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Design and Fabrication of Solenoid Compressed Hybrid Air Engine

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Abstract: ***As we are moving towards the developed country, the need of fossil fuel is increasing day by day with increasing population. We need alternative to replace fossil fuel. In IC engine, the chemical energy get converted into mechanical energy, i.e., the low grade energy get converted into high grade energy. The IC engine we use cause more pollution. So to overcome this problem, the electromagnetic force and compressed air is use to run the engine. The solenoid compressed hybrid air engine which uses electric energy and compressed air to run, can replace the use of IC engine. As we pass current through the copper wire winding, the magnetic field generated near the copper wire. The polarity of the magnetic field can vary according to the current. The magnet attached at the piston get attracted up as the polarity of permanent magnet and this force is transferred to the connecting rod and crankshaft assembly, which transfer the reciprocating motion of piston into rotating motion of crankshaft and finally the flywheel. The electromagnetic engine should be more compatible. The electromagnetic engine does not require extra components like cam follower, valves, fuel pump, injectors, fuel tank etc. The strength of magnetic force can be increase by varying the input voltage and current.***

Keywords: ***Compressed air, engine, Robotic system, pivot, Smart farming.***

I. INTRODUCTION

In present day, we can't imagine a day without IC engines, which is one of the greatest invention of man. The IC engine which is used in automobiles to run it. We need automobile for transporting goods and passenger to travel.

As increasing population, the need of automobile is increasing. The IC engine use petrol and diesel as fuel. The need of fossil fuel is increasing which give hike in the price of fuel. This create a situation that bring up a need to switch to alternative source of fuel to produce the power similar to IC engine. The challenge is not to create an engine that operates on an alternate fuel but also have higher efficiencies. The next source of energy that strike our minds is definitely electrical energy. We can use electrical energy or hybrid which runs on both fossil fuel and electric energy. To increase the efficiency of engine the combination of different energy us used . Government has taken many a steps to reduce the vehicular emission by setting emission standards. How ever, evolution of scientific methods for emission inventory is crucial. Therefore, analysis is done on the emissions from various vehicles by using IVE model .The quality of air in developing countries like India has reached a horrifyingly low level. Modal analysis to estimate a vehicular emission to showcase the temporal emission of vehicles [1].

Pistons and the cylinders of a conventional IC Engine are replaced by the permanent magnet pistons and non-ferro magnetic materials respectively which led to the invention of electromagnetic reciprocating engine by Sherman S. Blalock [2]. Multi-cylinder electro mechanical engine for the automotive that consists of the cylinders containing samarium cobalt type of magnets in pistons located at right angle to the pistons [3].Growth in this field has led to the invention of Maps Engines which are incorporated with various equipment and machineries whose application are in fields such as aircraft engine, ship engine, locomotive engine and lawn mower [4].

Compressed Air Engine Basics: A Compressed-air engine is a pneumatic actuator that creates useful work by expanding compressed air. A compressed- air vehicle is powered by an air engine, using compressed air, which is stored in a tank. Instead of mixing fuel with air and burning it in the engine to drive pistons with hot expanding gases, compressed air vehicles (CAV) use the expansion of compressed air to drive their pistons .They have existed in many forms over the past two centuries, ranging in size from hand held turbines up to several hundred horsepower. For example, the first mechanically- powered submarine, the 1863 Plongeur, used a compressed-air engine. The laws of physics dictate that uncontained gases will fill any given space. The easiest way to see this in action is to inflate a balloon. The elastic skin of the balloon holds the air tightly inside, but the moment you use a pin to create a hole in the balloon's surface, the air expands outward with so much energy that the balloon explodes. Compressing a gas into a small space is a way to store energy. When the gas expands again, that energy is released to do work.

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That's the basic principle behind what makes an air car go. Some types rely on pistons and cylinders, others use turbines. Many compressed air engines improve their performance by heating the incoming air, or the engine itself. Some took this a stage further and burned fuel in the cylinder or turbine, forming a type of internal combustion engine One manufacturer claims to have designed an engine that is 90 percent efficient. Compressed air propulsion may also be incorporated in hybrid systems, e.g., battery electric propulsion and fuel tanks to recharge the batteries. This kind of system is called hybrid-pneumatic electric propulsion. Additionally, regenerative braking can also be used in conjunction with this system

A. Study of the Compressed Air Engine and its Working

The laws of physics dictate that uncontained gases will fill any given space. The easiest way to see this in action is to inflate a balloon. The elastic skin of the balloon holds the air tightly inside, but the moment you use a pin to create a hole in the balloon's surface, the air expands outward with so much energy that the balloon explodes. Compressing a gas into a small space is a way to store energy. When the gas expands again, that energy is released to do work. That's the basic principle behind what makes an air car go .The first air cars will have air compressors built into them. After a brisk drive, you'll be able to take the car home, put it into the garage and plug in the compressor. The compressor will use air from around the car to refill the compressed air tank. Unfortunately, this is a rather slow method of refueling and will probably take up to two hours for a complete refill .If the idea of an air car catches on, air refueling stations will become available at ordinary gas stations, where the tank can be refilled much more rapidly with air that's already been compressed. Filling your tank at the pump will probably take about three minutes. If the idea of an air car catches on, air refueling stations will become available at ordinary gas stations, where the tank can be refilled much more rapidly with air that's already been compressed. Filling your tank at the pump will probably take about three minutes India's Tata Motors will likely produce the first air car in the marketplace in the next few years. Tata Motors' air car will also use the CAE engine. Although Tata announced in August 2008 that they aren't quite ready to roll out their air cars for mass production, Zero Pollution Motors still plans to produce a similar vehicle in the United States. Known collectively as the FlowAIR, these cars will cost about $17,800. The company, based in New Paltz, N.Y., says that it will start taking reservations in mid-2009 for vehicle deliveries in 2010. The company plans to roll out 10,000 air cars in the first year of production. MDI also recently unveiled the joystick-driven AirPod, the newest addition to its air car arsenal. Although the AirPod generates a top speed of only 43 mph, it's also extremely light and generates zero emissions.Major automobile makers are watching the air car market with interest.If the first models catch on with consumers, they'll likely develop their own air car models. At present, a few smaller companies are planning to bring air cars to the market in the wake of the MDI-based vehicles.

B. 3d Printed Solenoid Compressed Hybrid Air Engine

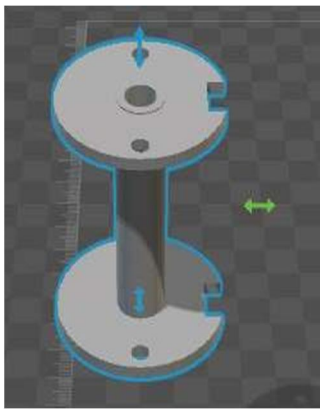


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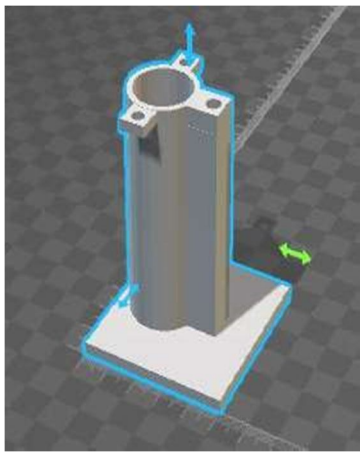
C. Parts of Engine

There are three main parts of our engine are

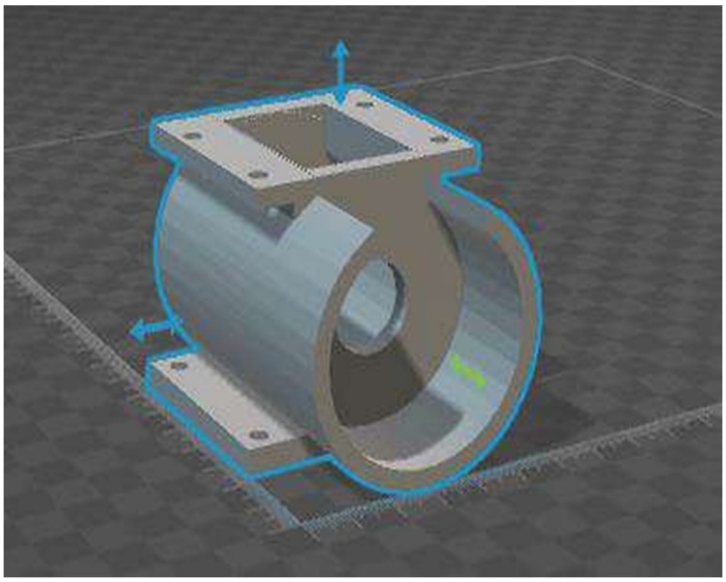
1) Solenoid Block



2) Air engine block



3) Crank and Starter Motor



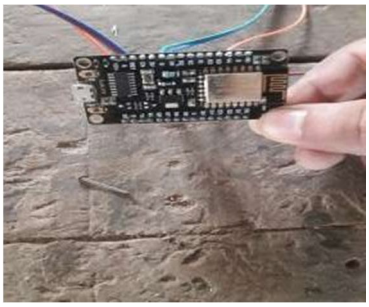
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II. LITERATURE

In general terminology, sustainability can be stated as; meeting the needs of current and future mankind/generations through environmental, social and economic improvements, whereas sustainabilityof the energy resources to preserve the oil and make brighter future of mankind by adding alternative energy sources such as: non-conventional and or renewable energy which is going to help current problem to some extent. Now worldwide researchers/inventors are paying full attention towards this issue. It is also learnt that there are two distinct reasons for search ofalternative to fossil fuel and make sustainable energy source; the first one is depletion of oil resources which is causing civilization vulnerable, thereby many researchers, technologists and scientist have spoken as to why alternative to fossil fuel is required another one is higher rate of emission due to rapid use of hydrocarbon fuel. [4] Behavior of compressed air Compressed air is clean, safe, simpleand efficient. There are no dangerous exhaust fumes of or other harmful by products when compressed air is used as a utility. It is a non-combustible, non- polluting utility. When air at atmospheric pressureis mechanically compressed by a compressor, the transformation of air at 1 bar (atmospheric pressure) into air at higher pressure (up to 414 bar) is determined by the laws of thermodynamics. They state that an increase in pressure equals a rise in heat andcompressing air creates a proportional increase in heat. Boyle's law explains that if a volume of a gas (air) halves during compression, then the pressure is doubled. Charles' law states that the volume of a gas changes in direct proportion to the temperature . These laws explain that pressure, volume and temperature are proportional.

III. ELECTRONICS PARTS

1) Esp8266



The ESP8266 uses a 32bit processor with 16 bit instructions. It is Harvard architecture which mostly means that instruction memory and data memory are completely separate. ... As any other microcontroller, ESP8266 has a set of GPIO pins (General Purpose Input(Output pins) that we can use to “control” external sensors

2) Motor driver (L293D)



The L293D is a 16 pin IC, with eight pins, on each side, dedicated to the controlling of a motor. There are 2 INPUT pins, 2 OUTPUT pins and 1 ENABLE pin for each motor. L293D consist of two H-bridge.
H-bridge is the simplestcircuit for controlling a low current rated motor.

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3) Soil Sensor, 4 Channel Relay andWater Pump





A. Applications

The compressed air engine can be used in many vehicles. Some of its applications to be used as engine for vehicles are:

1) Mopeds Jem Stansfield, an English inventor has been able to convert a regular scooter to a compressed air moped. This has been done by equipping the scooter with a compressed air engine and air tank.
2) Buses MDI makes MultiCATs vehicle that can be used as buses or trucks. RATP has also already expressed an interest in the compressed-air pollution-free bus.
3) Locomotives Compressed air locomotives have been historically used as mining locomotives and in various areas.
4) Trams Various compressed-air-powered trams were trialed, starting in 1876 and has been successfully implemented in some cases.
5) Watercraft and aircraft Currently, no water or air vehicles exist that make use of the air engine. Historically compressed air engines propelled certain torpedoes.
6) In agriculture robots.

B. Discussion

The main points is that with growing progress in technology , drones too are coming in differentshapes , sizes and configurations for better stability Moreover , extended components like soil sensors , farm tracker made it easy in mission completion.

After 10 years , the market for robots well reach $1.6 Billion .Each year , $6.8 billion is being spend on developing drone technology the robots are even providing new job opportunities .80000, new Smart farming related projects within next three years are going to start itself in U.S.A alone .

So no need for people to be in fear about losing their jobs because of replacement by robots in forthcoming future

Since the advantage of our technology are more than its disadvantages , then according to robots experts , robots will be ‘’ is trends ‘’ within next 10 years to 15 years ahead .

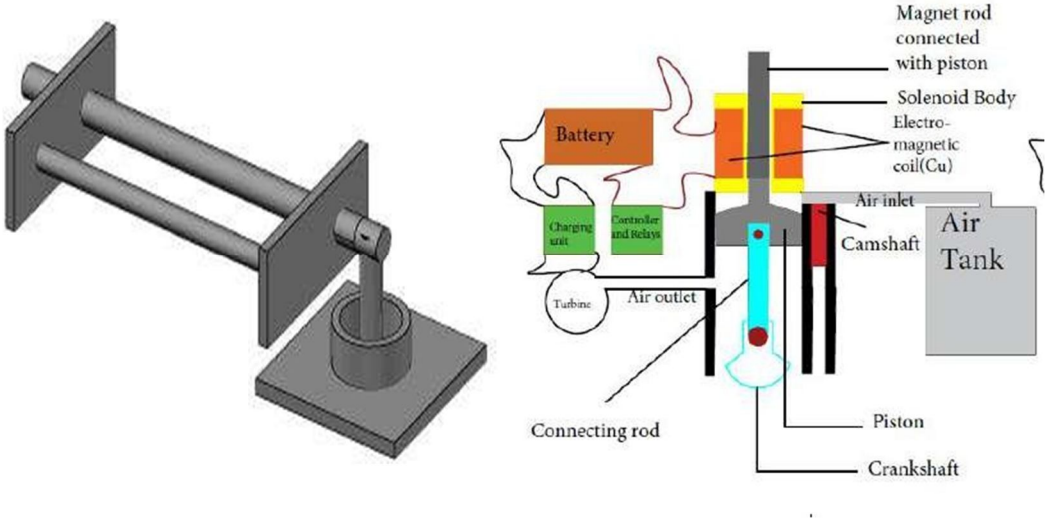
There is a wide scope that with its extending use in almost every field and with greater powerful components, drones will surely come into full time existence in upcoming future.

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IV. PIVOT OR CLOCK SYSTEM

A. Working

The Air Engine uses the power of compressed air to generate torque and rotational motion. Compressed air is filled in the storage tank with the help of compressor .The air is filled in storage tank upto the pressure of 6 to 8 bar .The high pressure air is then supplied to air motor which runs the motor .The power developed by the motor is 0.38-0.44 HP depending upon the road condition .The torque developed by the motor is 26.7 N-m at the maximum power of 307.56 watts. Now rotational motion is transferred to wheels via axle .On rear axle one wheel is fixed & other one is free which is connected via bearing.



Center pivot irrigation is a form of overhead sprinkler irrigation consisting of several segments of pipe (usually galvanized steel or aluminum) with sprinklers positioned along their length, joined together and supported by trusses, and mounted on wheeled towers. [1] The machine moves in a circular pattern and is fed with water from the pivot point at the center of the circle.[8] For a center pivot to be used, the terrain needsto be reasonably flat; but one major advantage of center pivots over alternative systems that use gravity flow is the ability to function in undulating country. This advantage has resulted in increased irrigated acreage and water use in some areas. The system is in use, for example, in parts of the United States, Australia, New Zealand, and Brazil [8] and also in desert areas such as the Sahara and the Middle East.

V. RESULT

In this paper prototype model is working very efficiently. Here we make an engine which runs on compressed air and electromagnetic power (Solenoid). This engine produces the required torque according to their work. It is Green energy and decreases the pollution and make environment clean.

VI. CONCLUSION

Compressed air for vehicle propulsion is already being explored and now air powered vehicles are being developed as a more fuel-efficient means oftransportation. In this project a preliminary investigation is carried out to run a vehicle oncompressed air. From the observation it can be concluded that compressed air power vehicles can prove to the future vehicles which is ecofriendly, pollution free, but also very economical. This redresses both the problems of fuel crises and pollution. These are zero emission vehicle .To sum it up, they are nonexpensive vehicles that do not pollute and are easy to get around in cities.

REFERENCES

[1] Haisheng Chen et al. "Air fuelled zero emission road transportation: A comparative study" ,Applied Energy 88 (2011), 24 June 2010,pp: 337–342.

[2] S. Mounty, A. Mirzaian, F.Gustin, A. Berthon, D. Depernet, C.Espanet, "High Torque Density Low Speed Permanent Magnet Machine", InternationalElectric Machine and Drives Conference (IEMDC), 2011, pp. 448-453.

[3] J. Rithula, J. Jeyashruthi, and Y. Anandhi, "Electric Vehicle with Zero-fuel Electromagnetic Automobile Engine", International Journal of Engineering Research and Technology (IJERT), ISSN0974-3154,Volume-6, pp. 483-486, November 4(2013).

[4] Shirsendu Das, "An Electromagnetic Mechanism which works like an Engine", International Journalof Engineering Trends and Technology (IJETT), Volume-4, Issue 6, June 2013.

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[5] Abil Joseph Eapen, Aby Eshow Varughese, Arun T.P., Athul T.N., "Electromagnetic Engine", International Journal of Research in Engineering and Technology (IJRET), eISSN:2319- 1163, pISSN:2321-7308, Volume-03, Issue 6, June 2014.

[6] Amarnath Jayaprakash, Balaji, G. Bala Subramanian, "Studies on Electromagnetic Engine", International Journal of DevelopmentResearch (IJDR), ISSN 2230-9926, Volume-4, Issue-3, pp. 519-524, March-2014.

[7] Piyush Hota, Mahima Rathore, Danish Shaikh, "Magnetic Repulsion Piston Engine", International Journal of Science and Research (IJSR), ISSN 2319-7064, Volume-4, Issue-12, December-2015.

[8] Ashwin Mathew John, Mathew George, Reenu Saji, Shamith Kaur, "Prototype Implementation ofElectromagnetic Piston", International Journal of Innovative Research in Electrical, Electronics, Instrumentation and Control Engineering (IJIREEICE), ISSN 2321-2004, Volume-4, Issue-4,April 2016.

[9] Pratik Kumar Sinha, "High Torque Solenoid Coil Engine", International Academy of Engineering and Medical Research (IAEMR), Volume-2, Issue-3March - 2017.

[10] Anamika Tiwari, Anurag Singh, Deepak Agarwal,Ajay Kumar Verma, "Design and Fabrication of 4-Stroke Solenoid Engine", International Research Journal of Engineering andTechnology (IRJET), Volume-6, Issue-12, December2019.

[11] Sharma P. C. & Aggarwal D.K., Machine Design, S.K.Kataria & Sons, Ed. 11th Reprint.

[12] J. Gary Wood et al. "Design of a low pressure Air engine for third world use" 17th Annual Intersociety Energy Conversion Los Angeles, California August, 1982.

[13] Tom, air engine You-tube channel, Aerospace Engineer.

[14] HE Wei et al. "Performance study on three-stage power system of compressed air vehicle based on single-screw expander" science china technological sciences, August 2010, pp:2299–2303.

[15] Mahadevan & Reddy, Design Data Handbook, CBSPublishers, Ed. 3rd.

[16] Mechanical Engineering and Design, Tata McGrawHill, Ed. 3rd.

[17] Design) Anjuman College of Engg and Tech,Nagpur, MS, India

[18] Compressed Air Car by, S.S.Thipse

[19] Compressed air energy storage system G.KARTHIKA,KRISHNAWAMY COLLEGE OF ENGINEERING ANDTECHNOLOGY, CUDDALORE.

[20] Latest Developments of a Compressed Air Vehicle:A StatusReport by, S.S.Verma

[21] Experimental Investigation on the Performance of a Compressed- Air Driven Piston Engine by, Chih- Yung Huang , Cheng-Kang Hu, Chih-Jie Yu and Cheng-Kuo Sung. Department of Power MechanicalEngineering, National TsingHua University, Hsinchu30013, Taiwan

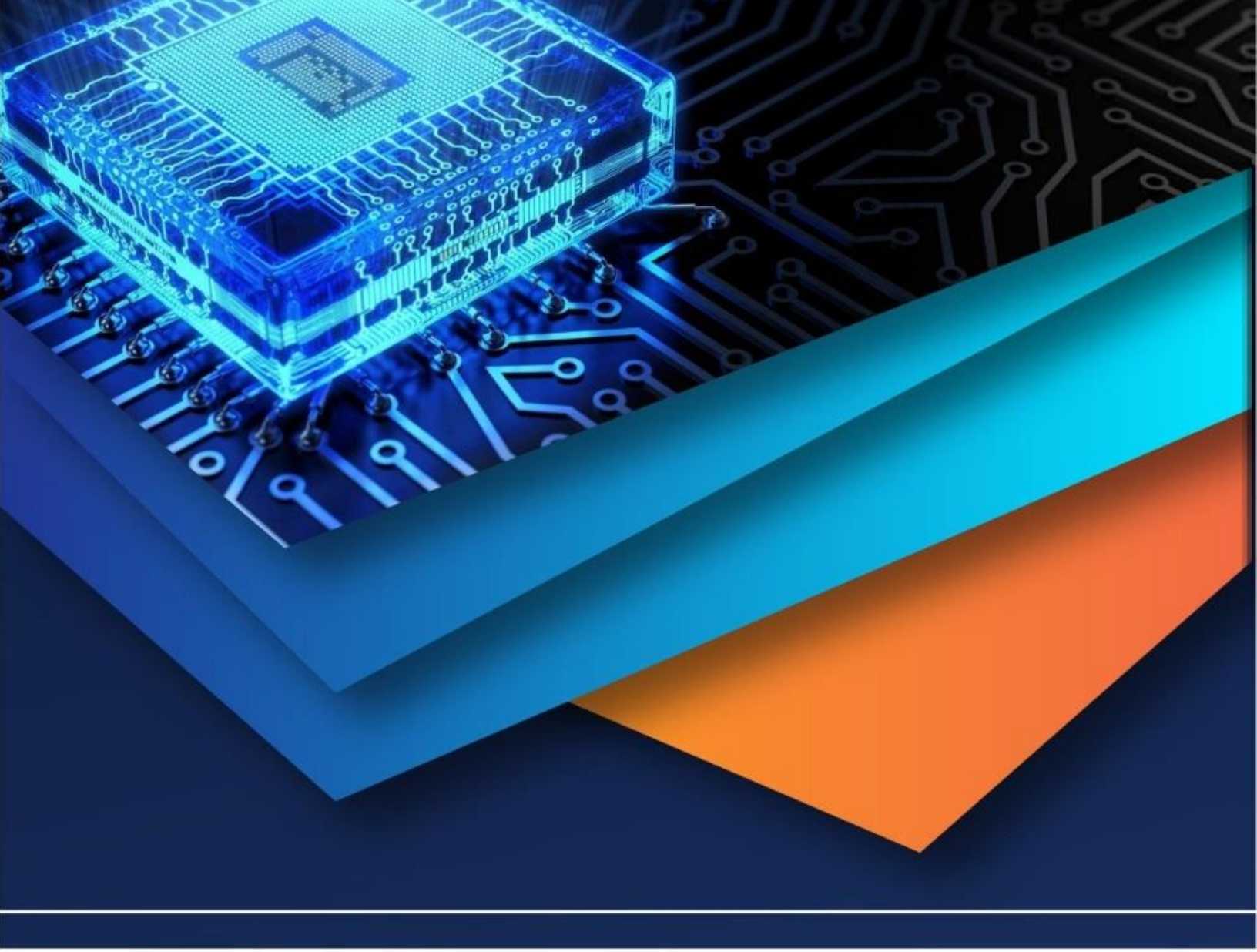
[22] Amir Fazeli et al. "A novel compression strategy forair hybrid engines" Applied Energy 88 (2011) ,8 March 2011,pp:2955–2966

[23] Ulf Bossel "Thermodynamic Analysis of Compressed Air Vehicle Propulsion" European Fuel Cell Forum,Morgenacherstrasse 2F CH-5452 Oberrohrdorf/Switzerland, April 2, 2009

[24] vehicle propulsion. European Fuel Cell Forum ; 2009.<http://www.efcf.com/e/reports/E14.pdf>

[25] MDIEnterprisesS.A(http://www.mdi.lu/eng/ afficheeng.php?page=minicats).Mdi.lu Retrieved2010-12-12.

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