying the growth of agriculture, shortage of man labor is the main reason for the reduction in the growth of agriculture. This shortage of manpower is mainly due to the following reasons:

Industries in urban areas.
Development of IT and Core companies will attract young minds.
Maintenance of agricultural lands is difficult. The farmers have to spend a lot of money and time to maintain their agricultural lands.
Reduction in agricultural income.

In recent years, electronic equipment plays a major role in implementing new agricultural tasks related to Precision Agriculture such as remote sensing and spatial variability mapping. The authors Godoy et al. (2009) described the design and implementation of agricultural robots suitable for remote sensing applications. They discussed the developed electronic hardware, the operation of a wireless telecommunication systemand the distributed control based on CAN protocol and ISO11783 for the mobile agricultural robot.

The performance parameters obtained with the robot operation are analyzed to benchmark the developed system. They proved that their systems meet the robot movement design requirements and give an acceptable response time for control commands and supervision (Godoy et al., 2009). Chouhan and Singh (2014) proposed about Mechanization Index (MI) based on the share of the cost of use of mechanical power operated farm equipment over the total cost of use of animate and mechanical power operated farm equipment. The analysis revealed a large diversity in MI for different crops at state and National levels. From the analysis, they inferred that states having higher MI or tractor intensity recorded better crop yield. In order to observe the growth and yield of the plants, the authors Thenmozhi et al. (2014) proposed a microcontroller based design to sense temperature, humidity, and sunlight by using corresponding sensor module.To solve optimization issue of a productive project of large-scale farms, to fulfill scientific and automation of crop productive project, to improve the optimization efficiency, and then to enhance the economic and social benefits of large-scale farms, the authors Yu and Shen (2010) proposed an improved genetic algorithm. They adopted J2EE to develop and optimize web-based agricultural productive project (Yu and Shen, 2010). Tamaki et al. (2009) developed an autonomous agricultural system for the operation in paddy fields. They designed a rice transplanting robot guided by a real-time kinematic global positioning system (RTKGPS) and an inertial measurement unit (IMU) using the controller area network (CAN). Gee et al. (2010) described a web-based Project Management System (PMS) for data sharing and cooperative research and speeding up the progress of the projects. Vijayakumar and Rosario (2011) provided a technical support to increase the rice production by developing a rice crop monitoring system using WSN. Thus automated control of water sprinkling and ultimate supply of information to farmers can be done. Kumar et al. (2014) designed two recharge filters with a modified flow pattern of recharging water from vertical to horizontal. According to the performance analysis, horizontal arrangement of filter materials followed by a sand layer to inflow water at the end will enhance the performance (Kumar et al., 2014). However, to obtain the desired filtration rate, a larger surface area will be required in horizontal filters as compared to vertical filters.

Flying cars-a green light in the redness of traffic

Mary Immaculate Joy
S5 ME

Flying cars which are only seen and heard in Harry Potter is not a distant reality. Even though there has been much research in this field such as that from Audi and BMW it seems Japanese company Toyota has achieved a breakthrough. Toyota has patented a design for flying cars which consists of spring loaded pop up rotor blades. This particular futuristic car can be used both on land and air. If the driver puts the car in flying mode it will cause the wheels of the car to move upwards on struts. From the wheels will pop out rotor blades which presumably provide enough lift to get up and away.

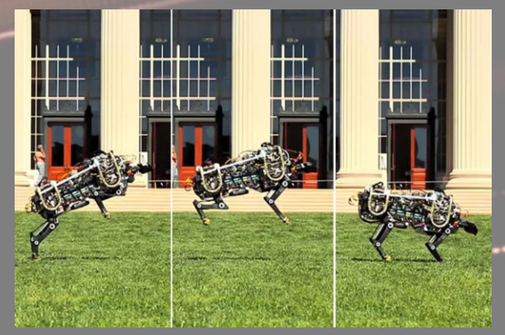
When the car is in land mode the vehicle can steer in a way similar to a tank or excavator where the vehicle turns by adding speed to one side of the tracked wheels. Other than Toyota, Uber has been working with NASA for a similar project named as Elevate which is expected to launch in 3 countries by 2020. In the recent turn of events Terrafugia, which belongs to the parent company of Volvo is all set to launch two-seat hybrid-electric vehicles, which can switch between driving and flying modes in less than a minute called as Transition. The aircraft has fold-out wings, weighing roughly 1,300 pounds, and has fixed landing gear. It can fly to a maximum altitude of 10,000 feet. The vehicle meets the National Highway and Traffic Safety Administration standards but consumers will need a pilot's license to operate the Transition. The company believes Transition could be a useful vehicle for pilots to land at small airports and drive straight home.

From these recent developments, it can be hoped that the nauseating traffic seen on roads will decrease exponentially with the development of these cars.

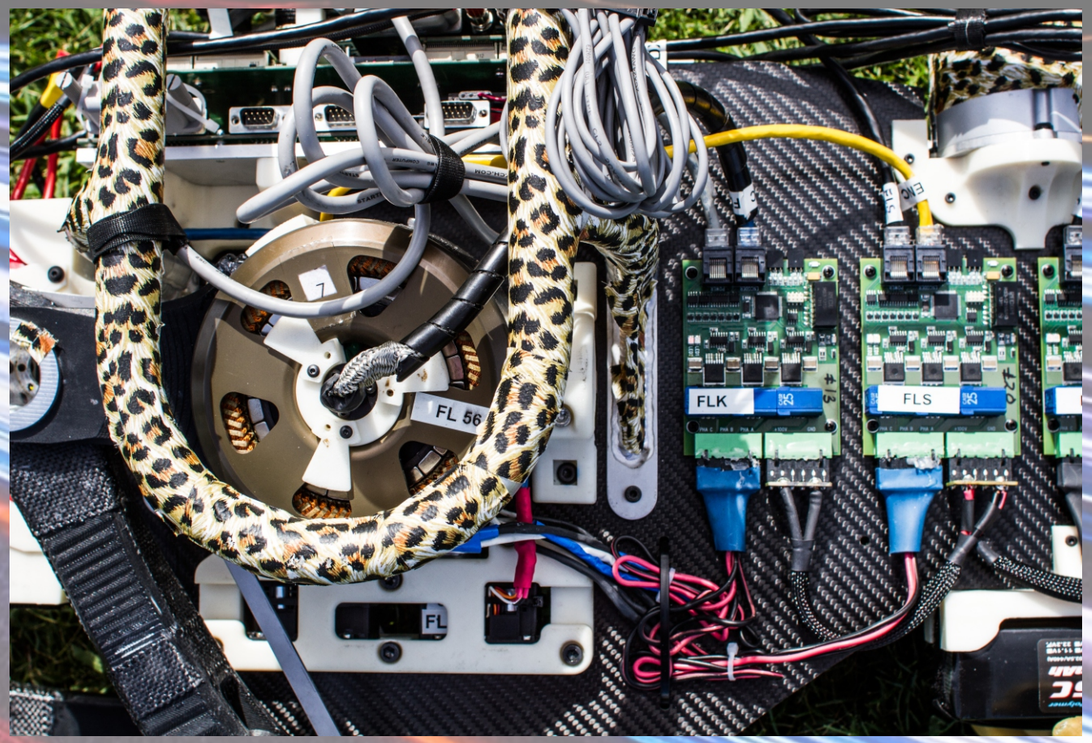
MIT Cheetah : A new design paradigm shift mobile robots

Abhijith Jose
S5 ME

Recent technological advances in legged robots are opening up a new era of mobile robotics. In particular, legged robots have a great potential to help disaster situations or elderly care services. Whereas manufacturing robots are designed for maximum stiffness, allowing for accurate and rapid position tracking without contact, mobile robots have a different set of hardware/software design requirements including dynamic physical interactions with environments. Events such as the Fukushima power plant explosion highlight the need for robots that can traverse various terrains and perform dynamic physical tasks in unpredictable environments, where robots need to possess compliance that allows for impact mitigation as well as high force capability. The talk will discuss the new mobile robot design paradigm focusing on the actuator



characteristics and the impulse planning algorithms. As a successful embodiment of such paradigm, the talk will introduce the constituent technologies of the MIT Cheetah. Currently, the MIT cheetah is capable of running up to 13mph with an efficiency rivaling animals and capable of jumping over an 18-inch-high obstacle



Bionic Eye

Akshay Babu
S5 ME

Bionic devices means devices that can convert nerve impulses in to corresponding electrical signals .Also it can convert physical phenomenon's like touch, light heat etc. into corresponding nerve impulses.

A bionic eye is constructed from an array of stimulating electrodes. The array is placed onto retina in the eye and fed signals from a digital camera. Digital camera work by converting light at each pixel in their sensor array into electrical signals that report the brightness of light. These signals are then used to generate am image on display at the rear of camera. Normally sighted then observe that image using their eyes.

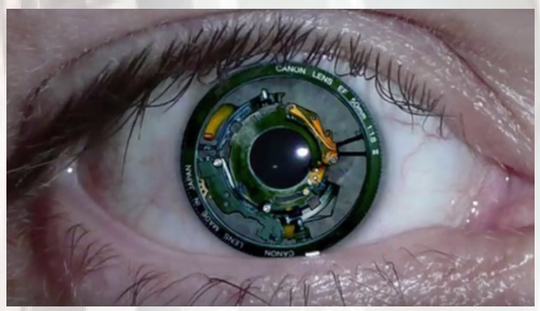
In bionic eye , bypass the visual display and send the electrical signals from each pixel in the camera to the array of stimulating electrodes positioned in the eye. When placed in to the eye of blind person ,the electrodes stimulate the nerve cells that would normally receive inputs from the absent photoreceptors. The nerve cells have no idea that electrical stimulation they are experiencing is through a man made electrode array. AS a results they send the signals to the brain and the corresponding person can experience sense of vision

The process is complex and development of these devices require high volume of knowledge. Also researchers want to know how the retina respond to these electrical signals. While using theses devices it involves variety of signals and waves. We should take care that these devices couldn't damage our eye or our retina.

<u>The Bionic Eye app</u>

This app stimulate the sort of vision that a person might experience using bionic eye . The bionic eye is retinal implant, placed at the back of the eye to restore a sense of vision for peoples with profound vision loss due to degenerative condition of the retina. An external camera capture the visual scene data to the implant. Electrode 9n the implant electrically stimulate the nerve cells in the retina providing sense of vision. In this app each spot of light that appears represents the percept from one electrode.

The purpose this app is to stimulate what bionic vision might look like. This app is not able to exactly represent the kind of vision processing that will be deployed with the full bionic eye devices. Also each and every patients experience with different will be different and hence the vision they experience might be different to what is represented in this app.



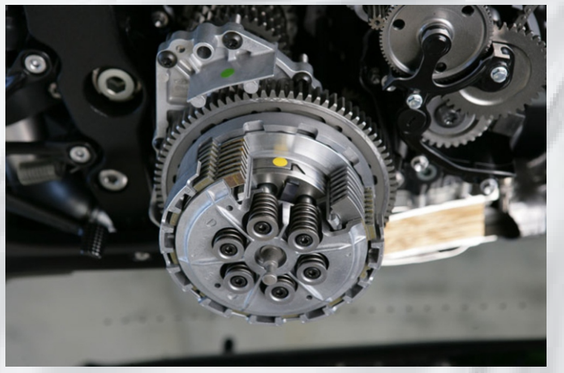
CAD Drawing

Edwin
S3 ME

Slipper Clutch

Dhanus Sowrab
S5 ME

When you are riding at high speeds and suddenly you encounter a sharp corner the obvious reaction would be to slow down by applying the brakes and shifting in lower gear, while we shift gears suddenly to a low gear the rear wheel of motorcycles may get locked and there are chances of sliding and causing accidents. So to prevent this we use slipper clutch i.e. we can shift gears suddenly to a low gear in



such conditions

In normal clutches, the engine braking force is transmitted to rear wheel via chain drive (or shaft drive) which causes rear wheel to shake, jump or lose traction. This is the main concept behind slipper clutch – to control rear wheel under hard braking and downshifting that causes the rear wheel to lose traction.

So what is engine braking, In a high compression engine, the crankshaft has to fight the trapped charge inside the combustion chamber during the compression stroke to push the piston back up, and this produces resistance in the form of Engine Braking, or “back torque”. As the rider decelerates and downshifts, the effect of engine braking becomes more pronounced; this happens because of the rpm difference between the engine and the rear wheel. Usually, it's found that while you enter a corner and downshift to a taller gear, the rear wheel rolls at a higher rpm than the engine, and due to the resistance offered by the engine (because of engine braking), the wheel hops and at worst locks up!

The slipper clutch serves like a simple friction clutch when the throttle is open and as you let off the throttle, and when the rear wheel tries to go quicker than the engine, the clutch will allow a certain amount of slippage in the opposite direction, letting the rear wheel to spin relatively freely from the engine drag. This slip is very crucial in Slipper Clutch design, it should be just enough to try and equalize the revs with the wheel speed, so that when the throttle is opened again, your motorcycle is ready and free of engine braking

<u>Components of a Slipper Clutch</u>

Slipper clutches are of various types and designs, but the most common and popular is the “Ramp Slipper Clutch”. This works more or less on the principle of a freewheel . In a Ramp Slipper Clutch, there are two sections, one section has a set of discs (friction and steel) and the other has a hub and dog assembly. Both the hub and the dog have a series of little ramps with roller balls embedded in hub-ramps. The dog is in permanent mesh with the clutch housing, which is linked to the engine flywheel. On the other hand, the hub is splined to the transmission/gearbox input shaft alike the steel discs in the friction clutch section of the Slipper clutch assembly.

Antimatter

Dilin C Jose
S1 ME

Antimatter, substance composed of subatomic particles that have the mass, electric charge, and magnetic moment of the electrons, protons, and neutrons of ordinary matter but for which the electric charge and magnetic moment are opposite in sign. The antimatter particles corresponding to electrons, protons, and neutrons are called positrons (e+), antiprotons (p), and antineutrons (n); collectively they are referred to as antiparticles. The electrical properties of antimatter being opposite to those of ordinary matter, the positron has a positive charge and the antiproton a negative charge; the antineutron, though electrically neutral, has a magnetic moment opposite in sign to that of the neutron. Matter and antimatter cannot coexist at close range for more than a small fraction of a second because they collide with and annihilate each other, releasing large quantities of energy in the form of gamma rays or elementary particles.

The concept of antimatter first arose in theoretical analysis of the duality between positive and negative charge. The work of P.A.M. Dirac on the energy states of the electron implied the existence of a particle identical in every respect but one—that is, with positive instead of negative charge. Such a particle, called the positron, is not to be found in ordinary stable matter. However, it was discovered in 1932 among particles produced in the interactions of cosmic rays in matter and thus provided experimental confirmation of Dirac's theory.
The life expectancy or duration of the positron in ordinary matter is very short. Unless the positron is moving extremely fast, it will be drawn close to an ordinary electron by the attraction between opposite charges. A collision between the positron and the electron results in their simultaneous disappearance, their masses (m) being converted into energy (E) in accordance with the Einstein mass-energy relation E = mc2, where c is the velocity of light. This process is called annihilation, and the resultant energy is emitted in the form of gamma rays (γ), high-energy quanta of electromagnetic radiation. The inverse reaction γ → e+ + e− can also proceed under appropriate conditions, and the process is called electron-positron creation, or pair production.

The Dirac theory predicts that an electron and a positron, because of Coulomb attraction of their opposite charges, will combine to form an intermediate bound state, just as an electron and a proton combine to form a hydrogen atom. The e+e− bound system is called positronium. The annihilation of positronium into gamma rays has been observed. Its measured lifetime depends on the orientation of the two particles and is on the order of 10−10–10−7 second, in agreement with that computed from Dirac's theory.

The Dirac wave equation also describes the behaviour of both protons and neutrons and thus predicts the existence of their antiparticles. Antiprotons can be produced by bombarding protons with protons. If enough energy is available—that is, if the incident proton has a kinetic energy of at least 5.6 gigaelectron volts (GeV; 109 eV)—extra particles of proton mass will appear according to the formula E = mc2. Such energies became available in the 1950s at the Bevatron particle accelerator at Berkeley, California. In 1955 a team of physicists led by Owen Chamberlain and Emilio Segrè observed that antiprotons are produced by high-energy collisions. Antineutrons also were discovered at the Bevatron by observing their annihilation in matter with a consequent release of high-energy electromagnetic radiation.
By the time the antiproton was discovered, a host of new subatomic particles had also been discovered; all these particles are now known to have corresponding antiparticles. Thus, there are positive and negative muons, positive and negative

Ride by wire technology

Geesmon George
S5 ME

The term ride by wire is analogous to 'drive by wire' which is used in case of motorcycles. In simple terms, it refers to the absence of mechanical linkage between accelerator and throttle. Instead, various sensors and actuators (connected by wires) control the fuel-air supply going to the engine. Yamaha pioneered the use of ride by wire technology in 2006 on YZF-R6.

Earlier, manufacturers used this technology only on large capacity motorcycle engines which were designed for race track use. However, now it finds application even in small capacity engines. This technology adds value in riding quality and efficiency in the age of stringent emission standards.As emission standards are getting stricter, it is becoming very difficult for motorcycle manufacturers to employ higher capacity engines while maintaining emission limit. This is because emissions from an engine generally increase with capacity and power. To pass stringent emission norms without compromising on performance, ride by wire technology plays a key role
.

In earlier bikes having carburettor, accelerator had a direct cable connection with the butterfly valve in the carburretor body. Thus, in such engines, a twist of the accelerator would directly control the supply of fuel-air mixture to the engine. However, this is not the case with ride by wire system as there is no cable connection between accelerator and throttle. In this system, when rider twists the accelerator, actuators in the electronic throttle body sense this movement and change the throttle opening accordingly. The movement of throttle alters air supply to the engine.

Afterwords, Throttle position sensor recognizes this change and sends a signal to ECM. Based on this signal, ECM calculates the exact amount of fuel required and orders fuel injection system to supply it. Hence, engine receives correct amount of air-fuel mixture in every situation.This technology offers several advantages. Firstly, it ensures precise control of the fuel air mixture going in the engine which enhances engine efficiency. This ultimately results in emission reduction. In addition, ride by wire technology allows setting up of various riding modes like cruise mode or sport mode; due to predictable throttle response.Alongwith other systems such as ABS and traction control, ride by wire enhances capability to control the motorcycle in various riding modes and terrains.

Sensing City

Fristo Denni
S1 ME

Numerous smart-city schemes have run into delays, dialled down their ambitious goals, or priced out everyone except the super-wealthy. A new project, is hoping to change that pattern of failures by rethinking an urban neighbourhood from the ground up and rebuilding it around the latest digital technologies.

Breakthrough The cities which aims to be the first place to successfully integrate cutting-edge urban design with state-of-the-art digital technology. Why It Matters Smart Cities could make urban areas more affordable, liveable and environmentally friendly.

One of this project's goals is to base decisions about design, policy, and technology on information from an extensive network of sensors that gather data on everything from air quality to noise levels to people's activities.

The plan calls for all vehicles to be autonomous and shared. Robots will roam underground doing menial chores like delivering the mail. It will open access to the software and systems it's creating so other companies can

build services on top of them, much as people build apps for mobile phones.

The company intends to closely monitor public infrastructure, and this has raised concerns about data governance and privacy. But it believes that, it can work with the community and the local government to alleviate those worries.

What's distinctive about what we're trying to do in Quayside is that the project is not only extraordinarily ambitious but also has a certain amount of humility. That humility may help Quayside avoid the pitfalls that have plagued previous smart-city initiatives.

Green Composite

Jishnu Padmakumar
S5 ME

A composite material (also called a composition material or shortened to composite, which is the common name) is a material made from two or more constituent materials with significantly different physical or chemical properties that, when combined, produce a material with characteristics different from the individual components. The rising concern towards environmental issues and, on the other hand, the need for more versatile polymer-based materials has led to increasing interest about polymer composites filled with natural-organic fillers, i.e. fillers coming from renewable sources and biodegradable. The composites, usually referred to as “green”, can find several industrial applications. On the other hand, some problems exist, such as worse processability and reduction of the ductility. The use of adhesion promoters, additives or chemical modification of the filler can help in overcoming many of these limitations. These composites can be further environment-friendly when the polymer matrix is biodegradable and comes from renewable sources as well.

The use of natural fibers to reinforce polymers is a well established practice, and biocomposites are increasingly used in sectors such as automotive and construction. Green composites are a specific class of biocomposites, where a bio based polymer matrix is reinforced by natural fibers, and they represent an emerging area in polymer science. This work discusses the environmental benefits deriving from the use of natural fibers in polymer composites and from substitution of oil derived polymers by bio based polymers as matrix material. New trends in the selection of natural fibers, that is, from waste rather than from valuable crops are described. Recently developed thermoplastic and thermosetting bio based polymers are reviewed, and commercially available green composites obtained thereof are discussed. POLYM. COMPOS., 2011. © 2011 Society of Plastics Engineers.

Chemical treatments on plant-based natural fibre reinforced polymer composites. In practice, the major drawbacks of using natural fibres are their high degree of moisture absorption and poor dimensional stability. The primary objective of surface treatments on natural fibres is to maximize the bonding strength so as the stress transferability in the composites. The overall mechanical properties of natural fibre reinforced polymer composites are highly dependent on the morphology, aspect ratio, hydrophilic tendency and dimensional stability of the fibres used. The effects of different chemical treatments on cellulosic fibres that are used as reinforcements for thermoset and thermoplastics are studied. The chemical sources for the treatments include alkali, silane, acetylation, benzoylation, acrylation and acrylonitrile grafting, maleated coupling agents, permanganate, peroxide, isocyanate, stearic acid, sodium chlorite, triazine, fatty acid derivate (oleoyl chloride) and fungal. The significance of chemically-treated natural fibres is seen through the improvement of mechanical strength and dimensional stability of resultant composites as compared with a pristine sample. A simplified process was developed for fabricating natural bio-based fiber-reinforced polymer composites for applications such as automotive interior trim substrates. Biofiber (Kraft pulp fiber) and four types of thermoplastic polymers (PP, two PP/PE polymer blends, and PLA) were first wet-formed into fiber/polymer mats and the mats were made into composites using a match-mold thermoforming process. The effects of void content on the composite tensile and flexural properties were investigated. Impact resistance and heat deflection temperature were tested and acoustic absorption coefficients of the composites were evaluated as well.

.Two types of prototype panels (2-D and 3-D) containing biofiber/polymer composite substrates with a bonded synthetic leather decorative surface were successfully made using this process. Biofiber/PP composites had comparable performance to the commercially available non-wood natural fiber/PP composite counterparts for the properties investigated in this study at the same density level (0.8 g/cm3). Interfacial and mechanical properties of environment-friendly “green” composites made from pineapple fibers and poly (hydroxybutyrate-co-valerate) resin. Physical and tensile properties of pineapple fibers were characterized. Tensile properties of pineapple fibers, like most natural fibers, showed a large variation. The average interfacial shear strength between the pineapple fiber and poly(hydroxybutyrate-co-valerate) (PHBV) was 8.23 MPa as measured by the microbond technique. Scanning electron microscopy (SEM) photomicrographs of the microbond specimens revealed an adhesive failure of the interface. Fully degradable and environment-friendly “green” composites were prepared by combining pineapple fibers and PHBV with 20 and 30% weight content of fibers placed in a 0°/90°/0° fiber arrangement. Tensile and flexural properties of these “green” composites were compared with different types of wood specimens. Even though tensile and flexural strength and moduli of these “green” composites were lower than those of some wood specimens tested in grain direction, they were significantly higher than those of wood specimens tested in perpendicular to grain direction. Compared to PHBV virgin resin, both tensile and flexural strength and moduli of these “green” composites were significantly higher. SEM photomicrographs of the fracture surface of the “green” composites, in tensile mode, showed partial fiber pull-out indicating weak bonding between the fiber and the matrix.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