A PROJECT REPORT

ON

‘’ DESIGN AND ANALYSIS OF STATIC EQUIPMENT ‘’

Submitted to

UNIVERSITY OF MUMBAI

In Partial Fulfilment of the Requirement for the Award of

BACHELOR’S DEGREE IN
MECHANICAL ENGINEERING

BY

SHAIKH MOHD SOOHAIB	**15ME103**
SHAIKH ABDULLAH SHADAB	**15ME97**
DESHMUKH MOHAMMED	**14ME12**
MANSOORI YASIR	**14ME91**

UNDER THE GUIDANCE OF
PROF. RAHUL THAVAI

DEPARTMENT OF MECHANICAL ENGINEERING
Anjuman-I-Islam’s Kalsekar Technical Campus
SCHOOL OF ENGINEERING & TECHNOLOGY
Plot No. 2 & 3, Sector - 16, Near Thana Naka,
Khandagaon, New Panvel - 410206

2020-2021

AFFILIATED TO

UNIVERSITY OF MUMBAI

A PROJECT II REPORT
ON

"DESIGN AND ANALYSIS OF STATIC EQUIPMENT AT NILSAN NISHOTECH S.PVT"

Submitted to

UNIVERSITY OF MUMBAI

In Partial Fulfilment of the Requirement for the Award of

BACHELOR'S DEGREE IN MECHANICAL ENGINEERING

BY

SHAIKH MOHD SOOHAIB	15ME103
SHAIKH ABDULLAH SHADAB	15ME97
DESHMUKH MOHAMMED	14ME12
MANSOORI YASIR	14ME91

UNDER THE GUIDANCE OF
PROF. RAHUL THAVAI

DEPARTMENT OF MECHANICAL ENGINEERING
Anjuman-I-Islam's Kalsekar Technical Campus
SCHOOL OF ENGINEERING & TECHNOLOGY
Plot No. 2 & 3, Sector - 16, Near Thana Naka,
Khandagaon, New Panvel - 410206

2020-2021
AFFILIATED TO

UNIVERSITY OF MUMBAI

Anjuman-i-Islam's Kalsekar Technical Campus

Department of Mechanical Engineering

SCHOOL OF ENGINEERING & TECHNOLOGY

Plot No. 2 & 3, Sector - 16, Near Thana Naka,

Khandagaon, New Panvel - 410206

CERTIFICATE

This is certify that the project entitled

"DESIGN AND ANALYSIS STATIC EQUIPMENT AT NILSAN NISHOTECH S.PVT.LTD"

submitted by

SHAIKH MOHD SOOHAIB	**15ME103**
SHAIKH ABDULLAH SHADAB	**15ME97**
DESHMUKH MOHAMMED	**14ME12**
MANSOORI YASIR	**14ME91**

is a record of bonafide work carried out by them, in the partial fulfilment of the requirement for the award of Degree of Bachelor of Engineering (Mechanical Engineering) at ***Anjuman-I-Islam's Kalsekar Technical Campus, Navi Mumbai*** under the University of MUMBAI. This work is done during year 2018-2019, under our guidance.

Date: / /

(Prof. RAHUL THAVAI)
Project Supervisor

(Prof. RIZWAN SHAIKH)
Project Coordinator

(Prof. ZAKIR ANSARI)
HOD, Mechanical Department

DR. ABDUL RAZAK HONNUTAGI
Director

External Examiner

Acknowledgements

After the completion of this work, we would like to give our sincere thanks to all those who helped us to reach our goal. It's a great pleasure and moment of immense satisfaction for us to express my profound gratitude to our guide **PROF. RAHUL THAVAI** Assistant Professor, Department of Mechanical Engineering, AIKTC, School of Engineering, Panvel for his invaluable support and guidance throughout my project research work. Without his kind guidance & support this was not possible.

We take this opportunity to give sincere thanks to **Mr.CHANDUBHAI** Owner Of JALIYANA EQUIPMENTS and **Mr. MOHD FAISAL (Q&A)** Technical Engineer at **NILSAN NISHOTECH S.PVT LTD, MUMBAI,** for all the help rendered during the course of this work and their support, motivation, guidance and appreciation

We would like to express deepest appreciation towards **DR. ABDUL RAZAK HONNUTAGI**, Director, AIKTC, Navi Mumbai, **PROF. ZAKIR ANSARI**, Head of Department of Mechanical Engineering and **Prof. RIZWAN SHAIKH**, Project Coordinator whose invaluable guidance supported us in completing this project.

At last we must express our sincere heartfelt gratitude to all the staff members and friends who helped me directly or indirectly during this course of work.

SHAIKH ABDULLAH SHADAB
SHAIKH MOHD SOOHAIB
DESHMUKH MOHAMMED
MANSOORI YASIR

Project I Approval for Bachelor of Engineering

This project entitled ***" DESIGN AND ANALYSIS OF STATIC EQUIPMENT AT NILSAN NISHOTECH S. PVT.LTD "*** by *SHAIKH MOHD SOOHAIB (15ME103), SHAIKH ABDULLAH (15ME97), DESHMUKH MOHAMMED UMAR (14ME12), MANSOORI YASIR (14ME91)* is approved for the degree of ***Bachelor of Engineering in Department of Mechanical Engineering.***

Examiners

1. ....
2. ....

Supervisors

1. ....
2. ....

Chairman

....

Declaration

I declare that this written submission represents my ideas in my own words and where others ideas or words have been included, I have adequately cited and referenced the original sources. I also declare that I have adhered to all principles of academic honesty and integrity and have not misrepresented or fabricated or falsified any idea/data/fact/source in my submission. I understand that any violation of the above will be cause for disciplinary action by the Institute and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been taken when needed.

Student Name
Roll Number:

ABSTRACT

The objective of this thesis is to learn and understand how a facility of manufacturing firm use its static equipment. This project is conducted at **NILSAN NISHOTECH S.PVT. LTD, KOPARKHAIRNE MIDC** where various pressure vessels, agitated vessels, chemical reactors, chimneys, heat exchangers, storage tank etc. like products are manufacturing company located at New Mumbai.

In Mechanical Engineering the word "Static Equipment" is given to any equipment which is in Static mode of motion or does not have rotating part. Application of Static Equipment is broadly used in Process Industry which cover, Refinery, Chemical & Fertilizer Plant. The purpose of Static Equipment is to hold the fluid generally at a pressure in an enclosed container, for storage or for any reaction/process to take place in the container. Large volume of liquid at atmospheric pressure is store in "Tank". For this general idea we have come on to this two equipment from our client side one is a sample cooler and a storage tank

A Design is proposed by using the steps involved in making the equipment, which is then going to be tested after fabrication. The proposed design involves optimizing the standards and norms of **ASME** which have high interrelationship and close to each other. The fabricated part is further evaluated by **Quality Engineers**. After Inspection of the product it is fitted in the facility and packaged to the Client Safely.

Keywords: .

Contents

List of Figures

Chapter 1

Introduction

In general, the equipment in oil and gas plants consists of two categories the static equipment and the rotating equipment. In this chapter, we will focus on the static equipment such as the separator vertical or horizontal and other equipment. These equipment are called also a pressure vessel as it contains a fluid under pressure.

The design of pressure vessel depends on factors such as pressure, temperature t, material selected, corrosion, loadings, and many other parameters depending on the applications.

A pressure vessel is a container having a pressure differential with respect to the atmosphere. The purpose of a pressure vessel is to store or process a high pressure high temperature fluid. The fluid can be toxic such as chemicals as well as nontoxic such as steam. The pressure vessel has to be designed according to the standard available codes such as ASME (American Society of Mechanical Engineers) Section VIII Division B, EN/DIN (European) Code, IS (Indian Standard) Code. These codes have been designed by experimentation to obtain standards that fit to any application. Generally, these codes are designed considering the factor of safety between 3 to 4.5. The design of pressure vessel is based on parameters such as pressure, temperature, corrosion, material selection, etc., the study of such parameters helps in designing of the vessel. Variety of materials is available which are to be selected according to the application.

This report elaborates the work done in design of pressure vessels to reduce failures in the pressure vessels and study of the parameters such as operating pressure and temperature, developing stresses, modes of failure etc. which cause fatigue or permanent failure or stress concentration in the vessels.

1.1 Problem Definition

NILSAN NISHOTECH S.Pvt Ltd, New Mumbai is a pharmaceutical company located at MIDC KOPARKHAIRNE. The products in this facility are manufactured by going through various processes like marking, inspection, fitting, welding, etc. On various workshop All the process is done at different locations in the facility which causes the improper work, sometimes unsafe working environment and increased in material traveling time at work but its friendly and trusted by the facility.

The industrial design is carried out using various software. The values and the design data obtained is further used for manufacturing of the vessel. The designer utilizes considerably higher values of the dimensions as per the code in order to make vessel safer during operation and intern increasing fatigue life. But the dimensions used for the construction and manufacturing result in heavier construction. This increases the amount of material utilized, overall cost and the transportation cost of the vessel. This paper focuses on minimizing the overall weight and cost of vessel by determining the optimum wall thickness for the vessel construction.

Figure 1.1: Industry Workshop

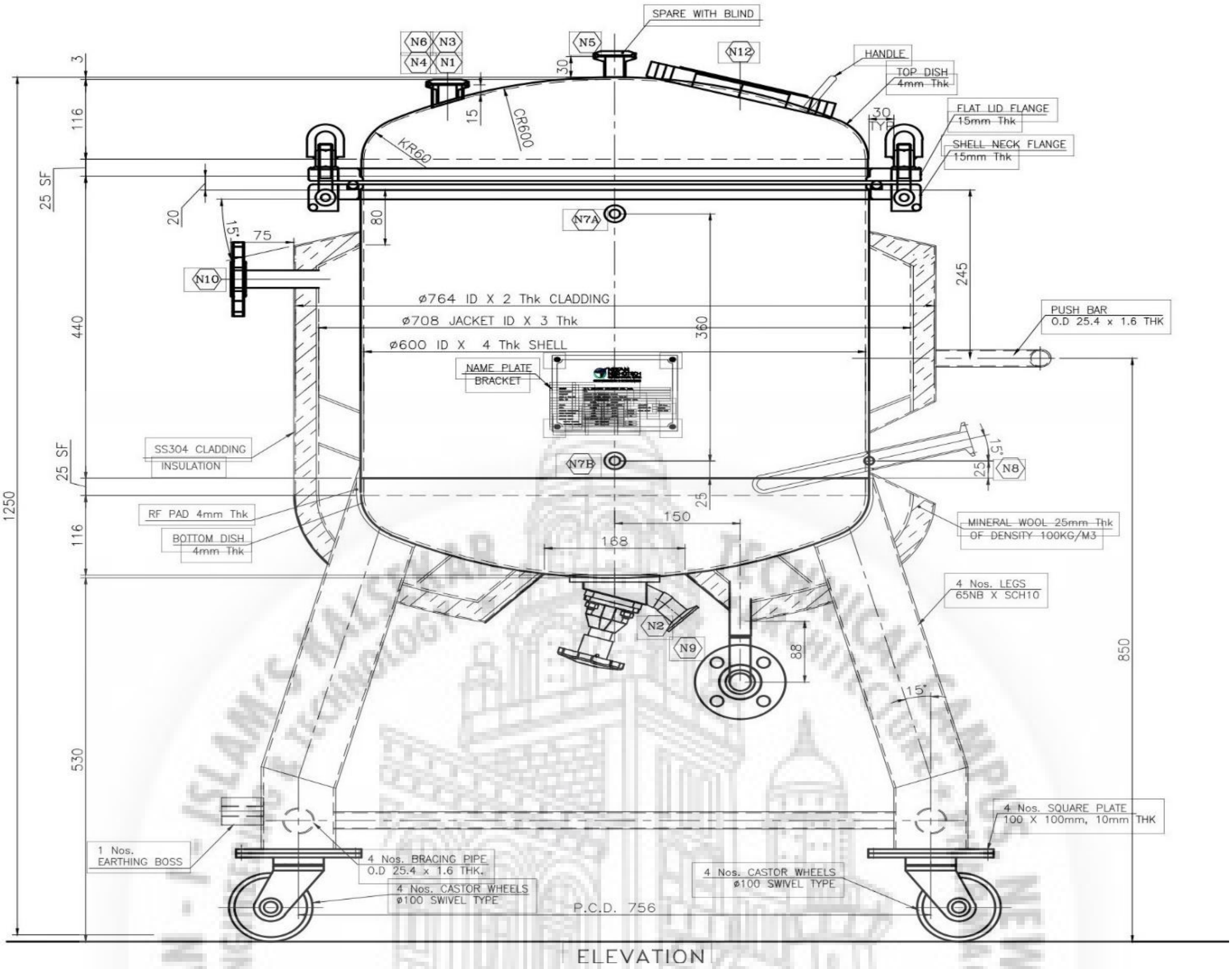

Figure 1.2: drawing

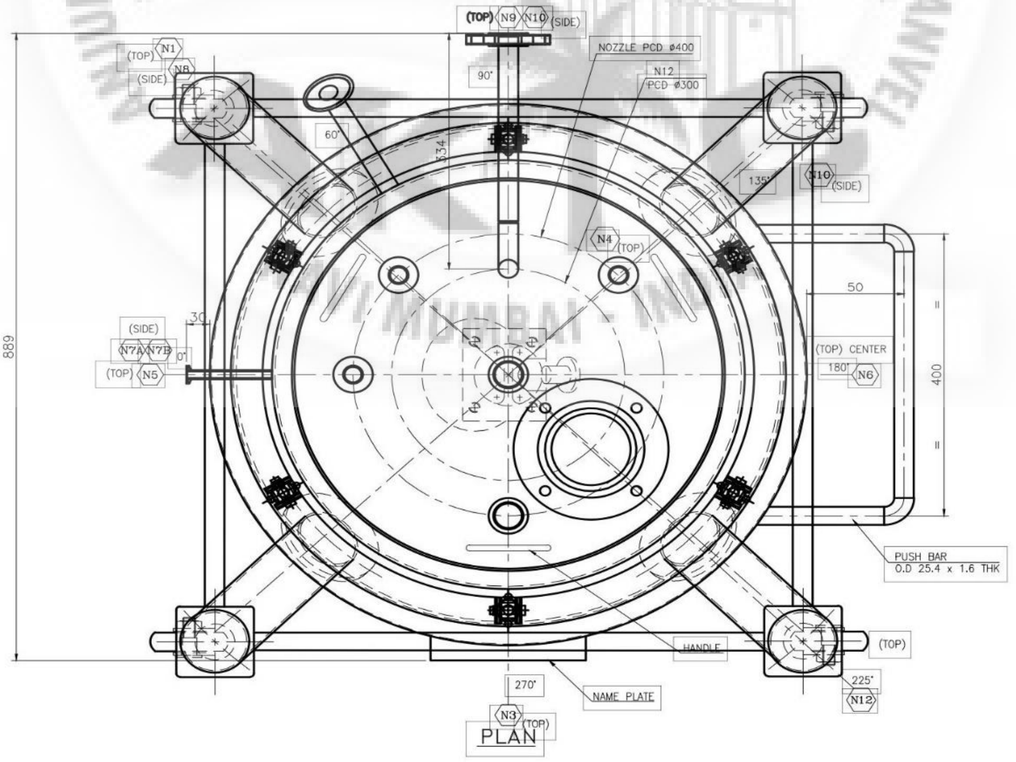

Figure 1.3: drawing

1.2 Proposed System

In response to the above problems the client of our company need this equipments to achieve the manufacturing goals of their company. This project proposes to use sys- tematic plant of Drawing and proper guidance to achieve our goal.

DESIGN/MANUFACTURING CODE

ASME Sec VIII Division B

1.3 Objective of the study

- To study the current situation and what exactly client want from us.
- To develop the understanding and proper steps for completion of project safely.
- To propose an appropriate and better material storage system.
- To propose an appropriate better sampling system from our side.
- To make solid design that can withstand their needs.
- To check and observe personally validating by naked eyes.
- To fit and check the working of the equipment and after packaging.

1.4 Scope of the study

In this thesis, the case study is limited to make a useful design for the client data provided by the Industry and can have all basics requirement full-filled such as mirror finished surface equipment while inspection of client is carried out.

Extra care is taken while fabricating the equipment at the work shops

1.5 Significance of study

Storage tanks and process tanks are used in a number of applications including short term storage, long term storage, mixing, blending, metering and dispensing. Materials of construction will dictate the application that is suitable for the tank.

Common industries and applications that use storage tanks and process tanks include:

- Chemical processing
- Cosmetics processing
- Food and beverage processing
- Oil and fuel processing
- Paper and pulp processing
- Pharmaceutical processing
- Plastic processing
- Power generation
- Energy processing
- Water applications

we have describe the problem by using these phases we have solved the way to communicate with management and HR and (QA.

Figure 1.4: Industry

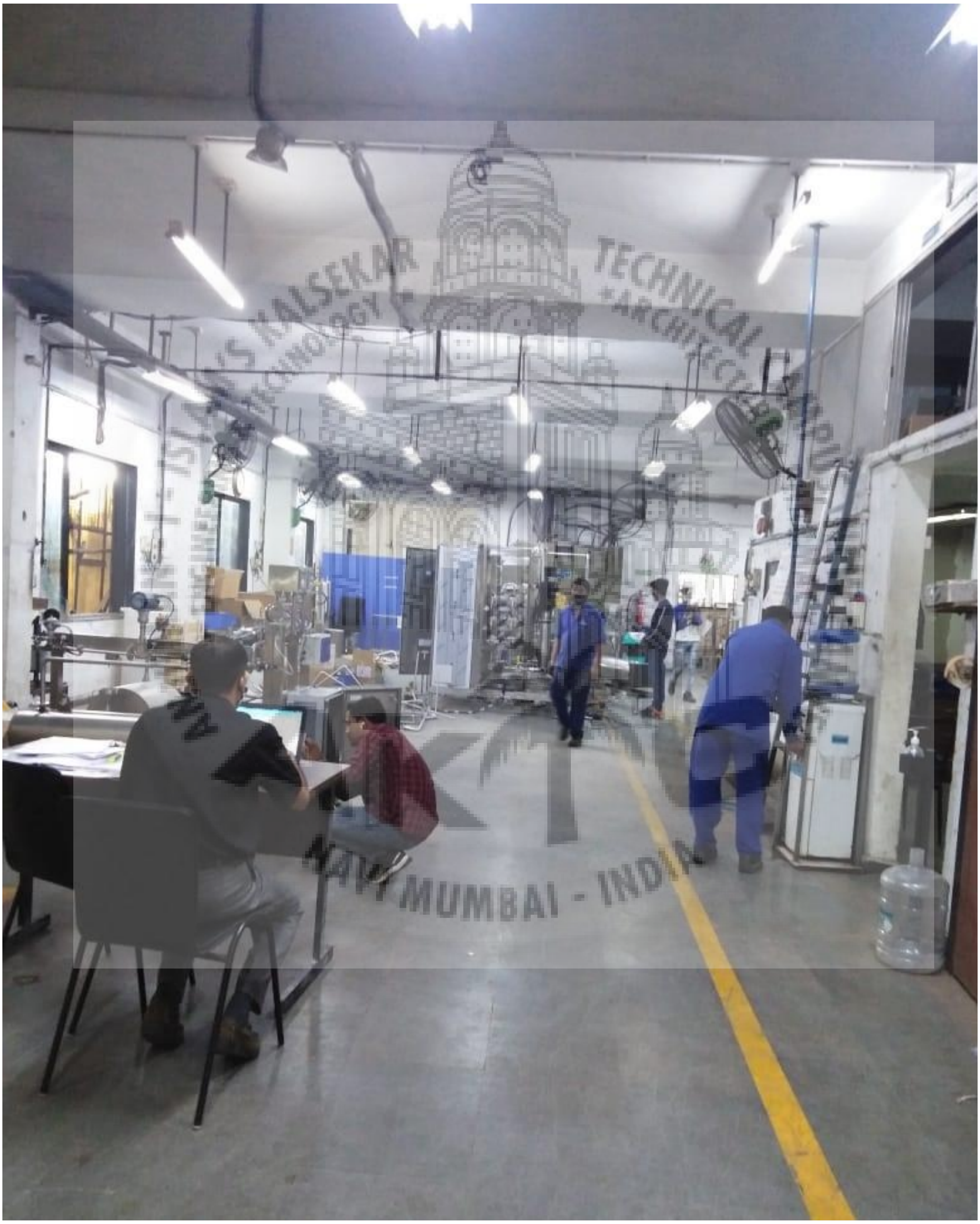

Figure 1.5: company processing area

1.6 Company Background

1.6.1 Introduction:

Nilsan Nishotech Systems Private Limited, established in **1996**, are a well-known manufacturer and trader of a huge gamut of Customized Engineering Solutions. Our range of products includes Purified Water Production Systems, Purified Water Generation & Distribution Systems and CIP Systems. Moreover, we are involved in offering highly reliable services regarding Turn Key Separation for Purification Systems and Sterile Process Piping. Our professional and futuristic approach has enabled us to be counted among the topmost process engineering companies in India acknowledged for project management, applied engineering and process development.

We have been climbing ladders of success since last twenty-five years under the expert guidance of our company's CEO **Mr. Sanjay Badani**. His vast experience and expertise in this domain has led us to carve a niche in this industry.

1.6.2 Company Vision:

Be amongst the top 3 Process Engineering Companies in India renowned for:

- Process Development
- Applied Engineering
- Project Management

Our Achievements


SGS

Nishotech Systems Pvt. Ltd.

ISO 14001:2004

The recent most milestone in the history of Nishotech has been the Excellence Award, ushered to us by SME Chamber of India, (Small & Medium Business Development Chamber of India) on 21st February 2009. This award is the felicitation of our outstanding contribution and achievement in the field of manufacturing activities.

This award announcement & felicitation was conducted at Hotel The Leela Kempinski, Mumbai in collaboration with IITC-India, (India International Trade Centre). The complete event was been supported by Ministry of Commence & Industry, Government of India, Government of Maharashtra and Ministry of Small & Medium Enterprises, Government of

India.

We received the award from Mr. Dinesh Rai - IAS - Secretary, Ministry of MSME, Government of India. Receiving this type of prestigious award is a proof that small & medium enterprise has a pivotal role to play in the economic development and growth of our country.

Figure 1.6: Final equipment

1.6.3 Conclusion

We never make compromises when it comes to the quality of our products. This is evident in our state-of-the-art infrastructural unit that covers a vast area and is equipped with advanced and modern technology based machines. As far as quality is concerned with our products, we never compromise with it and thereby, we source raw materials from industry certified vendors after conducting an extensive research to make sure of a defect-free product series. The products offered by us are strictly checked by our highly qualified quality control professionals before they are delivered to our customers. With the aid of our expert and qualified packaging personnel and well-organized supply chain system, we have been able to offer timely delivery of our products.

Chapter 2

Literature Review

2.1 Introduction:

This chapter in the thesis discuss about the different literature review and different methods to identify the process and overcomes the need for solving and making the vessels useful to the client need.

And basically what factors to look while designing the equipment.

2.2 Literature Survey:

Devaraju and Pazhanivel (2018) have studied stress analysis on pressure vessels by considering the internal pressure, self-weight and the fluid weight. They have designed the pressure vessel using manual calculations and compared these computed stress values with the results obtained from the ANSYS software. They concluded that the stress acting on the shell of the pressure vessel designed is much less than that of the allowable stress of the material. Thus, the pressure vessel is safe for the usage. Nitinchandra et al. (2018) have investigated pressure vessel for marine substation applications considering different materials [1].

Rashmi and vinod (2017) have done analysis on pressure vessel in order to find the difference between flat head and hemispherical head. They have done the analysis considering different orientation and different number of saddle support. They concluded that the Von-Moses and normal stress of the pressure vessel are almost same for both flat head and hemispherical head whereas, the stress at the closure of flat head is found to be almost double on the hemispherical head vessel. Anandhu and avis (2017) have studied the analysis of horizontal oriented pressure vessel. The pressure vessel designed was modeled using CATIA and analyzed using ANSYS software. They concluded that the pressure vessel with shell thickness of 18 mm issafer as compared to 16 mm shell thickness, whereas, the shell thickness of 16 mm economy of construction of pressure vessel [2].

Sadanandam et al. (2017) has done research on design and analysis of pressure vessel using finite element method. They have sub-divided the vessel into smaller elements and applied the internal pressure in order to analyze the stress. They used principal stress theory and distortion energy theory for validating their design and the calculated results were compared with the results from the FEA software. They concluded that the maximum principal stress as per manual calculation was in line with the FEA results and hence the pressure vessel design considered was safe. Sandeep gond et al. (2004) has done analysis on the pressure vessel. The selection of the material, design and stress calculation of the pressure vessel was done as per the ASME standard [3].

Siva krishna and seshaiah (2012) have studied multilayer pressure vessel that can withstand a high pressure. They designed the pressure vessel using ASME standards for designing and checking various parameters of pressure vessel. The finite element analysis was used to analyze both the solid pressure vessel and multilayer pressure vessel. They concluded that the internal stress formed in multilayer pressure vessel was much lesser when compared to solid pressure vessel. Kuhn et al. (2000) has studied the design and analysis of full composite pressure vessel using FEA. They studied the different types of end domes for optimizing the weight and material variation. They concluded that the composite material can be used for optimizing the weight in case of pressure vessels. Wadkar et al. has studied design and analysis of pressure vessel using ANSYS software [4].

Sheik Abdul and Chandra Sekhar (2012) have studied the structural analysis due to change in location of the nozzle in a pressure vessel. They intend to find the location of the nozzle for which the stress value is minimal. The pressure vessel analyzed was filled with water with a working pressure of 9 Kg/cm 2and internal diameter of 100 cm. They concluded that a minimum of 8 mm wall thickness is enough to hold the pressure vessel with a low value of factor of safety. Apurva et al. (2018) has done research on design and analysis of the pressure vessel. Their main focus is to analyze the safety parameters of the pressure vessel for a given working pressure. They have taken the main parameters that effect the safety of the pressure vessel like, material selection, design and fabrication. They have designed the pressure vessel using seamless pipe instead of making the shell using a plate. They concluded that the maximum working pressure considered was within the allowable limit. Merlin and chitaranjan (2017) have studied different types of end domes in the analysis of pressure vessel considering torispherical and hemispherical heads [5].

The pressure vessels are important component for Process industry which serves for various purposes. These vessels are designed considering the operating parameters such as Type of fluids, Quantity, Volume, and mainly temperature and pressure. The aim of this project is to perform the detailed design & analysis of pressure vessel for optimum thickness using ANSYS software. The selected components of pressure vessel like Shell, Heads, Nozzles, Supports and Lifting Lugs etc. are compared with Standard available thickness and optimization being done for the allowable stresses for MOC. The thickness of the pressure vessel is checked for different load cases. This results in the optimization of pressure vessel component thickness and hence reduces the overall weight and the cost the pressure vessel due optimum wall thickness for same service conditions.[9]

This technical paper presents design, and analysis of pressure vessel. High pressure rise is developed in the pressure vessel and pressure vessel has to withstand severe forces. In the design of pressure vessel safety is the primary consideration, due the potential impact of possible accident. There have a few main factors to design the safe pressure vessel. This writing is focusing on analyzing the safety parameter for allowable working pressure. Allowable working pressures are calculated by using Pressure Vessel Design Manual by Dennis Moss, third edition. The corruption of the vessel are probability occur at maximum pressure which is the element that only can sustain that pressure. Efforts are made in this paper to design the pressure vessel using ASME codes & standards to legalize the design.[10]

Design parameter of pressure vessels are design pressure, allowable stress, corrosion allowance. In the pressure vessels, Maximum Working pressure is the maximum pressure to which the pressure vessel is subjected, Hydrostatic test pressure is the pressure at which the vessel is tested. The pressure vessel is finally tested by the hydrostatic test before it is put into operation. The design of openings and nozzles is based on two considerations, first one is Primary membrane stress in the vessel must be within the limits set by allowable tensile stress. Peak stresses should be kept within acceptable limits to ensure satisfactory fatigue life. Theoretical calculated values by using different formulas are very close to that of the values obtained from ANSYS analysis. This indicates that ANSYS analysis is suitable for multilayer pressure vessels.[11]

Mr. Mukund Kavekar, Mr. Vinayak H .Khatawate, Mr. Gajendra V. Patil [1] have explained about use of composite materials to replace high strength to weight metals for use of pressure vessels in low weight applications such as aerospace and oil and gas.

Shyam R. Gupta, Ashish Desai [2] have designed a horizontal pressure vessel using PV Elite industrial software. For designing the vessel very few parameters such as design pressure, design temperature, inside diameter, volume, material, fluid properties, etc are required.

B. F. Langer [3] in his paper Design of pressure vessels for low cycle fatigue has described methods for constructing a fatigue curve based on strain fatigue data used in pressure vessel design. When this curve is used the same strength reduction factor is to be used for both low cycle and high cycle fatigue

2.3 Conclusion:

In this chapter, the literature review of the thesis is carried out where several paper and journals have been referred by us for better understanding on the work we are going to work.

Basically the researching of paper is the key point in Thesis overall we have understand and learn the proper way to make communication for our line of Project.

Chapter 3

Problem Identification

3.1 Introduction:

This chapter in the thesis discuss about the methods to identify the area where to be implemented. Process flow diagram, drawing sheets, all the static equipment's and small hurdles to overcome them according to the client perspective

3.2 Drawings of static equipment:

3.2.1 Flow of material:

All the materials flow from the whole production line are to be formulated into a from-to chart that indicates the material flow pattern and frequency among different departments or sections of plant. The analysis of material flow involves determining the most effective sequence of work and material. The flow of material is shown below represents initial material flow in the facility.

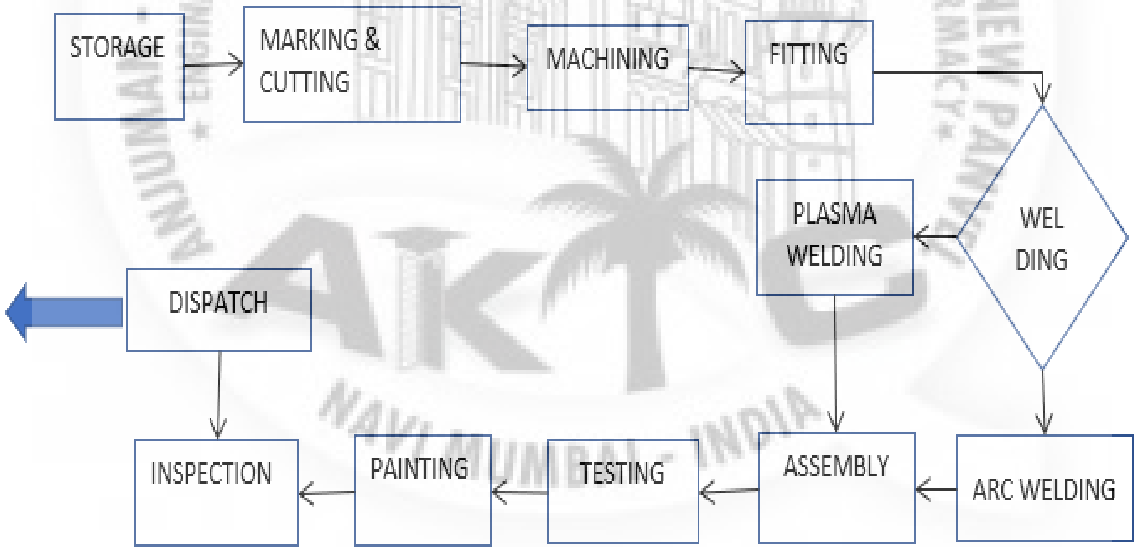

Figure 3.1 : Flow of materials

3.2.2 Requirement of clients:

This following table below down shows the requirements of the client.

	SHELL	JACKET	Units
FLUID	WFI WATER	CHILLED WATER	
MOC	SS316L	SS316L	
TEST PRESSURE	5.85	6.825	Bar(g)
DESIGN PRESSURE	4.5	5.25	Bar(g)
DESIGN TEMP.	180	180	Degree Celsius
EMPTY / FLOODED WEIGHT	80 - 250	80 - 250	Kgs.

Table : Requirements

3.2 Conclusion:

This Table represents basically a 100ltrs capacity tank which we are going to fabricate from our workshop for our client see that while testing that it withstands the given requirements or not.

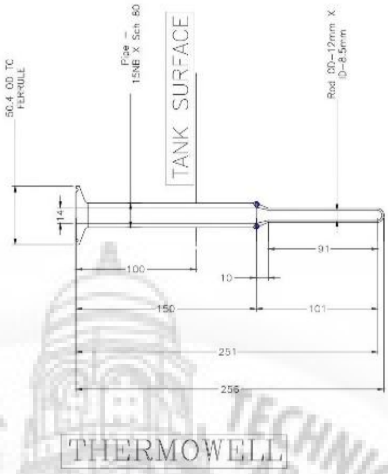

Figure 3.3: Drawing

3.2.1 Conclusion:

Figure 3.3: Manufactured

The main work for its to sense the temperature difference while in the storage tank we fit it carefully.

Chapter 4

Methodology

4.1 Introduction:

In this chapter, the main focus is to take main steps and procedure while designing and validating the equipment selecting the appropriate material and costing is also done analysis of stresses on the equipment while working. If failure recorrecting the failure testing is done to see proper working of the equipment.

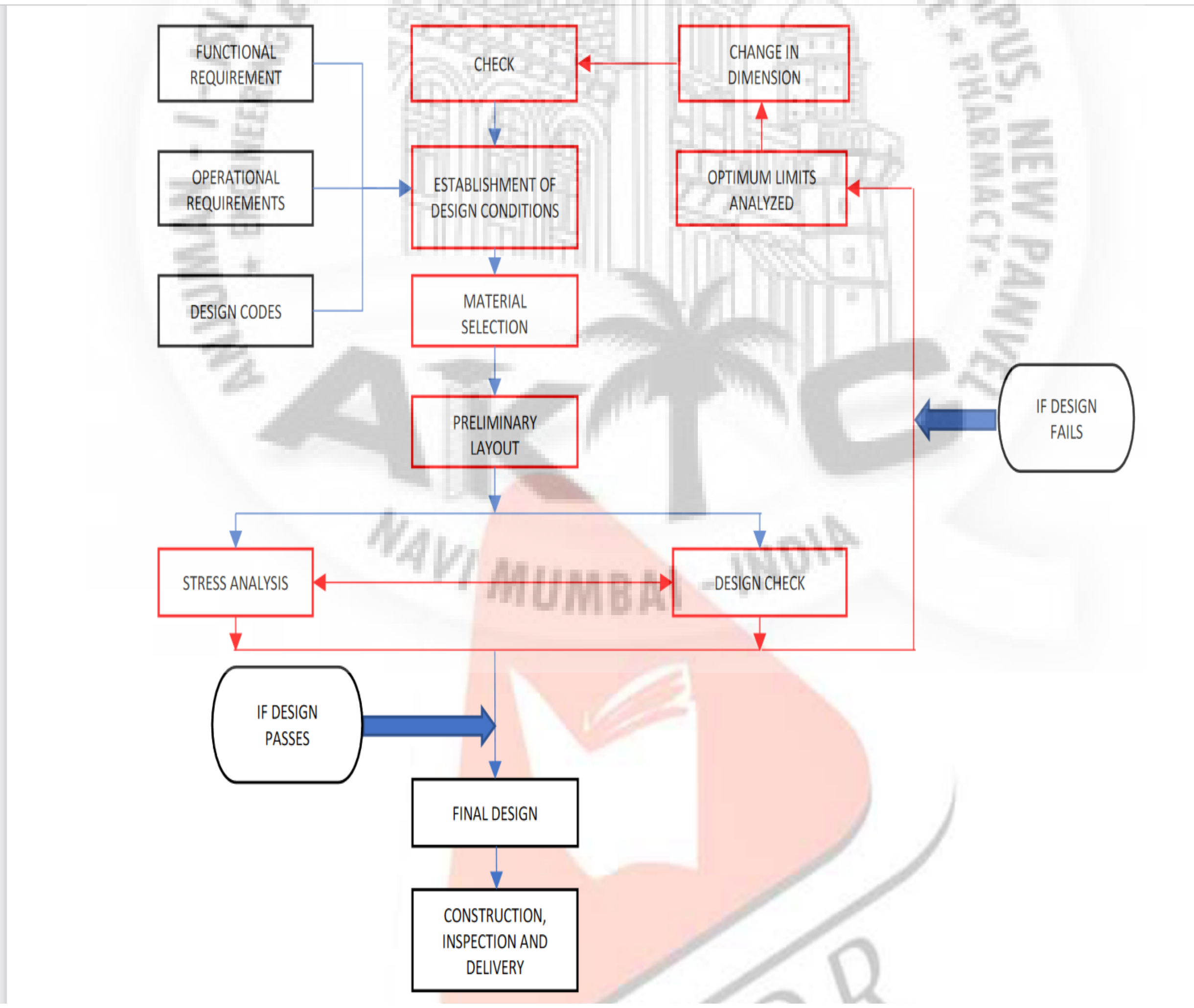

Figure 4.1: Methodology chart

Chapter

Evaluation of Results

1.7 Main calculation:

Based on the application, ASME standard and user requirements pressure vessels are selected. Low volume less than 5000 GALLONS, applications vertical Vessels is selected.

Vertical process vessels, as their name indicates, are erected in the vertical position.

Here we have selected a vertical vessel because the working volume is 100Litres only.

As per the actual process feed water flow rate is 100 Litres per hour and outlet flow is continues so in worst case of outlet flow, tank can hold feed volume for complete 1 hour.

Based on this vessel has been design.

- Vessel name – Process Vessel
- Working Volume – 100L
- Gross Volume – 160L
- Shell ID – 600 mm
- Shell Height – 722 mm
- L:D ration – 1.2:1
- MOC – SS 316L

- Working Pressure-3 kg/cm2

Considering above factors material thickness is calcuatted and also the selected thickness will withstand the said working pressure or not, is also validated.

As per the Standard:-

Design Pressure = 1.5 times of Working pressure
Also Test Pressure =1.3 to 1.5 times of Design Pressure.

So, if a vessel withstand at its test pressure that means it will be safe during its actual working conditions.

If the maximum allowable stress of selected material thickness is equals to or more than hydrotest pressure that means it will definitely withstand during it actual working conditions

5.2 Calculations for Thickness :

- **Working Pressure** – 3 kg/cm2

  - Working Pressure (MPa) – 3 x 0.980665 = 0.294 MPa.
    [Since :1 kg/cm2 =0.980665 MPa]

- **Design Pressure (MPa)** = 1.5 x Working Pressure
  = 1.5 x 0.294

= 0.441 MPa

- **Hydro-test Pressure (MPa)** = 1.3 x Design Pressure

  = 1.3 x 0.441

= 0.5733 MPa ≈ 0.585 (i.e 5.85 kg/cm2)……….Equation-1

- **Nominal Thickness of vessel** = 4 mm (Assumed)
- **Allowable Stress** = 80.5 MPa
- **Tolerance** = 0.5 mm
- **Corrosion Allowance** = 0.5 mm
- **Joint Efficiency** = 0.85
- **Outer Diameter Vessel** = 600 + 4 + 4 = 608 mm
- **Corroded Thickness** =[Nominal Thk. – Corrosion allowance – Tolerance]

  i.e 4 – 0.5 – 0.5 = 3 mm
- **Corroded Inside Radius**

  = outer Diameter/2 – Corroded Thickness

  = 608/2 – 3

  = 301 mm

- **Required Shell Thickness**

= (Design Pressure x Corroded inner radius) / {(Allowable stress x Joint Efficiency)

– (0.6 x Design Pressure)}

= (0.441 x 301)/ {(80.5 x 0.85) -(0.6 x 0.441)}

= 2.018 mm

- **Nominal Required Thickness**

= Required Shell Thickness + Corrosion allowance + Tolerance

= 2.018 + 0.5 + 0.5

= 3.018 mm

We have selected 4 mm shell thickness, upper side than Nominal Required Thickness. Which makes our system safer and stronger.

- **Max Allowable work Pressure**

= (Allowable Stress x Joint Efficiency x Corroded thickness)/ {(Corroded Inside Thickness + (0.6 x Corroded thickness)}

= (80.5 x 0.85 x 3)/ {(301 + (0.6 x 3)}

= 0.677 MPa = 0.677 / 0.0980655 = 6.9 kg/cm2.---------Equation-2

5.3 Conclusion of evaluation:

The actual working pressure of this vessel is 3.0 kg/cm2 for which hydrotest pressure is 5.85 kg/cm2 as shown in **Equation -1.**

While in **Equation-2** it is clearly seen that Max Allowable Pressure of vessel at selected thickness of 4 mm is 6.9 kg/cm2.

We can conclude that this vessel will withstand at both the pressure i.e working and testing and is safe during operation.

Chapter 6

Conclusion and Future Scope

6.1 Results:

6.1.1 Final product for packaging and dispatching:

Figure 6.1: Process vessel

6.1.1.1 The above three pictures show the result of HT testing of the shell and jacket part.

- And process vessel

6.2 Conclusion

Basically here we seen and understand the purpose of the equipment and working and application.

Designing the parts on software.

Validating it on the software.

Visual inspection on industry workshop on fabrication.

We are able to collect information on various factors that help in understanding of factors affecting design, manufacturing and analysis of static equipment.

6.3 Future Scope

- The future development can be carried out by increasing the number of machines so that more productivity, accuracy and efficiency of the product can be achieve.
- Making sure that the rules and guidance is practice in the industries.
- And repairing the old available machine can also increase the productivity and it will be beneficial economically
- As per our project we will be designing and analyzing the static equipment as per the company provided detail, in future we can see if we can optimize the equipment by using the software’s.
- We can try to limit the process in validation as it takes more and more iterative time in validating the final output of the pressure vessels.
- By using different software like cad cam or cae.

- We can automate the process of manufacturing the vessel as it takes more time building it manually.

6.3.1 Advantages:

i. An Industrial Vessel is a container designed to hold gases or liquids at a pressure
ii. These vessels can be dangerous and fatal accidents have occurred in the history, so that can be reduced.
iii. Heater vessel design, manufacture, and operation are regulated by engineering authorities backed by legislation. So the design and analysis has to be done according to these legislations.
iv. Human safety ensured.
v. Accuracy of production.

6.3.2 Disadvantages:

I. Improper selection of materials leads to lesser Factor of safety.
II. Design becomes complex for consideration of parameters such as pressure, temperature, wind load, seismic loads.
III. Higher Technical knowledge is required.
IV. Software package is costly.
V. Testing methods are too costly.


CAUTION
HIGH INTENSITY X-RAY BEAM
General Metals
Time 10.8 sec
SS-304 0.7
Cr 17.75 0.27
Fe 71.53 0.49
Ni 8.32 0.31
Cu 0.507 0.101
Mo 0.328 0.044

References

1. Devaraju, A., and Pazhanivel, K., (2018), A study on stress analysis for design of pressure vessel, International journal of mechanical and production engineering, 3(11), pp. 98-101.

2. Rashmi khobragade, and vinodhiwase., (2017), Design and analysis of pressure vessel with hemispherical and flat circular end, International Journal of Engineering Science and Computing, 7 (5), pp. 12458 – 12469.

3. Sadanandam., Ramesh., and Samuel Tamerat., (2017), Design and Analysis of pressure vessel using finite element method, International journal of latest technology in engineering, management and applied science (IJLTEMAS), 5(6), pp. 1-3.

4. Siva, Krishna., and T, Seshaiah., (2012), Design and Analysis ok Multilayer High Pressure vessels, International Journal of Engineering Research and Applications, 1(2), pp. 355–361.

5. Sheik, Abdul, Lathuef., and K Chandra, Sekhar, K., (2012), Design and structural analysis of pressure vessel due to change of nozzle location and shell thickness, International journal of advanced engineering research and studies., 2(1), pp. 1-4.

6. Apurva, R, Pendbhaje., Mahesh, gaikwad., Nitin, deshmukh., and rajkumar, patil., (2018), Design and analysis of pressure vessel, International journal of innovative research in technology and science (IJIRTS), 3(2), pp. 28-34.

7. Sawant, S. M., & Hujare, D. P. Thermo-Mechanical Analysis For Skirt Of Pressure Vessel Using FEA Approach. International Journal Of Mechanical Engineering (IJME) ISSN, 2319-2240.

8. Merlin, J, Thattil., and Chitaranjan, Pany., (2017), Design and analysis of pressure vessel with different end domes, International Journal of Science, Engineering and Technology

Research, 6(8), pp. 1225-1233.

9. Design and Analysis of Pressure Vessel Components as per ASME Sec. VIII Div. III. International Journal of Innovative Research in Technology & Science(IJIRTS) 28 INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH IN TECHNOLOGY & SCIENCE | VOLUME 2, NUMBER 3, DESIGN AND ANALYSIS OF PRESSURE VESSEL

10. DESIGN AND ANALYSIS OF MULTILAYER PRESSURE VESSEL 1Asst. Prof. V. V. WADKAR, 2 Jadhav Sumit S, 3 Jadhav Tejasvi D, 4Chougule Amit A, 5 Shete Suchita