

# Solar Based Regeneration of Electricity in Conveyor Belt Mechanism

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**Abstract**— Solar energy is referred to as the energy that comes from the sun's rays. There are many ways to use this power including heating a house, providing electricity, or desalination of seawater. Harvesting energy directly from sunlight by using photovoltaics (PV), photo catalysis, artificial photosynthesis, and other enabling technologies is a promising way to meet such requirements. As an alternative to conventional PV cells based on crystalline silicon wafer, vacuum-deposited CIGS and CZTS thin-film PV cells as well as solution-processed inorganic and organic thin-film PV cells offer processing advantages that will likely enable low-cost, high-throughput, and large-area PV production. Furthermore, the development of efficient and smart energy storage systems is imperative to effectively ensure reliable energy supply and increase the penetration of solar energy utilization.

To sustainably utilize solar energy, intelligent power distribution grids need to be locally developed for solar energy generation, storage, and utilization at affordable cost and with enhanced security of supply through flexible transition between grid interconnected and islanded operating modes.

## INTRODUCTION

Hybrid energy is the need of the day. The system that are installed in the industry or that are installed near the highways can be easily run on solar and wind energy. This type of energy is acceptable by the society. Solar energy is the ever ending source of energy. There is always a shortage of electricity that has been supplied. This ac volt causes an huge increment in the bill amount to the industry or a factory as per the consumption. But the generation of electricity through mechanical and solar can help industry to reduce the expenditure on electricity.

Conveyors offer a wide range of benefits, many of which are readily apparent. Before the invention and implementation of conveyors, workers in warehouses and factories needed to physically travel with an object from place to place. Not only was this cumbersome for the employee, it was inefficient for the company and, essentially, a huge waste of time. The conveyor brings a project to the worker, rather than a worker having to travel to a project. Conveyors can be used to transport parts to workers or locations throughout a plant or warehouse and, eventually, to the shipping dock for delivery.

Besides the obvious benefits of increased efficiency, conveyors can serve to increase quality control at a manufacturing or storage location. The use of automated production lines allows individual parts to be moved to and from automated machinery, allowing workers who were once designated to transporting parts to perform tasks that cannot as easily be automated, such as quality control or supervision/management processes.

## PROBLEM IDENTIFICATION

Aiming at solving the problem of high energy consumption in the rated belt speed operation of a belt conveyor system when the material flow is reduced, the power consumption of the motor and belt conveyor is analyzed, a power consumption model of the conveyor belt system is established. The relationship between conveyor system and belt speed is obtained and thus an energy saving strategy for the belt conveyor system is put forward. Since a very long time the mills and many other industries are using the conveyor belt system. In mills these conveyor belt mechanisms are governed by means of

heavy electricity supply, namely, three phase 230 volts AC supply. This incurs huge cost to the industry regarding only the conveyor mechanism. But the costs can be kept low if we somehow manage to use the rotary motion of the conveyor belt system to regenerate electricity. As well as even changing the type of motor and also installing a gearbox which will further increase the torque capacity of the motor or generator.

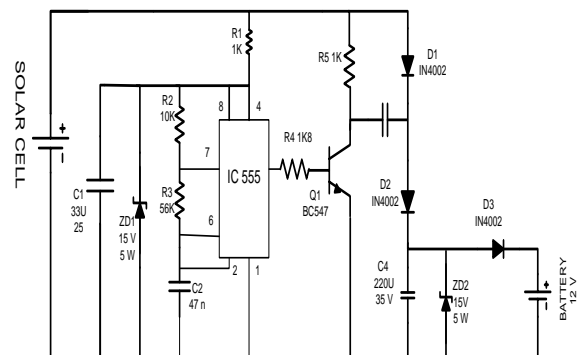
### WORKING METHODOLOGY

The entire model starts with the idea to use renewable source of energy. Apart from using renewable energy the mechanism should also generate additional electricity for lighting of area near it or use the energy for itself if needed.

The first thing to begin the entire model would be the solar panel. A solar cell or photovoltaic cell is an electric device that converts the energy of light into electricity by the photovoltaic effect, which is a physical as well as a chemical phenomenon. Solar panels are building blocks of photovoltaic molecules. The panel is exposed to the natural sunlight where it captures it and converts it into electricity as described by the photovoltaic effect above. When the electricity is generated, it is thereafter forwarded to the controller circuit.

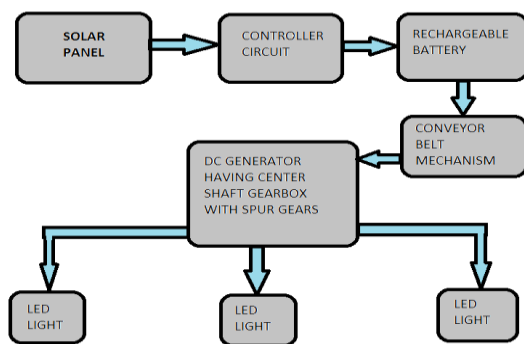
The controller circuit consists of a number of components. These components include IC's, transistors, zener diodes, resistors, common diodes, capacitors etc. The IC particularly used in here will be the Timer IC 555. The IC acts as a brain to the entire circuit. It controls the function ability of the entire controller circuit. The moment the controller circuit receives the electricity supply generated from the solar panel, it starts to act accordingly to forward the electricity to the battery as well as drop down the amount of electricity if it is already available in abundance in the battery. If there is scope for accommodation of electricity in battery then, the moment electric supply comes in as input it will also bypass the output supply at the same time. Moving on to the capacitors, there will be two types of capacitors present in the controller circuit. The two capacitors will be namely, Electrolytic capacitor and the Ceramic capacitor. Both these capacitors act as filters for the electric supply. In case this is an impurity in the electricity generated by the solar

panel, the capacitor will filter it and passes it further. A transistor is a semiconductor device used to switch electronic signals and electric power. It comprises of semiconductor material with at least three terminals for an external circuit. Here the transistor acts as an automatic switch. When the electricity generated by solar panel is available in sufficient amount or if it is not, in the battery then this transistor will be an automatic switch and will act accordingly in both the conditions in accordance with the IC. Then comes a Resistor, which is necessary for the protection of the entire controller circuit. The electricity generated by the solar panels vary from time to time, At some time in the year it produces electricity much more than the need, mostly summer, and at some point of time its quantity becomes much lesser. In case of lesser supply there may not be any problem, but when the generated electricity is much higher in quantity than needed, it can become a trouble for the circuit. These resistors are here for protection against the high voltages whenever they come. It will resist the voltage and tend to lessen it down for proper functioning. When looking at the entire controller circuit, all the components are clearly visible, the green ones are the resistors as well as two bigger size zener diodes along with smaller common diodes and capacitors. The diagram of the controller circuit is shown below.



Once the role of the controller circuit is done, then there comes the heart of the entire model, the conveyor belt mechanism. In this model the conveyor belt is constructed using a DC motor and the rubber belt setup. The motor used here is a DC motor. The electricity generated by the solar panel after getting stabilized through the controller circuit comes to the conveyor belt mechanism. In any industry, the conveyor belts are used to transfer materials or components from one place to another. The motor

receives the electricity and starts rotating. Since the conveyor belts need to transfer materials from one part to another, therefore they need to be rotated at much lesser speed than the actual speed of the motor which can be handled during material handling in industry. A spur gear mechanism is attached to the motor to achieve this which is connected to the shaft. When this spur gear mechanism runs according to the motor rotations the motor pulley rotates along with the conveyor belt attached to it. One side of this conveyor belt is further attached to the pulley of the DC generator. When the rotation of the belt is carried out, the motor not only rotates itself but this rotation also rotates the generator. A DC generator relies on the fact that like magnetic poles repel and the unlike magnetic poles attract each other. A coil of wire with a current running through it generates an electromagnetic field aligned with the center of the coil. Another spur gear mechanism is attached to the generator as well. This is done to increase the RPM of the generator in order to produce maximum amount of electricity possible. Since the rpm which the generator receives through the conveyor belt is much less, therefore this spur gear mechanism is there in front of the generator. Once the generator starts rotating, it begins to generate electricity. This electricity can be further used to switch on the dc lights in the conveyor belt path or otherwise it can even be used for running the conveyor belt system itself if there tends to be a shortage of electricity supply from the solar panel.



#### CONCLUSIVE INDUSTRIAL SCOPE

Finally, when we have gone through the entire model along with the functionalities of each component we can arrive at a conclusion that this project finds its application in terms of an efficient conveyor belt system that has to be self dependent in all terms as

well as depend on renewable source of energy when needed. The basic power which the system receives is through the solar panel which can be the most used renewable source of energy in countries like India. The conveyor belt system runs on the energy provided by the solar panel. When this conveyor belt rotates, it possesses huge amount of kinetic energy in terms of rotary motion. There are many mechanisms that can generate electricity from rotation, but amongst all those the most reliable one is a generator. Here we have made the entire system depend on DC supply looking at the future vulnerability of the dc. It consumes less power and tends to be efficient. When the generator receives rotary motion through the pulley attached to it from the conveyor belt, it generates electricity. We use this electricity to light up the path which is to be covered by the conveyor belt. Or else when there is scarcity of electricity to run the conveyor belt because solar energy cannot be consistently available throughout the year, we can use this energy which is generated by the generator to run the conveyor belt system as well.

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