Electricity Generation due Running Train

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Abstract— Energy is one of the major inputs for the economic development of a country. In case of developing countries, the energy sector assumes a critical importance in view of the ever increasing energy needs requiring huge investments to meet them. The growth of the world's human population has created several problems. One of them is global warming caused by the abundance of CO2 in the atmosphere. Many of these gases are produced from electrical plants burning fossil fuels all over the world. To reduce these emanations out into the atmosphere alternative sources of energy must be used. In the last two decades wind energy has become an alternative to traditional energy sources. These alternative energy sources are non-polluting, free in their availability and renewable. In recent years advance materials, better manufacturing processes have decreased their capital costs make them more attractive. Another way to attempt to decrease the cost of these systems is by making use of these designs that uses wind. Wind turbine modules, offer greater reliable.

Key words: Single-Phase and Three-Phase Current Source Inverter (CSI), ASCI Mode of Operation, CSI using Thyristor, Wind Turbine Modules, ROMless Versions, Battery, Energy Efficient

I. Introduction

In classical power systems, large power generation plants located at adequate geographical places produce most of the power, which is then transferred towards large consumption centers over long distance transmission lines. The system control centers monitor and control the power system continuously to ensure the quality of the power, namely the frequency and the voltage. However, now the overall power system is changing, a large number of dispersed generation (DG) units, including both renewable and non-renewable sources such as wind turbines, wave generators, photovoltaic (PV) generators, small hydro, fuel cells and gas/steam powered Combined Heat and Power (CHP) stations, are being developed and installed. A wide-spread use of renewable energy sources in distribution networks and a high penetration level will be seen in the near future many places. E.g. Denmark has a high penetration (> 20%) of wind energy in major areas of the country and today 18% of the whole electrical energy consumption is covered by wind energy. The main advantages of using renewable energy sources are the elimination of harmful emissions and the inexhaustible resources of the primary energy. However, the main disadvantage, apart from the higher costs, e.g. photovoltaic, is the uncontrollability. The availability of renewable energy sources has strong daily and seasonal patterns and the power demand by the consumers could have a very different characteristic. Therefore, it is difficult to operate a power system installed with only renewable generation units due to the characteristic differences and the high uncertainty in the availability of the renewable energy sources. The wind turbine technology is one of the most emerging renewable technologies. It started in the 1980'es with a few tens of kW production power to today with Multi-MW range wind turbines that are being installed. This also means that wind power production in the beginning did not have any impact on the power system control but now due to their size they have to play an active part in the grid. The technology used in wind turbines was in the beginning based on a squirrel-cage induction generator connected directly to the grid. By that power pulsations in the wind are almost directly transferred to the electrical grid. Furthermore there is no control of the active and reactive power, which typically is important control parameter to regulate the frequency and the voltage. As the power range of the turbines increases those control parameters become more important and it is necessary to introduce power electronics as an interface between the wind turbine and the grid. The power electronics is changing the basic characteristic of the wind turbine from being an energy source to be an active power source. The electrical technology used in wind turbine is not new. It has been discussed for several years but now the price pr. produced kWh is so low, that solutions with power electronics are very attractive. This paper will first discuss the basic development in power electronics and power electronic conversion. Then different wind turbine configurations will be explained both aerodynamically and electrically. Also different control methods will be explained for a turbine. Wind turbines are now more often installed in remote areas with good wind conditions (off-shore, on-shore) and different possible configurations are shown and compared. Finally, a general technology status of the wind power is presented demonstrating a still more efficient and attractive power source.

II. Literature review

A. How it works

Wind energy is the kinetic energy of air in motion. Differences in air temperature caused by energy from the sun's rays create air flows, and kinetic energy from this wind can be captured by wind turbines. Wind turbines essentially function like a fan in reverse: blades are propelled by natural wind flow and the energy is consolidated through a series of gears to turn a generator and produce electrical energy. Turbines range widely in physical size and energy production capacity. Smaller turbines can function efficiently at lower wind speeds; however, they cannot produce electricity at the utilityscale. Large wind farms can be located on land or offshore.

B. Opportunities in Asia and the Pacific Best wind speeds for utility-scale development in Eastern Asia

The greatest potential for large-scale wind energy development lies along the coast in East Asia including China, Japan, Republic of Korea and Taiwan Province of China, in coastal Oceania and parts of the Pacific. Wind speeds in northern China and Mongolia as well as parts of western China and India are high. But these areas are often far from load centres, unlike the coastal resources.

C. Offshore wind potential along Eastern seaboard

Some of the best wind speeds are offshore. Unfortunately, offshore installations cost as much as double the onshore wind farms due to the added cost of building foundations and transmission lines in water.2 Better wind speeds and higher production capabilities of offshore turbines may absorb the cost difference over time.

D. Trends in development

As of 2010, there were 60.7 GW of installed wind power capacity in Asia and the Pacific.3 this represents only a small share of the electricity generation mix in most markets – in 2009, wind power accounted for 0.7 percent of total electricity generation across the region.

E. Asia leading the world in growth

Growth in wind energy development is increasing more steadily in Asia than in any other continent. Installed capacity in Asia grew by more than 50 per cent each year from 2008 to 2010. Indeed, nearly 55 per cent of the worldwide wind capacity installed in 2010 was installed in Asia, elevating the continent to second place for total installed capacity, at 31 per cent.5 The Global Wind Energy Council projects that Asia will overtake Europe for most installed capacity by 2015, when the continent is projected to have more than 180 GW of installed capacity.

F. Fact Sheet

Low Carbon Green Growth Roadmap for Asia and the Pacific China leading the way Growth in Asia is in large part due to extensive wind farm development in China in recent years. At the end of 2010, total (cumulative) installed wind energy capacity in Asia was 61.2 GW, of which 44.7 GW, or 73 per cent, was in China.

G. Strengths with wind energy

– Scalability**:** There is no technical barrier to build wind power at various scales. Countries can choose the size of wind power according to their needs as well as climatic and geographic contexts.
– Wider potential for small-scale wind: Wind energy production at smaller scales (with smaller turbines) has lower required wind speeds and thus more potential across the region.
– Compatibility with existing grids powered by diesel: Small-scale production could feed into hybrid minigrids for rural electrification, with the potential to offset diesel- or biomass-burning generators when the wind is blowing. Feeding local wind energy into the mini-grid not only reduces environmental impact of a rural electrification scheme but also cuts long-term costs and increases reliability by reducing dependence on diesel.8

H. Challenges to using wind energy

– High upfront planning and capital costs: Investment costs for feasibility planning, turbine equipment and interconnection remain a large barrier for both large- and small-scale wind developments.
– Site-specific modelling and assessments needed: Ecologically sound and economically efficient locations for wind farms require extensive environmental assessments and wind resource modelling, adding to the time and cost of development.
– Intermittent power generation and seasonal fluctuations: Electricity production from wind energy is not easily dispatched. Currently available battery storage technologies are not cheap or efficient enough for utility-scale deployment. The variability of generation currently inhibits the amount of wind energy that can be fed into the grid.
– Land-use decisions: The best onshore wind resource is often along mountain ridge tops. In Asia and the Pacific, these areas tend to be heavily forested. Some forest would need to be cleared for access roads and construction; but the remaining tree cover surrounding turbines would decrease the wind power plant's efficiency.9 In some communities, proposed wind power plants have been met with local resistance due to concerns about aesthetic and low-frequency noise issues.

I. Implementing Strategies

Focus on small-scale and mini-grids: Feed-in tariffs, mandatory interconnections for small wind instalments and financial support mechanisms for off-grid and mini-grid-connected wind projects can help promote efficient wind energy development while also expanding rural electrification in a low-carbon way.

J. Pair wind with other renewable energies

Technological development to couple wind energy production facilities with pumped-storage hydroelectric plants could provide a means of storing intermittent energy production from wind.

III. SYSTEM DESIGN

A. PCB Design

The Printed Circuit Board usually serves three functions:
1) It provides mechanical support to the components mounted on it.
2) It provides necessary electrical interconnection.
3) It acts as heat sink i.e. it provides a conduction path leading to removal of most of the heat generated in the circuit.

B. Conductor Holes

A code can used for the conductor with a special width. Minimum spacing should also be provided.

Holes	Conductor Widths
Standard holes	Standard width, 0.5mm
1.1 mm	1 mm
1.5 mm	2 mm
3.2 mm	4 mm

Table 1: Conductor Holes

C. Procedure of Soldering

The points to be joined must be cleaned first and fluxed. The hard solder iron and solder wire is applied to the work. The melted solder becomes bright and fluid. The iron must be removed after sufficient time and joint is allowed to coal. At the end, finishing is done.

1) *IC 7805*

a) Features

- Output Current up to 1A
- Output Voltages of 5, 6, 8, 9, 10, 12, 15, 18, 24V
- Thermal Overload Protection
- Short Circuit Protection
- Output Transistor Safe Operating Area Protection

b) Description

The KA78XX/KA78XXA series of three-terminal positive regulator are available in the TO-220/D-PAK package and with several fixed output voltages, making them useful in a wide range of applications. Each type employs internal current limiting, thermal shut down and safe operating area protection, making it essentially indestructible. If adequate heat sinking is provided, they can deliver over 1A output current. Although designed primarily as fixed voltage regulators, these devices can be used with external components to obtain adjustable voltages and currents.

2) *TO-220*

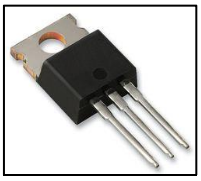

Fig. 1: TO-220

3) *D-PAK*

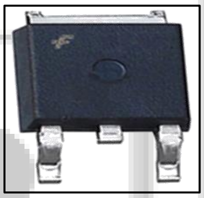

Fig. 2: D-PAK

- Input
- GND
- Output

D. Software Compiler

1) Click on the Keil Vision Icon on Desktop.
2) Click on the Project menu from the title bar.
3) Then Click on New Project.
4) Save the Project by typing suitable project name with no extension in u r own folder sited in either C:\ or D:\
5) Then Click on save button above.
6) Select the component for u r project i.e. Atmel
7) Click on the + Symbol beside of Atmel
8) Select AT89C51, Then Click on "OK"
9) Then Click either YES or NO………mostly "NO".
10) Now your project is ready to USE.
11) Now double click on the Target1, you would get another option "Source group 1" as shown in next page.
12) Click on the file option from menu bar and select "new".
13) The next screen will be as shown in next page, and just maximize it by double clicking on its blue boarder.
14) Now start writing program in either in "EMBEDDED C" or "ASM".
15) For a program written in Assembly, then save it with extension ".asm" and for "EMBEDDED C" based program save it with extension " .C"
16) Now right click on Source group 1 and click on "Add files to Group Source".
17) Now you will get another window, on which by default "EMBEDDED C" files will appear.
18) Now select as per your file extension given while saving the file.
19) Click only one time on option "ADD".
20) Now Press function key F7 to compile. Any error will appear if so happen.
21) If the file contains no error, then press Control+F5 simultaneously.
22) Then Click "OK".
23) Now click on the Peripherals from menu bar, and check your required port.
24) Drag the port a side and click in the program file.
25) Now keep Pressing function key "F11" slowly and observe.
26) You are running your program successfully.

E. Hardware Layout

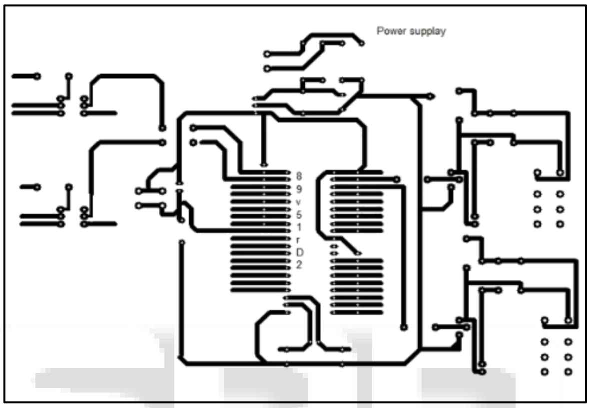

Fig. 3: Hardware Layout

F. Pin Configuration

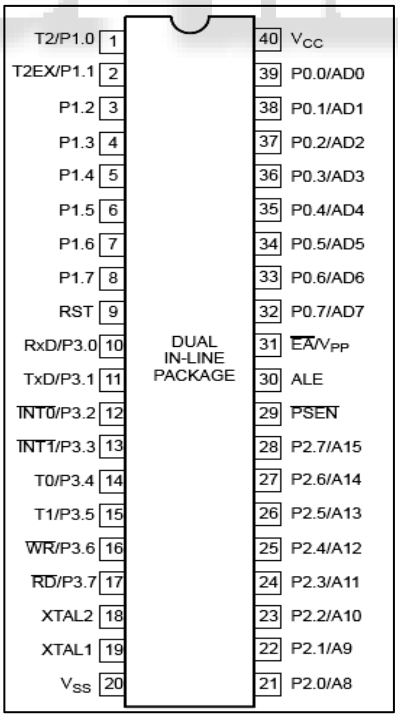

Fig. 4: Pin configuration of 8051 microcontroller

1) *PIN Description*

- VSS: Ground: 0 V reference.
- VCC (40) Power Supply: This is the power supply voltage for normal, idle, and power-down operation.

- P0.0-P1.7 (39–32) I/O Port 0: Port 0 is an open-drain, bidirectional I/O port with Schmitt trigger inputs. Port 0 pins that have 1s written to them float and can be used as high-impedance inputs. Port 0 is also the multiplexed low-order address and data bus during accesses to external program and data memory. In this application, it uses strong internal pull-ups when emitting 1s. Port 0 also outputs the code bytes during program verification and received code bytes during EPROM programming. External pull-ups are required during program verification.
- P1.0–P1.7 (2–9) I/O Port 1: Port 1 is an 8-bit bidirectional I/O port with internal pull-ups and Schmitt trigger inputs. Port 1 pins that have 1s written to them are pulled high by the internal pull-ups and can be used as inputs. As inputs, port 1 pins that are externally pulled low will source current because of the internal pull-ups. Port 1 also receives the low-order address byte during program memory verification. Alternate functions for Port 1 include.
  - T2 (P1.0): Timer/Counter 2 external count input/ clock out (see Programmable Clock-Out).
  - T2EX (P1.1): Timer/Counter 2 Reload/ Capture/ Direction control.
- P2.0–P2.7 (21–28) I/O Port 2: Port 2 is an 8-bit bidirectional I/O port with internal pull-ups and Schmitt trigger inputs. Port 2 pins that have 1s written to them are pulled high by the internal pull-ups and can be used as inputs. As inputs, port 2 pins that are externally being pulled low will source current because of the internal pull-ups. Port 2 emits the high-order address byte during fetches from external program memory and during accesses to external data memory that use 16-bit addresses (MOVX @DPTR). In this application, it uses strong internal pull-ups when emitting 1s. During accesses to external data memory that use 8-bit addresses (MOV @Ri), port 2 emits the contents of the P2 special function register. Some Port 2 pins receive the high order address bits during EPROM programming and verification.
- P3.0–P3.7 (10–17) I/O Port 3: Port 3 is an 8-bit bidirectional I/O port with internal pull-ups and Schmitt trigger inputs. Port 3 pins that have 1s written to them are pulled high by the internal pull-ups and can be used as inputs. As inputs, port 3 pins that are externally being pulled low will source current because of the pull-ups. Port 3 also serves the special features of the 80C51 family, as listed below:
  1) 10 I RxD (P3.0): Serial input port
  2) 11 O TxD (P3.1): Serial output port
  3) 12 I INT0 (P3.2): External interrupt
  4) 13 I INT1 (P3.3): External interrupt
  5) 14 I T0 (P3.4): Timer 0 external input
  6) 15 I T1 (P3.5): Timer 1 external input
  7) 16 O WR (P3.6): External data memory write strobe.
  8) 17 O RD (P3.7): External data memory read strobe.
  9) RST (9)I Reset: A high on this pin for two machine cycles while the oscillator is running, resets the device. An internal diffused resistor to VSS permits a power-on reset using only an external capacitor to VCC.
- ALE/PROG (30) O Address Latch Enable/Program Pulse: Output pulse for latching the low byte of the address during an access to external memory. In normal operation, ALE is emitted at a constant rate of 1/6 the oscillator frequency, and can be used for external timing or clocking. Note that one ALE pulse is skipped during each access to external data memory. This pin is also the program pulse input (PROG) during EPROM programming. ALE can be disabled by setting SFR auxiliary.0. With this bit set, ALE will be active only during a MOVX instruction.
- PSEN (29) O Program Store Enable: The read strobe to external program memory. When the device is executing code from the external program memory, PSEN is activated twice each machine cycle, except that two PSEN activations are skipped during each access to external data memory. PSEN is not activated during fetches from internal program memory.
- EA/VPP (31) I External Access Enable/Programming Supply Voltage: EA must be externally held low to enable the device to fetch code from external program memory locations 0000H to 0FFFH. If EA is held high, the device executes from internal program memory unless the program counter contains an address greater than the on-chip ROM/OTP. This pin also receives the 12.75 V programming supply voltage (VPP) during EPROM programming. If security bit 1 is programmed, EA will be internally latched on Reset.
- XTAL1 (19) I Crystal 1: Input to the inverting oscillator amplifier and input to the internal clock generator circuits.
- XTAL2 (18) O Crystal 2: Output from the inverting oscillator amplifier.

IV. COMPONENT LIST

Sr. No.	Component	Value	Qty.	cost
1	Diodes	IN4007	6	18
2	Capacitors	1000µF 16V	1	20
3	Capacitors	100 µF 16V	1	20
4	Voltage regulator	7805	1	30
5	LED	5mm RED	3	15
6	Resistors	470Ω ¼	3	3
7	IC Base	40 pin	1	20
8	Crystal	11.0592	1	20
9	Capacitors	33Pf	2	30
10	Capacitors	10 µF	1	20
11	PCB	Copper clad 30X30cm	1	200
12	Transformers	0-12V 1A	1	500
13	Power cable	1 M	1	100
14	Potentiometer	100K	3	60
15	Opto-coupler	4N35	2	60
16	Rainbow wire	1M		25
17	Microcontroller	89v51RD2	1	300
18	DC motor	200 rpm	1	300
19	Plywood	18inch*12 inch	1	150

20	Resistor	10K	2	2
21	Transistor	BC 547	2	40
22	Relay	6V,DC	2	100
23	Battery	12V,7.8Ah	1	2000
24	Screw	3inch	1x4	60
25	Other charges			4000

Table 2: Component

V. MICROCONTROLLER

There are four major microcontrollers: Freescale's 6811, Intel's 8051, Zilog's Z8 and PIC 16X from Microchip Technology. Each of them has a unique instruction set and register set; therefore, are not compatible with each other. Program runs for one will not run on others. There are also 16 bit and 32 bit microcontrollers, made by various chip makers. Three criteria in choosing microcontrollers are as follows:

1) Meeting the computing needs, of the tasks at hand efficiently an cost effectively,
2) Availability of software development tools such as compilers, assemblers and debuggers, and
3) Wide availability and reliable sources of the microcontroller.

In 1981, Intel Corporation introduced an 8 bit microcontroller called the 8051.

This microcontroller has following features:

1) 28 bytes of RAM,
2) 4Kbytes of on chip ROM.
3) Two Timers,
4) One Serial Port,
5) Six Interrupt Sources, and
6) Four Ports (each of 8 bits wide).

Microcontroller is considered as, "a system on chip".

A. Features

1) 80C51 Central Processing Unit
2) 5 V Operating voltage from 0 to 40 MHz
3) 64 KB of on-chip Flash program memory with ISP (In-System Programming) and
4) IAP (In-Application Programming)
5) Supports 12-clock (default) or 6-clock mode selection via software or ISP
6) SPI (Serial Peripheral Interface) and enhanced UART
7) PCA (Programmable Counter Array) with PWM and Capture/Compare functions
8) Four 8-bit I/O ports with three high-current Port 1 pins (16 mA each)
9) Three 16-bit timers/counters
10) Programmable Watchdog timer (WDT)
11) Eight interrupt sources with four priority levels
12) Second DPTR register
13) Low EMI mode (ALE inhibit)
14) TTL- and CMOS-compatible logic levels.

B. Performance and Analysis

1) System Testing

System is critical element of measure of assurance and represents the review of specification ultimate review of specification and design. The system is tested during above methods as a theoretical and practical verification of the results. An effort is made to compare the system with traditional one.

2) Testing Principles

Before applying method to the design test, must understand the basic principle that guide testing. The testing principle include,

– The entire test should be traceable to the operator requirement. The most serve defect is those that the program fails to meet its requirement.
– Test definition be planed long testing begins, test planning can be begin as soon as requirement model is complete.
– Detailed definition of the test has been solidified. Exhaustive testing is not possible. The path permutation for even or moderately sized programs exceptionally large. For this reason it is possible, however to adequately cover. The program logic and to ensure that all condition to complete level has been exercised.

3) Testing Objectives

There are various testing objective. Testing is process of executing hardware with intend of finding an error. We can find out an undiscovered error with minimum amount of time and effort. If testing is conducted successfully it will uncover error in hardware. As a secondary benefit, testing demonstrate that hardware function appear to the working specification that behaved and performance requirement appears to have been met. In addition data collected as testing cannot show absence of error and defect. It can show accuracy and deviation in the measured value. A good is one that of the has probability of finding an un discovered error. The objective is to design the test is that of systematically uncover different types of error and to do with minimum time and effort**.**

a) Faults and their Possible Remedies

– Checking all the connections.
– Checking all the Power Supply Sections.

b) Checking all the connections

By using the DMM check all the connection made by the wire. Also check the connections that the any wire is break or disconnected. If found so then connect it using the soldering Gun.

c) Checking the Power Supply Output

By using the DMM test all the Power Supply output voltage available at the series voltage regulator and Transformer bridge rectifier output.

d) Continuity Test

In electronics, a continuity test is the checking of an electric circuit to see if current flows (that it is in fact a complete circuit). A continuity test is performed by placing a small voltage (wired in series with an LED or noise-producing component such as a piezoelectric speaker) across the chosen path. If electron flow is inhibited by broken conductors, damaged components, or excessive resistance, the circuit is "open". Devices that can be used to perform continuity tests include multi meters which measure current and specialized continuity testers which are cheaper, more basic devices, generally with a simple light bulb that lights up when current flows. An important application is the continuity test of a bundle of wires so as to find the two ends belonging to a particular one of these wires; there will be a negligible resistance between the "right" ends, and only between the "right" ends.

C. Current Source Inverter

Instructional Objectives,

Study of the following:

- The circuit for single-phase Current Source Inverter (CSI) using thyristors
- Auto-Sequential Commutated mode of operation for 1-ph. Inverter (ASCI), with waveforms
- Three-phase Current Source Inverter (CSI) − circuit and operation, with waveforms.

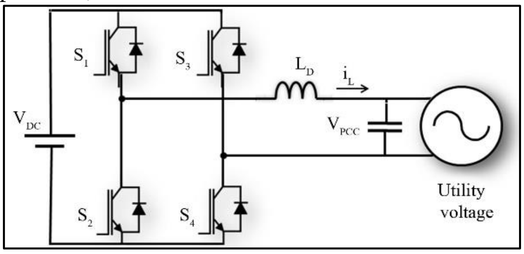

Fig. 5: Current Source Inverter

VI. CONCLUSION

In this chapter three level inverter and theory of torque control are illustrated. The induction motor voltages and currents are sensed to estimate the torque and the stator flux vector. Direct torque control ensures fast transient response and generates simple implementations due to the absence of closed loop current control. It can be implemented with speed sensor as well as in sensor less configurations. Here sensor based control is used. One drawback in DTC is pulsating torque. This torque pulsation is minimized by generating suitable gate drive pulse using fuzzy logic controller. This proposed fuzzy based space vector pulse width modulation controller is analyzed in the following chapter 6. The proposed fuzzy based space matrix pulse width modulation will reduce torque pulsation.

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