iJRASET
International Journal For Research in
Applied Science and Engineering Technology

INTERNATIONAL JOURNAL
FOR RESEARCH
IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 9 Issue: VII Month of publication: July 2021

DOI: https://doi.org/10.22214/ijraset.2021.36969

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.429
Volume 9 Issue VII July 2021- Available at www.ijraset.com

Electrical Scooter

Vishal[1], Abhishek Kashyap[2], Amit Kumar Vimal[3], Khusroo Tarique[4], Sandeep Goyat[5], Nikhil Gupta[6]
[1, 2, 3, 4]Student, Department of Electrical Engineering, Greater Noida Institute of Technology
[5]Assistant Professor, Department of Electrical Engineering, Greater Noida Institute of Technology
[6]H.O.D, Department of Electrical Engineering, Greater Noida Institute of Technology

Abstract: Now a day we are having the more number of Vehicles. It causes the many problems in the day to day life. The major problems are pollution, traffic, depletion of non-renewable resources etc. The basic aim behind our project was to make an environmental friendly portable automobile which would be easy to handle by both the genders and would emit 0% emission. We have used Li-Ion battery as our main power source due to which there is no emission at all and also the problem of fuel consumption is solved. Also keeping in mind the parking problems now days, we decided to make a scooter which can be folded easily, and so after the use one can fold the scooter and can be easily carried. The design allows users to easily transport the scooter using less space when it is "folded" it becomes compact in size. It is a light-weight foldable electric scooter, produced on the basis of a brand new concept. This is an advantage in terms of reaching a very low weight and fold ability. The maximum speed the scooter is capable to operate with is 35 km/h, and its range with a single charge is approximately 25 km (with double battery pack 40 km). It has in-wheel-motors in rare wheel (single-wheel drive). Its folding can easily be mastered. In its folded state the scooter is the size of a large trolley and it can be pulled similarly. Its weight is less than 25 kg. It requires no parking space; in a folded state it can be stored anywhere.

I. INTRODUCTION

In Recent years, environmental problems caused by fuel vehicles and fuel economy become more and more serious. The vehicles of new energy, which is green, environmentally friendly and economical, is an important goal for economic and social development of many countries, but also the future development direction of the vehicle. EV is a vehicle with zero pollution emissions, mileage and fuel vehicles can be mutually comparable electric vehicles.

Being an e-scooter the electric system plays a promising role in its designing and creation. The electric system consists of battery, motor, motor controller and other electronic equipment. The most important thing that electric system does is that it gives power to the motor which helps in the running of the scooter. This energy in form of chemical or electric energy is stored in the battery which is used by a hub In motor, thus the electric or chemical energy converted to mechanical energy. A proper electric system is important to ensure driver and vehicle safety in case of collision. The brushless DC (BLDC) motor is fixed to hub of rear wheel of e-scooter. The reason for choosing BLDC motor is its compactness and noiseless operation.

So our main Objectives to design or development an e-scooter are as following:-

1) To reduce running cost of vehicle
2) To reduce the emissions
3) To overcome the draw backs of electric vehicle
4) To increase life period and efficiency of existing e-scooters

II. METHODOLOGY

Now a days, utilization of fuel vehicles are increased rapidly which result into more air pollution. To control this, utilization of EV is must because it's several advantages like electric scooter is an eco-friendly product, It is more suitable for city as it can avoid the emission of harmful gases and thereby it can reduce the atmospheric pollution. Due to frequent increase in fuel prices, the electrically charged vehicle seen to be the cheapest one compared to the traditional vehicle. E-scooters are more suitable for rural areas where the numbers of petrol bunks are not adequate, so that the rural people can charge the vehicle with the help of electricity. To understanding the EV technology, this study helps to provide outline of EV (Scooter) and there various components. Now a days, Most of the vehicles used are based of fuel ignition principle for long as well as short run work. Hence, this have been resulting into greater air pollution which is harmful to human being. Thus, proposed paper researched on design and development of EV two wheeler. This given EV contained a lithium ion battery of capacity 48v, 25Ah and will charge within 5 hour using charger having capacity 48v, 5A. Thus EV can be charge up to 1150 to 1200wh using this charger, which will run up to 50 km in single charge with a appropriate speed of 35 to 40 kmph.

III. KEY COMPONENTS

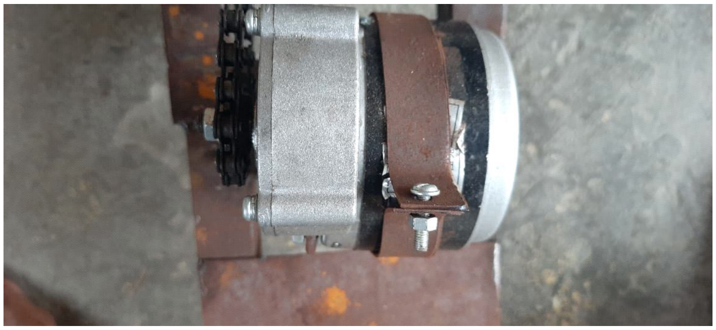
The Key Components in Electric Scooter

Following are the key components in Electric Scooter:-

1) Battery Charger
2) Battery
3) Motor Controller
4) Motor
5) DC-DC Converter
6) Vehicle Computer and Electronics

A. PMDC Motor

PMDC Motors have become a significant contributor of the modern drive technology. Their rapid gain in popularity has seen an increasing range of applications in the fields of Consumer Appliances, Automotive Industry, Industrial Automation, Chemical and Medical, Aerospace and Instrumentation. Even though they have been used for drives and power generation for a long time, the sub kilowatt range, which has been dominated by PMDC Motors, has always been a grey area. But the modern power electronics and microprocessor technology has allowed the small PMDC Motors to thrive, both in terms price and performance.

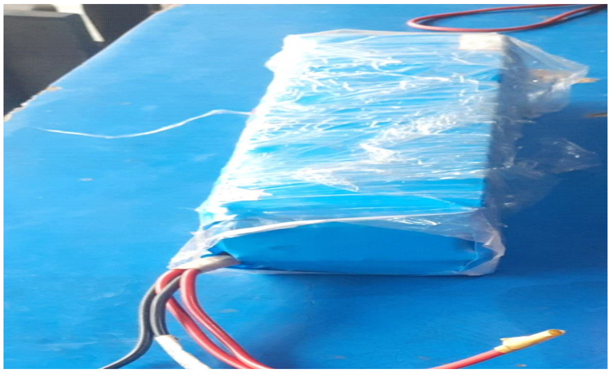


1) *What is BLDC Motor:* A Brushless DC Motor is similar to a Brushed DC Motor but as the name suggests, a BLDC doesn't use brushes for commutation but rather they are electronically commutated. In conventional Brushed DC Motors, the brushes are used to transmit the power to the rotor as they turn in a fixed magnetic field. As mentioned earlier, a BLDC motor used electronic commutation and thus eliminates the mechanically torn brushes. The main design difference between brushed and brushless motors is the replacement of mechanical commutator with an electric switch circuit. Keeping that in mind, a BLDC Motor is a type of synchronous motor in the sense that the magnetic field generated by the stator and the rotor revolve at the same frequency. Brushless Motors are available in three configurations: single phase, two phase and three phase. Out of these, the three phases BLDC is the most common one.
2) *Stator:* The structure of the stator of a BLDC Motor is similar to that of an induction motor. It is made up of stacked steel laminations with axially cut slots for winding. The winding in BLDC are slightly different than that of the traditional induction motor.
3) *Rotor:* The rotor part of the BLDC Motor is made up of permanent magnets (usually, rare earth alloy magnets like Neodymium (Nd), Samarium Cobalt (SmCo) and alloy of Neodymium, Ferrite and Boron (NdFeB)). Based on the application, the number of poles can vary between two and eight with North (N) and South (S) poles placed alternately. The following image shows three different arrangements of the poles. In the first case, the magnets are placed on the outer periphery of the rotor.

B. Battery

Batteries are the components that store electrical energy, allowing for the motor of the vehicle in question to run.The main materials that allow recharging are nickel cadmium, nickel zinc, nickel metal hydride, and lithium-ion/lithium-polymer.Specific energy is energy per unit of mass denotes a lighter battery as the value increases if the energy were to be kept constant. Electric scooters are commonly supplied with lead acid batteries. Electric scooters generally require four 12-volt batteries with a combined ampere-hour (AH) rating that varies, depending on cost.

1) *Lithium ion Batteries:* New models of electric scooters come with lithium ion batteries, and some older models are now offered with a lithium ion battery option in place of the lead acid battery option. An advantage of the lithium ion batteries is that their lifespan is 1000-3000 charging cycles and 3- 5 years. A disadvantage is the very high cost. Whereas a lead acid battery e-bike may be available for Rs.40,000 and below.



C. Battery Management System

It is also referred as BMS. The battery system is formed by a number of battery cells. They are connected in parallel or series that is according to the design. Each of the cell should be monitoring and regulated. The conditioning monitoring includes the voltage, current and temperature. The measured parameters are used to provide the decision parameter for the system control and protection.

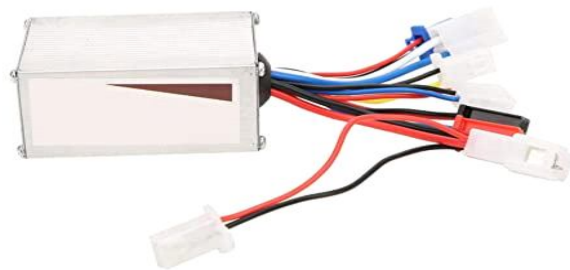
D. Battery Charger

In order to utilize the battery to its maximum capacity the battery charger plays a crucial role. The remarkable features of a battery charger are efficiency and reliability, weight and cost, charging time and power density. The characteristics of the charger depend on the components, switching strategies, control algorithms. This control algorithm can be implemented digitally using microcontroller. The charger consists of two stages. First, one is the AC-DC converter with power factor correction which converts the AC grid voltage into DC ensuring high power factor. The later stage regulates the charging current and voltage of the battery according to the charging method employed. The charger can be unidirectional i.e. can only charge the EV battery from the grid or bidirectional i.e. can charge the battery from the grid in charging mode and can pump the surplus amount of power of the battery into the grid. This is lithium ion battery charger circuit The circuit given here is a current limited lithium ion battery charger built around the famous variable voltage regulator IC LM 317. The charging current depends on the value of resistor R2. Resistor R3 and POT R4 determines the charging voltage. Transformer T1 steps down the mains voltage and bridge D1 does the job of rectification. C1 is the filter capacitor. Diode D1 prevents the reverse flow of current from the battery when charger is switched OFF or when mains power is not available.

E. Motor Controller

A motor controller is a device or group of devices that serves to govern in some predetermined manner of performance of an electric motor. A motor controller might include a manual or automatic means for starting and stopping the motor, selecting forward or reverse rotation, selecting and regulating the speed, limiting or regulating the torque, and protecting against overloads and fault. In this project we are using “sine wave vector controller”. The battery block is interfaced with the motor controller block. The motor controller controls all the functional capabilities and is the central component of the system. The basic requirement for the control is to regulate the amount of power applied to the motor, especially for DC motors. The motor controller can be adjusted to synchronize with other brushless motors. To drive and control the BLDC motor, the use of motor controller was implemented. The motor controller is an essential device for any motor driven device. The motor controller is analogous to the human brain, processing information and feeding it back to the end user. Of course, the applications of a motor controller vary based on the task that it will be performing. One of the simplest applications is a basic switch to supply power to the motor, thus making the motor run. As one utilizes more features in the motor, the complexity of the motor controller increases. Field-Oriented Control (FOC) or sine wave vector controller is an important technology for motor systems, particularly those using permanent magnets (PM). In general, FOC provides an efficient way to control BLDC motor in adjustable speed drive applications that have quickly changing loads and can improve the power efficiency of an BLDC motor.

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.429
Volume 9 Issue VII July 2021- Available at www.ijraset.com



F. Brakes

Brakes are the most important safety feature of an electric scooter. Modern electric scooters pack powerful motors and can go in excess of 20 mph! Although you might expect to get injured in a collision with vehicles, the reality is most falls are accidents that don't involve anyone else. Having a scooter with a good set of brakes may be the only difference between a close call and trip to the hospital. Your brakes determine stopping distance, physical effort to activate, durability, and performance in wet conditions. Electric scooters will have at least one braking system, and many come with more than one type. We prefer scooters with more than one braking system, in case one fails. Brake Systems: Front and Rear. Some electric scooters have brakes only on the front or rear wheel. This is less desirable than having an independent brake on each wheel. Scooters with only single-wheel braking won't stop as quickly and offer less redundancy than those with dual brakes. In wet conditions, where traction is worse, scooters with only a single brake are more prone to slipping because all the stopping force is coming from one rather than two wheels. However, most scooters come equipped with at least one mechanical brake (typically in the rear) and a front electronic brake. Brake Performance: Mechanical vs. Electronic How well your brakes perform starts with the type of braking system(s) equipped on your scooter, and we've done the research so you'll know which brakes have been the most effective in our realworld road tests. Mechanical brakes include disc brakes, drum brakes, and foot brakes. Foot, regenerative, and electronic brakes are all poor-performing braking systems for various reasons (deeper details below). Although foot brakes are mechanically controlled, they do not perform as effectively as disc or drum brakes. The typical 15 mph stopping distance using an electronic brake alone is 30 to 40 feet — more than the length of a squash or badminton court, for reference. This is also equivalent to the length of 2 to 3 cars, so imagine the force and injury you could suffer if you can't stop quickly enough. Disc brakes are the best and safest type of electric scooter brake and come ESG recommended. They provide strong braking power in both wet and dry conditions. Additionally, they are lightweight, reliable, and easy to adjust. You will find disc brakes on quality electric scooters in nearly every price range and exclusively on highperformance electric scooters.

1) *Types of Brakes:* There are two main brake categories: mechanical and electronic. In order of effectiveness, electric scooter brake types include: disc brakes, drum brakes, foot brakes, regenerative brakes, and electronic brakes.

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.429
Volume 9 Issue VII July 2021- Available at www.ijraset.com

G. Throttle

The throttle mode is similar to how a motorcycle or scooter operates. When the throttle is engaged the motor provides power and propels you and the bike forward. A throttle allows you to pedal or just kick back and enjoy a "free" ride! Most throttles can be fine tuned like a volume dial between low and full power.

H. Deck

The deck is the platform you stand on while riding. Many are rubberized to provide better traction. The electric scooter deck — like that of a skateboard — is the thing you stand on. Some electric kick scooters have the battery pack built into the deck. Most decks have some type of textured shoes and the scooter. Some scooters, like the Rev pictured above, have a sloped deck that gives you more space to place your feet. The typical scooter deck size is 14″ by 5″ inches and gives a few inches of ground clearance.finish that provides better grip between your

IV. FUTURE

Automakers are preparing to phase out cars powered solely by internal combustion engines (ICEs) as governments look to tackle fuel emissions.

The growth in electric vehicles (EVs) and hybrid electric vehicles (HEVs) is climbing and by 2025, EVs and HEVs will account for an estimated 30% of all vehicle sales.

Comparatively, in 2016 just under 1 million vehicles or 1% of global auto sales came from plug-in electric vehicles (PEVs).

2025, J.P. Morgan estimates this will rise close to 8.4 million vehicles or a 7.7% market share. While this jump is significant, it doesn't compare to the kind of growth expected in HEVs - cars that combine a fuel engine with electric elements.

This sector is forecast to swell from just 3% of global market share to more than 25 million vehicles or 23% of global sales over the same period.

This leaves pure-ICE vehicles with around 70% of the market share in 2025, with this falling to around 40% by 2030, predominantly in emerging markets.

In terms of production and sales of electric cars, no other nation comes close to China.

By 2020, the country is expected to account for a staggering 59% of global sales before easing slightly to 55% by 2025.

The rise of mini-EVs with smaller battery packs designed for short-range driving (around 100-150 km) has helped boost the popularity of EVs in China.

Prices for mini-EVs start at around RMB 40,000 or $6,250 USD making them affordable.

V. ADVANTAGES

1) Electricity is readily available.
2) Since there is no IC engine, the vehicle runs noiselessly, in fact many times you don't even know that some vehicle has just passed beside you.
3) Environmental friendly.
4) Require less maintenance.
5) Manufacturing is easy.
6) Doesn't depend upon fossils fuels.

VI. DISADVATNAGES

1) Price higher about 30-40%
2) Charging infrastructure is not adequate.
3) Driving range offered by battery is not adequate.
4) Most of electric vehicle is slowly charged

REFRENCES

[1] Ji-Young Byung-Chul Woo, Jong-Moo Kim and Hong Seok Oh "In-wheel Motor Design for an Electric Scooter" J Electr Eng Technol. Nov.2017
[2] Zhai Haizhou Heze University, Heze, China "Modeling of Lithium-ion Battery for Charging/Discharging Characteristics Based on Circuit Model" Article submitted 05 March 2017. Published as resubmitted by the author 17 April 2017
[3] K.W.E Cheng, "Recent Development on Electric Vehicles", Department of Electrical Engineering, The Hong Kong Polytechnic University, Hong Kong. June 2009
[4] Md. Rifat Hazari, Effat Jahan, "Design of a Brushless DC (BLDC) Motor Controller", Department of Electrical and Electronic Engineering American International University-Bangladesh (AIUB) Dhaka, Bangladesh. Oct 2014.

BIOGRAPHIES

The author is currently doing his bachelors degree in department of electrical engineering in Greater Noida Institute of technology under AKTU.

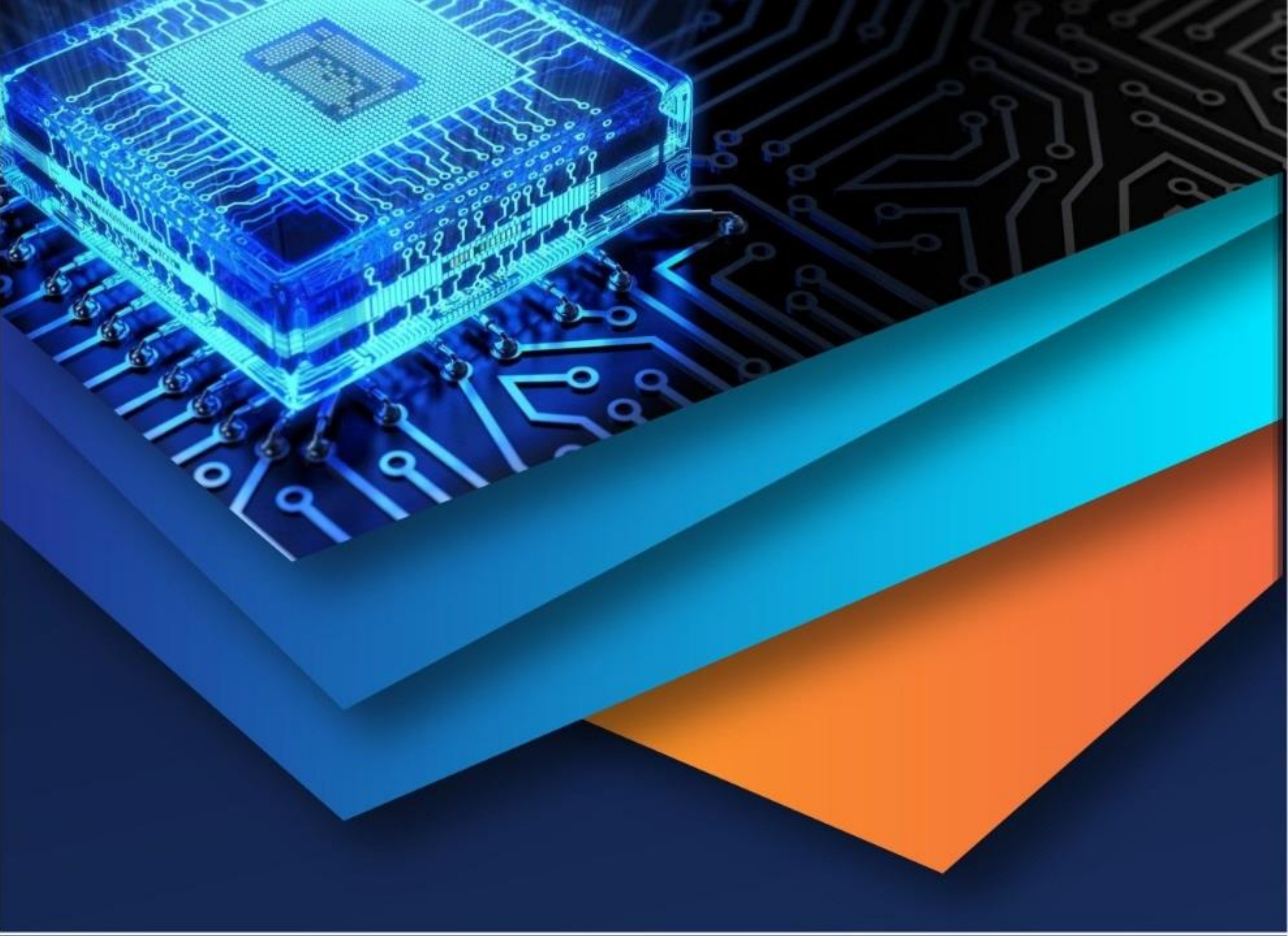
The author is currently doing his bachelors degree in department of electrical engineering in Greater Noida Institute of technology under DR APJ Abdul Kalam technical university.

The author is currently doing his bachelors degree in department of electrical engineering in Greater Noida Institute of technology under DR APJ Abdul Kalam technical university.

The author is currently doing his bachelors degree in department of electrical engineering in Greater Noida Institute of technology under DR APJ Abdul Kalam technical university.

(Assistant professor in GNIOT)

HOD in EE department of GNIOT



10.22214/IJRASET

INDEX COPERNICUS

45.98

IMPACT FACTOR: 7.129

TOGETHER WE REACH THE GOAL

IMPACT FACTOR: 7.429

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY