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Vehicle using Compressed Air

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Abstract:- For decades, scientists and engineers have been interested in compressed air as a source of energy in many applications and as a non-polluting fuel in compressed air automobiles. Our fossil fuel consumption has resulted in several environmental issues, yet vehicles that run on compressed air are indeed considered a pipe dream. The compressed air engine (CAE) is gaining popularity around the world since it is sustainable and produces zero pollution. Motorcycle engines emit the largest proportion of all fuel-powered engines. More than 3 million motorcycles (bikes, and covered three-wheeled motorbikes known as tuktuk) are now fueled by fossil fuels in Egypt. The current article provides a quick overview of the most recent breakthroughs in compressed-air vehicles, as well as an overview of the technology's numerous difficulties and solutions.Control of compressed air characteristics such as temperature, energy density, input power need, energy release, and emission control must be mastered throughout the creation of a safe, light, and cost-effective compressed air vehicle in the near future.

Keywords:- *compressed air vehicle, sustainable, fossil fuels, energy density, zero pollution, temperature, input power, energy release.*

I. INTRODUCTION

A pneumatic automobile is one that runs entirely on compressed air. There is no need for gasoline or fuel. The fundamental law of thermodynamics is followed. When air is compressed, it stores energy in the form of pressure. When the air expands into the cylinder, this energy is transferred into mechanical energy. A series of pistons is often employed to create linear motion from compressed air. The piston's shaft is housed in an airtight chamber where compressed air is provided. When air is not being pushed into the chamber, a spring is wrapped around the piston's shaft to keep the chamber entirely open. As more air is pumped into the chamber, the force on the piston shaft begins to outweigh the force on the spring. The pressure in the chamber rises as more air is pumped in, and the piston moves down the chamber. The air pressure in the chamber is released when it reaches its maximum length, and the spring completes the cycle by shutting the chamber and returning it to its original position. Compressed air vehicles (CAVs) use the expansion of compressed air to drive their pistons instead of combining gasoline with air and burning it in the engine to drive pistons with hot expanding gases. A 90 percent efficient engine has been claimed by one manufacturer. Compressed air propulsion can also be used in hybrid systems, such as those with battery electric propulsion and fuel tanks to replenish the batteries. Hybrid-pneumatic electric propulsion is the term for such a system. This technology can also work with regenerative braking.

According to Tata, the program's initial "proof of technical concept" phase is already complete, with "the compressed air engine idea being proven in two Tata Motors cars."

Finally, this discovery might have a big impact in Egypt, where there are a lot of motorbikes and tuktuks (covered three-wheeled motorbikes), especially in rural regions where there is little infrastructure and fossil fuel supply is scarce. Tuktuks are mostly utilized for transportation in some isolated parts of Egypt, where there are no alternative options for short distances with gravel roads infrastructure.

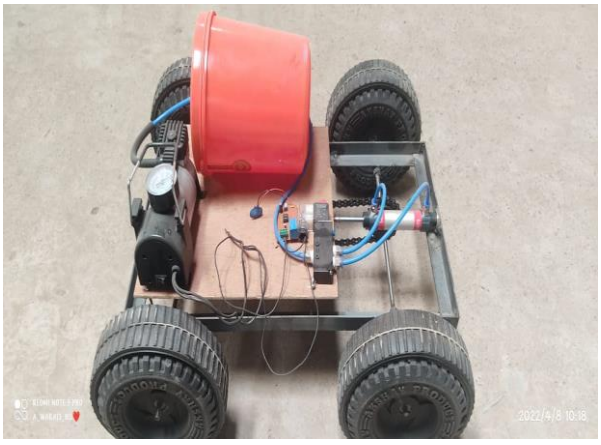

Fig. 1 Robot Design

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II. TECHOLOGICAL TRENDS

Inventors in Europe have created a basic air engine, ushering in a new era in compressed air vehicle technology. These engines enable automobiles to run on compressed air rather than gasoline. Instead of minor gas explosions, the car's pistons are pumped by super-compressed and strong air. Because these automobiles use compressed air instead of bursting gasoline, they have zero emissions–no pollution and no oil. Furthermore, the average weekly gasoline cost for a family is $60, with a hybrid car costing half that. For a few bucks, the new air engines can provide a week's worth of driving. The Dayun 150 cc motorcycle engine is a nominal internal combustion engine that runs on petrol (gasoline). This engine has been adapted to run on compressed air. Compressor, air tank, engine, solenoid valve, battery, nonreturn valve, throttle valve, pressure gauge, K-type thermocouple, electrical cables, and IR timing method are the most important components of the CA system. In addition to an actual shot of the engine auxiliary components, the schematic depicted the functioning principle and air flow with command signals.

- Retrofit scooters with a three-quarter-foot-diameter air-compression motor. A compressed air tank blasts into the chambers of a turbine whose axis is placed off-center from its housing, according to the engine's blueprints. As the turbine rotates, the vanes expand, allow the chambers to accept the amount of air as it expand and adds to the drive. The converted scooters, unlike with the Air Car, would run on the pressure required to fill a tyre at a petrol station.
- A Californian inventor has created a vehicle that runs on compressed air stored in scuba tanks. He tinkered with the Honda RC51 998cc Superbike's engine. He utilized the spark plug hole on the other cylinder to send compressed air into one of the engine's cylinders. As the power stroke begins, pressurized air pulls the piston down. The compressed air is released through the exhaust valves at the conclusion of the power stroke, leaving just air in the exhaust. The Honda motorcycle's six-speed gearbox connected the pistons to the wheels. This customized engine was put on a tubular frame with a body that resembled a strange crossbreed of a motorcycle and a race car. The compressed air was stored in a bank of three scuba tanks at 3400 pressure and throttled to 240 psi at the intake port with a self-designed throttle valve coupled to the accelerator pedal. The three tanks were adequate for the 2-mile test run, which saw an actual pace of 45.723 mph and a peak speed of 53.058 mph. Furthermore, compressed air is predicted to reach speeds of up to 300 mph. However, various concerns such as the great size and weight of the model owing to the utilization of several tanks must be addressed even before concept can be turned into a practical notion.
- Another Uzbek innovator has converted an automobile to operate on compressed air stored in a tank, claiming that the car would take in air as it drives. store it under pressure in a tank, resulting in a machine that never stops moving. Perpetual motion engines are, of course, impossible according to known principles of physics, yet the concept isn't discarded out of hand. It's interesting to think of pressurized air being replenished while the automobile is in motion.

III. COMPONENTS USED

The following are the various components of a **"air compressed car":**

1.Crank shaft
2.Connecting screw
3.Pneumatic cylinder
4.Solenoid valve
5.Bearing
6.Bearing stand
7.Tyre
8.Air cylinder
9.Compressor
10.Pneumatic pipe
11.Connectors
12.Body base
13.Fan regulator
14.Bridge rectifier
15.Transformer

IV. PROBLEM DEFINITION

- New automotive vehicles/machines/instruments are now automatically operated or controlled thanks to advanced technologies.
- We discovered that in motor vehicles such as cars, trucks, and rickshaws during our study (survey of local roads, visiting garage). It disperses a great deal of pollutants, including hazardous gases such as SO2, CO2, SO3, CO, and others.
- Humans aim to try to minimize pollution by switching to alternative combustion fuels.
- As a result, we'll call the project “VEHICLE USING COMPRESSED AIR”

V. WORKING PRINCIPLE

Instead of fuel, compressed air is used in air-powered vehicles. There is no pollution since the automobile runs on air. The automobile is powered by a two-cylinder compressed air engine. The engine may function as an internal combustion engine or run only on compressed air. At a pressure of 4251 pounds per square inch, compressed air is held in fibre or glass fibre tanks. The air is injected into the engine using an air injector and then expanded in a tiny chamber. The crankshaft is moved by the air pressing down on the piston, which gives the engine power. This vehicle is also developing a hybrid version of its engine that can operate on regular gasoline and air. Electronic control is used to adjust the energy source. When the automobile is travelling at less than 60 kilometers per hour, it operates on air. It operates on a fuel such as gasoline, diesel, or natural gas at greater speeds. A compressed-air vehicle (CAV) is a mode of transportation that is powered by the release and expansion of pressurized atmospheric gas within a pneumatic engine. Submarines, locomotives used in areas where regular engines are a hazard, and early design submarines have all utilized CAVs Compressed-air vehicles operate according to a thermodynamic process in which air cools when expanding and heats up when compressed, resulting in thermal energy losses that deplete the capacity factor. However, with recent developments in isothermal compressed air energy storage ICAES plants, pressurized air vehicles can now operate at higher capacity factors.

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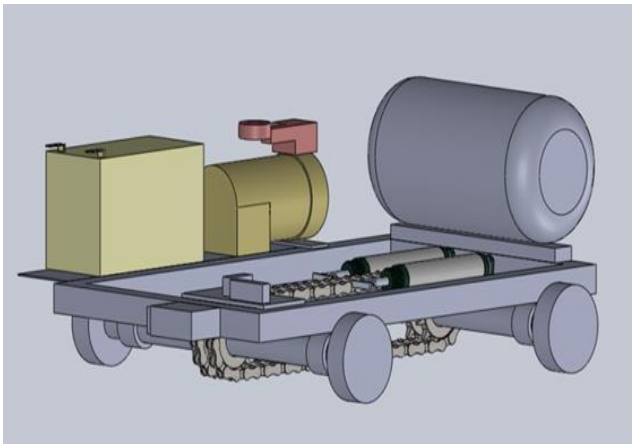

Fig. 2: 3D View of finally assembly in CATIA

VI. DESIGN PARAMETER

PARTNAME	DIMENSION
Dc motor	Std with 25 teethedgear mounted
Battery	Std12V
Air compressor	Std
Pneumatic Tubes (Pipes)	6ft.
Solenoid Control Valves	Std
Pneumatic cylinder/Motors	Std
Wheels	450mmDiameter
Steel Shafts	480mmx5.5mmDiameter
Wires	4ft.
Ply Board	425x230x4.5mm
Transformer	Std

VII. PROCEDURE FOR DESIGN

We must compute several characteristics and determine product dimensions in order to improve design and achieve the desired outcome:

- Now, some fundamental dimensions for a double-acting pneumatic cylinder are as follows:
- Compressed air energy storage is a technique for storing energy created at one time for later usage.
- Air-driven motors make advantage of the energy contained in a compressed gas to perform useful tasks.
- The intake enthalpy minus the outlet enthalpy times your mass flow rate equals the energy output.
- The inlet enthalpy is a well-known state that can be calculated using inlet pressure and temperature.
- Knowing the intake pressure and temperature, we can compute the inlet enthalpy. Internal energy specifies the amount of energy stored in compressed air as well as the amount of labour that may be extracted.

VIII. LITERATURE REVIEW

- **A pneumatic vehicle is a newly invented technology that allows an automobile to run on compressed air.**

According to S. S. Verma [1], compressed air has captivated engineers and scientists for millennia as a source of energy in many applications and as a nonpolluting fuel in compressed air vehicles.

Many inventors and manufacturers are working to perfect compressed air vehicle technology in all aspects for its earliest use by mankind. The current article provides a brief overview of recent breakthroughs in compressed-air vehicles, as well as an overview of major difficulties linked with the technology and their solutions. Management of compressed air factors such as temperature, energy density, input power requirements, energy release, and emission control must be mastered throughout the creation of a safe, light, and cost-effective compressed air vehicle in the near future.

According to Gopal Singh [2], compressed air has captivated scientists and engineers for millennia as a source of energy in many applications as a nonpolluting fuel in compressed air vehicles.

Using a compressor, compressed air is filled with electricity. When calculating total efficiency, the electricity required to compress air must be taken into account. Compressed air vehicles will help to reduce air pollution and eventually eliminate it. There is no combustion process going on there. Small utility vehicles are quickly becoming such a popular mode of short-distance independent mobility.

According to Venkatesh Boddapati [3], compressed air vessels made of carbon fibers would carry a large level of pressure in a small space, which clearly fits the criterion for zero-emission vehicles. The Air Operated Vehicle is the culmination of the most cutting-edge vehicle industry. It does away with the utilization of non-renewable energy sources. We can turn this car into a Multi-fuel Automobile that operates on compressed air and/or gasoline.

According to Sarvesh Kumar [4] was a student. An SI engine is transformed into a compressed air engine in this project.

Because of its design simplicity, a four-stroke single cylinder SI engine is converted to a two-stroke engine that runs on compressed air. This new technology is simple to implement since we changed an existing conventional engine into an air-powered one. Another advantage is that it runs on air, which is abundant in the environment.

IX. OBJECTIVE

Air, a sustainable source of power, can be used as a substitute fuel due to the over usage of non-renewable forms of energy. Compress Air can be utilized as an energy/fuel substitute. Compressed air can be kept in a tank and utilized to power the engine. Fossil fuels are now widely employed as a source of energy in a variety of disciplines, including internal and external combustion engines, heat in industrial

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industries, and so on. However, its supply is finite, and as a result of their widespread use, fossil fuels are rapidly decreasing. As a result, in this era of energy scarcity, it is unavoidable to create alternative technologies that utilize renewable energy sources in order to conserve fossil fuels. Internal Combustion Engines are one of the most common uses of fossil fuels.

The "Pressurized Air Powered Vehicle" is an alternative to the IC Engine. It's a vehicle that runs on compressed air.

X. APPLICATIONS

- Automobile manufacturers can make advantage of it.
- It is suitable for usage as a family vehicle. It has the capability of being utilized as a van.
- As a Taxi Service
- Personal makes advantage of Worker
- Owned businesses

XI. ADVANTAGES

Air-powered cars offer the following benefits over gasoline or diesel-powered vehicles:

- Air is non-flammable, plentiful, cost-effective, mobile, durable, and, most critically, non-polluting on its own.
- As there is no need to install a cooling effect, gasoline tank, spark plugs, or silencers, compressed air technology cuts vehicle production costs by around 20%.
- High torque in a small package.
- The engine's mechanical design is basic and reliable.
- Low production and maintenance expenses, as well as simple upkeep.
- Why Lighter automobiles would result in less road abuse, resulting in roads that endure longer.
- Fuel for air-powered cars will be substantially less expensive than present fuels.
- First it has a low production cost, and because there is no carbon residue, it has a low and realistic maintenance cost.
- Compared to batteries, compressed air storage tanks may be readily disposed of or repurposed with less pollution.
- It is environmentally benign since it does not release poisonous gases such as CO2 and SO2, and because it is lighter, it does less damage to roadways, leading in cheaper maintenance costs.

XII. COST ANALYSIS

S.N.	Material	Quantity	Cost Per	Total
1	Pneumatic Cylinder	1	500	500
2	Solenoid Valve	1	2200	2200
3	Wheel	4	150	600
4	Crank Shaft	2	100	200
5	Battery(12V)	1	800	800
6	Battery(9V)	2	20	40
7	Pneumatic Pipe	1	50	50
8	Compressor	1	750	750
9	Chain	1	50	50
10	Wood Ply	1	50	50
11	Body Base	1	500	500
12	Connecting Screw	10	4	40
13	Bearing	2	20	40
	Total			5820

XIII. CONCLUSION

Pressurized air vehicles aren't a brand-new concept. It has existed for quite some time. Engines that use pressurized air are both non-polluting and cost-effective. The compressed air vehicle will be released globally after 10 years of development and study. Compressed air cars, unlike electric or hydrocarbon vehicles, are inexpensive and have a long range. Compressed air vehicles are both cost-effective and perform well by today's standards. To summaries, they are low-cost, non-polluting vehicles that are simple to man oeuvre in urban areas. The advantages of using this zero-emission technology in terms of emissions are evident. Pressurized is already being investigated for vehicle propulsion, and air-powered automobiles are presently being created as a more energy method of transport. Some automakers are looking into pressurized air

hybrids and compressed fluids as a means to store energy in cars, which might pave the way for the development of a low-cost air-powered vehicle design. Unfortunately, serious issues must be resolved before air-powered vehicles can become a reality for widespread use. However, with advancements in science and technology, as well as an environmental conscious attitude and the need to replace costly transportation methods, air-powered vehicles will undoubtedly see the light of day.

XIV. FUTURE SCOPE

- The volumetric efficiency of a piston is improved by reducing its diameter.
- Cam-less inlet and outlet valves enhance efficiency by eliminating the need to spend a portion of the output power to power cams via chain drives.
- It is possible to design an entirely new technology that combines a fuel combustion engine and pressurized air storage. This vehicle is being developed in response to international need for fuel-efficient automobiles.

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- Motor Development International created an alternative fuel vehicle (Air pod) in conjunction with Tata Motors in India and Air France in Paris. -It is powered by compressed air. The Airpods engine is comprised of two cylinders that are joined together. Some plants are being manufactured in Sardinia, Italy, and will be accessible in India soon.

REFERENCES

[1.] Latest Developments of a Compressed Air Vehicle: A Status Report By S. S. Verma S.L.I.E.T., Longowal.
[2.] Sullivan, M. World's First Air-Powered Car: Zero Emissions by Next Summer, Popular Mechanics http://www.popularmechanics. com/automotive/new cars/4217016.html (June 2008 issue)
[3.] Harley, M.; Ford, G.M. Considering Joint Engine Development, http://www.autoblog.com/2008/08/04/ford-gm-considering-joint
[4.] https://en.wikipedia.org
[5.] https://www.seminarsonly.com
[6.] International Journal of Engineering Research & Technology (IJERT) ISSN: 2278-0181 Published by, www.ijert.org IC-QUEST - 2016 Conference Proceedings
[7.] Compressed air energy storage system based engine for Running light vehicle by, G.KARTHIKA, KRISHNAWAMY COLLEGE OF ENGINEERING AND TECHNOLOGY, CUDDALORE
[8.] International Journal of Engineering Research & Technology (IJERT) http://www.ijert.org ISSN: 2278-0181 IJERTV9IS050185 (This work is licensed under a Creative Commons Attribution 4.0 International License.) Published by : www.ijert.org Vol. 9 Issue 05, May-2020
[9.] Design Data Book by V.B. Bhandary
[10.] Machine Designby V.B Bhandary
[11.] MachineDesignby R.S. khurami
[12.] Research Paper by Venkatesh Boddapati, S.V.V. Vinod, M.Dora Babu . ISSN: 2319-4413 , January 2015 'Air Powered Vehicle –An Eco Friendly Engine
[13.] Research Paper by Pramod Kumar J. ISSN: 0976-6359, March-April 2016, 'AIR POWERED ENGINE'
[14.] http://www.google.com

BIBLIOGRAPHY:

Priyanshu Sachan-He is currently a B. Tech final year student at Rameshwaram Institute Of Technology And Management in Lucknow, where he is working on a vehicle that uses compressed air.

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