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Design and Fabrication of Bladeless Windmill Power Generation System

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Abstract

This Study discusses about the windmill which will provide simple, eco-friendly and efficient alternative to the conventional windmill and named it as Vortex Bladeless windmill. This is also known as Green turbine with almost no harmful effect on environment. The vibration created in Vortex utilized to develop a gadget that can gather wind and change it into electrical vitality by vortex shedding and piezoelectric material. Also, the components are of low cost which creates a way for low cost renewable source of energy. The main aim of this paper is to bring a new n of turbine with improved performance that will be economic as well as reliable. This paper will a focus on working principle, design and fabrication of a small prototype. The gadget is made out (a solitary basic part. For the most part, structures are intended to maintain a strategic distance vortex initiated vibrations so as to limit the mechanical failures. Be that as it may, here, we attem to build the vibrations to expand the age of power.

Keywords: Windmill, vortex, piezoelectric.

INTRODUCTION

Man has needed and used energy at an increasing rate for his sustenance and well being ever since he came on the earth a few million years ago. Primitive man required energy primarily in the form of food. He derived this by eating plants or animals, which he hunted. Subsequently he discovered fire and his energy needs increased as he started to make use of wood and other bio mass to supply the energy needs for cooking as well as for keeping himself warm. With the passage of time, man started to cultivate land for agriculture. He added a new dimension to the use of energy by domesticating and training animals to work for him.

With further demand for energy, man began to use the wind for sailing ships and for driving windmills, and the force of falling water to turn water for sailing

ships and for driving windmills, and the force of falling water to turn water wheels. Till this time, it would not be wrong to say that the sun was supplying all the energy needs of man either directly or indirectly and that man was using only renewable sources of energy. A blade less wind mill or damper is a mechanical device designed to smooth out or damp shock impulse, and dissipate kinetic energy.

DESCRIPTION

Pneumatic and hydraulic blade less wind mills commonly take the form of a cylinder with a sliding piston inside. The cylinder is filled with a fluid (such as hydraulic fluid) or air. This fluid-filled piston/cylinder combination is a dashpot.

The blade less wind mills duty is to absorb or dissipate energy. One design consideration, when designing or choosing a blade less wind mill, is where that energy will go. In most dashpots, energy is converted to heat inside the viscous fluid. In hydraulic cylinders, the hydraulic fluid will heat up, while in air cylinders, the hot air is usually exhausted to the atmosphere. In other types of dashpots, such as electromagnetic ones, the dissipated energy can be stored and used later. In general terms, blade less wind mills help cushion cars on uneven roads.

PIEZO ELECTRIC

Piezoelectricity is the electric charge that accumulates in certain solid materials (such as crystals, certain ceramics, and biological matter such as bone, DNA and various proteins) in response to applied mechanical stress. The word piezoelectricity means electricity resulting from pressure. It is derived from the Greekpiezo or piezein, (which means to squeeze or press, and electric or electron, which means amber, an ancient source of electric

MECHANISM

The nature of the piezoelectric effect is closely related to the occurrence of electric dipole moments in solids. The latter may either be induced for ions on crystal lattice sites with asymmetric charge surroundings (as in BaTi03 and PZTs) or may directly be carried by molecular groups (as in cane sugar). The dipole density or polarization (dimensionality

[Cm/m3]) may easily be calculated for crystals by summing up the dipole moments per volume of the crystallographic unit cell. As every dipole is a vector, the dipole density P is a vector field. Dipoles near each other tend to be aligned in regions called Weiss domains.

The domains are usually randomly oriented, but can be aligned using the process of poling

(not the same as magnetic poling), a process by which a strong electric field is applied across the material, usually at elevated temperatures. Not all piezoelectric materials can be poled. Of decisive importance for the piezoelectric effect is the change of polarization P when applying a mechanical stress. This might either be caused by a re-configuration of the dipole-inducing surrounding or by re-orientation of molecular dipole moments under the influence of the external stress. Piezoelectricity may then manifest in a variation of the polarization strength, its

direction or both, with the details depending on

PIEZO ELECTRIC EFFECT

The direct piezoelectric effect is that these materials, when subjected to mechanical stress, generate an electric charge proportional to that stress. An example of the use of the direct effect is found in gas lighters. Piezoelectric sensors, like acceleration sensors and pressure sensors, also exploit the direct piezoelectric effect.

The inverse piezoelectric effect is that the same materials become strained when an electric field is applied, the strain again being proportional to the applied field. An example of the use of the inverse effect is found in buzzers. Piezoelectric actuators, which can be used for micro-positioning, also rely on the inverse piezoelectric effect.

COMPONENTS AND DESCRIPTION

. Battery

.Frame

.Piezo electric chip

. Bladeless windmill

BATTERY

In isolated systems away from the grid, batteries are used for storage of excess solar energy converted into electrical energy. The only exceptions are isolated sunshine load such as irrigation pumps or drinking water supplies for storage. In fact for small units with output less than one kilowatt. Batteries seem to be the only technically and economically available storage means. Since both the photo-voltaic system and batteries are high in capital costs.

It is necessary that the overall system be optimized with respect to available energy and local demand pattern. To be economically attractive the storage of solar electricity requires a battery with a particular combination of properties:

Low cost

Long life

LEAD ACID WET CELL

Where high values of load current are necessary, the lead-acid cell is the type most commonly used. The electrolyte is a dilute solution of sulfuric acid (H2S04). In the application of battery power to start the engine in an auto mobile, for example, the load current to the starter motor is typically 200 to 400A. One cell has a nominal output of

2. IV, but lead-acid.

BLADELESS LL

Vortex Bladeless S.L is a Spanish tech startup that developed a multi-patented wind turbine without blades. In 2014, Vortex Bladeless won The South Summit Award in the category of energy and industry for the best project.

Vortex's innovation comes from its unusual shape, where a fiberglass and carbon fiber mast oscillates in the wind taking advantage of the vortex shedding effect. At the bottom of the mast a carbon fiber rod moves inside a linear alternator that generates the electricity, with no moving parts in contact. Vortex has a small carbon footprint, is noiseless, has low center of gravity and allows for small foundation dimensions, so more generators can be placed in an area, at twice the density of traditional turbines.

Vortex Bladeless is working three different products. The main characteristics of the three products are:

Vortex Atlantis: 3 meters height and IOOW generation capacity, working along with solar panels, mainly to bring energy to an off grid locations.

Vortex Mini: 13 meters height and 4 kW generation capacity, mainly for smallscale/residential wind.

Vortex Grand: 150 meters height and IMW generation capacity, capable of generating electricity for 400 houses.

Atlantis and Mini models are planned to be introduced for private homes in developing countries, or small constructions like radio antennas with their first field tests in Avila, Spain And by 2018, with help of corwdfunding, the deployment of the Vortex Grand.

MANUFACTURING PROCESS

METAL CUTTING

Cutting processes work by causing fracture of the material that is processed. Usually, the portion that is fractured away is in small sized pieces, called chips. Common cutting processes include sawing, shaping (or planning), broaching, drilling, grinding, turning and milling. Although the actual machines, tools and processes for cutting look very different from each other, the basic mechanism for causing the fracture can be understood by just a simple model called for orthogonal cutting.

SAWING

Cold saws are saws that make use of a circular saw blade to cut through various types of metal, including sheet metal. The name of the saw has to do with the action that takes place during the cutting process, which manages to keep both the metal and the blade from becoming too hot. A cold saw is powered with electricity and is usually a stationary type of saw machine rather than a portable type of saw.

The circular saw blades used with a cold saw are often constructed of high speed steel. Steel blades of this type are resistant to wear even under daily usage. The end result is that it is possible to complete a number of cutting projects before there is a need to replace the blade. High speed steel blades are especially useful when the saws are used for cutting through thicker sections of metal.

Along with the high speed steel blades, a cold saw may also be equipped with a blade that is tipped with tungsten carbide. This type of blade construction also helps to resist wear and tear. One major difference is that tungsten tipped blades can be re-sharpened from time to time, extending the life of the blade. This type of blade is a good fit for use with sheet metal and other metallic components that are relatively thin in design.

WELDING

Welding is a process for joining similar metals. Welding joins metals by melting and fusing

1, the base metals being joined and 2, the filler metal applied. Welding employs pinpointed, localized heat input. Most welding involves ferrous-based metals such as steel and stainless steel.Weld joints are usually stronger than or as strong as the base metals being joined.

Welding is used for making permanent joints. It is used in the manufacture of automobile bodies, aircraft frames, railway wagons, machine frames, structural works, tanks, furniture, boilers, general repair work and ship building.

Several welding processes are based on heating with an electric arc, only a few are considered here, starting with the oldest, simple arc welding, also known as shielded metal arc welding (SMAW) or stick welding. In this process an electrical machine (which may be DC or AC, but nowadays is usually AC) supplies current to an electrode holder which carries an electrode which is normally coated with a mixture of chemicals or flux. An earth cable connects the work piece to the welding machine to provide a return path for the current. The weld is initiated by tapping ('striking') the tip of the electrode against the work piece which initiates an electric arc. The high temperature generated (about 60000C) almost instantly produces a molten pool and the end of the electrode continuously melts into this pool and forms the joint.

The operator needs to control the gap between the electrode tip and the work piece while moving the electrode along the join

DRILLING

Drilling is a cutting process that uses a drill bit to cut or enlarge a hole of circular crosssection in solid materials. The drill bit is a rotary cutting tool, often multipoint. The bit is pressed against the workpiece and rotated at rates from hundreds to thousands of revolutions per minute. This forces the cutting edge against the workpiece, cutting off chips (swarf) from the hole as it is drilled.

OPERATION:

The geometry of the common twist drill tool (called drill bit) is complex; it has straight cutting teeth at the bottom - these teeth do most of the metal cutting, and it has curved cutting teeth along its cylindrical surface. The grooves created by the helical teeth are called flutes, and are useful in pushing the chips out from the hole as it is being machined.

Clearly, the velocity of the tip of the drill is zero, and so this region of the tool cannot do much cutting. Therefore it is common to machine a small hole in the material, called a center-hole, before utilizing the drill. Center-holes are made by special drills called centerdrills; they also provide a good way for the drill bit to get aligned with the location of the Common drill bit materials include hardened steel (High Speed Steel, Titanium Nitride coated steel); for cutting harder materials, drills with hard inserts, e.g. carbide or CBN inserts, are used;

In general, drills for cutting softer materials have smaller point angle, while those for cutting hard and brittle materials have larger point angle;

If the Length/Diameter ratio of the hole to be machined is large, then we need a special guiding support for the drill, which itself has to be very long; such operations are called gun-drilling. This process is used for holes with diameter of few mm or more, and LID ratio up to 300. These are used for making barrels of guns;

INSPECTION

Critical appraisal In volving examination, measurement, testing, gauging, and comparison of materials or items. An inspection determines if the material or item is in proper quantity and condition, and if it conforms to the applicable or specified requirements. Inspection is generally divided into three categories: (1) Receiving inspection, (2) In-process inspection, and (3) Final inspection. In quality control (which is guided by the principle that "Quality cannot be inspected into a product") the role of inspection is to verify and validate the variancedata; it does not involve separating the good from the bad.

ASSEMBLY

An assembly line is a manufacturing process (most of the time called a progressive assembly) in which parts (usually interchangeable parts) are added as the semi-finished assembly moves from work station to work station where the parts are added in sequence until the final assembly is produced. By mechanically moving the parts to the assembly work and moving the semi-finished assembly from work station to work station, a finished product can be assembled much faster and with much less labor than by having workers carry parts to a stationary piece for assembly.

APPLICATIONS

Industrial and manufacturing units are the largest application market, for piezoelectric devices, followed by the automotive industry. There is also high demand from medical instruments as well as information in telecommunication. The global demand for piezoelectric devices was valued at the approximately US$14.8 billion in 2010. The largest material group for piezoelectric device is piezocrystal and piezopolymer due to its low weight and small size. Piezoelectric crystals are now used in buzzer, solar system also. This technique can solve the problem of electricity to road lighting system, and without the need of kilometers of electrical wire which runs along the side of the road. It is more efficient operation techniques with cost effective device. Piezoelectric materials are capable of carrying high load and operating very high frequencies. It requires no maintenance as there are no moving parts. It acts as a capacitor and therefore requires very little power.

However, protection of sensitive piezoelectric devices is required against harsh weather condition, and strong electric fields (200-500V/mm) can break down dipoles and depolarize a piezoelectric material

CONCLUSION

This project work has provided us an excellent opportunity and experience, to use our limited knowledge. We gained a lot of practical knowledge regarding, planning, purchasing, assembling and machining while doing this project work. We feel that the project work is a good solution to bridge the gates between institution and industries. We are proud that we have completed the work with the limited time successfully Piezoelectric materials have the ability to transform mechanical strain energy into electrical charge. The amount of energy generated depends on the number of passing vehicles and the number of piezoelectric elements

on the road. Vehicles that are moving slowly appears to generate slightly more energy than faster -moving vehicles, but further research is needed to confirm this piezoelectric power generation system works successfully. It has tremendous scope for future energy/ power solution towards sustainability.

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