Volume-1, Issue-2

SREEPATHY

JOURNAL OF MECHANICAL ENGINEERING

Published by
Department of Mechanical Engineering
Sreepathy Institute of Management and Technology, Vavanoor
Palakkad - 679 533

January 2015

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Automated Waste Water Treatment Plan,*Sumith Mohan, Thomas, Shinu Samuel, Shafeeq*
Automated Waste Water Treatment Plants in the pharmaceutical industry are used for purifying the water content by removing excessive waste from it. In addition to this, these water treatment plants are customized according to the specifications of the clients and are offered at suitable prices .They offer excellent functionality, good purifying capacity and equipped with high precision components. **35**

ATMOSPHERIC WATER GENERATOR

SarathBabuTS, SatheeshKU, Shabeer, ShibinBalan, SivaPrasad
Seventh Semester, 2011 Admission
Department of Mechanical Engineering,
Sreepathy Institute of Management & Technology, Vavannoor, Palakkad, India-679533

Abstract— **An atmospheric water generator is a device that extracts water from humid ambient air. Water vapour in the air is condensed by cooling the air below its dew point temperature. Atmospheric water generator are useful where pure drinking water is difficult or impossible to obtain, because there is almost always a small amount of water in the air that can be extracted. In cooling condensation type atmospheric water generator, a compressor circulates refrigerant through a condenser and then an evaporator coil which cools the air surrounding it. This lowers the air temperature to its dew point, causing water to condense. A controlled-speed fan pushes filtered air over the coil. The resulting water is then passed into a holding tank with purification and filtration system to help keep the water pure and reduce the risk posed by viruses and bacteria which may be collected from the ambient air on the evaporator coil by the condensing water. The rate at which water can be produced depends on relative humidity, ambient air temperature and compression ratio of the compressor. Atmospheric water generators become more effective as relative humidity and air temperature increase. This means they are relatively inefficient when located inside air-conditioned offices.**

Keywords: Water generator, cooling condensation, relative humidity

I. INTRODUCTION

Water is becoming an increasingly important issue in the developed world. But this issue is nothing new for other, less developed nations. For centuries, clean drinking water has been hard to come by for many populations, especially the poor. In some areas, water may be available, but it's often disease-ridden, and drinking it can be fatal. In other areas, a viable water supply is simply not available at all. A 2006 United Nations report estimated that as much as 20 percent of the world's population doesn't have access to clean drinking water. This leads us to wonder: If we need it so badly, why can't we just make it?

"Water can live very well without people, but we people can only live for 3 days without water." This quotation already contains the whole truth about the importance of water as the most essential form of nourishment for all forms of life. But humanity treats water as if it were an infinite resource. Only around 3% of the total amount of water available in the world is fresh water. Most of this is only available in the form of ice or subterranean water which cannot be exploited by us so that all in all, only around 0.2% of all the water in the world can be used for drinking water. Water cannot be reproduced; it is recycled in a closed circuit. The human body is 2/3 water, and this fact alone shows just how important healthy drinking water is for us. Every cell in our bodies needs water to function properly. Without water there would be no people, no animals, and no plants.

Thus there exists a necessity to find a solution for the increase in demand for water. A machine which can generate water from atmospheric air is water generator.

II. PROPESED SYSTEM

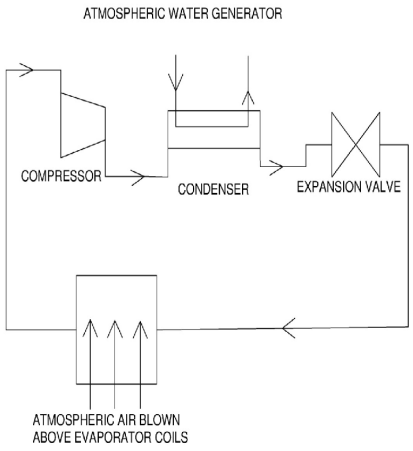

Figure 1- schematic diagram of AWG

III.WORKING PRINCIPLE

It works on the principle of vapour compression cycle. Evaporator coils are used instead of evaporator. On blowing air through the surface of evaporator coils, the water vapour in the air condenses when the temperature of air reaches dew point temperature.

IV. CONCLUSIONS

Scope of this project is that this machine can be sold as a product in the market so that water can be generated from atmosphere within the households. The feasibility of water generator in Kerala is high since the humidity is high in atmosphere. Hence water generator will be more suitable for our conditions. Thus this project will find a solution for water scarcity. Moreover the nearby surrounding gets a cooling effect.

First of all, a refrigerant which has a low boiling point is to be selected. Next step is to design a compressor which would compress the refrigerant to the required pressure. Then the temperature rose during the compression of the refrigerant is brought back to the temperature just before the compression by passing through an inter cooler. Inter cooler is to be designed such that the refrigerant at the outlet of the inter cooler is brought back to temperature of the refrigerant just before compression. Then the refrigerant is to be expanded such that the temperature of the refrigerant is below dew point temperature of ambient air. The expansion valve is to be designed such that the pressure after expansion is atmospheric pressure and temperature is considerably below dew point temperature of atmospheric air. Then atmospheric air is made to pass over the refrigerant in the coil. Thus water vapor in the air gets condensed from air.

Expected result from this project is that considerable amount of water can be condensed from the atmospheric air and if possible cooling effect can also be obtained in the surrounding area.

ADVANCED BUS SAFETY FEATURES

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***Abstract*—Present condition of roads are bad. Day by day accidents are increasing at a high rate. So there is need for some modification in the safety measures of vehicles. After an accident occur, we need to reduce its severity. It is done by providing new safety measures. Automatically the emergency exit is opened, also if in case of fire, it is extinguished. In our project we are adding these features to make the vehicle safer. The intention is to reduce the cost and improve the safety features in a bus. The additional safety features introduced, helps in reducing the severity of accidents to a greater extent**

I. PROPOSAL

From the above results, we can see that the amount of accidents are increasing at a high rate. So there is need for some modification in the safety measures of vehicles. After an accident occur, we need to reduce its severity. It is done by providing new safety measures. Automatically the emergency exit is opened, also if in case of fire, it is extinguished. Also a system to make emergency calls for rescue in case of accidents is introduced. In our project we are adding these features to make the vehicle more safe. Automatic stairs controlling mechanism is also introduced to make it suitable for handicapped people to escape in case of an accident. In our project, we are adding these features to make the vehicle more safe.

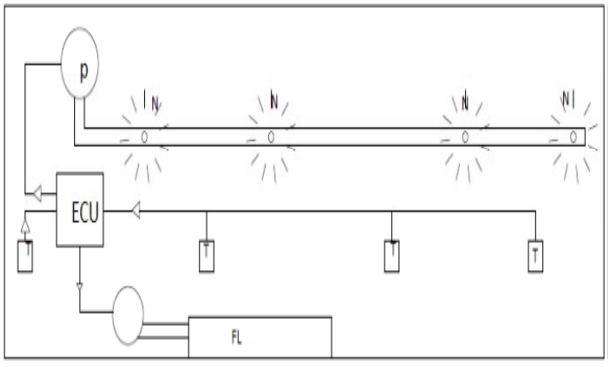

Figure 1 - Automatic fire extinguisher

T- temperature sensor
CU- control unit
P-pump
FL-fuel line
EC-extinguisher cylinder
N-nozzle

The temperature in the bus compartment is sensed by the temperature sensors and is sent to Control unit (CU). It then compares the measured value with respect to the reference value, if the measured value increases above reference value, CU then sends signal to Extinguisher unit. i.e, fire extinguisher and pump. The pump pumps water through the nozzle to the compartment and the fire extinguisher rejects carbon dioxide into the fuel line

A vibration sensor is provided which detects the vibrations and sends these signals to the control unit. The control unit then compare the measured value with respect to the reference value, if the measured value is larger than the reference value, the control unit then sends signal to the solenoid lock which actuates the emergency exit. Thus the emergency exit gets opened.

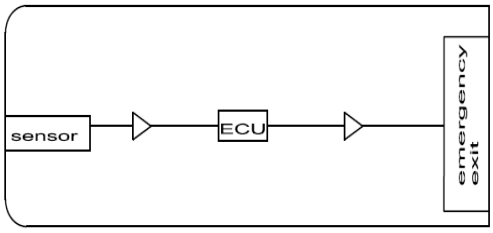

Figure 2 - Automatic Exit System

II CONTROL UNIT

Arduino is a tool for making computers that can sense and control more of the physical world than your desktop computer. It's an open-source physical computing platform based on a simple microcontroller board, and a development environment for writing software for the board. Arduino can be used to develop interactive objects, taking inputs from a variety of switches or sensors, and controlling a variety of lights, motors, and other physical outputs. Arduino projects can be standalone, or they can communicate with software running on your computer (e.g. Flash, Processing, MaxMSP.) The boards can be assembled by hand or purchased preassembled; the open-source IDE can be downloaded for free.

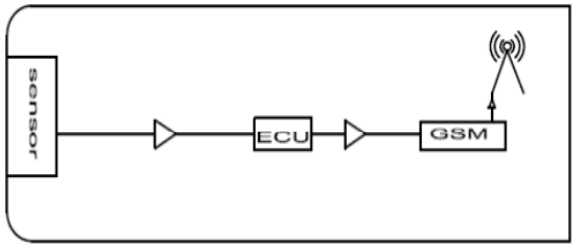

Figure 3 - Automatic Emergency Calling

III. CONCLUSION

Safety features in buses are poor compared to European standard buses in India. By comparing with European standard buses, we are implementing new safety features in Indian buses at low cost. By introducing new safety features in our project, we are expecting reduction of an accident's severity.
We have finished the selection of sensors, control unit, pump, electronic lock and other accessories.

COMPRESSED AIR ENGINE

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Abstract— **As the world is pressed with the verge of energy and fuel crisis and accompanied by pollutions of different kinds any technologies that bring solution to this crisis is considered as a bounty. One of such solution is the development of a new engine called as compressed air engine which does not require any of the known fuels such as petrol, diesel, CNG or LNG. The engine works only using compressed air. This will help to clear all types of pollutions caused by the above mentioned fuels. Since the engine runs only on high-pressure air the exhaust is free of any combustion products. No heat is generated since there is no combustion. Since no combustion and heat generation cooling system is not required. The above mentioned concept can be applied to develop a proto-type of the engine.**

Keywords: compressed air engine, pollution.

I. INTRODUCTION

Paralysis from the Transportation is an extremely important element in day-to-day functioning of countries worldwide. Without transportation the entire world would literally, come to a standstill. It is virtually impossible to imagine life without some form of transportation privately owned car, motorcycles, trucks, public buses and subways. However we know transportation though necessary it is causing harm to our environment and to our health. The transportation we use requires fuel. These fuels are refined by-products of oil, a fossil fuel, diesel which is mainly used for heavy duty application. From this we can say that our transportation system depends 90 percentages on oil and 50 percentages of them are imported. Use of alternative fuels to power our car, buses and trucks would significantly reduce the dependence on foreign oil. Other pressing issue with our use of oil is that it is finite resource. This means that it cannot be regenerated and once we have depleted all known reserves that will be the end of our ability to use gasoline. It is predicted that at this time, we have approximately 35 to 40 years left of oil, based on current usage figures. When the comparison is made with battery powered engine air is favorable because of high energy density, low-cost and long service life. With the growing demand of transportation and also being conscious about the environment, this technology can be implemented to develop a zero-emission engine. Many technologies were developed, like using solar power to drive an automobile, but the initial investment for such technologies was high. other clearance and more abundant fuel sources. The principle of supply and demand suggests that hydrocarbon supplies diminish. Price will fall. Therefore higher price will lead to increased alternative, renewable energy supplies as previously uneconomic sources become sufficiently economical to exploit. Artificial gasoline and other renewable energy resources currently require more expensive production and processing technologies than conventional petroleum reserves, but may become economically visible in the near future.

The concept of compressed air vehicle (CAV) will definitely give a solution to problems that are en-countered by using fossil fuels. Developing an engine using this technology would give technical as well as economic benefits.

II CONCEPT

The concept for our project CAPV was taken from the ideas of a French automobile firm Motor Development International (MDI). Motor Development International is a French company designing compressed air car prototypes marketed under the title “the Air car”.

2.1 PRODUCTION HISTORY

- 2000-2009: Production in France was claimed to be starting in the late 2000 and at frequent intervals, in several countries.
- 2003: The Eolo car is a version of the air car that was to be manufactured in Italy in 2003, but it failed to get into production
- 2009: There are now 50 fabrications and distribution license signed in the world. Some of the countries that signed agreements include France, New Zealand, Israel, South Africa, etc. Zero pollution Motors would like to make MDI in Colombia, Peru, Ecuador and panama.
- 2011: Mr. Vencat has said that manufacturing plants in the United States will open in late 2010 or year, with first possibly located in Newburgh New York.

2.2 MDI’S COMPRESSED AIR TECHNOLOGY

Unlike petrol or diesel engines, the MDI technology does not use any form of internal combustion. Instead it incorporates four key breakthroughs.

- First, the use of compressed air as energy carrier and storage medium. Compressed air is a clean, low cost and efficient form of energy storage. MDI uses around 300 bars in carbon fiber composite storage cylinders, compressed air is used at 30bar or less to push piston In the MDI engine.
- Second, the primary energy input is taking place outside the engine by the heating of gas at constant pressure results in expansion.
- Third, the MDI Active Chamber(incorporating two pistons per modular engine head)

The MDI Active chamber enables the energy efficiency of an engine, relative to an internal combustion engine, to be more than doubled.

Fourth, “Cool Combustion” using Giant Magneto-Caloric Effect to drastically cool the air intake. The use of GMCE, dubbed “cool combustion” by MDI, aims when implemented, to achieve further substantial energy efficiency gains. Much less work is required to compress to 30 bar the substantially cooled air. The drastic cooling of the air also substantially reduces the temperature of the primary energy input at the level of the heater combustor to below 350^0C. This means that biofuel requirements are greatly reduced. It also means that wide range of other resources of relatively low-grade e heat can be used, including the advanced form of thermal solar.

MDI 4-cylinder CAE

The above engine use fully configured MDI engine combines the four breakthroughs with the use of heat exchangers enabling solar energy from both direct thermal solar and also from ambient heat stored in atmosphere.

III WORKING PRINCIPLE

Compressing a gas to a small space is a way to store energy. When the gas expands again, that energy is used to do work. Compressed air which is the energy source is stored in the tank with the help of an external aid. The storage tank consists of a safety valve and a delivery valve. Initially the piston is bought into the TDC. When air is supplied into

the engine with the aid of the delivery valve the air pushes the piston to BDC.

Completion of work-PHASE 1

As for the required prototype to be constructed, certain studies were made. Detailed literature survey on conventional engines is done .Discussed the working outline of the project. Required modification on the conventional engines was studied. Size of the storage tank and bore clearance were estimated with the help of mathematical approach.

Schematic Diagram

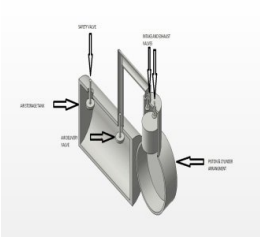

Figure 1: Schematic diagram of compressed air engine.

The proto-type mainly consists of an air storage tank consisting of a safety valve and delivery valve. The air is supplied into the engine. The engine is a conventional four stroke engine which is converted into a two stroke engine by the modification of the valve timing.

MACHINING CALCULATION

Actual Dimension of The Engine

Bore of the cylinder = 50mm.

Stroke Length = 50mm

Capacity of engine = Area x Stroke Length

$= \frac{\pi}{4} \text{ X } D^2 \text{ X Length}$

$= 98125 mm^3$

= 98 Cubic Centimeter

= 0.098 Liter

Modified Dimension Of The Engine

Bore Clearance = 0.5mm

Modified Bore of Cylinder = 50.5mm

Stroke Length = 50mm

Modified Capacity of Engine = Area X Stroke Length

$= \frac{\pi}{4} \text{ X } D^2 \text{ X Length}$

$= 100097.31 mm^3$

= 100 Cubic Centimeter

= 0.1 liter

STORAGE TANK CAPACITY

The storage tank used here is the air storage tank of a bus this selection is done with intention in reduction of weight of whole system.

Diameter of storage tank = 200mm

Length of the storage tank = 607mm

Volume of the storage tank = Area X Length

$= \frac{\pi}{4} \text{ X } D^2 \text{ X Length}$

$= 19059800 mm^3$

= 19 Liters

INVENTOR DRAWINGS

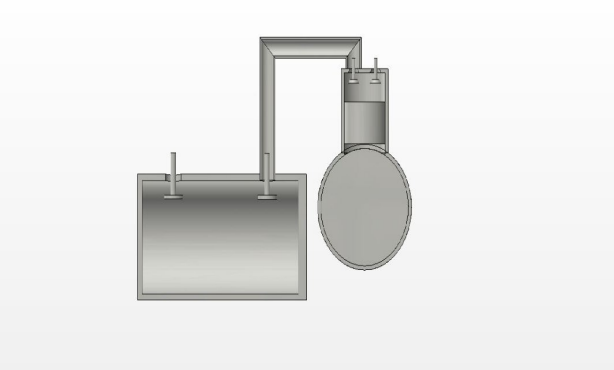

Figure 2 : Front View

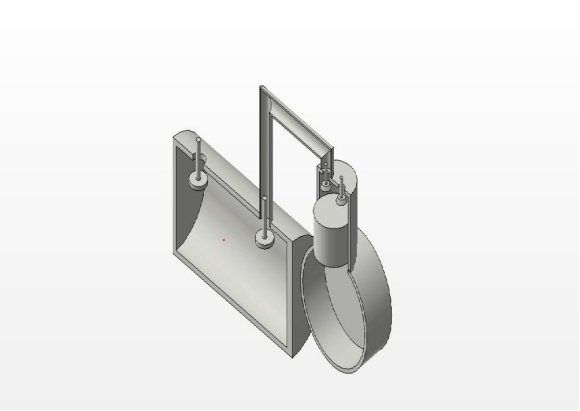

Figure 3 : Sectional View

The compressed air stored in the tank is supplied to the piston cylinder arrangement. The expanded air coming out of the device will be at low temperature.

IV ADVANTAGES

Zero emission engine
Heating of engine does not occur
Exhaust air can be used for air conditioning purpose
Longer service period for engine oil
Economical fuel when compared with gasoline
Easier maintenance

V CONCLUSIONS

The technology of compressed air engine is not new. In fact, it has been around for years. Compressed air technology allows for engines that are both non-polluting and economical is still our project compressed air powered engine may not be the first of its kind. It certainly needs refinements. Though poor in efficient is still attractive as renewable source of energy is the power source. It is a viable option for clean and efficient local transportation.

DESIGN AND FABRICATION OF ELECTROCHEMICAL MACHINE

Nikhil AP, NithinRaj, Nithul , Pranav, RahulRaj, Rajath
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Department of Mechanical Engineering,
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***Abstract*— Electrochemical machining (ECM) is a method for precision machining process in which material removal is take place by an electrochemical process. It is normally used for mass production and for working extremely hard materials or materials that are difficult to machine using conventional method. Normally an ECM machine consist of an anode (work piece), a cathode (tool), with an electrolyte in the middle portion. A DC power supply is used for the power requirement; a pump is used for obtaining a continuous flow of the electrolyte to the machining surface. Our aim is to fabricate a low cost and operational friendly "ELECTRO CHEMICAL MACHINE."**

I. INTRODUCTION

Electrochemical machining (ECM) is a method for precision machining process in which material removal is take place by an electrochemical process. It is normally used for mass production and for working extremely hard materials or materials that are difficult to machine through conventional methods.

In electrochemical machining process material is removed by the mechanism of anodic dissolution during an electrolysis process. A DC voltage is applied across the inter electrode gap between pre shaped cathode tool and an anode work piece. The electrolyte flows at a high speed through the inter electrode gap. The anodic dissolution rate which is governed by faraday's law of electrolysis, depend on electrochemical properties of the metal, electrolyte properties and electric current supply.ECM generates an approximate mirror image of the tool on the work piece.

II. WORKING PRINCIPLE

In Electro chemical machining process, an electrolytic cell is formed by the anode (work piece) and the cathode (tool) in the midst of a flowing electrolyte. The metal is removed by the controlled dissolution of the anode according to the well known **Faraday's Law of Electrolysis**. When the electrodes are connected to about 20 volt electric supply source, flow of current in the electrolyte is established due to positively charged ions being attracted towards the cathode and vice versa. Current density depends on the rate at which ions arrive at respective electrodes which is proportional to the applied voltage, concentration of electrolyte, and gap between electrodes. Due to electrolysis process at the cathode, hydroxyl (negatively charged) ions are released which combine with the metal ions of anode to form insoluble metal hydroxides. Thus the metal is mainly removed in the form of sludge and precipitates by electrochemical and chemical reactions occurring in the electrolytic cell. This process continues like this till the tool has reproduced its shape in the work piece. This process is thus reverse of electroplating, but the metal removed from the work before being deposited on the tool is pumped in the flowing electrolyte. It is a production process for machining conducting materials and gives highest chip removal rates with reasonable surface finish on repetitive work. By this process, even hardest possible materials can be machined. This process is ideally suited for the production of deep holes and profiled cavities in electrically conducting materials.

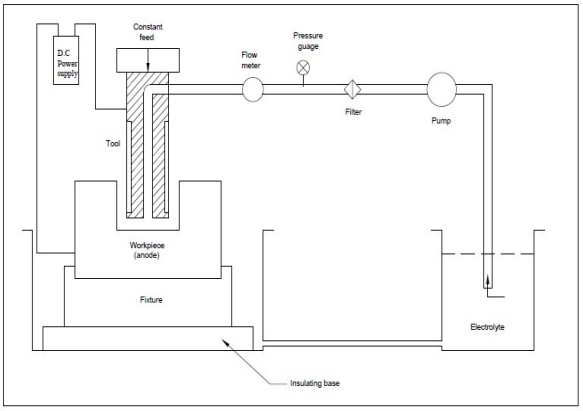

Figure 1: Electrochemical Machining Equipment

III. CONCLUSIONS

Fabrication of ECM equipments is an attempt to fabricate a low cost and user friendly ECM machine. An extensive survey is conducted by the help of which we have selected the material, tool (cathode), work piece (anode), electrolyte, pump and electric power source. The literature survey related to our project are collected and studied.

MAGNETIC GEAR BOX SYSTEM FOR VERTICAL WIND MILL

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***Abstract*— Magnetic gearboxes are contactless mechanisms for torque-speed conversion. They present no wear, no friction and no fatigue. They need no lubricant and can be customized for other mechanical properties as stiffness or damping. Additionally, they can protect structures and mechanisms against overloads, limiting the transmitted torque. Wind mill gearboxes conventionally use mechanical gears. But these needs to be properly maintained, lubricated during regular intervals and there are chances for corrosion. In this project we are designing a magnetic wind mill gear box which nullifies the disadvantages of mechanical type gear box and producing electric power using an alternator.**

I. INTRODUCTION

MAGNETIC GEARS WERE PROPOSED ALMOST A HUNDRED YEARS AGO. THE ABSENCE OF CONTACT AND WEAR BETWEEN TEETH SEEMED A WORTHY FEATURE TO PROMPT THEIR DEVELOPMENT, BUT LOW EFFICIENCY, DIFFICULTIES WITH MANUFACTURING TECHNIQUES, AND COST WERE STRONG HANDICAPS. IT WAS AT THE BEGINNING OFTHIS CENTURY THAT ATTENTION HAS BEEN PAID TO THEIR DEVELOPMENT, USING NEW MAGNETIC MATERIALS WITH HIGHER MAGNETIZATION OR PERMEABILITY, NEW PRECISE MANUFACTURING TECHNIQUES, AND ADVANCED MAGNETOMECHANICAL MODELING TOOLS.

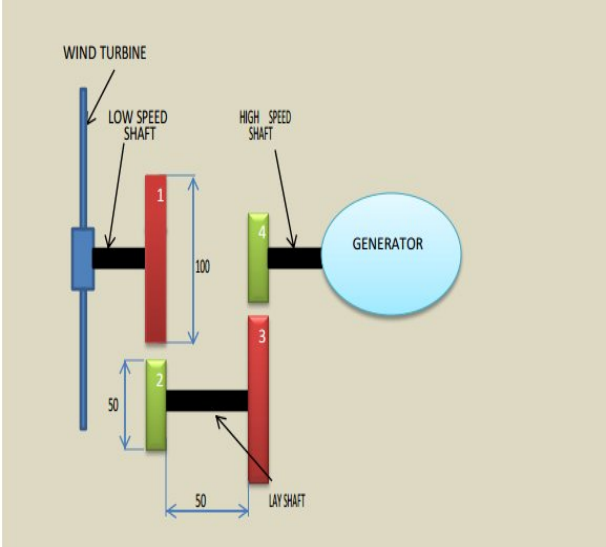

FIGURE 1 - BLOCK DIAGRAM

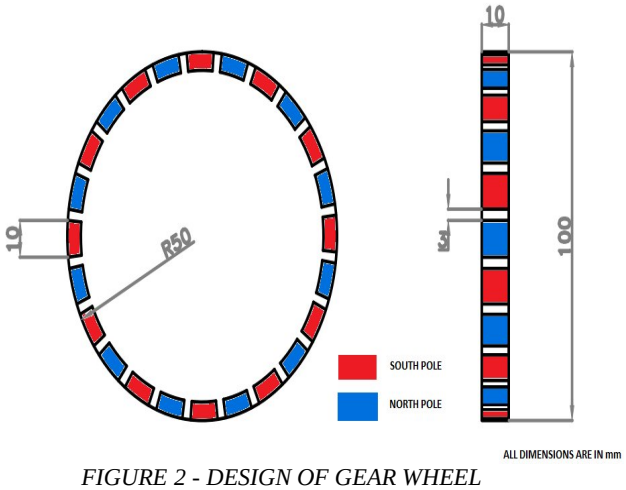

FIGURE 2 - DESIGN OF GEAR WHEEL

II.WORKING PRINCIPLE

The working principle of magnetic gear power transmission is ,"The like poles of magnet repels each other and unlike poles attract each other."

The wind velocity is trapped by the blades and converted to kinetic energy. With this kinetic energy the blades rotate and transfer power to the rotor shaft or low speed shaft. At the end of low speed shaft is a magnetic gear wheel which transfer the power to lay shaft through a magnetic pinion connected to lay shaft. The rpm is thus doubled. A magnetic gear wheel at the other end of the layshaft transfer power to the smaller magnetic pinion which is fixed over the generator shaft. Thus the rpm of the rotor shaft gets four times added as it reaches generator shaft. With the help of generator power is produced and stored in a battery.

III.CONCLUSION

There are Several reasons for consideration of this project. Magnetic gears has Non-contact elements, no friction between gears, Highly efficient, multiple magnetic poles engaged,Utilization of peak torque, Input and output shafts can be isolated, Increased temperature range, no elastomeric seals, Inherent overload protection, Increased tolerance of misalignment.

FINITE ELEMENT ANALYSIS OF CYLINDRICAL INTERSTAGE STRUCTURES FOR FUTURE LAUNCH VEHICLES

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***Abstract*—Thin shell structures find wide applications in many branches of engineering. Examples include aircraft, space shuttles, launch vehicle tankages for bulk storage of solid and liquid propellants, pressure vessels, pipelines etc.. The design involves the determination of stresses and deformations produced by imposed loads on the structure. The minimum weight criteria is important from the view point of achieving higher structural efficiency. The structure is subjected to buckling , a physically observed failure mode that is associated closely to load carrying capacity, when it is in service. The buckling strength of thin walled cylinders are to be determined and depending upon the material and geometry, the compressive stresses may lead to any of the failure modes like elastic buckling, elastic plastic buckling and plastic collapse.**

The different types of closed loop interstage structures are monocoque, stiffened shells and Isogrid type. The three-dimensional modeling of different types of closed loop structural configurations used for interstage structures along with its assembly with upper and lower stage are done in this project. Material widely used in aircraft, interstages and intertankages in aerospace vehicles are usually light alloy. Aluminum alloys like A7075, A2219, A2024 are termed as light alloys because they are light weight, as minimum structural weight is of paramount importance in aerospace vehicles. By the design criteria for launch vehicles, the optimum design is established by the selection of proper material having the least possible weight in carrying out the functions at minimum cost. The purpose of this report is to review the entire field of buckling of cylindrical shell structures to find the allowable stress and deformation under given load which is primarily accomplished by referring to reviews, scholarly articles, journals, books and study the load carrying capacities of shells under different loading mechanisms like torsion, axial compression and uniform lateral external pressure

This study of buckling of cylinders under various loading conditions can be regarded as the preliminary work of design of an interstage structure, by replacing Titanium alloy truss member by a closed loop cylindrical shell structure made of aluminium alloy in future launch vehicles. The types of loading conditions analysed in this work are those experienced by launch vehicles at some circumstances.

***Index Terms*— Interstages, launch vehicle structures**

I. INTRODUCTION

A launch vehicle, is transport medium which is designed to transmit a payload into a predetermined orbit around the earth or other planets. The structure is expected to function in hostile environments like high vibration, shock, high temperature and time varying loads. Launch vehicles are characterized by number of stages they employ, are often supplied with boosters which supply high thrust early on in the flight. Launch vehicle is a primary structure that comprises of motorcases/liquid tankages, Intertanks/interstages, Base shrouds, Nose fairings/Heat shields, Appendage structures etc. and are broadly classified as primary load bearing and secondary/appendage structures. Primary structures are generally designed against limit load/deflections and they are intended to provide a load transfer path during the actual service viz Motor cases, Interstages, Propellant tanks, thrust frame/structures, nose fairings etc. These primary/secondary structures are classified into pressurized and non pressurized structures and depending on service environment of these structures it is further classified into heated/hot structures and cold structures.

Depending on the type of load and geometry, the structural configurations of interstage structures are chosen. The types of structural designs are monocoque, sheet stringer construction, closely stiffened structure, honeycomb structure and isogrid type of structure, as shown in the figure. So the choice is governed by the load/geometry and functional demands of the user.

In general design, governing loads in the launch vehicle are primary flight loads that are wind induced loads, aerodynamics induced loads, propulsion induced loads like internal pressure, acceleration/thrust etc., propulsion-structure interaction loads POGO, fluid structure interaction, Thermo-elastic forces. In a launch vehicle, nose fairing is to provide an aerodynamic surface, giving minimum resistance at the same time providing a protection from high temperature flow to the payload. Propellant motor cases are generally axi-symmetric monocoque structures having cylindrical portion with hemispherical/ torispherical domes subjected to internal pressure as predominant loading.

II. LAUNCH VEHICLES BY ISRO

Launch vehicle structure is considered to be one of the most sophisticated structural systems. ISRO has made considerable progress in the field of launch vehicle from initial days in the late sixties. It has 3 class of launch vehicle to meet its requirement. It has started with sounding rocket RSR. It is made of full solid propellant and is launched every alternate week to study the atmosphere weather conditions. India launched SLV-3, the first launch vehicle which put a satellite in space orbit. It was later augmented as ASLV. The next launch vehicle is PSLV, having solid and liquid stages. Its main purpose is for carrying IRS group satellites, for remote sensing purpose. The next class of vehicle is GSLV, which fulfills all communication needs of the country. It uses solid, liquid and cryo propellants, as it has to carry the satellite into GSO orbit, which is 36,000km above the earth surface

Figure 1: Gslv Mk3 Launch Vehicle

A. Introduction To Buckling And FE Analysis Preprocessing

Buckling refers to the loss of stability of a component and is usually independent of material strength. This loss of stability usually occurs within the elastic range of the material. Buckling phenomena occurs when most of the strain energy which is stored as membrane energy can be converted to bending energy requiring large deformation resulting in catastrophic failure.

Cylindrical shells have been extensively used in all types of structures. They are subjected to various loadings both static and dynamic in nature. Amongst the most common types of loading are axial compression, torsion, lateral pressure and combination of both axial and lateral pressure, which is commonly seen in interstage structure that cause deformation of unacceptably large amplitude and could lead to loss of stability and collapse of the whole structure. To improve the load carrying capacity of the shells, they are stiffened in the axial and circumferential directions.

Titanium alloy truss structure is the existing interstage structure, which is very costly. During the separation of upperstage while take off of the flight clash occurs between the truss members. By design criteria of launch vehicles low cost material and low structural weight with good rigidity is to be implemented. So, truss is replaced by cylindrical shell structure made of aluminium alloy. Critical buckling loads is found out by finite element analysis using ABAQUS version 6.10-1 software under various loading conditions.

The various loading conditions are

1. Buckling of a cylindrical shell under the action of Uniform axial load.

2. Buckling of a cylindrical shell subjected to torsion

3. Buckling of a cylindrical shell under the action of Uniform External Lateral Pressure

4. Buckling of a cylindrical shell under combined action of axial and lateral pressure.

These loading conditions are applied to a standard model of a cylinder using ABAQUS software and numerical results are validated by the buckling load which is found analytically.

B. ABAQUS FINITE ELEMENT PACKAGE

ABAQUS is a general-purpose simulation tool, and can solve a wide range of engineering problems, including structural analysis and heat transfer problems.

The Abaqus suite has several parts, but only three were used in the current study: Abaqus/CAE, Abaqus/Standard, and Abaqus/Explicit. Abaqus/CAE is a graphical user interface (GUI) for pre-processing and post-processing a finite element analysis, Abaqus/Standard and Abaqus/Explicit are two different analysis solvers. These three parts are briefly described below

Abaqus/CAE is a graphical tool which allows an analyst to create and prepare a model for analysis and then view the analysis results. CAE is an abbreviation for Complete Abaqus Environment. Abaqus/CAE provides an analyst with tools to create a geometric model of the structure to be analyzed, give the model material properties and a mesh, and to setup an analysis in a way which allows the analyst to make small changes quickly without much hassle. The output database can be viewed in Abaqus/CAE, where pictures and graphs can be created.

Abaqus/Standard and Abaqus/Explicit are the two solvers in the Abaqus suite. Both solvers can handle nonlinearities in the materials, loads, and geometry. This is one of the primary strengths of Abaqus. However, each has its own uses, and particular features, so it is up to the analyst to decide which is best suited to his particular problem. Abaqus/Explicit determines the solution without iterating by explicitly advancing the kinematic state from the previous increment. Even though a given analysis may require a large number of time increments using the explicit method, the analysis can be more efficient in Abaqus/Explicit if the same analysis in Abaqus/Standard requires many iterations.

C. ISOGRID INTERSTAGE STRUCTURES

Isogrid structures are effectively used in space applications with the advantage of lower weight, compression load carrying cylindrical structures and higher structural efficiency. An Isogrid is an integrally machined shell structure having equally spaced triangular skin pockets with face sheet. The structure is characterized by face-sheet thickness (t), rib thickness (b), rib depth (d) and height of triangle (h). These parameters ensure simultaneous failure of Isogrid structure by local skin buckling, rib crippling and general instability. This pattern takes advantage of the simple

fact that triangular trusses are very efficient structure. It is found to be most efficient in resisting compression and bending loads. It is also a cost effective structure. Isogrid structures are effectively used in many aerospace applications such as Delta vehicle, Skylab and Space Shuttle to name a few.

Design Criteria

The Isogrid parameters which ensures simultaneous failure of Isogrid structure by 'General Instability', 'Skin Buckling' and 'Rib Crippling'.

1.General Instability

For a cylinder with L/R ratio ≤ 10 and subjected to combined bending and axial compression, the critical buckling load is given by

$Ncr(1) = c_0 E (t^2/R) \beta$, where $c_0 = 0.397$

2. Skin Buckling

The critical stress for skin buckling is given by

$Ncr(2) = c_1 E t (1+\alpha) t2/h2$, where $c_1 = 10.2$

3. Rib Crippling

The critical stress for rib crippling is given by

$Ncr(3) = c_2 E t (1+\alpha) b2/d2$, where $c_2 = 0.616$

For an optimum design, General Instability= Skin buckling= Rib crippling

D. FINITE ELEMENT MODELING AND LOAD CONDITIONS

This modeling is done using a certain package which is the numerical method of this project and is handled by ABAQUS version (6.10-1).This package has the ability to model both material and geometrical linearity's and non-linearity as per the need of the project. This package is used to study the buckling characteristics of shells at certain types of loading conditions.

The aerodynamic loads acting are:

(i) Axial loading

(ii) Torsional loading

(iii) Uniform lateral pressure loading

(iv) Combined axial and uniform lateral pressure loading

These are the loading conditions that will be modeled and analyzed in the package. This modeling and analysis is done to verify the theoretical values obtained from the equations.

In this FEA a standard shell is chosen for our analysis purpose. Over this shell all the loading conditions are modeled and analyzed. A comparative study also we have done using the package is that when the size of the standard shell is extended and the buckling load variation is accounted. The pattern of change in the buckling load with respective to the change in the length of the shell is studied in this project.

The specifications or the geometric details of the perfect shell models that will be used in the analysis for the axial and torsional loading conditions are given below.

- Young's modulus =70000 MPa
- Poisson's ratio = 0.3
- Thickness = 1mm
- Mesh Element size = 6.32mm

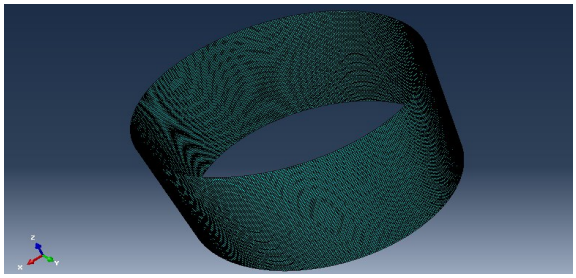

Figure 2: Finite Element Model

AXIAL BUCKLING

Buckling stress is given by

$$\sigma_{CR} = \frac{Eh}{a\sqrt{3(1-\vartheta^2)}}$$

Calculation of FEM buckling load:

Eigen buckling load , **Pcr =λ* Papp** where λ is the eigen value and Papp is the applied load

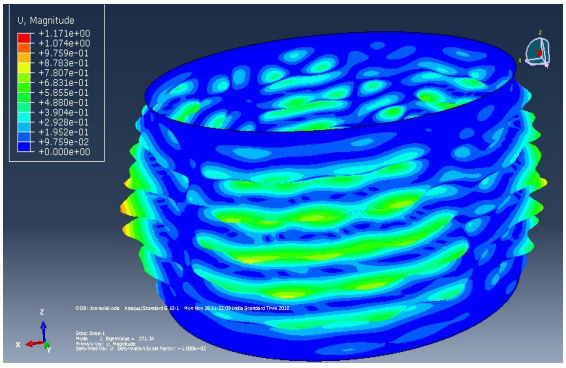

Figure 3: Axially buckled FE results

TORSIONAL BUCKLING

Buckling stress is given by

$$(1-\vartheta^2)\frac{\tau_{cr} l^2}{Eh^2} = 2.8 + \sqrt{2.6 + 1.4(\sqrt{1-\vartheta^2}\ \frac{l^2}{2ah})^{1.5}}$$

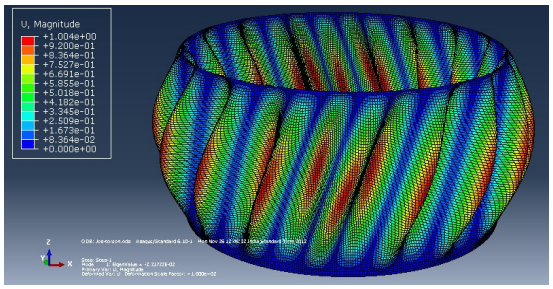

Figure 4: Torsionally buckled FE results

UNIFORM EXTERNAL LATERAL PRESSURE BUCKLING

Buckling stress is given by

$$\frac{(q_{cr} * a)}{E * h} = \frac{(\frac{\pi a}{l})^2 + n^2}{n^2} * \frac{(\frac{h}{a})^2}{12(1-\nu^2)} + \frac{(\frac{\pi a}{l})^4}{n^2((\frac{\pi a}{l})^4 + n^2)}$$

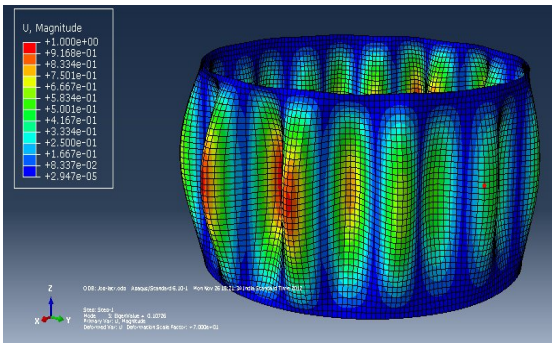

Figure 5: Laterally buckled FE results

COMBINED LOADED BUCKLING- BOTH AXIAL AND EXTERNAL PRESSURE

Buckling stress is given by

$$q_{cr} = \frac{Eh}{a} \frac{1}{n^2 + \frac{1}{2}(\pi a/l)^2} \{ \frac{1}{(n^2 + \frac{1}{2}(\frac{\pi a}{l})^2)^2} + \frac{h^2}{12a^2(1-\nu^2)} \left[n^2 + \left(\frac{\pi a}{l}\right)^2 \right]^2 \}$$

In this study of comparison between the buckling loads between the shells we see a considerable change on buckling load. The increment in length of the shell the buckling load of the shell is found to decrease or fall down considerably. This helps us to understand that the susceptibility of a shell to buckle under the same loading conditions is more as it length increases.

Along with this inference if we cross study the buckling due to uniform lateral pressure and buckling due to combination of both the uniform lateral pressure and axial loading, we can see that the buckling loads of each shell of respective lengths are found to be similar. This similarity in buckling loads helps us to understand that in buckling scenarios the buckling caused due to axial loads are found to be negligible when compared to buckling loads due to the uniform lateral pressure on the same shell

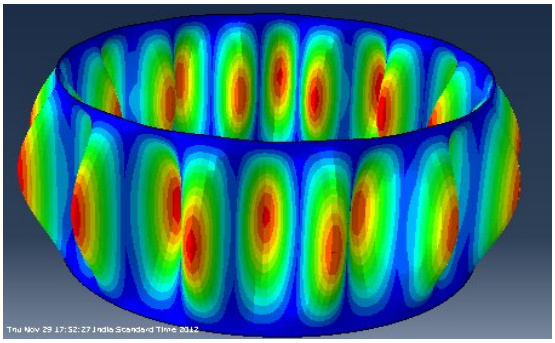

Figure 5: Combined loaded buckled FE results

CONCLUSIONS

The buckling load of the various models is analyzed and the analytical calculations of buckling loads for all the four loading conditions are discussed. In the case of axial buckling, buckling loads are almost same irrespective of variation in the length shows that the axial buckling loads are independent of the length of the shell and this matches with the conclusion made by Timoshenko[11] . It may also be concluded that the boundary conditions have negligible influence on the buckling load and hence it need not be considered as a contributing factor for reduction in the buckling loads. In the case of torsional buckling, it can be concluded that the shell is more venerable to buckling when the length is increased.

If we cross study the buckling due to uniform lateral pressure and buckling due to combination of both the uniform lateral pressure and axial loading, we can see that the buckling loads and FE results of each shell are found to be similar. This similarity in buckling loads helps us to understand that in buckling scenarios the buckling caused due to axial loads are found to be negligible when compared to buckling loads due to the uniform lateral pressure on the same shell. This helps to infer that in combined loading scenario the lateral buckling is dominant over axial buckling.

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PORTABLE MINI- LATHE

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***Abstract*— As now a day's micro-machining is becoming quite popular around the world our aim is to design a Mini lathe which is a miniature version of the standard bench lathe. It can used to shape small wooden, metal and nylon work pieces which are otherwise hard to reform into required shape. Another advantage of this mini-lathe is that it is quite portable. It may also be called as a table lathe or desktop lathe. This mini-lathe can be very useful in homes, basements, garages where a standard lathe can't be afforded easily.**

I. INTRODUCTION

Basically lathe is a machine tool which rotates the workpiece on its axis to perform various operations such as cutting, sanding, knurling, drilling, or deformation, facing, turning, with tools that are applied to the workpiece to create an object which has symmetry about an axis of rotation.

Lathes are used in woodturning, metalworking, metal spinning, thermal spraying, parts reclamation, and glass-working. Lathes can be used to shape pottery, the best-known design being the potter's wheel. Examples of objects that can be produced on a lathe include candlestick holders, gun barrels, cue sticks, table legs, bowls, baseball bats, musical instruments (especially woodwind instruments), crankshafts, and camshafts. Some of the basic types of lathe are: - Bench lathe, Turret lathe, Engine Lathe, Special purpose lathe etc.

II. MINI LATHE

Mini lathe which is a miniature version of the standard bench lathe. It can used to shape small wooden, metal and nylon work pieces which are otherwise hard to reform into required shape. Another advantage of this mini-lathe is that it is quite portable. This mini-lathe can be very useful in homes, basements, garages where a standard lathe can't be afforded easily.

PARTS OF A MINI LATHE

1. BED:-

The **bed** is a robust base that connects to the headstock and permits the carriage and tailstock to be aligned parallel with the axis of the spindle. This is facilitated by hardened and ground **ways** which restrain the carriage and tailstock in a set track. The carriage travels by means of a rack and pinion system, leadscrew of accurate pitch, or feedscrew. Manufacturers' installation instructions always specify that the bed must be 'leveled' as the first step in commissioning a lathe. The word 'level' in this context means 'free from twist or bend. Here the size of the bed is around 25*10 cm.

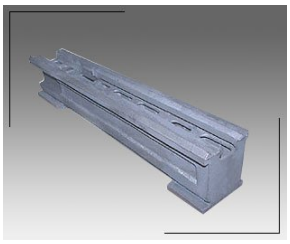

Fig 1 Bed

2. HEADSTOCK

The lathe Headstock used, at one time, to be called the "Fixed Headstock" or "Fixed Head", and the rotating shaft within it the "Mandrel". The headstock is normally mounted rigidly to the bed and holds all the mechanisms, including various kinds and combinations of pulleys or gears, so that the spindle can be made to turn at different speeds.

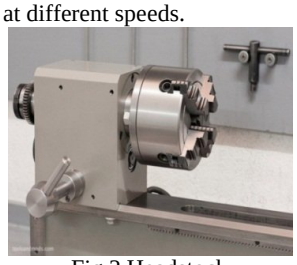

Fig 2 Headstock

3. CHUCK

A **chuck** is a specialized type of clamp used to hold an object, usually an object with radial symmetry, especially a cylindrical object. It is most commonly used to hold a rotating tool (such as the drill bit in a power tool) or a rotating workpiece (such as the bar or blank in the headstock spindle of a lathe). Some chucks can also hold irregularly shaped objects (ones that lack radial symmetry). In some applications, the tool or workpiece being held by the chuck remains stationary while another tool or workpiece rotates (for example, a drill bit in the tailstock spindle of a lathe). The chuck used here is a 2inch chuck.

Fig 3 Chuck

4. TAILSTOCK

The tailstock is a toolholder directly mounted on the spindle axis, opposite the headstock. The spindle does not rotate but does travel longitudinally under the action of a leadscrew and hand wheel. The spindle includes a taper to hold drill bits, centers and other tooling.

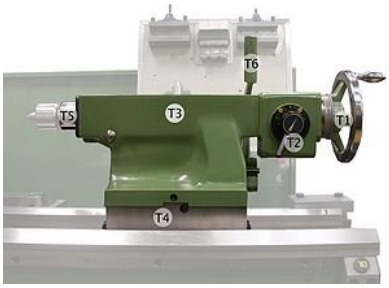

Fig 4 Tailstock

5. CARRIAGE

In its simplest form the carriage holds the tool bit and moves it longitudinally (turning) or perpendicularly (facing) under the control of the operator. The operator moves the carriage manually via the hand wheel or automatically by engaging the feed shaft with the carriage feed mechanism. This provides some relief for the operator as the movement of the carriage becomes power assisted. The handwheels on the carriage and its related slides are usually calibrated, both for ease of use and to assist in making reproducible cuts.

Fig 5 Carriage

6. CROSS-SLIDE

The **cross-slide** stands atop the carriage and has a feedscrew that travels perpendicular to the main spindle axis. This permits facing operations to be performed, and the depth of cut to be adjusted. This feedscrew can be engaged, through a gear train, to the feed shaft (mentioned previously) to provide automated 'power feed' movement to the cross-slide. On most lathes, only one direction can be engaged at a time as an interlock mechanism will shut out the second gear train.

Fig 6 Cross-slide

7. TOOL POST

(1) The tool bit is mounted in the tool post which may be of the American lantern style, traditional 4 sided square style, or in a quick change style such as the multifix arrangement pictured. The advantage of a quick change set-up is to allow an unlimited number of tools to be used (up to the number of holders available) rather than being limited to 1 tool with the lantern style, or 3 to 4 tools with the 4 sided type. Interchangeable tool holders allow the all the tools to be preset to a center height that will not change, even if the holder is removed from the machine.

Fig 7 Tool post

8. LEAD-SCREW

Originally termed a "master thread", or described as the "leading screw", but now always referred to as the "leadscrew", this is a long threaded rod normally found running along the front of the bed or, on some early examples running between the bed ways down the bed's center line. By using a train of gears to connect the lathe spindle to the leadscrew - and the leadscrew to the lathe carriage - the latter, together with its cutting tool, could be forced to move a set distance for every revolution of the spindle.

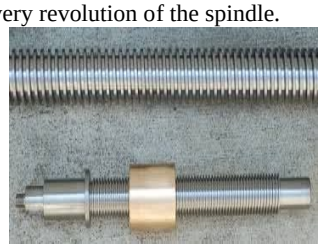

Fig 8 Lead-screw

9. APRON

The vertical, often flat and rectangular "plate" fastened to the front of the "Saddle" is known as the "Apron" and carries a

selection of gears and controls that allow the carriage to be driven (by hand or power) up and down the bed. The mechanism inside can also engage the screwcutting feed and various powered tool feeds, should they be fitted. The leadscrew, and sometimes a power shaft as well, are often arranged to pass through the apron and provide it with a drive for the various functions. The sophistication of the apron-mounted controls, and their ease of use, is a reliable indicator of the quality of a lathe.

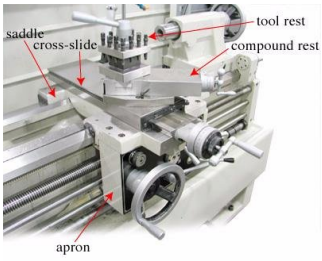

Fig 9 Apron

10. CONE-PULLEY

It is a pulley consisting of a cone like arrangement of graduated, concentric pulleys for driving the headstock at different speeds.

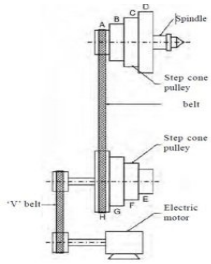

Fig1 Conepulley

11. MOTOR DRIVE

The pulley is powered or rotated by a small mini motor of 12volt dc motor is used which will run around 1500rpm.

Fig 11 Motor drive

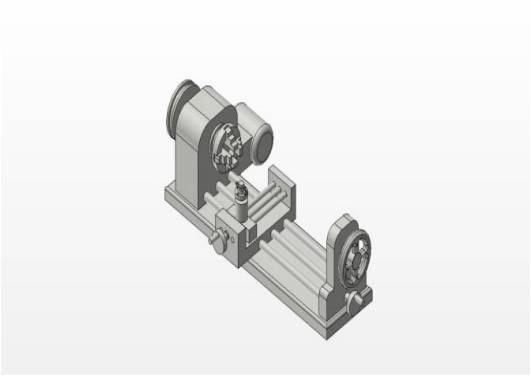

Figure 12 : Design of Mini Lathe using Inventor Software

III. CONCLUSIONS

A lathe is a widely used operating machine for performing all basic manufacturing and fabrication processes in each and every industrial works. Thus its need is inevitable.

Also micro machining is becoming quite a popular now a days. The size of the components is made to be reduced each and every day to reduce its weight and increase its working efficiency.

Thus here comes the purpose of mini-lathe as it can used to shape small wooden, metal and nylon work pieces which are otherwise hard to reform into required shape. Another advantage of this mini-lathe is that it is quite portable. It may also be called as a table lathe or desktop lathe. This mini-lathe can be very useful in homes, basements, garages where a standard lathe can’t be afforded easily.

SOLAR AIRCONDITIONER

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***Abstract*— Reduce harmful emission and conserving energy has become the biggest issue in present scenario.Addressing this issue globally efforts were made to create new product and designs. This work is an extension to the concept of desiccant wheel. Solar desiccant air conditioner is an alternative to air conditioning that uses less electricity which is economical for us and environmentally friendly also, which reduces harmful emission. The solar desiccant air conditioner uses solar rays to heat the water which is used to reduce humidity of air by passing hot water through the condenser. With this constructed design it is seen that temperature and humidity levels reduces throughout the system.**

I. INTRODUCTION

Air-conditioning has been attained reliably and efficiently from the last few years due to the popularity gained by vapour compression system as a result of halogenated hydrocarbon discovery. The need to conserve more amounts of energy and reducing the harmful emission, such as the contribution to the earth's ozone layer depletion and global warming due to harmful emission during production and use, necessitate developing alternative technique. The concept of desiccant cooling was first introduced by Hausen in 1935 (Pesaran et al., 1992). Based on this, many inventors like Shipman (1936), Fleisher (1939), Larriva (1941) and Altenkirch (1941, 1944) tried to develop commercial desiccant cooling systems but were not successful in the subsequent years.

In our system air is sucked from the room with the help of a fan and is passed to heat exchanger which works with the water from the solar collector. A desiccant wheel is employed for removing moisture. An evaporative cooler is used for cooling the air which is to be supplied in to the room. Here Fresh air is taken up each time and reuse of air from the room is not done.

FEASIBILITY STUDY SOLAR ASSISTED DESICCANT COOLING REVIEW:

Advantages of using desiccant cooling systems include the following: very small electrical energy is consumed and the sources for the regenerating thermal energy can be diverse (i.e., solar energy); a desiccant system is likely to eliminate or reduce the use of ozone depleting CFCs (depending on whether desiccant cooling is used in conjunction with evaporative coolers or vapor compression systems, respectively); control of humidity can be achieved better than those cases employing vapor compression systems since sensible and latent cooling occur separately and, improvement in indoor air quality is likely to occur because of the normally high ventilation and fresh air flow rates employed. Also, desiccant systems have the capability of removing airborne pollutants. Desiccant cooling systems show great energy saving potential by using low-grade heat source, such as solar energy. A lot of study solar assisted desiccant cooling; Jain and Dhar (1995) investigated four cycles(the ventilation cycle, the recirculation cycle, the Dunkle cycle and the wet surface heat exchanger cycle) for various outdoor conditions (Dry-bulb temperature and wet bulb temperature) of many cities in India. The study was aimed at evaluating the influence of the effectiveness of heat exchangers and evaporative coolers on the cooling Coefficient Of Performance (COP) as well as on the air volumetric circulation rate in different climatic conditions. The authors found the Dunkle cycle to have better performance compared to recirculation and ventilation cycles in all climatic conditions. But the cycle using wet surface featured the best performance with respect to all the three other cycles investigated. Camargo and Ebinuma (2005) and Kairouani and Nehdi (2005) investigated the works using the desiccant

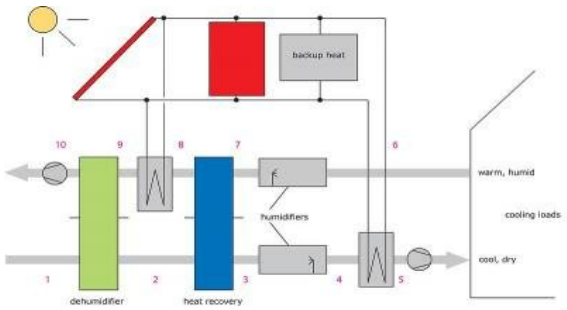
technology are involved with adsorption refrigeration and desiccant air conditioning systems. Dammak (2010) investigated parameters of a solar bubble pump for absorption-diffusion cooling systems. Ando and Kodama (2005) used 4-rotordesiccant cooling process equipped with a double stage dehumidification. Regeneration temperature around70°C could produce a sufficient dehumidifying performance at high ambient humidity. The present article proposes solar air conditioning desiccant wheel system for application in Malaysia. Design specifications of such a system to operate in the hot and humid conditions of Bangi-Malaysia. The article also provides the findings of coefficient of performance desiccant cooling system.

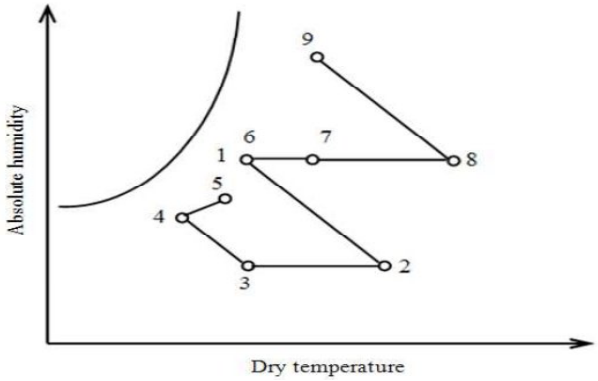
Materials and Methods

Figure show a desiccant cycle operates as follows: (1) dehumidified in a desiccant wheel (2); it is then cooled in the heat recovery wheel (3) by the return cooled air before being further cooled it an evaporative process (4), finally, it is introduced into condition room. The operating sequence for the return air (5) is as follows: it is cooled to its saturation temperature by evaporative cooler (6) and then it cools the fresh air in the heat recovery wheel (7)/ It is then heated in the heat exchanger by solar collector or heater (8) and finally regenerates the desiccant wheel (9) by removing the humidity before exiting the system.

Figure show the experimental setup used to investigate the desiccant cooling technology. The desiccant cooling units consist of a desiccant wheel, a heat recovery wheel, two evaporative cooler, blower and a regeneration heat exchanger (water to air).

The desiccant wheels are designed to operate with both a 50% area for reactivation and 50% for process (50/50 split). The diameter of the wheel is 250 mm and the width is 533 mm with the angular velocity of 8 rev h^{-1} for a nominal air-flow rate of 6000 m^3 h^{-1}. The heat recovery wheel is an aluminium honeycomb structure. It rotates at 12 rev min^{-1}. The diameter of the regenerator is 700 mm and its width is 700mm. The installed evaporative cooler max air flow 6000 m^3 h^{-1}. The electrical consumption of the motor is about 1 50 W. The system mainly includes 12 m^2 solar air collectors with temperature range of between 80 and 120^{0}C, feeding a storage tank of 1000L. In reality this storage capacity is over dimensioned since emergy is needed to raise the tank's temperature the desired level for regeneration. However this storage volume was chosen to protect the collectors from overheating since the installation is used for experimental purpose only and yet is not operational every day thus high capacity is needed.





Theoritical analysis: Desiccant cooling units are heat driven system sand the coefficient of performance is defined as:

$$COP = \frac{Q\ cool}{Q\ regn} = \frac{ms(h4)}{ms(h8-h7)}$$

Where:

Q_{cool}= Rate of heat removed from the cooled room

Q_{regn}= Rate of regeneration heat supplied to the unit

m_s= Mass flow rate of air

h = Enthalpy of moist air and the state numbers refer to fig. 1

throughout this stud

Considering that the mass flow rates are equal in process and regeneration lines, the effectiveness of rotary regenerator may be expressed as:

$$E_{HRW} = \frac{T_2 - T_2}{T_2 - T_4} \quad \text{————}$$

Where, T is temperature of moist air. The effectiveness of desiccant wheel may be expressed in similar way.

$$E_{DW} = \frac{T_2 - T_2}{T_2 - T_4} \quad \text{————}$$

The effectiveness relations for the evaporative coolers are:

$$E_{C1} = \frac{T_3 - T_4}{T_3 - T_{wb3}} \quad \text{————}$$

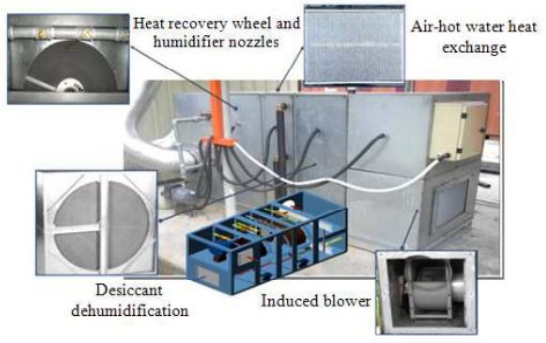
$$E_{C2} = \frac{T_5 - T_6}{T_5 - T_{wb5}} \quad \text{————}$$

where, T_{WS} is wet-bulb temperature of moist air. Also, a mass balance on the two evaporative coolers gives:

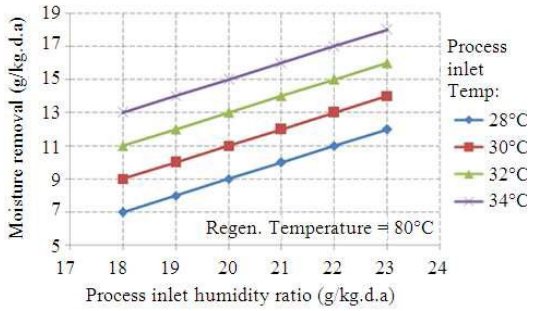
$m_{w1} = m_a (w_4 - w_3)$

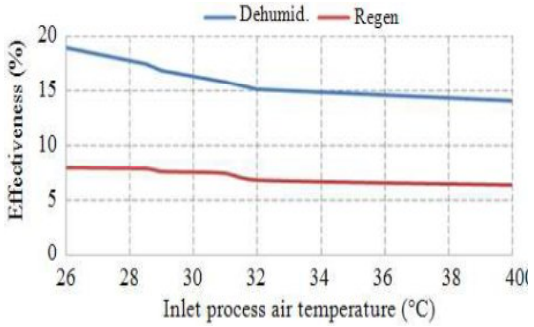
$m_{w2} = m_a (w_6 - w_5)$

where m_{w1} and m_{w2} are the rates of moisture added to air in the evaporative coolers in the process and regeneration lines, respectively.



The figure shows the effects of the ambient temperature and humidity ratio on the moisture removal. The ambient temperature and humidity affect the moisture removal greatly-the higher the moisture removal will be. The reason for this lies in the fact that the performance the rotary desiccant wheel is intimately with changes in ambient temperature. The increase of moisture removal, which can be attributed to that less latent heat loads is removed by the system.





According to our measurements and given relations efficiency of the desiccant wheel I n hot and humid condition have been presented in Fig. which show its variations versus air temperature in hot and humid conditions. By increasing the inlet air temperature, dehumidification of the desciccant wheel decrease because of the better adsorption operation at low temperatures. Decrease in the absorbed wheel humidity with assumption of constant regeneration heat leads to reduction in the regeneration and modified regeneration efficiency.

The second reasons are found in the regeneration and modified regeneration efficiencies, both of which are related to the amount of utilized regeneration heat for the description process. Respecting to the energy balance of regeneration side, some heat is used to remove water comment of the adsorbent and the remaining exists in the regeneration process with outlet stream and causes heating of the desiccant wheel.

Figure shows the efficiency of the heat recovery wheel at various temperature differences. The lower differences are those of direct evaporative cooling and the higher differences involve the desiccant mode. The efficiency of the heat recovery wheel is constant independently of the temperature difference and is always higher than 0.7.

The result is predictable since efficiency does not vary significantly with the conductance unless there are important heat losses which is not the case here. This efficiency of 0.7 is crucial for desiccant cooling system .

Figure shows the change of COP with respect to different regeneration temperature. It can be found that; COP could obtain a maximum when T, is between 70 and 800C. The influence of the increment of regeneration heat is much more significant, which leads COP to drops off.

Based on these results, to achieve a tradeoff between the system energy performance (COP) and the supply air condition, regeneration temperature between 65 and 800 C is more reasonable for the system operation under hot and humid climatic condition.

Hybrid air conditioning systems based on chemical dehumidification are characterized by high energy efficiency and low environmental impact. They can result profitable if compared to traditional air conditioning systems and allow to obtain better indoor thermal comfort and air quality.

It is well known that a considerable part of the primary energy is used for air conditioning purposes. Besides, it is worthwhile observing that: a) the most recent standards regarding environmental comfort and Indoor Air Quality (IAQ) impose both more restrictive limits to indoor R.H. values, and a considerable increase of outdoor airflow rates; b) CFC and HCFC refrigerant fluids are destined to disappearance; c) electric power peaks should be reduced. Therefore it seems necessary to develop new approaches to air conditioning techniques.

Hybrid air conditioning systems based on chemical dehumidification are characterized by high energy efficiency and low environmental impact. Besides, they can result profitable if compared to traditional air conditioning systems.

The moist air chemical dehumidification has been adopted for long tiem, mostly in the U.S.A., in the industrial and military fields, in ice arenas and, within the commercial fields, in high latent load environments, like supermarkets. However, the trend to extend this technique to other applications is evident, such as commercial and residential fields integrating it with traditional and innovative systems , in order to obtain energy saving and to get the best thermal and moisture indoor conditions (in particular regarding R.H. values). Such trend is also justified by the required external airflow rates increase for indoor ventilation in Italy stated by the UNI and, in the international field, stated by various codes and standards. The increase of required external airflow rates implies, for summer Italian climates, a corresponding latent loads increase that must be removed in order to maintain acceptable indoor R.H. values. With the purpose to balance such additional latent loads, external air pre-treatment technologies, such as chemical dehumidification, to couple with traditional air conditioning systems, are regarded with increasing interest; the correct equipment component sizing is strictly joined to the external air design conditions definition.

The main concepts about chemical dehumidification, successively employed during the analysis, are herein synthetically presented.

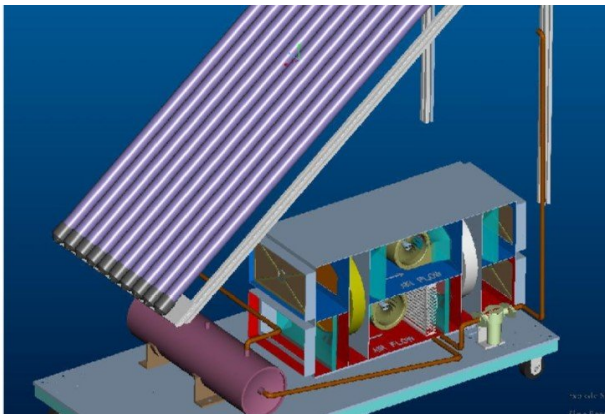
Air that has to be treated before supplying in indoor ambient is called “Process air”.

T moisture containe din humid air partially condenses in the chemical desiccant: it is adsorbed because of the vapour partial pressure difference between process air and desiccant surface. So the process air temperature increases because of the conversion in sensible heat of both condensation heat and heat due to the adsorption chemical process. Therefore, process air specific humidity decreases while temperature increases. For this reason, before supplying to the space, process air must be cooled by means of one or more of the following components: direct expansion or chilled liquid cooling coil (CC); indirect evaporative cooling (IEC); rotary or static heat recuperator.

Chemical desiccant – typically chemical compounds such as synthetic polymers, silica gel, titanium silicates, natural or synthetic zeolites, activated alumina, “silica + “, etc… must be periodically regenerated using thermal energy obtained by combustion process or thermal wastes (hot water from solar panels, condensation heat from refrigeration plant, cogeneration systems, etc.

A typical desiccant wheel is shown. The device rotates slowly between process and reactivation air streams; moisture is removed from process air stream by means of the desiccant material; after a partial rotation, the sector of saturated wheel is regenerated by hot and dry air (reactivation air stream) to be utilized again. The desiccant wheel structure is very similar to that of a rotary heat recuperator.

WORKING



The air from room is sucked into the first chamber and is passed into the heat exchanger.

The heat exchanger is powered by the hot water from the solar collector. The hot air from the heat exchanger passes to the desicent wheel and is exhausted out with moisture in it from the wheel. Mean time air is sucked into the second chamber and passed through the desicant wheel to remove the moisture. An evaporative cooler is employed and the cooled air is passed into the required space.

PARTS

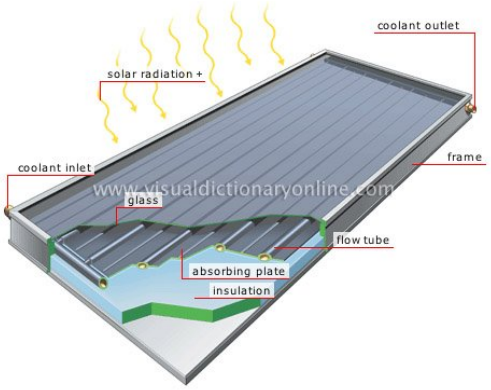
Solar collectors for solar cooling systems

Solar collectors transform solar radiation into heat and transfer that heat to a medium (water, solar fluid, or air). The solar heat can then be used for hot water, heating or cooling systems, or for heating swimming pools. Solar cooling technologies demand high temperatures (90-150oC); collectors that can achieve such temperatures are evacuated tube and selective coated flat-plate solar collectors. A solar collector array supplies hot water as a source of energy to the absorption chiller through a hot water storage tank.

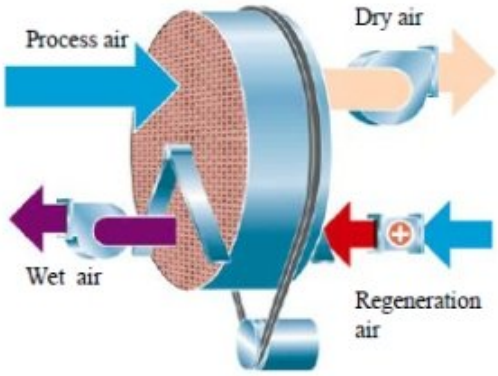
Flat plate solar collector

Flat-plate collectors are the most widely used kind of collectors for domestic water-heating systems and solar space heating/cooling. A typical flat plate collector consists of an absorber, transparent cover sheets, and an insulated box. The absorber is usually a sheet of high thermal conductivity metal such

as copper or aluminium, with tubes either integral or attached. Its surface is coated to maximise radiant energyabsorption and to minimise radiant emission. The insulated box reduces heat loss from the back or the sides of the collector. The cover sheets, called glazing, allow sunlight to pass through the absorber but also insulate the space above the absorber to prevent cool air to flow into this space.



A desiccant wheel is very similar to a thermal wheel, but with a coating applied for the sole purpose of dehumidifying, or "drying", the air stream. The desiccant is normally silica gel. As the wheel turns, the desiccant passes alternately through the incoming air, where the moisture is adsorbed, and through a “regenerating” zone, where the desiccant is dried and the moisture expelled. The wheel continues to rotate, and the adsorbent process is repeated. Regeneration is normally carried out by the use of a heating coil, such as a water or steam coil, or a direct-fired gas burner. Thermal wheels and desiccant wheels are often used in series configuration to provide the required dehumidification as well as recovering the heat from the regeneration cycle.



CONCLUSION

By employing this system we will be able to eliminate the emission of green house gases. Recycling of same air is not done in this process and hence better health. Consumption of electricity is less compared to conventional system.

ANALYSIS OF CHEVRON NOZZLE LOBE DESIGN MODIFICATION FOR REDUCING NOISE POLLUTION IN AIRCRAFT

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***Abstract*—Aircraft noise is an issue of enormous environmental, financial, and technological impact. There are two main sources of noise in today's commercial aircraft engines: fan/compressor noise and jet noise. An internal research and development program, with some invaluable assistance from NASA, was started to investigate how to reduce the jet noise while achieving acceptable impacts on performance, operability, manufacturability, weight, etc. The chevron nozzle for separate flow exhaust systems was the outcome, reducing jet noise by enhancing mixing of the fan, core and ambient streams faster than conventional nozzles, with a minimal impact on performance. Chevrons are zigzag or raw tooth shapes at the end of the nacelle, with tips that are bent very slightly into the flow, and are being implemented on modern jet engines. This technology has the potential for reduction of turbulent mixing noise which is the dominant component of jet noise in most of the aircrafts.**

In this project work, it is proposed to analyse different types of chevrons for performance evaluation. Different chevron nozzle design are modelled in using CATIA V5R20 software and analysed in ANSYS CFD for acoustic performance evaluation. Acoustic characteristics were also studied for the main flow parameters namely pressure, velocity to find the most efficient shape of chevron.

Index terms : jet noise, nozzle, chevrons

I. INTRODUCTION

Aircraft noise is an issue of enormous environmental, financial, and technological impact. There are two main sources of noise in today's commercial aircraft engines: fan/compressor noise and jet noise. Jet noise comprises of turbulent mixing noise and, in the case of imperfectly expanded jets, shock noise. Turbulent mixing noise is very difficult to control and turbulent mixing is caused by eddy formation due to the mixing of air streams at different temperature and speed. Usually outside air and high speed gasses from the engine results in eddies. Chevrons are zigzag or raw tooth shapes at the end of the nacelle, with tips that are bent very slightly into the flow, and are being implemented on modern jet engines. The technology has a potential for reduction of turbulent mixing noise that is the dominant component of jet noise for most aircraft. The triangular cut outs made along the trailing edge of the nozzle induce stream-wise vortices into the shear layer leading to increased mixing and reduced jet plume length, Hence the chevrons enhance mixing by the right amount and the total jet noise reduces. If the mixing is too much, the chevrons make the noise go up. If the mixing is too little, no noise reduction benefits are realized. The nozzle allows the core and bypass flows to miss in a way that reduces low frequency mixing noise from highly turbulent flows.

Jet noise continues to be the dominant noise component, especially during take-off. A great deal of effort has been dedicated to the development of practical passive flow control techniques for jet noise reduction. Thrust penalties associated with these designs must be minimized, before they can be used in commercial aircraft engines. Acoustic studies reveal that addition of chevrons to the nozzle reduces the sound pressure level reasonably with acceptable reduction in performance. The understanding of the fundamental mechanisms responsible for the acoustic benefit and the influence of various geometric parameters of chevrons are not clear. Parameters such as, the number of chevron lobes, the lobe length and the level of penetration of the chevrons into the flow have been investigated over a variety of flow conditions. Although experiments are necessary and provide useful data for validating the computations, they are expensive and can supply relatively limited amount of information. Hence it is desirable to have reliable CFD capabilities to quickly evaluate preliminary designs for noise reduction.

In this project work, it is proposed to analyze different types of chevrons for performance evaluation. Different chevron nozzle design are modeled in using CATIA V5R20 software and analyzed in ANSYS CFD for acoustic performance evaluation. Acoustic characteristics were also studied for the main flow parameters namely pressure, velocity to find the most efficient shape of chevron.

II.CATIA V5R20 ANDCOMPUTATIONAL FLUID DYNAMICS

The CATIA Version 5 part design application makes it possible to design precise 3D mechanical parts with an intuitive and flexible user interface, from sketching in an assembly context to iterative detailed design. CATIA Version 5 part design application will enable you to accommodate design requirements for parts of various complexities, from simple to advance.

This new application, which combines the power of feature-based design with the Flexibility of a Boolean approach, offers a highly productive and intuitive design environment with multiple design methodologies, such as post-design and local 3D Parameterization.

As a scalable product, CATIA Version 5 part design can be used in cooperation with other current or future companion products in the next CATIA generation such as CATIA Version 5 Assembly Design and CATIA Version 5 Generative Drafting. The Widest application portfolio in the industry is also accessible through interoperability With CATIA Solutions Version 4 to enable support of the full

product development Process from initial concept to product in operation.

Computational fluid dynamics, usually abbreviated as CFD, is a branch of fluid mechanics that uses numerical methods and algorithms to solve and analyzes problems that involve fluid flows. Computers are used to perform the calculations required to simulate the interaction of liquids and gases with surfaces defined by boundary conditions. With high speed super computers, better solutions can be achieved. Ongoing research yields software that improves the accuracy and speed of complex simulation scenarios such as turbulent flows. Initial experimental validation of such software is performed using a wind tunnel with the final validation coming in full scale testing, e.g. flight tests. The fundamental basis of almost all CFD problems are the Navier stokes equation, which define any single phase (gas, liquid but not both) fluid flow.

A. ANSYS

ANSYS (ANALYSING SYSTEM) is a general purpose finite element modeling and analyzing software package for numerically solving a wide variety of mechanical problems. These problems include: static/dynamic structural analysis (both linear and nonlinear), heat transfer and fluid problems, as well as acoustic and electromagnetic problems.

ANSYS as software is to be user friendly and simplified as much as possible with lots of interface options to keep the user as much as possible from the hectic side of programming and debugging process.

1. Preprocessing: define the problem; the major steps in preprocessing are given below:

- Define key points/lines/areas/volumes
- Define element type and material/geometric properties
- Mesh lines/areas/volumes as required

2. Solutions: assigning loads, constraints and solving; here we specify the loads (points or pressure), constraints (translational and rotational) and finally solve the resulting set of equations.

3. Post processing: further processing and viewing of the results; in this stage one may wish to see:

- Lists of nodal displacements
- Elements forces and moments
- Deflection plots
- Stress contour diagrams

B. CFX in Ansys

ANSYS-CFX is a commercial Computational fluid dynamics (CFD) program, used to simulate flow in a variety of applications. The ANSYS – CFX product allows engineers to test systems in a virtual environment. The scalable program has been applied to simulation of water flowing past ship hulls, gas turbine engines (including the compressors, combustion chamber, turbines and afterburners), aircraft aerodynamics, pumps, and fans, HVAC systems, mixing vessels, hydro cyclones, vacuum cleaners and more. ANSYS CFX software is a high performance, general purpose fluid dynamics program that has been applied to solve wide ranging fluid flow problems for over 20 years. The solver and its many physical models are wrapped in a modern, intuitive, and flexible GUI and user environment, with extensive capabilities for customization and automation using session files, scripting and a powerful expression language.

Integration into the ANSYS workbench platforms provides superior bi directional connections to all major modeling systems, powerful geometry modification and creation tools with ANSYS design modeler, advanced meshing, and easy drag and drop transfer of data and results to share between applications. ANSYS CFX used to simulate the flow through the chevron nozzle for the given input, output and boundary conditions.

C. CHEVRON NOZZLE

Aircraft noise remains a significant concern for airports, nearby communities, and aircraft passengers. As the large volume of air traffic continues to increase, and jet engine technology continues to advance, the aeronautics industry is challenged with reducing the noise levels generated by modern jets. Starting in the 1960s, significant attention was directed toward noise-reduction technologies for use on jet engines. This is because jet noise has played a significant role in the history of aviation. The commercial airline industry has remained invested in the advancement of payload capacity for decades, and the industry is frequently moving toward greater means of propulsion. This requires constant technical investigation of means for increasing power and efficiency of existing turbojet and turbofan engines while significantly reducing engine acoustic levels. Engine noise has become a serious concern for many airports and surrounding communities. Without noise-reducing technologies, the Federal Government, airline companies, and nearby schools must spend millions of dollars on soundproofing installments to avoid the negative impacts of jet noise on schools and neighborhood communities around airports. The defense industry is also very concerned with reducing noise levels in order to develop advanced stealth technology for future military vehicles. Stealth research is strongly dependent on reduced noise and infrared signatures, and ongoing research in noise-reduction benefits both of these technologies. Over the course of the past few decades, the field of aero acoustics has emerged to address many of these challenges and develop the enabling technologies needed to advance the next generation of aerospace vehicles. Modern commercial aircraft employ high bypass ratio (HBPR) engines with separate flow, non-mixing, short-duct exhaust systems. These propulsion systems are known to generate significantly high noise levels due to the high-speed, high-temperature, and high-pressure nature of the exhaust jet, especially during high-thrust conditions such as those required for takeoff. The primary source of jet noise is the turbulent mixing of shear layers in the engine's exhaust.

These shear layers contain instabilities that lead to highly turbulent vortices that generate the pressure fluctuations responsible for sound. In order to reduce the noise associated with jet flow, the aerospace industry has focused on developing various technologies to disrupt shear layer turbulence and reduce the overall noise produced. Through decades of innovative research, the chevron nozzle has emerged to achieve exactly this. The novel design has allowed modern aircraft to employ engines with more acceptable noise levels. This noise-reduction research has been one of the key aspects of Fundamental Aeronautics (FA) program in recent decades, and it will continue to be so for many years to come.

D. GEOMETRIC DETAILS

Chevron asymmetry and chevron lobe profile are varied to study their effect on the overall sound pressure levels. Chevron penetration, defined as the difference from the tip to the base radii of the chevron, is kept zero for all nozzles. The various chevron nozzles studied are as follows:

(a) A baseline round nozzle without chevrons

(b) A nozzle with six chevron lobes (symmetric) with 0^0 taper angle (Chevron6-0)

(c) A nozzle with unequal chevrons at top and bottom is made with the objective of studying the effect of asymmetry on chevron nozzle. The chevrons on one side have larger lobe length when compared to the other side (Chev6-Asym).

(d) Modified chevron nozzle configuration.

The objective of such a configuration is to study the effect of profile on the vortices generated and noise reduction. The asymmetric chevron nozzle (Chev6-Asym) is fabricated by cutting equilateral and isosceles triangular lobes at the trailing edge of the nozzle. The isosceles triangular chevron lobes have larger depth when compared with equilateral chevron lobes. The triangular lobes are placed such that the apexes of all the chevrons lie on a plane perpendicular to the nozzle axis. The longer lobes are isosceles.

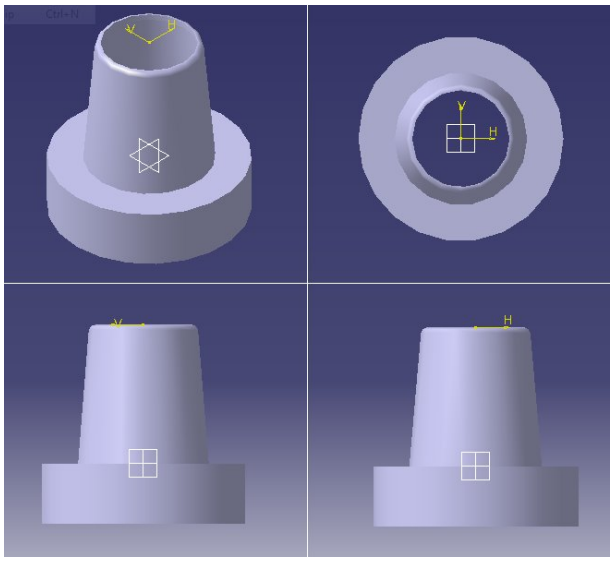

Figure 1: CATIA model of baseline nozzle

E. CFX ANALYSIS AND SIMULATION

To analyze the various chevron nozzles, the chevron nozzle model is opened with workbench platform in ANSYS CFX, and following steps are followed:

In the workbench platform, a project schematic appears for the simulation work. The left side of the project schematic, a toolbox appears with the list of analysis systems, components systems, custom systems, and design exploration. From that, analysis systems drag fluid flow(CFX) into the project schematic. Now a menu appears

From that, geometry tool is selected; a design modeler window opens .import the CATIA file using import external geometry file from file menu. By click the generate icon for attaching the geometrical model in the workbench.

After importing the geometrical model, the mesh tool is selected for meshing the chevron nozzle model. Attaching and transferring the model assembly takes place whenever the meshing windows opens. Generate Aboundary conditions of the chevron nozzle.

The iteration process has been done in the solution (CFX solver manager). To click the start run in the define run in the dialog box for starting the iteration.

Final step of the analysis is click on the result icon.in the CFX post, outline dialog box is used to display the model and to setup the pressure and velocity distribution contours.

The CFD analysis is carried out on four models to obtain pressure distribution. Initially the existing model of the chevron nozzle was modeled using CATIA V5R20 software and analyzed using CFX software to get the CFD results. The sound pressure level is calculated using this CFD results.

F. RESULTS AND DISCUSSIONS

The baseline nozzle model and the chevron nozzle models designed by CATIA V5R20 were analyzed virtually by ANSYS CFX, a CFD software package. The result obtained are discussed in this obtained. In ANSYS CFX software, results are obtained in the workbench platform. As convergence is an iterative process, successive iterations were performed by the CFX solver to obtain the pressure distribution, velocity distribution. The problem of CFD based jet noise prediction methods is thus one of great interest for real-world applications This is especially important for fast evaluation of designs intended to reduce the noise level from the jet. For such purposes, it is sufficient to predict the trends in the sound pressure level. Acoustic characteristics were studied for the main flow parameters namely pressure, velocity to find the most efficient shape of chevron.

The solver manager displays about the iteration process. The result of the CFX solver namely the pressure distribution and velocity distribution has been taken from the CFX – post (result) in the CFX tool.

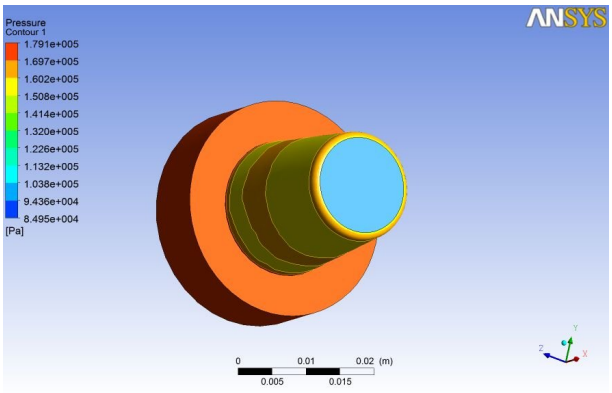

Figure 2: Velocity distribution of baseline nozzle model

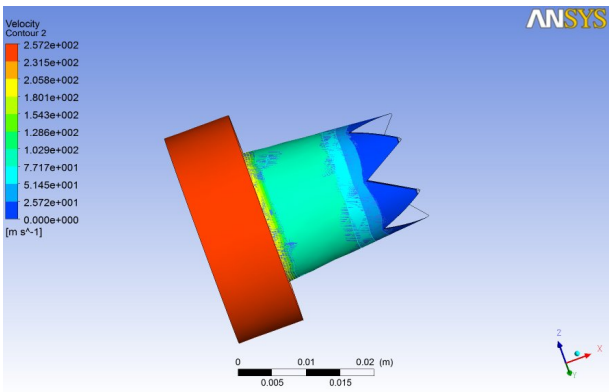

Figure 3: Velocity distribution of chevron nozzle model

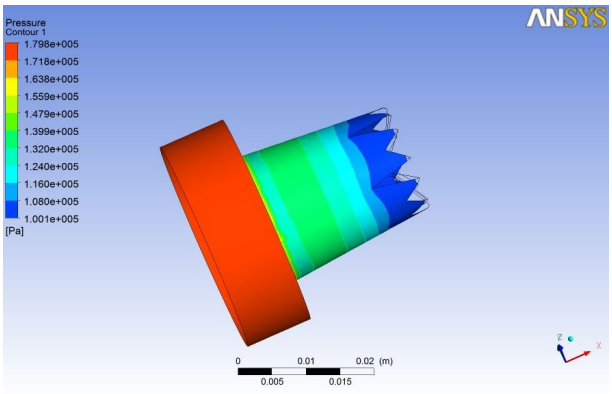

Figure 4: Velocity distribution of modified chevron nozzle model

CONCLUSIONS

Different chevron nozzles are modeled using CATIA software and analyzed for finding acoustic performance using ANSYS CFX Finite Element Software. Acoustic characteristics were studied for the main flow parameter namely pressure, velocity to find the most efficient shape of chevron. The differences between the four shapes of chevrons are noted. We can infer that the modified chevron nozzle had three decibels less than the baseline nozzle.

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DESIGN AND FABRICATION OF VERTICAL AXIS WIND TURBINE

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***Abstract*— We know that there is enough wind globally to satisfy much, or even most, of humanity's energy requirements, if it could be harvested effectively and on a large scale. Vertical axis wind turbines (VAWTs), which may be as efficient as current horizontal axis systems, might be practical, simpler and significantly cheaper to build and maintain than horizontal axis wind turbines (HAWTs).They also have other inherent advantages, such as they are always facing the wind, which might make them a significant player in our quest for cheaper, cleaner renewable sources of electricity. VAWTs might even critical in mitigating grid interconnect stability and reliability issue currently facing electricity producers and suppliers. Additionally, cheap VAWTs may provide an alternative to the rain forest destruction for the growing of bio-fuel crops.**

Vertical-axis wind turbines (VAWTs) are a type of wind turbine where the main rotor shaft is set vertically. Among the advantages of this arrangement are that generators and gearboxes can be placed close to the ground, and that VAWTs do not need to be pointed into the wind. Major drawbacks for the early designs (Savonius, Darrieus, and cycloturbine) included the pulsatory torque that can be produced during each revolution and the huge bending moments on the blades.

I. INTRODUCTION

With the recent surge in fossil fuels prices, demands for cleaner energy sources, and Government funding incentives, wind turbines are becoming a more viable technology for electrical power generation. If the efficiency of a wind turbine is increased, then more power can be generated thus decreasing the need for expensive power generators that cause pollution. This would also reduce the cost of power for the common people. The wind is literally there for the taking and doesn't cost any money. Power can be generated and stored by a wind turbine with little or no pollution. If the efficiency of the common wind turbine is improved and widespread, the common people can cut back on their power costs immensely.

Ever, since the Seventh Century people have been utilizing the wind to make their lives easier. The whole concept of windmills originated in Persia. The Persians originally used the wind to irrigate farm land, crush grain and milling. This is probably where the term windmill came from. Since the widespread use of windmills in Europe, during the Twelfth Century, some areas such as the Netherlands have prospered from creating vast wind farms.

The first windmills, however, were not very reliable or energy efficient. Only half the sail rotation was utilized. They were usually slow and had a low tip speed ratio but were useful for torque.

Since its creation, man has constantly tried to improve the windmill. As a result, over the years, the number of blades on windmills has decreased. Most modern windmills have 5-6 blades while past windmills have had 4~8 blades. Past windmill also had to be manually directed into the wind, while modern windmills can be automatically turned into the wind. The sail design and materials used to create them have also changed over the years.

In most cases the altitude of the rotor is directly proportional to its efficiency. As a matter of fact, a modern wind turbine should be at least twenty feet above and three hundred feet away from an obstruction, though it is even more ideal for it to be thirty feet above and five hundred feet away from any obstruction.

Different locations have various wind speeds. Some places, such as the British Isles, have few inhabitants because of high wind speeds, yet they are ideal for wind generation. The world's largest wind farm is located in California, and the total wind power generated there exceeds 1,400 megawatts of electricity. (A typical nuclear power plant generates 1,000 megawatts.)

Some geographic features such as mountains also have an influence upon wind. Mountains can create mountain breezes at night, because of the cooler air flowing down the mountain and being heated by the warmer valley air causing the convection current. Valleys are affected in much the same way. In the daytime, the cooler air is above the valleys and the hot air is above the mountains. The hot air above the mountain rises above the valleys and cools, thus creating the convection current in the opposite direction and creating a valley wind. The oceans

create convection currents, as well as they mountains or valleys. In the day, the hotter air is above the same and the cooler air is above the ocean. The air heats up over the sand and rises above the ocean and then cools, creating the convection current. At night, the cooler air is above the sand and the warmer air is above the ocean, so the air heats up over the ocean and cools over the sand. As you can clearly see, the time of day also affects the wind.

II.Horizontal Axis versus Vertical Axis Wind Turbines

We know that for windmills to operate there must be wind. Actually there are two types of windmills -- the horizontal axis windmills and the vertical axis windmills. The horizontal axis windmills have a horizontal rotor much like the classic Dutch four-arm windmill. The horizontal axis windmills primarily rely on lift from the wind. As stated in Bernoulli's Principle, "a fluid will travel from an area of higher pressure to an area of lower pressure." It also states, "as the velocity of a fluid increases, its density decreases." Based upon this principle, horizontal axis windmill blades have been designed much like the wings of an airplane, with a curved top. This design increases the velocity of the air on top of the blade thus decreasing its density and causing the air on the bottom of the blade to go towards the top ... creating lift. The blades are angled on the axis as to utilize the lift in the rotation. The blades on modern wind turbines are designed for maximum lift and minimal drag.

Vertical axis windmills, such as the Durries (built in 1930) use drag instead of lift. Drag is resistance to the wind, like a brick wall. The blades on vertical axis windmills are designed to give resistance to the wind and are as a result pushed by the wind. Windmills, both vertical and horizontal axis, have many uses. Some of them are: hydraulic pump, motor, air pump, oil pump, churning, creating friction, heat director, electric generator, Freon pump, and can also be used as a centrifugal pump

III.NEW IMPROVEMENTS

There have been many improvements to the windmill over the years. Windmills have been equipped with air breaks, to control speed in strong winds. Some vertical axis windmills have even been equipped with hinged blades to avoid the stresses at high wind speeds. Some windmills, like the cyclo-turbine, have been equipped with a vane that senses wind direction and causes the rotor to rotate into the wind. Wind turbine generators have been equipped with gearboxes to control [shaft] speeds. Wind turbines have also been equipped with generators which convert shaft power into electrical power. Many of the sails on windmills have also been replaced with propeller-like airfoils. Some windmills can also stall in the wind to control wind speed. But above all of these improvements, the most important improvement to the windmill was made in 1745 when the fantail was invented. The fantail automatically rotates the sails into the wind.

Most wind turbines start to generate power at 11 m/s and shut down at speeds near 32m/s. Another variable of the windmill's efficiency is its swept area. The swept area of a disk--shaped wind wheel is calculated as: Area equals pi times diameter squared divided by four (pi equals 3.14).

Another variable in the productivity of a windmill is the wind speed. The wind speed is measured by an anemometer.

Another necessity for a windmill is the tower. There are many types of towers. Some towers have guy wire to support them and others don't. The towers without guy wires are called freestanding towers. Something to take into consideration about a tower is that it must support the weight of the windmill along with the weight of the tower. Towers are also subject to drag.

Scientists estimate that, by the 21st Century, ten percent of the world's electricity will come from windmills.

IV.DESIGNING OF VERTICAL AXIS WIND TURBINE

A wind mill is machine for wind energy conversion. A wind turbine converts the kinetic energy of the wind's motion to mechanical energy transmitted by the shaft. A generator further converts it to electrical energy. So it is necessary to keep in mind, while designing the windmill's structural part.

4.1 Design of Shaft

While designing the shaft of blades it should be properly fitted to the blade. The shaft should be as possible as less in thickness & light in weight for the six blade, the shaft used is very thin in size are all properly fitted. So no problem of slipping & fraction is created, it is made up of seamless aluminium tubes which is having very light weight. Length of shaft & diameter are 150cm & 2.54cm respectively. And at the top and bottom ends mild steel of length 1inch each are respectively are fixed to give strength to the hollow shaft.

4.2 Design of Bearing

For the smooth operation of Shaft, bearing mechanism is used. To have very less friction loss the two ends of shaft are pivoted into the same dimension bearing. The Bearing has diameter of 2.54cm. Bearing are generally provided for supporting the shaft and smooth operation of shaft. We have used ball bearings for the purpose of ease of maintenance.

4.3 Design of Blades

The material used for blades should catch more wind with each revolution. It should have less weight. For this we use canvas cloth. Canvas is an extremely heavy-duty plain-woven fabric used for making sails, tents, marquees, backpacks, and other items for which sturdiness is required. This canvas cloth can be made into any angles to catch wind.

4.4 An Electric Generator

For generation of electricity from our vertical axis wind turbine, we convert a ceiling fan motor to a generator. By replacing the stator coils with the magnets we can produce electricity. The magnets used are neodymium disk magnets.

4.5 Specifications

BASE DIMENSIONS

Height 24 inches

Width 21 inches

BLADE DIMENSIONS

Height 18 inches

Thickness 0.125 inches

Angle 45 °

Angle b/w blades 60°

SHAFT DIMENSIONS

Diameter 2.54cm

Length 150 cm

4.6 Design Model

An Autodesk Inventor model of our Vertical Axis Turbine is drawn.

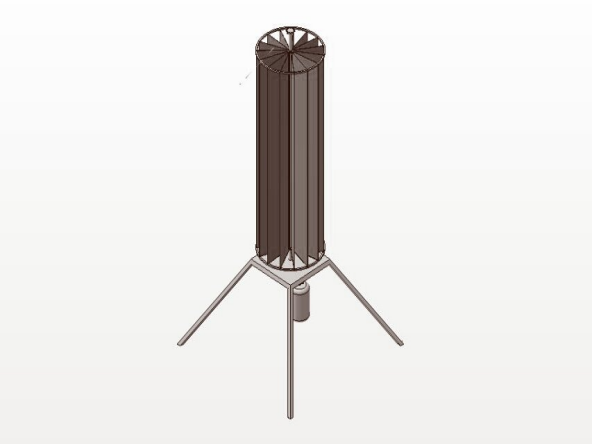
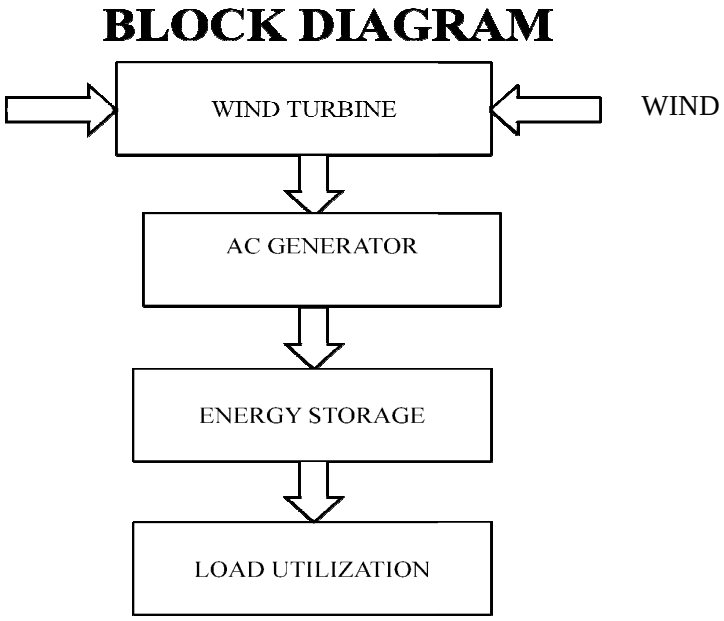


Figure 1.Proposed design of VAWT



V.CONCLUSIONS

The first part of the design process, which included literature survey, engineering analysis, and turbine design selection was completed during the first term. The literature survey and analysis portion of the project provided its share of complications. However, once completed it provides valuable information about the final design. To date, the major components of the turbine have been selected, in particular seamless aluminium tube for the shaft and canvas cloth for the blades. There are still some final design options that must be finalized, and these decisions will be made before turbine construction begins in early January. Construction of the full-scale turbine will begin during the first week of January with the goal of finishing the final product by the end of February. This will allow for a month of testing and data analysis, as well as provide time for making any design alterations that are needed.

ANALYSIS OF STEAM POWER PLANT DRIVEN BY INCINERATOR

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Abstract— **The world's power generation markets have been deregulated to a large extent over the past few Years, and this process is still ongoing. In order to remain competitive, power plants need to have features that match with the requirements of the changing market. One possible way to meet high efficiency requirements is to install sub-critical steam power plants. The realization of critical turbine components need improved design and materials, which offer all possibilities for a cost effective and flexible service. For steam turbines, the main design parameters are the power output, the steam conditions, the ambient temperature and the power plant configuration. The steam turbine is operated by the incinerator unit, where solid waste is burnt and the heat released upon combustion is used to generate steam in a boiler. This steam is passed through nozzle which is to be designed such that the outlet steam is highly pressurised and having high velocity. This steam is made to rotate the turbine which is coupled to a generator. Thus electricity can be produced from solid waste. This can be used for domestic use as well as other wider applications. These concepts also solve the problem of spending money on fuels and problem associated with solid waste.**

The world's power generation markets have been deregulated to a large extent over the past few years, and this process is still ongoing. In order to remain competitive, power plants need to have features that match with the requirements of the changing market. With the focus on cost efficient production of electricity, the most important requirements of today are low overall lifecycle costs, high reliability, availability and operating flexibility. Additionally, specific customer and local site requirements need to be met by the suppliers of power plants and components. At the same time, the market demands continuously decreasing turbine delivery

Keywords: steam turbine, nozzle, incinerator, solid waste

I. INTRODUCTION

The world's power generation markets have been deregulated to a large extent over the past few years, and this process is still ongoing. In order to remain competitive, power plants need to have features that match with the requirements of the changing market. With the focus on cost efficient production of electricity, the most important requirements of today are low overall lifecycle costs, high reliability, availability and operating flexibility. Additionally, specific customer and local site requirements need to be met by the suppliers of power plants and components. At the same time, the market demands continuously decreasing turbine delivery times and prices. Thus, one of the primary requirements of all steam turbine manufacturers is to standardize their products in order to meet the cost and delivery time targets while at the same time providing a high level of flexibility to their customers. This also helps to obtain optimum performance levels and product quality. For steam turbines, the main design parameters are the power output, the steam conditions, the ambient temperature and the power plant configuration. In single-shaft units a steam turbine commonly drive a single generator. For start-up and shutdown operations, this configuration requires a switch gear to separate the steam turbine from the shaft train. In a power plants the steam conditions depend on the power output and temperature level of the applied in turbine

Schematic diagram

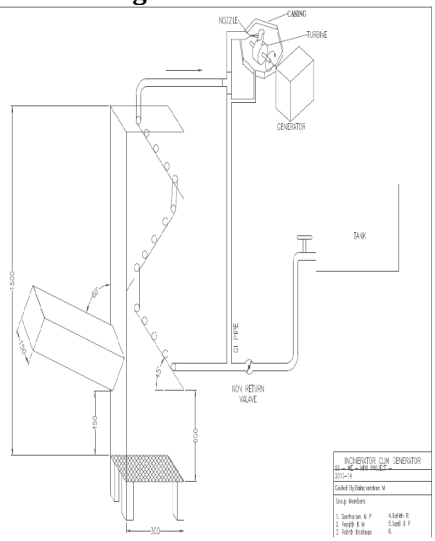

Figure 1: Schematic diagram of Incinerator cum Generator

The main components of incinerator cum generator are incinerator unit, turbine, generator and a tank. Incinerator unit, the main components of incinerator

units are CRCA which is used for covering the unit, inside the unit an inclined CRCA sheet of 30_30 are welded with a angle of 45 inclination and the pipes are fixed inside the unit in an zig-zag arrangement. Under the unit a strainer is placed for to collect the ash. A projected portion is for dumping the waste which is inclined at an angle of 60. The incinerator unit is of the dimension 30*30*150. At the end of pipe a nozzle is arranged with diameter of 3mm. The turbine blades are made up of aluminum and the generator is coupled with the turbine.

Completion of work - PHASE 1

As per the pre designed 'incinerator cum generator' unit, the flaws were noted down and measures were taken to improve the pressure of the steam at the outlet. The nozzle being used was removed and a newly designed nozzle was connected which helped in improvement and obtaining a high and constant pressure steam at the nozzle outlet. The new nozzle has a decreasing inner diameter (first one in the figure below).

Figure 2: Reconstructed and original nozzle

Works to be done in the next stage

Constant pressure of the steam is now obtained on the nozzle outlet. A casing is to be provided to the nozzle – turbine junction, so as to utilize maximum energy. Also, measures should be taken to improve the ease of rotation to the turbine blade. This shall be done by decreasing the weight of the turbine system, increasing surface area of steam hitting turbine blades, applying lubricants and bearing which will also help in rotation, effectively. And introducing pressure gauge and temperature measurement unit for finding out how much pressure will be generated and how much temperature will be generated.

After the complete rotation is made to the turbine, analysis part is to be carried out. This is done by noting down the temperature, pressure and velocity of steam outlet and also by noting down the power obtained by its working, which will be carried out in the next stage.

Working principle

Incinerator cum generator is working on the basis of Rankine cycle. In Rankine cycle the turbine is rotated by utilising energy from the steam. In this device the heat from the waste is utilised to produce steam which is used to run a turbine. Power output use to generate electricity is analysed. We dumped some amount of sample waste to the incinerator unit and it is heated by using diesel burner. And we allow to burn around 1 hour to 1:30 hour for getting high pressure steam. Inside the unit the arrangement is plate and tube, at the time the plate and tube are heated, at that time water from the tank is allowed to flow through the GI pipes and passed through the incinerator unit. By the effect of burning of waste the water is superheated and superheated steam is ejected through nozzle. The pressurized steam hit the turbine blade and this blade rotates and it is coupled with generator and thus power is produced

II. SCOPE OF PROJECT

The Disposal of solid waste is major problem from domestic level to international level. The authorities including local to national governments are not in a position to give clear guide lines for disposal of waste. But some of the municipalities use incinerator where waste is burned simply. By burning waste, even if it is done in an incinerator, pollution remains same as it is burned in an open space. In this context we decide to take this social problem as a challenge and utilize waste to generate other form of energies. It is a fact that all waste generated consist of hydro-carbon so by burning this waste we can generate heat energy. That heat energy can be utilized for producing high pressure steam using boiler. This steam can be used for driving a steam turbine and turbine is coupled to a generator which can be used for domestic use as well as other wider applications.

III. CONCLUSION

By the effect of burning of waste the water is superheated and superheated steam is ejected through nozzle. The pressurized steam hit the turbine blade and this blade rotates and it is coupled with generator and thus electricity is produced.

Automated Waste Water Treatment Plan

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***Abstract*— Automated Waste Water Treatment Plants in the pharmaceutical industry are used for purifying the water content by removing excessive waste from it. In addition to this, these water treatment plants are customized according to the specifications of the clients and are offered at suitable prices .They offer excellent functionality, good purifying capacity and equipped with high precision components. These water treatment plants are used to remove the wastes from the water and in order to perform this task; these make efficient use of the advanced technology and high precise machined components. In addition to this, these waste water treatment plants are engineered with perfection and are stringently tested for its quality by our renowned inspectors. These plants are installed for various residential and commercial purposes due to their highly efficient technique and mostly essential for hospitals.**

INTRODUCTION

The scientific advancements in this area and availability of pharmaceutical drugs has done much to improve the overall health of the world's population. But widespread of these materials increased the concerns about concentration of these substances through the water cycle. Hospitals are significant consumers of water .Generates considerable amount of waste water which consists of pathogens and harmful bacteria ,virus ,pharmaceuticals and its metabolites ,radioactive elements ,toxic elements and heavy metals .Pathogens can spread disease adversely affect the biodiversity. Microbial resistant strains to antibiotics can spread resistance vertically and horizontally. Persistent , non biodegradable , hydrophilic chemicals pass wwtp and pollute water bodies and nowadays the hospitals are rather becoming a pollution center than a health care. T he automated waste water treatment plans are necessary for purifying the water content by removing the wastes. But about 70% of the hospitals are not having a proper and hygenic wwtp. The lack of proper waste water treatment may lead to the problems of water quality and health. Most of the conventional waste water treatment plans are not specifically engineered or equipped to remove the waste water properly. Most commonly used some techniques are steroids are removed by using sludges, antibiotics are removed but carbon, anti inflammatory are removed by activated carbon, reverse osmosis, oxidation, nanofilteration also can be used.EIA methods can be used as a management tool. The different programs for runoff and wastewater management should be provided. The control and treatment of wastes should be done. The pollution should be controlled to maximum rate. These goals has to be fulfilled with automated waste water treatment plan.

CONCLUSION

Automated waste water treatment plans are necessary especially in the medical field . Hospitals consume water in a bulk amount . But less than 40% of the hospitals are not having a proper waste water treatment system and the treatment capacity of the these systems are low and do not meet environmental standards. A specific criterion is not implemented with most of the systems. Most of them are low technology to deal with the authority. With a proper system this could be changed and they are performed under this project. It has got the relevance in this present world.