

SOLAR-WIND HYBRID GENERATION

¹Ruchika Wankhede, ²Chanakya Hingu, ³Tejas Pardamwar

¹Assistant Professor, Smt Indira Gandhi College of Engineering Mumbai-India
 ruchiwankhede.rw@gmail.com

^{2,3}Final Year Student, Smt Indira Gandhi College of engineering Mumbai-India
 chanakyahingu97@gmail.com, tejaspardamwar@gmail.com

Abstract—The global energy need is increasing day by day as consumption is increasing and consequently the demand of generation is also increasing. The significant percentage of required capacity increase is based on renewable generation. Focusing on fossil-fuel exhaustion, Many new renewable techniques and effective conversion methods are implanted these days, along with hybrid and co-generation methods which not only electrifies the area but surplus can be synchronized to overhead transmission lines. Wind turbine and hydro turbine has the most effective conversion technologies. But other resources also play major role in renewable generation like solar, geothermal, tidal etc. In last one decade the generation using renewable source especially the hybrid technique his booming. The most efficient and cost-effective method of this type of generation is photo-wind generation where conversion is done using solar and wind turbine technique

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I. INTRODUCTION

We are all aware that world is facing a major threat of reserve fossil fuel depletion. Most of our plants use thermal or nuclear as the sole generation system. A small part of our generation is contributed using solar, wind geothermal, hydro etc. Soon a time will come when we will face severe fuel shortage, we have studied in physics that energy is neither created nor destroyed but can only be changed from one form to another. Research has been also made in these fields to build robust and effective energy conversion systems. Among which solar and wind have come up as the best and effective way to harness electrical energy. Focusing on hybrid generation this type of generation system has become the stand-alone power system generation technique. Here in this conversion technique two or more (mostly two) forms of different generation methods are employed together so generate and convert the raw form to useable electrical energy. The most popular effective methods are bio-fuel and photo-wind generation. This paper puts light on photo-wind generation and its conversion technique. Solar as the name suggests, sun that is in that in this type of energy generation, PV cells are incurred which convert solar energy to electrical energy and stored in batteries. The voltage generated is DC. Wind turbine

II. SOLAR WIND HYBRID-ENERGY SYSTEM

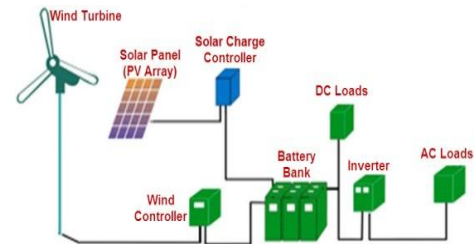


Figure 1 : Block Diagram of Hybrid System

Solar wind power is a combined power generation using solar panel and wind turbine. It also uses a battery which stores excess generated energy. Unlike conventional power in conventional system, this system also works in same way solar panel works when sun-light is available and wind turbine works when wind is in excess, so there is minimum power cut, therefore by providing battery back-up uninterrupted power supply is ensured. In some set-up diesel back-up is also provided for better efficiency.

The power generated from the wind is AC and is converted DC using rectifier circuit. Here a special type of converter called SEPIC is used to step up or step down through MOSFET. For solar system buck converter is used. Along with this there are different specific controllers used for power quality improvement which is our priority concern. The UPF, D-STATCOM, IPF, Fuzzy controller, SVC etc. Further output is connected to load via inverter but before that there is a device known as FACTS. Device is connected to output terminal of inverter used to reduce the harmonic in wave-form. STATCOM is a synchronous compensator used as shunt compensator reducing reactive power consumption in system and improve stability.

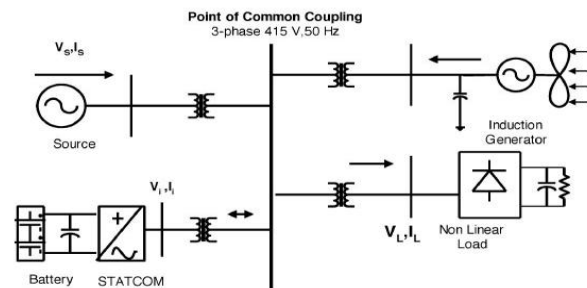


Figure 2: Grid connected FACTS system for power quality improvement

III. IMPROVEMENT OF POWER QUALITY OF SYSTEM

the power quality of multilayered inverter depends on the number of layers done the main advantage of these inverters is that output can be generated with low harmonics. Harmonics caused increases the current in the system which leads to low power factor and increases initial cost of electricity. In hybrid system the source is first connected to DC converter leading to multilayered converter. The most common used multilayered converter is diode clamp converter .in this diode is used as a clamping device in order to clamp the dc bus voltage so as to achieve steps in output voltage . the inverter is employed with low pass filter as high level harmonics are filtered easily.

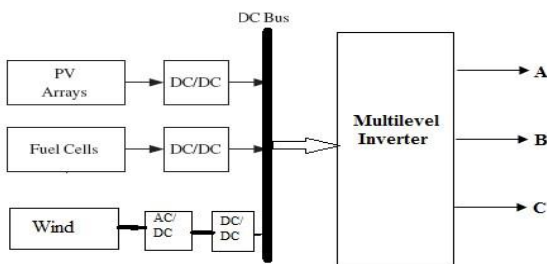


Figure 3 : Block Diagram of Hybrid System with Multilevel Inverter

IV. HYBRID POWER IN INDIA

Small agro-generators along with hybrid and solar combinations are motivated by government of India ministry of renewable source. Under this scheme financial support is also provided by government for installation of these agro-generato.

A. Activities

Program supports following objective

- Financial support for setting up water pumping wind mill and agro-generator.
- Demonstration
- Research and development
- Field trial and performance evaluation

B. Objective

This wing of Indian government is set up , to develop new technologies and invention in agro-generators and hybrid generations. It also objects to research and evaluation in major areas in India such as north-eastern and J&K region.

C. Installments in india

In case of SWES ministry has introduced new implant procedure for manufacture of SWES where in testing is mendatory.

SR NO.	STATE	CAPACITY
1	ANDHRA PRADESH	16
2	ARUNACHAL PRADESH	6.8
3	ASSAM	9
4	GOA	193.8
5	GUJARAT	20
6	JAMMU&KASHMIR	10
7	KARNATAKA	46
8	KERELA	39

9	MADHYAMPRADESH	8
10	MAHARASTRA MANIPUR	24
11	MEGHALAY	1468
12	PONDICHERRY	140
13	PUNJAB	191
14	RAJASTHAN	5
15	SIKKIM	50
16	TAMIL NADU	14
17	TRIPURA	15
18	WEST BENGAL	74
19	UTTRAKHAND	24
TOTAL	CAPACITY	2379.20

In India as per the wide population and also wide range of electricity utilization we need maximum electricity for our daily use as well as for our industries. To make India economically as well as to develop India's energy utilization India is going to provide many technologies in coming future this generator is also a part of it. In India the average wind flow is 1.2m/sec. thus average wind is usually seen flowing in garden, and in surroundings. And this average wind is sufficient for rotating the blades of the vertical axis generator. So as per the block diagram first the wind flows and rotates the blades of the generator, the blades start rotating in 1 mille second and thus the overall generator starts working. We had made one project in our diploma level the named as Vertical Axis Wind Turbine. The technology is expected to create new opportunities in low wind-speed areas, with starting speed as low as 1.5m/s. This new technology is remarkably cheap with low operating cost. Less noise compared to existing conventional wind turbines. Today wind turbines are considered to be the most developed form of renewable energy technology. Basically our wind turbine has 4 main parts. 1. Stator design 2. Rotor design 3. Blade assembly 4. Gear assembly.

A. STATOR DESIGN

Stator wiring is the most influential part of the stator as well as the generator as the regenedyne generator is works on the basic principle of the generator it has to be done with an accurate level of wiring. Copper wiring being used in the stator the generator has the 21 gauge wire assembly with 3 phases given out of the generator for the output. The wiring scenario of the stator is as follows, the star point in the stator of the 3 phase wiring assembly is like the star point given in the middle assembly gives the three phases and they are arranged as, first the wire from the star point is being taken out and then the inner winding of the coils starts and thus the inner winding of specific turns is then joint to another coil starting with the inner wounding process and then finally the third wounding of coil takes place from the inner side. And we get 1 phase in the output. Magnetic interference with coils takes place. Another coil taken from the star point is being started with wounding with the inner side and thus the inner coiling done is then joint to the another coil starting with the inner wounding and finally the and we get the 2nd phase in the output. The third phase is again taken out in the same way. The whole connection of 21 gauge wire is then assembled across the waxed wood with the insulation provided in the middle of each winding to avoid the losses in the winding. Resin is then poured and we get the whole stator in a solid way for generator. The insulation used is this

coil was one of the best home remedy being used in the insulation process of the adjusting coils between it. The plastic bags being cut into the rectangular shape is kept in middle of each coils. And thus the proper insulation is being given; also the coils are taped with the blue tapes highly insulated tapes used commonly in the residential wiring for insulation purpose. The threading is done in the coils to join the windings of each coil giving holding phenomenon. Losses are being eliminated.

B. ROTOR DESIGN



Rotor is made up of aluminum and has the circular disc shape. Rotor being the rotating part of the generator has to be light in weight and should rotate freely along the vertical axis blades. There are 2 rotors being used in the generator, of same dimension, shape, and disc, metal. High intensity neodymium magnets are being used for the induction with coils inside the stator. Neodymium magnets of round shape being used and the number of magnets is 24 (pair of thick and thin magnets). Magnets are arranged in the N and S alternates being used for the induction process. And the magnets being used in the disc is glued by using the adhesive of five-flex of high gluing adhesive.

ROTOR-1: is assembled above the stator,

ROTOR-2: is assembled below the stator.

Both of the rotors are the way to give the magnetic field around the stator coils for elf induction. The magnets are placed on 30° for the center of the plates. They are 7.5 cm from the away the center of the plates. These cover 2.5cm from these 7.5 cm line.

C. BLADE ASSEMBLY.

Basically there is fiber blade use to capture the wind energy and convert into rotational energy. These fiber blades are 2 ft. long and their breadth is about 10cm. these blades are hold by the holding disc. This disc is of 20cm (diameter). About 3 discs are used hold up the blades. About 6 blades are used to make up the turbine. These blades are constructing and fixed such a way that it makes 45° from the tangent drawn on the holding disc. Each tangent is drawn is 60° away from the center of the holding disc. So this turbine is capable to capture the wind in any direction and to convert it into one directional torque of whole turbine.

D. GEAR ASSEMBLY

Now the both sprockets are connected to each other with their slots making connection phenomenon and both the



sprockets rotates smoothly. As when bigger sprocket with 43 tooth's gets one rotation smaller sprocket moves with 3.3 times more rotation giving maximum rotation around the stator and rotor assembly making the rotor have more rpm. Bigger sprocket is connected to the S1 shaft. This shaft is also connected to the turbine of the generator. And the smaller sprocket is connected to the S2 shaft. This S2 shaft is also connected to the rotor plates. The power transmission from bigger sprocket to smaller sprocket is 3.3 times greater.

V. CASE STUDY

The word hybrid generation means power generation by combining two method of generation, these two method may be solar-bio, solar-hydel, but mostly the generation is done by solar hydel. It can be said that most of the generation is done by solar-hydel plant. If we say the total generation is of 50KW , out of which 30Kw of generation is done by hydel power plant and 20Kw is done using solar plant.

Now this type of generation can also be linked with combine power generation – As we know that hydel-power generation gives more efficiency than solar power during night time (5pm- night) therefore during this time and the remaining power is compensated by solar plants. So we can get approximate 24hr power using this hybrid generation.



Figure-4

A. Wind Section

Wind mills can-not be located everywhere therefore it has to be located in areas of faster wind speed. Based upon our need we have installed system of 30Kw. Among which each wind mill has a capacity to generate 30Kw of power - therefore total windmill mill we need is 10 (10*3). There are in all two type of wind system one is vertical axis wind turbine and other is horizontal axis wind turbine. Here we have used vertical axis wind turbine as these turbine have structure that they can align themselves according to wind direction, which makes it efficient to collect wind from all directions. And a mechanical breaking system is used to stop the system.

The output of wind turbine is not constant, it rater depends on climate so it is difficult to predict the exact generation

units. The table bellows gives us the basic idea of generation and system specifications.

Power	200w
Output voltage	30v
No. of panels	48
Total power	9.6 Kw

B. Solar section

Solar is one of most trending topic in renewable power generation. But it has some major drawback which resists itself from independent generation. Here solar system capacity is of 20Kw i.e. one-third of its total capacity. Solar section consist 100 solar cells each panel capacity of 200w (200*100). The solar panel here are installed with solar tracker this solar tracker here helps the panel align itself according to sun-rays. This enhances efficiency of solar panel. The most of the rotating type solar panel have 18 % crystalline structure.

VI. CONCLUSION

Hybrid power generation is one of the most leading power generation technical in modern world. Using this power generation technic we can use two power generation methods to generate and transmit power. The main advantage of this method is if we are having excess power

we can synchronize the power to main line. India is having a

No. of wind mills	6
Power	3.2Kw
Type	PMMC
Synchronous speed	3000 rpm
No. of poles	2
Frequency	50 Hz
Total power	19.2Kw

system call as I-landing system this system is a line connection all the major transmission lines. This system was made in conjunction of all power generation of India

VII. REFRENCES

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