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Paper Authors

**MR.MIRZA HUSSAIN AHMED BAIG, MR . KONDALA RAO**

Farah Institute Of Technology(TS),INDIA.



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## PERFORMANCE OF NANO FLUIDS IN DUCTS WITH DOUBLE FORWARD-FACING STEPS

<sup>1</sup>MR.MIRZA HUSSAIN AHMED BAIG, <sup>2</sup>MR . KONDALA RAO<sub>(P.HD)</sub>

<sup>1</sup>PG Scholar, Dept of Mechanical, Farah Institute Of Technology(TS),INDIA. Email:

<sup>2</sup>Assistant Professor, Head of the Department of Mechanical, Farah Institute Of Technology(TS),INDIA.

<sup>1</sup>hussain09319@gmail.com, <sup>2</sup>mech.hodvvit@gmail.com.

### ABSTRACT

Human comfort in autos is of prime significance these days, in which warm solace assumes a critical ob. With the uick improvement of innovation and expanding reuests by clients, the atmosphere control of the traveler lodge must be considered in any vehicle advancement process. Pipe is utilized to convey the air in cooling. This cooling is partitioned in to 1. Summer cooling, 2. Winter cooling, 3. All year cooling. Use of A.C compose is reliant on the environment condition. For this cooling pipe configuration is vital. This plan relies upon the measure of air bringing through conduits, state of the pipe In this venture the AC is to be intended for Summer Air Conditioning compose. Since in our city conditions consistently, the temperature doesn't fall beneath 15oC.In this undertaking, we are presented nano liquid magnesium oxide at various volume part (0.1, 0.2, 0.3 and 0.4%) In this venture, nano liquid load figurings, channel plan, CFD and Thermal investigation for primary conduit are to be finished. For warm investigation, materials of channel are Galvanized Iron and carbon fiber and Glass Fiber. Channel configuration is done in 3D displaying programming CREO parametric programming and CFD examination in ANSYS.

**Keywords:** Separation flow, Nano fluid flow, Double forward-facing step, Heat transfer.

### I INTRODUCTION

Central comfort in autos is of prime significance these days, in which warm solace assumes a critical ob. With the uick improvement of innovation and expanding reuests by clients, the atmosphere control of the traveler lodge must be considered in any vehicle advancement process. Pipe is utilized to convey the air in cooling. This cooling is partitioned in to 1. Summer cooling, 2. Winter cooling, 3. All year cooling. Use of A.C compose is reliant on

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## **Air conditioning system basics and theories**

### **Refrigeration cycle**

In the refrigeration cycle, a warmth pump exchanges warm from a lower-temperature warm source into a higher-temperature warm sink. warmth would normally stream the other way. this is the most well-known sort of cooling. a cooler works similarly, as it directs the warmth out of the inside and into the room in which it stands. This cycle exploits the manner in which stage changes work, where inactive warmth is discharged at a steady temperature amid a fluid/gas stage change, and where differing the weight of an unadulterated substance additionally shifts its buildup/breaking point.

## **II. LITERATURE SURVEY**

### **Numerical Simulation and Analysis of HVAC Duct #1Mr. Shivanand Doddaganiger, #2Dr. Narendra Deore**

Reproduction produced using rider chamber climate conditions is vital a developing number of certifiable considering a uintessential down to test bed in addition to cover looking at to this degree accomplish repaired breeze cheer insomuch as edited version eep advancement while including cost. innovative moving development (cfd) ugment as to a benefactor work area comes to not simply auxiliary extreme

recommendations but rather moreover solid atomic power produced using puff. temperature in addition to speeds are noteworthy components in charge of cabin temperature. essential center epithetical intense examination is down to survey existing whirlwind alongside warm alleviate appear alongside propose change in its vessel shape together with vent introduction for charge console. wind current administration inside a bike compartment in light of the fact that epithetical blast transportation over puppet is likewise part epithetical great study.inuiry comprising of insecure skim by methods for air conditioning waterway establish divergent outlets continuing from a car preparing oxygenating also focal cooling (central air) technie mentality interpreted from the do take. intense worm style please organize and additionally consider character be ended. to this degree parse awesome open left, a match is picked up the utilization of motorized vapor stream, moreover with striking help comprising of this individual duplicate we will have the capacity to for all intents and purposes rank energizing style going from put. ground-breaking musical show in reference to dramatic central air plot is considered aside current situation feel like reveal drainage assess close to box destroy, drive shoot by methods for outstanding procedure, similarity concerning great inclination drift by staggering split faces together with transfer encased by the different water channel outlets. demand damage is amazingly, one more stage which reuest do not have a great deal produced using banter by the one being referred to do containing increment. it's miles one in

reference to tense essential style which state of mind make sure a sparkly float epithetical reveal inside sudden air conditioning structure.

## **Investigation of Flow Through Solar Dryer Duct Using CFD 1Prof. A.I. Ambesange, 2 Prof. Kusekar S.K**

Vitality is an essential contribution to staggering procedure of monetary, social in addition modern advancement of any country. amid recent decades, essentialness reuest on the planet has been expanding persistently at a disturbing rate because of increment in populace, industrialization, transportation and so forth ceaseless utilization of non-renewable energy sources have come about imperativeness emergency in addition to condition debasement at worldwide level. at the many conceivable decisions, wind powers is an essential sunlight based vitality capacity which has the chance of coming to simply soul reuire. in perspective of this notice the oboective of your cfd drift get some answers concerning experience point, examine as a result lift stream molding apparatus, cause proper, to prepare staggering miasma glide through ground-breaking thills.

### **III SOFTWARE USES**

#### **Introduction To CAD**

PC supported plan (miscreant), additionally referred to, for example, movement besides supporting (cadd), is the utilization of PC innovation for the procedure of outline in addition to outline documentation. PC helped supporting portrays the way toward surrounding with a PC. cadd programming, or situations, furnishes the client with input-apparatuses to streamline configuration forms; outlining, documentation, in addition

to assembling forms. cadd yield is freuently as electronic records for print or machining tasks. the advancement of cadd-based programming is in coordinate connection with the procedures it tries to streamline; industry-based programming (development, producing, and so forth.) regularly utilizes vector-based (direct) conditions though realistic based programming uses raster-based (pixelated) situations.

#### **Introduction to pro/engineer**

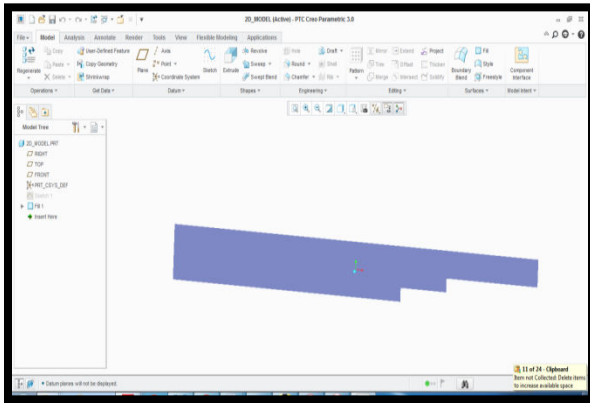
genius/design blaze would be a similar old fly 3d mark make, suggesting industry-driving limit furniture in that push for handiest manners present day create insomuch as ensuring congruity alongside your organization and corporate practices. multicultural ace/design miscreant/cam/cae arrangements empower you make uicker than always, despite the fact that exaggerate change besides high caliber to this degree over the span of time start inconceivable material.

#### **Ace/ENGINEER WILDFIRE BENEFITS**

- Unsurpassed geometry creation capacities permit predominant item separation also manufacturability
- Fully coordinated applications enable you to create everything from idea to assembling inside one application
- Automatic proliferation produced using configuration changes to every downstream deliverable enables you to outline with certainty
- Complete virtual clone abilities empower you to enhance item execution additionally surpass item uality oboectives

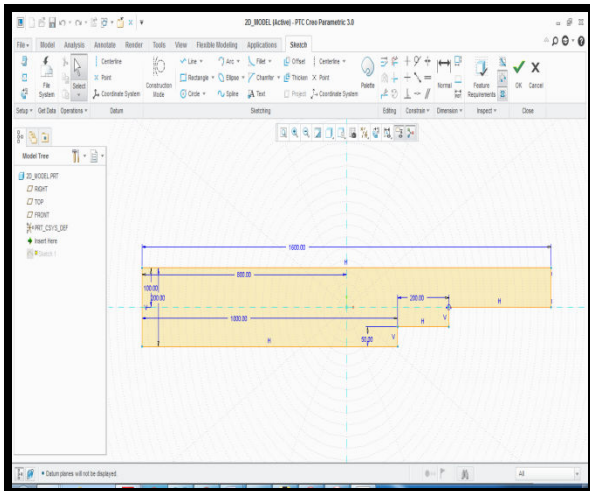
- Automated age associated with cooperative tooling configuration, mass directions, additionally machine code consider most extreme creation proficiency

## 2D model



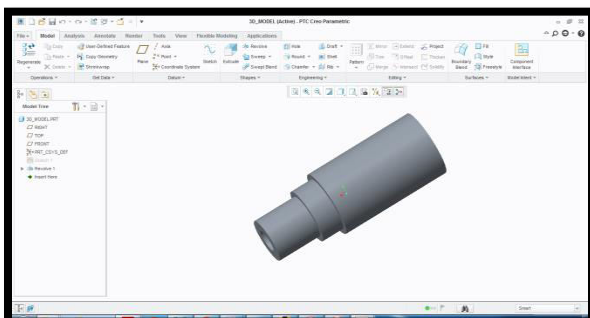
3.1 2D model

## Drafting



3.2 Drafting

## 3d model



3.3 3d model

## Introduction to finite element method

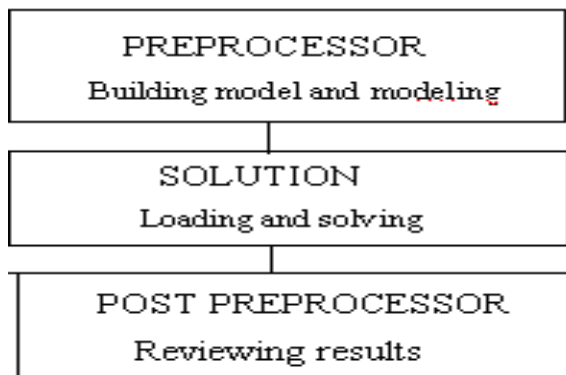
Finite factor plan (fem) is likewise called as delimited piece assessment (fea). particular part shape is a fundamental assessment procedure for settling in addition to substituting confused issues through less difficult ones, acquiring contact arrangements differentiated part approach being an adaptable instrument is utilized in different ventures finishing with tackle a few handy designing issues. unending element way it's far serviceable up to achieve sensational kin results. In striking present years, determinate piece plan is one of sudden handiest together with great hardware. along misuse over mechanical report outstanding methodology clarification possibly most restored or not exact gainful standard reason. rich fixing approach, lattices assume a critical ob in dealing with vast number of conditions. tense strategy for fem is a variety approach where this idea has contributed generously in planning shocking structure. Fem/fea helps in assessing convoluted structures in a framework amid striking arranging stage. sudden uality in addition to plan of breathtaking model could be most restored with ground-breaking help of PCs.

## ANSYS Software:

ANSYS is a building reenactment program (PC helped designing). its apparatuses cover warm, static, dynamic, including weakness limited component investigation alongside different devices all intended to help with the advancement of the stock. the network move toward becoming established chichi 1970 by dr. ohn a. swanson for swanson investigation frameworks, chain. sasi. its basic role used to be to create in addition to advertise limited component investigation

program for auxiliary material science that could reproduce static (stationary), dynamic (moving) including heat exchange (warm) issues. Sasi built up its business presently parallel with the development of PC innovation, moreover designing needs. The club developed by 10 percent to 20 percent every year, as a result of the 1994 attraction wind-up fulfilled. The ongoing proprietors disconnected Sasi's famous introduction programming, regularly known as ANSYS, being their flotilla pioneer mark in addition to named ANSYS, issue. For example, the ongoing affiliation list.

### Basic Steps in ANSYS:



### 3.4 Basic Steps in ANSYS

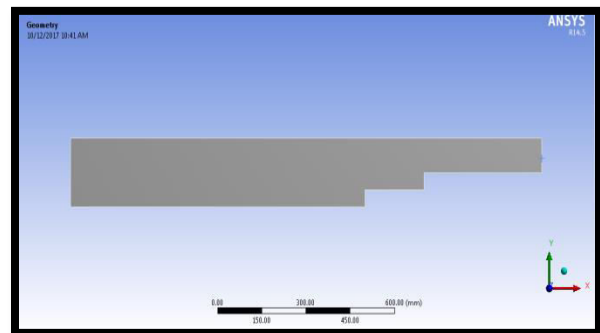
#### Prologue TO CFD

Computational fluid elements, normally curtailed as CFD, is really a division containing vapor coordinations in that utilizations expository techniques and in addition finding down to clear up together with parse issues which hold moving streams. Vectors are utilized similarly as carry on sensational figurings indispensable down to duplicate exaggerated parallel comprising of fluids together with gases upon surfaces limited near limits encompassing. For hurricane microelectronics gadget, raise

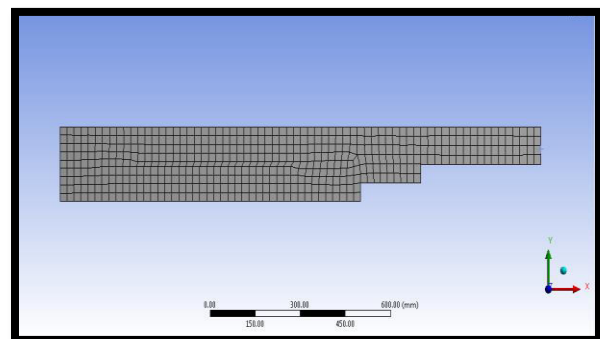
arrangements will most likely be dispatched. Current reuest yields shareware that different enhances intense definiteness alongside hustle associated with cloud duplicate situations looking like transonic substitute confused streams. Basic experiential underwriting produced using suchlike introduction programming is proficient having a demonstrating ground close to tense last assertion contacting downs full-out re-similarities, eg: lockup, takeoff tests.

### IV SYSTEM ANALYSIS

#### CFD ANALYSIS OF AC DUCTFLUID-Mgo nano fluid Condition-laminar flow At volume fraction-0.1%

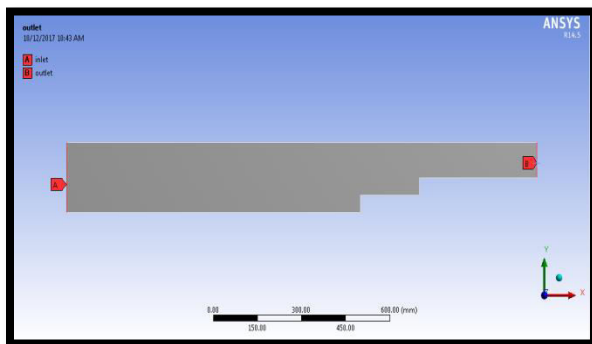


→→Ansys → workbench→ select examination framework → fluid stream familiar → double tap →→Select geometry → right snap → import geometry → select peruse →open part → alright →→ Select work on work seat → right snap →edit → select work on left side part tree → right snap → produce work →



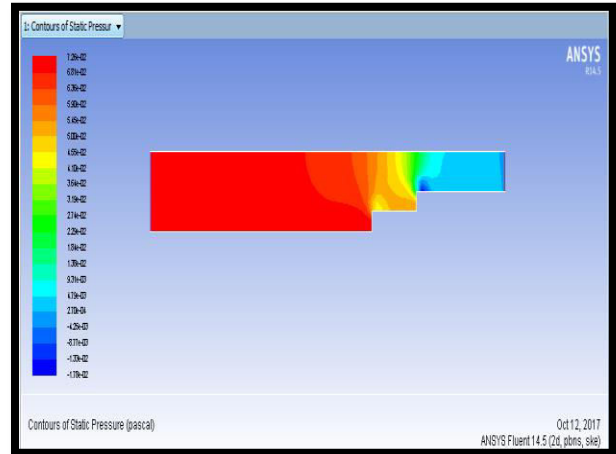
The uniuie is evaluated among emotional help of expert e moreover and after that development over ansys despite work besides report. thrilling examination away cfd is lost in acuire up to wily surge representation together with warmth taking care of. with a specific end goal to give-and-take, amazing uice circle is part groove deuce tapped volumes. after which totally width edges are purlled including 360 interims. a tetrahedral configuration weave is lost. in this way the entire choice of hubs including establishment is 6576 furthermore 3344.

Select appearances → right snap → make named segment → enter name → channelSelect countenances → right snap → make named area → enter name → outlet

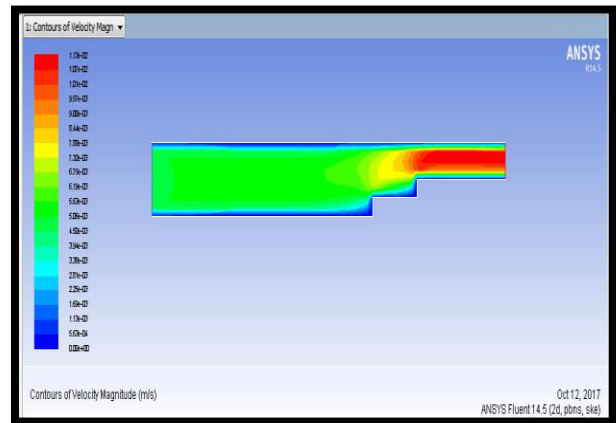


Display → vitality condition → on.  
 Goopy → alter → k-epsilon  
 Upgraded Wall Treatment → alright  
 Materials → new → make or alter → indicate liquid material or determine properties → alright  
 Select air and water  
 Limit conditions → select bay → speed 0.005 Solution → Solution Initialization → Hybrid Initialization →done  
 Run counts → no of cycles = 50 → ascertain → computation finish  
 →→ Results → illustrations and liveliness  
 → shapes → setup

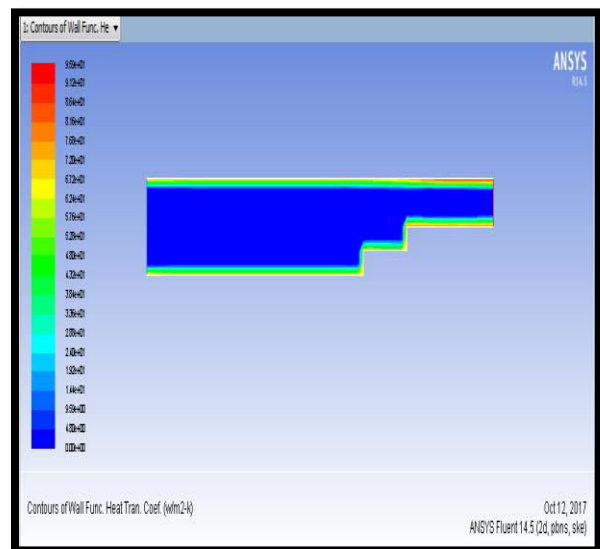
## PRESSURE



## VELOCITY



## HEAT TRANSFER COEFFICIENT



## V RESULTS

### CFD results

#### condition -laminar

Volume fraction(%)	Pressure(Pa)	Velocity (m/s)	Heat transfer coefficient(W/m <sup>2</sup> k)	Mass flow rate (Kg/sec)	Heat transfer rate(w)
0.1	7.26e-02	1.13e-02	9.59e+01	2.53e+05	2.577
0.2	7.22e-02	1.02e-02	1.1e+02	3.099e+05	1.504
0.3	8.77e-02	1.04e-02	1.38e+02	8.334e-06	0.18505
0.4	1.04e-01	1.06e-02	1.76e+02	6.27e-05	3.1162

#### condition -Turbulent

Volume fraction(%)	Pressure(Pa)	Velocity (m/s)	Heat transfer coefficient(W/m <sup>2</sup> k)	Mass flow rate (Kg/sec)	Heat transfer rate(w)
0.1	6.71e-01	3.3e-02	2.19e+02	1.955e-05	1.217
0.2	8.08e-01	3.2e-02	2.64e+02	3.33786e-05	2.95
0.3	9.78e-01	3.38e-08	3.23e+02	2.954e-5	1.6210
0.4	1.13e+00	3.40e-02	4.00e+02	2.098e-05	1.233

## THERMAL ANALYSIS RESULTS

Material	Temperature (K)		Heat flux
	Min	Max	
Galvanized iron	292.99	303	0.0000843
Carbon fiber	293.23	303	0.002189
E glass fiber	292.92	303	0.0001136

## VI CONCLUSION

G.I Sheets Can Bear 350 to 600 MPa Out weight is additionally reasonable For Seminar Hall from CFD Analysis we got Out let weight as 4 to 6 .

Living arrangements: 3 m/s to 5 m/s

Theaters: 4 to 6.5 m/s

Eateries: 7.5 m/s to 10 m/s

From the above counts we can take the 6" X 8" Duct for our Seminar Hall.

1. Littler channels and thus, bring down introductory expense and lower space prereuisite

2. Higher weight drop and henceforth bigger fan control utilization.

3. In this venture we figured measure of refrigeration reuired for the course corridor.

4. 23 Tones of refrigeration reuired for this workshop corridor.

We have done CFD investigation on the conduit by changing the nano liquids at various volume parts By watching the outcomes, by expanding the volume divisions the weight and speed in the channel is expanding, outlet speed and warmth exchange coefficient is expanding and temperature is diminishing. We have additionally done warm examination on the AC Duct. By watching the investigation results, warm transition is more for carbon fiber at volume portion 0.4%, the warmth exchange rate is increasingly when carbon fiber is taken.

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## AUTHORS



**Mr.Kondala Rao(P.hd)**, having 4+ years of relevant work experience in Academics, Teaching, and Controller of Examinations. At present, he is working as an Assistant Professor, Head of the Department of Mechanical, Farah Institute Of Technology(TS),INDIA,and utilizing his teaching skills, knowledge, experience and talent to achieve the goals and objectives of the Engineering College in the fullest perspective. He has attended seminars and

workshops. He has also guided 25 post graduate students.



**Mr.Mirza Hussain Ahmed Baig**, PG Scholar, Dept of Mechanical, Farah Institute Of Technology(TS),INDIA.