CO-PO Mapping of Project in the area of Application of Energy Management System

Title of the Project: A Hybrid Cascaded Multilevel Converter for Battery Energy Management applied in Electric Vehicles.

Area of the Project: Power Semiconductor drives

Methodology : Simulation

Name of the Supervisor: Dr. V. NAGA BHASKAR REDDY M.Tech, Ph. D, SMIEEE, MISTE

Name of the Students: A. V. SANDEEP (18095A0241)
G. MEGHANA (17091A0233)
P. PAVANI (18095A0224).

Abstract:

In electric vehicle (EV) energy storage systems, a large number of battery cells are usually connected in series to enhance the output voltage for motor driving. The difference in electrochemical characters will cause state-of-charge (SOC) and terminal voltage imbalance between different cells. In this paper, a hybrid cascaded multilevel converter which involves both battery energy management and motor drives is proposed for EV. In the proposed topology, each battery cell can be controlled to be connected into the circuit or to be bypassed by a half-bridge converter. All half bridges are cascaded to output a staircase shape dc voltage. Then, an H-bridge converter is used to change the direction of the dc bus voltages to make up ac voltages. The outputs of the converter are multilevel voltages with less harmonics and lower dv/dt, which is helpful to improve the performance of the motor drives. By separate control according to the SOC of each cell, the energy utilization ratio of the batteries can be improved. The imbalance of terminal voltage and SOC can also be avoided, fault tolerant can be easily realized by modular cascaded circuit, so the life of the battery stack will be extended. Simulations are implemented to verify the performance of the proposed converter.

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Process of CO-PO attainment for Project thesis of IV-year Main Project

Course Outcomes:-

1. To identify the problem formulation of the project after literature survey or study of existing technology
2. To analyze the basic concepts of the project in correlation with the engineering knowledge
3. To apply the concepts of technology with modern tool usage to overcome the problem.
4. To formulate the solution and to design simulation and prototype of the solution with the engineering knowledge.

CO-PO Mapping:-

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	-	-	-	-	-	-	-	3	-	-	-
CO2	2	-	2	-	-	-	-	-	3	-	-	-
CO3	2	-	-	-	-	-	-	-	3	-	3	-
CO4	2	-	2	-	2	-	-	-	3	-	3	-

Evaluation:-

Project work	100	External evaluation	This end viva voce in project work for 100 marks
	50	Internal evaluation	These 50 marks will be based on the performance of the student in the project reviews apart from attendance and regularity

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Table: Percentage Weightages for each CO

S.NO	REG	IM 50M	EM grade	TM 150M	EM	%IM	%EM	CO1	CO2	CO3	CO4	N.CO1	N.CO2	N.CO3	N.CO4
1	18095a0241	49	10	143	94	98	94.00	25.57	31.57	19.05	19.04	95.91	94.71	95.24	95.24
2	17091a0233	45	10	143	98	90	98.00	25.04	32.10	19.05	19.04	93.91	96.31	95.24	95.24
3	18095a0224	43	9	128	85	86	85.00	22.78	28.37	17.05	17.04	85.42	85.12	85.25	85.25

Table: Weightage marks for each CO

	CO1	CO2	CO3	CO4
INTERNAL	40	20	20	20
EXTERNAL	20	40	20	20
AVERAGE	26.66	33.33	19.99	19.99

Table: Percentage Attainment Values for each CO

	Co1				C02			C03			Co4	
Above & Equal 60%	3	3			3	3		3	3		3	3
Between 40-60%	0	2			0	2		0	2		0	2
Below40%	0	1			0	1		0	1		0	1
Total students	3				3			3			3	
Attainment value		3.00				3.00			3.00			3.00
% of attainment		100.00				100.00			100.00			100.00
Attained or not(GREATER 50% Y,NOT MEANS N		Y				Y			Y			Y

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A Hybrid Cascaded Multilevel Converter for Battery Energy Management Applied in Electric Vehicles

A Main project report submitted in partial fulfilment of the requirements for the award of the degree of

BACHELOR OF TECHNOLOGY

IN

ELECTRICAL AND ELECTRONICS ENGINEERING

Submitted by

A. V. SANDEEP (18095A0241)
G. MEGHANA (17091A0233)
P. PAVANI (18095A0224)

Under the Esteemed Guidance of

Dr. V. NAGA BHASKAR REDDY M.Tech, Ph. D, SMIEEE, MISTE

Professor & H.O.D in Dept. of E.E.E

(ESTD-1995)

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BONAFIDE CERTIFICATE

This is to certify that the thesis entitled "A HYBRID CASCADED MULTILEVEL CONVERTER FOR BATTERY ENERGY MANAGEMENT IN ELECTRIC VEHICLES" that is being submitted by **A. V. SANDEEP (18095A0241), G. MEGHANA (17091A0233), P. PAVANI (18095A0224)** have carried out the main project for the fulfilment of the award of Bachelor of Technology **in Electrical and Electronics Engineering** in Rajeev Gandhi Memorial College of Engineering & Technology (Autonomous) and this is a record of the work done by them during the year 2020 – 21.

Head of the Department

Dr. V. NAGA BHASKAR REDDY MTech, Ph. D,

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Project Guide

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Signature of External Examiner:

Date:

ABSTRACT

In electric vehicle (EV) energy storage systems, a large number of battery cells are usually connected in series to enhance the output voltage for motor driving. The difference in electrochemical characters will cause state-of-charge (SOC) and terminal voltage imbalance between different cells. In this paper, a hybrid cascaded multilevel converter which involves both battery energy management and motor drives is proposed for EV. In the proposed topology, each battery cell can be controlled to be connected into the circuit or to be bypassed by a half-bridge converter. All half bridges are cascaded to output a staircase shape dc voltage. Then, an H-bridge converter is used to change the direction of the dc bus voltages to make up ac voltages. The outputs of the converter are multilevel voltages with less harmonics and lower dv/dt, which is helpful to improve the performance of the motor drives. By separate control according to the SOC of each cell, the energy utilization ratio of the batteries can be improved. The imbalance of terminal voltage and SOC can also be avoided, fault-tolerant can be easily realized by modular cascaded circuit, so the life of the battery stack will be extended. Simulations are implemented to verify the performance of the proposed converter.

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