Proposed applications with implementation techniques of the upcoming renewable energy resource, The Tesla Turbine

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Abstract. Recent research has shown that tesla turbine can be one of the future efficient sources of renewable energy. Modern techniques used for designing of tesla turbine have given optimum results regarding efficiency and applications. In this paper we have suggested fully coordinated applications of tesla turbine in different fields particularly in power generation at both low level and high level generation. In Energy deficient countries the tesla turbine has wide range of applications and it can play an important role in energy management system. Our proposed applications includes,
- the use of tesla turbine as renewable energy resource
- using tesla turbine in distributed generation system
- use of tesla turbine at home for power generation
- use of tesla turbine in irrigation channels
- using tesla turbine in hybrid electric vehicles

All applications are explained with the help of flow charts and block diagrams and their implementation techniques are also explained in details. The results of physical experiments and simulations are also included for some applications.

1. Introduction

In this age of technology and revolutions the world is progressing very fast in each and every field. With the fast development in industrial and transportation sectors the demand of energy is increasing exponentially. The population of world is increasing rapidly and the life style of the people is also getting modernized. All these facts are leading the world to a serious energy crisis. To meet the technological and social revolutions power sector has also to grow with the demands of the consumers. Oil, gas, coal and other conventional fuels are the major sources of energy in these days and are being used extensively for the purpose of power generation. The rapid consumption of these energy resources is creating an alarming situation for the future of energy requirements and challenging both the developed and progressive countries to find out the energy resources for their future needs. World primary energy consumption has grown 2.5\% in the year 2011 as compared with the year 2010 [1]. No doubt the reserves of petroleum and gasoline are increasing as new reserves are being discovered in different countries but still the rate of increase in the reserves of these energy resources is far less than the rate of increase in the consumption of these resources in industrial, transport and power generation
sectors. Another drawback of conventional fuel is that the prices of the petroleum are increasing to a very high level. Figure 1 shows the estimated increases in price and the consumption of energy resources in the future [2]. In this graph the units used for oil prices are dollars per barrel and for energy consumption British thermal units are used. The figure clearly shows how the energy consumption and fuel prices are going to increase in the future. Demand of electricity is also increasing rapidly and it has increased from 439 million tonnes of oil equivalent to 1441 million tonnes of oil equivalent during the period of 1973 to 2009 [3]. This has been shown in figure 2 as a share of different electricity consumption sectors. Emission of Carbon dioxide and greenhouse effect is yet another big issue of the conventional fuels.

![Figure 1](image1.png)

**Figure 1.** Estimated world energy consumption and Oil prices in future, 2010-2035

![Figure 2](image2.png)

**Figure 2.** World electricity consumption in 1973 and 2009

The only solution to these crises is to convert the fuels from conventional to the renewable. Only the renewable energy resources can compensate for the growing demands of the energy consumption. Tesla turbine is an upcoming renewable energy resource as it is catching the attention of researchers and market holders. Although it has been invented long ago but due to the technical and political issues it was out of market for a long time. People were unaware of the advantages and applications of this turbine. The main thing of tesla turbine is that it is a bladeless turbine. That is why it is also called boundary layer turbine. It has many advantages and its use in many applications can make it much beneficent and thus it can reduce the demand of conventional fuels in the future. Some important applications of tesla turbine have been proposed and explained in details in the following paragraphs.
2. Proposed applications of the Tesla Turbine
Previously the applications of the Tesla turbine were in a very limited range. The use of this turbine was limited to the applications which required high speed but low torque. Many researchers have tried to elaborate the wide spread advantages of this turbine but still the Tesla turbine was not able to catch the attention of patents for its commercialization because of its narrow range of applications. This was due to the fact that there were some certain defects in its design. But now after the advancements in the design of this remunerative turbine it can become a promising source for the future needs in many aspects of the world particularly it can serve to compensate for a part of the future energy crises of the world. The new design of Tesla withdraws the defects of the turbine and makes it more beneficial by improving the torque of the turbine to a great extent and thus making it able to be used in a vast range of applications. Here we have proposed some useful applications of the Tesla turbine which are explained in the following paragraphs with some suggestions for the practical implementation of these applications.

2.1. Renewable energy resource
Like any other rotating machine Tesla turbine can also be used to rotate the rotor of a generator and thus it can be used for the generation of electric power. Usually Tesla turbine uses water or pressurized air as a fuel as its running cost is lowest than any other engine or turbine and its fuel is abundantly available everywhere in the world. The use of Tesla turbine in generation of electricity is proposed as it can be implemented on home level as well as on higher level. At home level it can be installed in the pipe lines of the daily use water tabs and on higher level they can be installed in irrigation channels, streams of waters and tube wells in agriculture areas and in the down-stream of water in hilly areas. A general scheme for implementation of Tesla turbine as a renewable energy resource is explained here which is shown in figure 3. There are many choices of using different fuels, depending upon the type and place of application the most suitable green fuel can be used which can be any fluid like water or air. This green fuel in form of fluid is definitely required to be filtered. Then to increase its speed it is passed through a pressurizer. After that a very fast and thin stream of fuel is injected to the discs of Tesla turbine which in return rotates the rotor of generator and thus we can get the electric power without any pollution and side effects.

![Figure 3. Implementing Tesla turbine as a renewable energy resource](image)

In this way the Tesla turbine can be used in the wind turbine applications and particularly Tesla turbine will be very beneficial in the geothermal power plants where hot steam from the earth is used as a fuel. So the viscous steam will be a good fuel to the Tesla turbine and it will give much better efficiency.

2.2. Distributed generation system
Another important application of Tesla Turbine is to use it in the distributed Generation system. It is known that the adhesive properties of the fluid are increased with the increasing temperature so the torque of the Tesla turbine can be increased by using the warm fuel [4]. In distributed generation the heat obtained from any generating source can be used to heat up the fuel of the Tesla turbine and thus make it more efficient. Particularly in case if fuel cell generation is being used than the heat which is a side product of fuel cell can be used to increase the temperature of water or the air (fuel for Tesla turbine). Similarly in the conventional power plants a lot of heat is wasted as a side product. This heat
can be utilized to heat up the fluid and provide this fluid to the Tesla turbine. The implementation of this process is explained with the help of block diagram in figure 4. In this figure the waste heat of a thermal power plant and the heat obtained from the operation of fuel cell, is used to rise the temperature and thus cohesive capability of the fuel for the Tesla turbine.

![Diagram](image)

**Figure 4.** Implementing Tesla turbine as a renewable energy resource

Distributed generation system is a new but popular technology in the modern electric power system particularly the DGS technology is being implemented in the smart grids. In this way Tesla turbine can become an important component of the smart grids which are a modern technology based power system.

2.3. Power generation at home level

In homes, Tesla turbine can be rotated by the water which is circulating by pressure from water reservoir tanks to our common use water tabs. To increase the pressure of water the pressurizer can be used. Thus the turbine will rotate at high speed and if its shaft is connected with the small generating unit via gears, a sufficient amount of power can be generated to charge the batteries. Then using inverter circuit we can get our desired AC voltage. Thus the running cost of Tesla Micro Generation System will be zero as free of cost fuel is used to run the turbine and even the water is not wasted and is used without any loss. This application can be very useful in remote areas where electric utilities cannot reach. This application can also be implemented in communities, residential colonies and other institutes like universities etc. where a common large scale reservoir tank is used to supply the whole colony or the institute. Thus in such areas Tesla turbine can be used at a relatively large scale and a large amount of electric power can be generated at a very low cost. The typical implementation scheme for this application has been shown in figure 5. More than one turbine can be used easily without sacrificing the performance of the any turbine.

![Diagram](image)

**Figure 5.** Installation of Tesla turbine for power generation at home level
2.4. Use of Tesla turbine in irrigation channels

Another proposed application of tesla turbine is especially for rural areas and agriculture lands where a large number of tube-wells and canals exist. The tesla turbines of relatively large size can be rotated by the extremely heavy pressure of the water of tube-wells and canals to generate relatively large amount of electricity which can be provided to homes. Also this turbine can rotate a motor of many horsepower which can run another tube-well. Hence a huge amount of energy can be used without any serious cost. The implementation technique for this application is very simple. The good thing in this application is that this turbine does not require the high head of water. Implementation scheme of application of tesla turbine in canals and other irrigation channel has been shown in figure 6. It has been shown that multiple turbines can be installed in a single canal at different places both in series and parallel. Some arrangement must be made to make the path or water a bit narrow or slope like so that the speed and pressure of the water can be increased.

![Diagram of Tesla turbines in irrigation channels](image)

Figure 6. application of multiple tesla turbines in irrigation channels

2.5. Using Tesla turbine in hybrid electric vehicles

Due to the high emission of carbon dioxide gas from transportation sectors the use of conventional fuels is becoming unlikely and electric or hybrid electric vehicles are making their ways to the market. As the electric vehicles do not use the conventional fuels so they are environment friendly and also the electric vehicles produces very low noise as compared to the vehicles having internal combustion engine. Hybrid electric vehicles are those vehicles which have a combination of both the internal combustion engine and the electric propulsion engine. Further there can be two types of hybrid electric vehicles. One in which the internal combustion engine is used to move the vehicle directly or in other case it is only used to work as a generator and recharge the storage batteries of the electric vehicle. Tesla turbine can be an efficient green fuel for the recharging of the batteries. The implementation technique for the using of tesla turbine in a hybrid electric vehicle is explained with the help of figure 7. Initially the vehicle will be started with the help of internal combustion engine (ICE) or if the batteries are already charged than it can also be started electrically. Once the vehicle is started the air faced by vehicle will be collected by an air receiver. After the filtration and compression of this air it will be sent to the tesla turbine via some special pressure nozzles at a certain angle and pressure. Thus the viscous and cohesive effect of air with the plates of turbine will rotate the turbine and so the
alternator will produce AC electric power which is used to charge the batteries after the rectification process.

![Diagram of electrical system](image)

**Figure 7.** Electrical system of a hybrid electric vehicle using Tesla turbine.

### 3. Conclusion
The outcome of the complete research is that’ due to the expected future energy crisis, it is not supposed to lose any type of energy anywhere. Use of renewable energy resources is need of the hour. Generation of power form solar and wind has the limitation that they are not reliable for whole day generation so adding the tesla turbine in the generation scheme will make the power system much more reliable and that too without any fuel cost. The only requirement is to use the turbine in many specific applications so that the optimum advantage can be taken from this bladeless and improved turbine.

### 4. References
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