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Title: **THERMAL ANALYSIS FOR THE FEASIBILITY STUDY OF MODIFIED SOLAR CHIMNEY APPLIED FOR BUILDING SPACE HEATING**

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THERMAL ANALYSIS FOR THE FEASIBILITY STUDY OF MODIFIED SOLAR CHIMNEY APPLIED FOR BUILDING SPACE HEATING

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ABSTRACT: syndrome and complicated ordinary protection and excessive energy intake, however may be without problem blanketed into green houses which offer a extra in shape and relaxed environment.Natural ventilation is an vital approach to beautify indoor thermal consolation and decrease the energy intake. A solar chimney device is an improving natural draft device, which uses sun radiation to warm temperature the air in the chimney, thereby changing the thermal strength into kinetic power. The gift have a look at taken into consideration some parameters together with chimney width and solar depth, which had been believed to have a outstanding effect on location air flow.In this thesis the CFD assessment to determine the pressure drop, velocity, warmth switch coefficient, turbulent depth, mass go along with the float charge and heat transfer rate for unique peak of chimney(0.Ninety 5,0.Nine &zero.8m) at particular solar intensity (300,500 &seven hundred w/m²

Keywords: solar chimney, stack effect, CFD etc

I INTRODUCTION

A sun chimney – often referred to as a thermal chimney – is a manner of improving the herbal air float of homes by way of the usage of convection of air heated with the beneficial resource of passive solar strength. A clean description of a solar chimney is that of a vertical shaft using solar strength to decorate the herbal stack air waft via a constructing.The sun chimney has been in use for masses of years, especially in the Middle east and Near East via the Persians, similarly to in Europe through the Romans.In its satisfactory shape, the sun

chimney includes a black-painted chimney. During the day solar energy heats the chimney and the air internal it, developing an updraft of air inside the chimney. The suction created on the chimney's base can be used to ventilate and funky the building beneath. In most elements of the location it is less tough to harness wind electricity for such ventilation as with a wind catcher, however on warm windless days a solar chimney can offer air flow wherein in any other case there could be none

Solar chimney and sustainable formSolar chimneys, moreover called warm

temperature chimneys or warmness stacks, additionally may be applied in architectural settings to lower the energy utilized by mechanical structures (systems that warmth and cool the building via mechanical method). Air conditioning and mechanical air flow had been for many years the same old approach of environmental control in plenty of building sorts, particularly workplaces, in advanced worldwide locations. Pollution and reallocating electricity assets have caused a present day-day environmental technique in building format. Innovative technologies on the facet of bioclimatic requirements and traditional format techniques are frequently combined to create new and potentially a success layout solutions. The solar chimney is this kind of standards presently explored via scientists further to designers, in the number one via research and experimentation.

constructing this affords a problem as it ends within the need for stepped forward aircon. By integrating the attic vicinity with a solar chimney, the state-of-the-art air in the attic may be placed to paintings. It can assist the convection in the chimney, improving air go with the flow.

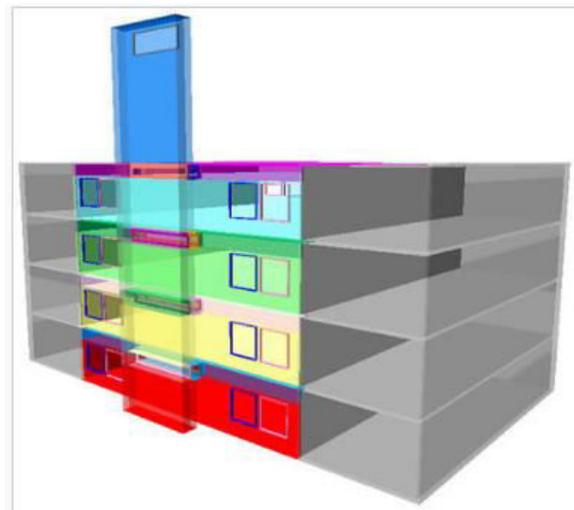


Fig 2:CAD (TAS) Solar Chimney model

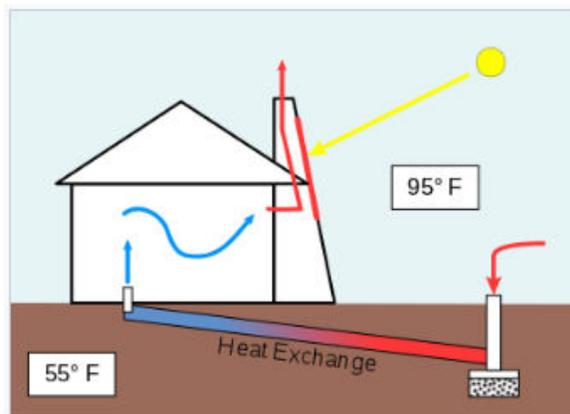


Fig 1:Heat Exchange Process

A version of the solar chimney idea is the solar attic. In a warm sunny climate the attic place is often blazingly warm within the summer season. In a conventional

II. LITERATURE SURVEY

1.Seismic Analysis And Design Of Industrial Chimneys

This paper describes a simplified approach that permit acquiring the essential period of vibration, lateral displacement, shear stress and bending 2d via a hard and fast of equations, acquiring for all times studied an errors under 10%. The consequences acquired in this test have been finished to a complete of 9 actual chimneys (four of metallic and 5 of bolstered concrete) constructed in Chile, with the goal of calibrating based expressions. During the diploma of the assessment, it turn out to be tested that the criterion of constant masses

provide better effects than the criterion of lumped masses, and as a totally critical stop a discrete assessment of the version in twenty segments of the beam is fine. The most representative variables that outline the version with which it's miles possible to carry out a parametric evaluation of the chimney. As critical parameters we must communicate to: slenderness ratio H/D_{inf} , radius ratio R_{sup}/R_{inf} , thickness ratio E_{sup}/E_{inf} and thickness diameter ratio D_{inf}/E_{inf} . Later, with the aid of way of varying each one of the decided on parameters numerous assessment of consultant chimneys of this high-quality family, can be performed. As seismic masses, the spectrums of accelerations recommended with the aid of the code of seismic format for systems and enterprise installations in Chile, have been taken into consideration. Modal responses were blended using the aggregate rule CQC. In all the cases studied in this research, the effect of the $P-\Delta$ effect, the soil form interaction, and the have an effect on on responses that provoke the inclusion of lining, were unnoticed.

2. Analysis Of Self Supported Steel Chimney As Per Indian Standard

Most of the industrial metallic chimneys are tall systems with round move-sections. Such slim, gently damped structures are prone to wind-exited vibration. Geometry of a self helping metallic chimney plays an essential characteristic in its structural behaviour underneath lateral dynamic loading. This is due to the truth geometry is in maximum cases liable for the stiffness parameters of the chimney. However, smooth dimensions

of enterprise self helping metal chimney, which encompass pinnacle, diameter at go out, and so forth., are generally derived from the associated environmental situations. To make certain a favored failure mode layout code (IS-6533: 1989 Part 2) imposes several necessities on the geometry (pinnacle-to-base diameter ratio and pinnacle-to-base diameter ratio) of steel chimneys. The objective of the triumphing look at is to justify the code requirements almost about fundamental dimensions of business steel chimney.

III SOFTWARE USES INTRODUCTION TO CAD

Computer-aided format (CAD), additionally called laptop-aided layout and drafting (CADD), is the use of pc era for the technique of design and layout-documentation. Computer Aided Drafting describes the way of drafting with a computer. CADD software application, or environments, provide the individual with enter-tools for the purpose of streamlining layout techniques; drafting, documentation, and production techniques. CADD output is frequently within the shape of digital documents for print or machining operations. The development of CADD-based totally software program software is in direct correlation with the strategies it seeks to save cash; employer-primarily based absolutely software software (introduction, production, and masses of others.) typically makes use of vector-primarily based absolutely completely (linear) environments while photo-based software software makes use of raster-based definitely (pixelated) environments.

CADD environments frequently contain extra than just shapes. As in the manual drafting of technical and engineering drawings, the output of CAD need to keep information, which includes substances, processes, dimensions, and tolerances, consistent with utility-specific conventions. CAD may be used to design curves and figures in -dimensional (2D) area; or curves, surfaces, and solids in 3-dimensional (3-d) devices. CAD is an important enterprise art work considerably utilized in loads of applications, collectively with car, shipbuilding, and aerospace industries, industrial agency and architectural design, prosthetics, and many more. CAD is likewise broadly used to provide laptop animation for computer pictures in films, marketing and advertising and technical manuals. The current ubiquity and power of pc structures way that even fragrance bottles and shampoo dispensers are designed the use of strategies unprecedented through way of engineers of the Nineteen Sixties. Because of its giant financial importance, CAD has been a high the use of pressure for research in computational geometry, pc images (each hardware and software), and discrete differential geometry.

INTRODUCTION TO CREO

PTC CREO, formerly called Pro/ENGINEER, is 3D modeling software program application program implemented in mechanical engineering, layout, production, and in CAD drafting provider businesses. It have become one of the first 3-D CAD modeling packages that used a

rule-based totally parametric device. Using parameters, dimensions and talents to capture the behavior of the product, it could optimize the development product in addition to the format itself.

The call have become modified in 2010 from Pro/ENGINEER Wildfire to CREO. It end up introduced via the commercial enterprise company who evolved it, Parametric Technology Company (PTC), at some diploma in the release of its suite of layout products that consists of packages together with assembly modeling, 2D orthographic views for technical drawing, finite detail evaluation and more.

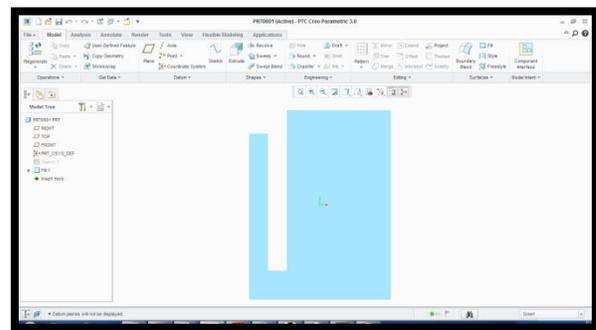


Fig 3: 2D orthographic view

INTRODUCTION TO FEA

Finite element assessment is a way of fixing, generally about, positive troubles in engineering and technology. It is used in particular for problems for which no authentic answer, expressible in a few mathematical shape, is available. As such, it's far a numerical in place of an analytical technique. Methods of this kind are wanted because analytical strategies can't cope with the real, complex issues which might be met with in engineering. For example, engineering strength of materials or the mathematical concept of elasticity may be

used to calculate analytically the stresses and contours in a dishonest beam, but neither can be very successful in finding out what is happening in a part of a car suspension tool in the course of cornering.

INTRODUCTION TO ANSYS

ANSYS is popular-reason finite element evaluation (FEA) software program package deal. Finite Element Analysis is a numerical approach of deconstructing a complex system into very small portions (of character-special period) referred to as elements. The software program software implements equations that govern the behaviour of these elements and solves them all; developing a entire clarification of tactics the tool acts as a whole. These consequences then may be offered in tabulated, or graphical office work. This sort of evaluation is typically used for the format and optimization of a system an extended way too complicated to analyze thru hand. Systems that may fit into this magnificence are too complicated because of their geometry, scale, or governing equations. ANSYS is the same vintage FEA training device inside the Mechanical Engineering Department at many schools. ANSYS is also utilized in Civil and Electrical Engineering, further to the Physics and Chemistry departments

INTRODUCTION TO CFD

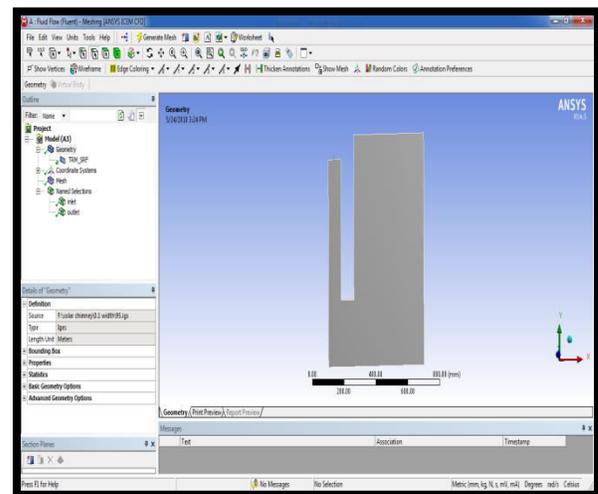
Computational fluid dynamics, normally abbreviated as CFD, is a branch of fluid mechanics that uses numerical techniques and algorithms to solve and study problems that involve fluid flows. Computers are used to perform the calculations required to

simulate the interplay of drinks and gases with surfaces defined thru the use of boundary situations. With immoderate-pace supercomputers, higher answers can be finished. Ongoing studies yields software that improves the accuracy and tempo of complicated simulation conditions together with transonic or turbulent flows. Initial experimental validation of such software program application is finished the use of a wind tunnel with the very last validation coming in complete-scale attempting out, e.G. Flight assessments.

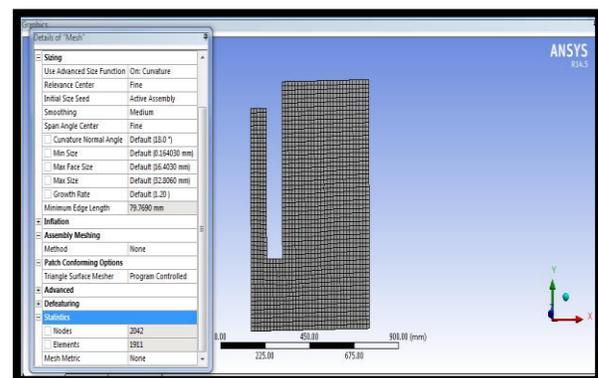
IV SYSTEM ANALYSIS

CFD ANALYSIS OF SOLAR CHIMNEY

Imported model



Meshed model



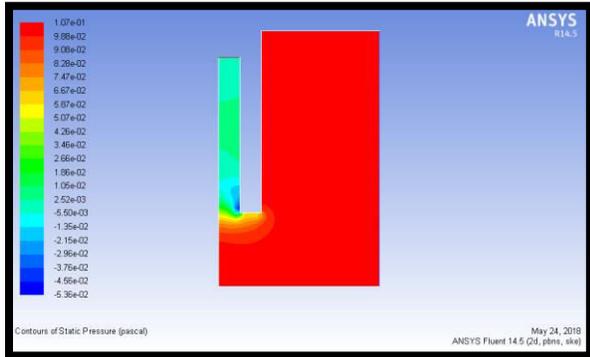
Case1: solar chimney height: 0.95m

V RESULTS

Solar intensity 300w/m²

CFD RESULT TABLE

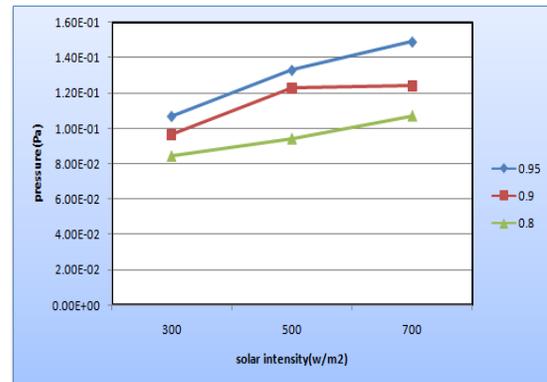
Pressure



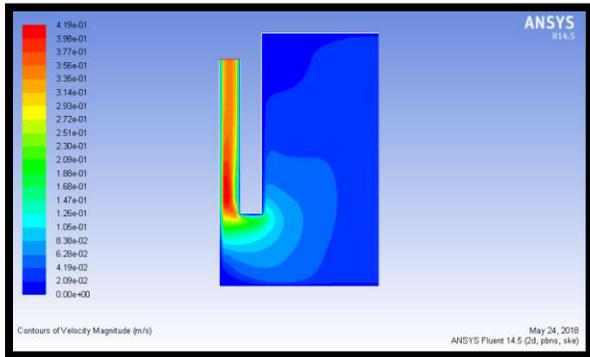
Model (chimney height(m))	Solar intensity (w/m2)	Pressure (Pa)	Velocity (m/s)	Heat transfer coefficient (w/m2-k)	Turbulence intensity (%)	Mass flow rate(kg/s)	Heat transfer rate(W)
0.95	300	1.07e-01	4.19e-01	3.82	5.59	0.000052616	5.7156
	500	1.33e-01	4.66e-01	4.18	6.28	0.00010842	9.7089
	700	1.49e-01	4.98e-01	4.40	6.69	0.0000759	21.976
0.9	300	9.67e-02	3.97e-01	3.69	4.84	0.000057489	2.0258
	500	1.23e-01	4.38e-01	3.94	5.53	0.00013865	37.717
0.8	300	8.44e-02	3.74e-01	3.8	5.32	0.00002878	22.7253
	500	9.42e-02	4.19e-01	4.15	5.91	0.00017393	25.34436
	700	1.07e-01	4.46e-01	4.38	6.33	0.00012237	14.20047

GRAPHS

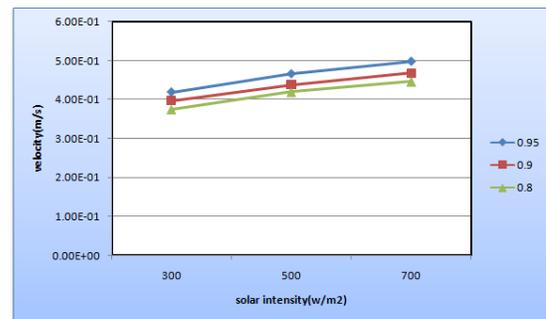
Pressure plot



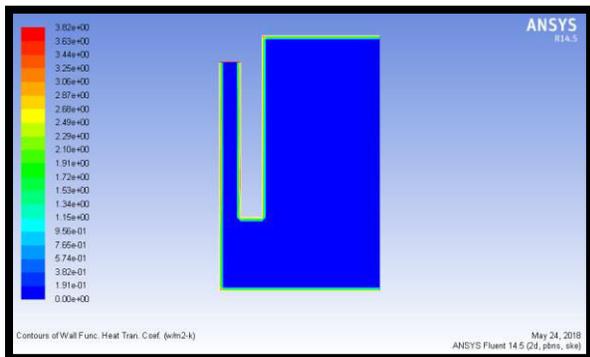
Velocity



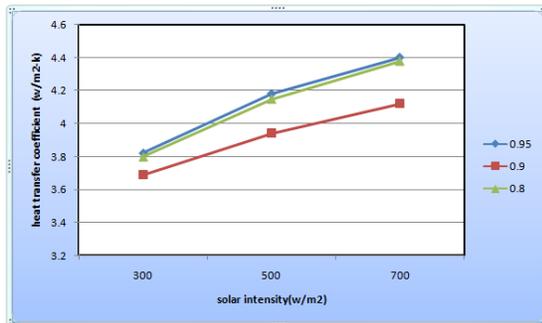
Velocity plot



Heat transfer coefficient



Heat transfer coefficient plot



VI CONCLUSION

Natural air waft is an critical technique to enhance indoor thermal consolation and reduce the power consumption. A sun chimney gadget is an improving herbal draft device, which makes use of solar radiation to warm temperature the air in the chimney, thereby converting the thermal power into kinetic electricity. The present have a look at considered some parameters collectively with chimney width and sun intensity, which have been believed to have a big effect on space air go with the drift. In this thesis the CFD evaluation to determine the pressure drop, velocity, warmth transfer coefficient, turbulent depth, mass go with the flow rate and warmth switch charge for one-of-a-kind top of chimney (0.95m, 0.9m & 0.8m) at particular sun intensity (3 hundred, 500 & seven-hundred w/m²). By looking the CFD assessment effects the pressure, velocity, warmth transfer coefficient, turbulent depth values are will increase via the use of increasing the sun intensity. The warmth switch coefficient values are extra for sun chimney pinnacle 0.95m

VII REFERENCES

[1] M R Tabeshpour, "Non linear Dynamic Analysis of Chimney-like towers", Asian

Journal of Civil Dynamic Analysis of RCC Chimney- A Review (IJSRD/Vol. 4/Issue 02/2016/037) All rights reserved by www.ijsrd.com 120 Engineering (Building and Housing), vol.13, NO.1 (2012), pp.97-112.

[2] Victor bochicchio, "Design of chimney with GRP liner for low and high temperature operation", Vol-22, no-1, pp-1-5.

[3] M Shivaji and V S N Raju, "Dynamic analysis of RCC Chimneys ", pp.1-14.

[4] Anurag Jain, Behnam arya, Charles Goddard and Jon Galsworthy, "Non linear Dynamic Analysis of an Industrial Chimney's Pile foundation system for hurricane loading", 11th Americas conference on wind engineering -sanjuan, Pucrto rico, June-22-26, 2019.

[5] K.S.Babu Narayan, Subhas .C. Yaragal, and Yukio Tamura, "Interaction Envelops for Limit State Design Chimneys", The fourth International Symposium on computational Wind Engineering (cwe2006), Yokohama, 2006, pp 439-442.

[6] B.R. Jayalekshmi, S.V. Jisha, R.Shivshankar, "Wind load Analysis of Tall Chimneys with Piled Raft foundation considering the Flexibility of Soil", International Journal of Advance Structural Engineering (2015), pp.95-115.

[7] Negar Sadegh Pour, Indrajit chowdhary, "Dynamic soil structure interaction analysis of tall multy-flue chimneys under aerodynamic and seismic force", The 12th International Conference of International

Association for Computer Methods and Advances in Geomechanics (IACMAG). 1-6 Oct, 2008, Goa, India, pp.2696-2703.

[8] Jeevan T, Sowjanya G V, "Soil Structure Interaction on 100m Tall Industrial Chimney under Seismic Load", International Journal of Engineering Research and Technology (IJERT), vol.3, issue 8, Aug 2014, pp.782-789.

[9] Ganeshkumar T, Shruthi H.K, "Soil structure interaction effect on 200m tall industrial chimney under seismic load", International Journal of Civil & Structural Engineering research, Vol.2, issue 1, pp.111-118.

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