

Design and Analysis of INVELOX

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Abstract :

A wind delivery system named INVELOX is suitable to harness the wind power. It has a striking feature as the capability of incorporating multiple wind turbine generator system in the Venturi section. The feature of elimination of tower mounted turbine is one of its most innovative feature. And second feature is that INVELOX captures wind flow through an omni directional intake or multi-unidirectional intakes and thereby there exists no need for a passive and active yaw control to orient the wind turbine. This study focuses on understanding the physics of fluid flow in and around the INVELOX delivery system. Increasing the capability of existing system to capture more amount of air by modifying the inlet configuration is the aim of this work. CFD analysis and corroboration with the experimental results has been done. According to studies of different inlet configurations it is obtained that the results are promising for generating more wind power as compared to the earlier configuration.

Keywords-*INVELOX, WINDENERGY, OMNIDIRECTION.*

I. INTRODUCTION

INVELOX stands for increased velocity. A new concept in utilizing the low speed wind is defined. INVELOX is the innovation of Daryoush Allaei supported SHEERWIND in developing and installing for experimental purpose. INVELOX consists of 5 main parts;

- 1) Intake with guide Blades.
- 2) Double nested cone (Wind channeling.)
- 3) Wind Concentrator.
- 4) Venturimeter and wind power conversion system.
- 5) Diffuser.

Free stream wind is conducted by the intake section due to its geometrical features into the tapered double nested cone where the wind is channeled. Further the wind is directed into the wind concentrator, due to reducing cross section at the Venturi wind gets naturally accelerated where the wind turbine is placed and power is extracted. Air is allowed to the environment by the diffuser safely. The magnification of wind velocity is defined by the term speed ratio. Speed ratio is defined as the ratio of average velocity of wind at the Venturi cross section to the free stream wind speed.

II. RELEVANCE

INVELOX is a wind delivery system used for wind power harnessing. It is used utilization of wind energy for the wind turbine for various applications. Initially wind energy was used for sailing boats, circulating the outside air in the houses for cooling purpose, also used for agricultural purposes for cleaning harvested grains.

III. LITERATURE REVIEW

Daryoush Allaei et.al ^[1], studied the utilization of wind energy for the wind turbine for various applications. Initially wind energy was used for sailing boats, circulating the outside air in the houses for cooling purpose, agricultural purposes for cleaning harvested grains.

Vinay C D ^[2], studied the CFD analysis and validation with the experimental results.

Anand L.Solanki ^[3], studied design modification & analysis for venturi Section of INVELOX system to maximize power using multiple wind turbine.

Amit.M.Ransing et.al. ^[4] studied Innovation has helped in building massive devices for harnessing wind energy, and better example of it is INVELOX. Till now we all are familiar of traditional wind turbines but we are unaware of its drawbacks, But INVELOX technology had succeeded in overcoming all the drawbacks of this traditional wind mills and is promising a better energy generation. It does not require site selection unlike in case of traditional wind. This INVELOX system can be retrofitted to residential building and factories.

Manan.D.Patel ^[6] studied "Performance Improvement of Modified Omnidirectional Ducted Wind Mill.

Allaei D ^[7], studied using CFD to predict the performance of innovative wind power generators. And also studied description of a new concept in wind power and its performance evaluation.

IV. CONCLUDING REMARK FROM LITERATURE REVIEW

1. It is evident from the literature that the increased velocity applied to the system gives appreciable change in the performance.
2. Most of the research work is focused on the effect of increased velocity in the power generation phenomenon.

V. PROBLEM STATEMENT

It is intended to design, develop, and analysis of invelox using appropriate software

VI. SCOPE OF WORK

INVELOX can be installed in the sites which are not suitable for traditional wind mills.

It can be very helpful in militaries, since there are sources of energy.

With proper planning this technology can also serve the purpose of ventilation in the places where there is scarcity of ventilation.

Irrespective of velocity of wind this technology can be installed in places with low velocity (2 m/s) to extremely high velocity like in typhoon conditions too.

VII. DESIGN AND ANALYSIS OF INVELOX

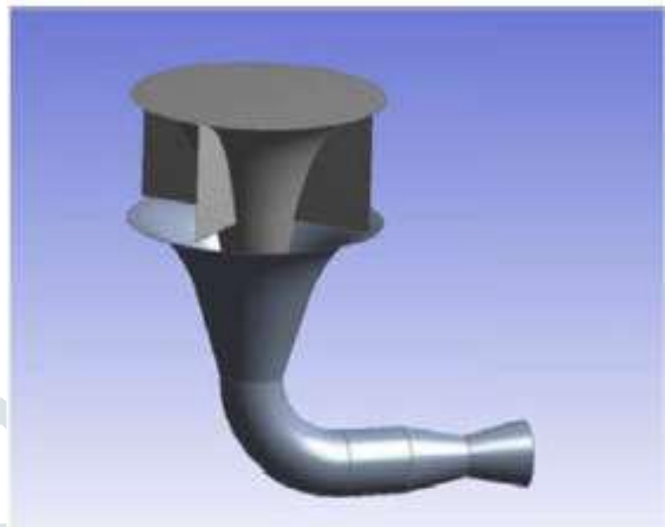
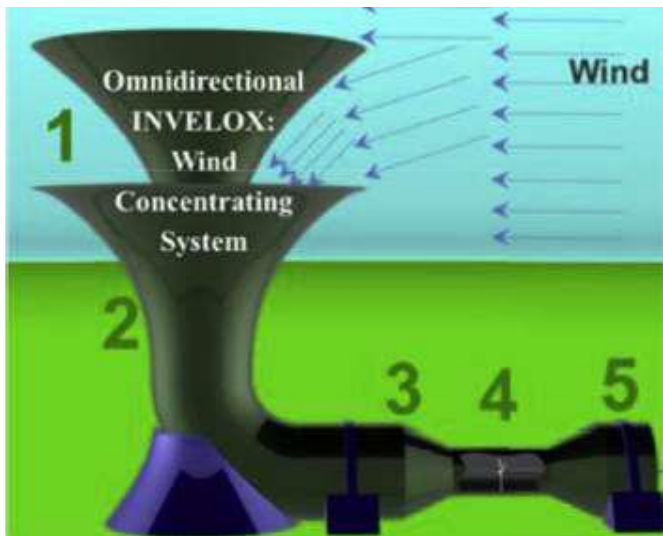


Fig.1 Schematic of INVELOX

Fig.2 INVELOX with 4 Guide Blades

- 1) Intake
- 2) WindChanneling
- 3) Wind Concentrator
- 4) Venturimeter plus Wind Power Conversion System
- 5) Diffuser

INVELOX can overcome the problems faced by traditional wind turbines such as;

- 1) Visual impact
- 2) High cut-in speeds
- 3) Distance from grid
- 4) Icing
- 5) Turbine reliability
- 6) Impact on wild life such as birds.

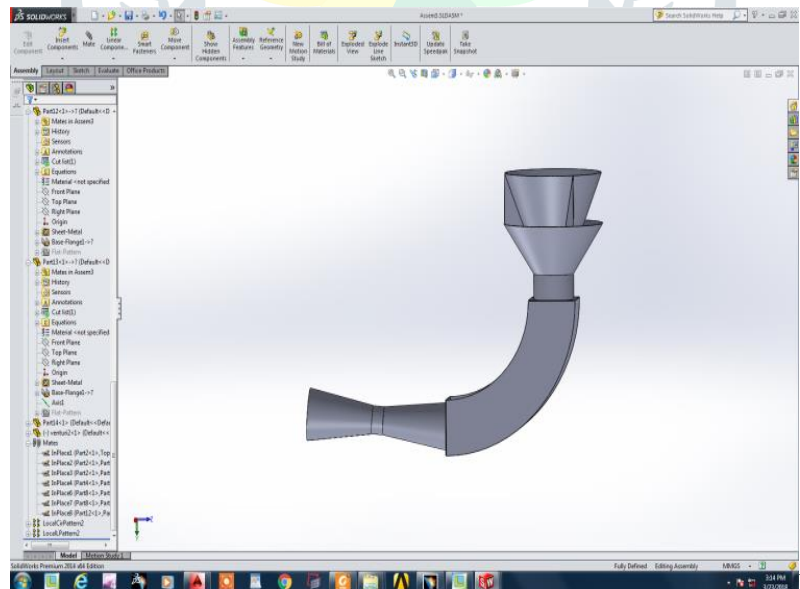


Fig.3 Cad model of INVELOX

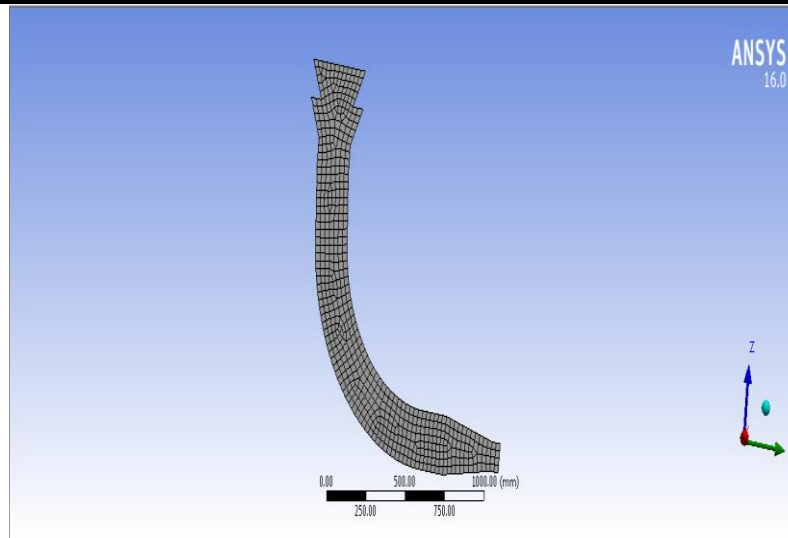


Fig. 4 Meshing of INVELOX

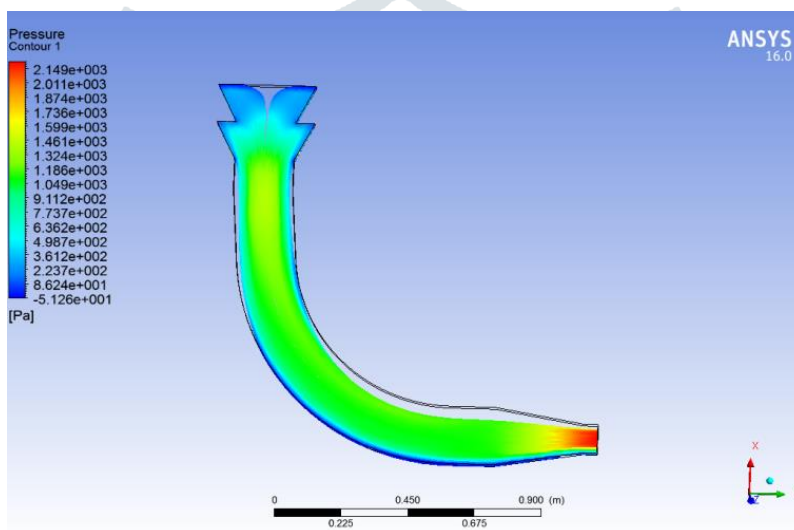


Fig.5 Pressure Analysis of INVELOX

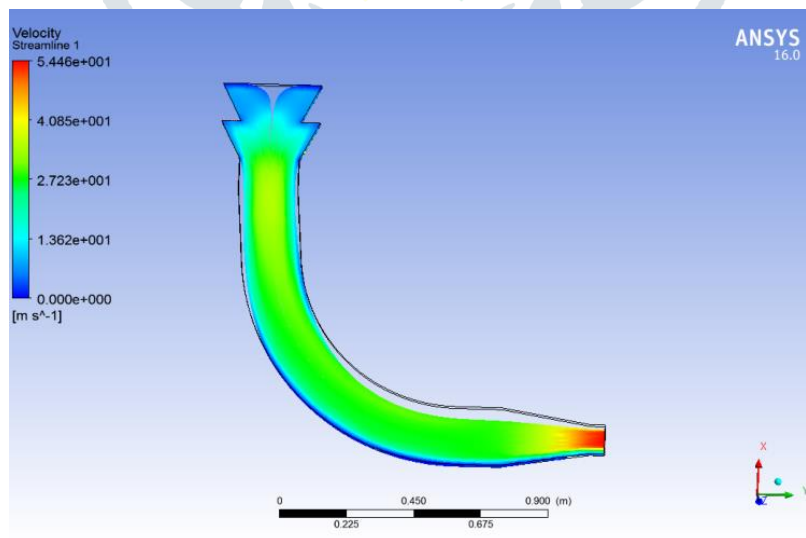


Fig.6 Velocity Analysis of INVELOX

FEA RESULTS :

Below analysis is done with the help of CFD, considering following parameters such as ;

Actual wind speed (M/s)	pressure (Bar)	Avg. V(M/s)of Invelox	Power .P (Watt)
V1	P	V2	P
7.5	1	12.54	1146.089

VIII. CONCLUSION

The fluid flow analysis is carried out in the present work using the commercially available CFD tool ANSYSFLUENT, along with the validation. Hybrid mesh was done. A successful validation for speed ratio is obtained with less than 3 % error. Following conclusions are made after studying the different cases:

- It is shown that INVELOX can be designed to capture and accelerate air using an omnidirectional intake.
- The system has low sensitivity with respect to the wind direction.
- The system gives satisfactory results for speeds up to 1 m/s.
- This configuration can be used for omnidirectional application.

IX. SCOPE OF WORK

- It could be placed on both agricultural, industrial estates and even in back gardens.
- The INVELOX can be such design and placed on the roof of house.
- INVELOX has developed several laboratory prototypes and full scale computer models and field testing has been initiated. Collaborating with industrial partners and U.S. military to formulate pilot programs.
- Power generation system.

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