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Experimental Investigation of Waste Heat Recovery System for Household Refrigerator

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ABSTRACT :- *Household refrigerator generally use air-cooled condenser. Most of the time the heat from the condenser side is dissipated to room air. If this heat is not utilised, it simply becomes waste heat. By retrofitting a waste heat recovery system this waste heat can be recovered and can be utilised for water heating purpose. The hot water thereby produced can be used for several residential and commercial usages. The hot water can also be stored in an insulated tank for later use. In our main project, we had designed, fabricated and experimentally analysed a waste heat recovery system for domestic refrigerator. We had analysed the system at various load conditions (No load, 40 W load and 100W load). We also carried out the techno-economic analysis by comparing the waste heat recovery system with the conventional geyser. From our obtained test results, we found that the waste heat recovery system performs well along with the household refrigerator. Hot water of moderate temperature can be obtained from it. This modification made the household refrigerator to be work as both refrigerator and water heater. Considerable amount of hot water at a significant temperature can be collected from the waste heat recovery system.*

KEYWORDS: - *Household refrigerator, waste heat recovery system, effectiveness, techno-economic analysis*

I. INTRODUCTION

A household refrigerator is a common household appliance that consists of a thermally insulated compartment and which when works, transfers heat from the inside of the compartment to its external environment so that the inside of the thermally insulated compartment is cooled to a temperature below the ambient temperature of the room. In most cases, household refrigerator uses air-cooled condenser. Tetrafluoroethane (HFC134a) refrigerant was now widely used in most of the domestic refrigerators and automobile air- conditioners and are using POE oil as the conventional lubricant. Generally, heat from the condenser side is dissipated to room air. If this heat is not utilised, it simply becomes waste heat. By retrofitting a waste heat recovery system this waste heat can be recovered and can be utilised for water heating purpose. The hot water thereby produced can be used for several residential and commercial usages. The hot water can also be stored in a tank for later use. The modified system results in energy saving due to non-usage of electricity for heating the water and cost saving by combining both utilities (refrigeration and heating) in one system. The hot water which was obtained from the water-cooled condenser can be utilised for household applications like cleaning, dish washing, laundry, bathing etc.

II. EXPERIMENTAL SETUP

II.1. Experimental System

The refrigerator was of 165L capacity, single door, manufactured by Godrej. The system was retrofitted with a Waste Heat Recovery System (WHRS). WHRS is a single tube heat exchanger coiled around and over the air-cooled condenser and compressor and having an inlet for the cooling water and an exit for collecting the hot water. The modified household refrigerator was properly instrumented with digital thermometer, pressure gauges and digital energymeter.

The temperature at various points was noted using digital thermometer. Evaporator and condenser pressure are noted using calibrated pressure gauges. The power consumption of the domestic refrigerator was measured by using a digital energymeter. Figure 1. shows the experimental test rig. The retrofitted WHRS can also been seen. The refrigerator specifications are given in TableI.

The waste heat recovery system is suitably attached over the air-cooled condenser and compressor. The cold water is then passed from one end and hot water is collected from the other end. PVC valves are provided to control the flow of water through the waste heat recovery system. Measuring instruments are used to measure various parameters.

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Different Modes in Four Wheel Steered Multi-Utility Vehicles

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Abstract : Four wheel steering is the innovative technology in which research is going on. The front-to-rear wheel alignment plays a significant role in the directional stability of a vehicle in a good manner. Four wheel steering is the system that allows the rear wheels to turn for maneuvering, rather than just follow the front wheels. The system is employed by some vehicles to improve steering response, increase vehicle stability while maneuvering at high speed, or to decrease turning radius at low speed. In Four Wheel Steering System, the rear wheels do play an active role for steering, which can be guided at high as well as in low speeds. In this paper we made a four wheel steered vehicle for the analysis of four wheel steering systems (4WS). Apart from normal front wheel steered vehicle our designed model can work in all four modes of four wheel steering. The four modes include front wheel steering, 360 degree rotation of vehicle with in the position, parallel parking mode and shorter radius mode. 4WS is one of the devices which are used for the improvement of vehicle maneuverability and stability. Another significant finding is the effect of vehicle add-ons which showed how a multi utility vehicle can be made by giving a floor cleaning machine with it. We introduced Neodymium magnets to attract metal scraps, which helps us to clean the floor. It is expected that our different modes will be very beneficial to everyone who involved or interested in the automotive design, steering modes, analysis, performance assessment and applications of various types of four wheel steering systems.

Keywords: *Four mode steering, four wheelers, Neodymium magnets, maneuverability.*

I. INTRODUCTION

In a typical front wheel steering system, the rear wheels do not turn in the direction of the curve, and thus curb on the efficiency of the steering. Normally, this system has not been the preferred choice due to the complexity of conventional mechanical four wheel steering systems. However, a few cars like the Honda Prelude, Nissan Skyline GT-R have been available with four wheel steering systems, where the rear wheels turn by a small angle to aid the front wheels in steering. However, these systems had the rear wheels steered by only 2 or 3 degrees, as their main aim was to assist the front wheels rather than steer by themselves. With advances in technology, modern four wheel steering systems boast of fully electronic steer-by-wire systems, equal steer angles for front and rear wheels, and sensors to monitor the vehicle dynamics and adjust the steer angles in real time. Although such a complex 4WS model has not been created for production purposes, a number of experimental concepts with some of these technologies have been built and tested successfully. The direction of steering the rear wheels relative to the front wheels depends on the operating conditions. At low-speed wheel movement is pronounced, so that rear wheels are steered in the opposite direction to that of front wheels. This also simplifies the positioning of the car in situations such as parking in a confined space. Since the rear wheels are made to follow the path on the road taken by the front wheels, the rear of a 4WS car does not turn in the normal way. Therefore the risk of hitting an obstacle is greatly reduced. At high speed, when steering adjustments are subtle, the front wheels and rear wheels turn in the same direction. As a result, the car moves in a crab-like manner rather than in a curved path. This action is advantageous to the car while changing lanes on a high-speed road. The elimination of the centrifugal effect and, in consequence the reduction of body roll and cornering force on the tyre, improves the stability of the car so that control becomes easier and safer. In a 4WS system, the control of drive angle at front and rear wheels is most essential.

II. LITERATURE REVIEW

Lohith et al [1] shows that the Four-wheel steering is a serious effort on the part of automotive design engineers to provide near-neutral steering. In certain cases like low speed cornering, vehicle parking and driving in city conditions with heavy traffic in tight spaces, driving would be very difficult due to vehicle's larger wheelbase and track width. Hence the requirement of a mechanism which results in less turning radius arises and it will be achieved by implementing four wheel steering mechanism instead of regular two wheel steering. The rear wheels were drawn out of phase to the front wheels. In order to achieve this, a mechanism which consists of two bevel gears and intermediate shaft which transmit 100% torque as well turns rear wheels in out of phase was developed.

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Experimental Analysis of YSZ Coating on an IC Engine Piston

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ABSTRACT : *As per the second law of thermodynamics the IC (Internal Combustion) engine efficiency depends upon the extraction of work against the heat supplied. Minimization of heat rejection leads to increase the work. Heat rejection takes place through the engine piston, valves and cylinder heads to the surroundings. The aim of the study is to minimize this heat rejection to the surroundings. Heat transfer through the engine parts can minimize by applying the thermal barrier coating materials on the top surface of the engine piston, cylinder heads and valves. In this study an attempt is made to reduce the intensity of heat rejection by using a layer of the ceramic material, like Yttrium Stabilized Zirconia (YSZ) which has low thermal conductivity, high thermal resistance, chemical inertness, high resistance to erosion, corrosion and high strength was selected as a coating material for engine component. In this paper the experiments were carried out with 0.4mm YSZ coated piston and it is found that it has 1% total fuel consumption, 1.2% specific fuel consumption and 0.7% exhaust gas temperature less than the conventional engine with uncoated piston. It is also seen that 2.6% brake thermal efficiency, 2.14% indicated thermal efficiency and 1.35% mechanical efficiency more than the conventional engine with uncoated piston.*

Keywords : *Brake thermal efficiency, indicated thermal efficiency, Mechanical efficiency, Total fuel consumption, Yttrium stabilized zirconia*

I. INTRODUCTION

Energy conservation and efficiency have always been the quest of engineers concerned with internal combustion engines. Even the petrol engine rejects about two thirds of the heat energy of the fuel, one-third to the coolant, and one third to the exhaust, leaving only about one-third as useful power output. Theoretically if the heat rejected could be reduced, then the thermal efficiency would be improved. Low Heat Rejection engines aim to do this, by reducing the heat lost to the coolant. The energy flow through the reciprocating engine is considered. According to the first law of thermodynamics, energy can neither be created nor destroyed. It can only be converted from one form of energy to another form. In internal combustion engines, the chemical energy of the fuel is converted to thermal energy during combustion. The liberated thermal or heat energy cannot be fully utilized for driving the piston due to the losses. The losses are-loss through the engine exhaust, to the coolant and due to radiation. When fuel is supplied to the engine, heat is liberated and 30% of the heat supplied is lost through the engine exhaust, 30% of the heat supplied is lost to coolant. These heat losses need to be minimized to reduce the fuel consumption and to increase the efficiency of the engine. To achieve these goal different engine components like Piston, Combustion Chamber, Cylinder Head are coated. The Combustion Chamber is coated with low heat conducting ceramic materials, which indirectly increase the efficiency of the engine due to the increase of temperature and pressure inside the closed system. This also finds application as Thermal Barrier Coatings, which can improve the efficiency of the engine. The Emission can be reduced and Performance of the internal combustion engine can be increased by different coating methods. Catalytic Coating is done to speed up the reaction rates during combustion. Like Catalysts, various Catalytic surfaces enhance the chemical reaction and speed up the reaction rates. The petrol engine with its combustion chamber walls insulated by ceramics is referred to as Low Heat-Rejection (LHR) Engine. The LHR engine has been conceived basically to improve fuel economy by eliminating the conventional cooling system and converting part of the increased exhaust energy into shaft work using the turbocharged system. This study presents effect of Yttrium stabilised zirconia on the piston on the performance of the modified four stroke petrol engine and emission characteristics of the exhaust gas.

Karuppasamy et al [1] conducted experimental study where alumina-titania and nickel-chromia are used as thermal barrier materials. These materials are used to reduce the heat loss from engine. The Coating is performed by Plasma spraying technique. The results showed a reduction in specific fuel consumption, CO and HC emissions are slightly more than the conventional coated diesel engine at low and medium loads but less

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Fabrication and Analysis of Solar Powered Air Cooler

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ABSTRACT

Cooling process is very important to maintain the foods, fish and many items at constant temperature to avoid the effect of viruses. Cooling process employs the different methods to cool the air. But considering the lower application and cost effective the water cooling system is considered for our project. The main aim of our project is to supply the cooled air with the help of water circulation. It consists of Solar panel, Battery, Fan, Water tank and Pump. The present air cooling methods are evaporative coolers, air conditioning, fans and dehumidifiers. But running these products need a source called electricity. The producing of electricity is ultimately responsible for hot and humid conditions i.e. global warming. In hot and humid conditions the need to feel relaxed and comfortable has become one of few needs and for this purpose utilization of systems like air-conditioning and refrigeration has increased rapidly. These systems are most of the time not suitable for villages due to longer power cut durations and high cost of products. Solar power systems being considered as one of the path towards more sustainable energy systems, considering solar-cooling systems in villages would comprise of many attractive features. Despite increasing performance and mandatory energy efficiency requirements, peak electricity demand is growing and there is currently no prevalent solar air cooling technology suited to residential application especially for villages, schools and offices.

Keywords– *Cooling, Power Cut Problems, Solar Power Systems, Sustainable Energy Systems, Water Circulation.*

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I. INTRODUCTION

Solar energy is the light and radiant heat from the Sun that influences Earth's climate and weather and sustains life. Solar power is sometimes used as a synonym for solar energy or more specifically to refer to electricity generated from solar radiation. Since ancient times, solar energy has been harnessed for human use through a range of technologies. Solar radiation along with secondary solar resources such as wind and wave power, hydroelectricity and biomass account for most of the available flow of renewable energy on Earth.

Solar energy technologies can provide electrical generation by heat engine or photovoltaic means, space heating and cooling in active and passive solar buildings; potable water via distillation and disinfection, day lighting, hot water, thermal energy for cooking, and high temperature process heat for industrial purposes. Sunlight can be converted into electricity using photovoltaics (PV), concentrating solar power (CSP), and various experimental technologies. PV has mainly been used to power small and medium-sized applications, from the calculator powered by a single solar cell to off-grid homes powered by a photovoltaic array.

The term "photovoltaic" comes from the Greek φώς (*phos*) meaning "light", and "voltaic", meaning electrical, from the name of the Italian physicist Volta, after whom a unit of electrical potential, the volt, is named.A solar cell, or photovoltaic cell (PV), is a device that converts light into direct current using the photoelectric effect. The first solar cell was constructed by Charles Fritts in the 1880s. Although the prototype selenium cells converted less than 1% of incident light into electricity, both Ernst Werner von Siemens and James Clerk Maxwell recognized the importance of this discovery.

1.1 NEED FOR RENEWABLE ENERGY

Renewable energy is energy generated from natural resources—such as sunlight wind, rain, tides and geothermal heat—which are renewable (naturally replenished). In 2006, about 18% of global final energy consumption came from renewable, with 13% coming from traditional biomass, such as wood-burning. Hydroelectricity was the next largest renewable source, providing 3%, followed by solar hot water/heating, which contributed 1.3%. Modern technologies, such as geothermal energy, wind power, solar power, and ocean energy together provided some 0.8% of final energy consumption.

Design and Fabrication of Reverse Gear Mechanism for Handicapped People

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Abstract— In the present scenario there were no mopped vehicles equipped with reverse gear facility. So it is very difficult for a handicapped person while the vehicles front wheel gets into a trench as well as in the case of parking. Here introducing a reverse gear mechanism, with portable gear box that can be easily operated by hand. Four gears are used for obtaining reverse motion of the vehicle. In this paper, proposes and designed a gear box which will be fitted into those vehicles without much altering the existing transmission system. This reverse gear mechanism provides a simple, low cost reverse transmission system which will be helpful for handicapped people.

Index Terms— Reverse gear mechanism,Mopped vehicle,Portable gear box, handicapped people,Gear train,Transmission System,Low cost,

1. INTRODUCTION

This project aims to help the handicapped people for their easy convience for travelling.

They are facing many problems related to their transportation. Presently, handicapped people drive two wheelers with extra support wheelsThey face difficulty in reversing the vehicle while travellingBy using this mechanism the handicapped people can easily move the vehicle backward. At present, there is no system available to back the vehicle. At times when the frontwheel gets into a trench it is very difficult to take the vehicle from parking. Even normalpeople face much problem to take the vehicle out of the parking at that time. In case of thehandicapped people who drive two wheelers with extra support wheels, face much problem to take the vehicle out of the parking by pushing the vehicle with legs as we do. In order to take the vehicle out of the parking they need to seek others help or they should push it out of the parking. As a help to them we have designed a gear box which will be fit to the vehicle. It is fitted to the side of the vehicle and helping in the backing of the vehicle. When the driver wants to move the vehicle backward what he needs is just to move the rod in the newly designed gear box in one direction and when the driver wants the vehicle to move in the forward direction, then the rod is to be moved to the earlier position. The change of direction of the vehicle is just by the movement of the gear rod.

The physically challenged persons are one of the excluded sections of the society and also they face number of problems in their daily life. In order to bring them in the main stream both the central as well as the state governments are introducing many welfare measures and schemes. To avail these welfare measures and the schemes, first of all they must aware about the same. In motor vehicles, the transmission generally is connected to the engine crankshaft via a flywheel and or partly because inter combustion engines cannot run below a particular speed. . A simple but rugged sliding-mesh or unsynchronized/non-synchronous system, where straight-cut spur gear sets spin freely, and must be synchronized by the operator matching engine revs to road speed, to avoid noisy and damaging clashing of the gears. The now common constant-mesh gearboxes, which can include non-synchronized, or synchronized/synchromesh systems, where typically diagonal cut helical (or sometimes either straight-cut, or double-helical) gear sets are constantly "meshed" together, and a dog clutch is used for changing gears. On synchromesh boxes, friction cones or "synchro-rings" are used in addition to the dog clutch to closely match the rotational speeds of the two sides of the (declutched) transmission before making a full mechanical engagement

2. SELECTION OF MATERIALS

The gear material should have the following properties:

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Experimental Investigation of a Helical Coil Heat Exchanger

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ABSTRACT :- *Helical coil heat exchangers are one of the most common equipment found in many industrial applications. Helical coil heat exchanger is one of the devices which are used for the recovery system. The helical coil heat exchangers can be made in the form of a shell and tube heat exchangers and can be used for industrial applications such as power generation, nuclear industry, process plants, heat recovery systems, refrigeration, food industry etc. In our work we had designed, fabricated and experimentally analysed a helical coil heat exchanger and a straight tube heat exchanger. From the observations and calculations, the results of the helical coil heat exchanger and straight tube heat exchanger are obtained and are compared. From our obtained results, the helical coil heat exchanger showed increase in the heat transfer rate, effectiveness and overall heat transfer coefficient over the straight tube heat exchanger on all mass flow rates and operating conditions. The centrifugal force due to the curvature of the tube results in the secondary flow development which enhances the heat transfer rate. Comparative study shows that helical coil heat exchanger is having better performance that straight tube heat exchanger.*

KEYWORDS: *- Helical coil heat exchanger, straight tube heat exchanger, effectiveness, overall heat transfer coefficient*

I. INTRODUCTION

Heat exchange between flowing fluids is one of the most important physical process of concern, and a variety of heat exchangers are used in different type of installations, as in process industries, compact heat exchangers nuclear power plant, HVACs, food processing, refrigeration, etc. The purpose of constructing a heat exchanger is to get an efficient method of heat transfer from one fluid to another, by direct contact or by indirect contact. The heat transfer occurs by three principles: conduction, convection and radiation. In a heat exchanger the heat transfer through radiation is not taken into account as it is negligible in comparison to conduction and convection. Conduction takes place when the heat from the high temperature fluid flows through the surrounding solid wall. The conductive heat transfer can be maximised by selecting a minimum thickness of wall of a highly conductive material. But convection is plays the major role in the performance of a heat exchanger. Heat exchangers are the important engineering systems with wide variety of applications including power plants, nuclear reactors, refrigeration and air-conditioning systems, heat recovery systems, chemical processing and food industries. Helical coil configuration is very effective for heat exchangers and chemical reactors because they can accommodate a large heat transfer area in a small space, with high heat transfer coefficients. The flow through a curved pipe has been attracting much attention because helical coiled pipes are widely used in practice as heat exchangers and chemical reactors. The fluid flowing through curved tubes induces secondary flow in the tubes. This secondary flow in the tube has significant ability to enhance the heat transfer due to mixing of fluid. Forced convection in a heat exchanger transfers the heat from one moving stream to another stream through the wall of the pipe. The cooler fluid removes heat from the hotter fluid as it flows along or across it.

II. EXPERIMENTAL SETUP

II.1. Experimental System

The experimental test rig is properly set up for parallel flow arrangement or counter flow arrangement. Set the volume flow rate of both hot water and cold water to a suitable value using measuring jar and stop watch. Measure the inlet and exit temperatures of hot and cold water using digital thermometer. Observations are noted and results are calculated. The graphs are plotted according to the obtained results. The same procedure is used for both helical coil heat exchanger and straight tube heat exchanger. Figure 1 shows the experimental test rig.

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Analysis of Regenerative Braking In Brushless Dc Motor Drive Using Adaptive Neuro Based Fuzzy Inference System

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Abstract - ***The electronically commuted Brushless DC motors are widely used in many industrial applications which increase the need for design of efficient control strategy for these motors. This paper deals with the efficient control mechanisms for these drives using meaningful fuzzy sets and rules. The proposed system includes Brushless DC motor control utilizing the PID control, and improved performance via adaptive neuro based fuzzy control. A simplified current controlled modulation technique for BLDC motor is presented so that one can evaluate the performance of the BLDC motor with PWM Control scheme and effective regenerative braking system has been implemented which has the ability to recover energy An adaptive neuro fuzzy inference system is developed using MATLAB. Simulation results shows that ANFIS reaches to the target faster and overcomes the complexity of the problem.***

Key Words: *Brushless DC (BLDC) motor, fuzzy control, Proportional-Integral-Derivative (PID) control, Adaptive neuro based fuzzy inference system (ANFIS), Regenerative Braking System (RBS).*

1. INTRODUCTION

With the emergence of energy crisis, waysf reducing the air pollution have become the great challenge. . Nowadays, fossil-fueled automobiles have become the major transportation tools. Automakers have made a great effort to find green, energy saving and zero pollution transportation tools. Thus, electric vehicles (EVs) have grown at an accelerated pace lately. However, some of the main difficulties for commercialization of EVs such as driving range still remain. Effective battery utilization and advanced motor control have become an important issue for EVs. A pure electric vehicle (PEV) contains three major parts: the power battery pack (usually in series as an energy-storage unit), the driving motor [can be induction motor (IM), brushless direct-current motor (BLDCM) and switched reluctance machine (SRM)], and the power converter Controller. Among all the driving motors, the brushless direct-current (DC) motor has many advantages over other brush DC motors, IMs and switch reluctance machines. Brushless DC motors works similar to the conventional DC motor with the mechanical commutation replaced by an electronically controlled commutation system. These motors have the rotating permanent magnets and stationary armature. The BLDC motor that are utilized in this control design is star connected BLDC motor. The power distribution is achieved by the intelligent electronic controller. The electronic controller requires rotor position information for proper commutation of currents in the respective stator windings. The rotor position can be sensed using Hall effect sensors embedded in the stator and thus stator windings are energized accordingly. BLDC has the merits of simple structure, high efficiency, electronic commutating device, high starting torque, noiseless operation and high speed range, *etc.* Hence, the brushless DC motor has been widely used in EVs. Conventional EVs use mechanical brakes to increase the friction of the wheel for deceleration purposes. Thus, the braking kinetic energy is wasted. With this problem in mind, this paper will discuss how to convert the kinetic energy into electrical energy that can be recharged to the battery pack. As a result, regenerative braking can realize both electric brake and mechanical brake.

1.1 Regenerative Braking

Regenerative braking is defined as that in which the motor, which acts as a generator during braking turns the inertial energy generated in the process of moving into electrical energy that is stored in the storage devices for reuse. At the same time motor braking torque is applied to the driving wheels to brake the vehicle through the transmission system.

This paper is organized as follows. BLDC Motor and Control in section II. EV Modeling in section III and MATLAB simulation along with results are explained in section IV. Section V concludes the paper

Integrated Dual Output Buck Boost Converter for Industrial Application

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***Abstract*— Now a days most of the fields such as industries, telecommunication, plug in hybrid vehicles etc, there will be different voltage level because of the auxiliary circuits in addition to main power circuit. In such system, Single Input Multiple output (SIMO) dc to dc converters have very good place and researches on SIMO dc to dc converters are worthy. Integrated Dual Output Buck Boost converter is one of the SIMO dc to dc converter which yields one step up output and one step down voltage. This converter is developed by replacing the switch in conventional boost converter by two series switches and taking a lowpass filter from the two series connected switches. This can be extended to N outputs which require on only N switches. But in conventional converters 2N switches are required. So the proposed converter reduces the bill amount. The cross regulation and voltage regulation further can be reduced by N+1 switches for N outputs. This converter does not require any other circuit components in order to achieve good cross regulation. So that it again reduces the cost which will be an attractive feature in modern market. In order to check the behavior of the converter simulation is carried out in MATLAB environment. The simulation results validate the operation of the converter.**

Keywords*— *DC-DC converters, Integrated Dual Output Converter (IDOC), Single Input Multiple Output (SIMO)

I. INTRODUCTION

In the modern world fields such as industries, telecommunication, LED drivers, dc based nano grid etc require multiple output because of the auxiliary circuits present in those system other than main circuit. So that the researches on Single Input Multiple Output dc-dc converters are progressive in order to get a less bulky system, more reliable control strategy and less cross regulation etc.

Fig.1. various industrial applications

Fig 2.a and Fig 2.b shows conventional and proposed SIMO dc to dc converters respectively. In conventional SIMO dc to dc converters individual dc to dc converters are connected to common input dc bus. But in the proposed SIMO dc to dc converters, an integrated architecture is used for multiple outputs.

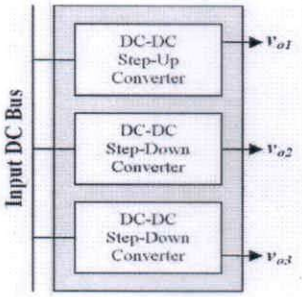

Fig 2.a conventional

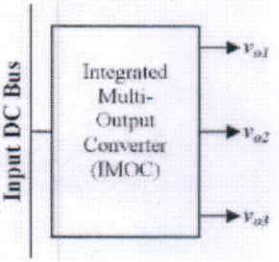

Fig 2.b proposed

Problems met by different SIMO dc to dc converters are discussed in the following sections.

SIMO converters where individual dc to dc converters are used, the whole system will be bulky. This is because it requires at least four switches including the front end and the back end. So that the system will be bulky and there in turn costly.

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PFC Cuk Converter Fed BLDC Motor Drive using Artificial Neural Network

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Abstract—**In this paper a Power Factor Correction Cuk converter fed Brushless DC Motor Drive using a Artificial Neural Network is used. The Speed of the Brushless dc motor is controlled by varying the output of the DC capacitor. A Diode Bridge Rectifier followed by a Cuk converter is fed into a Brushless DC Motor to attain the maximum Power Factor. Here we are evaluating the three modes of operation in discontinuous mode and choosing the best method to achieve maximum Power Factor and to minimize the Total Harmonic Distortion. We are comparing the conventional PWM scheme to the proposed Artificial neural network. Here simulation results reveal that the ANN controllers are very effective and efficient compared to the PI and Fuzzy controllers, because the steady state error in case of ANN control is less and the stabilization if the system is better in it. Also in the ANN methodology the time taken for computation is less since there is no mathematical model.The performance of the proposed system is simulated in a MATLAB/Simulink environment and a hardware prototype of the proposed drive is developed to validate its performance.**

Keywords — Brushless dc motor, Discontinuos input inductor mode , Discontinuous output inductor mode, Discontinuous intermediate capacitor mode ,Cuk converter,Power Factor Correction,Total Harmonic Distortion, Artificial Neural Network,Pulse width modulation

I. INTRODUCTION

Brushless Dc Motor is recommended for many low cost applications such as household application, industrial, radio controlled cars, positioning and aeromodelling, Heating and ventilation etc. ,because of its certain characteristics including high efficiency, high torque to weight ratio, more torque per watt , increased reliability, reduced noise, longer life, elimination of ionizing sparks from the commutator, and overall reduction of electromagnetic interference(EMI) etc. With no windings on the rotor, they are not subjected to any centrifugal forces, and because the windings are supported by the housing, they can be cooled by conduction, requiring no airflow inside the motor for cooling purposes. The motor's internals can be entirely enclosed and protected from dust, dirt or any other foreign obstacles.

The two main factors that determine the power quality of a motor are the Power Factor (PF) and the total harmonic Distortion (THD). The Power Factor determines the amount of useful power being consumed by an electrical system. The term THD is defined as the ratio of the harmonic components of voltage (or current) to the voltage (or current) of the fundamental. So the Power Factor Correction (PFC) is the best method of improving the PF by making the input to the power supply purely resistive or else due to the presence of non linear loads the input will contain phase displacement which causes harmonic distortion and thus the power factor gets degraded.

The main aim of all papers is to improve the power quality according to the standards recommended ,But in the conventional schemes for example diode bridge fed Brushless Dc Motors due to the presence of huge capacitor value it draws a non sinusoidal current from the ac mains which increased the THD to 65% and power factor to 0.8.The other conventional schemes by using many of the converters fed BLDC motors like Sepic ,Buck, Boost ,Buck Boost etc. by using high frequency pulse width modulation increases the switching losses. Bridgeless configuration of these converters were also existed ,even though they reduces the switching losses ,the no of active and passive components were more which increases the complexity in designing the circuit and the overall cost. The Power Factor in these cases is very less and a high value of THD which reduces the power quality. In this paper we are using a Cuk converter for PFC correction to the maximum value and to attain a low value of THD using Artificial neural network.

There are some draw backs in using conventional Power Factor Correction Methods, By using a Boost converter in Discontinuous Current Mode leads to a high ripple output current. The Buck converter input voltage does not follow the output voltage in DCM mode and the output voltage is reduced to half which reduces the efficiency.In our proposed system front-end Cuk converter is used in both continuous and discontinuous mode because of its certain advantages like easy implementation of the transformer isolation ,protection against high inrush current ,low current ripple and also low electromagnetic interferences.

The two modes of operation for the front-end converter are continuous conduction mode and discontinuous conduction modes of operations. The current multiplier approach is used in continuous mode with low voltage and current stresses but which make use of three sensors(One voltage sensor and twocurrent sensors) and increase the cost. But in the case of discontinuous mode of operation we use voltage control follower with comparatively more voltage and current stresses but only one voltage sensor is used .

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One-Cycle Control of Interleaved Buck Converter with Improved Step-Down Conversion Ratio

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Abstract - ***One of the main disadvantages of the buck converter and the interleaved buck converter is the narrow duty cycle which limits the application of the converters for high step-down applications. The interleaved buck converter with high conversion ratio overcomes this drawback. This converter provides continuous input current and also reduces the voltage stress of the semi-conductor devices to below the input voltage. This is possible due to the presence of two input capacitors. Also, compared to the conventional interleaved buck converter the converter provides much lower output current ripple. The simulation of the circuit with 200 V input, 24V/10A output is done using MATLAB. One-cycle control is used to generate the gate pulses.***

Key Words: *Buck converter; interleaved structure; high step-down conversion ratio; one-cycle control.*

1. INTRODUCTION

The step-down power conversion technique is widely used in power sources for LED drivers, microprocessors, battery chargers, solar power regulators and so on. These applications require low current ripple, which can be achieved by increasing the switching frequency. However, these may lead to high semiconductor losses. The buck converter is widely used for step-down dc-dc conversion when there is no isolation requirement. The conventional buck converter is very efficient when not too large a potential difference separates the output voltage from the input voltage (i.e., when the duty cycle D is high, and typically over 50%).

The main drawback of the buck converter is the low on-time of the switch in the case of high-step down applications with high switching frequency. Thus, the regulation period is very short and becomes very difficult in high frequency applications. In applications where non-isolated, high step-down conversion ratio and high output current with low ripple are required, interleaved buck converters (IBC) have received a lot of attention. Fig. 1. shows the conventional interleaved buck topology. However the semiconductor devices in the conventional IBC suffers from input voltage stress and hence various topologies have been introduced to reduce the voltage stress. In [2] an IBC having low switching losses has been implemented by carrying out zero current transition. [3] describes a topology in which the switches are connected in series rather than parallel. The voltage stress of the semiconductor devices is half of the input voltage after turn-on and before turn-off. However, the input rms current is high in spite of the interleaved structure. [4] introduces a two phase transformer-less interleaved structure with an improved step-down conversion ratio and lower switch voltage stress. It can be noted that in [4] for a 2 phase converter 4 switches are used and the number of components are higher. Thus, the topology becomes more complicated as the number of phases increases.

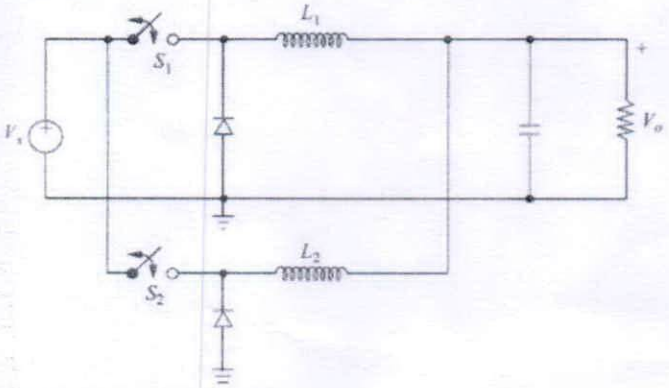

Fig -1: Conventional IBC

An application of IBC is seen in [5]. Standard buck converters require high value inductor to reduce the current ripple. Due to the high value of inductor and high switching frequency, the dimming frequency is reduced which results in audible noise. Thus, IBC are used as a high brightness LED electronic driver. Also, fuel cell plate and lead-acid battery lifetime depends on the ripple current drawn [6], [7], i.e., the output ripple current of the converter has to be low. For such applications IBCs are more preferred.

[8] - [9] use coupled inductors/tapped inductors to improve the efficiency of the interleaved converters. In [8], a coupled inductor is used to further reduce the size of the

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CLOSED LOOP CONTROL OF HIGH STEP-UP DC/DC CONVERTER BASED ON COUPLED INDUCTOR AND SWITCHED-CAPACITOR

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Abstract *- This paper proposes a high voltage gain dc/dc converter with coupled inductor cells and switched capacitor for renewable energy applications. It includes coupled inductor, switched capacitor and voltage multiplier cell. Switched capacitor charged during off period by using the energy stored in the coupled inductor. This will increase the performance of the converter. The operation principle and steady state analyses are discussed thoroughly. Simulation is done with 40V input voltage, 300W output power and 400V output voltage using MATLAB.*

Keywords—*Dc/dc converter,boost converter, coupled inductor, PWM control scheme*

1. INTRODUCTION

The future is looking towards alternative power sources all of which will need to be regulated in one Form or another. To make this possible, a highly efficient low cost product will have to be designed. Among all the different converter designs only a few are capable of providing high power with high efficiency. The basic switched-mode dc–dc converters including buck, boost, buck-boost, cuk, zeta, and sepic have been used in various electronic applications due to their numerous advantages such as good performance, simple structure, , high efficiency, easy design, and simple control circuit. To get high voltage from low voltage boost converters are used. The high voltage converters are widely used in many industry applications, such as photovoltaic systems, fuel cell systems, electric vehicles, and high intensity discharge lamps. PV cells can be connected in series in order to obtain a large dc voltage. Though PV cells can be made into array and connected in series to produce high voltage there exist serious problems like shadowing effects, short circuit which drastically reduces its efficiency. In order to overcome such adverse effects this micro source energy is utilized by the high step up converter to produce high voltage and satisfy the demands. Thus high step up dc-dc converters are used as front end converters to step from low voltage to high voltage which are required to have a large conversion ratio, high efficiency and small volume [2].

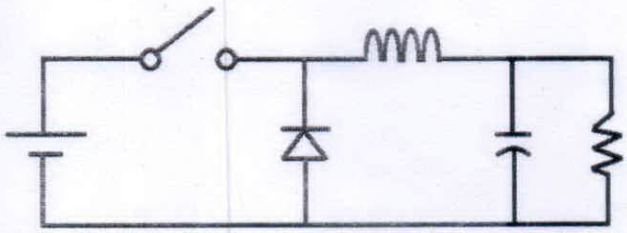

Fig.1.conventional boost converter

The conventional boost converters are not suitable for the high step-up conversion [3] applications because the duty cycle of the boost converter with high step-up conversion is large, which results in narrow turn off time. The extremely narrow turn-off time will bring large peak current and considerable conduction and switching losses [4] .conventional boost converter is shown in fig(1). However extreme duty ratio will result in serious reverse recovery problems and electromagnetic interferences. Impacts of SiC (silicon carbide) MOSFETS on converter, switching and conduction losses are reduced even though fast switching is done. Si diodes have ideal, but sill SiC devices processes large amount of ringing current at turn off relatively to other devices. And the SiC are comparing0 with Si [5].

Forward converter, push-pull converter and flyback converters are transformer based converters (isolated converters) ,can achieve high voltage gain by adjusting the turns ratio of the transformers. But it has the disadvantages of voltage spike across the main switch and power dissipation due to leakage inductance of the transformer [7] and safety standard needs [8]. In [9] it proposes a novel single switch high step-up converter. The coupled inductor is act as both forward and flyback converter, thus it can charge two capacitors in parallel and discharge in series.

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Ripple Current Reduction Technique for DC to DC Converter Using Tapped Inductor

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Abstract: A new ripple current cancellation network (RCN) using Tapped inductor at the input of the boost converter with high conversion ratio is presented in this paper. This converter provides continuous input current and reduces the size and weight of the converter compared with the conventional Boost Converter (CBC). The tapped inductor can be easily realized by adding an extra tap in the main inductor of the CBC. Since the capacitor and inductor in the RCN do not need to handle the main power as the conventional LC input filter. A ripple current cancellation technique injects alternating current into the output voltage bus of a converter that is equal and opposite to the normal converter ripple current. The proposed converter is compared with conventional Interleaved Boost topology (IBC) shows that input current ripple cancellation in various power ranges without increasing the losses. The tapped inductor technology based DC—DC converter is an integration of boost converter with coupled inductors. The tapped converter of the classical switch –mode power converter is an extension of the conventional switch mode power converters. Using the tapped configuration the control parameter of the converter can be using tapping. The proposed converter has two modes in one operational period. This converter is controlled by switch S. Design for a 500W converter is conveyed in this paper with input voltages taken as 36V and output voltages of 50V is done for a switching frequency of 100 kHz. The duty cycle of the boost converter during the steady operation is 0.3 and turns ratio of tapped inductor is 2(10:20). The converter is simulated for both modes of operation using PSIM. Output levels are obtained as per the design values for converter operations. This converter shares the same characteristic of CBC and input current ripple cancellation can be achieved by adding one capacitor and one inductor without significantly increasing the current stress and losses. Simulation results conveys the operability of the converter structure.
Keywords: TAPPED INDUCTOR,INTER LEAVED BOOST CONVERTER

I. INTRODUCTION

The DC to DC converter with high step-up voltage gain is widely used for many applications such as fuel-cell energy-conversion systems, solar-cell energy-conversion systems, and high-intensity-discharge lamp ballasts for automobile headlamps. Conventionally, the DC–DC boost converter is used for voltage step-up applications, and in this case, this converter will be operated at extremely high duty ratio to achieve high step-up voltage gain. A practical limitation of switch mode power converters is the presence of inductor ripple current. This ripple current creates filtering difficulties, control issues, output voltage noise, and other problems.Low noise supplies are required for signal processing, high performance imaging, instrumentation equipment, and other signal to noise sensitive applications. In order to minimize the input current ripple of the conventional boost converter (CBC), large input inductor value has to be chosen. However, large inductor values not only increase the total weight of the converter but also lead to worse dynamic response. A well-designed input filter is able to reduce the input current ripple, but the size and weight of the filter are quite unacceptable particularly in high-power applications.A ripple current cancellation technique injects alternating current into the output voltage bus of a converter i.e; equal and opposite to the normalconverter ripple current.

Coupled inductor based boost topology reduces the input current ripple when the coupling coefficient is equal to $K=\sqrt{\frac{L_1}{L_2}}$ .This is very impractical to fix the coupling coefficient.

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Closed loop Contol of ZCS Interleaved High Step Up Converter For Sustainable Energy Applications

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Abstract— **The grid-connected systems employing Photovoltaic and fuel cells call for high step- up dc/dc topologies . Large voltage conversion ratio with ten times of voltage gain is essential for the front-end dc/dc converters. In this paper, the built-in transformer multiplier cell is inserted into each phase of the conventional interleaved boost converter.The multiplier cell is composed by the built-in transformer windings, diodes and capacitors. Additional active switches are not required to simplify the circuit configuration. Moreover, the switch voltage stress and the diode peak current are also minimized and reverse recovery problem of the diodes can be minimised. In addition, the switch turn-off voltage spikes are suppressed effectively by zero current switch (ZCS) turn-on across the switches, which can enhance the reliability. To study the performance of the high step up Interleaved boost converter with closed loop, simulations has been carried out in MATLAB 2013 environment. The waveforms agreed with the operating principles and the steady-state analysis.**

Keywords— boost converter, interleaved converter,built in transformer voltage multiplier cell, regenerative diode, soft switching (ZCS).

I. INTRODUCTION

Nowadays, the renewable-energy systems with Photovoltaic and fuel cells call for high step-up dc/dc topologies .Because ,the low voltage generated by the PV and fuel cells should be boosted to a high dc bus voltage for the grid-connected systems. In order to supply the energy to a single-phase 220-V utility grid, a 380-V DC is required with a full-bridge inverter. The output voltage of most fuel cell stacks or the individual PV cells is lower than 40 V due to the safety issues in the household applications.

Large voltage conversion ratio with nine times of voltage gain is necessary for the front-end dc/dc converters. As a result, non-isolated high-step-up dc-dc topologies are mandatory to reduce the system cost and improve the power density. In this paper, the built-in transformer voltage multiplier cell is inserted into each phase inorder to provide additional control freedom for the voltage gain extension without extreme duty cycle. The voltage multiplier cell is composed of the built-in transformer windings, diodes and capacitors. And additional active switches are not required to achieve ZCS condition .

The switch voltage stress and the diode peak current are minimized due to the built-in transformer multiplier cells to improve the conversion efficiency. Furthermore there is no reverse-recovery problem for the clamp diodes and the reverse recovery current for the regenerative and output diodes are controlled by the leakage inductance of the transformer to reduce the losses. In addition, the switch turn-off voltage spikes are suppressed effectively by zero current switch (ZCS) turn-on which can enhance the power device reliability.

In a closed-loop control system, the sensor monitors the system output and feeds the data to a controller that adjusts the control to maintain the desired output and hence remains unaffected to the external noise . A closed loop control has high reliability, easy to implement ,output short circuit and overload protection.

Future energy supply requires PV cells and wind energy since fossil fuels are diminishing nowadays.This energy sources has random energy fluctuations.To absorb the energy fluctuations the sustainable energy sources require backup storage elements[1].The PV panel and back up battery cell has low output voltage. Therefore high step up boost converters are required to lift the low voltage .

High step up converter is needed for renewable Energy applications. Diode reverse recovery problems and voltage stress are the main disadvantages seen in the conventional converters.The converter proposed in this paper can solve these problems.

Conventional Interleaved converter is an excellent candidate for the power factor correction applications.

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3D Brain Tumor Detection

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***Abstract*— Brain tumor detection using image processing is meant to identify the cancerous growth and its intensity in the human brain. The proposed system in addition to identifying the cancer lesions, also keeps a record of the patient's treatment history. This helps the medical practitioner in proceeding with the treatment of that particular patient. The scan images of a patient are given as input. Using Partial Voluming algorithm and expectation maximization algorithm in image processing, the cancer lesions are projected out.**

***Index Terms*— Edge detection, ImageJ, Magnetic resonance, Partial volume, voxel**

I. INTRODUCTION

Based on statistics, tumors are the second cause of cancer-related deaths in children (both male and female) and adults. This facts increase the importance of the researches on the tumor detection and this will present the opportunity for doctors to help save lives by detecting the diseases earlier and perform necessary actions. Varieties of image processing techniques to be applied on various imaging modalities for tumor detection that detect certain features of the tumors such as the shape, border and texture. These features will make the detection processes more accurate and easier as there are some standard characteristics of each feature for a specific tumor [1-2]. All tumors will start small and grow with time. As they grow, they will become conspicuous and increase the probability of showing their characters.

Imaging technology has progressed immensely in recent years. Image processing is the study of any algorithm that takes an image as input and returns an image as input. Information is conveyed through images. Image processing is a process where input image is processed to get output also as an image. Main aim of all image processing techniques is to recognize the image or object under consideration easier visually. MRI (magnetic resonance image) is commonly used in the medical field for detection and visualization of details in the internal structure of the body. It is basically used to detect the difference in the body tissues which have considerably better technique as compared to computed tomography [3].

In this paper, we introduced a new high level 3D visualization framework for Image J. The framework provides an interactive 3D scene for image volume visualization, annotation, segmentation and transformation. The framework has been very well received by the ImageJ user and developer community and it is currently in use by numerous Image J based applications. In this system we identify the presence of the cancer by verifying the presence of its characteristics in the scan images.

II. SYSTEM DESIGN

The MRI scanner gives an input of MRI image of the patient. Using the brain tumor detection system , we detect the tumor and using the ImageJ, view of the detected area in 3D.

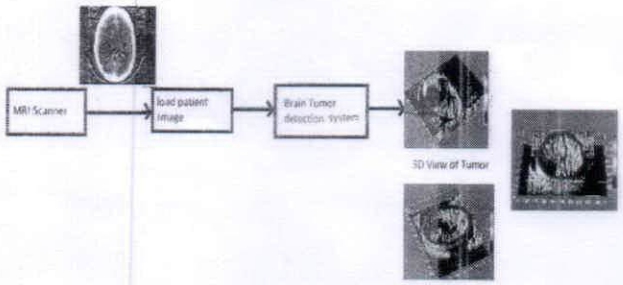

Fig 1: General concept for proposed system

III. DETAILED DESCRIPTION

Our framework is integrated into ImageJ. The ImageJ software libraries greatly reduces the complexity.Java3D provides a fine-grained representation of a virtual scene as a directed acyclic graph.

A. Brain Image from MRI

The input to the system would be MRI images of the brain .It have mainly three types of MRI sequences. (a)Diffusion MRI. It measures the diffusion of water

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Voltage mode control of soft-switched single switch Isolated DC-DC Converter

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Abstract - ***The high switching frequencies in power converters increases the switching losses, and electromagnetic interferences. These losses can be overcome by employing soft switching techniques. The paper introduces a soft switched single switch isolated DC-DC Converter where Switching losses, current and voltage stress can be reduced. The presented converter can be Zero current Switching (ZCS) turn on and Zero-Voltage Switching (ZVS) turn off of diodes and switches, regardless of load variation. Low rated lossless snubber used in the paper can reduce the transformer volume due to low magnetizing current. In the presented voltage mode control topology makes the output voltage constant and also switching stress is reduced even for load variations. The simulation of the circuit with 28V input, 380V/0.65A output is done using MATLAB***

Key Words: *Isolated step up dc-dc converter, single switch, soft switching*

1. INTRODUCTION

Isolated step up dc-dc converters are used in many applications, such as photovoltaic module–integrated converter (MIC) systems, portable fuel cell systems, and vehicle inverters where high efficiency, high power density, and low cost are required [2]. Isolated DC-DC Converters are used to provide galvanic isolation to regulate the output in telecom DC/DC converters. The non isolated switching regulators are mainly classified as Buck, Boost, and Buck Boost. Isolated DC DC Converters are derived from these non isolated DC-DC Converters by adding an isolating transformer and various other components.

The isolated boost converter topology was conceived by Davidson on June 15, 1982 at Varian Canada micro wave division. Isolated boost converters have some inherent advantages when used in fuel cell applications. With storage inductor placed at the input side, ripple current is inherently low. The drawback of boost topologies is need for the clamping of voltage spikes on primary switches caused by parasitic inductors. Thus various topologies have been analyzed to overcome these drawbacks.[4] . The Fly back

current fed push pull DC-DC converter shown in fig 1 is composed of a push pull transformer and a two winding transformer. These converters have several advantages over conventional current fed push pull transformers. In this topology [5] , there is no output inductor and has only a single input which makes the topology best suited for multiple output power supply.

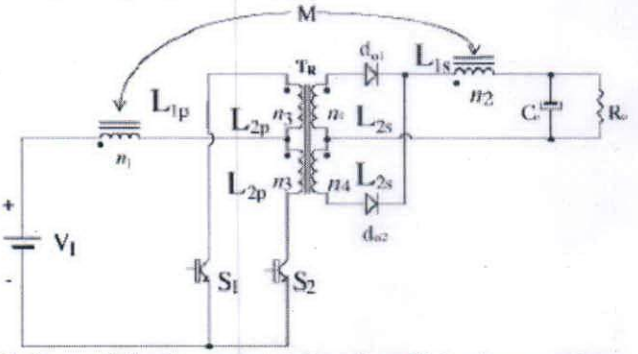

Fig 1 new flyback-current-fed push–pull dc–dc converter

In order to miniaturize a converter it is preferred to use high switching frequency. Increasing the switching frequencies helps to reduce the volume of power supplies. In medium power applications where isolation is required, which can be achieved by transformers, fly-back [6] and forward converters [7].

Current fed push pull DC-DC Converters [8] features good regulation. The main drawbacks of this topology are severe voltage over shoot, and the practical implementation of the circuits becomes unfeasible. The two possible techniques to solve such problems are passive clamping and active clamping techniques. The passive clamping techniques reduces the voltage over shoot problem, however diminishes the converter's efficiency, since energy is wasted through the clamping resistor. The active clamping techniques [9] promote the complete devolution of the energy stored in the leakage inductances.

During turn OFF of ZVT Converters [10], a snubber circuit is added across the switch to achieve turn off at Zero

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PWM Contol of High Gain Sepic Boost Converter With Coupled Inductor and Charge Pump Capacitor

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Abstract— ***The demand for Electrical energy is increasing with the advancement of Technology. The distributed generation based system with renewable energy resources have rapidly developed in recent years. These distributed generation systems are powered by sources such as fuel cell, photovoltaic (PV) systems and batteries. This consists of two conversion stages, in the first stage the low level voltage from the PV cell is converted to high level voltage by using a dc-dc converter. In the second stage the high level dc voltage is converted into AC voltage by using inverter. To attain the high energy demand requirements the efficiency of the systems must be increased. The energy demand requirements can be achieved by increasing the gain of the converter. The paper introduces a high gain boost converter which is derived from basic the single-ended primary-inductor converter (SEPIC) topology. The proposed converter achieves high gain by using coupled inductor and charge pump capacitor. The regenerative snubber helps to attain zero voltage and zero current switching (zvs and zcs) conditions, which improve the converter efficiency. The proposed converter also inherits the SEPIC advantage of continuous input current.***

Keywords— *boost conveter, coupled inductor, regenerative snubber, soft switching (zvs and zcs).*

1. INTRODUCTION

The energy shortage and atmospheric pollution led to more researches on the renewable energy sources such as the solar arrays (PV cells) and fuel cells. Renewable energy systems generate low voltage output; thus, high step-up dc-dc converters are widely employed in many renewable energy applications. Among renewable energy systems, photovoltaic systems are expected to play an important role in future energy production. Such systems transform light energy into electrical energy, and convert low voltage into high voltage via a step-up converter, which can convert energy into electricity using a grid-by-grid inverter [1]. The high step up converter performs importantly among the system because the system requires a sufficiently high step-up conversion. Classical converters with magnetic coupling as flyback or current-fed push-pull converters easily achieve high step-up voltage. But the disadvantages of the isolated dc-dc converters are large size, high switching losses and large electro-magnetic interference. Therefore non-isolated converters are widely used in many applications.

Conventional boost converters can be used for this purpose, but to enhance the output voltage of PV systems to such a higher value the duty cycle of the converter must be very high i.e around 0.9. This is not feasible due to the reverse recovery problem of the diode. To overcome this drawback number of topologies has been proposed. Voltage multiplier technique is applied to a classical non-isolated dc-dc converter in order to obtain high step-up gain [6]. The basic structure of the single phase voltage multiplier cell is composed of diodes, capacitors and a resonant inductor. It is possible to add more multiplier cells in order to achieve higher step-up ratios. The voltage multiplier cell increases the static gain of the classical boost by a factor of (M+1). Where M is the number of multiplier cells. The main disadvantage of this technique is usage of large number of components that increases the losses.

Switched capacitor and switched inductor structures are proposed for obtaining transformer less hybrid dc-dc PWM converters [7]. These switched structures are introduced in classical converters in order to achieve high conversion ratio. When the active switch of the converter is on, the inductors in the inductor switching blocks are charged in parallel or capacitors in the capacitor switching blocks are discharged in series. When the switch is turned off, the inductor in the L-switching blocks are discharged series or capacitors in C –switching blocks are charged parallel. Main disadvantages of this technique is increased the component count, cost and control complexity.

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The Derivative of a Switched Coupled Inductor DC–DC Step-Up Converter by Using a Voltage Lift Network with Closed Loop Control for Micro Source Applications

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Abstract: ***The derivative of a switched coupled inductor DC-DC step-up converter by using voltage lift network for micro source application is handling in this paper. High voltage gain is obtained by employing a switched coupled inductor and a switched capacitor in to one converter. The coupled inductor charges the capacitor, the voltage gain can be effectively increased, and the turns ratio of the coupled inductor can be also reduced. The output and the voltage conversion ratio of this converter can be enlarged by adding a voltage lift network. A module with capacitor and diode will form the voltage lift network. In this derivative circuit, capacitors are charged in parallel during the switch-on period and are discharged in series during the switch-off period. Beside from high voltage gain, lower conduction loss and higher power conversion efficiency is also offered as compared to conventional dc-dc converter. The steady state analysis and operating principles in continuous conduction mode are discussed. To study the performance of the switched coupled inductor high step up DC-DC converter with voltage lift network, simulations has been carried out in MATLAB 2013 environment. The derivative circuit design and its implementation with closed loop control are given with operational results. The simulation results are tested for an input voltage of 20V. The input voltage is stepped up to output voltage of 220V, while by adding voltage lift network output voltage is lifted to 325V, which can be used for various applications.***

Keywords: coupled inductor, high step-up converter, switched capacitor, voltage lift network

1. Introduction

Nowadays renewable energy sources are widely used in distributed generation (DG) systems. DG systems are composed of micro sources like fuel cells, photovoltaic (PV) cells, wind power etc. However fuel cells and photovoltaic cells are low voltage sources to provide enough dc voltage for generating ac utility voltage. PV cells can be connected in series in order to obtain a large output voltage. But the main drawback is the efficiency is degraded due to the panel mismatch and partial shadowing. The PV panel parallel connected structure is more efficient than the series-connected configuration. Meanwhile, only a low voltage is generated with parallel connected Configuration. So, high step up converters are used as a solution for the aforementioned problem. These converters boost the low input voltage into high voltage level. However these converters are used in many other applications, such as portable fuel cell systems, and vehicle inverters where high efficiency, high power density, and low cost are required.

The conventional STEP-UP dc-dc converter is easy to control and its structure is very simple. But in this case, this converter will be operated at extremely high duty ratio near unity, to achieve high step-up voltage gain [2], [6]. This will cause high conduction loss due to the reverse recovery problems of output diode and large input current. However, the voltage gain and the efficiency are limited.

Isolated converters can achieve high voltage gain without operating at extreme duty ratio. But the voltage stress across the switch is higher, and the efficiency is also reduced. So an active clamp technique can be introduced to improve the efficiency. But this will increase the number of components used, moreover the weight and size of the converter is higher which reduce the power density.

DC–DC converters with coupled inductors can provide high voltage gain. A coupled inductor basically consists of two identical windings wound onto one core. The important criterion is that the windings are exactly identical to generate the coupling effect. From an economical standpoint, the use of coupled inductors saves cost and reduces the size. It also helps to save actual PCB real estate, due to the usage of one component with 2 integrated windings. From a technical standpoint the advantages of a coupled inductor are as follows:

If L1 and L2 are closely coupled, the ripple current is divided between them, and the required inductance is halved. In some applications, there is even close to zero ripple current due to the use of a coupled inductor. This also results in a simpler EMI filtering and smaller input capacitor. But their efficiency is degraded by the losses associated with leakage inductors. The leakage inductance of the coupled-inductor will cause a high voltage spike on active switches when the switches were turned off [17]. Alternatively, employing an active clamp technique to recycle the leakage energy can achieve soft switching for active switches [10]. The active-clamp flyback converter can recover the leakage energy and minimize the voltage stress. The drawbacks of the active-clamp solution are the topology complexity and the loss related to the clamp circuit. The active-clamp solution requires two switches and two isolated gate drivers. The current through the