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The Conversion of a Novel Integrated Power Traction Energy Storage

[1] Jella Aruna, [2] G.Ganesh

[1] *M. Tech Student Deptt of of Electrical & Electronics Engg. Arjun college of technology and science, Hydearabad.*
jella.aruna@gmail.com

[2] *Assistant Professor, Department of Electrical & Electronics Engg. college of technology and science, Hydearabad,*
ganesh92.guguloth@gmail.com

ABSTRACT:

Electrical energy storage has the task Role to play in improving future performance electric traction systems. This paper proposes a new power electronics topology integrates energy Power electronics with storage of the inverter unit System. This structure reduces weight and component The count is compared with the previous topology but still allows Use standard machines. Indicative energy savings full size system is presented. A study on the city tram class public Black pool transport system, and it seems so obvious You can achieve energy savings by using ultra capacitor energy storage with the proposal Structure. In the proposed system the maximum energy Available during braking depends on the kinetic energy And therefore the speed and load of the tram. the actual Energy that can be captured is a more complex function, Depending on the grade of strength and energy for storage System and time and function driving course Streetcar during the normal course and speed braking because Energy balance and the recovered energy is used to Overcome mechanical losses.

INTRODUCTION:

With the increasing importance placed on Remove the coal in the world economy and achieve energy Security plays and public transport to electrified Gradually a more important role in society. Compared to Personal transportation, and provide great energy is Check with public transport, especially in the peak Times passengers. And you can achieve economies of other carbon ago The power grid to allow renewable and low-carbon Energy to provide the motive power. Energy consumed across the electrified The system can be reduced further by installing energy storage Systems (ESSS) on board the vehicle.

energy storage devices It can be used to replenish energy during braking, and energy And otherwise dissipate the mechanical Brake or braking resistors. This energy can then be reused. Energy is stored on board the aircraft using the electrical system double layer capacitors (EDLC) is one of the A promising tool to prevent failure of regenerative energy Rolling stock. energy storage devices, which Transformers loading / unloading and continued Home DC power supply.

II. Energy storage viability

This technology has a long history. Center Construction of train stations in London with high, This means that the trains had to climb gradient to enter the station And when it came down to the station. This form of energy Low loss of a small shop. Modern technology can today Be more effective. Study of the application of energy in the race storage showed the light rail system west coast US The potential energy saving of 23%. Financial considerations To emphasize the benefits of reducing the peak power demand, Although this depends on the customs of energy tariffs. But nevertheless, Find all locomotives and wagons plug-in hybrid It has been shown to bear a systems approach Achieve maximum benefit storage and reducing excess weight is added.

The maximum available power during brakingIt depends on the kinetic energy, and therefore the speed and Download tram. The actual consumption of energy that can be collected The function is more complex, depending on the strength and nominal power storage system, and the time Job driving a tram cycle through the natural course and braking, due to the energy balance and recovered The energy used to overcome mechanical losses. For this study, the braking power of staff The car in the long tram typical audience Blackpool The use of the transport system from the actual unit (measure) The cycle data as part of this research project. The It is to determine the effect on engine cycle through simulation Using the electrical system integration model and The mechanical effects, tram cycle engine. East The model validation experiments on the nature of the site Energy storage process without city tram class and Centigrade tram (the concept of low cost and high efficiency Car under development). By applying the braking saturation function Strength of character, which limits the ability to sort the Convert, then combine the braking force on the engine cycle, the energy captured using the specified Power

converter can be found. Note that That due to the layout Blackpool tram, much of the Trams run 'Costa brake as short motor / / Cycles. Choosing a point on the curve where the openings Flatten allows the converter to be selected catches A sufficient amount of energy available. two options Choose to consider. The first is the conversion of 50 kW, 3.1 MJ potentially allowing braking energy to be captured During the session. This solution reduces the size of Convertible to ensure that a large proportion of The braking energy is available to collect. The second option 100 kW, allowing more energy to be the ratio Arrest, is also considered.

A. choose energy storage

Systems for traction and durability is critical because The energy storage device in traction application is He left every time the car starts and stops, and from This could be equivalent to hundreds of times a day, it is essential that energy storage device due to deterioration charge-discharge cycle is minimal. Maintenance Requirements must be possible lowest level. It must also be high energy and power density But the intensity of the task is less important. Ultra capacitor energy storage devices meet these needs. as well No moving parts, which increases reliability and Intensity in mobile applications. In the ensuing discussion, the ultra capacitors Be used as energy storage, and therefore, You must convert electricity to communicate Ultra capacitor (DC) source the remaining system. To Discuss design decisions and data of the city during service The class will use the tram in Blackpool tram.

III. Power Management

During braking, the maximum braking power as Possible should be stored in ultra capacitors. Braking The dissipated energy is not stored by the energy storage device In braking resistors. However, the energy storage is limited Before energy conversion and energy storage device need

It does not allow the maximum level of effort beyond it. The Usually, convert operating systems

The input voltage range for several reasons: to keep Operations should not be allowed to fall ultracapacitors Less than the minimum level of effort. Little extra energy is Available at low voltages from three-quarters of energy It is available in the upper half of the voltage range. and to extracting energy at the same speed requires more power in less Voltages. Therefore, when the voltage drop ultracapacitor Less than the minimum of effort, which is providing traction completely traction supply. The

analysis shows that 40% of the energy used by the Dissipated in the braking of the car. these energy Likely to be used to charge the energy storage device. The The energy storage device also be a loss and, therefore, No braking energy does not represent the potential is calculated Energy saving.

IV. Adapter choosing a pre-ART

While both sides of the track and table solutions It is possible, after the energy storage units on the tram to him Put the following solution to this problem is an advantage. When Multiple tramways running on the same part of the network, Increased storage capacity in the local energy If all tram It holds its own storage Installing energy storage devices in vehicles It is not a new idea. The development of Yverdon girobús It started in 1945. He was working the bus for the steering wheel, which traditional generator was. Flywheel loaded in three aspects Periodically load points. And the need for girobús complex payment system, consisting of three engines Linked together through the gear reduction. all cars It can be operated in two different electrode configurations, Effectively giving six engine and transmission of different speeds Formations, covering a required speed. Such mechanically complex system and possibly undesirable Resulted in a limited setting giro-bús

SIMULATION MODEL OF THE PROPOSED SYSTEM WITH PV CELL:

The simulation circuit of simplified power converter for integrated traction energy storage using PV cell for mixed mode operation is shown in fig 6.15.When pulses are given to traction inverter and energy storage source inverter then it is known as mixed mode operation.

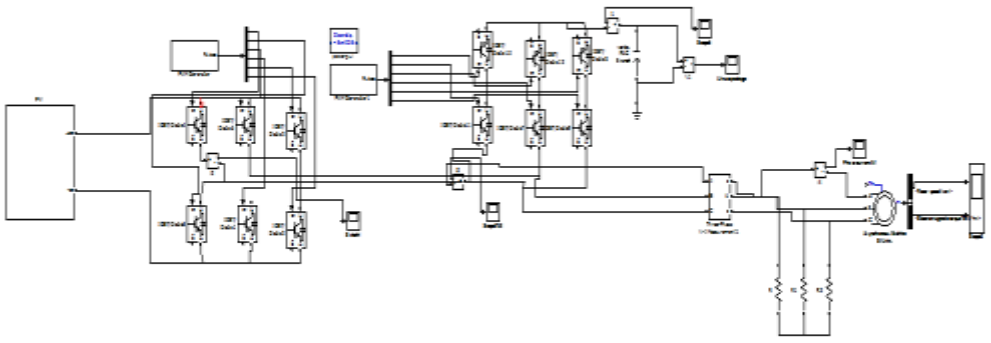


Fig 6.15 Simulation circuit of the proposed mode

The waveform of current across switch 1 for mixed mode operation using PV cell is shown in fig 6.16.The pulses are given to the traction inverter and the current across switch1 is a square wave.

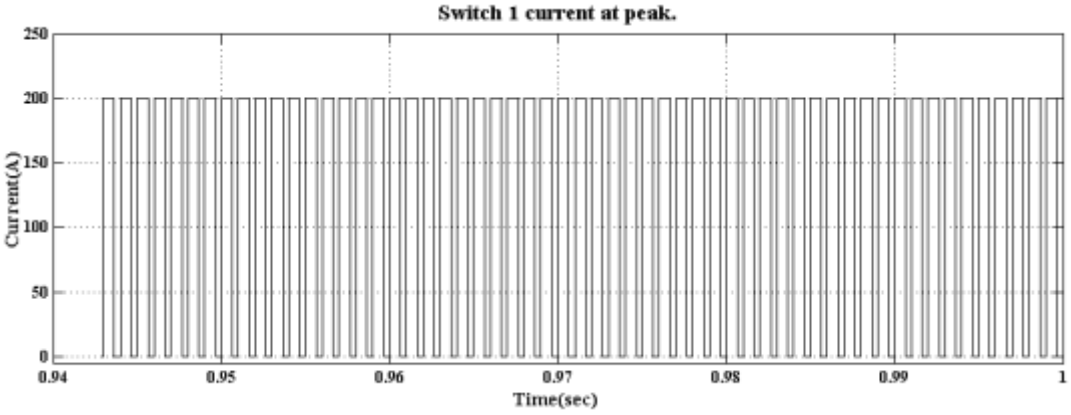


Fig 6.16 Switch1 Current.

The waveform of current across switch 7 &8 for mixed mode operation is shown in fig 6.17.The pulses are given to the energy storage source inverter and the current across switch 7 & 8 is a square wave.

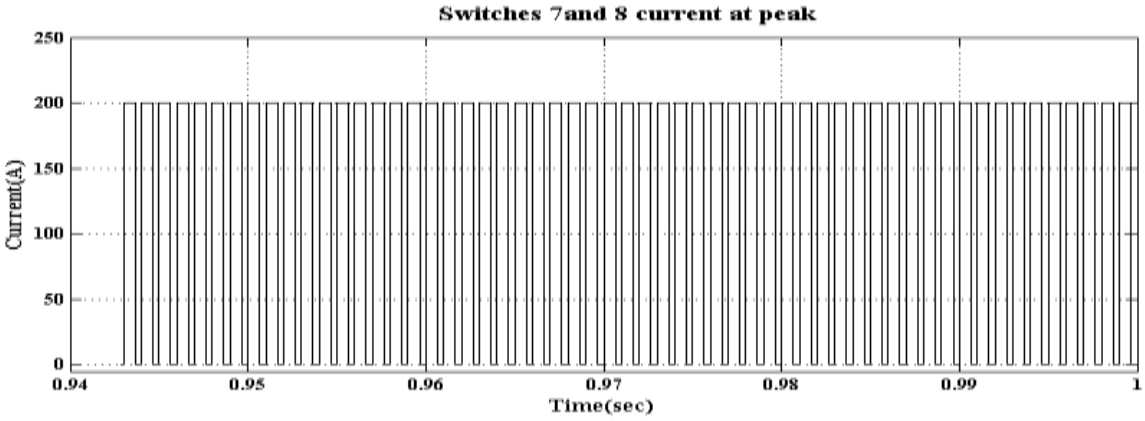


Fig 6.17 Switch 7&8 Currents.

The waveform of capacitor voltage for mixed mode operation is shown in fig 6.18 and it is maintained at a constant voltage of 420v.

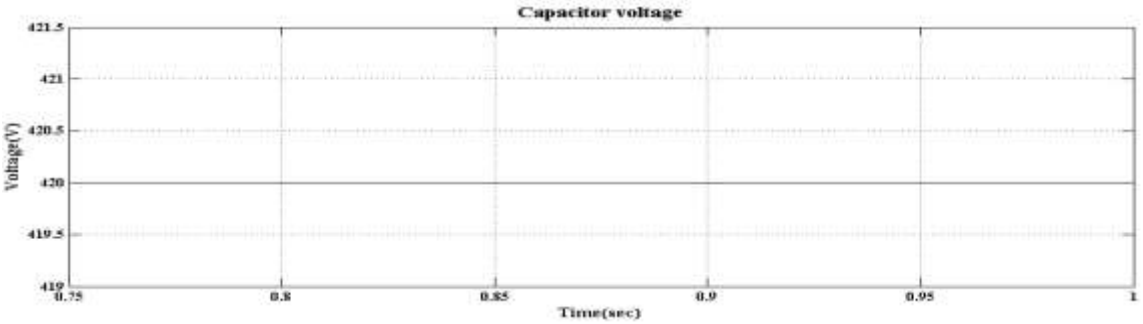


Fig 6.18 Capacitor Voltage.

The waveform of motor phase current for mixed mode operation using PV cell is shown in fig 6.19.

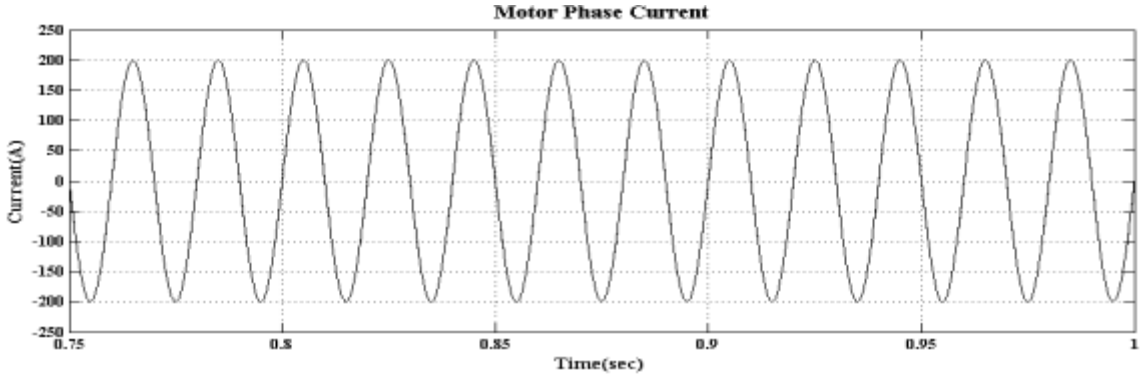
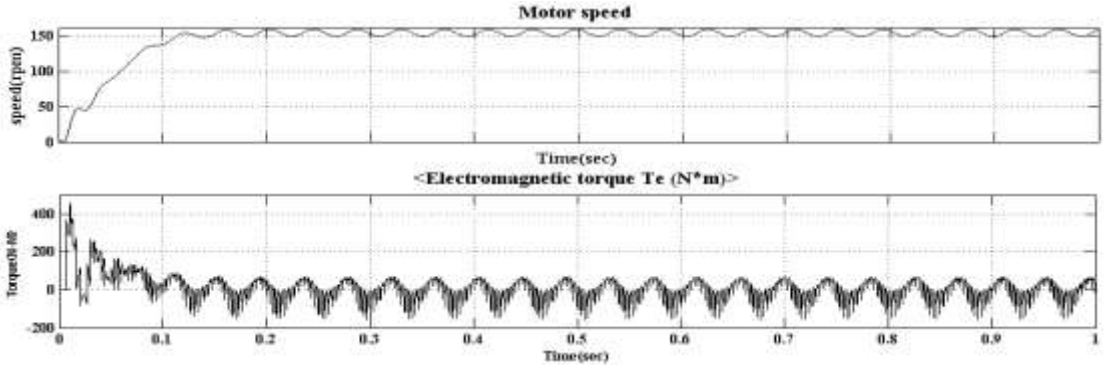


Fig 6.19 Motor Phase Current.

The waveforms of speed versus time and torque versus time is shown below fig 6.20. Depending up on the load conditions the speed and torque waveforms are fluctuating.



6.20 Speed and Torque Waveforms

CONCLUSION

This project has presented a new converter topology for light rail traction. The Blackpoll tram system in the U.K. has been taken as a study case. It has been shown that energy storage onboard each tram can substantially reduce energy use per kilometer. A new converter circuit has been presented with PV cell. It has been shown that further energy savings(30%) per kilometer can be achieved with the novel converter as opposed to conventional power electronics topology. A reduction of energy consumption is therefore ecological and - in the near future - economical reason able.

It has been that ultra capacitor used is more efficient at energy cycling than batteries. Ultra capacitors are electrical energy storage devices, which offer high power density, extremely high cycling capability and mechanical robustness. It has been shown that this topology reduces weight and component count when compared with previous topologies. The simulation results are obtained using MATLAB/SIMULINK software.

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