"INSTALLMENT OF EFFICIENT COOLING SYSTEM IN ROLLING MILL"

A PROJECT SUBMITTED TO

SMT. S. R. PATEL ENGINEERING COLLEGE,
GUJARAT TECHNOLOGICAL UNIVERSITY

IN PARTIAL FULFILLMENT OF THE PROJECT ASSIGNED TO PREFINAL

SEMESTER (7^{TH}) OF

BACHELOR OF ENGINEERING

IN

MECHANICAL ENGINEERIiNG

SUBMITTED BY

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UNDER THE GUIDANCE OF

PROF. SNEHAL S. PATEL

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DEPARTMENT OF MECHANICAL ENGINEERING
SMT. S. R. PATEL ENGINEERING COLLEGE, DABHI, UNJHA
GUJARAT TECHNOLOGICAL UNIVERSITY, GANDHINAGAR

(SEPTEMBER, 2015)

DEPARTMENT OF MECHANICAL ENGINEERING

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Certificate

This is to certify that we have examined the project entitled

"Installment of efficient cooling system in rolling mill"

Being submitted by

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Are Undergraduate Students of Mechanical Engineering. We hereby accord our approval. it as studycarried out and presented in manner required forits acceptance in fulfilment of t he project assigned to Semester(7th) for bwhich it has been submitted. This approval does not necessarily endorseraccept every statement made, opinion expressed or conclusion drawn as recorded in this project.Itonlysignified the acceptance of the project for the purpose for which it is submitted.

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Certificate of examination

This is to certify that the work presented in the Project Entitled

"Instalment of efficient cooling system in rolling mill"

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In fulfilment of the project assigned to Final Semester (7^{th}) of

BACHELOR OF ENGINEERING
In
MECHANICAL ENGINEERING
Of

Gujarat Technological University, Gandhinagar during the academic year 2015-16.

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DATE: ____________

SIGN: ____________

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First and foremost let our grateful to almighty God. Our deepest regards and greatest admiration remain to my parents & family, who has taught our how to walk on an untrodden path in the quest of knowledge.

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ABSTRACT

The uses of metal channels, angles, sections are used in wide range. Rolling mill used for manufacturing of these parts has required very efficient cooling system. If proper cooling system is not used roller get failure. The cost of roller is very high. We have introduced a efficient cooling system in rolling mill which no used any forced draft cooling system. The cost of forced draft cooling is high so, our project will meet efficient cooling of rolling mill as possible as lowest cost.

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CHAPTER: 1

INTRODUCTION

1.1 INTRODUCTION

- DEFINATION OF ROLLING: The process of plastically deforming metal by passing it between rolls.
- Rolling is the most widely used forming process, which provides high production and close control of final product
- The metal is subjected to high compressive stresses as result of the friction between the rolls and the metal surface.
- Rolling process mainly divided into 1) hot rolling 2) cold rolling.[5]

FIGURE: 1.1ROLLING PROCES

1.2: PROJECT BACKGROUND

There is temperature of outlet water is 60 C. This hot water is recirculate in rolling mill for cooling purpose so water get evaporated fast and more fresh water is required.

Due to presence of metal particle in water impeller of pump get blocked and rotor life is also reduced.

Fig 1.2 COOLING SYSTEM

Recirculation of hot water:

Water used for cooling of roller is continuously recirculate without cooling of water.

Blockage of pump impeller:

Due to mixing of metal particles and other foreign particles the impeller of pump is wearied out after sometime.

Problem detects in furnace:

The overall productivity of the furnace is less than actual capacity of It. Because the draught used in furnace is not correct.

Problem in material handling method:

The conventional material handling method what the labors are using is not convenient .When labor moves material from cutting place to furnace in take takes more time than its actual required.

Die design and Material:

The design of die suspects about not reliable and convenient which is depreciates after few pass of cycles. Requirement of change in die after some cycle due to tear.Because the impropermaterial is used.

1.3 PROJECT OBJECTIVE

- To eliminates failure of roller.
- To reduce the time consumption.
- To increase production rate.
- To reduce power consumption of water circulation system.
- Increase the life of roller.
- To eliminate blockage of pump.
- To increase profit of company.
- To reduce maintenance work.

1.4 Scope of project

- There are no of companies which are use automation in rolling mill. But automated project has very high cost compare to semi automatic rolling mill.
- Automated rolling mills has no any cooling problem because of they used forced draft cooling system
- But in small scale rolling mill they does not use any proper cooling system so life of die is reduced.
- Probability of implementation of our project in all types of small scale roolin mill.

FIG:-1.3 COOLING PROCESS

CHAPTER 2

LITERATURE REVIEW

2.1 HISTORY OF ROLLING MILL

The invention of the rolling mill is attributed to Leonardo da Vinci. Earliest rolling mills were slitting mills, which were introduced from what is now Belgium to England in 1590. These passed flat bars between rolls to form a plate of iron, which was then passed between grooved rolls (slitters) to produce rods of iron. The first experiments at rolling iron for tinplate took place about 1670. In 1697, Major John Hanbury erected a mill at Pontypool to roll 'Pontypool plates'—black plate.[citation needed] Later this began to be rerolled and tinned to make tinplate.[citation needed] The earlier production of plate iron in Europe had been in forges, not rolling mills.

The slitting mill was adapted to producing hoops (for barrels) and iron with a half-round or other sections by means that were the subject of two patents of c. 1679.

Some of the earliest literature on rolling mills can be traced back to Christopher Polhem in 1761 in PatriotistaTestamente, where he mentions rolling mills for both plate and bar iron. He also explains how rolling mills can save on time and labor because a rolling mill can produce 10 to 20 or more bars at the same time.

A patent was granted to Thomas Blockley of England in 1759 for the polishing and rolling of metals. Another patent was granted in 1766 to Richard Ford of England for the first tandem mill. A tandem mill is one in which the metal is rolled in successive stands; Ford's tandem mill was for hot rolling of wire rods.

Modern rolling practice can be attributed to the pioneering efforts of Henry Cort of Funtley Iron Mills, near Fare ham, England. In 1783 a patent was issued to Henry Cort for his use of grooved rolls for rolling iron bars. With this new design mills were able to produce 15 times more output per day than with a hammer. Although Cort was not the first to use grooved rolls, he was first to combine the use of many of the best features of various iron making and shaping processes known at the time. Thus modern writers have called him "father of modern rolling.

2.2 INTRODUCTION OF HOT AND COLD ROLLING PROCESS

2.2.1 HOT ROLLING PROCESS

The distinctive mark of hot rolling is not a crystallized structure, but the simultaneous occurrence of dislocation propagation and softening processes, with or without recrystallization during rolling. The dominant mechanism depends on temperature and grain size. In general, the recrystallized structure becomes finer with lower deformation temperature and faster cooling rates and material of superior properties are obtained by controlling the finishing temperature.

Fig: 2.1-HOT ROLLING PROCESS

The initial breakdown of ingots into blooms and billets is generally done by hot-rolling. This is followed by further hot- rolling into plate, sheet, rod, bar, pipe, rail.

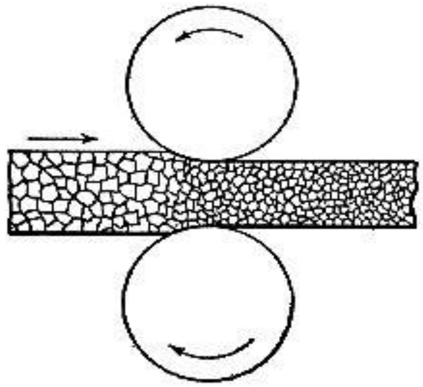


FIGURE 2.2: REDUCED THE GRAIN SIZE DURING ROLLING PROCESS

2.2.2 ADVANTAGES OF HOT ROLLING PROCESS

1) Flow stresses are low, hence forces and power requirements are relatively low, and even very large work pieces can be deformed with equipment of reasonable size.
2) Ductility is high; hence large deformations can be taken (in excess of 99% reduction).
3) Complex part shapes can be generated.
4) The upper limit for hot rolling is determined by the temperature at which either melting or excessive oxidation occurs. Generally, the maximum working temperature is limited to 50°C below the melting temperature. This is to allow the possibility of segregated regions of lower melting material

2.3 COLD ROLLING PROCESS

The cold-rolling of metals has played a major role in industry by providing sheet, strip, foil with good surface finishes and increased mechanical strength with close control of product dimensions.

2.3.1 Advantages of cold rolling:

- In the absence of cooling and oxidation, tighter tolerances and better surface finish can be obtained.
- Thinner walls are possible.
- The final properties of the work piece can be closely controlled and, if desired, the high strength obtained during cold rolling can be retained or, if high ductility is needed, grain size can be controlled before annealing.
- Lubrication is, in general, easier.

2.4 BASIC VIEW ABOUT ROLLING MILL PROCESS

Semi- finished	Bloom is the product of first breakdown of ingot(cross sectional area > 230 cm).
	Billet is the product obtained from a further reduction by hot rolling products (cross sectional area > 40x40mm).
	Slab is the hot rolled ingot (cross sectional area > 100 cm and with a width 2 x thickness).

FURTHER ROLLING STEPS:

Mill products	Plate is the product with a thickness > 6 mm.
	Sheet is the product with a thickness < 6 mm and width > 600 mm
	Strip is the product with a thickness < 6 mm and width < 600 mm.

2.5 RESEARCH PAPER

TAN Ming-hao and et. Al (2010) In a hot strip mill, steel slabs are heated and rolled to reduce the thickness to the target value (1 – 20 mm) before they become strips[l]. After rolling, the hot strip undergoes a laminar cooling process where it is accelerated on the run out table and cooled with laminar flow water between the finisher and the coiler. This cooling process can not only increase productivity, but also lead to significant grain refinement and improved mechanical properties', Due to the complex nature of the laminar coolingprocess , itis very difficult to describe with accurate mathematicalmodels. The authors have developed an intelligent modelfor the laminar cooling process that incorporatescase-based reasoning into the first principles dynamicalmodel-'".The proposed model iseasily adaptable to changing operating conditions.In this paper, the software package for the proposedmodel[2] was introduced. The software packagecan be used to perform virtual experiments onthe plant without disrupting the production of thereal laminar cooling process or endangering thesafety of the plant. It can not only be used to explorethe dynamics of laminar cooling processes.but also to test the performance of various controlmethods.

WANG BIN and et al.(2013) recorded thatThe improvement of hole-expansion properties for medium carbon steels by ultra fast cooling (UFC) afterhot strip rolling was investigated. It was found that finely dispersed spherical cementite could be formed after ultrafast cooling, coiling and annealing treatment. Tensile strength of the steel after annealing was measured to be about440 MPa. During hole-expansion test, cracks were observed in the edge region around the punched hole becausenecking or cracking took place when tangential elongation exceeded the forming limit. Cracks were mainly formed bythe coalescence of micrevoids. Fine and homogeneous microstructure comprised of ferrite and spheroid zed cementitecould increase elongation values of the tested sheets by suppressing the combination of the adjacent micro-voids, resultingin the improved hole-expansion property.

Li Hia-jun and et al(2013) investigated thatUltra-fast cooling (UFC) is an advanced technology in hot rolling field. Through this technology, greatchanges on the run-out table are produced in the strip cooling process. In order to adapt to these changes, a new generationof hot strip cooling control system after rolling was developed based on the UFC basic principle. The systemcan not only accomplish temperature of UFC delivery side, coiling temperature, cooling rate, etc, and multi-objectiveaccuracy control, but also offer more flexibility and new attractive possibilities in terms of cooling pattern on the run outtable, which could be of prime importance for the production of some difficult steels. In addition, through thetime-velocity-distance (TVD) profile prediction combined with speed feed-forward control and coiling temperaturefeedback control, the coiling temperature control precision can be effectively improved during accelerative rolling inthe system. At present, the system has been successfully used in the conventional strip production line and CSPshort process production line, and its application effect is perfect.

US PATENT-4507949 An apparatus and method for cooling product in a continuous hot-rolling mill. The apparatus comprises acooling unit including a frame defining a plurality ofspaced, cartridge receiving slots in which a plurality ofguide and spray cartridges are removable mounted. Theguide and spray cartridges are similarly configured sothat either cartridge can be mounted in a given frameslot so that the number and ratio of spray to guide cartridges can be varied to modify the cooling characteristics of the cooling unit. Valves are provided to adjust the coolant flowrate to a cartridge and a quick release coupling is utilized to enable the cartridges to be easily removed forservice and/or replacement. One embodiment of aspray cartridge includes a housing that defines a centralthrough passage in which radially directed nozzles aremounted, which are operative to spray coolant receivedfrom a coolant chamber defined by the cartridge housing, onto the‘ product as it passes through the opening.In another embodiment, a spray tube dining a throughpassage is mounted in the cartridge housing and includes two sets of ports that communicate with thecartridge coolant chamber. One set of ports is angledwith respect to the spray tube centerline whereas theother set of ports are directed radially. In the preferredcooling method, cooling units are placed before andafter the last finishing roll stand so that pre- and postroll cooling is provided.

US PATENT-4706480A metal rolling mill coolant spraying System for minimizing formation of tight edges of rolled strip- The system comprises supplemental assemblies for sprayingField of Search the work rolls adjacent to the strip edges, mounted forlateral adjustment controlled in response to signals from a computer for initial setup or continuous operation ReferencesClted based on shape meter roll edge rotor signal feedback.

US PATENT-3994151 In a rolling mill for reducing metal, having upper andlower work rolls between which the metal is passedand at least one back-up roll for the upper work roll,the combination of means for applying coolant to thesurface of the upper work roll only on the outgoingside of the mill, casing structure enclosing the localityof coolant application and so arranged that a narrow gap is defined between the upper work roll and aTransverse wall of the casing below the coolantapplying means, and means for creating a rapid flowof air along the upper work roll surface adjacent thegap in a direction to prevent exit of coolant throughthe gap from the casing structure while withdrawingair from the casing structure. The air-flow creatingmeans may include means for maintaining the interiorof the casing structure at sub atmospheric pressure. A

method of cooling the upper work roll in such a millcomprises applying coolant to the surface thereof onlyat a locality on the outgoing side of the mill whilemaintaining an enclosure in surrounding relation tothe coolant-applying locality with a narrow gap defined between the enclosure and the upper work rollsurface at a level below that locality, and directing arapid flow of air along the latter roll surface adjacent the gap to prevent exit of coolant through the gap.The back-up roll, which is in contact with the upperwork roll, cooperates with the foregoing structuresand steps to prevent carryover of excessive coolantonto the upper work roll surface on the ingoing side ofthe mill.

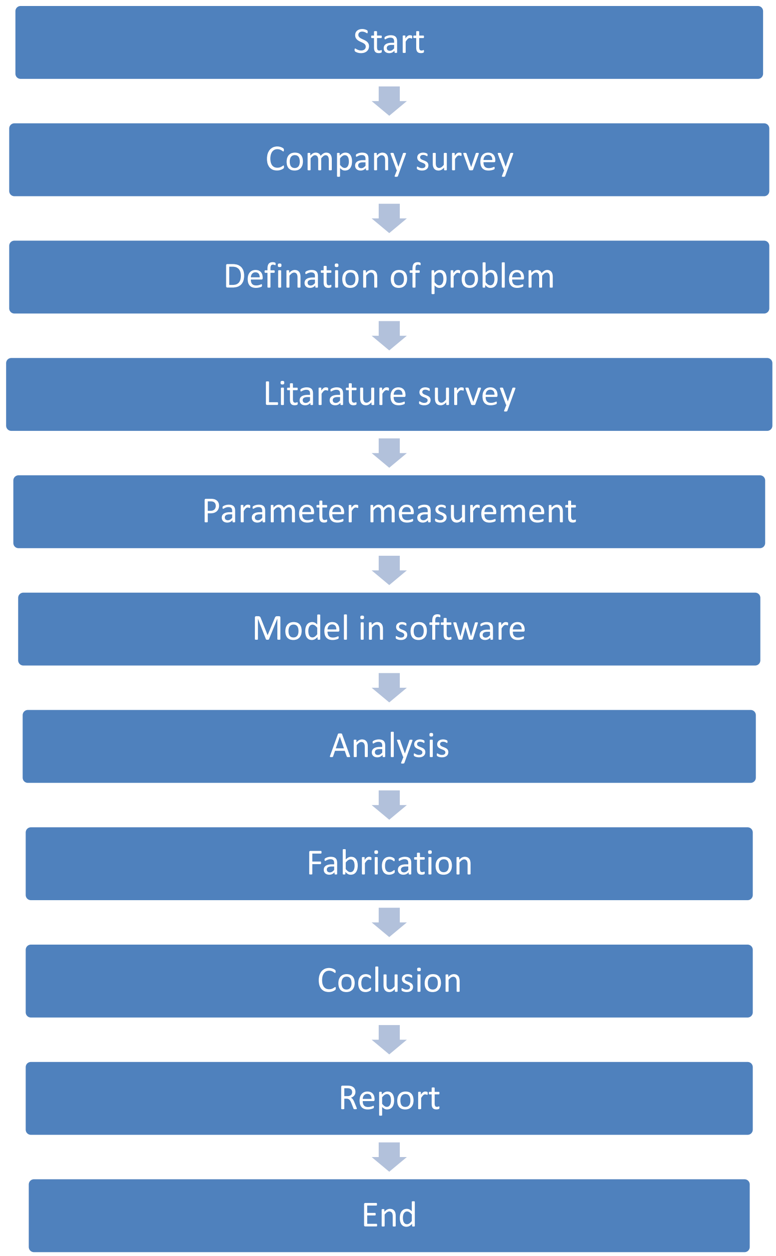
US PATENT-401600 In order to decrease the austenitic grain size, it hasbeen suggested to subject steel rod, during rolling, tointermediate cooling down to a temperature lower thanA3, before the rod enters the finishing stands of therolling mill. On emerging from the finishing stands, therod undergoes rapid cooling in a suitable cooling install lation to a temperature of 700° C to 800° C, and thenslower cooling.It has been also suggested to cool a steel rod, after ithas emerged from the final stand of the rolling mill, by means of a fluid so as to cause martensitic and/or bainitic quenching of the surface of the rod. According tothis procedure, upon emerging from the fluid coolinginstallation, the unquenched part of the rod is at atemperature sufficient to allow tempering of the surface layer of martensite and/or bainite to take place(during air-cooling) due to the heat of the core of therod, whereby the rod progressively assumes a ferritic orferritic-pearlitic structure, or possibly even a pearliticbainitic structure. In this way, a product of compositestructure is obtained.

CHAPTER-3

METHODOLOGY

3.1 work flow of project:

Methodology is the systematic, theoretical analysis of the methods applied to a field of study. Methodology describes the complete project planning procedure for the project implementation.



CHAPTER-4

DESIGN

4.1 Experimental analysis

- Hot water temperature 65˚C.

4.2 GRAPHICAL RESULT(CHART)

CHART: - 1 WITHOUT FAN

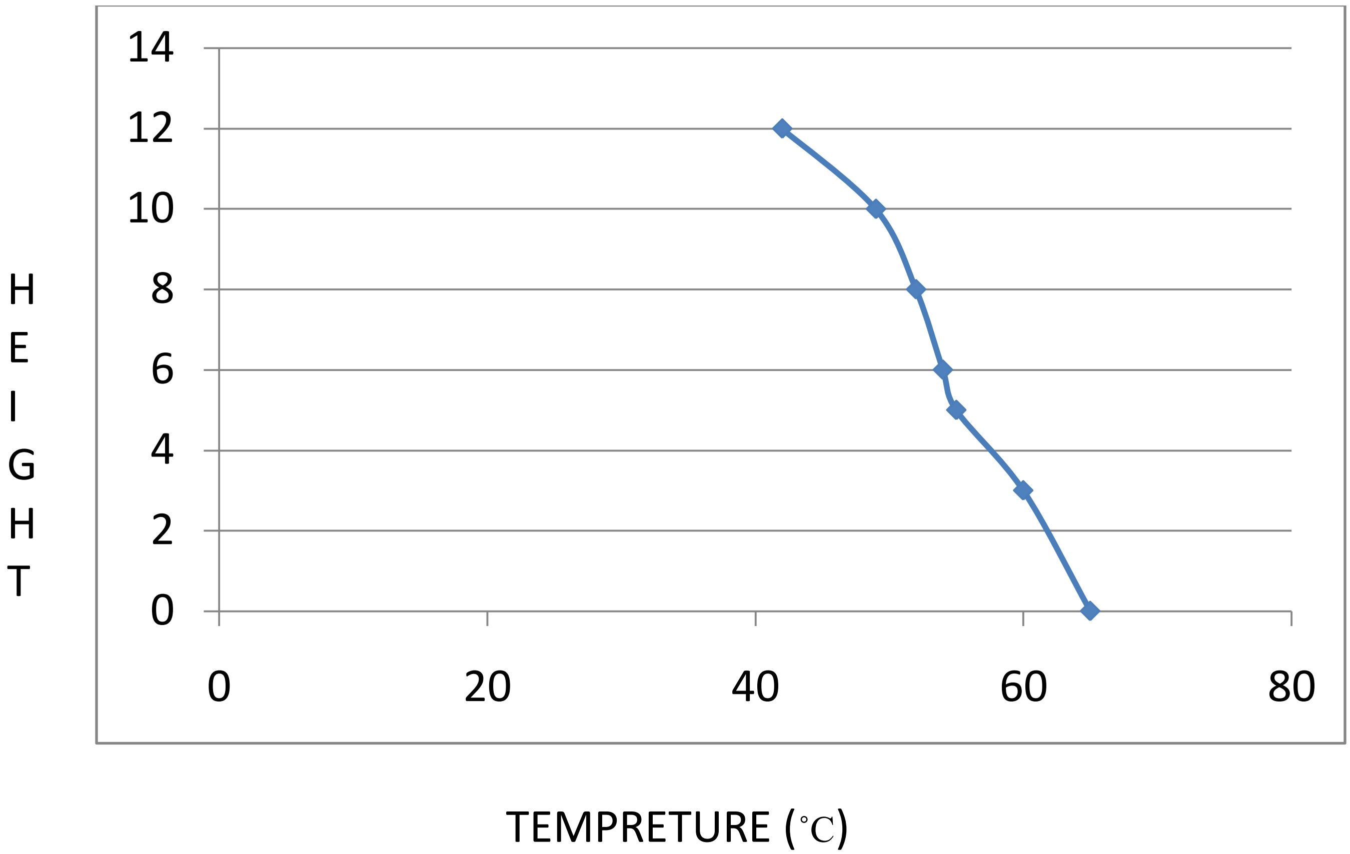
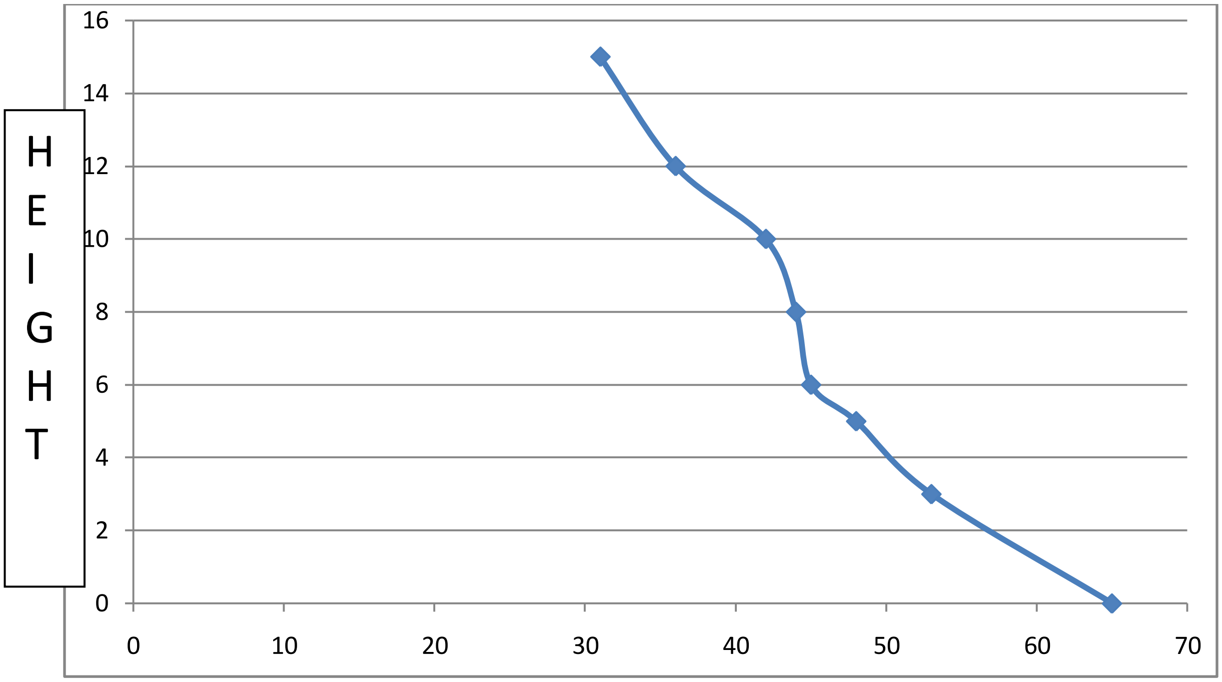


FIG:- 4.1 WITHOUTFAN

Height	**TEMP** ˚C.
0	65
3	60
5	55
6	54
8	52
10	49
12	42
15	39

Chart:-2 with fan



TEMPRETURE (°C)

FIG:- 4.2WITHFAN

Height	Withfan
0	65
3	53
5	48
6	45
8	44
10	42
12	36
15	31

CHAPTER-5
MODELING

5.1FLUID MODEL OF ACTUAL SYSTEM

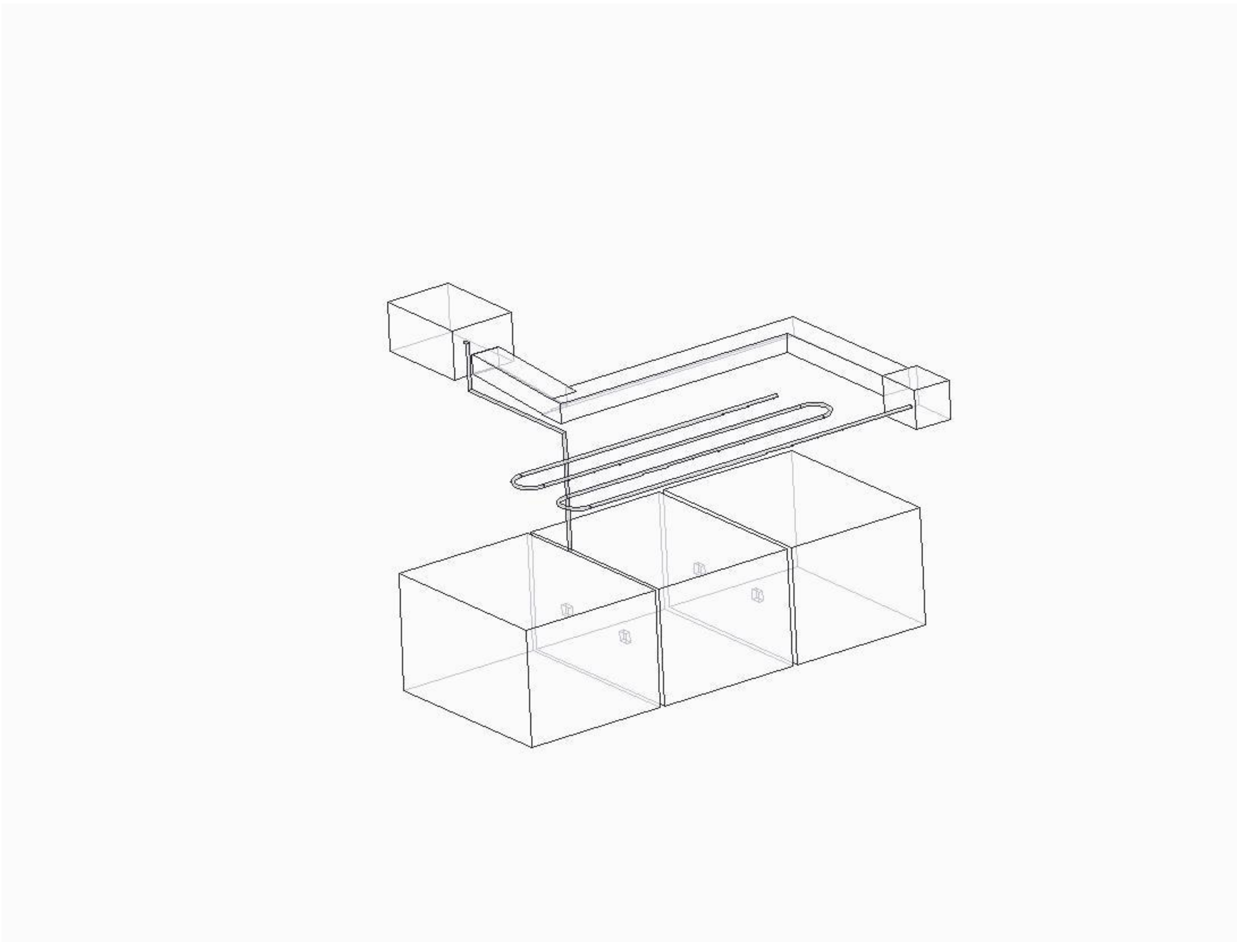


FIG 5.1: DESIGN OF FLUID MODEL

5.2 MODIFICATION IN COOLING TOWER PARAMETER

Cooling tower works on the Principle of water evaporation. Based on rate ofevaporation, the hot water could be cooled more effectively. The rate of evaporation of hot water by

- Increasing time of contact of air with hot water.
- Increasing area of contact of air and hot water.
- Increasing air velocity.

Objectives	Methodologies
Increasing contact time of air with hot water	Changing the air inlet angle
Increasing air velocity	Implementing convergent type nozzle
Increasing area of contact of air and hot water	Nozzle implementation enhances swirl of air

Air inlet pipe angles

- 0˚ degree
- 30˚ about horizontal axis
- 30˚ about vertical axis
- 30˚ about both horizontal and vertical axis

In this project the performance of this cooling tower has been analyzed by changing the air inlet parameters, by varying air inlet angles as 0 ˚, 30 ˚ horizontally, 30 ˚ vertically, 30 ˚ both horizontally and vertically. These varied air inlet angle models have been designed without changing any other parameters of reference model. Then these 4 models have been again modeled by assembling convergent nozzle at the air inlet. Totally 8 cooling tower models have been modeled and analyzed.

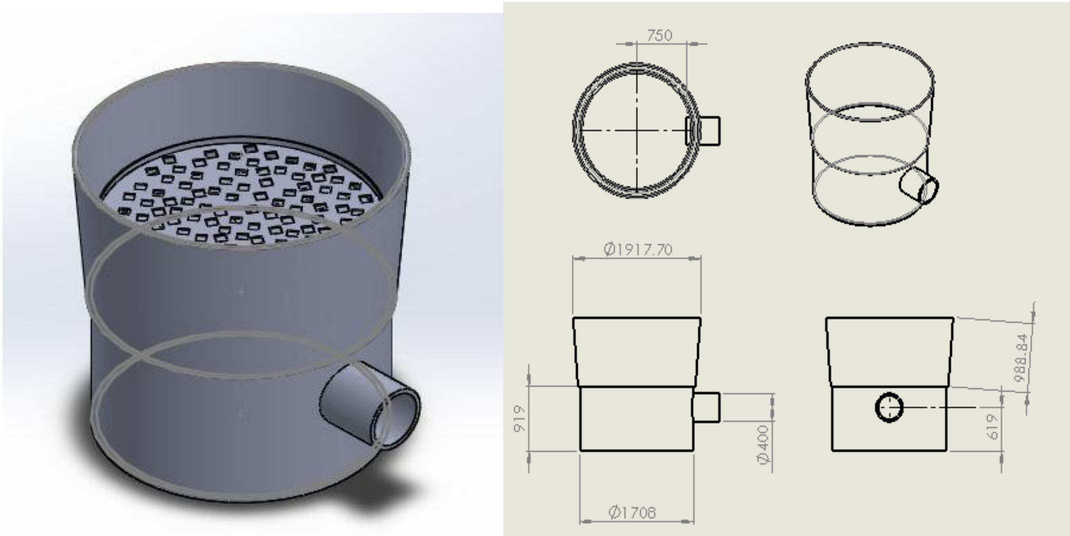


FIG:- 5.2 MODELING IN SOLID WORKS

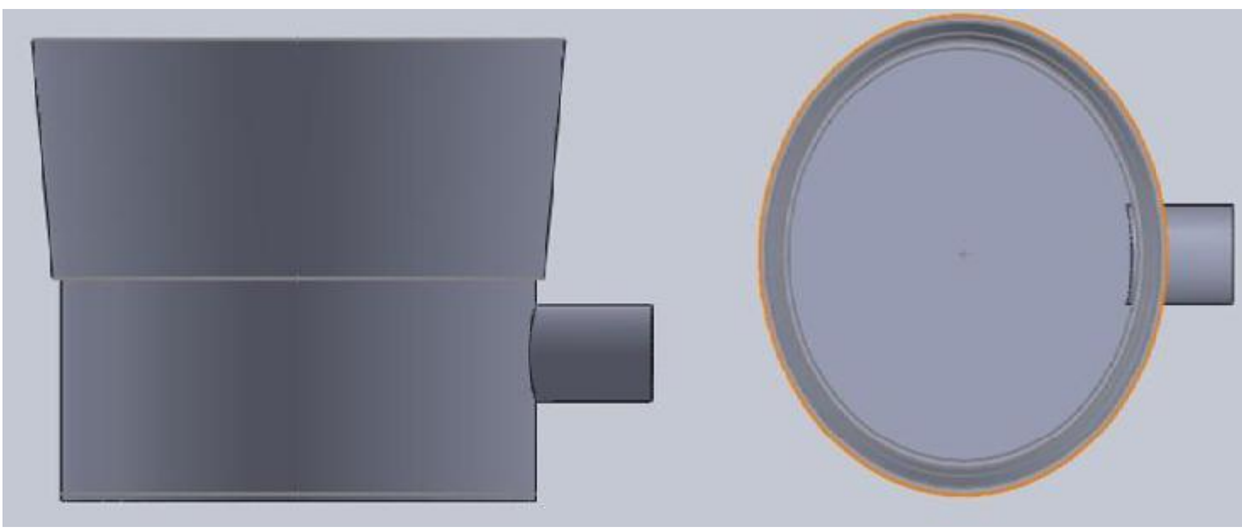


Fig:-5.3 AIR INLET PIPE AT 0°DEGREE

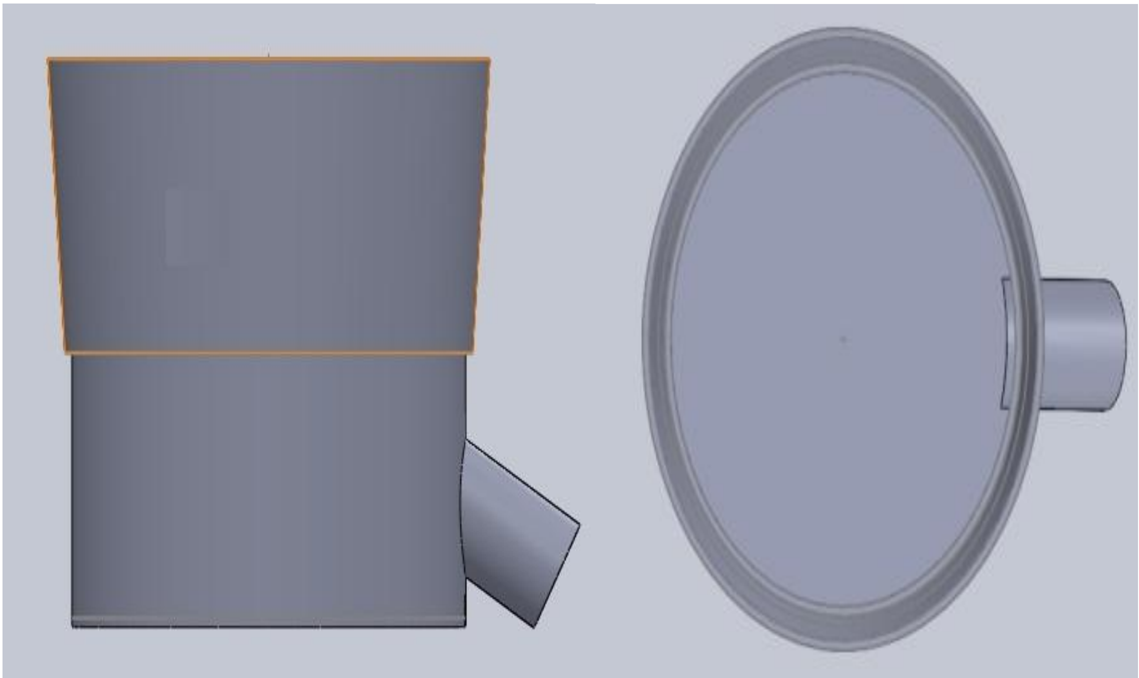


FIG:-5.4 AIR INLET PIPE AT 30 ˚ TO THE HORIZONTAL AXIS

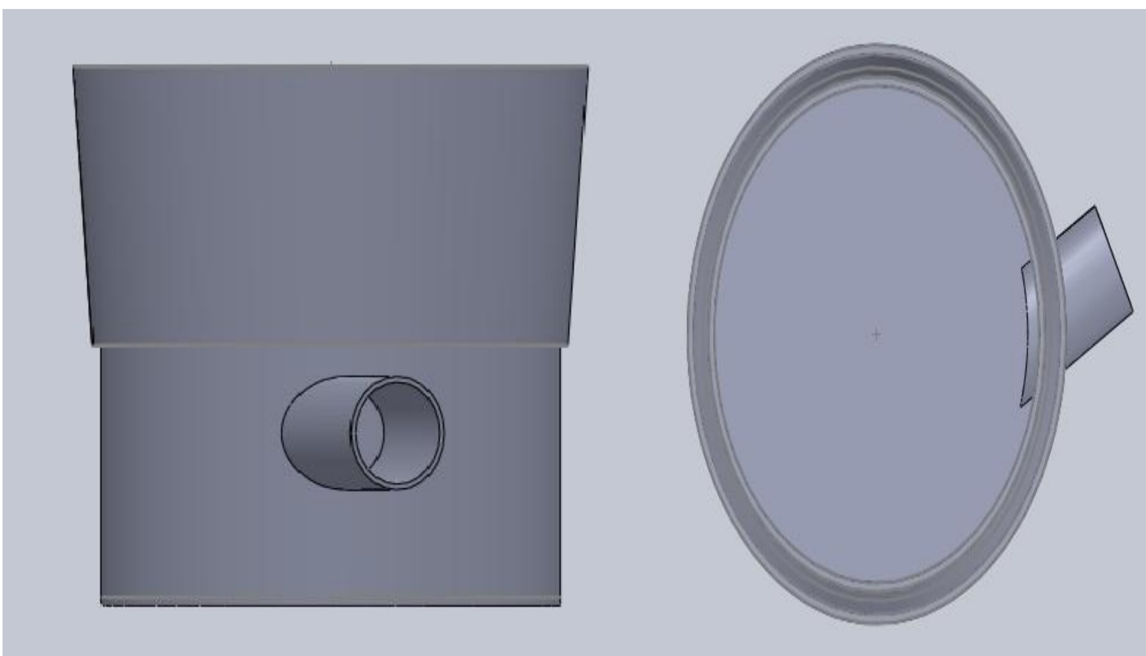


FIG:-5.5 AIR INLET PIPE AT 30 ˚ TO THE VERTICAL AXIS

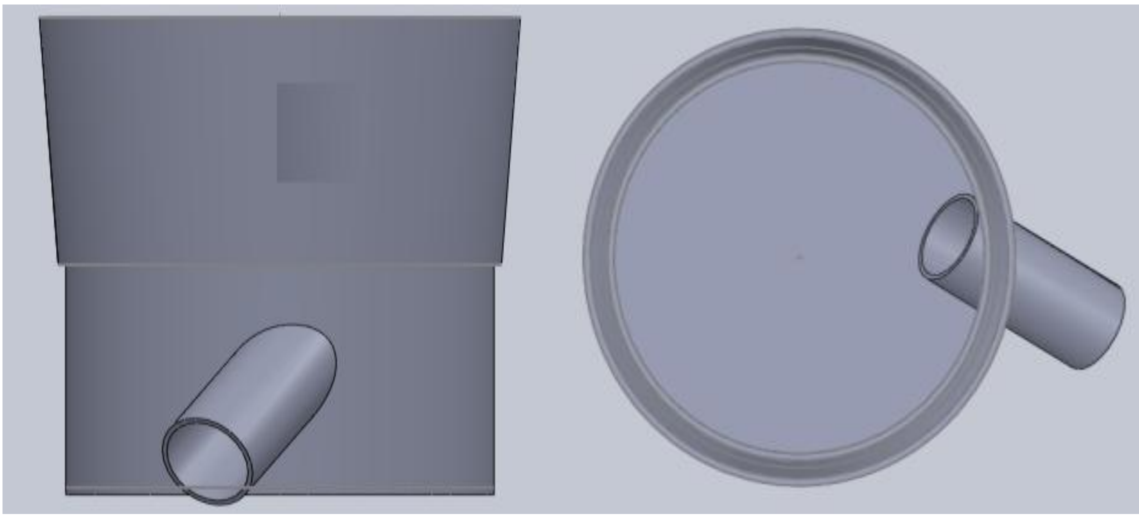


FIG:-5.6AIR INLET PIPE AT 30 ˚ TO THE HORIZONTAL AND VERTICAL AXIS

CHAPTER-6

ANALYSIS

6.1 ANALISYS IN ANSYS

6.1.1 GEOMETRY:-

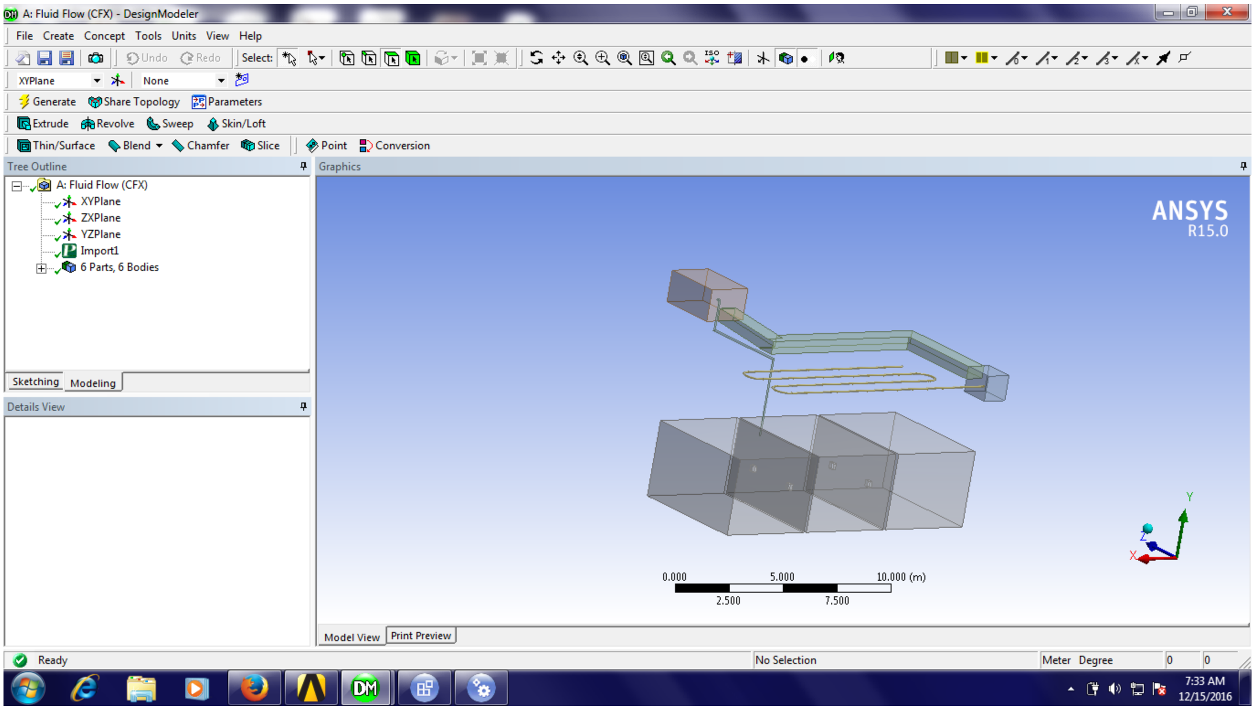


FIG:-6.1 GEOMETRIC

6.1.2MESHING

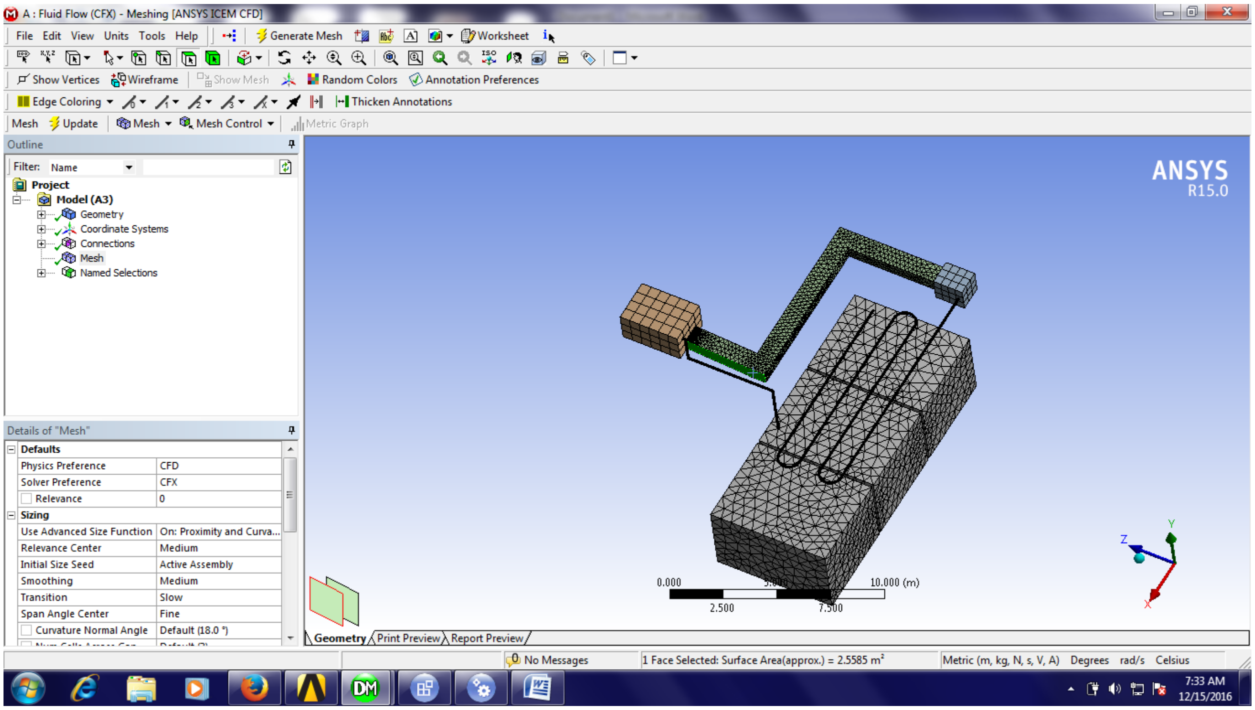


FIG:- 6.2 MESHING

6.1.3 SOLUTION

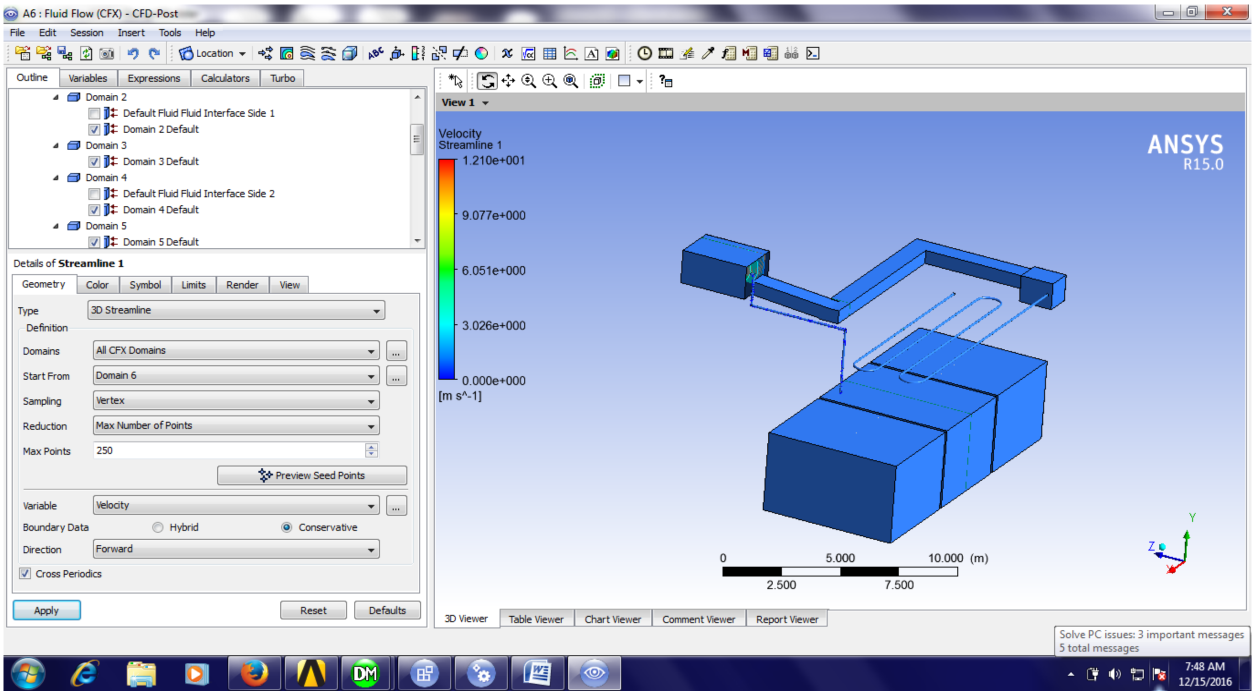


FIG:-6.3 SOLUTION

6.2 INLET PARAMETER

BOUNDARY CONDITION

- Air inlet pipe dia. Da- 0.18 m
- Water inlet dia. Dw- 1.66 m
- Mass flow Rate of water, mw-0.055 kg/s
- Mass flow rate of air, ma- 0.0404 kg/s
- Water inlet temperature, T1-330 K
- air inlet wet bulb temperature, Twb-300 K

6.2.1Air inlet pipe at 0˚ without Nozzle

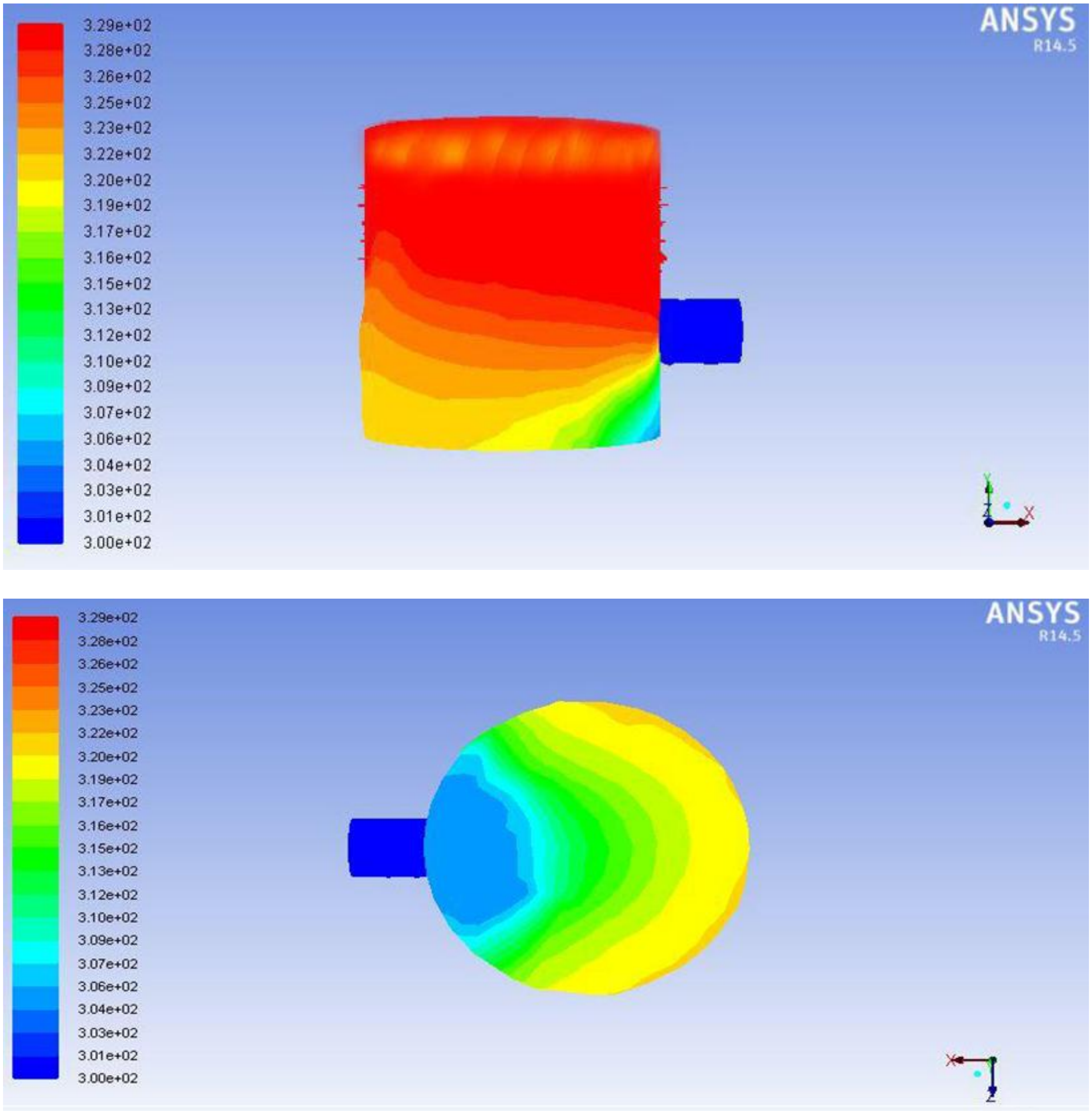
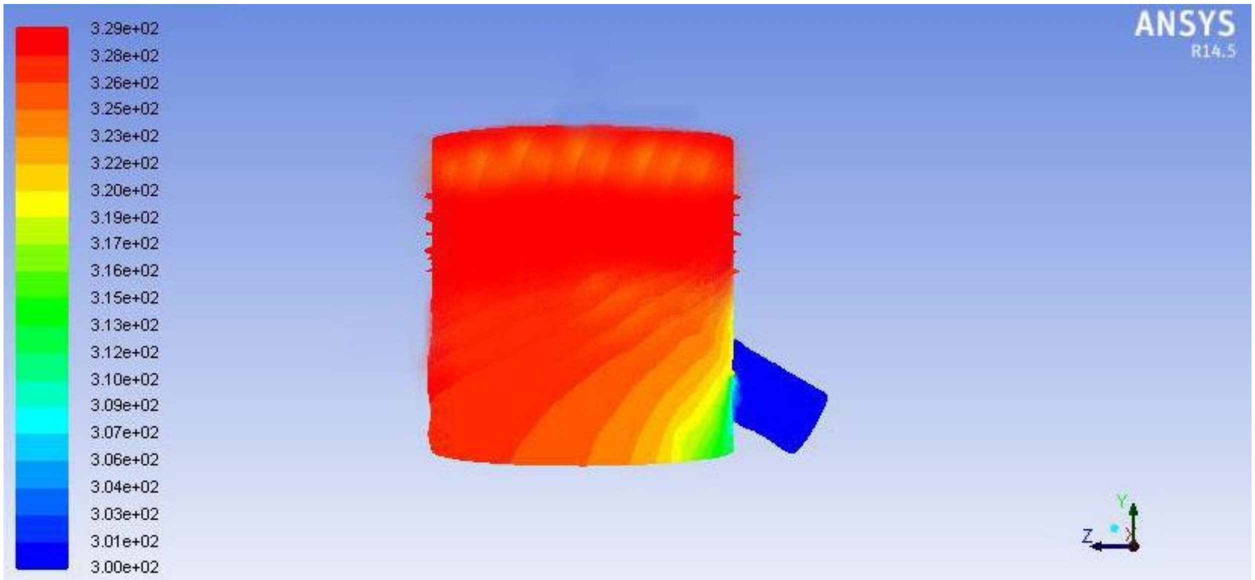


FIG:-6.4Air inlet pipe at 0˚ without Nozzle

Air inlet temperature	300 K
Water inlet Temperature	330 K
Water outlet Temperature	304 K

6.2.2 Air Inlet Pipe at 30 ˚ Inclined Horizontally without Nozzle



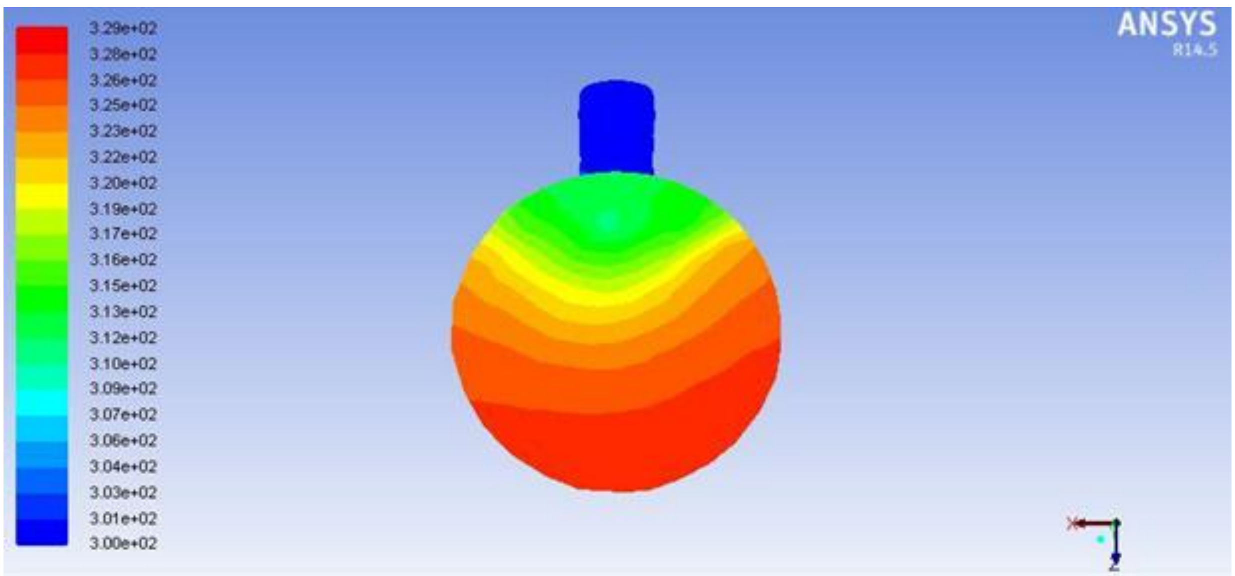
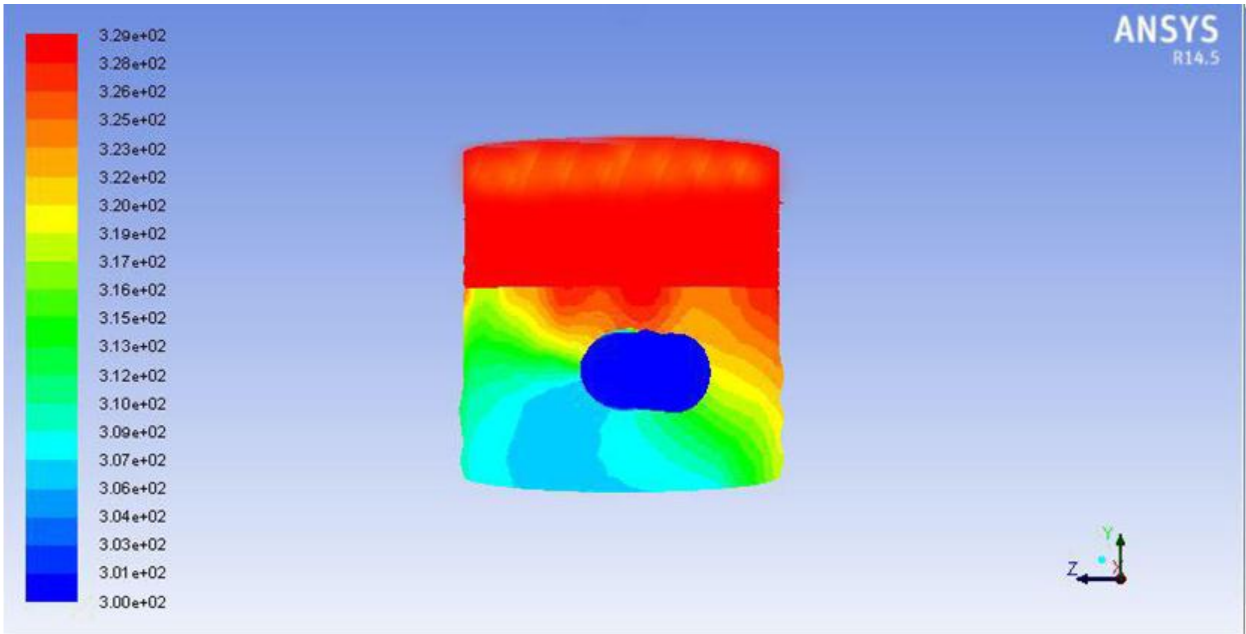


FIG:-6.5Air Inlet Pipe at 30 ˚ Inclined Horizontally without Nozzle

Air inlet temperature	300 K
Water inlet Temperature	330 K
Water outlet Temperature	312 K

6.2.3 Air Inlet Pipe 30 ˚ Inclined Vertically without Nozzle



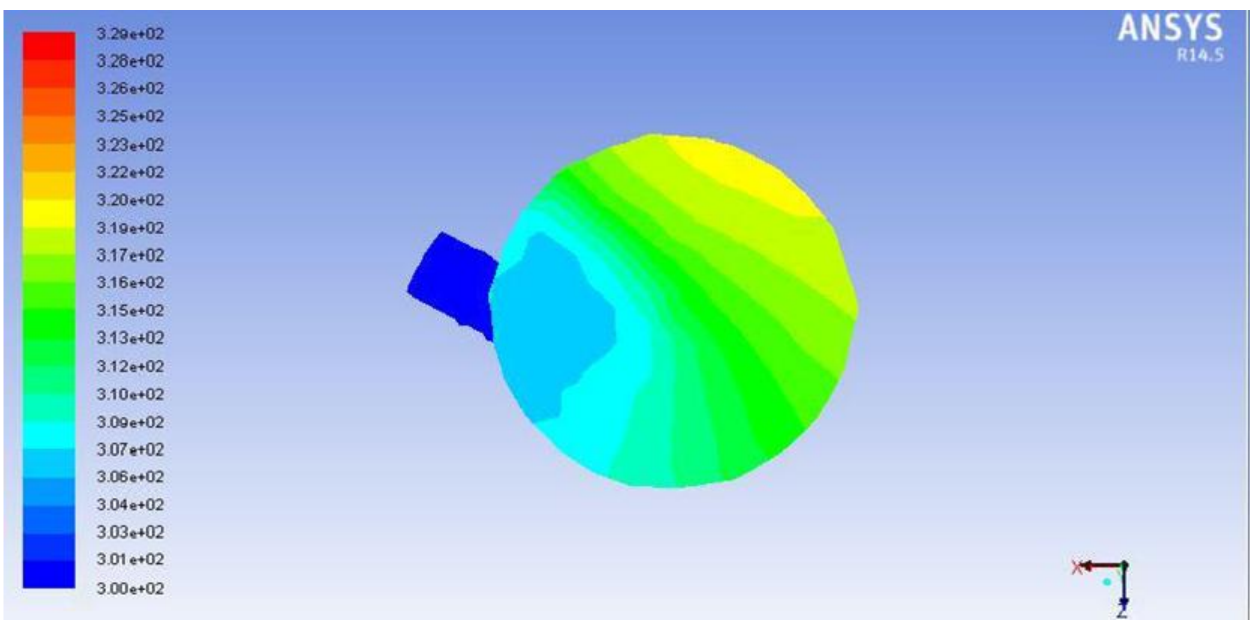
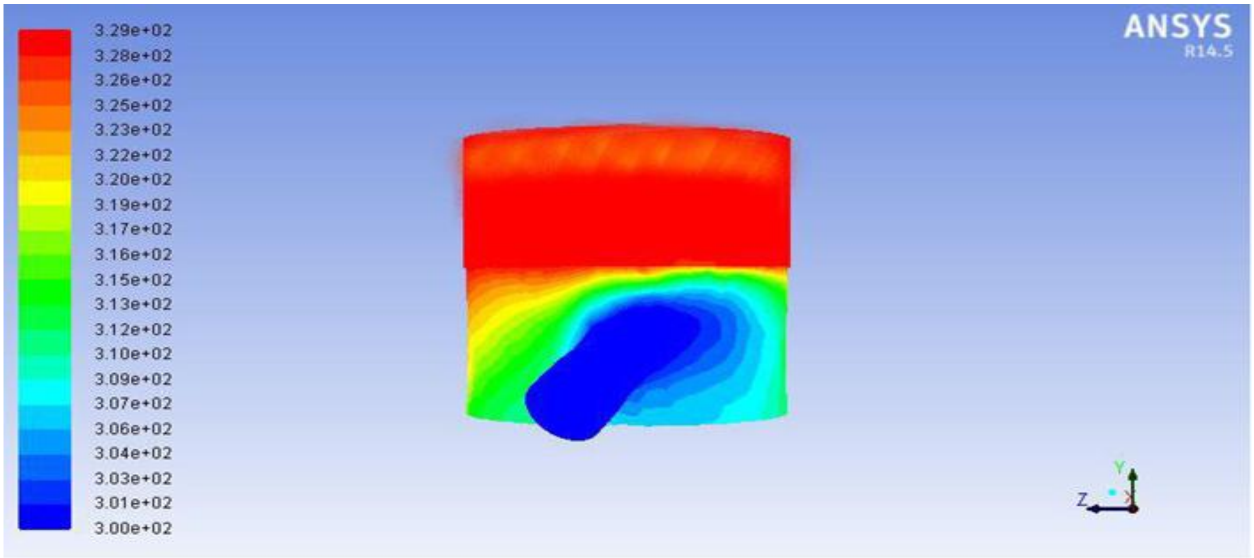


FIG:-6.6 Air Inlet Pipe 30 ˚ Inclined Vertically without Nozzle

Air inlet temperature	300 K
Water inlet Temperature	330 K
Water outlet Temperature	307 K

6.2.4Air Inlet Pipe 30 ˚ Inclined Vertically & Horizontallywithout Nozzle



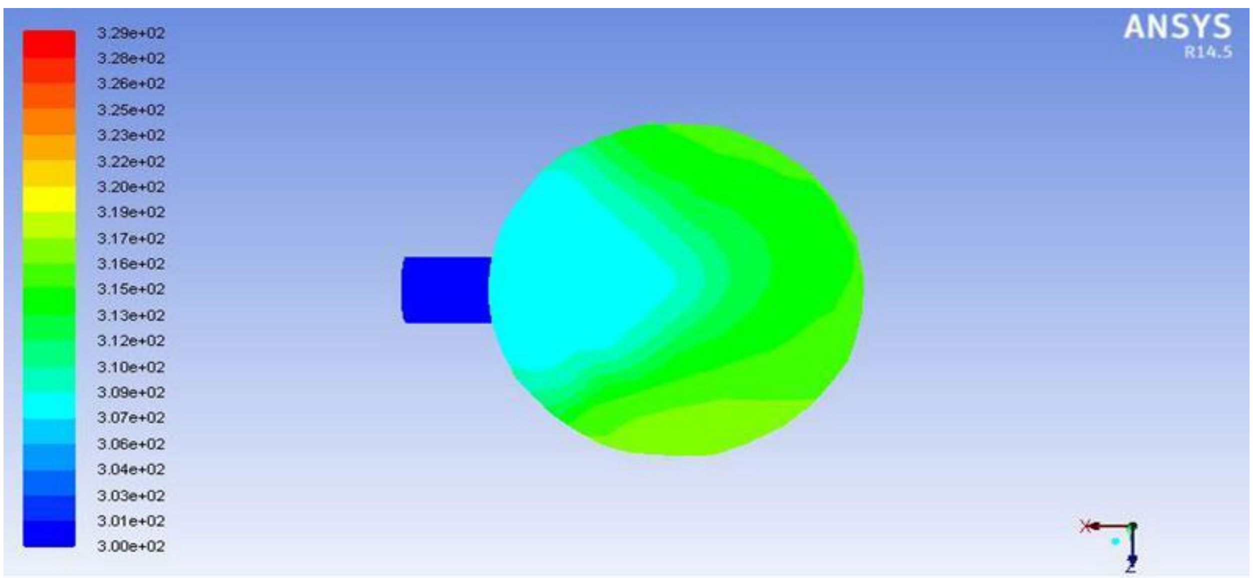


FIG:-6.7 Air Inlet Pipe 30 ˚ Inclined Vertically & Horizontally without Nozzle

Air inlet temperature	300 K
Water inlet Temperature	330 K
Water outlet Temperature	309 K

CHAPTER-7

CALCULATION

7.1 Cooling performance analysis calculation

1. Range (K)

= T1-T2

= 330-303

= 27 K (air inlet pipe at 30˚ to the horizontal& vertical axis)

2. Approach (K)

= T2-Twb

= 303-300

= 3 K

3. Effectiveness (%) :

=[Range/(Range+Approach)]*100

= [27/(27+3)]*100

= 90 %

4. Evaporation loss (m^3 /hr):

=0.00085*1.8*Qw*(T1-T2)

=0.00085*1.8*0.198*(330-303)

=0.0081 m^3 /hr

5. Percentage evaporation loss(%)

=(E.L./Qw)*100

=(0.0081/0.198)*100

=4.09 %

CHAPTER-8

SCOPE OF PROJECT

8.1 SCOPE:

- Now a day's all companies which have automation used forced draft cooling system which is efficient but cost of cooling is high.
- As per viewing in research paper all company has been with only one type of standard element.
- Small companies produce verity of relative products as per requirement of customer.
- This type of all company reuses water without cooling. So evaporation of water is high. And require more quantity of water compare to automation plant.

CHAPTER-9

CONCLUSION

After actual parameter measurement and analysis in ASNSYS we have found that inlet temperature will drop up to 25 to 30 degree centigrade and metal particles and other slurry from water will reduce therefore pump will work efficiently without blocking and wear of impeller.

CHAPTER – 10REFFERANCES

10.1 BOOKS

1. HEAT AND MASS TRANSFER (R.K.RAJPUT)
2. FLUID MECHANICS AND HYDRULIC MACHINES (R.K.RAJPUT)
3. THERMAL ENGINEERING (R.K.RAJPUT)
4. THERMODYNAMICS (J.P.HADIYA , H.G.KAPADIYA)
5. THERMODYNAMICS (P.K.NAG)
6. REFRIGERATION AND AIR CONDITIONRING

10.2 WEBSITES:-

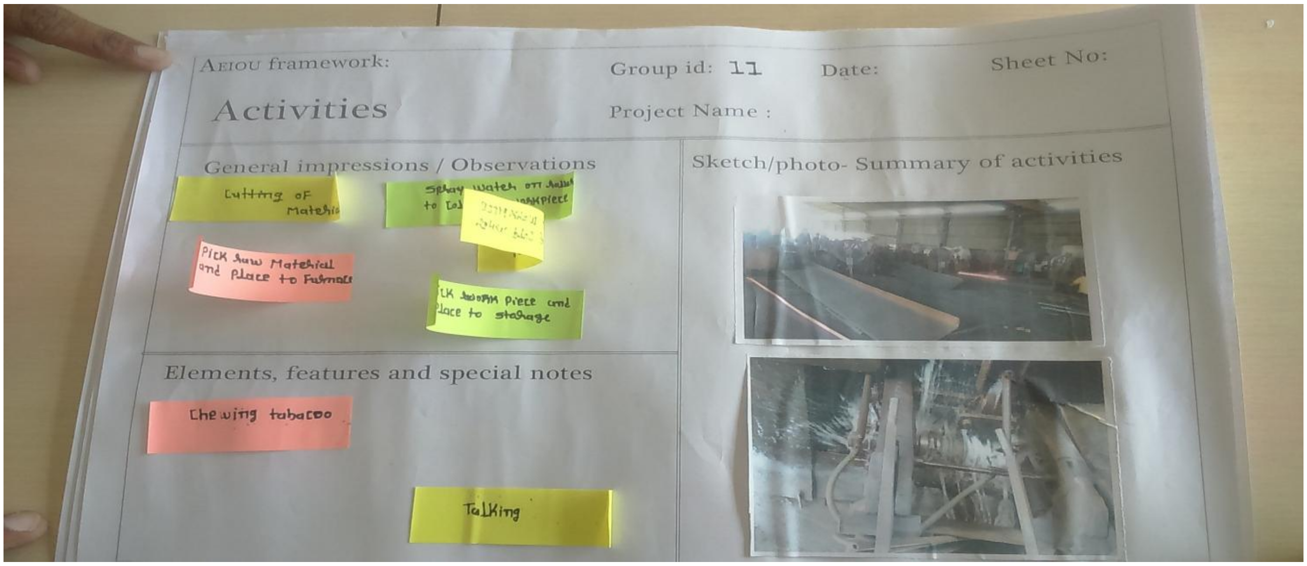
1. http:/patents.google.com
2. http://patft.uspto.gov/
3. http://www.WIPO.int./directory/en/urls.jsp
4. http://www.SCIENCEDIRECT.COM
5. http://www.CFD-online.com
6. http://www.coneluniversity/ANSIStutorial.com

10.3 RESEARCH PAPER:-

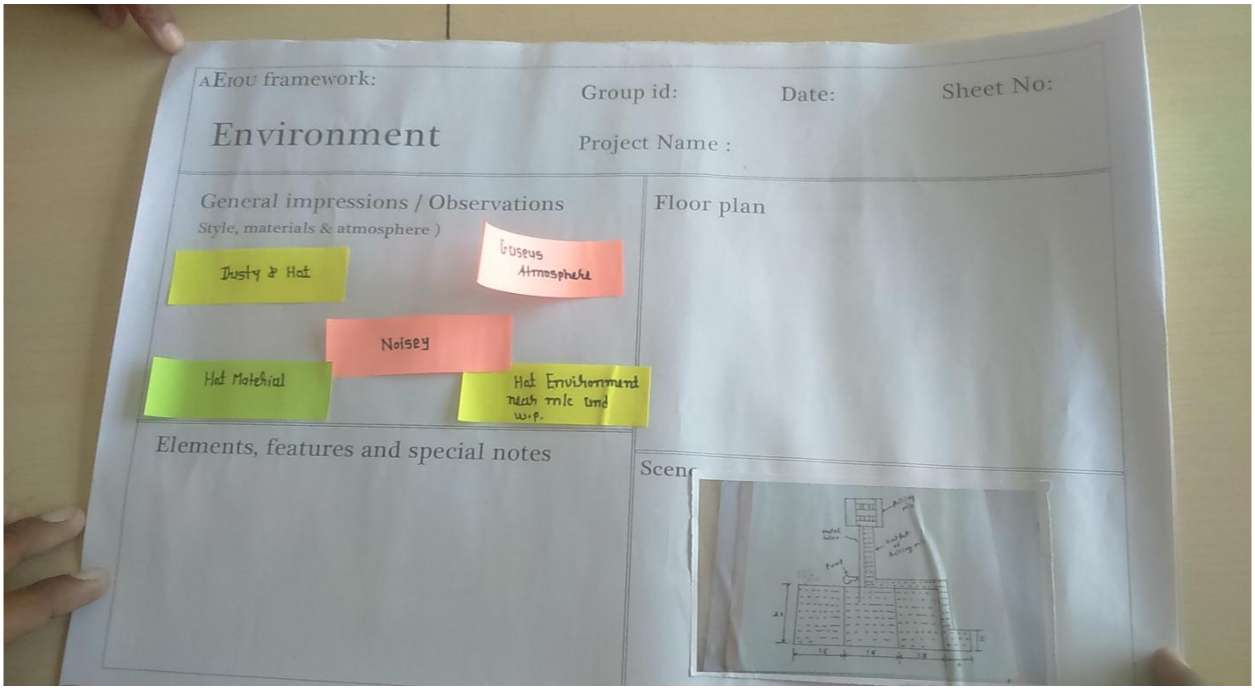
1. LI Hai-jun, LI Zhen-lei, YUAN Guo, WANG Zhao-dong, WANG Guo-dong
   (State Key Laboratory of Rolling and Automation, Northeastern University, Shenyang 110819, Liaoning, China)
2. Sven-Erik Lundberg*, Therfse Gustafsson
   (Received January 17, 1993; accepted August 2, 1993)
3. C. SCHUSTER
   Fachgebiet Thermische Verfahrenstechnik und Heizungstechnik, Technische Hochschule Darmstadt PetersenstraJe 30, 6100 Darrnstadt (F.R.G.)
   Prof. Dr.-Zng. W. Kast on the occasion of his 65th birthday
   (Received June 21, 1991; in final form September 6, 1991)
4. united states patent-2624178 patented by N. P. BADSON in jan-6-1953
5. United states patent-3345841 patented by J.E. Pholen in 10/10/1990
6. United states patent-Hostetter in 16/04/1995
7. United states patent-3994151 in 30/11/1996
8. United states patent-4016009 by Economopoulos in 09/04/1997

APPENDIX -1 (canvas)

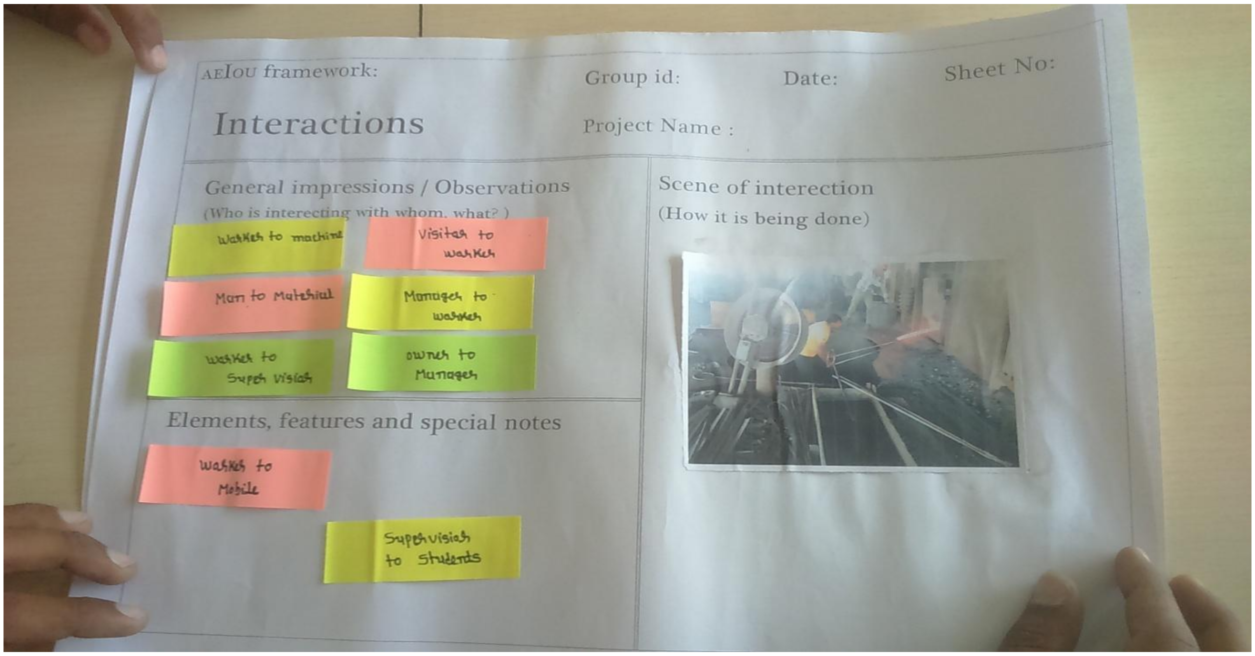
1.1 Activity canvas



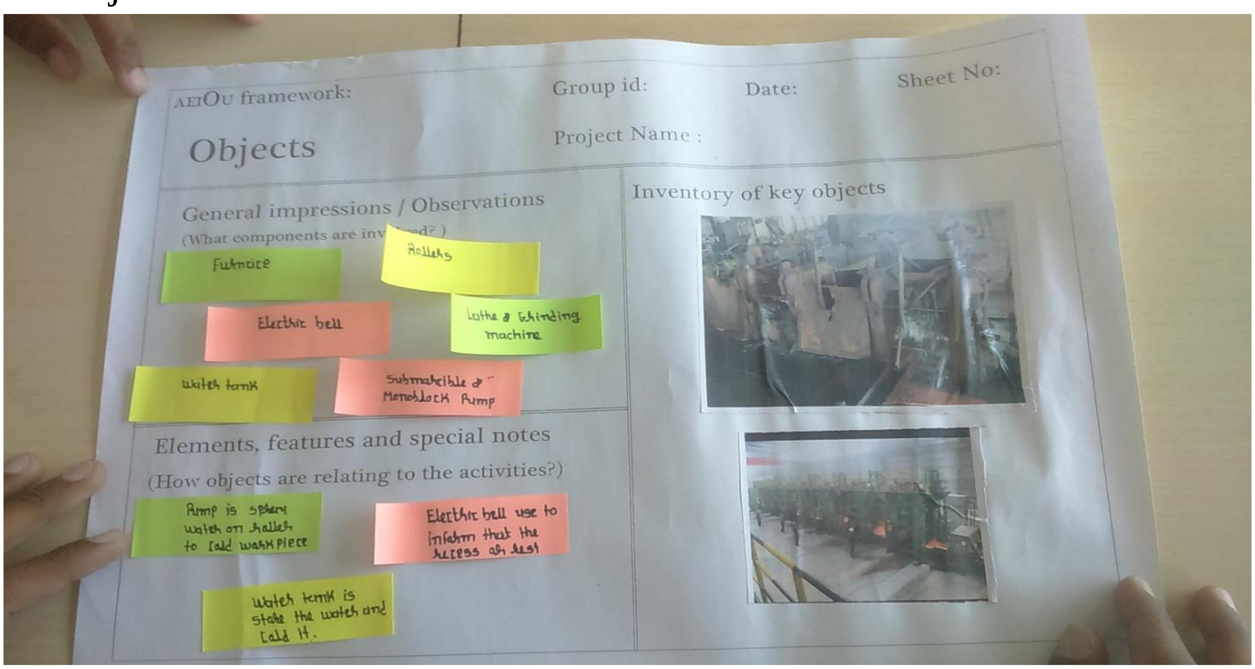
1.2 Environment canvas



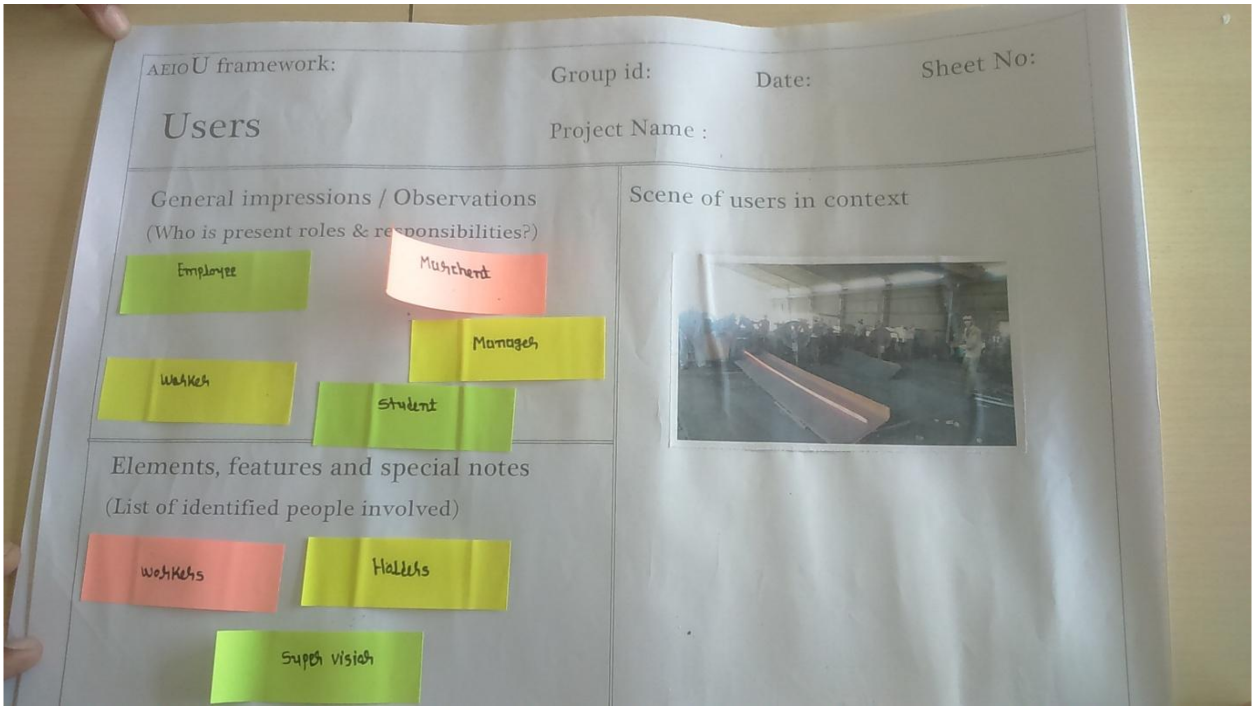
1.3 Interaction canvas



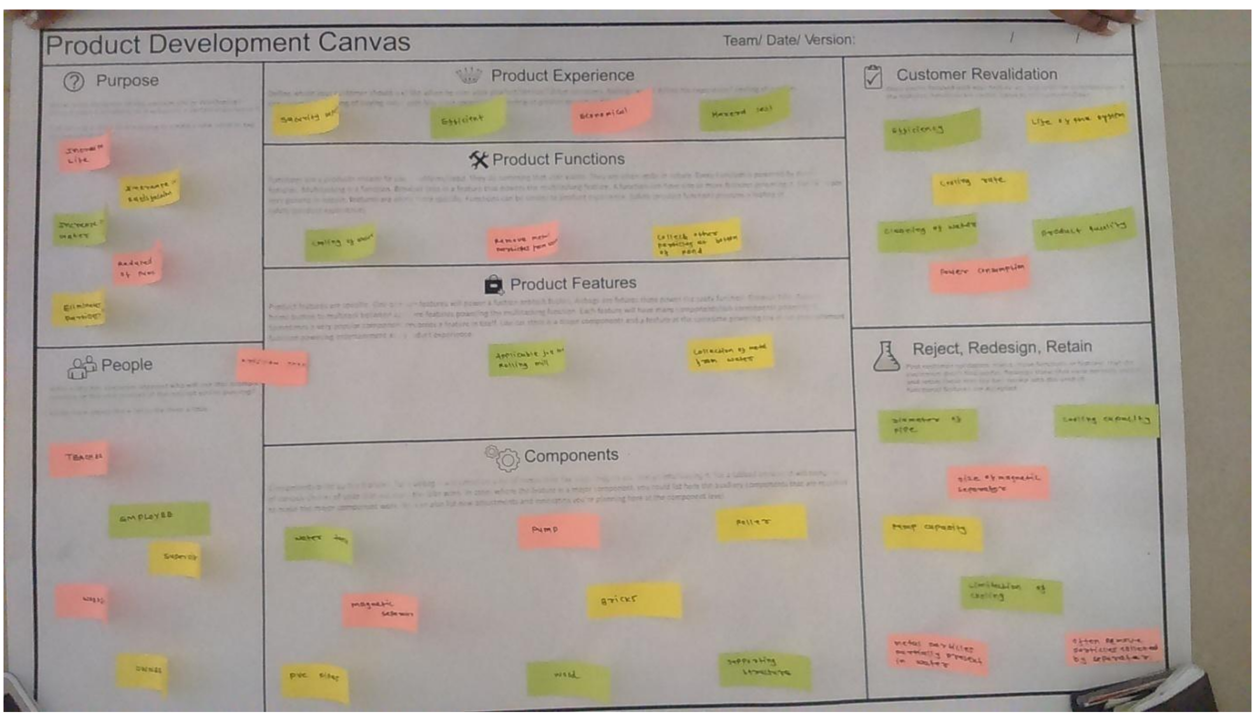
1.4Object canvas



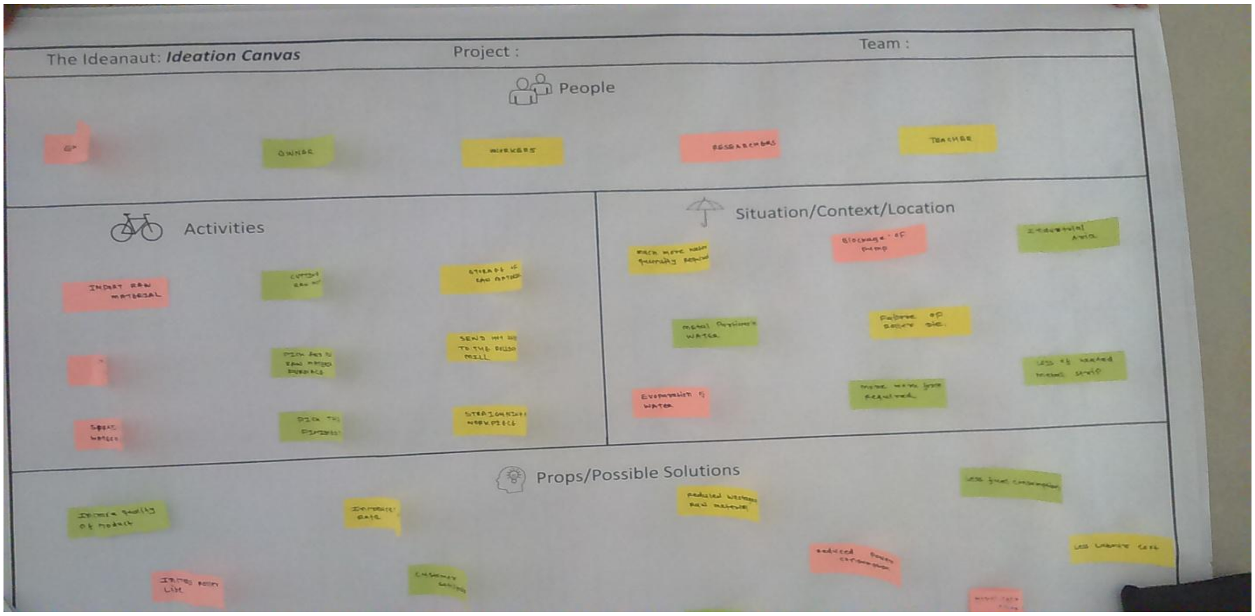
1.5 User canvas



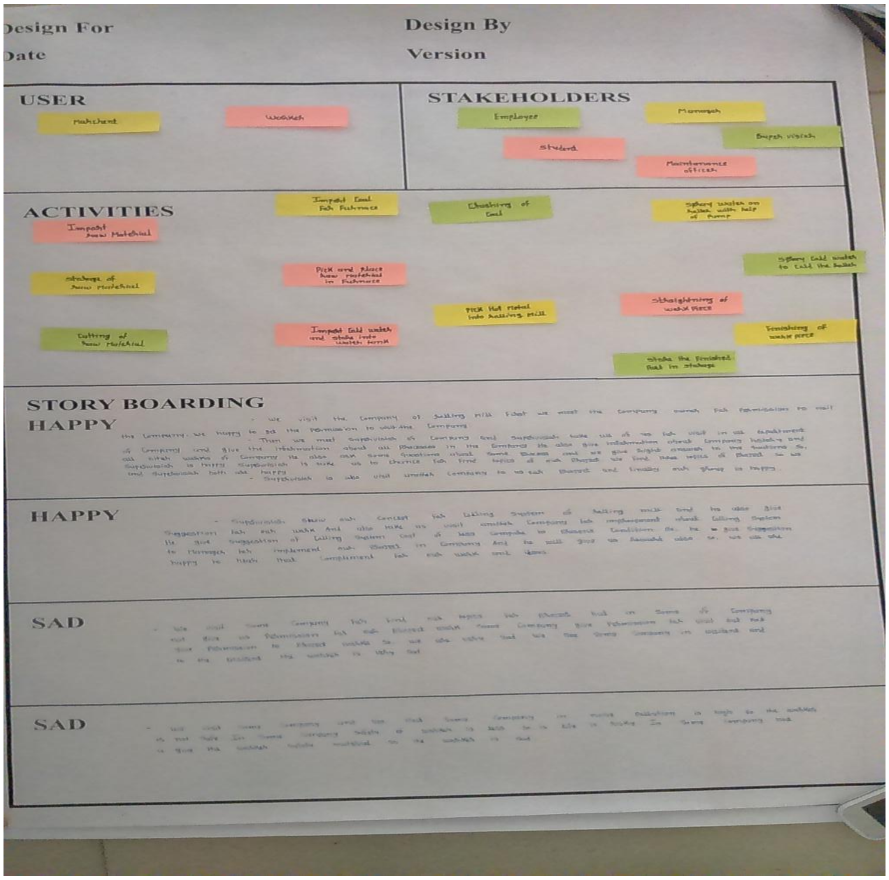
1.6 Product development canvas



1.7 Ideation canvas

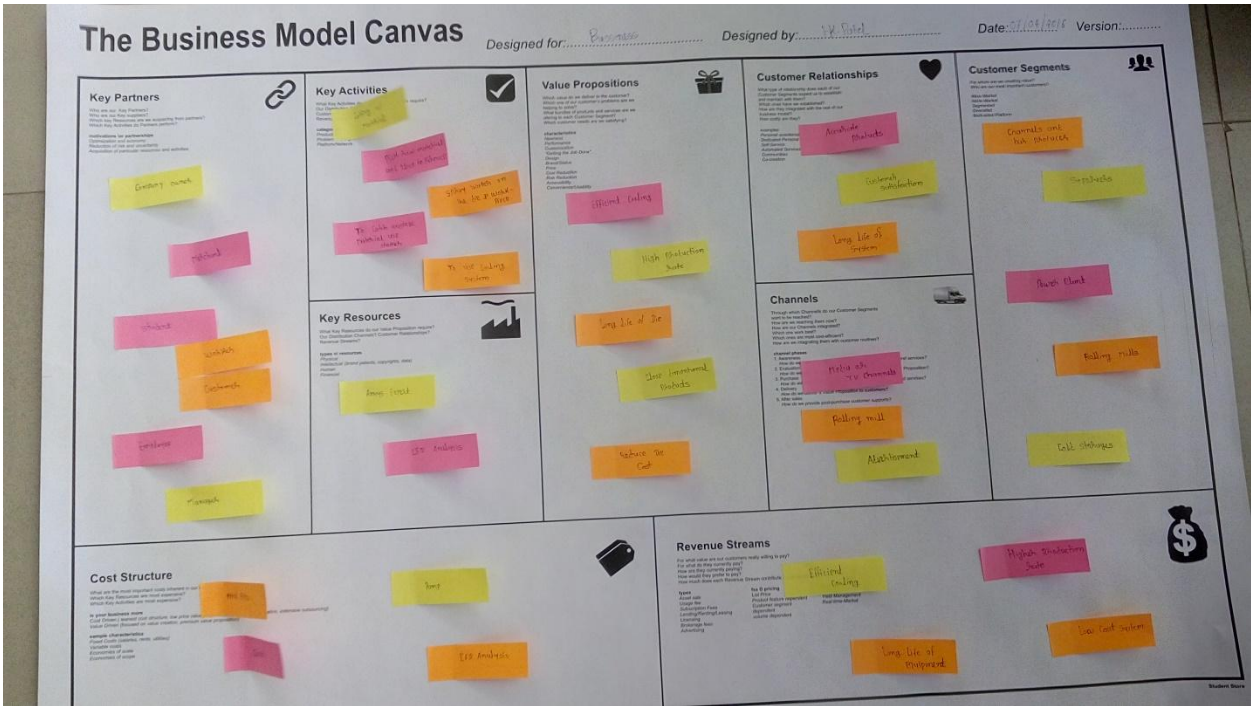


1.8 Empathy canvas



APPENDIX -2

BUSSINESS MODEL CANVAS


The Business Model Canvas
Designed for:
Designed by:
Date:
Version:
Key Partners
Key Activities
Value Propositions
Customer Relationships
Customer Segments
Key Resources
Channels
Cost Structure
Revenue Streams

APPENDIX -3

PDE FORM

3.1 - PDE FORM 1

GIC Patent Drafting Exercise Team ID: 48408

GTU Innovation Council

Patent Drafting Exercise (PDE)

FORM 1 THE PATENTS ACT 1970 (39 OF 1970) & THE PATENTS RULES, 2003 APPLICATION FOR GRANT OF PATENT	(FOR OFFICE USE ONLY) Application No: Filing Date: Amount of Fee paid: CBR No:__________

1. Applicant(s) :

ID	Name	Nationality	Address	Mobile No.	Email
1	Thakor Jagamalji Chetanji	Indian	Mechanical Engineering , Smt. S. R. Patel Engineering College , Gujarat Technologycal University.	9724758052	jagmal.t514me01@srpec.org
2	Thakkar Tarunkumar Dasharathlal	Indian	Mechanical Engineering , Smt. S. R. Patel Engineering College , Gujarat Technologycal University.	9427526103	tarunthakkar95@gmail.com
3	Patel Hardikkumar Kantilal	Indian	Mechanical Engineering , Smt. S. R. Patel Engineering College , Gujarat Technologycal University.	7383779848	hardpatel15694@gmail.com
4	Thakor Kiransinh Kanjiji	Indian	Mechanical Engineering , Smt. S. R. Patel Engineering College , Gujarat Technologycal University.	9974390242	kiranthakor.89@gmail.com

2. Inventor(s):

ID	Name	Nationality	Address	Mobile No.	Email
1	Thakor Jagamalji Chetanji	Indian	Mechanical Engineering , Smt. S. R. Patel Engineering College , Gujarat Technologycal University.	9724758052	jagmal.t514me01@srpec.org
2	Thakkar Tarunkumar Dasharathlal	Indian	Mechanical Engineering , Smt. S. R. Patel Engineering College , Gujarat Technologycal University.	9427526103	tarunthakkar95@gmail.com

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3	Patel Hardikkumar Kantilal	Indian	Mechanical Engineering , Smt. S. R. Patel Engineering College , Gujarat Technologycal University.	7383779848	hardpatel15694@gmail.com
4	Thakor Kiransinh Kanjiji	Indian	Mechanical Engineering , Smt. S. R. Patel Engineering College , Gujarat Technologycal University.	9974390242	kiranthakor.89@gmail.com

3. Title of Invention/Project:

INSTALLMENT OF EFFICIENT COOLING SYSTEM IN ROLLING MILL

4. Address for correspondence of applicant/authorized patent agent in India

Name: Thakor Jagamalji Chetanji

Address: Mechanical Engineering , Smt. S. R. Patel Engineering College , Gujarat Technological University.

Mobile: 9724758052

Email ID: jagmal.t514me01@srpec.org

5. Priority particulars of the application(S) field in convention country

Country	Application No.	Filing Date	Name of the Applicant	Title of the Invention
N/A	*N/A*	*N/A*	*N/A*	*N/A*

6. Particulars for filing patent co-operation treaty (pct) national phase Application

International application number	International filing date as alloted by the receiving office
N/A	N/A

7. Particulars for filing divisional application

Original(First) Application Number	Date of filing of Original (first) application
N/A	N/A

8. Particulars for filing patent of addition

Original(First) Application Number	Date of filing of Original (first) application
N/A	N/A

9. DECLARATIONS:

(i) Declaration by the inventor(s)

I/We, the above named inventor(s) is/are true & first inventor(s) for this invention and declare that the applicant(s). herein is/are my/our assignee or legal representative.

Date : 7 - April - 2016

Name Signature & Date

Note : This is just a mock Patent Drafting Exercise (PDE) for semester 8, BE students of GTU.These documents are not to be submitted with any patent office. Page 2

1 Thakor Jagamalji Chetanji ____________

2 Thakkar Tarunkumar Dasharathlal ____________

3 Patel Hardikkumar Kantilal ____________

4 Thakor Kiransinh Kanjiji ____________

(ii) Declaration by the applicant(s) in the convention country

I/We, the applicant (s) in the convention country declare that the applicant(s) herein is/are my/our assignee or legal representative.applicant(s)

(iii) Declaration by the applicant(s)

I/We, the applicant(s) hereby declare(s) that:-

- ✓ I am/We in possession of the above mentioned invention.
- ✓ The provisional/complete specification relating to the invention is filed with this aplication.
- ✓ The invention as disclosed in the spcification uses the biological material from India and the necessary permission from the competent authority shall be submitted by me/us before the grant of patent to me/us.
- ✓ There is no lawful ground of objection to the grant of the patent to me/us.
- ✓ I am/we are the assignee or the legal representative of true & first inventors.
- ✓ The application or each of the application,particulars of each are given in the para 5 was the first applicatin in the convention country/countries in respect of my/our invention.
- ✓ I/we claim the priority from the above mentioned applications(s) filed in the convention country/countries & state that no application for protection in respect of invention had been made in a convention country before that date by me/us or by any person
- ✓ My/Our application in India is based on international application under Patent Cooperation Treaty (PCT) as mentioned in para 6
- ✓ The application is divided out of my/our application(s) particulars of which are given in para 7 and pray that this application may be treated as deemed to have been filed on ___________under section 16 of the Act.
- ✓ The said invention is an improvement in or modification of the invention particulars of ehivh are given in para 8.

10. Following are the attachments with the application:

- ✓ (a) Provisional specification/Complete specification
- ✓ (b) Complete specification(in confirmation with the international application) / as amended before the International Preliminary Examination Authority (IPEA),as applicable(2 copies),No.of pages.....No.of claims.....
- ✓ (c) Drawings (in confirmation with the international application)/as amended before the International Preliminary Examination Authority(IPEA),as applicable(2 copies),No.of sheets....
- ✓ (d) Priority documents
- ✓ (e) Translations of priority documents/specification/International search reports
- ✓ (f) Statement and undertaking on Form 3
- ✓ (g) Power of Authority

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☑ (h) Declaration of inventorship on Form 5

☑ (i) Sequence listing in electronic Form

☑ (j) .... Fees Rs.XXX in Cash /Cheque/Bank Draft bearin No.XXX Date: XXX on XXX Bank.

I/We hereby declare that to the best of my /our knowledge, information and belief the fact and mtters stated herein are correct and I/We request that a patent may be granted to me/us for the said invention.

Dated this 7 day of April , 2016

	Name	Signature & Date
1	Thakor Jagamalji Chetanji	____________
2	Thakkar Tarunkumar Dasharathlal	____________
3	Patel Hardikkumar Kantilal	____________
4	Thakor Kiransinh Kanjiji	____________

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3.2 PDE FORM 2

GIC Patent Drafting Exercise | Team ID: 46408

FORM 2
THE PATENTS ACT, 1970
(39 OF 1970)
&
THE PATENTS RULES, 2003
PROVISIONAL SPECIFICATION

1. Title of the project/invention :

INSTALLMENT OF EFFICIENT COOLING SYSTEM IN ROLLING MILL

2. Applicant(s) :

Thakor Jagamalji Chetanji (Indian)
Address : Mechanical Engineering , Smt. S. R. Patel Engineering College , Gujarat Technologycal University.

Thakkar Tarunkumar Dasharathlal (Indian)
Address : Mechanical Engineering , Smt. S. R. Patel Engineering College , Gujarat Technologycal University.

Patel Hardikkumar Kantilal (Indian)
Address : Mechanical Engineering , Smt. S. R. Patel Engineering College , Gujarat Technologycal University.

Thakor Kiransinh Kanjiji (Indian)
Address : Mechanical Engineering , Smt. S. R. Patel Engineering College , Gujarat Technologycal University.

3. Preamble to the description :

The following specification describes the invention.

4. Description :

a. Field of Application / Project / Invention :

THERMAL
ALL TYPES OF SMALL SCALE INDUSTRIES WHICH USED COOLED WATER FOR THE PRODUCTION

b. Prior Art / Background of the Invention / References :

Due to recerculation of hot water life of the rolling die is decreased

c. Summary of the Invention/Project :

cooled water by spraying at different height and flowing of air and also changes of different nozzle angles

d. Objects of the Invention/Project :

to increase the life of the rolling die, increase production rate, to reduce the erosion of the pump impeller

e. Drawing(s) :

46408_1_DSC_0018
46408_2_asm0002
46408_5_asm0002

f. Description of the invention :

make model in creo software and then take a actual dimension from the company and take inlet and outlet temp of the water in company. after that we search all cooling related information and also research paper and pattern.
after that we make simple model and take observation by cooling hot water by different height and also from different angle.
observation we take without fan and also with fan.
after all that we take our result from analysis in cfd in ansys software

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g. Examples :

cooling tower

h. Unique Features of the Project :

increase life of roller die for hot rolling mill

5. Date & Signature :

Date :7 - April - 2016

Sign and Date Thakor Jagamalji Chetanji	Sign and Date Thakkar Tarunkumar Dasharathlal
Sign and Date Patel Hardikkumar Kantilal	Sign and Date Thakor Kiransinh Kanjiji

6. Abstract of the project / invention :

Our objective is for study is to efficient working of rolling and improvement in material handling.
While moving material from its cutting place to furnace for heating purpose its take more time. Die dimesions are also decrease with some cycles of operations. overall capacity of furnace is also less than its actual capacity

Drawing Attachments :

46408_1_DSC_0018

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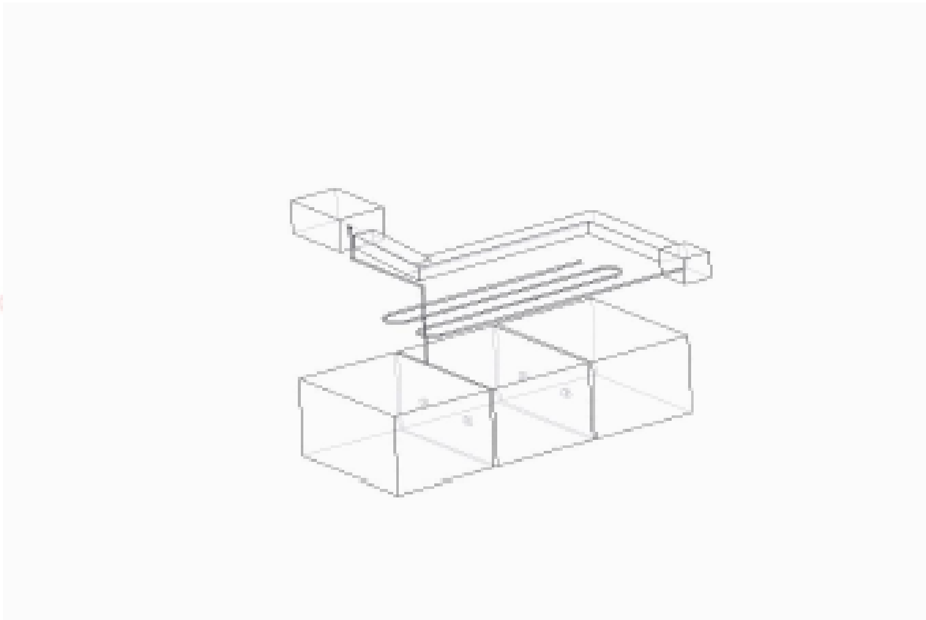
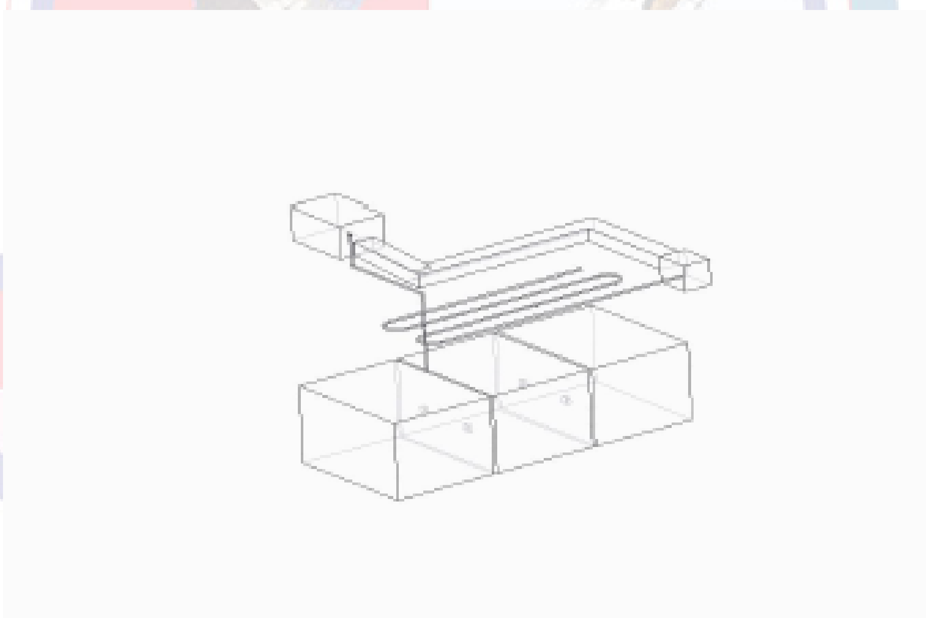
46408_2_asm0002



46408_5_asm0002



Note : This is just a mock Patent Drafting Exercise (PDE) for semester 8, BE students of GTU.These documents are not to be submitted with any patent office. Page 3

3.3PDE FORM 3

GIC Patent Drafting Exercise | Team ID: 48408

FORM 3
THE PATENTS ACT, 1970
(39 OF 1970)
&
THE PATENTS RULES, 2003
STATEMENT AND UNDERTAKING UNDER SECTION 8

1. Declaration :

I/We, Thakor Jagamalji Chetanji ,
Thakkar Tarunkumar Dasharathlal ,
Patel Hardikkumar Kantilal ,
Thakor Kiransinh Kanjiji

2. Name, Address and Nationality of the joint Applicant :

Thakor Jagamalji Chetanji (Indian)
Address :Mechanical Engineering , Smt. S. R. Patel Engineering College , Gujarat Technologycal University.

Thakkar Tarunkumar Dasharathlal (Indian)
Address :Mechanical Engineering , Smt. S. R. Patel Engineering College , Gujarat Technologycal University.

Patel Hardikkumar Kantilal (Indian)
Address :Mechanical Engineering , Smt. S. R. Patel Engineering College , Gujarat Technologycal University.

Thakor Kiransinh Kanjiji (Indian)
Address :Mechanical Engineering , Smt. S. R. Patel Engineering College , Gujarat Technologycal University.

Here by declare :
(i) that I/We have not made any application for the same/substantially the same invention outside India.
(ii) that the right in the application(s) has/have been assigned to,

Name of the Country	*Date of Application*	*Application Number*	*Status of the Application*	*Date of Publication*	*Date of Grant*
N/A	N/A	N/A	N/A	N/A	N/A

(iii) that I/We undertake that up to the date of grant of patent by the Controller , I/We would keep him inform in writing the details regarding corresponding application(s) for patents filed outside India within 3 months from the date of filing of such application.

Dated this **7** day of **April** , **2016**

3. Signature of Applicants :

Sign and Date
Thakor Jagamalji Chetanji

Sign and Date
Thakkar Tarunkumar Dasharathlal

Note : This is just a mock Patent Drafting Exercise (PDE) for semester 8, BE students of GTU.These documents are not to be submitted with any patent office. Page 1

Sign and Date	Sign and Date
Patel Hardikkumar Kantilal	Thakor Kiransinh Kanjiji

To
The Controller of Patent
The Patent Office, at Mumbai.