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Power Generation Through The Agriculture Pump Sets

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Abstract-
The power generation through the agriculture electrical pump sets it is clearly explained as the agriculture pump sets discharging water has mass energy and potential and kinetic energy this energy is used to rotates the specially designed pelton wheel which is produced the mechanical energy this mechanical energy is coupled with the generator with help of gear wheels the electrical energy is produced the generator this electrical power used to another motors for same ratings and battery charging applications the future extension is to improve the power up to 5kw for each generating station the goal overall generation is producing the 2megawatts power this power sending back to the govt.
KEY POINTS Alternator- Turbine -.Gear box- Electrical motor

I. INTRODUCTION

It consisting the this turbine is made for cast iron plates and its shaft is strain less steel material and friction less bearings the turbine is rotates the nearly friction less rotation this turbine is made for specially design with respected to direction of water flow this turbine is made in proto type model only. this turbine is give the nearly 2hp output. The rating of the generator is 1kw, 220v, 50hz,(5-10)amps. The gear box is designing for based on the turbine output speed the turbine rotates 300rpm the gear box step up the 300 to 1500rpm.this gear box coupled with help of dove couplings it reducing the shaking of the turbine and producing smoothing operation. This type of power generation system is used for future days mainly because it is a renewable energy system. In upcoming days very demand for renewable energy source in that time govt searching for alternating power generation methods and encroaching the alternating power generation methods and purses the power through the public [developers]. Already japan singapure rasya and America countries it will happens in india also in future days. This type of power generation is low cost as compared to any power generation because it has no maintenance cost and not need the high amount of capital cost . it has very low initial cost it is works times depends on type of pump sets and area of pump sets and power timings of Transco depts.

1.1 ALTERNATOR

The **definition of alternator** is hidden in the name of this machine itself. An **alternator** is such a machine which produces alternation electricity. It is a kind of generators which converts mechanical energy into alternating electrical energy. It is also known as synchronous generator.

History of Alternator

Michael Faraday and Hippolyte Pixii gave the very first concept of **alternator**. Michael Faraday designed a rotating rectangular turn of conductor inside a magnetic field to produce alternating current in the external static circuit. After that in the year of 1886 J.E.H. Gordon, designed and produced first prototype of useful model. After that Lord Kelvin and Sebastian Ferranti designed a model of 100 to 300 Hz synchronous generator. Nikola Tesla in 1891, designed a commercially useful 15 KHz generator. After this year, poly phase alternators were come into picture which can deliver currents of multiple phases.

1.2 Use of Alternator

The power for electrical system of modern vehicles produces from alternator. In previous days, DC generators or dynamos were used for this purpose but after development of alternator, the dc dynamos are replaced by more robust and light weight alternator. Although the electrical system of motor vehicles generally requires direct current but still an alternator along with diode rectifier instead of a DC generator is better choice as the complicated commutation is absent here. This special type of generator which is used in vehicle is known as automotive alternator.

Another use of alternator is in diesel electric locomotive. Actually the engine of this locomotive is nothing but an alternator driven by diesel engine. The alternating current produced by this generator is converted to DC by integrated silicon diode rectifiers to feed all the dc traction motors. And these dc traction motors drive the wheel of the locomotive.

This machine is also used in marine similar to diesel electric locomotive. The synchronous generator used in marine is specially designed with appropriate adaptations to the salt-water environment. The typical output level of marine alternator is about 12 or 24 volt. In large marine, more than one units are used to provide large power. In this marine system the power produced by alternator is first rectified then used for charging the engine starter battery and auxiliary supply battery of marine

1.3 Types of Alternator

Alternators or synchronous generators can be classified in may ways depending upon their application and Design.

According to application these machines are classified as-

1. Automotive type – used in modern automobile.
2. Diesel electric locomotive type – used in diesel electric multiple unit.
3. Marine type – used in marine.
4. Brush less type – used in electrical power generation plant as main source of power.
1. 5. Radio alternators – used for low brand radio frequency transmission.

These ac generators can be divided in many ways but we will discuss now two main **types of alternator** categorized according to their design.

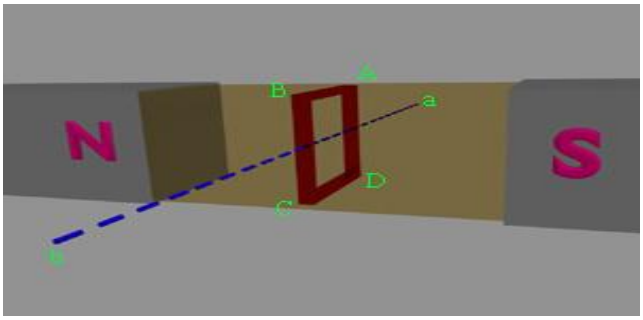
SALIANT POLE ROTOR

It is used as low and medium speed alternator. It has a large number of projecting poles having their cores bolted or dovetailed onto a heavy magnetic wheel of cast iron or steel of good magnetic quality. Such generators are characterized by their large diameters and short axial lengths. These generator are look like big wheel. These are mainly used for low speed turbine such as in hydral power plant.

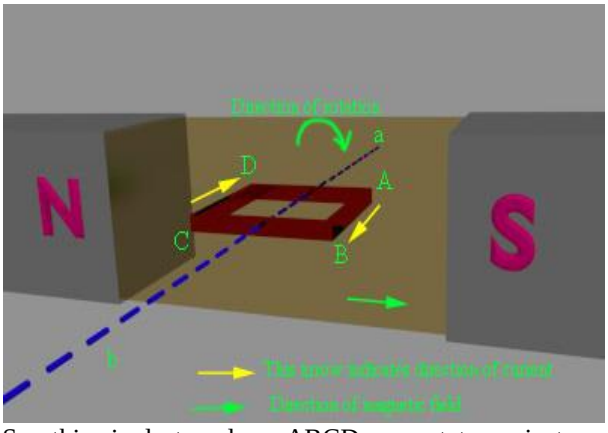
SMOOTH CYLINDER ROTOR

It is used for steam turbine driven alternator. The rotor of this generator rotates in very high speed. The rotor consists of a smooth solid forged steel cylinder having a number of slots milled out at intervals along the outer periphery for accommodation of field coils. These rotors are designed mostly for 2 pole or 4 pole turbo generator running at 36000 rpm or 1800 rpm respectively.

WORKING PRINCIPAL OF ALTRANATOR



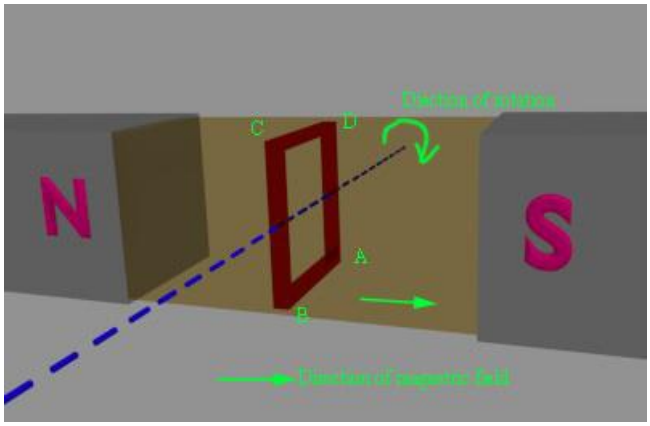
The working principle of alternator is very simple.[7] It is just like basic principle of DC generator. It also depends upon Faraday's law of electromagnetic induction which says the current is induced in the conductor inside a magnetic field when there is a relative motion between that conductor and the magnetic field. For understanding working of alternator let's think about a single rectangular turn placed in between two opposite magnetic pole as shown above.



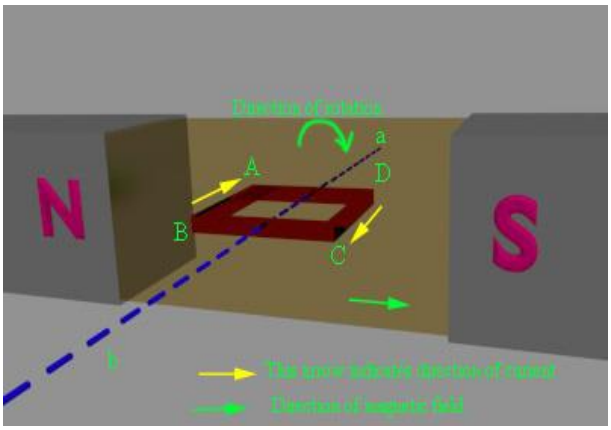
Say this single turn loop ABCD can rotate against axis a-b. Suppose this loop starts rotating clockwise. After 90° rotation the side AB or conductor AB of the loop comes in front of S-pole and conductor CD

comes in front of N-pole. At this position the tangential motion of the conductor AB is just perpendicular to the magnetic flux lines from N to S pole. Hence rate of flux cutting by the conductor AB is maximum here and for that flux cutting there will be an induced current in the conductor AB and direction of the induced current can be determined by Fleming's right hand rule. As per this rule the direction of this current will be from A to B. At the same time conductor CD comes under N pole and here also if we apply Fleming right hand rule we will get the direction of induced current and it will be from C to D.

Now after clockwise rotation of another 90° the turn ABCD comes at vertical position as shown below. At this position tangential motion of conductor AB and CD is just parallel to the magnetic flux lines, hence there will be no flux cutting that is no current in the conductor. While the turn ABCD comes from horizontal position to vertical position, angle between flux lines and direction of motion of conductor, reduces from 90° to 0° and consequently the induced current in the turn is reduced to zero from its maximum value.



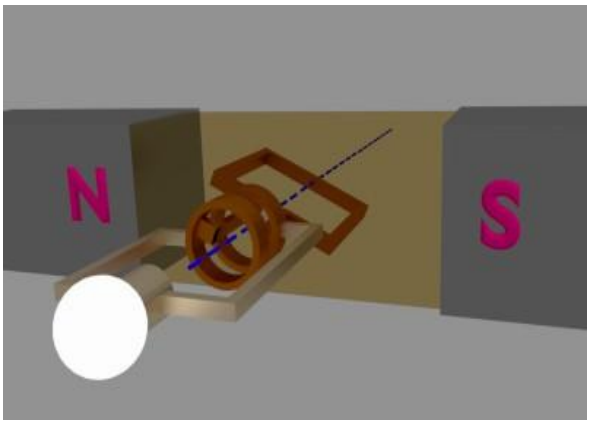
After another clockwise rotation of 90° the turn again come to horizontal position and here conductor AB comes under N-pole and CD comes under S-pole, and here if we again applyFlemming's right hand rule, we will see that induced current in conductor AB, is from point B to A and induced current in the conductor CD is from D to C.



As at this position the turn comes at horizontal position from its vertical position, the current in the conductors comes to its maximum value from zero. That means current is circulating in the close turn from point B to A, from A to D, from D to C and from C to B. Just reverse of the previous horizontal position when the current was circulating as A → B → C → D → A.

While the turn further proceeds to its vertical position the current is again reduced to zero. So if the turn continues to rotate the current in the turn continually alternate its direction. During every full revolution of the turn, the current in the turn gradually reaches to its maximum value then reduces to zero and then again it comes to its maximum value but in opposite direction and again it comes to zero. In this way the current completes one full sine wave form during each 360° revolution of the turn. So we have seen how an alternating current is produced in a turn is rotated inside a magnetic field. From this, we will now come to the actual working principle of alternator.

Now we cut the loop and connect its two ends with two slip rings and stationary brush is placed on each slip ring. If we connect two terminals of an external load with these two brushes, we will get an alternating current in the load. This is our elementary model of alternator.



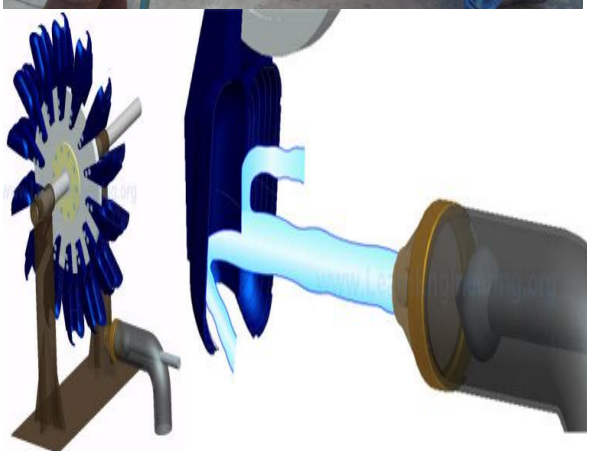
Having understood the very basic principle of alternator, let us now have an insight into its basic operational principal of a practical alternator. During discussion of basic working of alternator, we have considered that the magnetic field is stationary and conductors (armature) is rotating. But generally in practical construction of alternator, armature conductors are stationary and field magnets rotate between them. The rotor of an alternator or a synchronous generator is ,
mechanically coupled to the shaft or the turbine blades, which on being made to rotate at synchronous speed Ns under some mechanical force results in magnetic flux cutting of the stationary armature conductors housed on the stator. As a direct consequence of this flux cutting an induced emf and current starts to flow through the armature conductors which first flow in one direction for the first half cycle and then in the other direction for the second half cycle for each winding with a definite time lag of 120° due to the space displaced arrangement of 120° between them as shown in the figure below. This particular phenomena results in 3φ power flow out of the alternator which is then transmitted to the distribution stations for domestic and industrial used.

II. TURBINE

a machine for producing continuous power in which a wheel or rotor, typically fitted with vanes, is made to revolve by a fast-moving flow of water, steam, gas, air, or other fluid.

PELTON TURBINE WORKING.

Working principle of Pelton turbine is simple.[5] When a high speed water jet injected through a nozzle hits buckets of Pelton wheel; it induces an impulsive force. This force makes the turbine rotate. The rotating shaft runs a generator and produces electricity



In short, Pelton turbine transforms kinetic energy of water jet to rotational energy

Governing in Pelton Wheel:

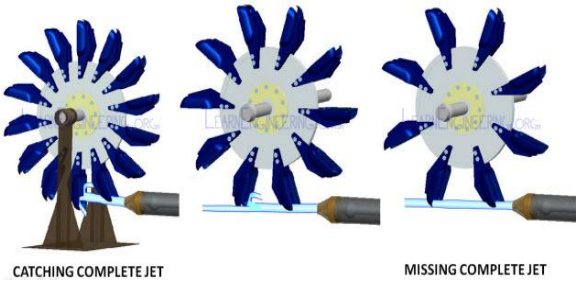
Demand of power may fluctuate over time. A governing mechanism which controls position of the spear head meets this requirement. With lowering power demand the spear head at water inlet nozzle is moved in. So that water flow rate is reduced. If power demand increases spear head is moved out this will increase the flow rate. Following figure illustrates this mechanism. The first position of the The first position of the spear head produces a low flow rate, while the second position produces a high flow rate.

So in Pelton turbine synchronization between power demand and power supply is met by controlling the water flow rate. The same technique is used in other

types hydroelectric turbines. If the power supply is more than the demand, then the turbine will run over speed otherwise in under speed. But such a governing. mechanism in turn will balance the power supply and demand and will make sure that the turbine rotates at a constant specified *RPM*. This speed should also conforms to the power supply frequency. So this mechanism acts as a speed governing mechanism of Pelton wheel.

Number of Buckets in Pelton Wheel:

One of the most important parameter of Pelton turbine design is number of buckets on the disk. If number of buckets is inadequate, this will result in loss in water jet. That means when one bucket departs from the water jet next bucket may not get engaged with the jet. This will result in loss in water jet for a small time duration, thus sudden drop in turbine efficiency. Following figure illustrates what happens when the number of buckets are lowered. With lowering number of buckets at some point of operation, complete water jet might be lost (3rd figure). So there should be an appropriate number of buckets, which will make sure that no water is lost (1st figure).



Pelton Bucket - Design & Features

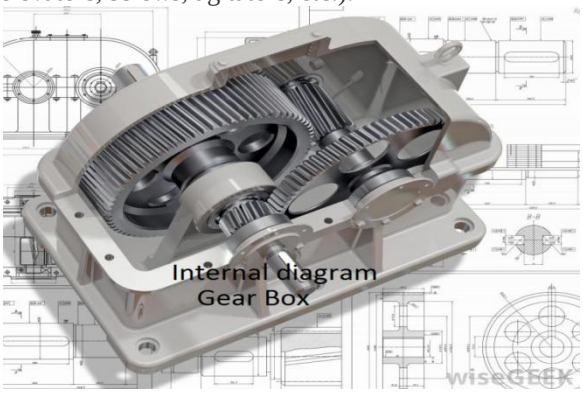
Most vital component of Pelton wheel is its bucket. Buckets are casted as single solid piece, in order to avoid fatigue failure. You can note that force acting on the turbine bucket is not constant with time. If you follow one particular bucket, it will have high force for a small time duration (at the time of jet impingement) after that a larger idle period where no jet interaction takes place. So the force acting on the bucket is also not constant. It varies with the time but it is having a cyclic nature. If bucket were made using pieces by welding attachment such cyclic fore will easily lead to premature.

Water jet is split into 2 equal components with help of a splitter. The special shape of bucket makes the jet turn almost 180 degree. This produces an impulsive force on bucket. Force so produced can easily be derived from Newton's 2nd law of motion. Blade outlet angle close to 180 degree is usually used in order to maximize impulsive force.

A cut is provided on bottom portion of buckets. This makes sure that water jet will not get interfered by other incoming buckets.

III. GEAR BOX

Gear reducers are used in all industries, they reduce speed and increase torque.[1] You will find them between the prime mover (i.e.: electric motor, gas, diesel or steam engine, etc.) and the driven equipment: conveyors, mills, paper machines, elevators, screws, agitators, etc.).



An industrial gearbox is defined as a machine for the majority of drives requiring a reliable life and factor of safety, and with the pitch line velocity of the gears limited to below 25 m/s, as opposed to mass produced gearboxes designed for a specific duty and stressed to the limit, or used for very high speeds etc., e.g. automobile, aerospace, marine gearboxes.

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3.1 BASIC SIZE AND SELECTION OF GEAR BOXS

The two types of tooth that can be used for both parallel and angled drives are straight or helical (spiral). Spur gears are easier to manufacture and inspect than helical gears, and they can be rectified more easily at the assembly stage if required. The main disadvantage of a spur gear compared with a helical, is in the tooth engagement process. The whole of the spur tooth enters engagement at the same time, and therefore any pitch (spacing) error will cause interference and noise. Spur gears are generally used for pitch line speeds below 10 m/s in drives that are not loading the teeth to their maximum allowable limits. They are also used where gears are required to slide axially in and out of mesh. Helical gears can be manufactured on most modern gear cutting machines. They will probably take longer to machine because of the relative wider face, and hence be more expensive than an equivalent size spur gear. However, this is offset by the fact that the helical gear may be capable of carrying up to fifty per cent more load. Conversely, for a given power, helical gears elimination of end thrust, as the two helices producing the thrust are cut with opposite "hands". This type of gearing is also useful where the pinions are of small diameter, as the equivalent face to diameter ratio is only half that of a similar net face single helical gear. Bevel gears are used for drives requiring the input shaft to be at an angle, usually 90° to the output shaft. They can be cut with either straight teeth, where the same comments as for spur gears apply, or they can be cut spiral which correspond to the helical type of parallel gearing. Gearboxes can be designed using the same type of gearing throughout, or a combination depending on powers, speeds and application.

3.2 TORQUE SELECTION

Before starting the preliminary design, the following factors must be known.

- The type, powers and speeds of the prime mover.
- The overall ratio of the gearbox.
- The types of unit required – parallel or angled drive.
- Any abnormal operating conditions.
- The disposition of the input to output shaft. • The direction of rotation of the shafts.
- Any outside loads that could influence the unit, e.g. overhung loads, brakes, outboard bearing etc.
- The type of couplings to be fitted.
- Any space restriction.

There are three important points to remember when calculating the nominal torque:

1. That if a brake is positioned anywhere before the gearbox output shaft, the unit should be sized on the brake torque, (assuming this torque is greater than the motor torque). This is because any external loads back driving the gearbox will be sustained by the unit until the brake slips. The above is also true of any form of back stopping (anti-reversing) device. A check should also be made on the kinetic energy that would have to be sustained by the unit if the brake is to be applied in an emergency
2. That some prime movers, namely electric motors, can develop 2 or more times full load torque (FLT) on start up. If stop/start is a frequent occurrence then the gearbox must be sized accordingly. 3
3. . Those rigid type couplings can transmit shock more easily to the gearbox than can flexible or gear type couplings, and the application factor selected accordingly.
4.

IV. AGRICULTURE MOTOR

The agriculture motors are 3 phase induction motors are used its torque is min 5hp to 7hp motors are used its capacity carriers the 22meters heat and water jet falls nearly 1.5meters distance this high pressure water strikes the turbine vanes after striking the water flows Normal to the agriculture fields. [9] his motors consuming the 380volts to 440volts.11AMPS.

- Deferent Models of Agriculture Pumps

Before installing the motor it need floore area for proper installing the pump sets and reducing the shaking of turbine and gear box. The turbine placed at the angle of 25 degrees from earth the water get striking the turbine after this water flow under the turbine this water is utilising the agriculture fields.

This type of power generation system not effected the agriculture fields it is a simplest way for power generation. It is completely pollution free energy source.

ADVANTAGES

- Low initial cost for construction of power house.
- Very low maintenance cost nearly negligible .
- There is no pollution problems.
- Flexible power generation.
- Less floor area required for installation.

LIMITATIONS

- It need constant jet of water for rotating the turbine
- It need for minimum 2-2.5inches water.

V. CONCLUSION

It is conclude that the electrical power is generation we know many types of plants I can used principal of hydro power generation system model but it not need dam and river it need agriculture water pump only this pump pipe is refers to penstock and under ground water I can considered the dam or river. This type of power generation is called power generation through the agriculture pump set.

VI. Acknowledgment

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