Study of Tesla Turbine

Ashutosh Jain, Sunita Jana, Sneha Shiju, Tejas Kumar

Abstract: ***This record shortens a bladeless turbine arranged by Nikola Tesla. In the first place this improvement, which can in like manner be used as a pump, is generally depicted. By then we consider a logical model of Tesla turbine. Conditions speaking to fluid stream in this model are modified, however are still non-straight. To disentangle them deductively, we dismiss non-straight terms. By then we survey the numerical response for previously streamlined non-straight conditions. Finally, changes of special framework are shown and their possible use. Examination of this sort of stream issue is a key segment in the perfect arrangement of Tesla drag-type turbines for geothermal, waste warm, essentialness social affair, or daylight based elective imperativeness applications. In various plate turbines, quick stream enters digressively at the outer scope of round and empty scaled down scale channels confined by solidly separated parallel circles, spiraling through the channel to an exhaust at a little traverse or at the point of convergence of the plate. Past examinations have generally made models in perspective of streamlining admirations of the stream in these conditions. Change of rotor drag in this kind of turbine updates essentialness change profitability. Show desires exhibit that overhaul of plate drag by crucial scaled down scale sorting out of the circle surfaces can in a general sense fabricate turbine profitability. Exploratory calculations with the model demonstrate that turbine efficiencies outperforming 75% can be proficient by getting ready for perfect extents of the managing dimensionless parameters. The same parametric examples in execution are stood out from test data for a scaled down scale A Computational Fluid Dynamics (CFD) exhibit is then appeared differently in relation to both the investigative and exploratory turbine efficiencies.***

Keywords: (CFD), Tesla Drag-Type Turbines for Geothermal, Waste Warm,

I. INTRODUCTION

Sub-Megawatt turbines, generally called micro turbines, are fundamental to the starting late creating fields of Combined Heat and Power (CHP), essentialness social occasion, and little scale control age. The solicitations and framework necessities of micro turbines are not exactly the same as megawatt and greater turbines, on account of amassing limitations and the fluctuating solicitations of specific applications. Properties of gooey stream turbines, like the Tesla turbine, may be useful for understanding a segment of the specific challenges in this blueprint space. This examination expects to give a foundation to plotting Tesla turbines with control yield reaching out from ~1 kW down to ~1 microwatt. Kilowatt scale control age has applications in Combined Heat and Power (CHP) control plants, misuse warm recovery, geothermal power, and scattered scale control age.

Revised Version Manuscript Received on 02 May 2018.

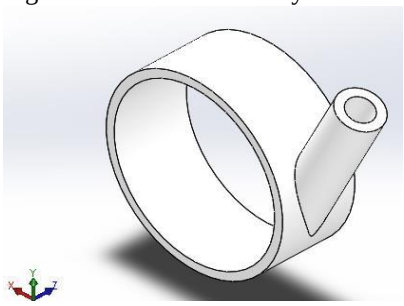
Ashutosh Jain, SRM Institute of Science and Technology, Ramapuram (Chennai), India.
Sunita Jana, SRM Institute of Science and Technology, Ramapuram (Chennai), India.
Sneha Shiju, SRM Institute of Science and Technology, Ramapuram (Chennai), India.
Tejas Kumar, SRM Institute of Science and Technology, Ramapuram (Chennai), India.

The basic favored outlook of CHP systems is that the waste warmth from the power cycle is created at the motivation behind end use, and can be utilized for current process warming, space warming, or water warming. The all inclusive imperativeness association (IEA) has perceived CHP as a basic bit of ozone hurting substance diminish techniques, and proposes methodology changes that may stimulate change of these structures. The IEA similarly communicated that CHP is calm in that it doesn't require authoritative monetary propelling powers to be down to earth. Since CHP control plants are sent toward the end-use region of the made warm, they are close to nothing, on the demand of 1 kW when the glow is being used as a piece of a singular private unit, up to around 1 GW when warm is being coursed on a citywide scale. While standard winding turbines can be used as a piece of broad scale CHP, tinier scale CHP plants require incredibly compelling expanders to be productive. So likewise, misuse warm streams from mechanical methodology, and geothermal warmth streams address potential usages of micro turbines. The viability of current micro turbine progressions in the kilowatt measure run move dependent upon the sort of device, kind of fuel, and application, yet standard efficiencies are in the 20 - 40% region. If Tesla turbines can be made with for all intents and purposes indistinguishable efficiencies, they can battle well with other turbine headways since Tesla turbines can be made almost cheaply. To begin with, the ease of Tesla turbines empowers them to be created at little scales financially and satisfactorily, instead of bladed turbines. A minute issue is that gooey forces end up being more basic at little scales. Tesla turbines, as opposed to various contraptions, rely upon thick powers to trade essentialness from the moving fluid to the rotor, and subsequently may truly benefit by scaling back to little sizes. These reasons give a persuading case to inquiring about Tesla turbine advancement for control plants going from 1 kW down to 1 micro watt. Next to applications for which Tesla turbines have recently been assessed, a concentrated appreciate of Tesla turbine execution could illuminate additional open entryways for included profitability in control cycles, imperativeness extraction from misuse warm streams or weight heads, or new open entryways for essentialness age. Since Tesla turbine advancement is so far a to a great degree energetic development, this examination does not expect to look into Tesla turbines for a specific application, yet rather to give an essential cognizance of Tesla turbine action, and to give a framework to researching and redesigning the execution of these devices.

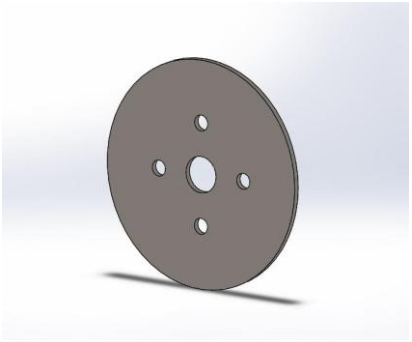
II. MODULE COMPONENTS

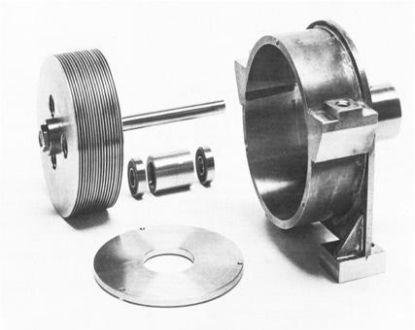
1. Stator of turbine The rotor get together is housed inside a round and empty stator, or the stationary bit of turbine.

The estimation of barrel's inside chamber is fairly greater than the rotor circles. Each complete of the stator contains bearing for the post. The stator also contains the delta. The material chose for the stator is Polypropylene Or Polyethylene. We will likely make the bundling clear so within working can be seen successfully

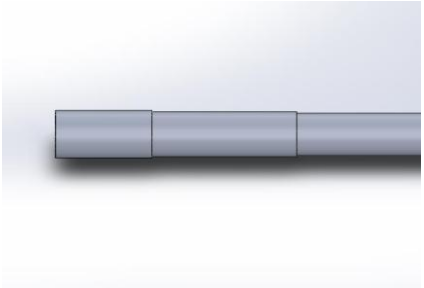


2. Disc Plate is mounted on shaft. Plate is of inner separation crosswise over 16mm and outside estimation of 100mm.The thickness of circle is The material which we have picked is STAINLESS STELL 30L Number of Disk is taken as 10. Single Disk

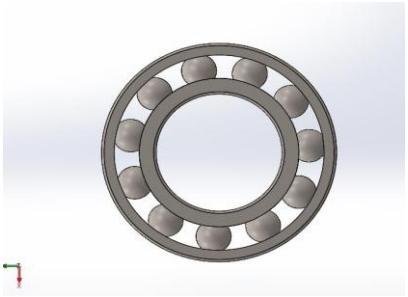




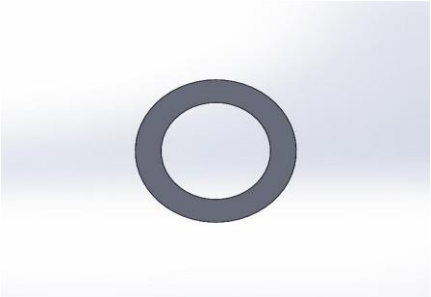
3.Shaft A post is a turning machine part, regularly round in cross region, which is used to transmit control beginning with one area then onto the following, or from a machine which produces vitality to a machine which ingests control. The post which we have used as a piece of our undertaking is Aluminum 1060



4. BEARING In this wander of tesla turbine we have used two particular bearing to be particular 6002(I.D =15mm and O.D= 32mm) and 6003(I.D =17mm and O.D= 35mm for the smooth turn of shaft. The bearing is involved material Stainless Steel



5.Washer A thin plate with gap is otherwise called Washer which is utilized to fit the pile of a hung get For this circumstance Washers are used to seclude the circles, are fitted on a sleeve, hung toward the end and nuts are used to hold thick end plates together. Inward separation crosswise over of washer is 17mm and outside estimation is 20mm.



The material chose for washer is STAINLESS STEEL 316/316A.

6. BOLTS A screw is a sort of hung hook with an external male hung. In this model 4 shocks are used to hold the front and down plate which covers the opening of stator. Jar used as a piece of this model is M10. The material chose for the scramble for this circumstance is STAINLESS STEEL AISI 1020

III. CONCLUSION

The flow in the Tesla turbine was simulated with different geometrical models as well as laminar and turbulent approach. Since the flow itself is found in a transition regime with multiple processes -as transition, relaminarization, recirculation, between other phenomena- an exact simulation that full fills all the physical requirements is quite difficult to achieve with CFD tool. Nevertheless both approximations are valid and they would show different features, characteristics and behavior typical for each case and in extension for the Tesla turbine. One of these differences is that the inflection point of radial velocity profile presented in laminar solution disappears in the turbulence model, for which the turbulent effects act as a mechanism of balanced in the axial direction. In contrast, experimental research cannot measured velocities profiles, only static pressure as it was reported by Adams and Rice due to the gap between disks is very thin; CFD provide solution to this problem and further more to micro turbines. Generally, there is a lack of reports of experimental works; for this analysis the geometry selected from Rice to perform the simulations was not possible to compare with the experimental data because of omitted data in the reported experimental results of Adams and Rice.

In this last comparison, it is visible that turbulent approach describes better the flow inside the turbine for this geometry and operation point. Besides, the field of static pressure and his corresponding velocity field show good agreement with experimental results. Separately from transition problems, the flow has also high swirling velocity components with significant gradients of acceleration at the inner region of the rotor, which make the solution more complicated to solve and need extra iterations in order to achieve a good convergence solution. Convergence is an important issue in CFD because of the iterative nature of the solution, and it can give evidence of a well posed model indicating some physical facts, for example a turbulent flow will not convergence easily with a laminar approach or vice versa. Simulation with very low flow coefficients do not show convergence because physically the flow would go in outward radial direction and the turbine would work a with big zones of ventilation when the angular speed is maintain constant. Additionally, there is no unification of the Reynolds number and dimensionless number presented by several researches. The numbers reported in this work can be converted with flow

REFERENCES

1. Vincent Domenic Romanin. Theory and Performance of Tesla Turbines,University of California, Berkeley, 2010
2. M. C. Breiter and K. Pohlhausen. Laminar Flow Between Two Parallel Rotating Disks. Aeronautical Research Laboratories, Wright-patterson Air Force Base, Ohio, 1962.
3. Carey. “Assessment of Tesla Turbine Performance for Small Scale Rankine Combined Heat and Power Systems”. In: Journal of Engineering for Gas Turbines and Power
4. Combined Heat and Power. Tech. rep. International Energy Agency, 2008. -dimensional roughness effect on microchannel heat transfer and pressure drop”. In: International Journal of Heat and Mass Transfer
5. R. T. Deam et al. “On Scaling Down Turbines to Millimeter Size”. In: Journal of Engineering for Gas Turbines and Power
6. Energy and Environmental Analysis Technology Characterization: Microturbines. Tech. rep. Prepared for EnvironmentalProtectionAgency,2008.url:www.epa.gov/chp/documents/catalog_chptech_microturbines.

AUTHORS PROFILE

Ashutosh Jain, SRM Institute of Science and Technology CSE-3D
RA1511003020254

Sunita Jana, SRM Institute of Science and Technology CSE-3D
Ra1511003020209

Sneha Shiju, SRM Institute of Science and Technology CSE-3D
RA1511003020211

Tejas Kumar, SRM Institute of Science and Technology CSE-3D
RA1511003020222