



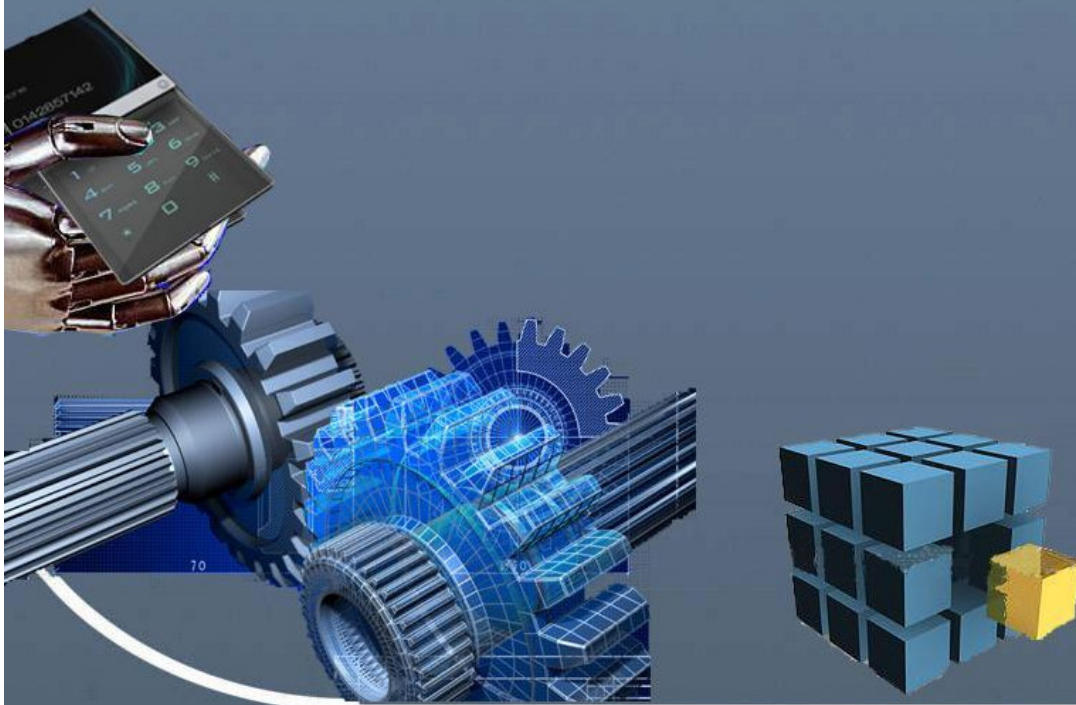
GMARIT



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Foreword (First Draft)

Principal's photo

**Dr. C.L.V.R.S.V.PRASAD,
Principal, GMRIT, Rajam**

It is my pleasure to welcome the sixth edition of TechMag keeping the tradition of GMRIT alive in bringing out annual technical magazine bearing technical articles written by students and faculty members. The Institute witnessed a number of scientific, academic and administrative activities and events during the year 2011-12.

The institute is repositioning itself to face technical challenges confront in India. Research groups have been formed to give orientation towards research apart from teaching and learning atmosphere. A good number of faculty with erudite research publications have been inducted to support the new research activities. The Institute has taken up several new research projects during the year sponsored by national agencies and government departments.

The year also witnessed a large number of exchange visits of eminent scholars for meetings, seminars, workshops, conferences and specialized research collaborations in the country and abroad. Institute vies with premier institute to undertake several observational programmes in different environmental conditions at different places in the country under its own and national/international collaborative research programmes, and collect valuable data.

The Institute improved its infrastructural facilities by addition of new equipment / computational systems and enhancement of the existing ones. The whole campus of the Institute has received a new look and environmental enrichment by carrying out necessary repairs and improvements.

Faculty members of the institute have actively participated in research publications and other activities of the Institute during the year.

I take this opportunity to express my sincere thanks to the Department of Science and Technology, Govt. of India for continued support and encouragement. I also offer my appreciation and thanks to all my colleagues of the Institute for their co-operation and devotion to work.

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What Every Engineer Should Know about Crystal Controlled Oscillators????????????

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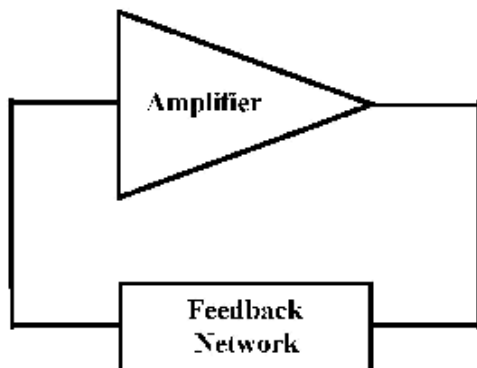
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This article is intended to provide basic information about crystal control oscillators for engineers. For the purposes of this paper, an oscillator may be defined as a device used to stabilize time-frequency generators, specifically those that provide the clock signals used by data processing equipment.

Oscillators have become nearly ubiquitous, because of the proliferation of microprocessor devices with built-in time-keeping capabilities. Despite this trend (or perhaps because of it) it is useful to summarize basic information about oscillators.

In its simplest form, an oscillator consists of two networks, an amplifier network and a feedback network. Figure 1.0 illustrates such a basic configuration.

Figure 1.0



As might be expected, the amplifier network amplifies the strength of an applied signal. The feedback network receives that signal, corrects any out-of-phase condition that might exist and then returns the signal to the amplifier network and to the output stage of the oscillator.

This process continues for as long as the oscillator is energized. Because of the nature of the devices in question, we may take for granted that an out-of-phase condition will exist at the input side of the feedback network.

Based on the above, it would appear that the feedback network is critical to the successful operation of our oscillator, and indeed, that is absolutely the case. While it is possible to use some combination of discrete components, such as an L-C-R network, as the phase-correction mechanism, experience has shown that this approach is seldom satisfactory. Such a circuit will have a very low "Q" value and will be quite large physically. However, its greatest shortcoming is the complete inability of such a network to maintain reasonable frequency stability over any significant temperature deviation.

Because the usual goal of an oscillator is to provide a specific, well-controlled frequency to the output stage, a precise means of phase-correction is required. Experience has shown that piezoelectric quartz crystal units are admirably suited to this task.

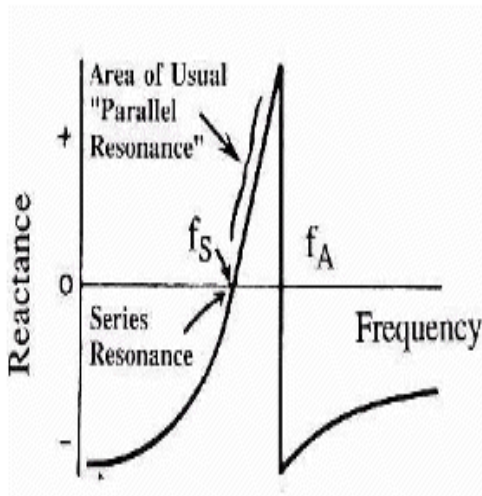
For the purpose of this discussion, we will assume that the Amplifier network of Fig 1.0 consists of an integrated circuit and that the feedback network consists of a quartz crystal. Two conditions must be satisfied before an oscillator circuit will operate as expected:

1. The loop gain around the circuit must be equal to one, or unity. This may be achieved either through the self-limiting characteristics of the amplifier network or through some external gain-control circuitry.
2. The net phase shift around the circuit must be equal to $2\pi n$, where n is an integer, usually 1 or
3. In our present example, the quartz resonator is responsible for shifting the phase to the degree required to meet condition number 2. If the signal is so grossly out of phase that the frequency is far from the resonator's resonant frequency, the oscillator will not operate as desired, if at all.

A change in phase of the applied signal not only results in a change in frequency, but a change in reactance as well. While all components within the oscillator may cause a change in reactance to a greater or lesser degree, the reactance of a quartz crystal is so pronounced that the other components may be assumed to be of zero reactance.

Figure 2.0 illustrates the reactance curve of quartz crystal.

Figure 2.0



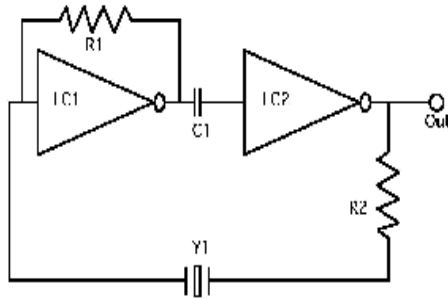
If we apply an alternating signal at a frequency close to the natural resonant frequency of the crystal, the crystal will be energized through the piezoelectric effect. As the frequency is increased, we will reach a point where the resistance of the crystal is minimal and the current flow is maximal. This point is identified as the "series" resonant frequency, indicated as " f_s " above. At this point the crystal is resonating at zero-phase.

If we continue to increase the frequency, we will reach yet another point of zero phase, known as the "anti" or "parallel" resonant point. At this point, the resistance of the crystal unit is maximal and the current flow is minimal.

This frequency is inherently unstable and should never be selected as the frequency of operation for an oscillator. Figure 2.0 also illustrates a region identified as the "area of usual parallel resonance." For our purposes, we will consider a frequency within this area as being a "parallel" frequency.

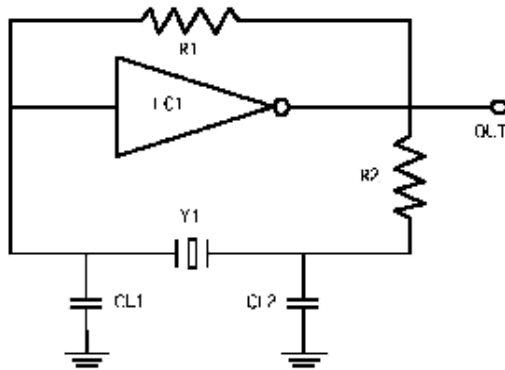
Just as there are two frequencies of zero phase associated with a quartz crystal, there are two fundamental types of oscillator. As with a crystal, the first of these is known as the Series Resonant type, illustrated in Figure 3.0.

Figure 3.0



The series resonant circuit illustrated in Figure 3.0 is capable of oscillating at some non-crystal controlled frequency in the event of crystal failure. This circuit provides no means of frequency adjustment should it be required. This circuit is also known to be, on occasion, difficult to start. Further, a true series circuit is very difficult to achieve in production and therefore the output frequency usually differs, if only slightly, from the design parameter.

Figure 4.0



The second type of circuit is the "Parallel Resonant" circuit, illustrated in Figure 4.0. You will note immediately the inclusion of two capacitors, referred to as CL1 and CL2. These capacitors are external to the quartz crystal and have the effect of increasing the resonant frequency above that of series resonance. Note especially that it is the oscillator frequency that is increased and not that of the crystal. This frequency is often referred to as the "parallel" frequency but this is in fact a misnomer. This frequency results from the

inclusion of the capacitors and should properly be called the "Load Resonant" frequency. Because the capacitors increase the frequency to a point above the series resonant frequency, their value must be carefully calculated and specified.

In contrast to the series resonant circuit, the circuit illustrated in Figure 4.0 will not continue to oscillate in the event of crystal failure, and does provide a means of frequency adjustment if adjustment should be required. All oscillator circuits rely on noise as a means of starting oscillations; the parallel circuit provides additional noise through the medium of the capacitors. The so-called "Parallel Resonant" circuit is recommended in applications using integrated circuits.

This article provides only a brief overview of the basics of oscillator circuits in any application involving the use of quartz crystal oscillators.

FORTUNE FROM DISCARDED PLASTIC

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Abstract

Now days due to monetary advance and Growth, increase in plastic consumption and leftovers of plastic has been increasing rapidly. As there is a rapid increase in generating plastic, they occupy a foremost amount in solid waste and this became a big task for solid waste management. Using the opportunities we have, we can recycle the waste plastic to petroleum. And this can be achieved by Pyrolysis process. And recycling has great prospective for resource conservation. It is more advantageous as it releases are less than a normal furnace's. It tends to release more than 12% oxygen in to the atmosphere. To reduce the pollution caused by this process we can use catalytic converter. Therefore, having a good idea, countries all over the world can use this technology. This article provides technology for recycling waste plastic to petroleum hoping it raises awareness among the society.

1. Petroleum reserves

Petroleum, it is a non-consumable resource on which every part of the world moves. Among all over the world, Arabian countries and Gulf region have nearly 90% of oil reserves. Where as in India, we consume more petroleum resources than what we have by getting the oil from international market. Based on our necessity, the demand continues to grow for every year. In Andhra Pradesh Krishna-Godavari basin and is being extracted now. In India we have oil reserves in Assam and Maharashtra.

2. Petroleum extraction

Petroleum is extracted by fractional distillation method, in which Crude oil is heated up to 400⁰c and above in a fractional distillation column. We can get L.P.G, Kerosene, Diesel, Engine oil at different temperatures from the distillation column. And even, natural gas is found in the oil wells by which we can run the vehicles.

We can produce Bio-fuels from the plants, seed oil etc. And now a day's research is going on for extracting Hydrocarbon fuel from plastics. If this is achieved, it is going to be a revolution in the world.

3. Plastics and its origin

Plastics, we can't even imagine a day without using a product made of plastic. Even, the pen we use daily, small accessories and everything in the world are almost made from plastic. Perhaps, in the last two decades plastic industries are growing rapidly than any other industry in the modern era.

Plastics origin takes place in 1868, by a young printer “JOHN WESLEY HYATT”. He mixed ‘pyrocylin’ made from cotton and nitric acid with camphor in order to create an artificial plastic, that is what we call celluloid. After that in 1909, “Dr.LEE HENDRICK BEAKELAND” introduced ‘phormaldehyde’ and evolved techniques for that material formation under heat and pressure. After that for every decade a new type of plastic rises (nylon, polyester, polyethylene).But manufacturing of plastic differs.

4. Process for manufacturing plastics

- Monomers are subjected to chemical reaction which is known as Polymerization. This results in monomers to bond with each other (so, which causes small molecules to link together into larger molecules, which can contribute to manufacture different type of products.
- From crude oil alkanes, alkenes are obtained. By adding a catalyst we can obtain a powder material known as polymer. The following is heated and required shape can be obtained.

5. Effects caused by plastics

Plastics are harmful because they cannot biodegrade, and it depends on the type of plastic. They affect the human as well as living beings. Biodegradable life of different types of plastic is as follows.

1. Plastic coated with milk carton-4 years
2. Plastic bags-10 years
3. Soft plastic-100 years
4. Hardplastic-500 years

- They kill lakhs of aquatic animals which mistaken them for food.
- During its manufacturing many carbon molecules are released into atmosphere.
- It has been found to stimulate prostate cancer and change in gender variations.
- It decreases sperm production and hormones like testosterone.
- It adversely effects R.B.C, kidneys and stomach

Frankly speaking, Petroleum is a form of energy which we use to run any component. And if we use it for making plastics energy cannot be utilized. BUT, WE CANNOT REPLACE PLASTIC WITH IRON OR WOOD TO MAKE BRUSH, PEN, SLUICE PACKETS FOR OUR CONVINIENCE. So it is better to recycle them. As plastics take many years to biodegradable (nearly 100 years).

As we can re-use thermoplastics, it's better to recycle thermosetting plastics through pyrolysis to hydrocarbon fuel and it is obtained by catalytic converter. It involves breaking of plastic hydrocarbon at ambient pressure and low temperature using a reusable catalyst which requires less energy to separate molecules.

6. Salient features in recycling process

Here are some basic points which we use in recycling process and which will help us to understand the concept very easily.

- A Liquid boils when its vapour reaches to atmospheric pressure.

- Molecules with strong inter molecular force will have high boiling point.
- And short hydrocarbons have low boiling point.
- Hydrocarbons having low boiling point cannot be condensed and phase cannot be changed.
- If there are more bonds in a molecule, it leads to high boiling point.
- Heating of plastics should take place in the absence of oxygen, as it leads burning of plastics.

7. Experimental set up for recycling plastics

The procedure involves pyrolysis, condensation, catalytic conversion. So, it needs the following equipment.

- Reactor with a magnetic stirrer: it is used for heating the plastic. For uniform heating we can place sand at the bottom part of the reactor. It should have high thermal conductivity in order to dissipate the heat produced during plastics heating. Magnetic stirrer is for mixing the organic vapour produced inside the reactor. And care should be taken such that vapour should not be emitted to atmosphere.
- Catalytic cracker: It plays the crucial role in the process. It is used for reducing the pollution. It converts harmful materials into simple carbon molecules. Generally 3 way converter is used. Without this involvement harmful components may be released into the atmosphere.
- Condensers: It is used for reducing the temperature of the organic vapour. This plays an important role by separating the condensed and uncondensed gases. From condenser, shorter hydrocarbons will be separated and stored in a tank. These shorter hydrocarbons will be in gaseous form. Longer hydrocarbons will be converted into liquid state.
- Storage Tanks: Obtained hydrocarbons from condenser are stored in different tanks. They can be used for the required purposes, such as refinement of diesel etc. And uncondensed hydrocarbons can be used in chemical industries.

8. Methodology

Firstly, clean the collected plastic in order to remove the dust as it is safe for the reactor. Dump the plastic into the reactor and heat it gently to 450⁰c-550⁰c.

And verify the working condition of reactor and magnetic stirrer. Then allow organic vapour to pass through catalytic converter and the condensers.

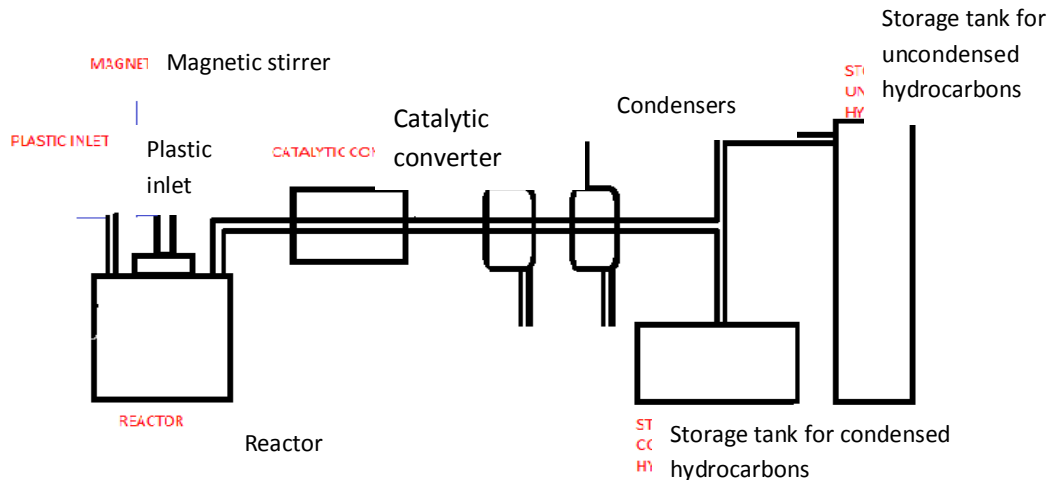


Figure 1: experimental setup for the extraction of petroleum from plastics

Then condensed and uncondensed vapours get separated and it can be stored in the collecting tanks and can be used for the required purpose.

Generally we get condensed gas in liquid form and uncondensed gas in gaseous form.

As we obtain Hydrocarbon fuel in liquid form we can convert it to diesel, petrol and other products.

We can use uncondensed vapour in chemical industries Alkane and other products.

According researches conducted, nearly 90% of plastic can be recycled.

9. Properties of hydrocarbon fuel obtained after recycling

The condensed gas obtained after condensation will have the following properties.

- Hydrocarbon fuel obtained is of low viscosity.
- It is of high calorific value.
- Its specific gravity is nearly 0.75-0.80 (g/ml).

10. Catalyst used

For converting condensed hydrocarbon fuel to petroleum we can use fly ash obtained from burning the coal as a catalyst. As it gives the products with similar features of diesel and petroleum nearly, fly ash can be used as a catalyst. In addition to that it has high thermal stability.

11. Advantages and limitations

- Emissions are less than that released by a natural gas furnace.
- It emits more than 14% of oxygen into the atmosphere.
- Running cost is less.
- It captures 90% of hydrocarbon fuel from plastics.

- There should not be any kind of leakages in the passage of organic vapour.
- Reactor should have high thermal conductivity.
- Catalytic converter is must as it reduces the pollution.

Conclusion

From the results, we get it is better to recycle the plastics than to waste the energy and more over it takes nearly 100 years to biodegrade (depends on the plastic type). Waste can be diverted from landfills and can be converted into resources.

References

www.newscientist.com, www.gizmag.com, www.wikileaks.com, www.youtube.com

COMPRESSED AIR TECHNOLOGY (CAT)

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Introduction

In this modern era we want more comfortable life and to achieve this, there are many inventions and researches are going on in the field of engineering but as each action having there some opposite reaction that may be good or bad. Some achievements may lead to problems in future and one of these achievements is fossil fuel engines which were a good achievement for us before 30-40 years but now they are one of the sources of contributor of global warming and pollution with fossil fuel crises.

To cope up with this problem, we have to use such engines which emits less or zero CO_x & NO_x particles, for that one of the solutions is hybrid electrical vehicle but again they emit some CO_x & NO_x so this is not a complete solution for this problem. The best feasible solution is Zero Emission Vehicle i.e. Compressed Air Technology (CAT) which does not require any type of fossil fuel. The gasoline-powered engine requires 4 Rs/mile where as for air powered engines it is 75% less i.e. 1 Rs/mile with no emission CO_x & NO_x pollutants. The cost of the hybrid electric vehicle is more which requires the charging period of 5 to 6 hours whereas the cost of air powered vehicle is less than half which requires only 3 to 4 minutes for recharging.

We are confident that Compressed Air Technology (CAT) holds the key to the automobile's future. At the same time, though we are aware that no one type of vehicle can meet all society's needs. That's why we are pushing ahead with research on a range of vehicle propulsion technologies.

Our environment must be protected against various anthropogenic contaminations, among which the emission of large amounts of CO, NO_x, hydrocarbons and soot produces some of the most adverse environmental effects. These emissions, which are above all caused by road traffic and power plants, damage the flora and fauna and deteriorate human health. NO_x, for example, after oxidation forming nitric acid, contributes to the acid rain which has caused severe forest damage in the past decades. On the other hand, the photolysis of NO₂ leads to the formation of ozone which, in elevated concentration, can cause diseases of the human lung and bronchial system. For this reason, the legal emission standards have recently been repeatedly tightened up.

The internal combustion engine is still the predominant means of propulsion, and we have made great strides in reducing its impact on the environment. We have also come a long way in solving the practical problems of electric vehicles, and in developing applications that make full use of their potential. And of course, need leads the world in hybrid technology. Hybrid vehicles have been contributing to a cleaner environment since 1997. Finally, Compressed Air Technology (CAT), which is the zero emission vehicles, may become the ultimate power source of the 21st century.

The ultimate eco fuel will combine high efficiency with minimal environmental impact. It must be available in sufficient quantities, and it must be possible to harness and refine economically. Further, there needs to be an adequate distribution infrastructure in place. But what about the 700 million conventional vehicles already on the road and the many more to come? These vehicles need cleaner-burning fuels, too. Hydrogen may indeed turn out to be the ultimate eco fuel, but we must also consider the alternatives, and arrive at creative solutions to help solve the problems of today which is Compressed Air Technology (CAT).

In order to comply with the increasingly stringent standards in the field of emissions from road traffic, the automobile industry as well as other firms and research institutions have increasingly placed emphasis on the development of zero emission vehicles i.e. Compressed Air Technology (CAT) .

Compressed Air Technology (CAT):

Compressed Air Technology (C.A.T.) uses compressed air as its energy source and requires no gasoline or batteries to drive the engine. C.A.T. is developed by Mr. Guy Negre to run engines with compressed air. Although the technology is new, the idea isn't completely unknown to Formula One Cars & those interested in engine technology. In fact, every Formula One engine starts with a shot of compressed-air as an Energy-Booster. Guy Negre has simply extended its potential by turning it into a single source of energy for running the engine.

Construational Details

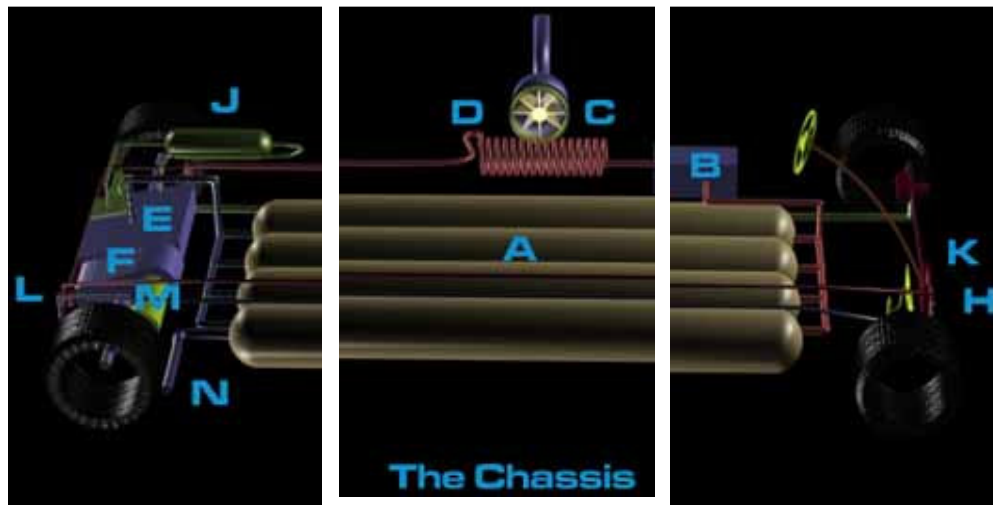


Fig.1:- Chassis of air powered car

In practical terms compressed air at 300 bars is stored in the carbon fibre tanks **A**. The air is released through the main line firstly to an alternator **B** where the first stage of decompression takes place. The now cold air passes through a heat exchanger **C** which adds thermal energy to the air and provides a convenient opportunity for air conditioning **D**. The warmed compressed air now passes to the motor **E**, where a two more stages of decompression and re-heating take place. The motor drives the rear axle **G** through the

transmission **F**. Control of engine speed is through a conventional accelerator pedal **H** controlling a valve within the motor.

An energy recycler **J** is under test which uses engine braking **K** to recompress air during braking into a secondary storage facility, providing additional energy for re-start and acceleration. Conventional hydraulic braking **L** is supplied. The vehicle can be refilled by using the onboard compressor **M** or by refilling the tank at an air station at **N**. Ultimately the engine generates 37 Kilowatts, notwithstanding the small size of this unit.

The "exhaust" leaves the engine at about zero degrees Celsius, a result of the expansion and cooling action. The exhaust is totally pure and fit to breathe. A compressed air driven engine offers enormous benefits to the car designer. Because of its small size and weight, and the removal of a host of devices and parts not required, the designer has free rein to maximize his materials and space to provide a simple, economic platform for the vehicle.

Working of cat engines

In principle the technology is very similar to the internal combustion system in that compressed air is used to drive a piston in a barrel. The secret of the engine lies in the way it efficiently converts the energy stored in the tanks of compressed air.

By way of explanation, it has long been known that to compress air to high pressures a staged process should be used, compressing air to first 50 bars, then to 150 bars then three hundred and so on. This technique, commonly employed by the air and gas liquefaction industries, uses a fraction of the energy used to compress the gas in one operation. The secret of the compressed air motor is simply to reverse the process - decompress the air in stages and in so doing efficiently release energy at each point in the chain.

HAZOP STUDIES IN CHEMICAL INDUSTRIES

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Introduction

The HAZOP process is based on the principle that a team approach to hazard analysis will identify more problems than when individuals working separately combine results. The HAZOP team is made up of individuals with varying backgrounds and expertise. The expertise is brought together during HAZOP sessions and through a collective brainstorming effort that stimulates creativity and new ideas, a thorough review of the process under consideration is made.

The HAZOP Process

The HAZOP team focuses on specific portions of the process called "nodes". Generally these are identified from the P&ID of the process before the study begins. A process parameter is identified, say flow, and an intention is created for the node under consideration. Then a series of guidewords is combined with the parameter "flow" to create a deviations. For example, the guideword "no" is combined with the parameter flow to give the deviation "no flow". The team then focuses on listing all the credible causes of a "no flow" deviation beginning with the cause that can result in the worst possible consequence the team can think of at the time. Once the causes are recorded the team lists the consequences, safeguards and any recommendations deemed appropriate. The process is repeated for the next deviation and so on until completion of the node. The team moves on to the next node and repeats the process.

Philosophy- Hazard vs. Operability Study

HAZOPs concentrate on identifying both hazards as well as operability problems. While the HAZOP study is designed to identify hazards through a systematic approach, more than 80% of study recommendations are operability problems and are not, of themselves, hazards. Although hazard identification is the main focus, operability problems should be identified to the extent that they have the potential to lead to process hazards, result in an environmental violation or have a negative impact on profitability. A definition of hazard and operability is given below.

Definitions

Hazard - any operation that could possibly cause a catastrophic release of toxic, flammable or explosive chemicals or any action that could result in injury to personnel.

Operability - any operation inside the design envelope that would cause a shutdown that could possibly lead to a violation of environmental, health or safety regulations or negatively impact profitability.

Process Hazard Analysis (PHA) Team Leader

The PHA team leader works with the PHA coordinator in defining the scope of the analysis and selection of team members. Directs the team members in gathering of process safety information prior to the start of the study. Plans the study with the PHA coordinator and schedule team meetings. Leads the team in the analysis of the selected process keeping team members focused on discovering hazards associated with the process and directs the team scribe in recording the results of the team's findings. Ensures that the analysis thoroughly covers the process as it is defined at the start of the hazard analysis and ensures that the study is completed in the time allotted during the planning stage. Writes a report detailing the study findings and recommendations the group makes and report the findings and recommendations to management. Fields any follow-up inquiries by project implementation regarding the study recommendations.

Engineering Experts

The engineering experts assigned to the process hazard analysis may include some or all of the following: a project engineer, a machinery engineer, an instrument engineer, an electrical engineer, a mechanical engineer, a safety engineer, a quality assurance engineer, maintenance engineer or technician and a corrosion/materials engineer. These individuals will be responsible for providing expertise in their respective discipline as it applies to the hazard analysis of the process being studied. These individuals are responsible for attending the initial hazard analysis kick-off meeting. They are also required to be available to the team as required with the understanding that the team leader will give adequate advance notice when their expertise is required. They are required to provide documentation of any existing safeguards and procedures.

Guidewords, Selection of Parameters and Deviations

The HAZOP process creates deviations from the process design intent by combining guide words (No, more, less, etc.) with process parameters resulting in a possible deviation from design intent. For example, when the guide word "No" is combined with the parameter "flow" the deviation "no flow" results. The team should then list all credible causes that will result in a no flow condition for the node. A sample list of guide words is given below. It should be pointed out that not all guideword/parameter combinations will be meaningful. A table of meaningful guideword/parameter combinations and their application are given in the Appendix.

Guidewords

- No
- More
- Less
- As Well As
- Reverse
- Other Than

The application of parameters will depend on the type of process being considered, the equipment in the process and the process intent. The HAZOP-PC software includes two pop-up menus that list both specific parameters and general parameters. The most common

specific parameters that should be considered are flow, temperature, pressure, and where appropriate, level. In almost all instances, these parameters should be evaluated for every node. The scribe shall document, without exception, the team's comments concerning these parameters. Additionally, the node should be screened for application of the remaining specific parameters (see list below) and for the list of applicable general parameters (see PHA-Pro 3™ software). These should be recorded only if there is a hazard or operability problem associated with the parameter. A sample set of parameters includes the following:

- Specific Parameters
- Flow
- Temperature
- Pressure
- Composition
- Phase
- Level
- Relief
- Instrumentation Sampling
- Corrosion/Erosion
- Services/Utilities
- Maintenance
- Addition
- Safety
- Reaction
- Inserting /Purging
- Contamination

Requirement:

Specific parameters should be considered by the team when evaluating each node. If a particular parameter does not change from one node to the next then it is not necessary to repeat all of the deviations that were considered in the previous node. Merely refer to that case in the deviations column of the node presently being considered.

The Concept of Point of Reference

When defining nodes and performing a HAZOP on a particular node it is useful to use the concept of point of reference (POR) when evaluating deviations. As an illustration of this idea, suppose in the example of the flash drum in section 5.3 the node consists of the flash drum and liquid product piping up to the flange on a product storage tank. If the deviation "no flow" is proposed then a dilemma becomes apparent when you start talking about the causes of no flow. If a cause of no flow is pipe rupture and the pipe ruptures at the flange connection on the flash drum. The term "no flow" is ambiguous since there is flow out of the flash drum but not through the piping to the storage tank. Therefore a POR should be clearly established at the time the node is defined. It is recommended to always establish the POR at the downstream terminus of the node.

Screening for Causes of Deviations

It is necessary to be thorough in listing causes of deviations. A deviation is considered realistic if there are sufficient causes to believe the deviation can occur. However, only credible causes should be listed. Team judgment is used to decide whether to include events with a very low probability of occurring. However, good judgment must be made by the team in determining what events have a low probability of occurring so that credible causes are not overlooked. There are three basic types of causes. They are:

1. Human error which are acts of omission or commission by an operator, designer, constructor or other person creating a hazard that could possibly result in a release of hazardous or flammable material.

2. Equipment failure in which a mechanical, structural or operating failure results in the release of hazardous or flammable material.
3. External Events in which items outside the unit being reviewed affect the operation of the unit to the extent that the release of hazardous or flammable material is possible. External events include upsets on adjacent units affecting the safe operation of the unit (or node) being studied, loss of utilities, and exposure from weather and seismic activity.

The level of detail required in describing causes of a deviation depends on whether or not the cause of the upset occurs in inside or outside the node. For example, suppose that a drum includes a level controller as part of the node. Suppose the level control valve closes resulting in a high level condition. Since the valve and controller are part of the node the causes should be stated in more detail. The valve may close because the wrong set point was input by an operator (human error); the valve may fail closed due to mechanical failure of the valve; or the valve may close due to loss of instrument air to the unit (external event). If the level controller were outside the node being studied it is sufficient to merely state "Level control valve LV-XXXX closes". When the team reaches the node in which the level controller is located then more detail can be listed for the various causes.

Consequences and Safeguards

The primary purpose of the HAZOP is identification of scenarios that would lead to the release of hazardous or flammable material into the atmosphere, thus exposing workers to injury. In order to make this determination it is always necessary to determine, as exactly as possible, all consequences of any credible causes of a release that are identified by the group. This will serve a twofold purpose. One, it will help to determine a risk ranking in HAZOPs where multiple hazards are uncovered by the group so that priority can be established in addressing the hazard. And two, it will help make the determination as to whether a particular deviation results in an operability problem or hazard. If the team concludes from the consequences that a particular cause of a deviation results in an operability problem only, then the discussion should end and the team should move on to the next cause, deviation or node. If the team determines that the cause will result in the release of hazardous or flammable material, then safeguards should be identified. Safeguards should be included whenever the team determines that a combination of cause and consequence presents a credible process hazard. What constitutes a safeguard can be summarized based on the following general criteria:

1. Those systems, engineered designs and written procedures that are designed to prevent a catastrophic release of hazardous or flammable material.
2. Those systems that are designed to detect and give early warning following the initiating cause of a release of hazardous or flammable material.
3. Those systems or written procedures that mitigate the consequences of a release of hazardous or flammable material.

The team should use care when listing safeguards. Hazards analysis requires an evaluation of the consequences of failure of engineering and administrative controls, so a careful determination of whether or not these items can actually be considered safeguards must be made. In addition, the team should consider realistic multiple failures and simultaneous

events when considering whether or not any of the above safeguards will actually function as such in the event of an occurrence.

Deriving Recommendations (Closure)

Recommendations are made when the safeguards for a given hazard scenario, as judged by an assessment of the risk of the scenario, are inadequate to protect against the hazard. Action Items are those recommendations for which an individual or department has been assigned. Information Needs are identified as recommendations in the software for follow-up by one of the team members. The following guidelines are suggested for the implementation of hazard analysis recommendations:

- I. High priority action items should be resolved within 4 months
- II. Medium priority action items should be resolved within 4-6 months, and
- III. Lower priority action items should be resolved following medium priority items.

Conclusion

Recommendations include design, operating, or maintenance changes that reduce or eliminate Deviations, Causes and/or Consequences. Recommendations identified in a hazard analysis are considered to be preliminary in nature. Requests for additional information or study can also be recommended.

HIDING TEXT IN IMAGE (STEGANOGRAPHY)

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Steganography is the art and science of writing hidden messages in such a way that no one, apart from the sender and intended recipient, suspects the existence of the message, a form of security through obscurity. The word steganography is of Greek origin and means "concealed writing" from the Greek words steganos meaning "covered or protected", and graphei meaning "writing", where common practices consisted of etching messages in wooden tablets and covering them with wax, and tattooing a shaved messenger's head, letting his hair grow back, then shaving it again when he arrived at his contact point.

Generally, messages will appear to be something else: images, articles, shopping lists, or some other cover text and, classically, the hidden message may be in invisible ink between the visible lines of a private letter.



Steganography includes the concealment of information within computer files. In digital steganography, electronic communications may include steganographic coding inside of a transport layer, such as a document file, image file, program or protocol. Media files are ideal for steganographic transmission because of their large size. As a simple example, a sender might start with an innocuous image file and adjust the color of every 100th pixel to correspond to a letter in the alphabet, a change so subtle that someone not specifically looking for it is unlikely to notice it.

Steganography sometimes is used when encryption is not permitted. Or, more commonly, steganography is used to supplement encryption. An encrypted file may still hide information using steganography, so even if the encrypted file is deciphered, the hidden message is not seen.

Special software is needed for steganography, and there are freeware versions available at any good download site. Following is one such link.

<http://www.4shared.com/file/vhiXU4Sa/ImageHide.html>

Here is a free application to hide your text in a image file. What you have to do is just load an image file, type the text you want to hide and click on "write data" and save the image file.

You can also encrypt the image file with a password by clicking on "Encrypt".

CAN PLASTICS HELP IN FLEXIBLE PAVEMENT CONSTRUCTION.....?

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Plastic, the first thing which we get into minds on listening to this word is waste, garbage, pollution, non-biodegradable substances. But in the present scenario, it got completely a different form, as it is used for construction purpose. Can plastic really be a part of flexible pavement? Yes, this is true that the so called plastic waste is now used in flexible pavement construction along with bitumen and by coating the aggregates.

General usage of plastic:

Plastic has become one of the essential substances in manufacturing and found its use in almost all fields. The general use of plastic is mostly in the form of carry bags, cups etc. The consumption has increased from 4000tonns/annum to 4million tones/annum. Plastic is maximum used for packing purpose, which is non-biodegradable & can neither be composed by landfills and incinerated.

At the beginning, plastic was used along with bitumen, but later on used as coating on aggregates for pavement laying. This is used as one of the construction materials because of several reasons like better binding property, strength, water resistance and so on. It even reduces plastic waste and pollution, since most of the polymer is waste.

Polymer modified Bitumen:

Bitumen, a petroleum derivative is used in construction purposes for binding aggregate. It improves strength of road. It is in general resistant to water, air to some extent. But if any of the agents combine they lead to brittleness and damage of the structure. After conducting studies on thermal behaviour & binding property of the molten plastic promotes plastic waste bitumen blend. This improves quality of bitumen.

Characterization of plastic waste

The properties of plastic were studied by conducting tests like thermal test, binding test and stripping test. These studies further helped in preparation of plastic waste-bitumen.



Preparation of Blend

The preparation of blend will be carried in a systematic manner. Polyethylene carry bags are cut into pieces using a shredding machine. The plastics pieces passing through 4.75mm sieve and retaining at 2.36mm sieve are used in the process. These plastic pieces will be added slowly to the hot bitumen of temperature around 170-180°C, which will be stirred well using mechanical stirrer for about 20-30 minutes. Now the plastic mixture is mixed with bitumen to conduct tests on it.

After preparation, the blend will be undergoing a set of tests. By these tests one can know different characteristic qualities of it. The tests are

- Separation test
- Penetration Test
- Ductility Flash and fire point
- Stripping Test
- Marshall Test



LIMITATIONS:

- Needs high power stirrer with thermostatic facilities to maintain temperature around 180°C. Increase in it may affect bitumen.
- The proper storage of such polymer-blended bitumen is very important. It should be stored in a freezer and it is also referred that it is stable for 6 hrs at a temperature of 180°C.
- If plastic is mixed beyond the soluble range (from 2% and above) the excess plastic material gets separated on cooling.

These limitations necessitated developing an alternate method for using higher percentage of plastic waste for flexible pavement.

Modified Process (Dry Process)

Now there exists an alternate method in which aggregate coated with plastic is used as the raw material but bitumen won't be blended with plastic waste. In this high percent of plastic is effectively used.

Preparation of Plastic-Waste Coated Aggregate

The aggregate gets heated to around 170°C. The plastic waste which is shredded to the size varying between 2.36mm and 4.75mm should be added over hot aggregate. Constant mixing is necessary to give a uniform distribution. The plastic gets softened and coated over the aggregate which will be used in mixed with the hot bitumen.



Characterization of PCA-Bitumen Mix

The characterization of plastic coated aggregate-bitumen mix (PCA-BITUMEN MIX) can be known by conducting stripping and Marshall Stability test. The test values are more than that of pure bitumen, which shows that this can PCA-Bitumen mix, is one of the best road construction materials.

Polymer Modified Bitumen is used due to its better performance. But in the case of higher percentage of polymer bitumen blend, the blend is a more polymer dispersion in bitumen, which gets separated on cooling. This may affect the properties and quality of the blend.

In the modified process (dry process) plastics-waste is coated over aggregate. This helps to have better binding of bitumen with the PCA-aggregate due to increase bonding and area of contact between polymer and bitumen. Even there are many other uses as stated below

The dry process thus helps to

- Use higher percentage of plastic waste
- Reduce the need of bitumen by around 10%
- Increase the strength and performance of the road & can withstand heavy traffic and show better durability.
- Avoid the use of anti-stripping agents.
- Reduces voids, which prevents absorption of moisture and oxidation of bitumen.
- Resulted in reduced rutting, raveling, and there is not pothole formation. The road Reduce the cost to around Rs. 5000/Km. of single lane road
- Carry the process in situ
- Avoid disposal of plastic waste by incineration and land filling.
- Add value to plastic waste
- Generate jobs for rag pickers
- Develop a technology, which is eco-friendly
- Use of Waste Plastic in Construction of Flexible Pavement
- Since this is made out of waste there is no chance of further waste production.

APPLICATIONS

Since there are many advantages in different aspects like strength, water resistance etc by using plastic in construction, their applications are increasing. Road length of more than 1200 km was laid at different places in Tamil Nadu, Cochin, Mumbai, and Pondicherry. The corporation laid test roads using this technology. The roads are exposed to heavy traffic, monsoonal change, heavy rain, hot summer etc. The roads are functioning well without

potholes, raveling and rutting. In recent times, this was even used in the foundation of a flyover bridge constructed in Kakinada.

CASE STUDY-BENGALURU

Nearly one-fourth of the waste generated in Bangalore everyday comprises plastic. But Ahmed Khan, Founder of KK Plastic Waste Management, discovered a unique and an innovative way to use the waste to make better and stronger roads. The plastic he collected has helped pave a 430-km stretch of road. He goes to dump yard every day where he uses his patented technology to mix tons of the city's plastic waste with bitumen that's used to construct roads. The technology has also given the city a way to get rid of the 9,000 tons of plastic waste it generates every day. He tied up with the Bangalore Mahanagara Place to use plastic in laying 40 per cent of the city's roads.

By this we can come to a point that plastic waste which is considered to be a menace, now turned to be a very important construction material, which helped to uplift the properties of aggregates and their binding materials. The entire test almost turned to be in its favour. By this technology even we can reduce the plastic waste there by controlling pollution. More over there are mostly no disadvantages by using this technique. This can be one of the best technologies which are in practise in some parts, which is soon going to lead the pavement construction field. It would be a boon to the country if it comes into full practise. Let's hope so and we being Civil engineers conduct much more studies on such things and contribute to the society.

APACHE HADOOP

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The Apache Hadoop project develops open-source software for reliable, scalable, distributed computing. The Apache Hadoop software library is a framework that allows for the distributed processing of large data sets across clusters of computers using a simple programming model. It is designed to scale up from single servers to thousands of machines, each offering local computation and storage. Rather than rely on hardware to deliver high-availability, the library itself is designed to detect and handle failures at the application layer, so delivering a highly-available service on top of a cluster of computers, each of which may be prone to failures.

The project includes these subprojects:

- [Hadoop Common](#): The common utilities that support the other Hadoop subprojects.
- [Hadoop Distributed File System \(HDFS\)](#): A distributed file system that provides high-throughput access to application data.
- [Hadoop Map Reduce](#): A software framework for distributed processing of large data sets on compute clusters.

Other Hadoop-related projects at Apache include:

- [Avro](#): A data serialization system.
- [Cassandra](#): A scalable multi-master database with no single points of failure.
- [Chukwa](#): A data collection system for managing large distributed systems.
- [HBase](#): A scalable, distributed database that supports structured data storage for large tables.
- [Hive](#): A data warehouse infrastructure that provides data summarization and ad hoc querying.
- [Mahout](#): A Scalable machine learning and data mining library.
- [Pig](#): A high-level data-flow language and execution framework for parallel computation.

- [ZooKeeper](#): A high-performance coordination service for distributed applications.

A wide variety of companies and organizations use Hadoop for both research and production. Users are encouraged to add themselves to the Hadoop Powered by wiki page.

In 2010, Face book claimed that they have the largest Hadoop cluster in the world.

Besides Face book and Yahoo!, many other organizations are using Hadoop to run large distributed computations. Some of the notable users include:

- | | |
|---------------------|--------------------------------------|
| • Amazon.com | • Federal Reserve Board of Governors |
| • American Airlines | • foursquare |
| • AOL | • Fox Interactive Media |
| • Apple | • Hewlett-Packard |
| • eBay | • IBM |

Now that Apache.org has listed more than 150 enterprises as Hadoop users -- including JPMorgan Chase, IBM, Google, Booz Allen Hamilton and the New York Times -- it seems likely that the big data management system could soon become all the rage among corporate IT executives.

This is a bug fix release for version 1.0. This release is now considered stable, replacing the long-standing 0.20.203.

Bug fixes in this minor release include

- Added hadoop-client and hadoop-miniclust artifacts for ease of client install and testing
- Support run-as-user in non-secure mode
- Better compatibility with Ganglia, HBase, and Sqoop

Apache Avro™ is a data serialization system.

HBase is the Hadoop database. Think of it as a distributed scalable Big Data store.

HBase provides

- Linear and modular scalability.
- Strictly consistent reads and writes.
- Automatic and configurable sharing of tables
- Automatic failover support between Region Servers.
- Convenient base classes for backing Hadoop Map Reduce jobs with HBase tables.
- Easy to use Java API for client access.
- Block cache and Bloom Filters for real-time queries.
- Query predicate push down via server side Filters

- Thrift gateway and a REST-ful Web service that supports XML, Protobuf, and binary data encoding options
- Extensible ruby-based (JIRB) shell
- Support for exporting metrics via the Hadoop metrics subsystem to files or Ganglia; or via JMX.

Hive is a data warehouse system for Hadoop that facilitates easy data summarization, ad-hoc queries, and the analysis of large datasets stored in Hadoop compatible file systems. Hive provides a mechanism to project structure onto this data and query the data using a SQL-like language called HiveQL. At the same time this language also allows traditional map/reduce programmers to plug in their custom mappers and reducers when it is inconvenient or inefficient to express this logic in Hiveql

Apache Pig is a platform for analyzing large data sets that consists of a high-level language for expressing data analysis programs, coupled with infrastructure for evaluating these programs. The salient property of Pig programs is that their structure is amenable to substantial parallelization, which in turns enables them to handle very large data sets.

At the present time, Pig's infrastructure layer consists of a compiler that produces sequences of Map-Reduce programs, for which large-scale parallel implementations already exist (e.g., the Hadoop subproject). Pig's language layer currently consists of a textual language called Pig Latin, which has the following key properties:

- **Ease of programming:** It is trivial to achieve parallel execution of simple, "embarrassingly parallel" data analysis tasks. Complex tasks comprised of multiple interrelated data transformations are explicitly encoded as data flow sequences, making them easy to write, understand, and maintain.
- **Optimization opportunities:** The way in which tasks are encoded permits the system to optimize their execution automatically, allowing the user to focus on semantics rather than efficiency.
- **Extensibility:** Users can create their own functions to do special-purpose processing.

ZooKeeper is a centralized service for maintaining configuration information, naming, providing distributed synchronization, and providing group services. All of these kinds of services are used in some form or another by distributed applications. Each time they are implemented there is a lot of work that goes into fixing the bugs and race conditions that are inevitable. Because of the difficulty of implementing these kinds of services, applications initially usually skimp on them, which make them brittle in the presence of change and difficult to manage. Even when done correctly, different implementations of these services lead to management complexity when the applications are deployed.

But analysts and early users warn that companies should move slowly to take advantage of the open-source technology, noting that Hadoop requires extensive training along with analytics expertise not seen in many IT shops today.

Some also noted that the swollen ranks of suppliers of Hadoop technology could soon thin out, leaving some users without vendor support for the complex technology.

To be sure, Hadoop clearly has some technical advantages over traditional database management systems; especially its ability to simultaneously handle both structured data and unstructured information such as video, audio and email messages. Hadoop systems can also scale with minimal fuss and bother.

Forrester Research analyst James Kobielus pointed out that only about 1% of U.S. enterprises are currently using Hadoop in production environments. That figure should remain small for now, perhaps growing to 2% or 3% over the course of the year, he projected.

Concurrent Computer and eBay may be more typical of today's early Hadoop adopters; they use the big data technology for specific applications while maintaining traditional relational database technology for the bulk of their IT operations.

As such IT operations build up expertise, they can figure out more things to do with Hadoop, Kobielus said.

Online auction house eBay stores unstructured data on Hadoop-based clusters running on "thousands" of nodes, while using relational databases for key tasks like transaction processing, said Hugh Williams, vice president of experience, search and platforms.

RECOVERING LOST DATA IN HDD WHEN IT CRASHES

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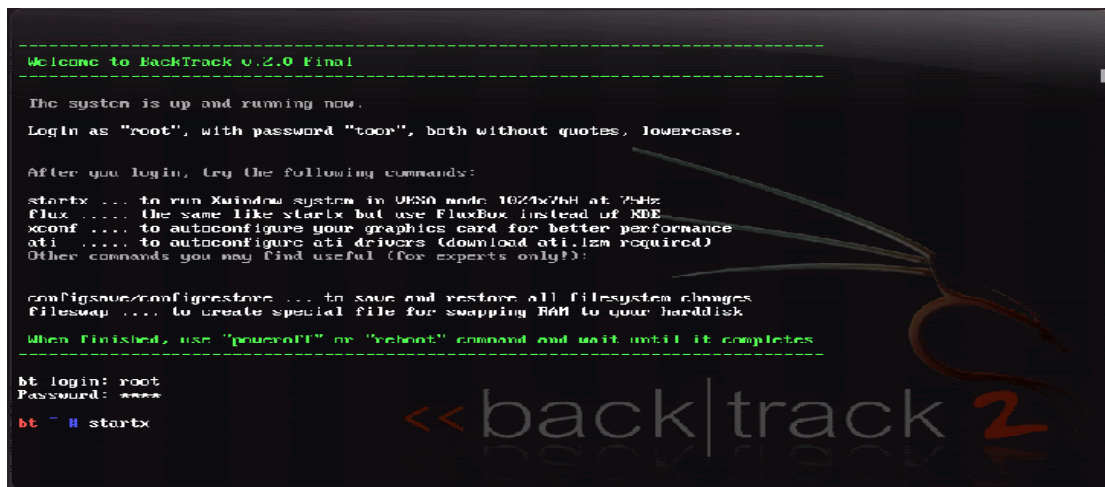
Now a days, most of the laptops, we are purchasing, are coming with a Hard Disk, which has a single partition. So, we are using that single drive, which we often have our default Operating System files and folders. So we will store our information in the available one and only drive. If any the Hard disk crashes, there is no other way to retrieve the data (formatting is the only way). So at that time, if we have very important information in our hard disk, which we cannot loose, then it costs very high.

Using an open source utility, we can get all the data that has been lost inside our hard disk including the free space which is usually allocated for operating system files. That is BackTrack.

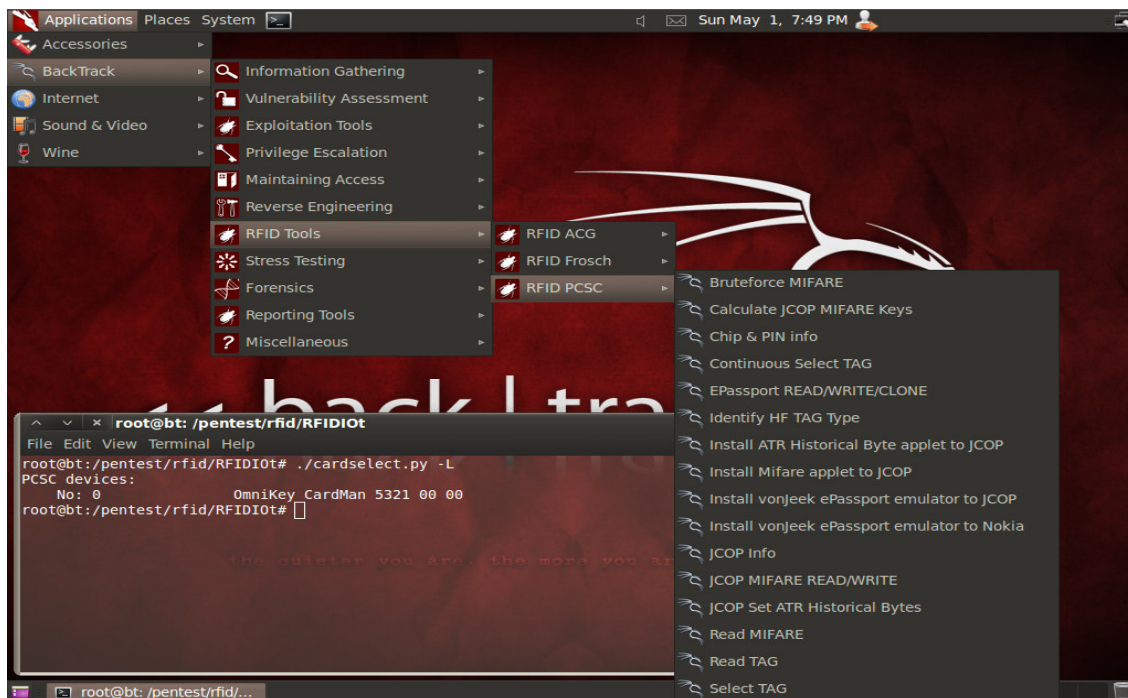
BackTrack is an operating system based on the Ubuntu GNU/Linux distribution aimed at digital forensics and penetration testing use. It is named after backtracking, a search algorithm. The current version is BackTrack 5 R2. So when we are unable to boot from our Hard Disk, then if we insert BackTrack cd and if we boot from this, it will have its own user interface (GUI) and through that, we can explore the data stored by us in the drive. And even you can hack windows, create an admin account with the support of this OS. But make sure that you use it for a proper cause only.

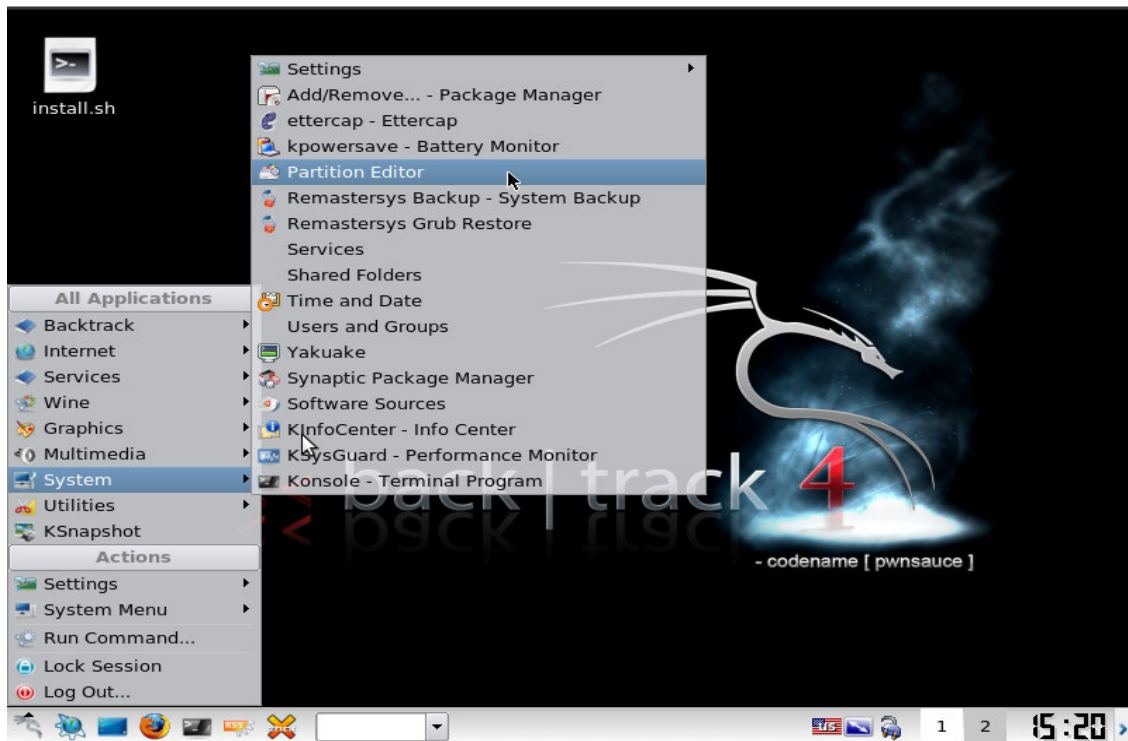
BackTrack is intended for all audiences from the most savvy security professionals to early newcomers to the information security field. BackTrack promotes a quick and easy way to find and update the largest database of security tools collection to-date.

After inserting BackTrack CD/DVD, and booting from it, we can start its GUI using startx command and can start doing our work. It has many uses. But here it will be useful for windows users for recovering the data because BackTrack can be run as a live DVD environment which will not affect our Windows install in any way.



After the GUI is started, start exploring all of your windows files. And even you can delete some effected virus files from here if any, so that next time when you boot windows, those virus files cannot effect windows environment.





More information about BackTrack at <http://www.backtrack-linux.org/backtrack/> and its download at <http://www.backtrack-linux.org/downloads/>

IPMSM TECHNOLOGY FOR HYBRID ELECTRIC VEHICLES

- Advances in Hybrid Electrical Machines.

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Abstract

Synchronous machines have been improving their technology over the past years. Over this period, interior permanent magnet synchronous machines (IPMSM) have expanded their presence in the commercial marketplace from few specialized markets such as machine tools, air conditioner compressors, servo drives to mass-produced applications, including high-efficiency electric traction drives for the latest generation of hybrid-electric vehicles (HEV). Power ratings of available IPM motor drives have dramatically expanded by approximately three orders of magnitude during this period, now reaching power levels up to 1 MW ratings. Closer examination reveals that several different knowledge-based technological advancements and market forces have combined, sometimes in fortuitous ways, to accelerate the development of the impressive IPMSM drives technology that we find available today. The purpose of this technology is to provide a broad explanation of the various factors that

lead to the current state-of-the-art IPM technology, and to illustrate its application success in the commercial sector, including automotive industry.

Introduction

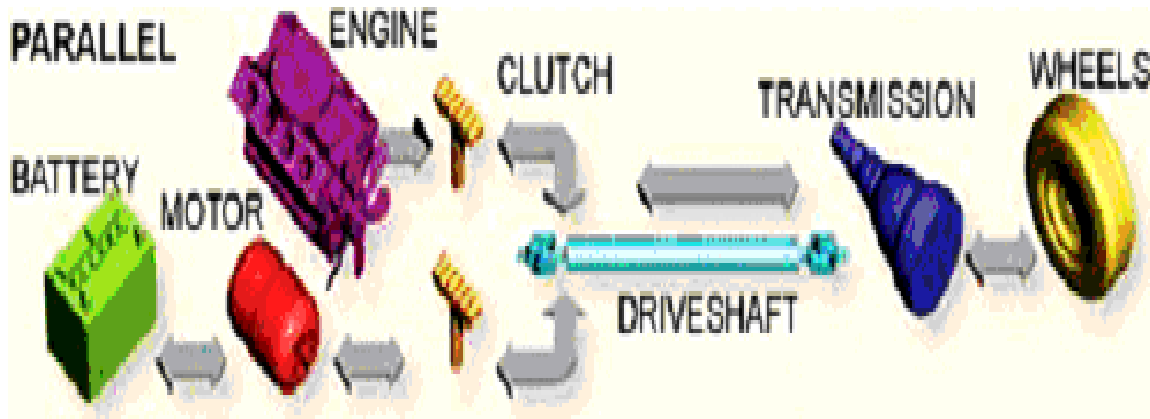
Electric power system forms the backbone of the modern society. Electricity and its accessibility are the greatest engineering achievements in the past century. In the 21st century, global warming has become an important issue. Modern human beings, who need electric energy technologies for climate controlled home and work place environments via air conditioners and mass transportation using cars as necessities, cannot put up with the inconveniences of the past. In order to maintain and develop this energy consuming technologies, availability of sustainable energy sources and their effective uses through efficiency improvements are of paramount importance. Power electronics and electric motor drives are the enabling technologies crucial for industrial competitiveness in the world market place. One of the most valuable achievements in power electronics is to introduce degree of freedom to variable frequency from the fixed value of the generated ac power supplies. Over 60 % of the generated energy is consumed by electric motors. Variable ac speed drive, which regulates the speed of the motor by controlling the frequency, can significantly reduce the energy consumption, particularly in heavy-duty cycle fans, pumps, compressors and traction in hybrid electric vehicles. Thus improvements in efficiency of the electric motor drive systems are the most effective measures to reduce primary energy consumption; and thereby reduce CO₂ gas emissions, which cause global warming.

Analysis

The principle of operation of any rotating electric motor is derived from Lorentz force. A current carrying conductor placed in a magnetic field is acted upon by a force by way of the *BLI* rule. For a conventional synchronous motor the stator is fed from 3-phase balanced voltage source and rotor field winding is supplied by dc excitation current through slip rings. The machine starts as an induction motor, and when it attains near synchronous speed, the dc excitation current is switched on. The rotor is snapped into synchronism and it runs at synchronous speed. The obvious disadvantage is that the motor needs two sources of power; one ac from the stator and dc through the rotor involving brushes and slip rings. Unlike in induction motor, the speed of a synchronous motor is constant irrespective of loads. But an induction machine is a singly fed motor. The rotor is squirrel cage, simple and robust. The disadvantage is that it cannot operate at synchronous speed N_s , and the rotor speed N_r decreases with load in the normal stable region of the torque speed curve. Thus an induction motor is an inherently inefficient motion control device, with its speed $N_s(1-S)$, where Slip $S = (N_s - N_r)/N_s$. These disadvantages of both the conventional doubly fed synchronous motor and the singly fed induction motor can be overcome by means of a permanently excited singly fed IPM motor. An IPM motor can be an induction start but synchronously run high efficiency motor. It is sometimes referred as induction-synchronous motor. It must overcome the magnet brake torque at starting. The IPM motor can also be started by direct control of stator magnetic field, so as to react with the permanent magnet and produce torque. However, there are many challenges to overcome.

Some are given as follows:

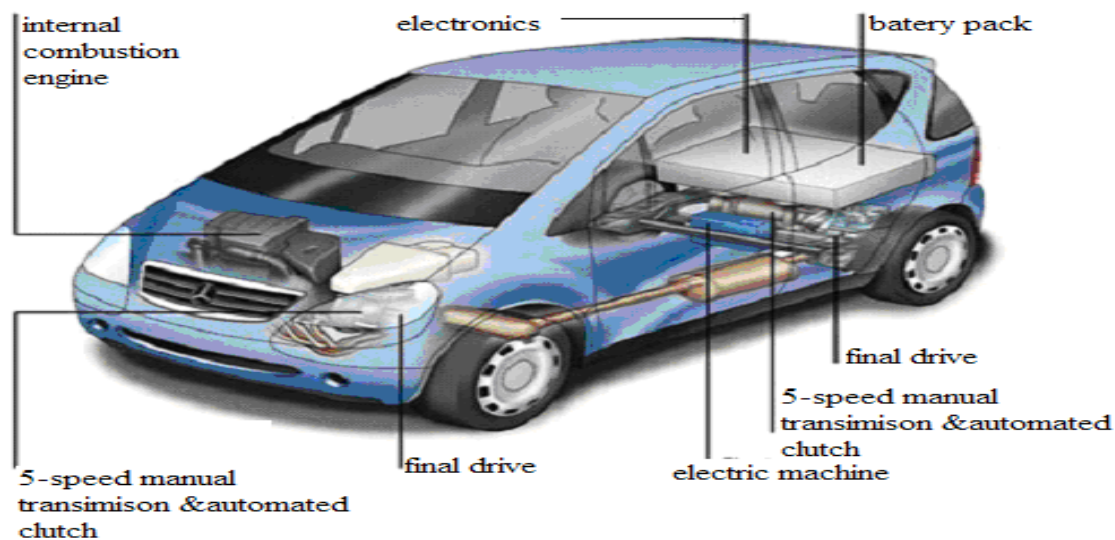
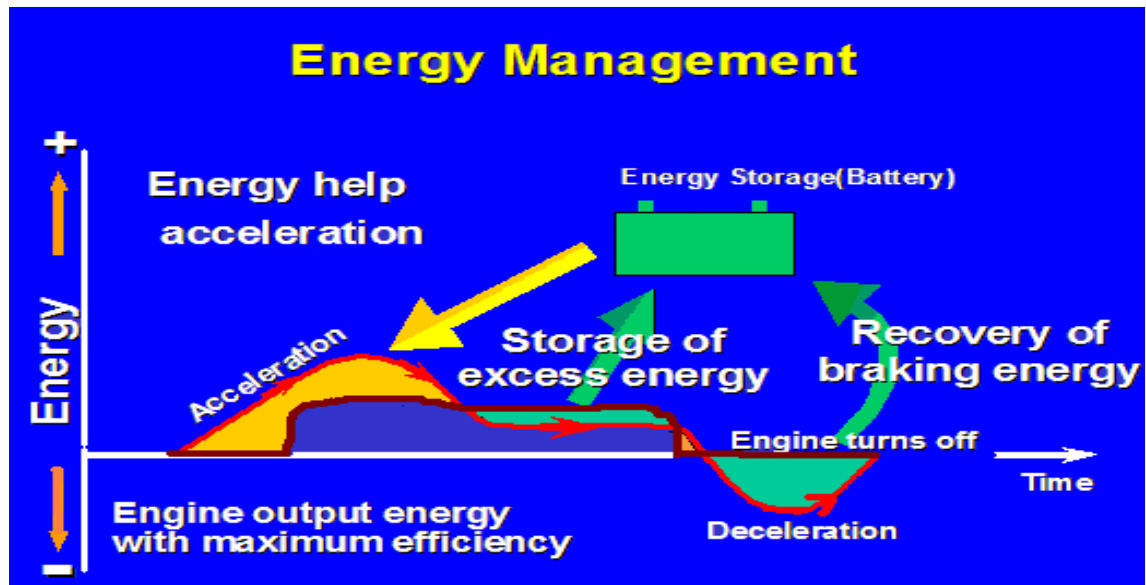
- Create variation of d-q axis inductances without varying air gap.
- Vary and control of excitation of permanently excited rotor of IPM motor.
- Optimum variation of PM torque and reluctance torque for specific applications.
- Reduction of cost, weight and size of IPM motor.
- Intelligent converter and inverter for IPM drive.



Applications

IPM motors with intelligent power module are now used for heavy duty cycle loads, which include ventilation fans, blowers, air conditioner, heat pumps, compressors, cranes, elevators/escalators, blood pumps, ship propellers, locomotive traction drives, electric and hybrid electric vehicles (HEV). The ratings span from few watts to few megawatts range. Double IPM motors are now increasingly used for energy saving applications in hybrid electric vehicles.

The following figure shows the energy management graph and the schematic diagram of the hybrid electric vehicle



The key requirements of IPM propulsion motors for HEV applications include:

High torque and power density, high torque at low speeds for starting and uphill climb, but high power at high cruising speeds, maximum efficiency over wide speed and torque ranges including at low torques, wide speed range with constant power mode, exceeding 2-4 times the base speed, optimum compromise between motor peak torque and volt-ampere ratings, short term overload capability, typically twice the rated torque over short duration, low acoustic noise, low cogging torques, low torque ripples, optimized stator distributed winding with minimum total harmonic distortion factor, reduction of cross-coupling magnetic saturation, least magnet flux leakage, magnet demagnetization withstand with respect to armature reaction, temperature and load and no load stator iron loss at high speeds, high reliability and robustness for various operating conditions, minimum weight and smallest size, low fuel consumption rate, clean, quiet, smooth, powerful, efficient and having low cost.

Conclusion

This gives a brief introduction to the emergence of high efficiency interior permanent magnet synchronous motors (IPMSM). Highlight of IPM motor drives includes its wide spread application in hybrid electric vehicles (HEV), which are just one of many items of ac motor drives in passenger automobiles to save precious energy.

References

1. M.A. Rahman, "Combination Hysteresis, Reluctance, Permanent Magnet Motor", US Patent No. 5,187,401.
2. F.W. Merrill, "Permanent Magnet Excited Synchronous Motors", AIEE Transactions, vol.74, 1955, 1754-1760.

TELEPORTATION

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INTRODUCTION:

Ever since the wheel was invented more than 5,000 years ago, people have been inventing new ways to travel faster from one point to another. The chariot, bicycle, automobile, airplane and rocket have all been invented to decrease the amount of time we spend getting to our desired destinations. Yet each of these forms of transportation shares the same flaw: They require us to cross a physical distance, which can take anywhere, from minutes to many hours depending on the starting and ending points.

But what if there were a way to get you from your home to the supermarket without having to use your car, or from your backyard to the International Space Station without having to board a spacecraft? There are scientists working right now on such a method of travel, combining properties of telecommunications and transportation to achieve a system called **teleportation**.

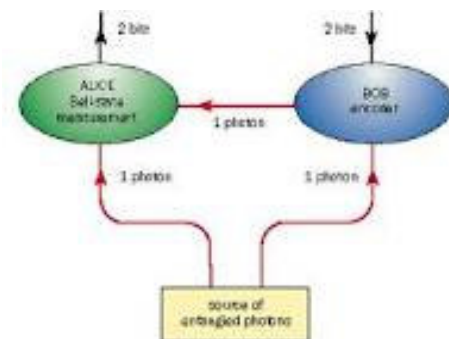


Teleportation involves dematerializing an object at one point, and sending the details of that object's precise atomic configuration to another location, where it will be reconstructed. What this means is that time and space could be eliminated from travel -- we could be transported to any location instantly, without actually crossing a physical distance.

Many of us were introduced to the idea of teleportation, and other futuristic technologies, by the short-lived **Star Trek**

television series (1966-69) based on tales written by Gene Roddenberry. Viewers watched in amazement as Captain Kirk, Spock, Dr. McCoy and others beamed down to the planets they encountered on their journeys through the universe.

In 1993, the idea of teleportation moved out of the realm of science fiction and into the world of theoretical possibility. It was then that physicist **Charles Bennett** and a team of researchers at IBM confirmed that **quantum teleportation** was possible, but only if the original object being teleported was **destroyed**. This revelation, first announced by Bennett at an annual meeting of the American Physical Society in March 1993, was followed by a report on his findings in the March 29, 1993 issue of Physical Review Letters. Since that time, experiments using photons have proven that quantum teleportation is in fact possible.



Principle

The main barrier for teleportation of objects is larger than a photon. This principle states that you cannot simultaneously know the location and the speed of a particle. But if you can't know the position of a particle, then how can you teleport it? In order to teleport a photon without violating the Heisenberg Principle, the Caltech physicists used a phenomenon

known as **entanglement**. In entanglement, at least three photons are needed to achieve quantum teleportation:

- Photon A: The photon to be teleported
- Photon B: The transporting photon
- Photon C: The photon that is entangled with photon B

If researchers tried to look too closely at photon A without entanglement, they would bump it, and thereby change it. By entangling photons B and C, researchers can extract some information about photon A, and the remaining information would be passed on to B by way of entanglement, and then on to photon C. When researchers apply the information from photon A to photon C, they can create an exact replica of photon A. However, photon A no longer exists as it did before the information was sent to photon C

Human Teleportation

We are years away from the development of a teleportation machine like the transporter room on Star Trek's Enterprise spaceship. The laws of physics may even make it impossible to create a transporter that enables a person to be sent instantaneously to another location, which would require travel at the speed of light. In the Star Trek episodes, and the spin-off series that followed it, teleportation was performed by a machine called a transporter. This was basically a platform that the characters stood on, while Scotty adjusted switches on the transporter room control boards. The transporter machine then locked onto each atom of each person on the platform, and used a transporter carrier wave to transmit those molecules to wherever the crew wanted to go. Viewers watching at home witnessed Captain Kirk and his crew dissolving into a shiny glitter before disappearing, rematerializing instantly on some distant planet.

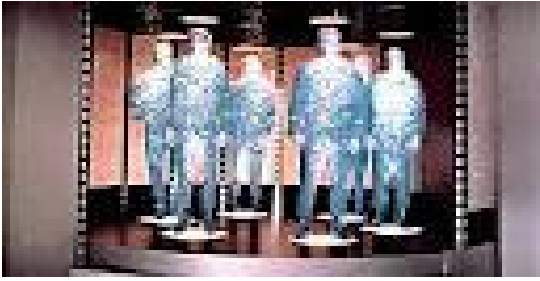


If such a machine were possible, it's unlikely that the person being transported would actually be "transported." It would work more like a fax machine -- a duplicate of the person would be made at the receiving end, but with much greater precision than a fax machine. But what would happen to the original? One theory suggests that teleportation would combine genetic cloning with digitization.

In this **biodigital cloning**, tele-travelers would have to die, in a sense. Their original mind and body would no longer exist. Instead, their atomic structure would be recreated in another location, and digitization would recreate the travellers' memories, emotions, hopes and dreams. So the travelers would still exist, but they would do so in a new body, of the same atomic structure as the original body, programmed with the same information.

But like all technologies, scientists are sure to continue to improve upon the ideas of teleportation, to the point that we may one day be able to avoid such harsh methods. One day, one of your descendants could finish up a work day at a space office above some far away planet in a galaxy many light years from Earth, tell his or her wristwatch that it's time to

beam home for dinner on planet X below and sit down at the dinner table as soon as the words leave his mouth.



For a person to be transported, a machine would have to be built that can pinpoint and analyze all of the 10^{28} atoms that make up the human body. That's more than a trillion trillion atoms. This machine would then have to send this information to another location, where the person's body would be reconstructed with exact precision. Molecules couldn't be even a

millimetre out of place, lest the person arrive with some severe neurological or physiological defect. **Teleportation** is a term that refers to a number of theories and notions concerning the transfer of matter from one point to another without traversing the physical space between them, similar to the concept *apport*, an earlier word used in the context of spiritualism.

Teleportation is the transfer of physical objects from one place to another, distant place, without transferring the physical particles that constitute the original object. By most definitions, the object in its original location is either destroyed or rendered otherwise unrecognizable and unable to function. This limits teleportation devices to transportation roles only, incapable of duplicating or manufacturing objects. Although teleportation devices were until recently considered by the scientific community to stay confined to the realm of science fiction, recent understandings of quantum mechanics have led to the development of successful teleportation techniques.

The current state of the art in teleportation technology, having successfully moved relatively large masses relatively large distances, relies on the uncertainty principle and quantum entanglement phenomenon. The uncertainty principle states that the more information that is extracted from an object, the more the object is malformed. The point in which the object is so malformed as to prevent further scanning occurs well before enough information is extracted to produce an exact copy. Quantum entanglement allows the quantum state of one particle to be predicted based upon the quantum state of another particle that had once been in contact with it. Thus, a teleportation sending station and receiving station can be prepared by bringing two such particles into contact, and then bringing one to the sending station, and the other to the receiving station. The particle at the sending station is then scanned along with the object to be teleported. The scanning process malforms both the particle and the object. The scanned information is then sent to the receiving station, which then performs the reverse process to raw material together with the second particle. As the second particle is currently in the same quantum state as the first particle, together with the original object, the finished product is identical to the original object.

The first objects to be successfully teleported were photons, or light particles. These massless particles are ideal for such experimentation as they have relatively few quantum states and readily entangle with other photons. As early as 1998 experiments have proven with over 75% accuracy that the quantum state of a photon can be imparted on a distant photon by way of an intermediate photon that is quantumly entangled with the target photon. While this method could theoretically be used to transmit **data**, it would not permit the movement of tangible objects. Six years later, two separate research teams had independently succeeded in teleporting collections of atoms. Although the atoms themselves had been teleported, their respective arrangement had not been preserved. Thus, the current state of the art does not permit the teleportation of large or complex structures. However, new

developments in technology, as well as a more thorough understanding of quantum mechanics, may help researchers overcome that obstacle.



Future Expectation

In about 300 years, teleportation will be possible and within the knowledge of human technology. If you doubt that, read this article and you will understand. Scientists already know how to do it, but they don't have enough technology.

It's not the kind you see in TV, that people teleport anywhere with mind powers. The actual teleportation is a big scanner that people go in and every one of their atoms is scanned, type (H^2 , C, O^2 , O^3), and their exact position. A modern computer sends the info to the destiny computer and it makes a person from a barrel of oil by changing its atoms form and position. Scientists can only teleport a few atoms these days, and anyway, there would be a problem. The person that goes into the scanner has to be scanned and disintegrated very quickly, otherwise the person would die in the middle of the process. And even if it is quick, after the disintegration, the person is dead, and another person exactly like the one that died appears in the destiny with the exact same memories, but it still wouldn't be the same person, she wouldn't be able to tell if it's her or not. The good thing is that you would be able to teleport objects!

AIR CUSHION VEHICLE HOVERCRAFT (ACV)

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Introduction

Air-cushion machine, also called ground-effect machine, or hovercraft, any of the machines characterized by movement in which a significant portion of the weight is supported by forces arising from air pressures developed around the craft, as a result of which they hover in close proximity to the Earth's surface. It is this proximity to the surface that chiefly distinguishes such craft from aircraft which derive their lift from aerodynamic forces created by movement through the air. Two main classes of air-cushion vehicles exist: those that generate their own pressure differential irrespective of forward speed; and those, more closely related to true aircraft, that require forward speed before the pressure differential can be generated. The former are classed as aerostatic crafts (ACVs); the latter are called aerodynamic ground-effect machines (GEMs). A hovercraft or air-cushion vehicle (ACV) is a craft, designed to travel over any smooth surface supported by a cushion of slow moving, high-pressure air, ejected downwards against the surface below, and contained within a skirt. Because they are supported by a cushion of air, hovercraft are unique among all forms of ground transportation in their ability to travel equally well over land, ice, and water.

A land transportation system comprising a fully enclosed tubular guide way and a self-propelled air cushion vehicle disposed in the guide way for providing short and long distance transportation within the environment. Air cushion vehicles can easily traverse terrains from asphalt to quicksand and can be used for tasks ranging from their well-known use as high-speed water transportation for people, vehicles and freight to ice or flood rescue and harvesting cranberries. Since an air cushion vehicle travels on a cushion of air it reduces or eliminates damage to ground surfaces. This makes it the transport of choice when avoidance of environmental damage is our concern. An air cushion vehicle also can travel on surfaces which are not otherwise easily traversable such as thin ice, swamps and marshes. Air-cushion vehicles can attain higher speeds than can either ships or most land vehicles and use much less power than helicopters of the same weight. Air-cushion suspension has also been applied to other forms of transportation, in particular trains, such as the French Aero train and the British Hover train. A relatively smooth land or water surface, however, is a necessity; most of these vehicles cannot clear waves higher than 3 to 5 1/2 ft (1–1.67)

History

The first man to research the air-cushion vehicle concept was Sir John Thornycroft, a British engineer who, in the 1870s, began to build test models to check his theory that drag on a ship's **hull** could be reduced if the vessel were given a concave bottom in which air could be contained between hull and water. His patent of 1877 emphasized that "provided the air cushion could be carried along under the vehicle" the only power that the cushion would require would be that necessary to replace lost air.

In the meantime aviation developed, and pilots early discovered that when they were flying very close to land or water surface their aircraft developed greater lift than in free air. It was soon determined that the greater lift was available because **wing** and ground together created a "funnel" effect, increasing the air pressure. The amount of additional pressure proved dependent on the design of the wing and its height above ground. The effect was strongest when the height was between one-half and one-third of the average front-to-rear breadth of the wing (chord).

Principle

The basic principle of an air cushion is that if you lift an object off the ground using air you reduce the force needed to move the object. Because the object is no longer in contact with the ground the friction this causes (surface friction) is reduced, making it easier to move the object. This also implies that the smoother the surface the less the friction. This is also true. Uneven surfaces with rocks and other obstacles can significantly slow down or even stop and damage an air cushion vehicle if the chamber containing the air cushion (the plenum chamber) was made of rigid materials.

Hence the use of a flexible skirt and the need for sufficient lift. This allows the craft to pass over (smaller) rocks and other uneven terrain obstacles without (too much) trouble or damage or slowing down.

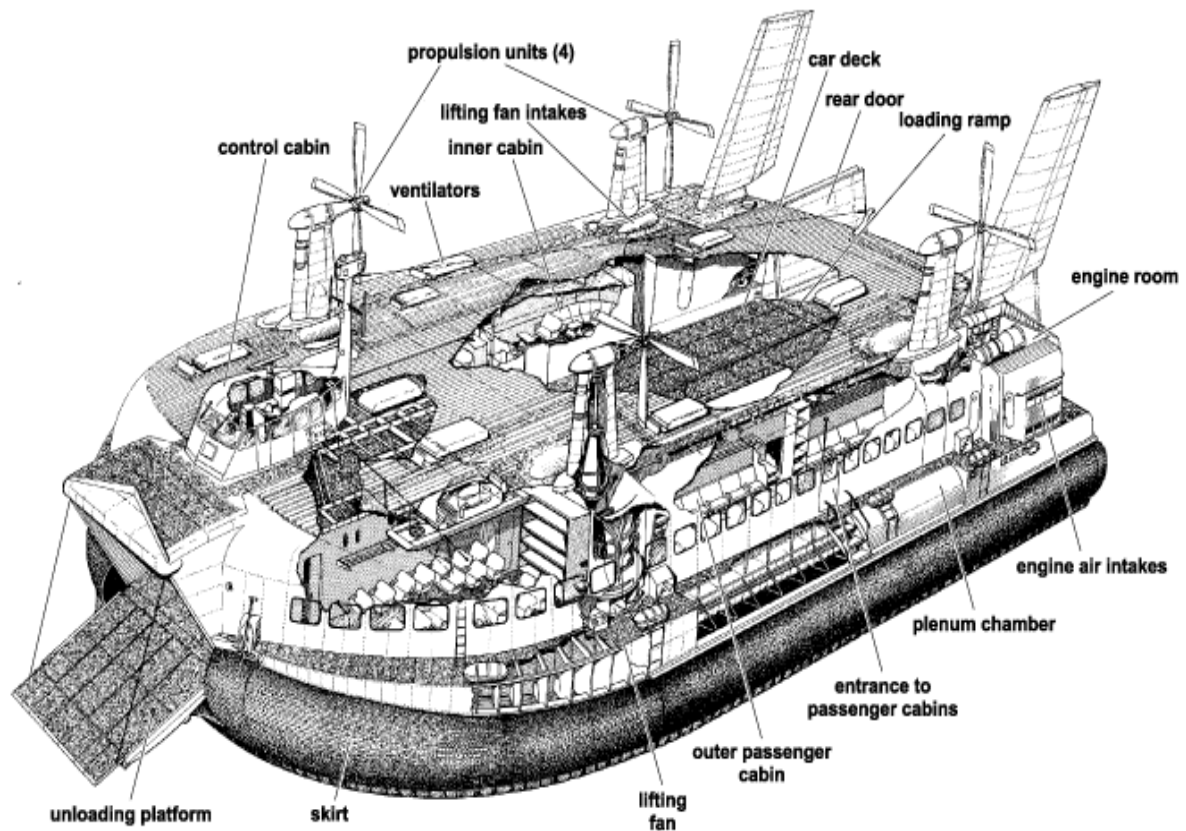
Basic Parts

That said with a hovercraft we can identify four basic construction necessities - 1) the hull, below which is attached the skirt system, 2) the carriage or cabin part which needs to hold the passenger(s), crew or freight, 3) a propulsion system to move the craft, and 4) the lift system to feed air into the plenum chamber below the craft in order to create the air cushion.

Some hovercraft uses a single engine system to provide both the air for the plenum chamber and propulsion. The difficulty in using one engine is to provide optimal efficiency for both systems, dividing the power for propulsion as well as for the fan to produce enough air for the lift.

Many modern air cushion vehicles use separate systems for air and propulsion. But advances in engines have made it possible to choose between one and two engine systems, especially for smaller, recreational hovercraft. Bigger, industrial, commercial or military hovercraft can have anywhere up to eight engines for propulsion and lift.

Basic Design



Design & Operation

The first recorded design for an air-cushion vehicle was put forward by Emmanuel [Swedenborg](#), a Swedish designer and philosopher, in 1716. The rigid sidewall hovercraft have lift engines powered fans that created a pressurized air cushion under the cutter, thereby lifting the craft, thus reducing drag and draft. The solid sidewalls pierced the water, creating a catamaran hull, and the air cushion was sealed by flexible rubberized skirts at the bow and stern. This allowed these craft to operate at high speeds in waters both shallow and deep, making them ideal patrol craft. Their wide beam and the catamaran hull also made them extremely stable craft, even in high seas.

In a sidewall air cushion vehicle the forward end of each sidewall is generally shaped to an edge in order to reduce its drag through the water. Since the inner surface of each sidewall has to co-operate with the front cushion seal to prevent escape of air from the cushion it is usual for this inner surface to be straight and for the outer surface at the forward end of each sidewall to taper or curve inwardly to meet with the inner surface at the leading edge of the sidewall.

A curved or angled surface having movement relative to a fluid produces a force normal to the direction of movement, and because the shape of the forward end of each sidewall is asymmetric a net differential force is produced in each sidewall substantially at right angles to the normal direction of travel of the vehicle. This net differential force, which has to be absorbed by the structure of the sidewall and the vehicle body, can become significant in the

large, high speed, type of sidewall air cushion vehicles presently being proposed known as surface effect ships.

Air-cushion vehicles comprise a hull and one or several propulsion units. These units are located either close to the longitudinal axis of the vehicle or symmetrically at both sides thereof in the front or the rear of the vehicle. Turning of the vehicle is obtained, for example, by means of one or several side rudders. When the propulsion units are located symmetrically at both sides of the longitudinal axis of the vehicle, steering can also be carried out by varying the output power of one or several of the propulsion units.

Technically, an inflatable skirt formed of a flexible material, such as rubber, plastic, etc., is mounted beneath the vehicle about its periphery and directs fluid flow from a motive source, such as a fan mounted on the vehicle, through the inflatable skirt against the underlying ground or water surface to both raise the vehicle a short distance, such as nine to twelve inches and no more than a few feet, above the underlying surface as well as propelling and providing thrust rearward of the vehicle for forward or sideway movements as controlled by a steering mechanism.

ADVANTAGES

- The hovercraft became an effective transport system for high-speed service on water and shallow land, leading to widespread developments for military vehicles, search and rescue, and commercial operations.
- If the propulsion units are located symmetrically on both sides of the longitudinal axis in the front as well as in the rear of the vehicle, a good steering response can be obtained also at low speed
- Air Cushion Vehicles (ACVs) have been developed and tested in Britain, Russia, and other European and Scandinavian countries, for hauling materials and transporting people.
- The United States military has extensively used ACVs for transporting personnel and equipment from ship to shore.
- Logging with ACV may be feasible in areas with topographic slopes less than five percent.
- The South-eastern United States, with its vast areas of wetlands, provide the greatest potential for use of ACVs for removing timber that would otherwise be inaccessible or very costly to remove by using other logging methods.
- There must be enough air pressure not only to lift the vehicle but also to overcome the weight component acting parallel to the ground surface or the vehicle as it is lifted. At some as-yet unknown slope, the vehicle will have a tendency to slide down the hill.

Limitations

- When using air cushion vehicles on water and particularly with smaller craft when moving at speed across water they will operate satisfactorily if the flow of air into the cushion is maintained. If the vehicle moves downwind, the drag, and therefore the thrust required maintaining speed, decreases. Under certain conditions the volume of

air fed into the cushion may decrease. If this reduction allows the cushion to decay the craft will "plough in", and cause the occupants to be thrown in the direction of the "plough-in" with possible resultant injury to the vehicle and its occupants.

- A primary problem with all air cushion vehicles is stabilization and directional control, since there is no appreciable contact with the supporting surface. The air cushion provides a very low friction support and the vehicle is easily displaced by small disturbances. Small air cushion vehicles, in particular, are affected by

Conclusion

The only conclusion that can be drawn from available research literature, which includes engineering measurements and qualitative assessments made during field trials, is that the concept of using ACVs for logging operations is a promising one.

RADIX SORT

A Radix Sort is a clever and intuitive little sorting algorithm

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Radix sort is one of the linear sorting algorithms for integers. It functions by sorting the input numbers on each digit, for each of the digits in the numbers. However, the process adopted by this sort method is somewhat counterintuitive, in the sense that the numbers are sorted on the least-significant digit first, followed by the second-least significant digit and so on till the most significant digit.

Efficiency

Radix sort's efficiency is $O(k \cdot n)$ for n keys which have k or fewer digits. Note that this is not necessarily better than $O(n \cdot \log(n))$ when n is sufficiently small.

A least significant digit (LSD) radix sort is a fast stable sorting algorithm which can be used to sort keys in integer representation order. Keys may be a string of characters, or numerical digits in a given 'radix'. The processing of the keys begins at the least significant digit (i.e., the rightmost digit), and proceeds to the most significant digit (i.e., the leftmost digit). The sequence in which digits are processed by a LSD radix sort is the opposite of the sequence in which digits are processed by a most significant digit (MSD) radix sort.

An LSD radix sort operates in $O(nk)$ time, where n is the number of keys, and k is the average key length. This kind of performance for variable-length keys can be achieved by grouping all of the keys that have the same length together and separately performing an LSD radix sort on each group of keys for each length, from shortest to longest, in order to avoid processing the whole list of keys on every sorting pass.

An example

Original, unsorted list: 170, 45, 75, 90, 802, 24, 2, 66

Sorting by least significant digit (1st place) gives: 170, 90, 802, 2, 24, 45, 75, 66

Notice that we keep 802 before 2, because 802 occurred before 2 in the original list, and similarly for pairs 170 & 90 and 45 & 75. Sorting by next digit (10s place) gives:

802, 2, 24, 45, 66, 170, 75, 90

Notice that 802 again comes before 2 as 802 comes before 2 in the previous list. Sorting by most significant digit (100s place) gives:

2, 24, 45, 66, 75, 90, 170, 802

It is important to realize that each of the above steps requires just a single pass over the data, since each item can be placed in its correct bucket without having to be compared with other items.

Some LSD radix sort implementations allocate space for buckets by first counting the number of keys that belong in each bucket before moving keys into those buckets. The number of times that each digit occurs is stored in an array. Consider the previous list of keys viewed in a different way:

170, 045, 075, 090, 002, 024, 802, 066

The first counting pass starts on the least significant digit of each key, producing an array of bucket sizes:

2 (bucket size for digits of 0: 170, 090)
2 (bucket size for digits of 2: 002, 802)
1 (bucket size for digits of 4: 024)
2 (bucket size for digits of 5: 045, 075)
1 (bucket size for digits of 6: 066)

A second counting pass on the next more significant digit of each key will produce an array of bucket sizes:

2 (bucket size for digits of 0: 002, 802)
1 (bucket size for digits of 2: 024)
1 (bucket size for digits of 4: 045)
1 (bucket size for digits of 6: 066)
2 (bucket size for digits of 7: 170, 075)
1 (bucket size for digits of 9: 090)

A third and final counting pass on the most significant digit of each key will produce an array of bucket sizes:

6 (bucket size for digits of 0: 002, 024, 045, 066, 075, 090)
1 (bucket size for digits of 1: 170)
1 (bucket size for digits of 8: 802)

At least one LSD radix sort implementation now counts the number of times that each digit occurs in each column for all columns in a single counting pass. (See the external links section.) Other LSD radix sort implementations allocate space for buckets dynamically as the space is needed.

Example in C++

```
#include <iostream>
#include <vector>
#include <iterator>
#include <algorithm>

typedef std::vector<unsigned int> input_type;

void radix_sort(input_type & x)
{
    if ( x.empty() ) return; // at least one element

    typedef std::vector< std::vector< input_type::value_type > > buckets_type;
    buckets_type buckets;

    buckets.resize(10); // allocate buckets
    // for sorting decimal numbers
```

```

int pow10 = 1; // pow10 holds powers of 10 (1, 10, 100, ...)

// find maximum in the array to limit the main loop below
input_type::value_type max = *std::max_element(x.begin(), x.end());

//begin radix sort
for(; max != 0 ; max/=10, pow10*=10)
{
    // 1. determine which bucket each element should enter
    // for each element in 'x':
    for(input_type::const_iterator elem = x.begin(); elem != x.end(); ++elem)
    {
        // calculate the bucket number:
        size_t const bucket_num = ( *elem / pow10 ) % 10;
        // add the element to the list in the bucket:
        buckets[ bucket_num ].push_back( *elem );
    }

    // 2. transfer results of buckets back into main array
    input_type::iterator store_pos = x.begin();
    // for each bucket:
    for(buckets_type::iterator bucket = buckets.begin(); bucket != buckets.end();
    ++bucket)
    {
        // for each element in the bucket:
        for(buckets_type::value_type::const_iterator bucket_elem = bucket->begin();
        bucket_elem != bucket->end(); ++bucket_elem)
        {
            // copy the element into next position in the main array
            *store_pos++ = *bucket_elem;
        }
        bucket->clear(); // forget the current bucket's list
    }
}

int main(){

    input_type input;

    // read numbers from standard input (ends with end-of-file: ^Z / ^D, or
    // with a new line that contains something that's not a number)
    std::cout << "Enter positive numbers to sort:" << std::endl;
    std::copy(std::istream_iterator<unsigned int>(std::cin),
        std::istream_iterator<unsigned int>(), std::back_inserter(input));

    if ( input.end() != std::find_if(input.begin(), input.end(),
        std::bind1st(std::equal_to<unsigned int>(), 0)) )
    {
        std::cerr << "Zero isn't positive" << std::endl;
    }
}

```

```
    return 1;
}

std::cout << " ** Elements before sorting: " << std::endl;
std::copy(input.begin(), input.end(),
    std::ostream_iterator<unsigned int>(std::cout, " "));

radix_sort(input);

std::cout << std::endl << " ** Elemets after sorting: " << std::endl;
std::copy(input.begin(), input.end(),
    std::ostream_iterator<unsigned int>(std::cout, " "));
std::cout << std::endl;

return 0;
}
```

BIOMETRICS

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Biometrics is a modern technological field that identifies an individual through his or her unique physical features. Biometric identifiers are the distinctive, measurable characteristics used to describe individuals. The categories of biometric identifiers include physiological and behavioural characteristics. **Behavioural** characteristics are related to the behaviour of a person, includes typing rhythm of keyboard, the way they walk and their voice. **Physical** characteristics include face, fingerprint, hand geometry, iris, and retina.

Biometrics has been around since 29,000 BC when cavemen would sign their drawings with handprints. But from recent years it has become very popular in which many systems have emerged. Most popular biometric identification systems include fingerprint, voice, iris, retina, hand, and facial.

Today, biometrics can be considered as one of the security systems, a system that can reduce the risks of the system security. This can also eliminates the need of the traditional security overhead of remembering passwords and securing them from hijacking.

The above mentioned systems of biometrics are most popular these years due to its dominance over other security systems. But each form of biometrics has its own strengths and weaknesses.

Fingerprint

Finger printing is one of the most common forms of biometric authentication. Its uniqueness of a fingerprint remains in the pattern of ridges and furrows as well as the minutiae points. Minutiae points are local ridge characteristics that occur at either a ridge bifurcation or a ridge ending.

In this system, not much storage is required. But this technology is more often used for criminal activities. So, the normal users can show reluctance to use. This system needs more cooperation of people, when providing their fingerprints to the system.

Hand

This can be more secure due to more ridges, when comparable to fingerprint. This uses smaller amount of information than fingerprint. This method is doubtful, if there are injuries to hand and is also more expensive to install. Also hand scans are not unique to every user

Voice

Voice recognition differs from speech recognition. This takes voiceprint which is based on different factors: size of the vocal cavities (throat, oral, nasal) as well as their characteristics. Also based on the way the articulators (mouth, lips etc) move.

Additional hardware for this system is microphone, which is cheap. The cons are background noise, large storage capacity. It will be difficult to detect if person has sore throat, common cold etc.

Iris and retinal

A specialized camera takes a picture of the eye. Software then locates the iris, taking account of the eyelids as well as light reflection and eye moisture. Then, it creates an Iris Code. The Iris Code is so specialized that the chances of two irises having the same code are 1 in 10^{52}

Retinal scanning also provides a similar level of accuracy. Retinal scanning uses a device to read their retina by having them look very closely at a rotated green light, while the system reads in more than 400 different points. This gives highly accurate results.

Both have low data storage and high accuracy rate. But they are extremely expensive and require special hardware.

Facial

This will measure and analyze the overall structure, shape and proportions of the face: Distance between the eyes, nose, mouth and jaw edges; upper outlines of the eye sockets, the sides of the mouth etc. To prevent an image of the face from a mask being used, these systems will ask the user to smile, blink, or nod their head. Also, facial thermography can be used to record the heat of the face (which won't be affected by a mask).

This can be done from a distance, even without the user being aware of it (for example at the entrance to a bank). These can be more suited for authentication than for identification purposes, as it is easy to change the proportion of one's face by wearing a mask, a nose extension etc. Users may feel violation of privacy as data may be captured verified and user without their knowledge

Report from NRC

Biometric systems are “*inherently fallible*” says a new report from the National Research Council. This report also specifies that no single distinguishing feature is identified that is stable and distinctive. Biometric systems are used to control access to many facilities, information, and other security purposes, but still there are many questions arising, regarding their effectiveness for heightened security systems. Empowering this science is very essential to gain a better understanding of these systems. Even the likelihood of an imposter is rare, systems with very accurate sensors and matching capabilities can also have a high false-alarm rate.

We know that, various characteristics of an individual may vary due to their age, stress, disease, or other factors. Technical issues related to calibration of sensors, degradation of data, and security breaches also should vary in these systems. But biometric data cannot be updated. Trustworthiness of the biometric recognition process cannot rely on secrecy of data, since an individual's biometric traits can be publicly known or accessed.

Biometrics has many advantages as well as they can also be affected by fake proofs. Many of the attempts of fraud in biometric identification can be seen in films. The weak attempt is the reproducing fingerprints using silicone or other plastics. The use of contact lenses with iris painted on them can also be easily detected. In case of facial recognition, use of masks or

plastic surgery might sometimes be successful. Presently, scientists are working in the field of analyzing possible attempts of fraud and their solutions, which is called “*anti-spoofing*”.

From the above discussion, we know that various biometric systems can easily be faked. But we need to secure our security systems; therefore a new technology is going to evolve by using brain patterns.

This can be achieved by combining new types of biometrics with latest sensors. This uses electrocardiograms (ECGs), which record heart rhythms, and electroencephalograms (EEGs), which record brain patterns, to identify people. The also includes two electrodes to take the readings.

There are also other new types of biometrics which include analysis of the way people walk and analysis of their seated posture. This also includes improving facial and voice recognition techniques, and this puts every biometric into a multimodal biometric identification system which can be more secure than the present unimodal biometrics.

PHOTON ENHANCED THERMIONIC EMISSION

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Abstract

Solar-energy conversion takes one of two forms: the quantum approach which uses large per-photon energy of solar radiation to excite electrons, as in photo-voltaic cells or the thermal approach which uses concentrated sunlight as a thermal-energy source to indirectly produce electricity using a heat engine. Here we present a new concept for solar electricity generation , photon enhanced thermionic emission, which combines quantum and thermal mechanics into a single physical process. The device is based on thermionic emission of photo excited electrons from a semiconductor cathode at high temperature. Temperature-dependent photoemission-yield measurements from GaN show strong evidence for photon enhanced thermionic emission, and calculated efficiencies for idealized devices can exceed the theoretical limits of single-junction photovoltaic cells. The proposed solar converter would operate at temperatures exceeding 200oC, enabling its waste heat to be used to power a secondary thermal engine, boosting its waste heat to be used to power a secondary thermal engine, boosting theoretical combined conversion efficiencies above 50%.

Introduction

Stanford engineers have figured out how to simultaneously use the light and heat of the sun to generate electricity in a way that could make solar power production more than twice as efficient as existing methods and potentially cheap enough to compete with oil.

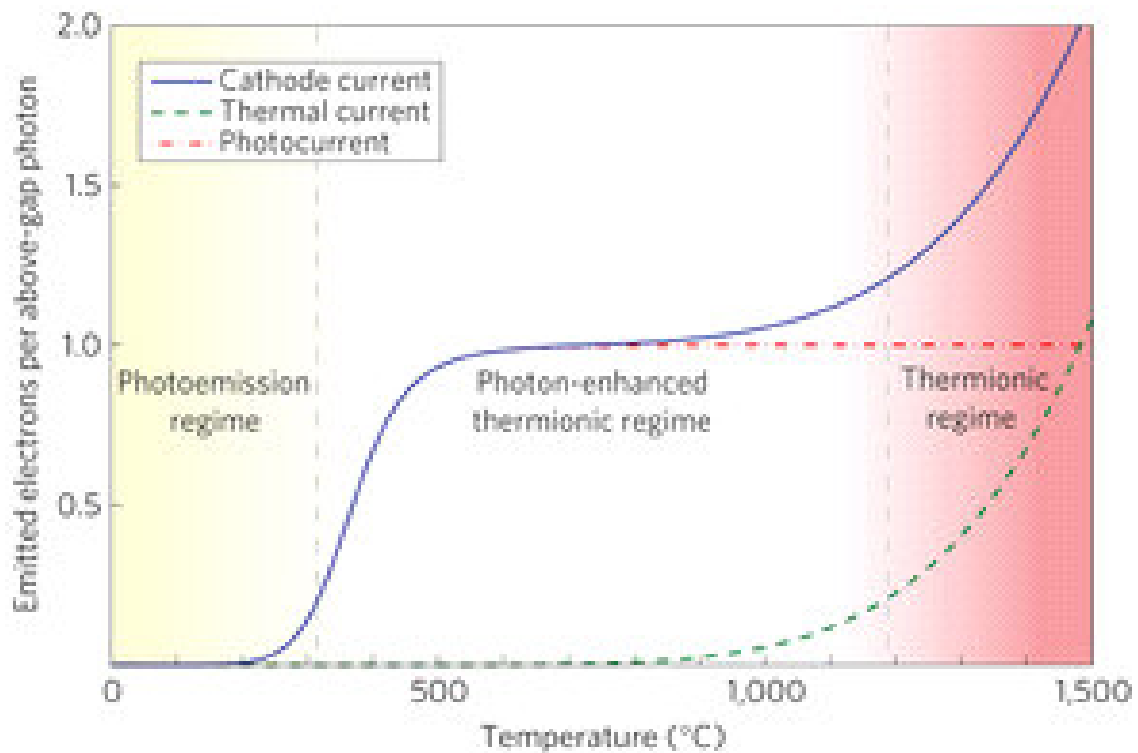
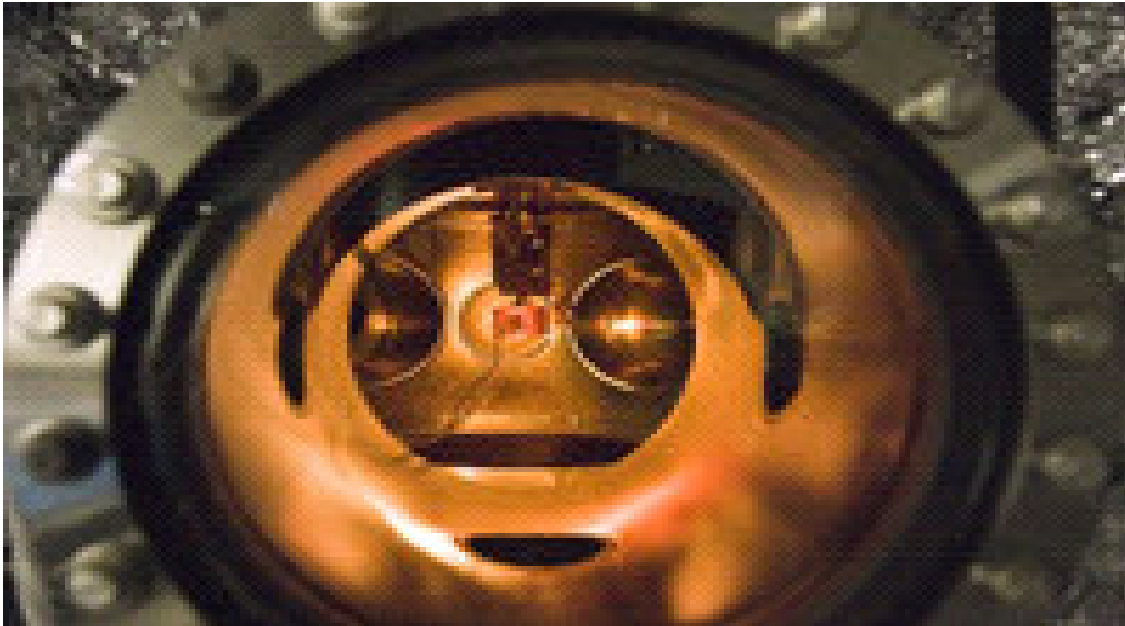


Unlike photovoltaic technology currently used in solar panels -- which becomes less efficient as the temperature rises -- the new process excels at higher temperatures.

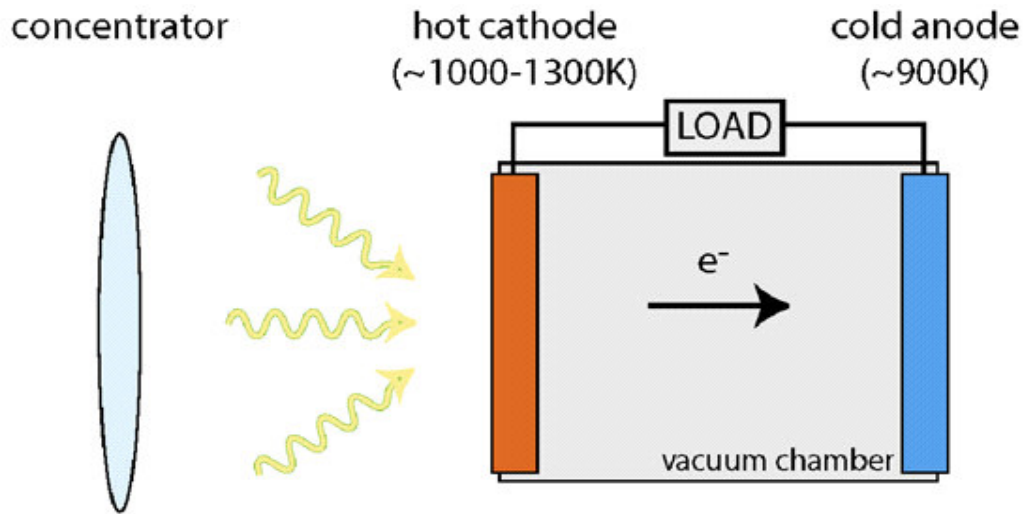
Called "photon enhanced thermionic emission," or PETE, the process promises to surpass the efficiency of existing photovoltaic and thermal conversion technologies.

Breakthrough Process

In the new process, the semiconducting material was coated with a thin layer of cesium which allowed the material to use both the light and heat of sun to generate electricity

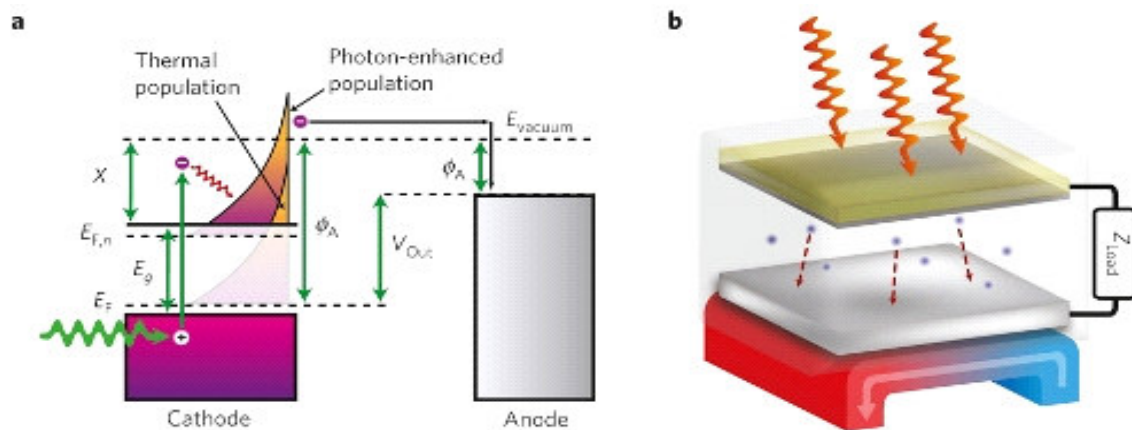


Though this is not actually standardized photovoltaic mechanism happening, this is a photovoltaic like response happening best at very high temperatures. The new process is called Photon Enhanced Thermionic Emission (PETE).



Pete Process

- Energy diagram of the PETE process. Photo excitation increases the conduction-band population, leading to larger thermionic currents and enabling the device to harvest both photon and heat energy.
- One possible implementation of a parallel-plate PETE converter. Photons impinge on a nanostructured cathode and excite electrons, which then emit into vacuum and are collected by an anode. Unused heat from the PETE cycle is used to drive a thermal engine.



Way To Make Cells More Efficient

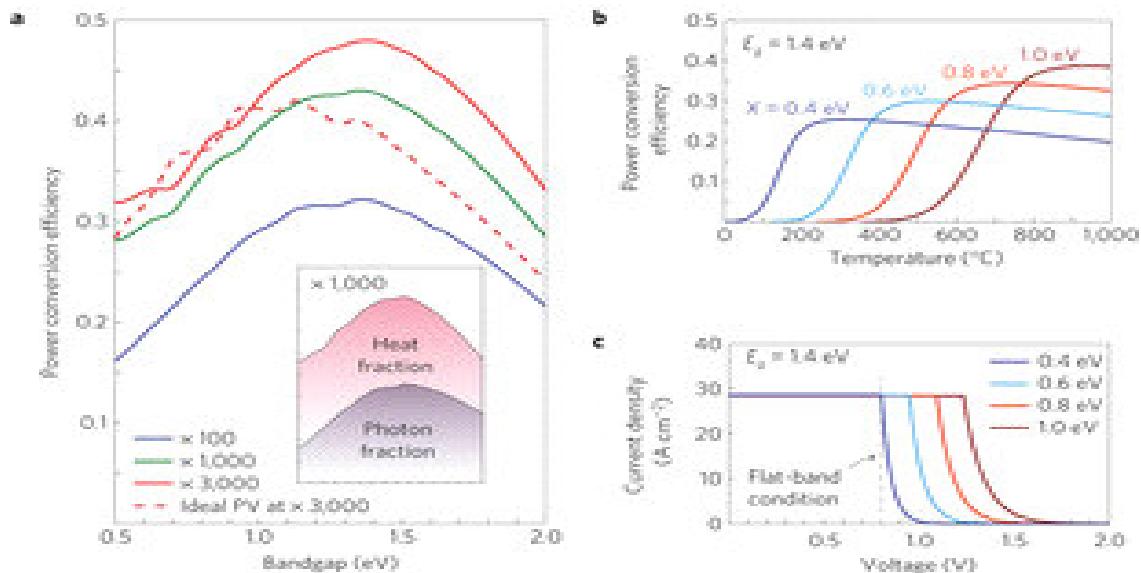
The best way to increase the efficiency of the solar cells is to somehow harvest the wasted heat energy and to keep up and utilize the high temperatures which are reached during conversion. Utilizing the existing technology along with utilizing both the photovoltaic and thermal conversion techniques is what is needed.

Weakness Harnessed As Strength

What is the weak point with most silicon cells – losing efficiency in higher temperatures – is the strong point of PETE process as the devices working with PETE process works best at temperatures as high as 800 degree Celsius. The PETE device utilizes the light and high temperatures produced are usable and dumped in the thermal.

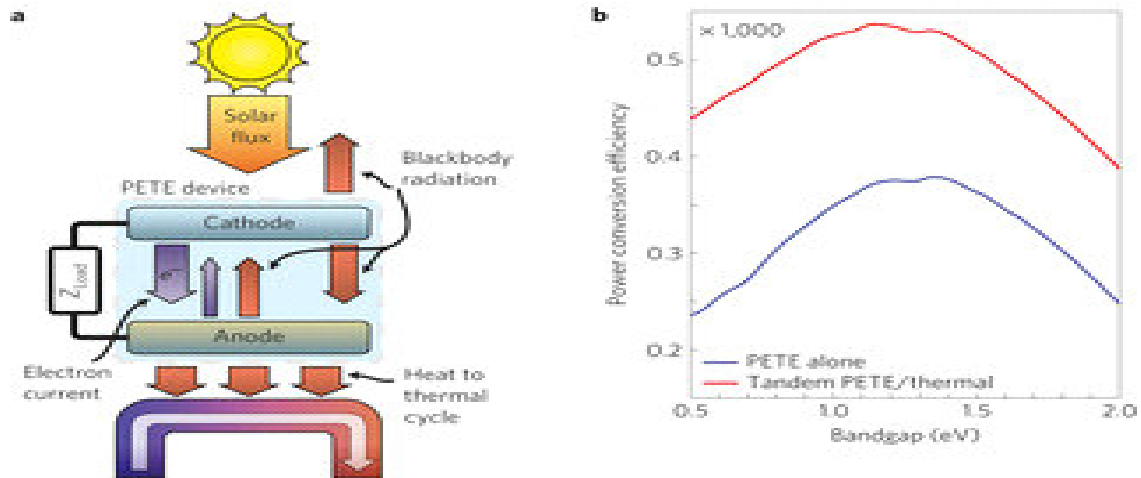
Theoretical Pete Efficiency

- PETE efficiency for the AM1.5 direct+circumsolar spectrum as a function of bandgap. The cathode temperature and electron affinity are chosen to maximize the overall efficiency . The anode temperature is 227 degree Celsius to maximize the reverse current. In the inset , the power output at $\times 1000$ is shown to be due to roughly equal contributions from thermal(X) and photon (E_g) energy .
- Power - conversion efficiency increases with X owing to larger voltage but requires higher temperatures . Power output decreases almost linearly with temperature after current saturation in the PETE regime owing to the increases cathode Fermi level. The concentration is $\times 1000$.
- J-V curves for PETE devices with the same electron affinities as in **b**, showing the flat-band condition for $X=0.4\text{eV}$. The temperatures are those at which the efficiencies in **b** are maximized.



Theoretical Tandem Efficiency

Energy-flow diagram for the PETE/thermal tandem device. Solar radiation is absorbed by the cathode . The cathode emits blackbody radiation both away from the device and towards the anode , whereas in PETE efficiency curve, radiation exchange between cathode and anode is minimal . Electron current from the cathode J_c is absorbed by the anode , delivering heat energy of $J_c(\Delta A + 2KT_c)$. Excess heat in the anode due to electrons and photons from the cathode is released as blackbody radiation or reverse current , or delivered to a thermal cycle , which converts a fraction into useful work .



Peaking Efficiency

PETE process has the potential to almost triple the existing system efficiency as demonstrated in solar farms in Mojave Desert in Southern California. Melosh says, "PETE process has two really big benefits in energy production over normal technology".

Applications

In the process of wireless power reception through antenna, solar energy from sun is adsorbed by photovoltaic cells which were placed in SPS. By replacing the photovoltaic cells with this concept of photon enhanced thermionic emission process we can achieve the power with double efficiency than obtained before.

Conclusion

The research team published their paper after demonstrating the process successfully. The team is experimenting on various semiconductors like gallium arsenide and other such materials. Even a 10% boost to the existing solar efficiency is a 50% overall hike and very welcome for solar cell power generation.

CYBER ATTACKS – STILL A THREAT!!!

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The word “Hack” or “Cyber Attack” still continues to strike horror and threat in the minds of people. Without any doubt, the terror has increased in the recent times. The security has been breached and today’s hackers find it very easy to move or “hack” into others personal systems, websites, wifi etc.

There have been around 9,000 websites in India that were hacked in the past five years. The threat India has faced has been brash – like the attack on the Central Bureau of Investigation website a couple of months ago. In addition to this, India’s oils rigs have also been targeted in the recent past.

It would not be of shock that the cyber attackers have been growing in big numbers. Teenagers have developed their mindsets thinking its ‘cool’ and ‘fun’ to pop up or steal others authorization.

Ways for Getting Information: (This is how the Hackers do)

Stealing Cookies, Phishing, Brute Force Attack, Social Engineering

THE SOLUTION OBSERVED IS

A person who knows how to crop or ‘hack’ can only stop an attacker. Yes, this is a fact which has been accepted worldwide in the recent years: A hacker can only stop a hacker. The traps and the tricks set by a black hat hacker can only be unleashed by a white hat hacker. Nevertheless, a hacker should be a perfect programmer. He must be that perfect that no other attacker can attack him.

Countermeasures:

1. Don’t Click any unwanted links in any Website
2. Use Cookie Safe Add-ons and Clear your cookies from Browsers
3. Update your Browsers and Antivirus

IMPLEMENTING NANO ROBOTS IN VENTILATION & IN BLOOD SUGAR DETECTION

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Introduction

Nano-biotechnology is now becoming an emerging field that is going to bring a lot of changes in the current century of technological revolution. It is a one part of Nano technology. Apart from its participation in all fields, the part of nanos in human science and medicine is large. Nanomedicine is the process of diagnosing, treating, preventing disease and traumatic injury, of relieving pain, and of preserving and improving human health, using molecular tools and molecular knowledge of the human body. Most symptoms such as fever and itching have specific biochemical causes that can also be managed, reduced, and eliminated using the appropriate injected nanorobots.

Nanomedicine will eliminate virtually all common diseases of the 20th century, virtually all medical pain and suffering, and allow the extension of human capabilities most especially our mental abilities. Consider that a nanostructured data storage device measuring $\sim 8,000$ micron³, a cubic volume about the size of a single human liver cell and smaller than a typical neuron, could store an amount of information equivalent to the entire Library of Congress. If implanted somewhere in the human brain, together with the appropriate interface mechanisms, such a device could allow extremely rapid access to this information.

Making Nano Robots

The typical medical nanodevice will probably be a micron-scale robot assembled from nanoscale parts. These parts could range in size from 1-100 nm (1 nm = 10^{-9} meter), and might be fitted together to make a working machine measuring perhaps 0.5-3 microns (1 micron = 10^{-6} meter) in diameter. Three microns is about the maximum size for blood borne medical nanorobots, due to the capillary passage requirement. Carbon will likely be the principal element comprising the bulk of a medical nanorobot, probably in the form of diamond or diamonded/fullerene nanocomposites largely because of the tremendous strength and chemical inertness of diamond. Many other light elements such as hydrogen, sulfur, oxygen, nitrogen, fluorine, silicon, etc. will be used for special purposes in nanoscale gears and other components.

Appearance of Nano Robots

It is impossible to say exactly what a generic nanorobot would look like. Nanorobots intended to travel through the bloodstream to their target will probably be 500-3000 nanometers (1 nanometer = 10^{-9} meter) in characteristic dimension. Non-blood borne tissue-traversing nanorobots might be as large as 50-100 microns, and alimentary or bronchial-traveling nanorobots may be even larger still. Each species of medical nanorobot will be designed to accomplish a specific task, and many shapes and sizes are possible.

In most cases a human patient who is undergoing a nanomedical treatment is going to look just like anyone else who is sick. The typical nanomedical treatment (e.g. to combat a bacterial or viral infection) will consist of an injection of perhaps a few cubic centimeters of micron-sized nanorobots suspended in fluid (probably a water/saline suspension). The typical therapeutic dose may include up to 1-10 trillion (1 trillion = 10^{12}) individual nanorobots, although in some cases treatment may only require a few million or a few billion individual devices to be injected. Each nanorobot will be on the order of perhaps 0.5 micron up to perhaps 3 microns in diameter. (The exact size depends on the design, and on exactly what the nanorobots are intended to do.) The adult human body has a volume of perhaps 100,000 cm^3 and a blood volume of $\sim 5400 \text{ cm}^3$, so adding a mere $\sim 3 \text{ cm}^3$ dose of nanorobots is not particularly invasive. The nanorobots are going to be doing exactly what the doctor tells them to do, and nothing more (barring malfunctions). So the only physical change you will see in the patient is that he or she will very rapidly become well again. Most symptoms such as fever and itching have specific biochemical causes which can also be managed, reduced, and eliminated using the appropriate injected nanorobots. Major rashes or lesions such as those that occur when you have the measles will take a bit longer to reverse, because in this case the broken skin must also be repaired.

Artificial Red Cell

We named this Nanorobot as ventilons. The ventilons measures about 1 micron in diameter and just floats along in the bloodstream. It is a spherical nanorobot made of 18 billion atoms. These atoms are mostly carbon atoms arranged as diamond in a porous lattice structure inside the spherical shell. The ventilons is essentially a tiny pressure tank that can be pumped full of up to 9 billion oxygen (O_2) and carbon dioxide (CO_2) molecules. Later on, these gases can be released from the tiny tank in a controlled manner. The gases are stored onboard at pressures up to about 1000 atmospheres. (Ventilons can be rendered completely nonflammable by constructing the device internally of sapphire, a flame proof material with chemical and mechanical properties otherwise similar to diamond.). The surface of each ventilons is 37% covered with 29,160 molecular sorting rotors that can load and unload gases into the tanks. There are also gas concentration sensors on the outside of each device. When the nanorobot passes through the lung capillaries, O_2 partial pressure is high and CO_2 partial pressure is low, so the onboard computer tells the sorting rotors to load the tanks with oxygen and to dump the CO_2 . When the device later finds itself in the oxygen-starved peripheral tissues, the sensor readings are reversed. That is, CO_2 partial pressure is relatively high and O_2 partial pressure relatively low, so the onboard computer commands the sorting rotors to release O_2 and to absorb CO_2 . Ventilons mimic the action of the natural hemoglobin-filled red blood cells. But a ventilons can deliver 236 times more oxygen per unit volume than a natural red cell. This nanorobot is far more efficient than biology, mainly because its diamonded construction permits a much higher operating pressure. (The operating pressure of the natural red blood cell is the equivalent of only about 0.51 atm, of which only about 0.13 atm is deliverable to tissues.) So the injection of a 5 cm^3 dose of 50% ventilons aqueous suspension into the bloodstream can exactly replace the entire O_2 and CO_2 carrying capacity of the patient's entire $5,400 \text{ cm}^3$ of blood! Ventilons will have pressure sensors to receive acoustic signals from the doctor, who will use an ultrasound-like transmitter device to give the ventilons commands to modify their behavior while they are still inside the patient's body. For example, the doctor might order all the ventilons to just stop pumping, and become dormant. Later, the doctor might order them all to turn on again.

Application

By adding 1 liter of ventilons into our bloodstream, we could then hold our breath for nearly 4 hours if sitting quietly at the bottom of a swimming pool. Or if we were sprinting at top speed, we could run for at least 15 minutes before we had to take a breath! It is clear that very "simple" medical nanodevices can have extremely useful abilities, even when applied in relatively small doses. Other more complex devices will have a broader range of capabilities. Some devices may have mobility, the ability to swim through the blood, or crawl through body tissue or along the walls of arteries. Others will have different shapes, colours, and surface textures, depending on the functions they must perform. They will have different types of robotic manipulators, different sensor arrays and so forth. Each medical nanorobot will be designed to do a particular job extremely well, and will have a unique shape and behavior.

Conclusion

A single nanocomputer CPU, also having the volume of just one tiny human cell, could compute at the rate of 10 teraflops (10^{13} floating-point operations per second), approximately equaling (by many estimates) the computational output of the entire human brain. Such a nanocomputer might produce only about 0.001 watt of waste heat, as compared to the ~25 watts of waste heat for the biological brain in which the nanocomputer might be embedded.

But perhaps the most important long-term benefit to human society as a whole could be the dawning of a new era of peace. We could hope that people who are independently well-fed, well-clothed, well-housed, smart, well-educated, healthy and happy will have little motivation to make war. Human beings who have a reasonable prospect of living many "normal" lifetimes will learn patience from experience, and will be extremely unlikely to risk those "many lifetimes" for any but the most compelling of reasons.

BUILDING CONSTRUCTION USING PLASTIC BOTTLES

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Every year millions of plastic bottles are used and disposed of, quickly filling landfills. While some effort is placed into recycling this plastic, doing so is an involved process that takes time and energy. The bottles themselves though can be put to use. Concrete is a strong and versatile building material, and when properly used in conjunction with plastic bottles and bags, can create useful structures. Building with concrete and plastic bottles is simply a matter of forming the core of the structure with the bottles and then reinforcing that core with the concrete. While not as strong as concrete only structures, these bottle structures are usable, can be built cheaply, and help to recycle a product that's widely available.

There are many methods developing now a day to use the waste plastic (non biodegradable) in different field of works, one of them is construction.

One of such method is using waste plastic bottles as bricks in the construction of buildings. Yes it is difficult to think bottle as a brick, but a mud-filled bottle is as strong as a brick and whatever you can do with a brick you can do with a bottle too.

Process of building:



- The initial thing everyone has to do is to collect the plastic bottles as many as possible.
- Next process is to take the bottles, fill them with sand, sealed and then paste them with a mixture made of earth, clay, sawdust and a little cement to provide additional strength and durability.



- Take the thread and make a knot around the neck of the bottle you just laid. Put the next bottle in similar way keeping in mind that the caps of the 2 bottles touch each other. Make a knot around the 2nd bottle also. Repeat the steps until you lay all the 11 bottles. You have made your first course of bottles.



- Now lay the bottles (with their neck facing outwards) one by one on this bed and tie them to each other as shown in the picture. After laying a course, fill the inside area with cement, clay or rubble. If you want to make more courses, make sure that you knot each bottle of the underlying course with the above course as shown in the picture. This is to impart more strength to the structure.
- You can put any type of roof over this because the pillars are really strong enough to hold them.
- Create your own designs, and build your own structures with this cheap construction method.



“These houses are ideal for people with modest means, but also for better-off people too because they are real works of art which will last, much more so than brick houses, with the bottles being much stronger than bricks.” They are also comfortable, safe and energy-efficient and can withstand earthquakes.

SPACE ELEVATOR

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A huge, tall structure comes out of the ground and goes straight up through the clouds; at the end is a wonderful, mysterious castle. Experts agree that the biggest drain of energy takes place when a vehicle blasts off, pushing through Earth's gravitational pull requires great amounts of fuel, but once they get out of our atmosphere, the rest is easy. If you could cut out that "blast off" portion, space travel would be easier and much more fuel-efficient.

Introduction

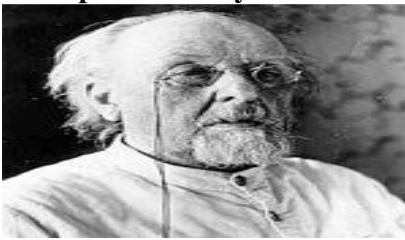
A **space elevator** is a proposed structure designed to transport material from a celestial body's surface into space. Or simply, the space elevator is a revolutionary Earth-to-space transportation system that will enable space exploration. Many variants have been proposed, all of which involve traveling along a fixed structure instead of using rocket powered space launch. The concept most often refers to a structure that reaches from the surface of the Earth on or near the Equator to geostationary orbit (GSO) and a counter-mass beyond. . This structure would be held in tension between Earth and the counterweight in space like a guitar string held taut. Space elevators have also sometimes been referred to as *beanstalks*, *space bridges*, *space lifts*, *space ladders*, *skyhooks*, *orbital towers*, or *orbital elevators*



The primary issue is that the total mass of conventional materials needed to construct such a structure would be so great that the cable would break under its own weight. Recent conceptualizations for a space elevator are notable in their plans to use carbon nanotubes-based materials as the tensile element in the tether design, since the measured strength of microscopic carbon nanotubes appears great enough to make this theoretically possible. produce elevators

for locations in the solar system with weaker gravitational fields such as the Moon or Mars-In this concept, which is very fuel efficient and which brings space tourism closer common man uses the newly added concept of nanotubes to light.

Conceptual History



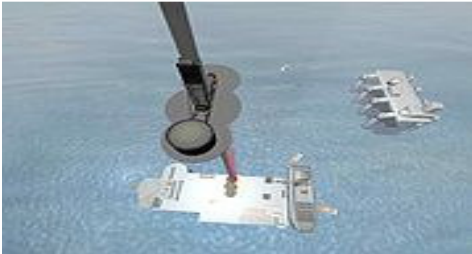
The key concept of the space elevator appeared in 1895 when Russian scientist Konstantin Tsiolkovsky was inspired by the Eiffel Tower in Paris to consider a tower that reached all the way into space, built from the ground up to an altitude of 35,790 kilometers above sea level

(geostationary orbit).He noted that a "celestial castle" at the top of such a spindle-shaped cable would have the "castle" orbiting Earth in a geostationary orbit (i.e. the castle would remain over the same spot on Earth's surface)Tsiolkovsky's tower would be able to launch objects into orbit without a rocket. Since the elevator would attain orbital velocity as it rode up the cable, an object released at the tower's top would also have the orbital velocity necessary to remain in geostationary orbit. Unlike more recent concepts for space elevators, Tsiolkovsky's (conceptual) tower was a compression structure, rather than a tension (or "tether") structure

Working Principle of Space Elevator

The centrifugal force of earth's rotation is the main principle behind the elevator. As the earth rotates, the centrifugal force tends to align the nanotube (material used in the construction of space elevators) in a stretched manner.

Structure of a Space Elevator



One concept for the space elevator has it tethered to a mobile seagoing platform. There are a variety of tether designs. Almost every design includes a base station, a cable, climbers, and a counterweight.

<http://en.wikipedia.org/wiki/File:SpaceElevatorClimbing.jpg>

Base station

The base station designs typically fall into two categories—mobile and stationary. Mobile stations are typically large oceangoing vessels. Stationary platforms would generally be located in high-altitude locations, such as on top of mountains, or even potentially on high towers

Mobile platforms have the advantage of being able to maneuver to avoid high winds, storms, and space debris. While stationary platforms don't have these advantages, they typically would have access to cheaper and more reliable power sources, and require a shorter cable. While the decrease in cable length may seem minima (no more than a few kilometers), the cable thickness could be reduced over its entire length, significantly reducing the total weight

Cable

Carbon nanotubes would be a highly useful material for creating a space elevator

Carbon nanotubes' theoretical tensile strength has been estimated between 140 and 177 GPa (depending on plane shape) and its observed tensile strength has been variously measured from 63 to 150 GPa, close to the requirements for space elevator structures. Nihon University professor of engineering Yoshio Aoki, the director of the Japan Space Elevator Association, has stated that the cable would need to be four times stronger than the strongest carbon nanotube fiber as of 2008, or about 180 times stronger than steel. Even the strongest fiber made of nanotubes is likely to have notably less strength than its components. Improving tensile strength depends on further research on purity and different types of nanotubes

Launching into outer space

The velocities that might be attained at the end of Pearson's 144,000 km cable can be determined. The tangential velocity is 10.93 kilometers per second, which is more than enough to escape Earth's gravitational field and send probes at least as far out as Jupiter. Once at Jupiter a gravitational assist maneuver permits solar escape velocity to be reached

Challenges faced by space elevator

The major challenges faced for bringing this concept to light are

1. Atmospheric issues: Lightening, clouds, winds.

Historic data maps show lightening occurs more on land masses, less on mountains and least along equator. Further experimental cables don't attract lightening. Winds aren't a factor since it is capable of withstanding wind speed of 71m/hr and hurricanes are not a problem since they form and travel outside the equatorial region.

2. Impact or Collision

Big issues requiring more study .Debris is monitored using radar. Study between Debris and meteors indicate space debris to be more hazardous .It must be noted number of impacts on ribbon, not as important as degradation cost due to impact.

Advantages

This concept of the space elevator, when successfully realized, will have the following advantages:

- Low operations costs - US\$250/kg to LEO, GEO, Moon, Mars, Venus or the asteroid belts.
- Space exploration would be more fuel efficient.
- No launch vibrations.
- Safe access to space - no explosive propellants or dangerous launch or re-entry forces.
- Easily expandable to large systems or multiple systems.
- Easily implemented at many solar system locations.
- It leads to GREATER SCIENTIFIC EXPLORATION of OUTER SPACE.

Applications

The applications of these Space elevators are:

- Solar power satellites - economical, clean power for use on Earth.
- Solar System Exploration - colonization and full development of the moon, Mars and Earth orbit.
- Telecommunications - enables extremely high performance systems.

Conclusion

Design, deployment and operational scenarios for the first space elevator have been put together. Potential challenges have been laid out and solutions developed. Development of the space elevator requires an investment in materials and engineering but is achievable in the near future with a reasonable investment and development plan.

**MAGENN AIR ROTOR SYSTEM
(M.A.R.S.)**

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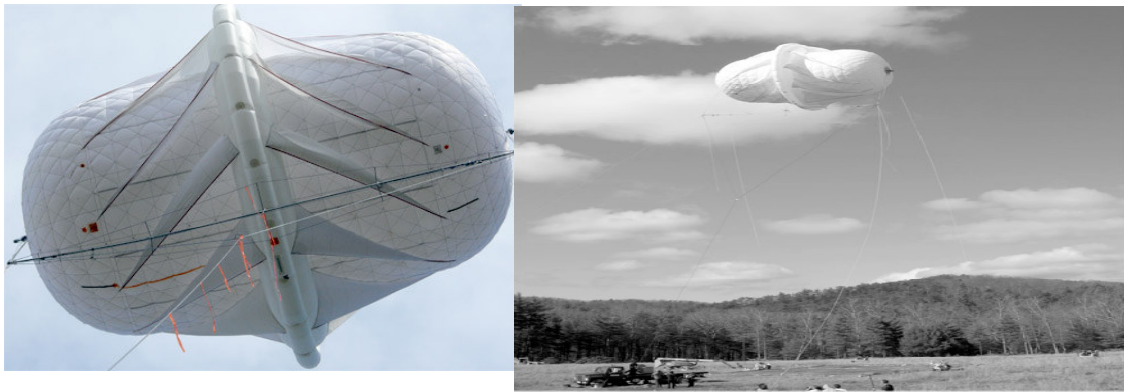
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Introduction

The Magenn Air Rotor System (MARS) is a drag-type wind turbine based on lighter-than-air ('blimp') technology. It consists of an axisymmetric helium filled core balloon, anchored to the ground via a tether containing both high-tenacity fibres and copper conductors. Sails fixed to the surface of the balloon provide the torque for rotation, and a winch located on the ground allows the tether to be reeled in and out up to a height of 300 m.

It is intended that in a full-size unit, an internal air bladder (ballonet) will be used to maintain internal pressure with changes in temperature and pressure and loss of helium. While the drag-type rotor is aerodynamically inefficient, with a power coefficient CP less than 20% of that of a typical propeller-type turbine¹, it has great advantages in terms of scalability and structural Efficiency. The inflatable structure enables the construction of a very large, resilient structure with a minimum of materials, and lighter-than-air technology enables operation at an altitude 10 times the hub height of a typical 100 kW turbine.

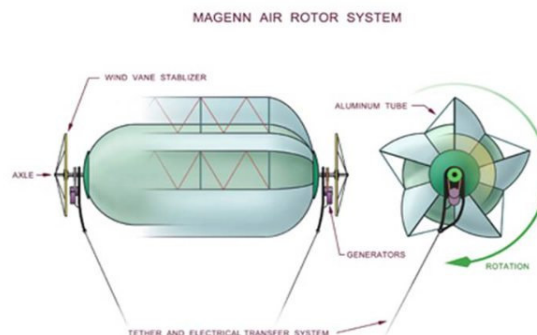


Magenn Power's MARS is a Wind Power Anywhere™ solution with distinct advantages over existing Conventional Wind Turbines and Diesel Generating Systems including: global deployment, lower costs, better operational performance, and greater environmental advantages.

This electrical energy is transferred down the 1000-foot tether for immediate use, or to a set of batteries for later use, or to the power grid. Helium sustains MARS and allows it to ascend to a higher altitude than traditional wind turbines. MARS captures the energy available in the 600 to 1000-foot low level and nocturnal jet streams that exist almost everywhere. MARS rotation also generates the "Magnus effect" which provides additional lift, keeps the MARS stabilized, and positions it within a very controlled and restricted location to adhere to FAA (Federal Aviation Administration) & Transport Canada guidelines.

Early Test Results

The prototype MARS rotor was unpacked, assembled and inflated with helium in the space of one work day. With the winch mounted on a truck, no significant Ground preparation or



foundation work was required. The next day, it was flown to a height of approximately 110 m in winds averaging 5.8 m/s and gusting to 6.3 m/s. It remained inflated during six days, during which time it flew several more times. It was also subjected to rain, storms and high winds while moored on the ground. The turbine self-starts in winds over approximately 4m/s, and rotates at 5.4 RPM with a 1.4 kW electrical load in winds of 5.8 m/s⁶. Manually orienting the rotor to the wind was fairly effective, but required constant attention due to the rotor's poor yaw stability. While several areas for improvement were noted in the testing – stability being one – the test results were quite positive and provided good direction for future development.

Prototype Description

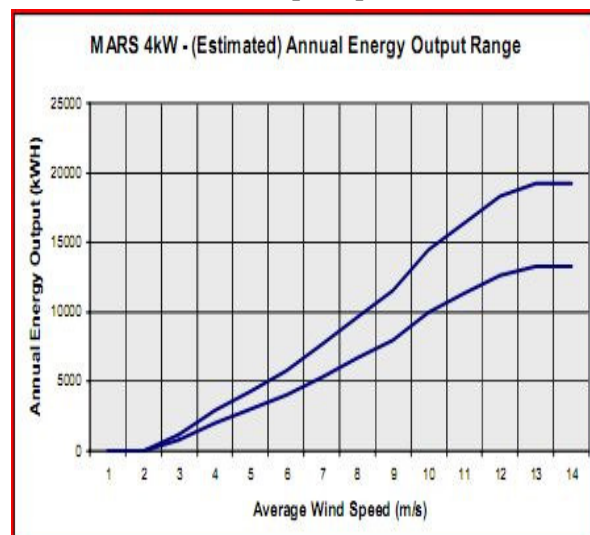
In April 2008, a small prototype MARS rotor was tested near Elizabeth City, North Carolina. The prototype has a core balloon measuring 17.4 m long by 9 m in diameter, and can be flown on a tether up to 110 m. The purpose of this group of tests was primarily to test the mechanical aspects of the design and to assess flight characteristics, rather than to generate usable power. It is estimated that the rotor could generate up to 10 kW in 12 m/s wind, however for the purposes of the testing two 2.5 kW generators were installed (one at each end of the balloon), and only rudimentary instrumentation was installed to measure wind speed and power. There are ten sets of sails, which are designed to collapse when moving upwind and inflate when moving downwind to create a differential drag between the top and bottom sides of the rotor. A net was used to support the loads on the balloon envelope and provide attachment points without point-loading the balloon itself.

MARS Target Markets

Developing nations where infrastructure is limited or nonexistent; off-grid combined wind and diesel solutions for island nations, farms, remote areas, cell towers, exploration equipment, backup power & water pumps for natural gas mines; rapid deployment diesel & wind solutions (to include airdrop) to disaster areas for power to emergency and medical equipment, water pumps; on-grid applications for farms, factories, remote communities; and wind farm deployments.

The Magenn Power Air Rotor System (MARS) is an innovative lighter-than-air tethered device that rotates about a horizontal axis in response to wind, efficiently generating clean renewable electrical energy at a lower cost than all competing systems. This electrical energy is transferred down the tether to a transformer at a ground station and then transferred to the electricity power grid. Helium (an inert non-reactive lighter than air gas) sustains the Air Rotor which ascends to an altitude for best winds and its rotation also causes the Magnus effect. This provides additional lift, keeps the device stabilized, keeps it positioned within a very controlled and restricted location, and causes it to pull up overhead rather than drift downwind on its tether.

All competing wind generators use bladed two-dimensional disk-like structures and rigid towers. The Magenn Power Air Rotor system is a closed three-dimensional structure (cylinder). It offers high torque, low starting speeds, and superior overall



efficiency thanks to its ability to deploy higher. The closed structure allows Magenn Power to produce wind rotors from very small to very large sizes at a fraction of the cost of current wind generators.

Initial	MARS	Target	Markets	include
1.	Developing and island nations	where infrastructure is limited or nonexistent.		
2.	Rapid deployment (to include airdrop)	to disaster areas for power to emergency and medical equipment, water pumps, and relief efforts (ex. Katrina, Tsunami).		
3.	off grid for cottages and remote uses such as cell towers and exploration.			
4.	Military applications.			

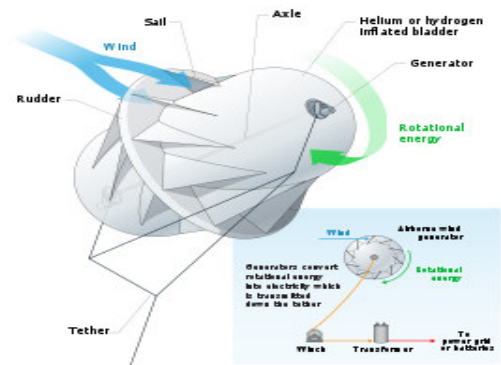
The Advantages of MARS over Conventional Wind Turbines are:

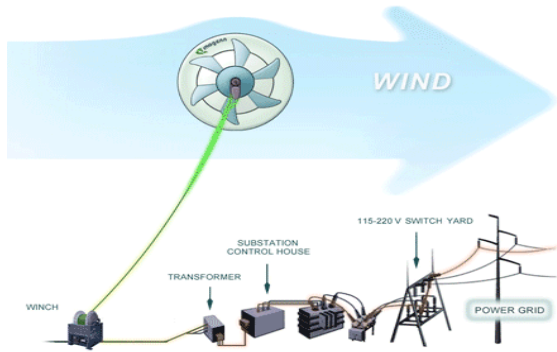
1. Low cost electricity - fewer than 15 cents per kWh.
2. Bird and bat friendly.
3. Lower noise.
4. Wide range of wind speeds - 2 to more than 28 meters/second.
5. Higher altitudes - from 200 to 1,000 feet above ground level are possible without expensive towers or cranes.
6. Fewer limits on placement location - coast line placement is not necessary.
7. Ability to install closer to the power grid
8. Ideal for off grid applications or where power is not reliable.

Internal Parts

The Advantages of a MARS combined Wind and Diesel Solution over a Diesel Generator-only solution:

MARS can complement a diesel generator by offering a combined diesel-wind power solution that delivers power below 20 cents per kWh. This compares to a wide range of 25 cents to 99 cents per kWh for diesel-alone, reflecting the high fuel and transportation costs in remote areas. The MARS combined solution allows lower pollution and green house gas emissions. It also results in lower handling, transporting, and storage costs.





devices has the potential to open up a new wind Resource in areas that are not served by conventional turbines.

Conclusions

The MARS system is very simple to install, requiring minimal on-site work. Despite its large size, no cranes or oversized vehicles were required to deploy the system, nor are they expected to be required for larger units. High-altitude wind power using tethered wind turbine

References

- 1 . Peter South ET. al., SERI/SP-635/1142 *Strategies for he Evaluation of Advanced Wind Energy Concepts*, Solar Energy Research Institute, 1983, 153
- 2 . W. F. Chen, *Handbook of Structural Engineering*, CRC Press, 1997, p. 911
3. D. L. Elliott et. al., DOE/CH10093-4 *Wind Energy Resource Atlas of the United States*, Pacific Northwest Laboratory, 1986
- 4 . *Ontario Wind Resource Atlas*, Retrieved on June 1,
- 5 . R. M. Banta et. al., *Doppler Lidar measurements of the Great Plains low-level jet: Applications to wind energy*, 14th International Symposium for the Advancement of Boundary Layer Remote Sensing, 2008

NUCLEAR ENERGY-PAST, PRESENT AND FUTURE

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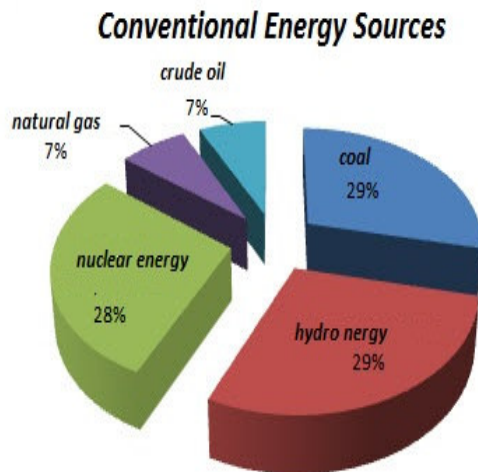
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For decades people have been pondering on the same questions: Is nuclear energy worth betting on? Will it be the energy of the future? Is it too dangerous for the humanity to keep developing nuclear facilities around the world? No wonder that there are many supporters and adversaries. Each party has weighty arguments.

Introduction:

Nuclear energy is widely used to meet the global energy needs. These days nuclear energy is relatively cheap and efficient. In some countries, nuclear power plants are major sources of energy.



Nuclear energy is quickly becoming the most preferred for its clean and cost effectiveness. Over the decades, nuclear energy has gained momentum for its wide range of utilities that has made life of humans so simple. Reason why nuclear energy is achieving acceptance and many countries are joining is a clear indicator that its benefits are immense. Meeting world's needs of 21st century, which are dynamic and changing with each passing moment, is almost impossible without continuous energy supply.

Hence, quickest, safest and affordable mode of power generation becomes a necessity which is addressed by nuclear power. Several decades of industrial practice with commercial nuclear power plants, fuel cycle facilities are providing today the base for deriving and executing the advanced systems responding to the requirements of the 21st century.

Simultaneously, addressing the security of energy supply, the threat of global climate change and socio-economic goals of the 21st century is a major challenge. Reaching the objective of long term and fruitful development is impossible and incomplete without the combination of technology and policy measures. Nuclear energy is one option amongst many others that has potential of supplying that is secure, carbon-free and competitive, on a large scale.

Nuclear energy is the present and future of our energy needs. With government employing efforts to make the best use of the opportunities proposed by this modern platform of power generation, even the citizens are now joining hands and accepting it more openly. Nuclear energy advantages are not limited to just power generation but extend to powering submarines, aids in treating cancer, boost agricultural productivity and a lot more. Nuclear scientists are positive that many more such advantageous possibilities of nuclear energy will surface.

The global nuclear industry is moving forward at a brisk pace, only slightly slowed by the Fukushima accident. The International Atomic Energy Agency's most realistic estimate is that 90 new nuclear plants will enter service by 2030. Ten new nuclear plants went online over the past two years. There are now 439 nuclear reactors in operation around the world in over 30 countries, providing almost 16% of the world's electricity.

Nuclear Energy in India

India has one of the world's fastest-growing economies over the past decade. During this same period, the country has made big strides in increasing its capacity for nuclear generation of electricity.

India has a flourishing and largely indigenous nuclear power program and expects to have 20,000 MWe nuclear capacity on line by 2020 and 63,000 MWe by 2032. It aims to supply 25% of electricity from nuclear power by 2050. India now ranks sixth in terms of production of nuclear energy, behind the U.S., France, Japan, Russia, and South Korea.

Nuclear Power Developments

Nuclear power for civil use is well established in India. Its civil nuclear strategy has been directed towards complete independence in the nuclear fuel cycle, necessary because it is excluded from the 1970 Nuclear Non-Proliferation Treaty (NPT) due to it acquiring nuclear weapons capability after 1970.

As a result, India's nuclear power program has proceeded largely without fuel or technological assistance from other countries. Its power reactors to the mid 1990s had some of the world's lowest capacity factors, reflecting the technical difficulties of the country's isolation, but rose impressively from 60% in 1995 to 85% in 2001-02. Then in 2008-10 the load factors dropped due to shortage of uranium fuel. India has a small fast breeder reactor and it is building a much larger one. It is also developing technology to utilize its abundant resources of thorium as a nuclear fuel.

Bhabha Atomic Research Centre (BARC) was set up at Trombay, near Mumbai, in 1957. Plans for building the first Pressurised Heavy Water Reactor (PHWR) were finalized in 1964, and this prototype - Rajasthan-1, which had Canada's Douglas Point reactor as a reference unit, was built as a collaborative venture between Atomic Energy of Canada Ltd (AECL) and NPCIL. It started up in 1972. Subsequent indigenous PHWR development has been based on these units, though several stages of evolution can be identified.

Radioactive Waste Management

Radioactive wastes from the nuclear reactors and reprocessing plants are treated and stored at each site. Waste immobilization plants are in operation at Tarapur and Trombay and another is being constructed at Kalpakkam. Research on final disposal of high-level and long-lived wastes in a geological repository is in progress at BARC.

Regulation and Safety

The Atomic Energy Commission (AEC) was established in 1948 under the Atomic Energy Act as a policy body. Then in 1954, the Department of Atomic Energy (DAE) was set up to encompass research, technology development and commercial reactor operation. The Atomic Energy Regulatory Board (AERB) was formed in 1983 and comes under the AEC but is independent of DAE. In April 2011, the government announced that it would legislate to set up a new independent and autonomous Nuclear Regulatory Authority of India that will

subsume the AERB, and that previous safety assessments of Indian plants would be made public.

The Nuclear Safety Regulatory Authority Bill was drawn up in response to events at Fukushima and aims to establish several new regulatory bodies. A new senior Council of Nuclear Safety (CNS) chaired by the Prime minister will oversee and review policies on radiation safety, nuclear safety and other connected matters. The second major body to be established is the Nuclear Safety Regulatory Authority (NSRA) and will be responsible for ensuring radiation safety and nuclear safety in all civilian sector activities.

Climate Change: Avoid Carbon Emissions

Nuclear power emits virtually no greenhouse gases. The complete nuclear power chain, from uranium mining to waste disposal, and including reactor and facility construction, emits only 2-6 grams of carbon per kilowatt-hour. This is about the same as wind and solar power, and two orders of magnitude below coal, oil and even natural gas. Worldwide, if the 440 nuclear power plants were shut down and replaced with a proportionate mix of non-nuclear sources, the result would be an increase of 600 million tones of carbon per year.

Improving Nuclear Safety

Although substantial progress has been made in improving the safe operational performance of nuclear installations over the past years, a number of issues continue to be of concern. As nuclear power technology continues to spread and more countries develop indigenous plant designs, the resultant diversification highlights the importance of: ensuring quality; managing and sharing knowledge; utilizing common, internationally accepted safety standards; balancing the needs of safety and security; promoting cooperation and sharing of experience among regulatory authorities; and adapting the practices of international vendors and contractors to the diverse cultures of countries with new nuclear programs.

Conclusion

Hence nuclear energy tends to be one of the best energy sources in the present generation. The depletion of non renewable resources in a faster pace pushes the immense need for the production of nuclear energy. Energy requirements will further grow up in the future and it is only nuclear energy that can cater needs to all. India still has been depending upon other alternative sources because the nuclear energy production has still been developing. Apart from these advantages, nuclear energy even tends to be a risk.

It is high time that we look out and make progress in the field of nuclear energy.

THE GANDHI-SETU BRIDGE: PATNA, BIHAR

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Gandhi-Setu bridge was considered as one of the world's longest river bridge .It is built over the river "GANGA" and it connects Patna in south to Hajipur in north of Bihar. Its total length is 5.575km (18291feet) which makes it the longest single river bridge in India. The bridge was built by the "GAMMON INDIA LIMITED". The construction of this bridge started in 1972 and the construction ended in 1982. It was inaugurated by the then Prime Minister, Mrs. Indira Gandhi in May 1982.



Figure 1 : TOP VIEW OF THE ROAD BRIDGE

Now talking about its architecture, we find that a cantilever segmental construction has been adopted "Cantilever Segmental Construction" to construct this mega structure.

It consists of a total of 46 spans of 121.065metres (397feet) each and 2 spans of each 63.53metres (207feet) at the ends.

The width of this bridge is 25metres (83.33feet). The deck of the bridge 7.5metres (25feet) wide provides 2 lane roadway for IRC class 70R loading with footpaths on either side.

The materials used for the construction are concrete and steel.

650 millions (or) 65crores of rupees were spent for the construction of this mega bridge (as per the prices of India in 1972).

There are 40 piers inside the water and the clearance below is 265.



Figure 2: Cantilever structure of the bridge

At present this bridge is a part of the National Highway 19.

It carries 4 lanes of roadways and pedestrian pathways on the either sides of the bridge.

As per the official records, the government had collected 134.45crores from 1982-83 till march 2009 but the total cost for the construction of the bridge was only87.22crores.

Later in 2007 the "Indian postal department" issued a commemorative postage stamp on landmarks of India.

During this even the Ganga setu was also issued a denomination 500paise on 17th august 2007.

Before the construction of the bridge, people who wanted to go to the north of Bihar had to travel in boats or small ships or streamers or just take the long railway route. But after the construction of this bridge it really helped the people in reducing their efforts to go to the other side of the bridge and also reduced the travel chargers too.



Figure 3: Ganga rail cum road bridge under construction

The rail bridge, Ganga rail bridge has been further improved and has been transformed into a rail cum road bridge in 2006.

It was completed in 5 years. By the time the construction got completed it was 4,556(14,948feet) metres long and it is now under longer bridges in India, even longer than the Ganga setu bridge. The total length of the bridge including approaches would be 20km. It is a K-truss bridge.

THE MAGIC OF "MEALS IN A MINUTE"

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Are the microwaves confined to the communication purposes? How do the microwaves help in saving the time and making the work simpler? How can we cook food using microwaves? To answer these questions, we need to go through this article.

There was a time when chulhas or traditional stoves were the only appliances present in our kitchens. The new buzz word in Indian homes is “Microwave Oven”. Today, a microwave oven is an indispensable part of our kitchen. Most of us consider invention of the microwave

oven as one of the most magnificent scientific inventions of the twentieth century. Microwave cooking has provided us a faster way to prepare food. This article is about the magic of “meals in a minute” using microwave oven.



The microwave oven did not come about as a result of someone trying to find a better, faster way to cook. During World War II, two scientists invented the magnetron, a tube that produces microwaves. By accident, several years later, it was discovered that microwaves also cook food. The first commercial microwave oven was developed by Raytheon after World War II from radar technology developed during the war. Named the 'Radarange', it was first sold in 1947.

Working principle:

You often hear that microwave ovens cook food "From the inside out." What does that mean? Here's an explanation to help make sense of microwave cooking.

Let's say you want to bake a cake in a conventional oven. Normally you would bake a cake at 350 degrees F or so, but let's say you accidentally set the oven at 600 degrees instead of 350. What is going to happen is that the outside of the cake will burn before the inside even gets warm. In a conventional oven, the heat has to migrate (by conduction) from the outside of the food toward the middle. You also have dry, hot air on the outside of the food evaporating moisture. So the outside can be crispy and brown (for example, bread forms a crust) while the inside is moist.

In microwave cooking, the radio waves penetrate the food and excite water and fat molecules pretty much evenly throughout the food. No heat has to migrate toward the interior by conduction. There is heat everywhere all at once because the molecules are all excited together. There are limits, of course. Radio waves penetrate unevenly in thick pieces of food (they don't make it all the way to the middle), and there are also "hot spots" caused by wave interference, but you get the idea. The whole heating process is different because you are "exciting atoms" rather than "conducting heat."

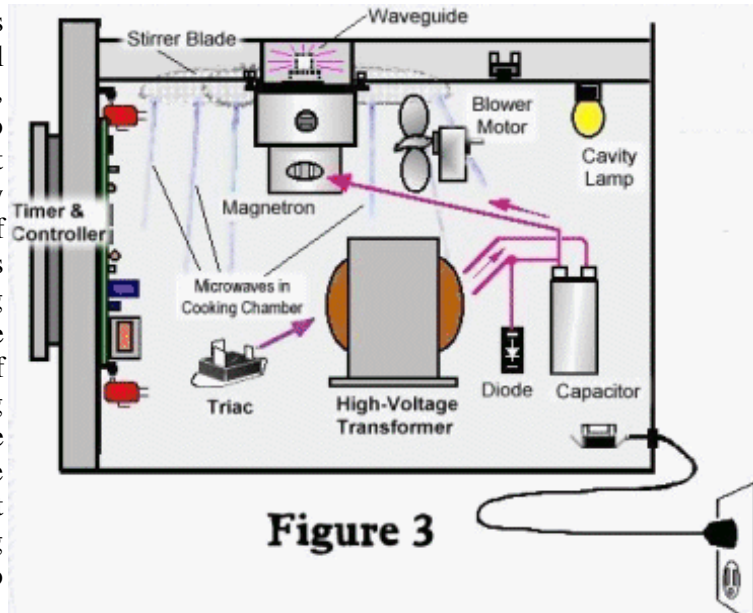
How do the microwaves cook food?

A microwave oven works by passing non-ionizing microwave radiation, usually at a frequency of 2.45 gigahertz (GHz)—a wavelength of 122 millimeters (4.80 in)—through the food. Microwave radiation is between common radio and infrared frequencies.

Microwave ovens use various combinations of electrical circuits and mechanical devices to produce and control an output of microwave energy for heating and cooking. Generally speaking the systems of a microwave oven can be divided into two fundamental sections, the control section and the high-voltage section. The control section consists of a timer (electronic or electromechanical), a system to control or govern the power output, and various interlock and protection devices. The components in the high-voltage section serve to step up the house voltage to high voltage. The high voltage is then converted microwave energy

In the high-voltage section (Figure 3), the high-voltage transformer along with a special diode and capacitor arrangement serve to increase the typical household voltage, of about 115 volts, to the shockingly high amount of approximately 3000 volts! While this powerful voltage would be quite unhealthy -- even deadly -- for humans, it is just what the magnetron tube needs to do its job -- that is, to dynamically convert the high voltage in to undulating waves of electromagnetic cooking energy.

The microwave energy is transmitted into a metal channel called a waveguide, which feeds the energy into the cooking area where it encounters the slowly revolving metal blades of the stirrer blade. Some models use a type of rotating antenna while others rotate the food through the waves of energy on a revolving carousel. In any case, the effect is to evenly disperse the microwave energy throughout all areas of the cooking compartment. Some waves go directly toward the food, others bounce off the metal walls and flooring; and, thanks to special metal screen, microwaves also reflect off the door. So, the microwave energy reaches all surfaces of the food from every direction.



Benefits and safety features:

The lower temperature of cooking (the boiling point of water) is a significant safety benefit compared to baking in the oven or frying, because it eliminates the formation of tars and char, which are carcinogenic. Microwave radiation also penetrates deeper than direct heat, so that the food is heated by its own internal water content. In contrast, direct heat can fry the surface while the inside is still cold. Pre-heating the food in a microwave oven before putting it into the grill or pan reduces the time needed to heat up the food and reduces the formation of carcinogenic char. Unlike frying and baking, microwaving does not produce acrylamide in potatoes, however unlike deep-frying, it is of only limited effectiveness in reducing glycoalkaloid (i.e. Solanine) levels. Acrylamide has been found in other micro waved products like popcorn.

Effects on food and nutrients:

Several studies have shown that if properly used, microwave cooking does not change the nutrient content of foods to a larger extent than conventional heating, and that there is a tendency towards greater retention of many micronutrients with microwaving, probably due to the shorter preparation time.

Any form of cooking will destroy some nutrients in food, but the key variables are how much water is used in the cooking, how long the food is cooked, and at what temperature. Nutrients are primarily lost by leaching into cooking water, which tends to make microwave cooking healthier, given the shorter cooking times it required.

Hazards:



A micro waved DVD-R disc showing the effects of electrical discharge through its metal film

Liquids can superheat when heated in a microwave oven in a container with a smooth surface. That is, the liquid reaches a temperature slightly above its normal boiling point without bubbles of vapour forming inside the liquid. The boiling process can start explosively when

the liquid is disturbed, such as when the user takes hold of the container to remove it from the oven or while adding solid ingredients such as powdered creamer or sugar. This can result in spontaneous boiling (nucleation) which may be violent enough to eject the boiling liquid from the container and produce severe scalding.

Closed containers, such as eggs, can explode when heated in a microwave oven due to the increased pressure from steam. Insulating plastic foams of all types generally contain closed air pockets, and are usually microwave-unsafe, as the air pockets explode and the foam (which can be toxic if consumed) may melt. Not all plastics are microwave-safe, and some plastics absorb microwaves to the point that they become dangerously hot.

Products that are heated for too long can catch fire. Though this is inherent to any form of cooking, the rapid cooking and unattended nature of microwave oven use results in additional hazard. Because the microwave oven's cavity is enclosed and metal, fires are generally well contained. Switching off the oven and allowing the fire to consume the available oxygen with the door closed will typically contain and quickly extinguish the fire and limit damage to the oven itself.

Some magnetrons have ceramic insulators with beryllium oxide (beryllia) added. The beryllium in such oxides is a serious chemical hazard if crushed and ingested (for example, by inhaling dust). In addition, beryllia is listed as a confirmed human carcinogen by the IARC; therefore, broken ceramic insulators or magnetrons should not be handled. This is obviously a danger only if the microwave oven becomes physically damaged, such as if the insulator cracks, or when the magnetron is opened and handled directly, and as such should not be a concern during normal usage.

Direct microwave exposure:

Direct microwave exposure is not generally of any hazard, as microwaves emitted by the source in a microwave oven are confined in the oven by the material out of which the oven is constructed. Tests have shown confinement of the microwaves in commercially available ovens to be so nearly universal as to make routine testing unnecessary. According to the

United States Food and Drug Administration's Center for Devices and Radiological Health, a U.S. Federal Standard limits the amount of microwaves that can leak from an oven throughout its lifetime to 5 milli watts of microwave radiation per square centimeter at approximately 5 cm (2 in) from the surface of the oven. This is far below the exposure level currently considered to be harmful to human health.

The radiation produced by a microwave oven is non-ionizing. It therefore does not have the cancer risks associated with ionizing radiation such as X-rays and high-energy particles. Long-term rodent studies to assess cancer risk have so far failed to identify any carcinogenicity from 2.45 GHz microwave radiation even with chronic exposure levels, i.e., large fraction of one's life span, far larger than humans are likely to encounter from any leaking ovens. However, with the oven door open, the radiation may cause damage by heating; as with any cooking device. Every microwave oven sold has a protective interlock so that it cannot be run when the door is open or improperly latched.

There are, however, a few cases where people have been exposed to direct microwave exposure from malfunctioning microwave ovens, or where infants have been placed inside them, resulting in microwave burns.

Like many other facilities available to those who lead a busy lifestyle, the microwave oven may also contribute to certain hazards. The best option is to use it selectively. It can be used for reheating, melting and making popcorn. Many new features are incorporated in the modern versions like facility to programme the cooking process.

EFFECT OF FLUIDIZED BED PEENING ON FATIGUE BEHAVIOUR OF MATERIALS

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Abstract:

The aim of this review paper presentation is to elucidate the innovative Fluidized Bed Peening (FBP) to improve the fatigue behavior of the materials. The specimens are found to have an increased fatigue life by four to five times. There is also improvement in topography, smoothing of surface, surface work hardening which induces a related increase in their fatigue life. The number of cycles to fracture versus the maximum amplitude of alternating stress for fluidized bed peened and unpeened specimen graphs have been plotted. This process can also be automatized with basic equipment and is known to retard crack initiation in materials.

Introduction:

Fatigue resistance of highly stressed component is by far one of the most important issues to consider when they are submitted to constant and variable amplitude loading. Their fatigue life is strictly dependent on nucleation and propagation of fatigue cracks. Fatigue cracks typically start at the surface where as the presence of micro structural defects or morphological alterations (i.e. notches, pores, inclusions) can speed up their nucleation and propagation. Therefore, surface treatment, aimed at inhibiting the nucleation and propagation of fatigue cracks, play a crucial role when ever structural components are submitted to cyclic loading conditions.

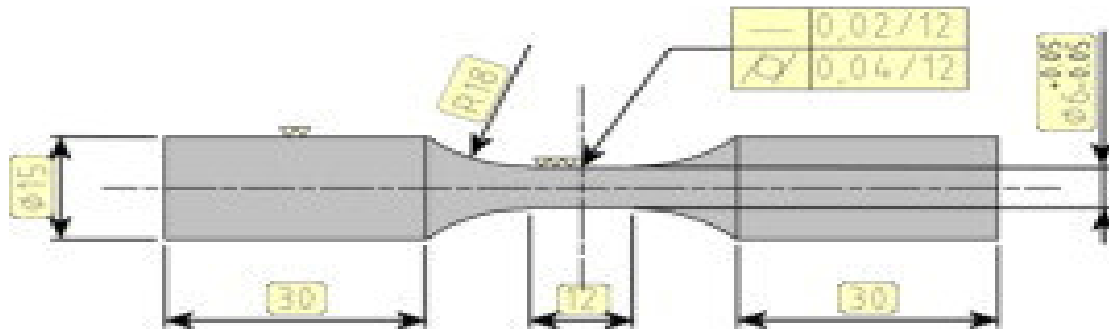
Mechanical (shot peening, hammer peening, deep rolling and ultrasonic peening etc), Thermal (laser shock peening,

Conventional heat treatment, etc), and Chemical (carburizing, nitriding, chromizing, boronizing, etc) treatments are widely used to improve the outermost layers of the involved material. Alternatively, the application of surface overlay coatings (electroplating, electro less depositions, thermal spray etc) with the aim of eliminating the surface defects and increasing overall mechanical performance of the coated material is increasingly become more attractive.

Among mechanical treatments, shot peening is, of course, one of the most widespread technologies. It is essentially used to induce a compressive residual stress in the topmost layers of the involved material with the final aim of producing the speed at which the nucleation and the propagation of fatigue cracks take place, shot peening also used on work-harden able materials to increase their surface hardness, being this feature of great value on all those materials that cannot be heat treated.

Although shot peening belongs to a class of mechanical treatments well established in industrial practice, several drawbacks, can occur and be deleterious to the final properties of the treated materials .Shot peening is a multi parameter process in which the choice of the duration of the treatment, the intensity of the single shot, the impact angle, shape and material all play crucial role.

Errors in setting of operating parameters can transform shot peening, which can severely damage the exposed surface, entailing alterations of the surface morphology. In this respect, the introduction in the industrial practice of a mechanical treatment of comparable effectiveness, but less sensitive to the choice of operating parameters, would be of utmost importance and warmly welcomed.



Fatigue Test Sample

Fluidized bed peening (FBP) is a recent technique that allows the exposure of metal substrates to repeated impacts of relatively small media (commonly, metal, glass, or ceramic beads). Inside a fluidized bed, preloaded media are taken in a fluid like state by fluxing air at moderate relative pressure (few hundreds of millibars) through a porous plate distributor. Rotating or suspending metal substrates inside the fluidized media means exposing them to high number of low energy impacts, thus modifying their surface properties by moderate surface deformation. Compressive residual stresses and work hardening can be effortlessly induced on metal substrates.

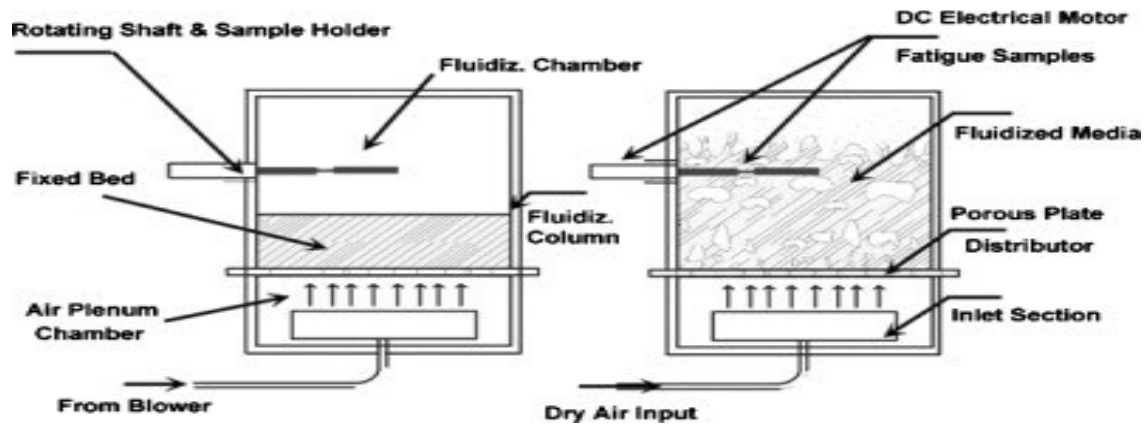
In the present investigation, FBP was applied to AISI 316L in order to verify the suitability of the treatment to increase the fatigue life of the processed substrates. This study encompasses the way in which the morphology and microstructure of the peened material are affected. In particular, the changes in the roughness, hardness, and residual stress field of the substrates after FBP are accounted for. The way to rupture the untreated and FB treated substrates was also detailed. Finally, the influence of peening time on fatigue endurance of the substrate after FBP was looked into, revealing how FBP does not cause the over treatment of the substrates, whatever be the setting of the operating parameters.

Experimental Materials:

AISI 316L stainless steel substrates were submitted to FB processing. Material properties and typical composition can be easily found in literature.

From 6m long rods belonging to the same manufacturer and production lot, 15 mm diameter fatigue test samples with a 12mm long and 6mm in diameter were manufactured by conventional machining. A very special tool and mild cutting parameters were used to machine the test zone of the fatigue samples to ensure a good surface finish and minimize the risk of surface defects or alterations as well as work hardening.

From the same alloy, flat cylindrical samples 16 mm diameter and 5mm thick were drawn out. All the cautions to achieve cylindrical and flat samples with comparable characteristics have been taken.



Fluidized Bed Experimental Apparatus

Heat treated martensitic-bainitic steel beads, diameter 2mm, and shape factor 0.9, hardness 46-51 HRC were used during FBP. Before being employed in the FB, the stainless steel beads were preventively sieved to remove all the fines. The beads were never used more than 4h in the bed and, systematically, replaced with fresh ones.

Fluidized Bed (Fb) Appatatus

The experimental fluidized bed (FB) consists of 200*200*1200 mm³ vertical column. The column was made from stainless steel, with a thickness of 5mm to provide wall rigidity and resistance to wear. It was provided with glass window so that the fluidization process would be visible during the process. At the very bottom of the column, a porous plate distributor, made from a rather thin stainless steel mesh, was used to support the stainless steel beads when not suspended, simultaneously ensuring vertical permeability to the incoming air flux when the fluidized bed is switched on. A purified air flow, free from moisture and oil, was supplied to the fluidized bed by a high power blower. A standard flow meter and an inverter were used to read the current value of air flow and correct it so that the flow rate was kept constant through out the treatment. A pressure probe, a hygrometer, and a thermocouple set were also used to monitor the process and ensure environmental conditions were kept constant, there by guaranteeing the best reproducibility of experimental settings.

Experimentalprocedure

Stainless steel beads were used as a fluidizing material with a static bed height of 200 of 200mm. Fluidization of beads is observed when they come in contact with a vertical upward fluid, in an intermediate range of flowage rates. The air flow suspends the beads, increasing their volume, and makes the beads to behave like fluid. Each bead becomes individually suspended in the fluid flow, while on the whole the bed remains motionless relative to the column walls; the bed is said to be fluidized. Each time the fluidized bed is loaded with fresh beads, it was run for a few miniatures at low flow rates to ensure thorough mixing of powder. After that higher flow rates was set to achieve the fluidization regime and perform the treatments. Processing times ranging from 15 min to 16 min was chosen. During FB processing, the fatigue samples were clamped on the shaft of a direct current electric motor and rotate at moderate speeds in order to ensure process uniformity over the entire sample surface. Flat samples were simply dipped inside the bed and exposed to the incoming flux of air and beads.

Characterization Tests

After FB processing, the samples surface was characterized by field emission scanning electron microscopy (FESEM) and energy dispersive X-ray spectroscopy. To monitor the wear, a 1 micrometer resolution digital palmer was used, while the evolution of surface morphology was evaluated by a contact gauge profiler.

After this, the flat samples were submitted to X-ray diffraction analysis to investigate the changes in the residual stress field and the work hardening induced by the FB treatment. Micro hardness tests were performed at different depths (10-200) micrometer over the cross-sections of the FB processed samples using a micro Vickers indenter.

Fatigue Tests

Fatigue tests were performed to investigate the effect of FB process, the influence of loading conditions and FB process time.

All the fatigue tests were carried out using a rotating bending Moore's machine, a double end cantilever, a rotation frequency of 25 Hz, and a variable loads from 8.85 kg to 15 kg were corresponding to a variable maximum amplitude of alternating stress in the range of approximately 350-550 MPa. After the rupture of fatigue samples, tare cross sections were examined by FESEM.

Results and discussion

FB Peening of AISI 316 L Stainless steel Substrates.

Fluidized bed peening of AISI 316 L stainless steel is able to induce noteworthy micro strains of the treated surface. Although the speed at which the beads impinge the surface is relatively low as result of the typical moderate pressure inside the FB, the rather large dimension of the beads (~2 mm) and their mass can cause effective impacts with considerable kinetic energy [35].

ANDROID

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The world is contracting with the growth of mobile phone technology. As the number of users is increasing day by day, facilities are also increasing. And with the new technologies, new software and operating systems are required.

Operating Systems have developed a lot in last 15 years. Starting from black and white phones to recent smart phones or mini computers, mobile OS has come far away. Especially for smart phones, Mobile OS has greatly evolved from Palm OS in 1996 to Windows pocket PC in 2000 then to Blackberry OS and Android.

One of the most widely used mobile OS these days is ANDROID. Android is a software bunch comprising not only operating system but also middleware and key applications. Android Inc was founded in Palo Alto of California, U.S. by Andy Rubin, Rich miner, Nick sears and Chris White in 2003. Later Android Inc. was acquired by Google in 2005. After original release there have been number of updates in the original version of Android.



Earlier this week, Google officially announced the latest version of its popular Android mobile OS, v4.0, a.k.a., "Ice Cream Sandwich," along with a brand new device that runs Android 4.0: The Samsung Galaxy Nexus--formerly referred to as the "Nexus Prime."

1) Android 4.0 Supports On-Device Encryption

The latest version of Android, 4.0, supports full on-device data encryption, according to Dan Morrill, a Google engineer who works on the Android OS. Past versions of the Android handheld OS could connect to Microsoft Exchange Servers for access to corporate e-mail, calendars, contacts and more, but only if those Exchange Servers did not have a device-encryption IT policy enabled. (Microsoft's brand new Windows Phone 7.5 "Mango" OS does not support on-device encryption

Android Ice Cream Sandwich device encryption means any corporate data stored on users' devices is "scrambled" to protect the info if the handheld is lost or stolen.

2) Voice Typing Enhancements in Android 4.0

Android's talk-to-talk engine got a lot "smarter" with Ice Cream Sandwich, according to Google. Text should instantly appear on screen as you speak. You simply touch the microphone on your Android 4.0 device's keyboard and use your voice to instantly type your emails, SMS, or anywhere you want to enter text.

3) "Face Unlock" in Android 4.0

Google hasn't really released too many details on the new "Face Unlock" feature in Android Ice Cream Sandwich, which lets users unlock their handhelds by simply staring into their devices' digital camera lenses. So it's unclear whether or not Face Unlock will meet organizations' security requirements and serve as a suitable number- or alphanumeric-password replacement. But if so, the feature could make it easier for users to unlock devices while still maintaining data security.

4) Disabling Apps in Android 4.0

Android Ice Cream Sandwich has a new feature that lets users disable practically any application they may want to, including those pesky carrier pre-installed apps that can strain device resources and drain battery even if you choose not to use them, according to Google's Morrill.

5) "Android Beam" Uses NFC to Share Data

Android Ice Cream Sandwich also makes sharing contact information, URLs, maps and directions, videos and media quicker and easier thanks to a new, Near Field Communications (NFC) based feature called "Android Beam." Businesspeople can instantly share data by simply holding two NFC-enabled, Android 4.0 devices close together to initiate the process.

CORROSION IN AIRCRAFT FUSELAGE LAP JOINTS

How Environmental Effects Cause Degradation in Fuselage Materials

Kalpana Gollapalli,



Corrosion was a factor in the Aloha 243 accident. - *Wikimedia Commons*

Normal flight operations combined with exposure to corrosive elements can cause material loss and a reduction of structural integrity in fuselage lap joints.

Corrosion is a chemical reaction that occurs when a base material is exposed to an environmental agent. In metals,

corrosion occurs when the metal atoms lose electrons due to reactions with water or oxygen. The base metal is converted to an oxide or salt compound, depending on the metal and the environmental agent. Corrosion in its most well-known form is rust, in which iron or steel reacts with air or water to form iron oxide, a reddish flaky material on the surface of the ferrous metal.

How Corrosion Occurs in Aircraft Fuselage Lap Joints

Aircraft fuselages are constructed from lightweight aluminum, which is much more resistant to general air and water corrosion than iron, in addition to its many other benefits. Aluminum, like stainless steel and titanium, forms a very thin oxide layer when exposed to air, and this layer actually acts to protect the metal from further corrosion.

Aircraft can be exposed to a variety of corrosive elements while in the air and on the ground. Aircraft that fly near or over ocean areas are exposed to water vapor with a high salt content. Aircraft in locations prone to cold weather are often exposed to deicing fluid to prevent icing during flight. Even normal rainfall has an acidic component that can result in corrosion.

A lap joint consists of two sheets of thin, lightweight aluminum riveted together. While a good seal can be present, it is not always water-tight and can loosen up over time. Water vapor, rainfall, and other agents can be pulled into these thin gaps between the sheets and in the rivet holes through capillary action and remain within the lap joint for extended periods of time, resulting in a slow reaction with the aluminum and transformation of the material.

Identifying Corrosion in Aircraft Fuselage Lap Joints

While several oxides can be created when corrosion occurs in aluminum fuselage lap joints, the most common oxide is aluminum oxide trihydrate. This material has a volume up to seven times larger than elemental aluminum. When aluminum oxide trihydrate is created, it pushes the two sheets in the lap joint apart, causing a phenomenon called “pillowing”, where the skin plumps up around the rivets. Pillowing in itself creates increased stress concentrations around

the rivet holes, and the reduction in aluminum cross section results in an increased load stress on the skin. These two factors can result in crack initiation and growth in the lap joints, such as the catastrophic growth that occurred in Aloha Airlines Flight 243 in 1988.

Non-destructive inspection (NDI) techniques are commonly used to detect corrosion in aging aircraft. Techniques such as ultrasound, eddy current, thermal wave imaging, and optical methods have been implemented with varying degrees of success to detect the presence of corrosion in aircraft lap joints and to quantify the degree of corrosion present.

Preventing Corrosion in Aircraft Fuselage Lap Joints

One of the best methods of preventing corrosion in fuselage lap joints is to seal the lap joint in some way to prevent vapors and liquids from entering the lap joint. A sealant is generally applied to the mating surfaces of the lap joint prior to assembly. However, sealants can degrade over time. Regular inspection of airframes, particularly older airframes, is required to identify corrosion when it occurs and replace the corroded material.

Sources

Read more at Suite101: Corrosion in Aircraft Fuselage Lap Joints: How Environmental Effects Cause Degradation in Fuselage Materials | Suite101.com <http://susan-kristoff.suite101.com/corrosion-in-aircraft-fuselage-lap-joints-a126069#ixzz1mckJVRHR>

VIRUS AND SPYWARE

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One of the biggest slowdowns of a PC is caused by viruses, adware or spyware as it's often called. Before you can benefit from any other optimization tips or improvements you really need a system relatively free from those pests. A virus is a piece of malicious software code written to cause some kind of damage to a computer system or network or even the Internet itself. Viruses spread, similar to their biological namesake, from one machine to another and can spread havoc wherever they go. They are most commonly spread by sharing files with others or through email attachments where they can be set up to send themselves to all the addresses in your email address book.

Adware is usually downloaded and installed along with some other program without your knowledge and unlike a virus doesn't spread by itself. Very often you click "OK" without reading the terms and conditions and by doing so you agree to have the files installed. An example is you see a "free" program on offer that you think might be useful and download it without thinking. Even some anti-spyware programs install adware and the website earns money from the ads that are clicked on.

The catch is that the extra files introduced are used to determine things like your surfing habits and the data is used to serve up popup ads or redirect your browser to a page other than the one you wanted. Some of the programs can be used to install keyloggers which can send back information about passwords and bank details etc. Adware is not a security problem it is more an annoyance especially when you have ten different programs trying show ads. The amount of computer resources it uses up slows your system to a crawl.

Spyware is more malicious and evil intentioned and is designed to steal something from you. It can be downloaded by visiting the wrong types of websites or along with other files the same way as adware. Spyware can often be hard to remove as it can continually recreate itself and hide somewhere on your hard drive. Programs such as Trojans can be used to allow access to hackers at a later date. From the story of the Trojan horse where the Greeks hid inside the wooden horse left as a peace offering and were wheeled into the fort by the Trojans themselves. Then at night the Greeks crept out of the horse and opened the gates and let the enemy in. Trojans and adware unlike viruses don't spread themselves. It is wise to run more than one spyware checker as no one system gets rid of them all. You can never be certain you have every one removed because new ones may not have been discovered and the Spyware program doesn't recognize it yet.

NANO GLANDS – A REVOLUTION IN DRUG INJECTION

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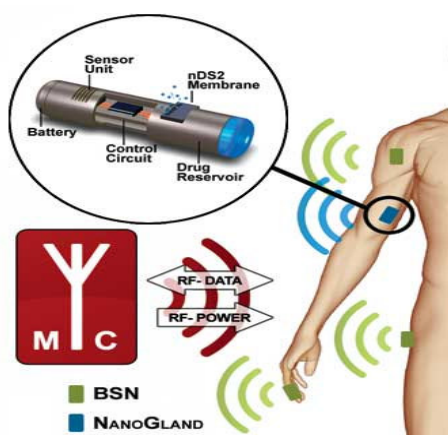
Abstract

The main focus of this review paper presentation is to bring into limelight, the nano technological application that would mimic the body's natural control over the raise of molecules with accurate dosing and precise timing. By the advancements in the field of nano fluidics, nano membranes can be used as molecular sieve capable of releasing prerequisite quantity of drug.

This technology can be used for preparing steady release implants and active release implant. The rudimentary methods of drug administration, which have certain drawbacks, can be overcome by this technique. Mainly aimed at restoring normoglycemia in diabetic patients, this even deals with pain management for cardiovascular diseases. As reliable nanoscale sensors like this evolve, it may be possible to invoke more complex, closed-loop systems for molecular delivery and health monitoring in extreme environments is possible.

Introduction

Human body has got the best ever found communication system within it. The body senses all signals which can be chemical, biochemical, mechanical or thermal and generates appropriate response proportionate to the stimuli. In this context, glands of the body play a major role in secreting of the hormones that regulate the growth and metabolism of the body.



A network of bio sensing nodes (BSN) communicates with the nanogland with feedback loops.

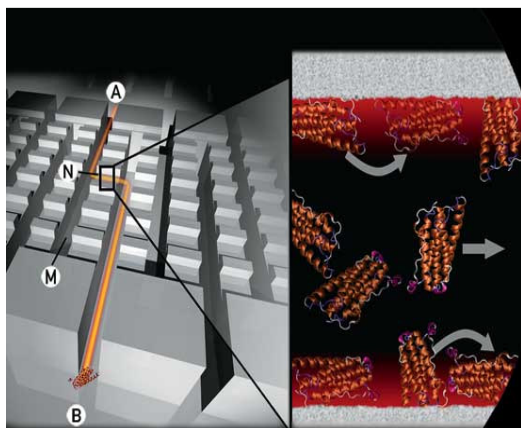
The nanogland, remotely powered through radio frequency, responds to the input and modulates the release of therapeutics while communicating health status to a monitoring centre. As per our present topic concerned, diabetic patients need to take fixed amount of insulin daily. Any variation in the amount of insulin being injected would result in fatal consequences.

Despite this realization, the most common approaches to drug administration in current medicine are oral or intravenous delivery of bolus or intravenous slow infusions. Bolus administration may cause localized high concentration of the medicine whereas slow infusions may not serve the requirements properly. Hence, there is an utmost need to develop automated mechanism that would accept the drug based upon the requirements of the body. This paper would serve this purpose.

Study Release Implants

Steady release implants are characterized by very thin nano channel which are controlling core of the membrane, and modulate the transport of molecules by means of nano confinements, electrostatic interactions, and molecule-to-surface interactions.

By shrinking the size of the channel to a few times the size of diffusing molecules, it is possible to achieve a saturated, concentration-independent transport through membranes.



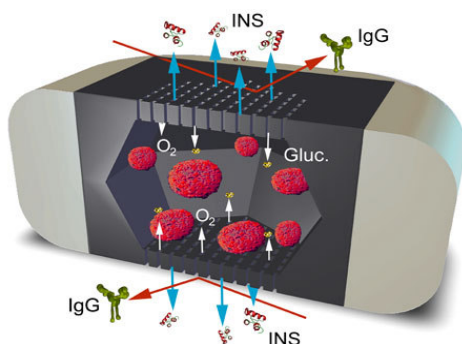
A rendition of the inner structure of a silicon nanochannel membrane (left). Molecules and particles diffuse from inlet (A) to outlet (B) through interdigitated micro channels (M), connected by perpendicular nanochannel (N). The nanochannel (enlarged on the right) is the controlling core of the membrane, and modulates the transport of molecules by means of nanoconfinement, electrostatic interactions, and molecule-to-surface interactions.

At the nanoscale, molecular interactions with the channel wall dominate the transport of fluid due to osmotic pressure and constrained diffusion.

With these methodologies, constant release of therapeutics, over a broad range of molecular sizes, at release rates relevant for medical applications are facilitated. By exploiting the nanochannel in passive systems, a controlled and constant for extended periods of time mimicking the natural glands has been obtained.

Active Release Implants:

Based upon the condition of the area considered, a time variable rate of release can also be achieved through active release implants. This nanochannel technology allows for precise adjustments of timing, duration and frequency of administration. By applying the phenomena, such as electrophoresis and electro-osmosis wherein flow is induced between two electrodes.



A nanogland for cell transplantation embedded in a soft silicone rubber shell (light gray).

The silicon nanochannel encapsulation protects pancreatic islets (red globes) from the body's immune system, preventing the permeation of immunoglobulin (IgG),

while promoting the exchange of oxygen and nutrients, necessary for the islets' viability. In addition to a basal insulin (INS) secretion, the protected islets are able to respond to glucose stimuli from the body.

Charges near the channels will move along the surface following the gradient of electrical potential and mechanically drag the fluid by viscous forces. In a nanochannel, viscous dragging becomes more effective and more energy efficient and hence is highly suitable for implantable technologies. Internally build with communication hardware for remote external control of the activation, cessation or modulation of drug delivery.

Conclusion

Development and preclinical trial of such an effective system is still going on. Design of active components of these membranes requires further development of the mechanics of fluids at nanoscale. Molecular interactions with channel walls, including adsorption and desorption mechanisms, molecule-to-molecule interactions, charge distribution, physical confinement and fluctuation in fluid properties are some other known problems. To entangle this problem, further research in area concerned is required. The ultimate goal of this analysis is development of engineering techniques for better drug delivery systems that would drive to the care of the mankind.

NUCLEAR AND RADIATION ACCIDENTS

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Introduction

It is the biggest accident that affects not only the environment but also the livelihood adversely. The likelihood and potential impact of nuclear accidents has been a topic of debate practically since the first nuclear reactors were constructed. It has also been a key factor in public concern about nuclear facilities. Many technical measures to reduce the risk of accidents to minimize the amount of radioactivity released to the environment have been adopted. Despite the use of such measures, "there have been many accidents with varying impacts as well near misses and incidents".

Definition

A **nuclear and radiation accident** is defined by the International Atomic Energy Agency as "an event that has led to significant consequences to people, the environment or the facility."

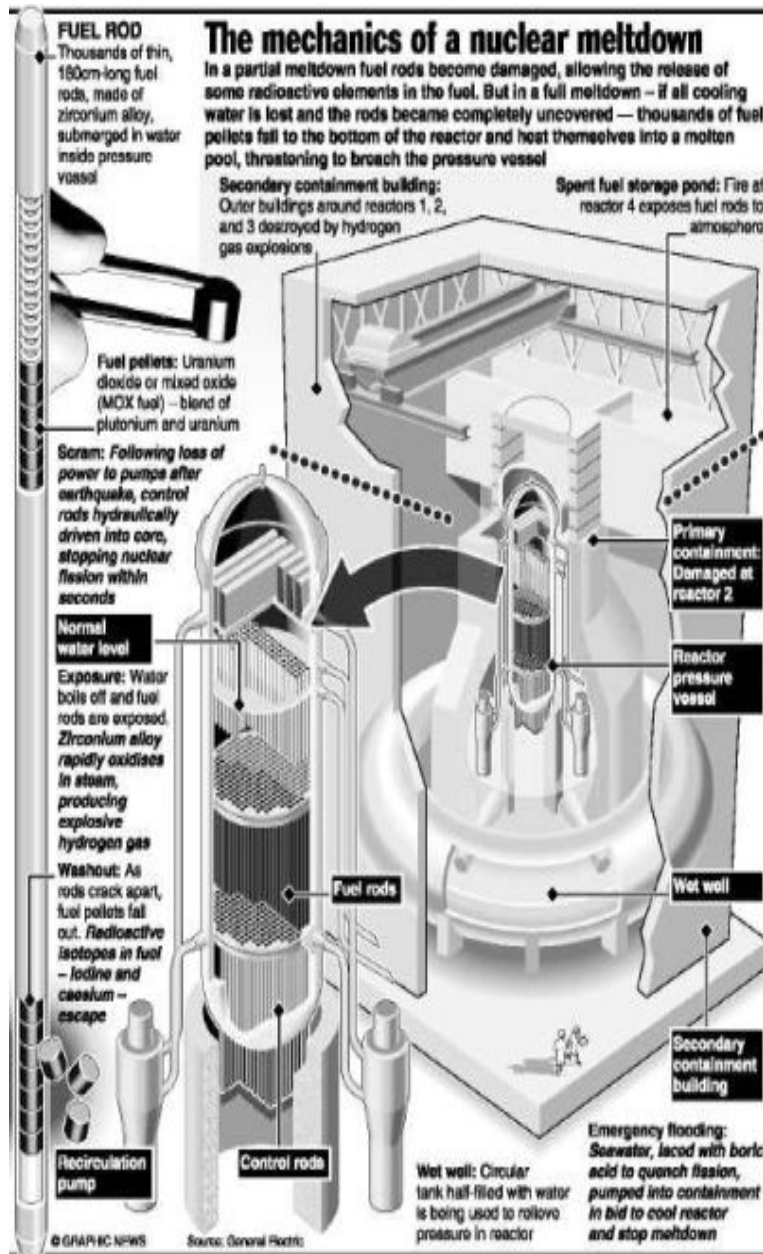
History



The worst nuclear accident to date was the Chernobyl disaster which occurred in 1986 in Ukraine. That accident killed 56 people directly, and caused an estimated 4,000 additional cases of fatal cancer, as well as damaging approximately \$7 billion of property. Radioactive fallout from the accident was concentrated in areas of Belarus, Ukraine and Russia. Approximately 350,000 people were forcibly resettled away from these areas soon after the incident. Recent estimations say that between 4,00,000 and 5,00,000 inhabitants (including unborn children) near Kiev province had been exposed to a very high dose of toxic radiation,

and have a strong probability to develop cancer, leukemia and DNA malformation in the next 10 to 40 years. According to Scientific American, the average coal power plant emits more than 100 times as much radiation per year than a comparatively sized nuclear power plant in the form of toxic coal waste known as fly ash.

How The Nuclear Plant Crisis Happened ?



The fuel in all the 3 Units is thought to have at least partially melted down despite pumping sea water and boric acid into the Units

The crisis at the three Fukushima Daiichi nuclear power stations did not come from buildings collapsing due to the March 11 earthquake of magnitude 9 but from power failure following the quake. The tsunami knocked out the generators that produced the power. Lack of power in turn caused the cooling systems of the reactors to fail.

The Fukushima nuclear reactor 1 went critical on March 1971 and is a 460 MW reactor. Unit-2 and Unit-3 are 784 MW each and went critical in July 1974 and March 1976 respectively. All the three are Boiling Water Reactors (BWR) and use demineralised water for cooling nuclear fuel.

The fuel, in the form of pellets, is kept inside a casing called cladding. The cladding is made of zirconium alloy, and it completely seals the fuel. Fuel pins in the form of bundles are kept in the reactor core. Heat is generated in the reactor core through a fission process sustained by chain reaction. The fuel bundles are placed in such a way that the coolant can easily flow around the fuel pins. The coolant never comes in direct contact with the fuel as the fuel is kept sealed inside the zirconium alloy cladding.

The coolant changes into steam as it cools the hot fuel. It is this steam that generates electricity by driving the turbines. All the heat that is produced by nuclear fission is not used for producing electricity. The efficiency of a power plant, including nuclear, is not 100 per cent. In the case of a nuclear power plant the efficiency is 30-35 per cent. "About 3 MW of thermal energy is required to produce 1 MW of electrical energy. Hence for the 460 MW Unit-1, 1,380 MW of thermal energy is produced," said Dr. K.S. Parthasarathy, former Secretary, Atomic Energy Regulatory Board, Mumbai. "This heat has to be removed continuously."

Coolant flow

Since a very high amount of heat is generated, the flow of the coolant should never be disrupted. But on March 11, pumping of the coolant failed as even the diesel generator failed after an hour's operation. Though the power producing fission process was stopped by using control rods that absorbed the neutrons immediately after the quake, the fuel still contains fission products such as iodine-131 and caesium-137 and activation products such as plutonium-239.

Decay heat

The heat produced by radioactive decay of these radionuclides is called "decay heat."

"Just prior to the shut down of the reactor the decay heat is 7 per cent. It reduces exponentially, to about 2 per cent in the first hour. After one day, the decay heat is about 1 per cent. Then it reduces very slowly," he said.

While the uranium fission process can be stopped and heat generation can be halted, there is no way of stopping radioactive decay of the fission products. Apart from the original heat, the heat produced continuously by the fission products and activation products has to be removed even after the uranium fission process has been stopped. Inability to remove this heat led to a rise in coolant temperature. According to the *Nature* journal, when the temperature reached around 1,000 degree C, the zirconium alloy that encased the fuel (cladding) probably began to melt or split apart. "In the process it reacted with the steam and created hydrogen gas, which is highly volatile," *Nature* notes.

Though the pressure created by hydrogen gas was reduced by controlled release, the massive build-up of hydrogen led to the explosion that blew the roof of the secondary confinement (outer buildings around the reactor) in all the three units (Unit-1, Unit-2 and Unit-3). The reactor core is present inside the primary containment. But the real danger arises from fuel melting. This would happen following the rupture of the zirconium casing. "If the heat is not removed, the zirconium cladding along with the fuel would melt and become liquid," Dr. Parthasarathy explained. The government has said that fuel rods in Unit-3 were likely already damaged.

Effect of melted fuel

Melted fuel is called "corium." Since melted fuel is at a very high temperature it can even "burn through the concrete containment vessel." According to *Nature*, if enough melted fuel gathers outside the fuel assembly it can "restart the power-producing reactions, and in a completely uncontrolled way."

What may result is a “full-scale nuclear meltdown.”

Pumping of sea-water is one way to reduce the heat and avoid such catastrophic consequences. The use of boric acid, which is an excellent neutron absorber, would reduce the chances of nuclear reactions restarting even if the fuel is found loose inside the reactor core. Both these measures have been resorted to in all three Units. Despite these measures, the fuel rods were found exposed in Unit-2 on two occasions.

Fate of reactor core

While the use of sea-water can prevent fuel melt, it makes the reactor core completely useless due to corrosion. The case of Unit-4 is different from the other three units. Unlike in the case of Unit-1, 2 and 3, the Unit-4 is under maintenance and the core has been taken out, and the spent fuel rods are kept in the cooling pond. Whatever led to a decrease in water level, the storage pond caught fire on March 15 possibly due to hydrogen explosion. The radioactivity was released directly into the atmosphere.

Spent fuel fate unknown

It is not known if the integrity of the cladding has been already affected and the fuel exposed. Since the core of a Boiling Water Reactor (BWR) is removed only once a year or so, the number of spent rods in the pond will be more. If the fuel is indeed exposed, the possibility of fuel melt is very likely. Though the fuel will be at a lower temperature than found inside a working reactor, there are chances of the fuel melting. Since it does not have any containment unlike the fuel found inside a reactor, the consequences of a fuel melt would be really bad. Radioactivity is released directly into the atmosphere. Radioactivity of about 400 milliSv/hour was reported at the site immediately after the fire.

Conclusion

Considering the unstable state of the world as we know it, prudence should dictate that it is worthwhile for risk-averse people to learn a bit about nasty events that can befall your plant. Three main routes to avoid further nuclear accidents are:

1. Good design

The overall concept has to be well thought out, and big decisions like secondary containment decided on. Then it is a matter of working out all possible failure sequences, and showing that major accidents are reduced to a probability of less than 10^{-6} per annum. This analysis relies on a multitude of assessments of, for example, properties of materials and how they behave in possible conditions in the plant, especially in the primary circuit. Stress analysis is very important and must take account of thermal cycles and vibration levels. Also the behavior of materials in possible chemical conditions. The possible earthquake levels in the locality need to be assessed and applied to the design to find any weak points. The control and instrumentation must be assessed for the required functions and made reliable enough. And so on, you get the idea I expect.

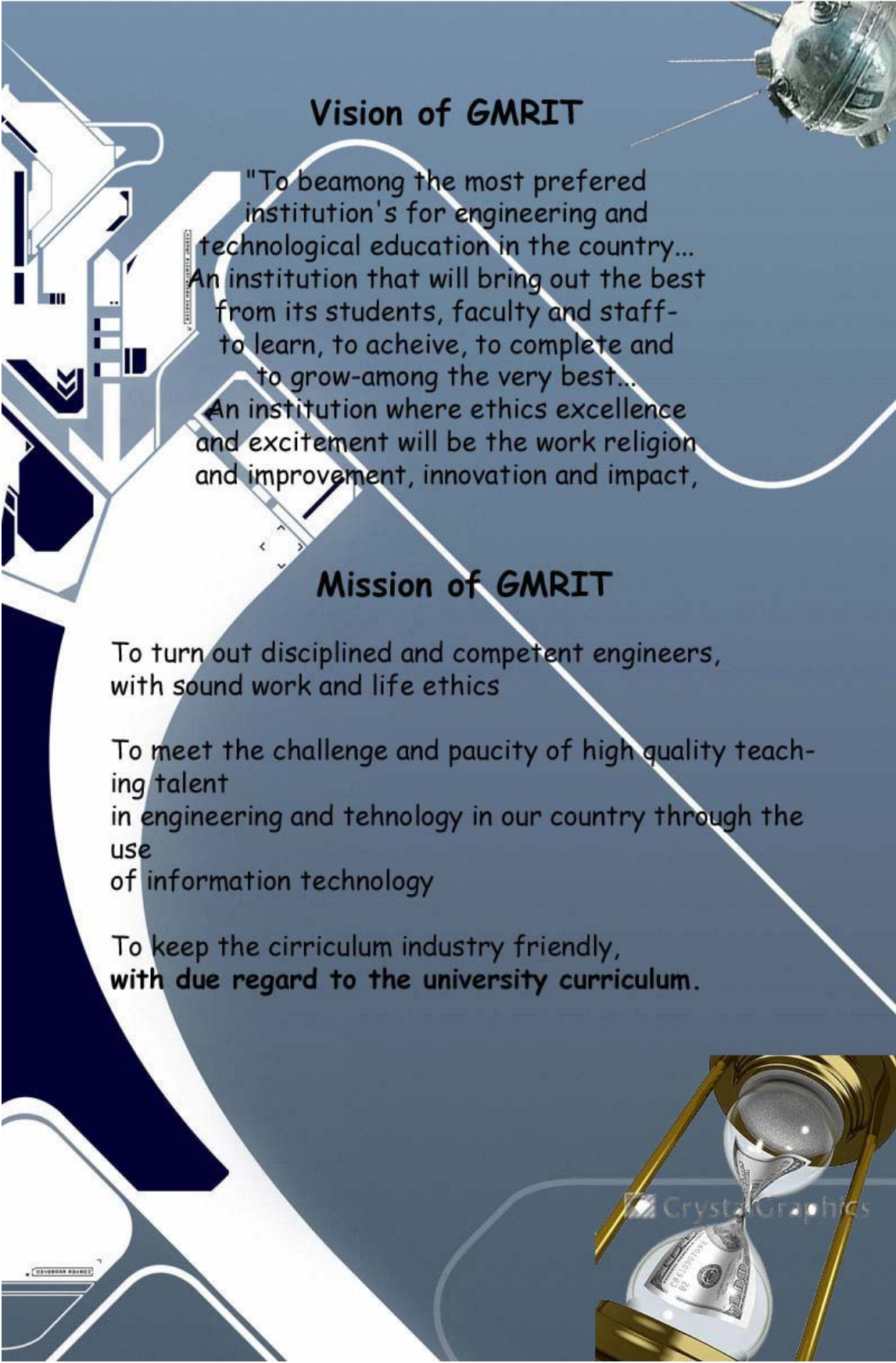
2. Construction

It is very important to make sure the plant is actually built to the required specification, the correct materials used, and techniques such as welding must be fully inspected and recorded.

3. Operation:

The operators must be well trained and supervised, and have the correct operating manuals, and have had training in what to do in unusual conditions. The owners should also have a team of head office engineers who can continuously assess that the plant is being run correctly, and analyze for any improvements to be made in the plant.

The above all applies to the owners and builders. In addition there must be an independent body who give the license to operate and regularly examine the plant and operations for compliance. This is the NRC in the US and the NII in the UK, but all countries must have such a body.



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