THENI MELAPETTAI HINDU NADARGAL URAVINMURAI

NADAR SARASWATHI COLLEGE OF ENGINEERING & TECHNOLOGY

Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai
Vadapudupatti, Annanji (po), Theni - 625 531,
Tamilnadu, India.

3.1.1 Grants received from Government and non-governmental agencies for research projects / endowments in the institution during the last five years

Academic Year	:	**2019-2020**
Name of the Project Application	:	**Electric Powered Lift for Construction**
Name of the Principal Investigator	:	**Mr. B. Radha Krishnan** Assistant Professor, Department of Mechanical Engineering, Nadar Saraswathi College of Engineering and Technology, Vadapudupatti, Theni.
Name of the Co-Principal Investigator	:	**Mr. V. Sivaganesan** Assistant Professor, Department of Mechanical Engineering, Nadar Saraswathi College of Engineering and Technology, Vadapudupatti, Theni.
Name of the Funding Agency	:	Sakthi Builders and Consultants, Theni
Amount Sanctioned	:	**Rs. 5,50,000** /-
Duration of the project	:	Six Months

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Tamilnadu, India.

3.1.1 Grants received from Government and non-governmental agencies for research projects / endowments in the institution during the last five years

Academic Year	:	**2019-2020**
Name of the Project Application	:	**Electric Powered Lift for Construction**
Name of the Principal Investigator	:	**Mr. B. Radhakrishnan** Assistant Professor, Department of Mechanical Engineering, Nadar Saraswathi College of Engineering and Technology, Vadapudupatti, Theni.
Name of the Co-Principal Investigator	:	**Mr. V. Sivaganesan** Assistant Professor, Department of Mechanical Engineering, Nadar Saraswathi College of Engineering and Technology, Vadapudupatti, Theni.
Name of the Funding Agency	:	Sakthi Builders and Consultants, Theni
Amount Sanctioned	:	**Rs. 5,50,000 /-**
Duration of the project	:	Six Months

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THENI 625 531

Dr. C. MATHALAI SUNDARAM, M.E.,M.B.A.,Ph.D.,
Principal
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Vadapudupatti, Theni-625 531.

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Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai
Vadapudupatti, Annanji (po), Theni - 625 531,
Tamilnadu, India.

Date: 18/10/2019

To

Sakthi Builders and Consultants
56 GD, Varatharajapuram Street,
Cumbum, Theni – 625 531.

Dear Sir,

Sub: ***Research project work – Joint Venture*** – reg.

The Nadar Saraswathi College of Engineering and Technology (NSCET) was founded in 2010 and is renowned for its modern infrastructure and amenities. The location is Vadaputhupatti, Annanji, in Theni. The primary objective of Nadar Saraswathi College of Engineering and Technology (NSCET) is to offer a superior educational environment that emphasises both effective instruction and a well-regulated and orderly setting. Our institution provides courses in the fields of Civil Engineering, Computer Science and Engineering, Electronics and Communication Engineering, Electrical and Electronics Engineering, and Mechanical Engineering. Additionally, we offer postgraduate degrees in Manufacturing and Structural Engineering. Our college is engaged in research and consulting activities related to engineering competence. The faculty members in our Mechanical Engineering department possess specialised knowledge in their respective areas of competence within the field of Mechanical Engineering. Hence, I am composing this correspondence to convey our keenness in initiating research endeavours and forming a collaborative partnership with Sakthi Builders. We eagerly anticipate the chance to collaborate on a new scientific endeavour with Sakthi Builders

Thanking you,

Yours sincerely,

Mani 18/10/19

Dr. C. MATHALAI SUNDARAM, M.E., M.B.A., Ph.D.,
Principal
Nadar Saraswathi College of Engineering and Technology
Vadapudupatti, Theni-625 531.

Mani

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NADAR SARASWATHI COLLEGE OF ENGINEERING & TECHNOLOGY
THENI 625 531

Sakthi
Builders & Consultants

Er.N.Nagarathinam, M.E,MIE,CE.,
Licensed Building Surveyor,Charted Engineer,
Registered Structural Engineer - Grade I
SE/Gr I/MR/July2019/019,SE 008/2019

Date: 31/10/2019

To

The Principal,

Nadar Saraswathi College of Engineering and Technology,

Annanji (P.O),Vadapudupatti,Theni-625531.

Dear Sir,

Subject: ***Research Project Fund***– reg.

Ref: *Letter from Principal at Nadar Saraswathi College of Engineering dated on 18-10-2019*

The research project request letter is in my possession. At Sakthi Builders and Consultants, we are experts in providing top-notch building services for mechanical engineering applications. Our goal is to meet the unique needs of each customer by offering innovative and environmentally friendly solutions. They approach every job with a dedication to quality, bringing their knowledge and workmanship to guarantee constructions that are both long-lasting and visually beautiful. Consequently, we are in need of the research services of your college to investigate the topic of electric powered lifts for domestic construction. Because of this, we are happy to grant your request and invite you to submit a proposal for research. As a result of this study, we hope that manufacturing of mechanical components will advance. Consequently, we kindly request that you present a comprehensive project plan that incorporates a budget.

Thank you

Er. N. NAGARATHINAM, M.E(Struct), MIE.,CE.,
Chartered Engineer & Structural Consultant
Registered Engineer Grade-I (122/LS/2013/00011)
DTCP Registered Structural Engineer Grade-I (SE008/2019)
56GD, Varatharajapuram, Cumbum - 625 516
Cell: 9994068898, 9095100234

31/1/2019

Authority Signature

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Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai
Vadapudupatti, Annanji (po), Theni - 625 531,
Tamilnadu, India.

Date: 18/11/2019

To

Sakthi Builders and Consultants
56 GD, Varatharajapuram Street,
Cumbum, Theni – 625 531.

Dear Sir,

Subject: ***Research project work-Acknowledging your letter dated*** **31/10/2019** - Submission of the Project Proposal titled " Electric Powered Lift for Construction" - Reg.

Ref: Your Reference letter Dated 31.10.2019

I am writing to express my heartfelt appreciation on behalf of the teachers and students of Nadar Saraswathi College of Engineering and Technology for allowing us to submit our project proposal to Sakthi Builders and Consultants. We are really honoured and appreciative for the opportunity to collaborate on this project. We recognise the benefits of collaborating with a reputable organisation like Sakthi Builders and Consultants since we understand how important your company is to the industry. Your willingness to let us communicate our ideas and solutions is encouraging and motivating for our academic community. As a result, I am proposing a study proposal named "Electric Powered Lift for Construction" for your review and consideration. And please accept the necessary budgets as well as team member allocations for the proposed project and do the necessary.

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Principal
Nadar Saraswathi College of
Engineering and Technology
Vadapudupatti, Theni-625 531.

Yours Sincerely,

18/11/19

Dr. C. MATHALAI SUNDARAM, M.E.,M.B.A.,Ph.D.,
Principal
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Vadapudupatti, Theni-625 531.

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Nadar Saraswathi College of Engineering & Technology

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Vadapudupatti, Annanji (po), Theni - 625 531,
Tamilnadu, India.

TMHNU

Date: 18/11/2019

To

Sakthi Builders and Consultants
56 GD, Varatharajapuram Street,
Cumbum, Theni – 625 531.

Dear Sir,

*Sub: **Submission of Project proposal with Budget & Allocation of Team**-reg.*

With reference to the above, herewith, I submit a project proposal attached with budget and also assigning the team for the forthcoming research project, kindly receive it and do the needful.

Yours Sincerely,

Mani 18/11/19

Dr. C. MATHALAI SUNDARAM, M.E., M.B.A., Ph.D.,
Principal
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Mani

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Vadapudupatti, Annanji (po), Theni - 625 531,
Tamilnadu, India.

Submission of Research Proposal

On

Electric Powered Lift for Construction

Submitted

to

Sakthi Builders and Consultants

56 GD, Varatharajapuram Street,

Cumbum, Theni – 625 531.

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Project Overview

1. Objectives:

1. Successfully procure and manufacture the electric-powered lift, ensuring compliance with industry standards and safety regulations.

2. Efficiently install and integrate the lift into our construction processes, optimizing its functionality within our operational framework.

3. Provide comprehensive training programs to our staff, ensuring they are well-versed in operating and maintaining the Electric Powered Lift.

4. Implement the lift to optimize project timelines, reduce manual labor, and enhance overall construction efficiency.

5. Ensure strict adherence to safety standards and regulations in the operation and maintenance of the Electric Powered Lift, fostering a secure working environment.

6. Monitor and minimize the project's environmental impact, contributing to our sustainability goals.

These goals and objectives underscore our commitment to modernizing construction practices, fostering a safer workplace, and aligning with sustainable development principles.

2. Scope of Work:

1. Load Capacity:

- The electric-powered lift should have a load capacity of 500Kg, ensuring it can efficiently transport materials and personnel commonly encountered in our construction projects.

2. Vertical Travel Height:

- The lift should be capable of reaching a vertical travel height of 35 feet, accommodating the varied elevation requirements of our construction sites.

3. Power Source:

- The lift must be powered by electricity, aligning with our commitment to eco-friendly solutions and reducing reliance on traditional fuel sources.

4. Control Mechanism:

- A user-friendly and precise control mechanism is essential, allowing operators to easily navigate the lift and ensuring optimal control during material and personnel transportation.

5. Safety Features:

- Advanced safety features are a prerequisite, including emergency braking systems, overload

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protection, and safety interlocks to prevent accidents and ensure the well-being of construction personnel.

6. Durability and Weather Resistance:

- The lift should be designed with robust materials, ensuring durability under varying weather conditions commonly encountered in construction environments.

7. Ease of Maintenance:

- Maintenance should be straightforward, with accessible components and clear documentation provided for routine inspections and repairs.

8. Compliance with Standards:

- The electric-powered lift must comply with relevant industry standards, certifications, and safety regulations, ensuring adherence to legal and operational requirements.

9. Training Requirements:

- The manufacturer or supplier should provide comprehensive training programs for our staff to operate and maintain the lift safely and effectively.

10. Integration with Existing Infrastructure:

- The lift should seamlessly integrate with our existing construction equipment and processes, minimizing disruptions during implementation.

11. Remote Monitoring and Diagnostics:

- Incorporation of remote monitoring and diagnostics capabilities is desirable, enabling real-time tracking of lift performance and timely identification of potential issues.

12. Customization Options:

- The manufacturer should offer customization options to tailor the lift to our specific project requirements, ensuring versatility and adaptability to various construction scenarios.

By specifying these detailed requirements, we aim to ensure that the selected electric-powered lift aligns precisely with our operational needs, safety standards, and environmental considerations, contributing to the project's overall success.

Expected outcomes and deliverables

The implementation of the electric-powered lift in our construction operations is anticipated to yield transformative outcomes and deliverables. Firstly, we expect a substantial increase in operational efficiency, with streamlined vertical transportation reducing project timelines and enhancing overall productivity. The advanced safety features inherent in the lift are poised to deliver a safer working environment, significantly mitigating risks associated with traditional lifting methods and fostering a culture of workplace well-being. Additionally, the project aligns with our commitment to environmental sustainability, and we anticipate a notable reduction in carbon emissions through the adoption of this eco-friendly solution. The expected deliverables encompass successful procurement or manufacturing of the lift, seamless integration into our construction processes, a well-trained workforce proficient in lift operation, and comprehensive documentation of safety and environmental compliance. Ultimately, these anticipated outcomes and deliverables position the project as a strategic investment in the enhancement of our construction capabilities, workplace safety, and commitment to sustainable practices.

3. Project Plan:

Timeline for the project

Month 1-2: Project Initiation and Planning

- Develop a detailed project plan outlining tasks, responsibilities, and milestones.
- Identify and finalize the supplier or manufacturer for the electric-powered lift.
- Establish a project team and allocate roles and responsibilities.

Month 3-4: Procurement or Manufacturing

- Initiate the procurement process or commence manufacturing of the electric-powered lift components.
- Conduct regular quality checks to ensure compliance with industry standards.
- Begin documentation of the manufacturing process.

Month 5-6: Installation and Integration

- Receive the electric-powered lift components and initiate the installation process.
- Collaborate with the manufacturer's technical team to ensure seamless integration.
- Conduct safety inspections and certifications upon installation completion.

Month 7-8: Training and Capacity Building

- Develop training programs for staff on the operation and maintenance of the electric-powered lift.
- Conduct training sessions to ensure the workforce is proficient in utilizing the lift safely and efficiently.

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- Create comprehensive documentation for future reference.

Month 9: Finalization, Testing, and Project Closure

- Conduct final testing and quality assurance checks to ensure the electric-powered lift operates as intended.
- Address any outstanding issues or adjustments.
- Complete all project documentation, including a final project report.
- Officially close the project and transition the electric-powered lift into regular construction operations.

This timeline is designed to ensure a systematic and efficient implementation of the electric-powered lift project over the course of 9 months, allowing for thorough planning, execution, and testing phases. Adjustments can be made based on the specific requirements and progress of the project. Regular communication and collaboration within the project team will be essential to adhere to the proposed timeline successfully.

4. Rationale for Electric Powered Lift:

An electric-powered lift is essential for our construction operations due to its transformative impact on efficiency, safety, and sustainability. Unlike traditional lifts, it streamlines vertical transportation, significantly reducing time and effort. Advanced safety features ensure a secure working environment, mitigating risks associated with conventional lifting methods. Moreover, the electric-powered lift aligns with our commitment to environmental responsibility by minimizing carbon emissions and promoting eco-friendly practices in our construction projects. Its necessity lies in its ability to optimize project timelines, enhance workplace safety, and contribute to our broader goal of adopting modern, sustainable technologies in construction.

Benefits over traditional lifts

1. Enhanced Efficiency:
   - Streamlines vertical transportation, reducing time and effort compared to traditional lifts.
2. Advanced Safety Features:
   - Incorporates cutting-edge safety mechanisms, including emergency braking and overload protection, ensuring a secure working environment.
3. Eco-Friendly Operation:
   - Minimizes carbon emissions by operating on electricity, aligning with environmental sustainability

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goals.

4. Precise Control Mechanism:

- User-friendly controls and precision in operation for optimal and controlled movement.

5. Durability in Construction Environments:

- Constructed with robust materials to withstand the challenging conditions common in construction sites.

6. Ease of Maintenance:

- Designed for easy access to components, facilitating routine inspections and minimizing downtime.

7. Compliance with Safety Standards:

- Meets industry standards and safety regulations, ensuring a safe and compliant lifting solution.

8. Versatility and Adaptability:

- Seamlessly integrates with existing construction equipment and processes, providing versatility for various scenarios.

9. Remote Monitoring Capabilities:

- Allows for real-time tracking of performance and proactive identification of potential issues.

10. Customization Options:

- Offers flexibility through customization, catering to specific project requirements and operational preferences.

11. Noise Reduction:

- Maintains a low noise level during operation, minimizing disturbances in construction environments.

12. Operational Efficiency:

- Demonstrates high operational efficiency with quick response times and minimal energy consumption.

These benefits collectively position the electric-powered lift as a superior alternative to traditional lifts, addressing specific challenges in construction while providing a technologically advanced and sustainable solution.

6. Technical Specifications:

- Detailed technical requirements and specifications of the electric-powered lift

The electric-powered lift with rack and pinion system must adhere to stringent technical requirements and specifications to ensure optimal performance in our construction operations. It

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should have a minimum load capacity of [Specify Capacity] and be capable of reaching a vertical travel height of [Specify Height] to accommodate diverse construction needs. Operating on a [Specify Voltage] power supply, the lift must employ a precision-engineered rack and pinion system for smooth and controlled vertical movement. A user-friendly control interface with emergency braking, overload protection, and safety interlocks is essential for secure operation. The lift's construction should prioritize durability and weather resistance, ensuring resilience in varying environmental conditions. Accessible components and clear documentation are imperative for ease of maintenance, and the lift must comply with industry standards, including CE certification. Comprehensive training programs for staff, seamless integration with existing infrastructure, remote monitoring capabilities, and customization options are vital considerations. The lift should maintain low noise levels, demonstrate high operational efficiency, and obtain necessary certifications, collectively ensuring a technologically advanced and safety-compliant solution for our construction projects.

7. Budget Overview:

- Breakdown of the 5 lakhs and 50 thousand budget

Certainly, let's adjust the budget to meet the specified amount of 5,50,000:

1. Equipment Purchase:

   - Procurement of Electric-Powered Lift Components: INR 2,00,000
   - Manufacturing of Rack and Pinion System: INR 1,25,000
   - Purchase of Electrical Components and Motors: INR 75,000
   - Additional Accessories and Spare Parts: INR 50,000
   - Total Equipment Purchase: INR 4,50,000

2. Installation Costs:

   - Professional Installation Services: INR 60,000

3. Contingency:

   - Unforeseen Expenses and Adjustments: INR 40,000

Grand Total Budget: INR 5,50,000

This adjusted breakdown aligns with the specified budget of 5,50,000, ensuring that each category receives an appropriate allocation while maintaining the overall financial constraints.

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8. Funding Justification:

- Cost-benefit analysis

Benefits:

1. Operational Efficiency:

 - Reduction in Project Timelines

 - Increased Productivity and Output

2. Enhanced Safety:

 - Decreased Accident Rates

 - Improved Workplace Safety Culture

3. Environmental Sustainability:

 - Lower Carbon Emissions

 - Adherence to Sustainable Construction Practices

4. Technological Advancements:

 - Integration of Modern Technology

 - Future-Proofing Operations

5. Adaptability and Versatility:

 - Seamless Integration with Existing Infrastructure

 - Ability to Cater to Varied Construction Scenarios

9.Analysis:

The initial investment of 5,50,000 is well-justified by the numerous benefits the project offers. The reduction in project timelines and increased productivity contribute to operational efficiency gains, while the emphasis on safety and sustainability aligns with modern construction practices. The integration of advanced technology and adaptability to varied scenarios further position the project as a strategic investment in the long-term success of our construction operations. The intangible benefits, such as improved company reputation and operational resilience, enhance the overall value proposition. Continuous monitoring and evaluation during implementation will be crucial to maximize benefits and address any emerging challenges.

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10.Risks and Mitigation:

1. Technical Risks: Regular testing and prototyping to identify and address issues within budget constraints.
2. Market Acceptance: Engage potential users for feedback to ensure the machine meets their expectations.

11.Conclusion:

This project, within the budget of Rs. 5,50,000/-, aims to deliver a cost-effective Electric Powered Lift addresses the domestic need for efficiency and cost reduction. With a carefully planned approach and adherence to budget constraints, we anticipate delivering a valuable solution to domestic users.

PRINCIPAL INVESTIGATOR

PRINCIPAL

Dr. C. MATHALAI SUNDARAM, M.E.,M.B.A.,Ph.D.,
Principal
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Vadapudupatti, Annanji (po), Theni - 625 531,
Tamilnadu, India.

Date: 18/11/2019

The Following faculty members are assigned for conducting the research work for the proposed project titled "Electric Powered Lift for Construction".

List of Faculty members

S. No	Name of the PI & Co-PI	Designation and Specialization	Contact Information
1.	**Mr. B. Radhakrishnan**	Assistant Professor/ Mechanical Engineering	9159989767 radhakrishnannscet@gmail.com
2.	**Mr. V. Sivaganesan**	Assistant Professor/ Mechanical Engineering	8678925269 sivaganesan8686@mail.com

Mani 18/11/19

PRINCIPAL

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Er.N.Nagarathinam, M.E,MIE,CE.,
Licensed Building Surveyor,Charted Engineer,
Registered Structural Engineer - Grade I
SE/Gr I/MR/July2019/019,SE 008/2019

Date: 28/11/2019

To

The Principal,
Nadar Saraswathi College of Engineering and Technology
Annanji (P.O), Vadaputhupatti, Theni -625531

Dear Sir,

Ref: Your Reference letter Dated 18.11.2019

I am pleased to notify you that the project for the Electric Powered Lift for Construction has undergone a comprehensive evaluation and has been granted approval. We acknowledge the potential influence and importance of your initiative, and we are eager to assist in its effective implementation. The allocated budget for the project is INR Rs. 5, 50,000/-. This budget includes the expenses related to the acquisition, setup, and any supplementary needs to guarantee the successful execution of the project.

Project Title	: Electric Powered Lift for Construction
Project Duration	: 30.11.2019 – 31.05.2020
Approved Budget	: Rs.5,50,000/- (for Materials and Component Purchase including transport and Fabrication)
Project Investigator Details	: Mr.B. Radhakrishnan & Mr.V. Sivaganesan
Cheque Details	: Cheque no: 364351 – Indian Bank, dated on 28/11/2019.

We also respectfully request that the Project Investigator periodically forwards all required reports to us for further action in the future.

Thank You

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Dr. C. MATHALAI SUNDARAM, M.E.,M.B.A.,Ph.D.,
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Vadapudupatti, Theni-625 531.

28/11/2019.
Authority Signature

Er. N. NAGARATHINAM, M.E(Struct), MIE.,CE.,
Chartered Engineer & Structural Consultant
DTCP Registered Structural Engineer Grade-I
56GD, Varatharajapuram, Cumbum - 625 516

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Vadapudhupatti, Theni - 625 531

(Approved by AICTE, New Delhi and Affiliated to Anna University, Chennai)

Report for

Electric Powered Lift for Construction

Submitted By

Dr.B. Radhakrishnan, AP/Mech,

Mr.V. Sivaganesan, AP/Mech

For

Sakthi Builders and Consultants

On

30/05/2020

THENI 625 531

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Vadapudupatti, Theni-625 531.

ELECTRIC POWERED LIFT FOR CONSTRUCTION

ABSTRACT:

The Electric-Powered Lift for Construction project marks a pivotal advancement in the realm of vertical transportation within the construction industry. This abstract encapsulates the essence of the project, focusing on the integration of cutting-edge electric-powered technology to streamline lifting processes. The project aims to enhance operational efficiency, reduce project timelines, and contribute to a safer working environment by introducing innovative safety features. Embracing a commitment to sustainability, the project aligns with eco-friendly practices. With a clear emphasis on modernization and improved construction methodologies, this project seeks to redefine industry standards and set a new benchmark for efficient, safe, and sustainable construction practices.

Keywords:electric-powered technology, streamlined lifting, operational efficiency, reduced timelines, safety features, sustainability, modernization, and construction practices.

PROJECT SYNOPSIS

The project contains of designing and fabrication of power operated portable lift machine. There are difference between this lift machine and the current lift machine in market. The design of this lift machine will be more user friendly in handling and use. To achieve the objective of this project, it needs a lot of knowledge and skills such as AutoCAD, Pro-E software, welding skill, drilling, grinding, and fastener.

PROJECT PROBLEM STATEMENT

According to the market lift machine, basically the lift machines nowadays are provided using the hydraulic system and other complex system. What try to do in this task is try to develop lift machines that not use the hydraulic system but more to the conventional system. The system that will use is only use the gear and motor system to lift the material. The problem statements as follows:

a) The lift is only used in the three phase due to the three phase motor is used.

b) Many product (lift machine) designing in a big range of load the level settings in the lift take time.

PROJECT OBJECTIVE

The purpose of this project is to practice a student that has been gathered before in solving problem using academic research and also to gain knowledge and skills. This project also important to train and increase the student capability to get information, research, data gathering and then solves a problem by doing the calculation. The Pre-final year project also will generate students that have capability to make a good report in thesis form or technical writing. It also can train student to create in design, fabricate and analysis a new thing. The other thing, pre-final year project will teach student to doing a task with independently in searching and expending the experience and knowledge. So the objectives of this project are:

a) To design and development lift machine (using gear and gear box)

b) To lift a material (load) to other place at various height.

c) To fabricate and make analysis to the body of lift machine including analysis of mechanical part of machine and the system of mechanical part.

d) To lift a load not more than 250 kg.

SCOPE OF PROJECT

From the title that has been given, the development of this project must include how to design and fabrication of power operated portable lift machine. It also needs some knowledge and skill to finish the project. There is some other guide must have followed to finish this project.

a) Literature review

It includes all the information from internet that is related withthis project.
Such as;

i. The history of lift
ii. The type of lift
iii. The gear system
iv. Machinery process used.

b) Design concept

i. Sketch the new design of lift (consists of 3 designs). It bases on customer needs
ii. Evaluated the designs and come out with the new design (final concept).
iii. Using the AutoCAD software, make the isometric, orthographic and 3D drawing.

c) Fabrication

i. In fabricate the lift, the material used; steel bar, hollow, gear box, gear, rollers, bearing and motor.
ii. the process used in fabrication:

- Welding: in this process, it uses to combine many part of material in the lift fabrication
- Fastening: combine some other part such as between the angles and the hollow steel bar using screw, bolt.
-

d) Report writing

i. Report writing will covered for the whole work progress from start until the end of the work.

PROJECT BACKGROUND

Basically, the purpose of development of lift machine is too used to lift, transport a material to certain height and to work in certain height. Lift machine also called a power operated portable lift, The modern in lift machine was developed in the 1920s. The lift machine has since become an indispensable of equipment in manufacturing and warehousing operation.

In this Pre-final year project, the design of this lift machine should be creative, simple, user friendly and use the minimum cost especially the material cost.

PROJECT SCHEDULE

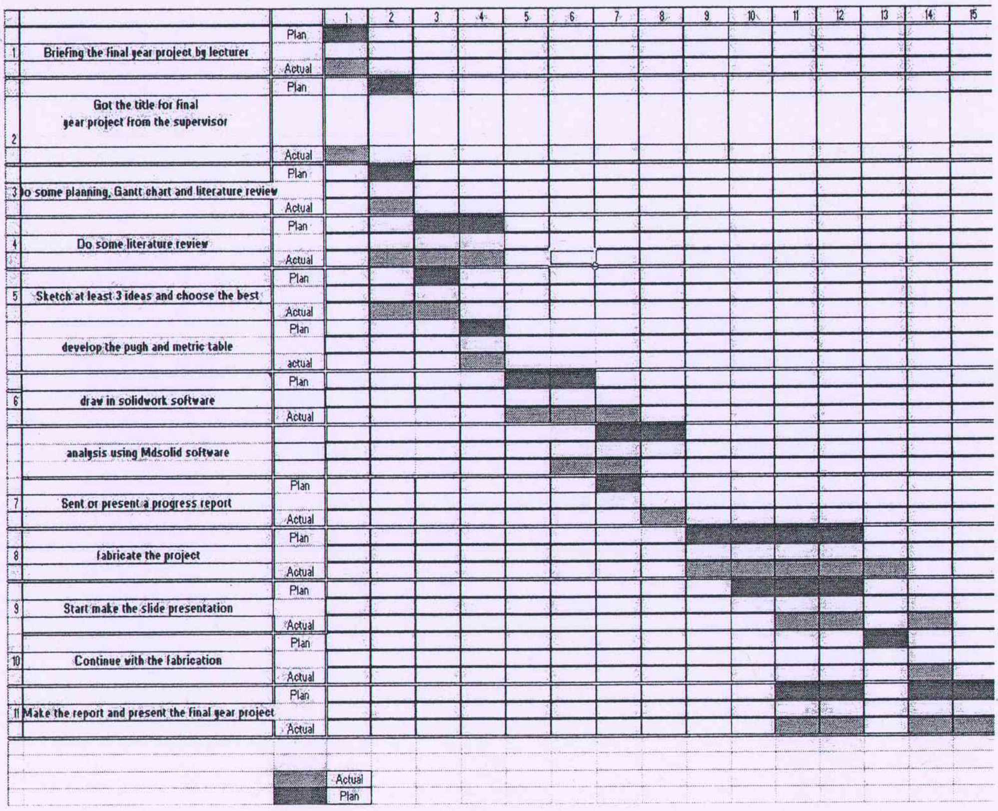

Table.1.1 Gantt chart

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Referring the Gantt chart in table 1.1, this Pre-final year project (P-FYP), start with some introduction or briefing by supervisor. Beginning week, need to do some schedule management for this project that covered for the whole week. It will be apply in Microsoft excel to make a Gantt chart.

After that, this project continuing with some literature review about the title. In this literature review, it is about to find or to gather all the information related with this project. Find the type, design, and the system used on the development of lift machine (power lift). It is also including the differences for each design in marketing. All the information gathers from internet, journal, reference book and people.

The project continued with design the concept of lift machine. The designs come out using from all data collection, Pugh concept and metric link before this. Try to evaluate or analysis the mechanical part of machine and the system for each design come out. From the all source, develop (engineering drawing) the final concept.

After all information, data and detail drawing are improved, the fabrication process stage start. As the reference, we look at detail drawing to fabricate. The dimension and the material are already list on the drawing. In the fabrication of the lift machine, it's need us to apply many knowledge and skills such as; welding, fastening, drilling and cutting the material.

Lastly, the final report writing and prepare the final presentation. A report is guided by Anna university thesis format and also guidance from supervisor. Due to all problems that student facing, the management have agreed to extend the time to submit a report and presentation. All task scheduled is take around fourteen weeks to complete

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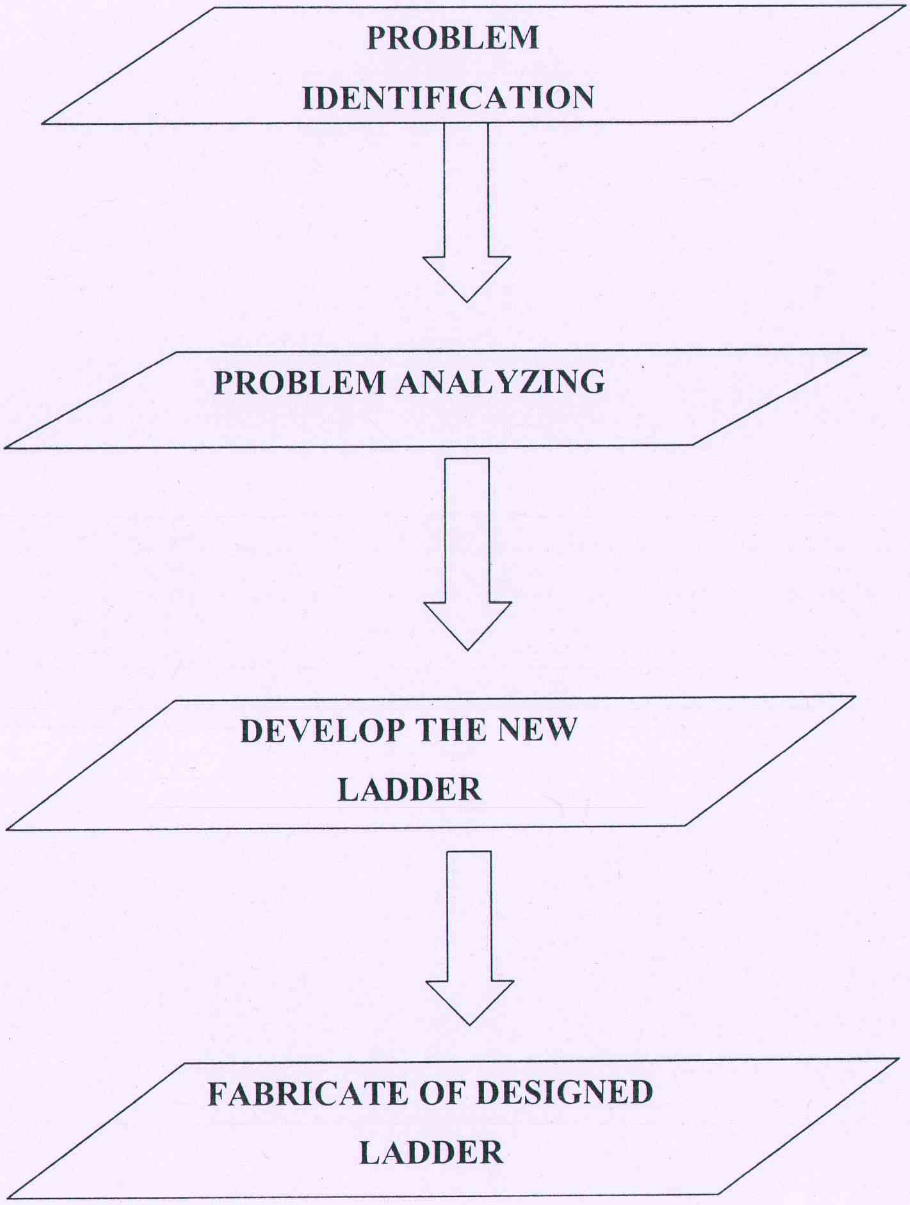
METHOD OF PROBLEM SOLVING



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MECHANISM USED

a) RACK AND PINION

A rack and pinion is a type of linear actuator that comprises a pair of gears which convert rotational motion into linear motion. A circular gear called "the pinion" engages teeth on a linear "gear" bar called "the rack"; rotational motion applied to the pinion causes the rack to move relative to the pinion.

b) WORM DRIVE

A worm drive is a gear arrangement in which a worm (which is a gear in the form of a screw) meshes with a worm gear (which is similar in appearance to a spur gear). The two elements are also called the worm screw and worm wheel. The terminology is often confused by imprecise use of the term worm gear to refer to the worm, the worm gear, or the worm drive as a unit.

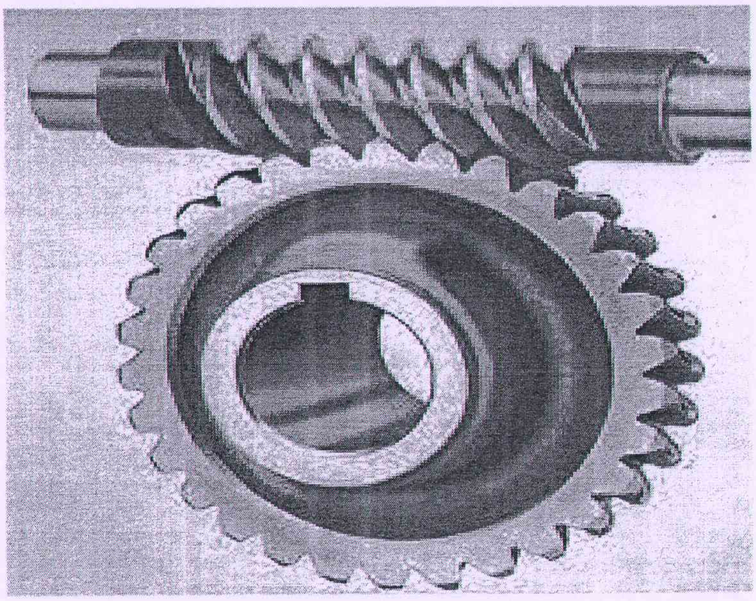

Fig.2.1 Worm drive

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HISTORY REVIEW

INTRODUCTION

A lift also called an Elevator, used to lift and vertically transport materials. The lift was developed in the 1743s by various companies including the U.S. division bought by Kone in 1981, Canadian division bought by Schindler in 1982. The lift has since become an indispensable piece of equipment in manufacturing and warehousing operations.

THE BEGINNING – 1853

Rudimentary elevators, or hoists, were in use during the Middle Ages and can be traced to the third century BC. They Were operated by animals and human power or by water –driven mechanisms. The elevators as we know it today was first developed during the 1800s and relied on steam or hydraulic plungers for lifting capacity. In the latter application, the cab was affixed to a hollow plunger that lowered into an underground cylinder. Liquid, most commonly Water, was injected into the cylinder to create pressure and make the plunger elevate the cab, which would simply lower by gravity as the water was removed.

Values governing the water flow were manipulated by passengers using ropes running through the cab, a system later enhanced with the incorporation of lever controls and pilot values to regulate cab speed. The "granddaddy" of today's traction elevators first appeared during the 19^{th} century in the U.K., a "lift" using a rope running through a pulley and a counter weight tracking along the shaft wall. Give us the power. The power elevators debuted mid-19^{th} century in the U.S. as a simple freight hoist operating between just two floors in a New York City building. By 1853, Elisha Graves Otis was at the New York Crystal Palace exposition, demonstrating an elevators with a "safety" to break the cab's fall in case of rope failure, a defining moment in elevators development .

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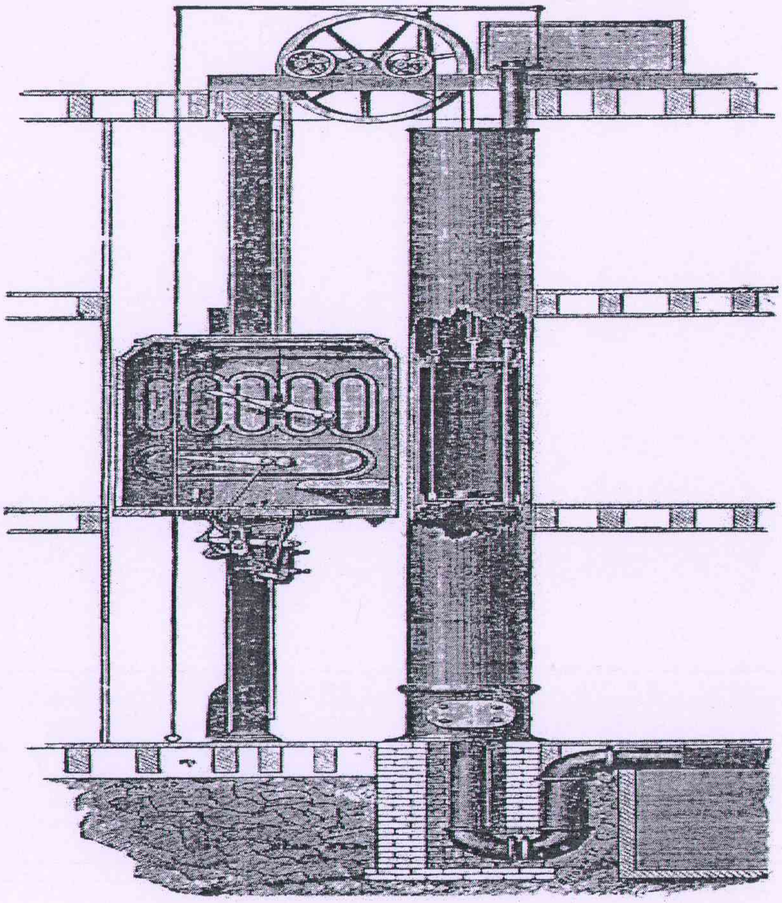

Fig.3.1 Gearless Lift

By 1857, the country's first Otis passenger elevator was in operation at a New York City department store, and ten years later, Elisha's sons went on to found Otis Brothers and company in Yonkers, NY, eventually to achieve mass production of elevators in the thousands. Various other elevators design appeared on the landscape, including screw- driven and ropes-geared, hydraulic models.

Later in the 1980s, with the advent of electricity, the electric motor was integrated into elevators technology German inventor Werner von Siemens. With the motor mounted at the bottom of cab, those design employed gearing scheme to climb shafts walls fitted with racks.

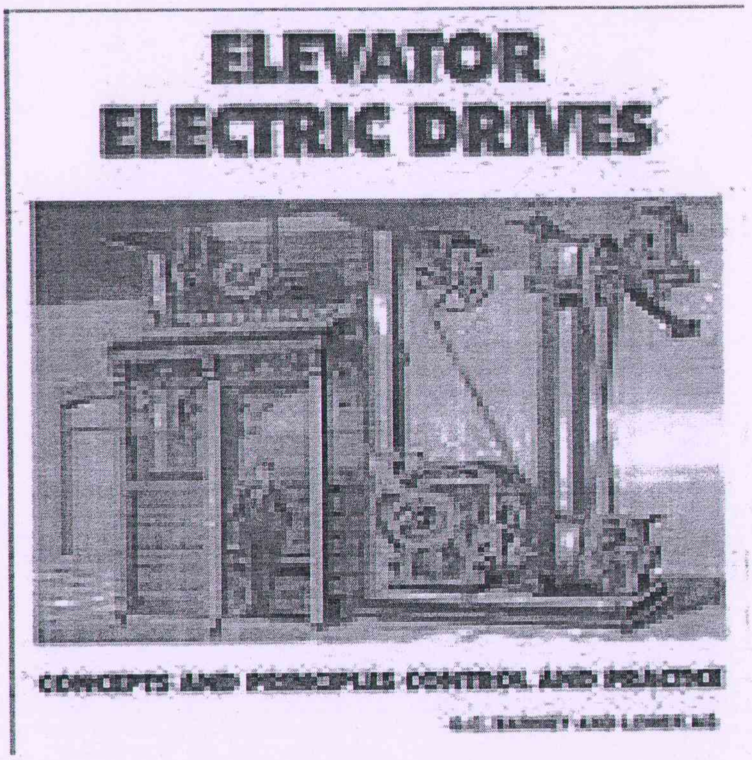

Fig.3.2 First Elevator Electric Drives

Motor technology and control methods evolved rapidly. In 1889 came the direct-connected geared electric elevator, allowing for the building of significantly taller structures. By 1903, this design had evolved into the gearless traction electric elevators, allowing hundred-plus story buildings to become possible and forever changing the urban landscape. Multi- speed motors replaced the original single-speed models to help with landing-leveling and smoother overall operation. Electromagnet technology replaced manual rope-driven switching and braking. Push-button controls and various complex signal systems modernized the elevators even further. Safety improvements have been continual a notable development by Charles Otis, son of original "safety" inventor Elisha, that engaged the "safety" at any excessive speed, even if the hoisting rope remained intact.

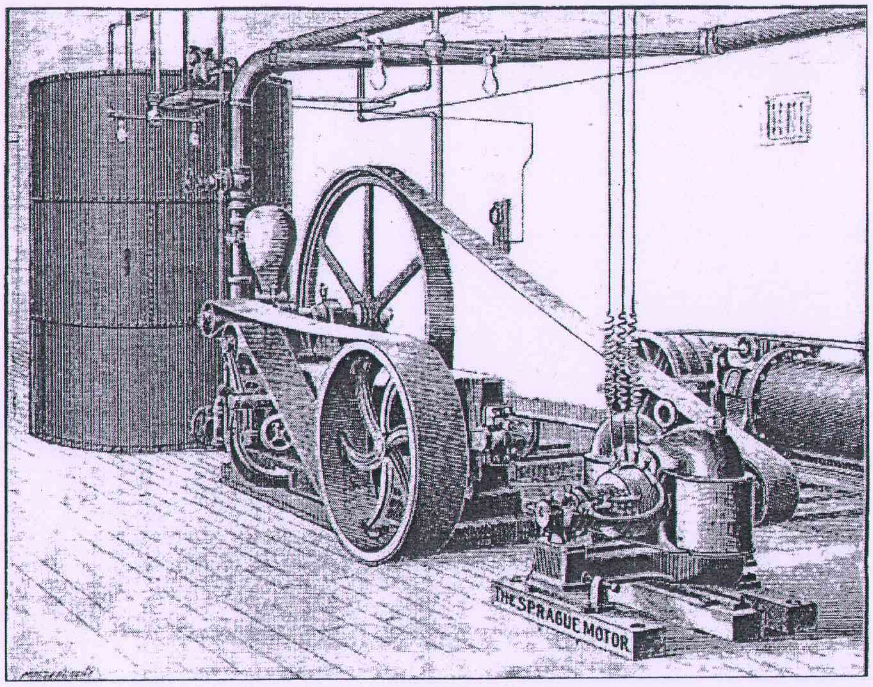

Fig.3.3 Elevator Drive

Today, there are intricate governs and switching scheme to carefully controls cab speed in any situation. "Buttons" have been giving way to keypads. Virtually all commercial elevators operate automatically and the computer age has brought the microchip-based capacity to operate vast banks of elevators with precise scheduling, maximized efficiency and extreme safety. Elevators have become a medium of architectural expression as compelling as the buildings in which they're installed, an new technologies and designs regularly allow the human spirit to soar.

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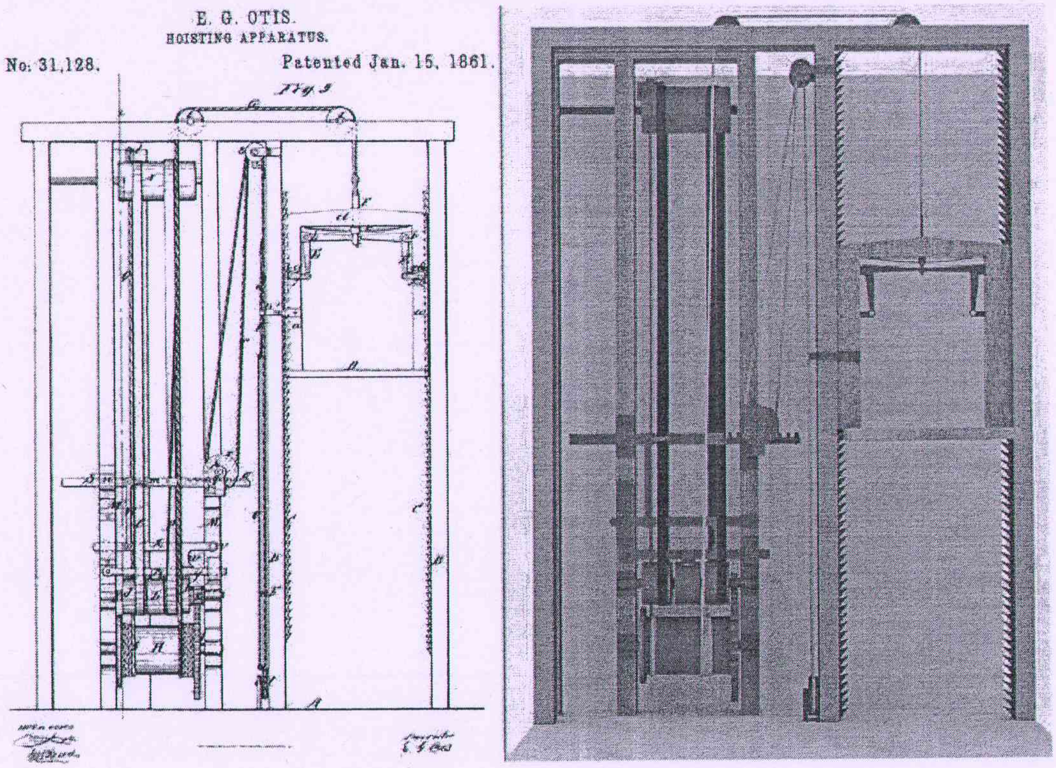

Fig.3.4 Modern Lift System

PRODUCT REVIEW

a) Design type by function

The following is a list of the more common lift types. It is arranged from

i. Trade lift

ii. Hospital lift

iii. High residential lift

b) Lift machine type

i. Passenger lift

Passenger elevator's capacity is related to the available floor space. Generally passenger elevators are available in capacities from 1,000 to 6,000 pounds (450-2,700 kg) in 500 lb (230 kg) increments.

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Fig.3.5 Passenger Lift

ii. Goods lift

A Goods Lift can save a huge number of trips up and down stairs when running a B&B, and conserve a lot of human energy. In commercial premises they can make lifting of heavy goods fairly easy.

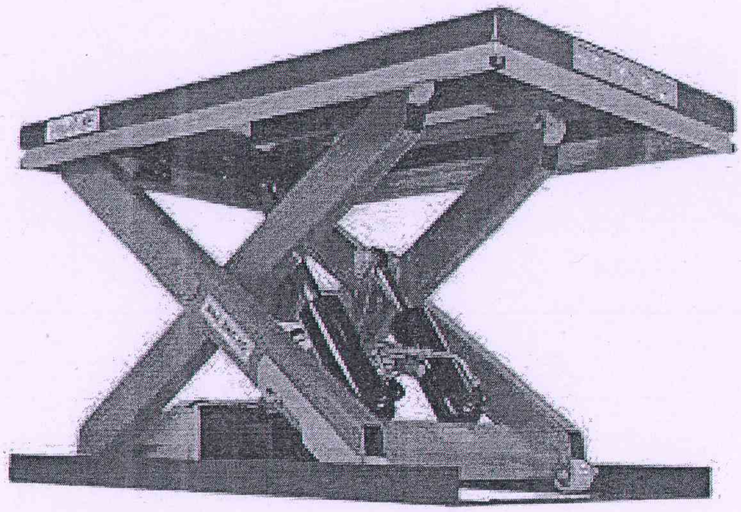

Fig.3.6 Goods Lift

c) Lifts by mechanism

i Hydraulic Elevators.

ii Traction Elevators.

iii Climbing elevator.

MOTOR

An electric motor is an electrical machine that converts electrical energy into mechanical energy. The reverse of this is the conversion of mechanical energy into electrical energy and is done by an electric generator.

In normal motoring mode, most electric motors operate through the interaction between an electric motor's magnetic field and winding current to generate force within the motor. In certain applications, such as in the transportation industry with Traction motors, electric motors can operate in both motoring and generating or braking modes to also produce electrical energy from mechanical energy.

Found in applications as diverse as industrial fans, blowers and pumps, machine tools, household appliances, power tools, and disk drives, electric motors can be powered by direct current (DC) sources, such as from batteries, motor vehicles or rectifiers, or by alternating current (AC) sources, such as from the power grid, inverters or generators. Small motors may be found in electric watches. General-purpose motors with highly standardized dimensions and characteristics provide convenient mechanical power for industrial use. The largest of electric motors are used for ship propulsion, pipeline compression and pumped-storage applications with ratings reaching 100 megawatts. Electric motors may be classified by electric power source type, internal construction, application, type of motion output, and so on.

Electric motors are used to produce linear or rotary force and should be distinguished from devices such as magnetic solenoids and loudspeakers that convert electricity into motion but do not generate usable mechanical powers, which are respectively referred to as actuators and transducers.

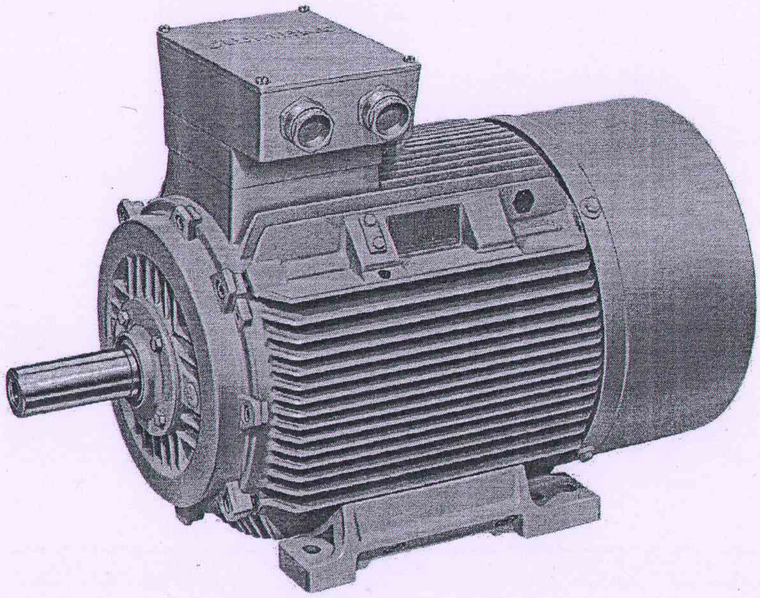

Fig. 4.1 Electric motor

TYPES OF MOTORS

DC MOTORS:

A DC motor is any of a class of rotary electrical machines that converts direct current electrical energy into mechanical energy. The most common types rely on the forces produced by magnetic fields. Nearly all types of DC motors have some internal mechanism, either electromechanical or electronic; to periodically change the direction of current flow in part of the motor.

- Permanent magnet
- Electromagnets
- Shunt
- Compound

AC MOTOR

An AC motor is an electric motor driven by an alternating current (AC). The AC motor commonly consists of two basic parts, on outside stationary stator having coils supplied with alternating current to produce a rotating magnetic field, and an inside rotor attached to the output shaft producing a second rotating magnetic field. The rotor magnetic field may be produced by permanent magnets, reluctance saliency, or DC or AC electrical windings

- Induction Motor
- Synchronous motor.

INDUCTION MOTOR

AC induction motors are the most common motors used in industrial motion control systems, as well as in main powered home appliances. Simple and rugged design, low-cost, low maintenance and direct connection to an AC power source are the main advantages of AC induction motors.

Various types of AC induction motors are available in the market. Different motors are suitable for different applications. Although AC induction motors are easier to design than DC motors, the speed and the torque control in various types of AC induction motors require a greater understanding of the design of these motors.

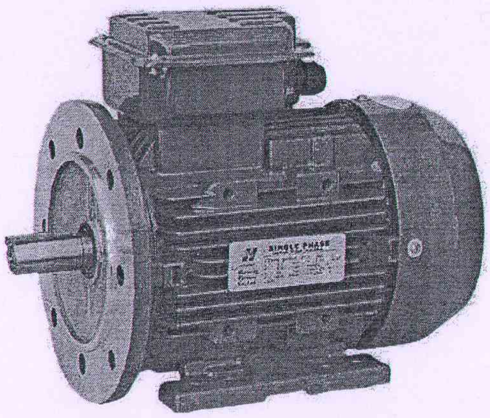

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Fig.4.2 Single phase induction motor

SYNCHRONOUS MOTOR

THREE-PHASE AC INDUCTION MOTOR

Three-phase AC induction motors are widely used in industrial and commercial applications. They are classified either as squirrel cage or wound-rotor motors.

These motors are self-starting and use no capacitor, start winding, centrifugal switch or other starting device. They produce medium to high degrees of starting torque. The power capabilities and efficiency in these motors range from medium to high compared to their single-phase counterparts. Popular applications include grinders, lathes, drill presses, pumps, compressors, conveyors, also printing equipment, farm equipment, electronic cooling and other mechanical duty applications.

GEAR

A gear or cogwheel is a rotating machine part having cut teeth, or cogs, which mesh with another toothed part to transmit torque. Geared devices can change the speed, torque, and direction of a source. Gears almost always produce a change in torque, creating a Mechanical advantage through their gear ratio and thus may be considered a simple machine. The teeth on the two meshing gears all have the same shape. Two or more meshing gears, working in a sequence, are called a Gear train or a transmission. A gear can mesh with a linear toothed part, called a rack, thereby producing translation instead of rotation.

APPLICATION

SPUR GEAR

- Metal cutting machines
- Power plants
- Marine engines
- Mechanical clocks and watches

- Fuel pumps
- Washing Machines
- Gear motors and gear pumps

HELICAL GEAR

- Helical gears are used in fertilizer industries, Printing industries and earth moving industries
- Helical gears are also used in steel, Rolling mills, section rolling mills, power and port industries.

BEVEL GEAR

- Drive to bobbin rail on roving machine
- Drive between the doffer and feed roller on low speed carding machines.
- Drive from calendar roller to coiler rollers, top coiler to bottom coiler plates in card, comber and drawing machine.

WORM GEAR

- Gate control mechanisms
- Hoisting machines
- Automobile steering mechanisms
- Lifts
- Conveyors

WELDING

Welding is a fabrication or sculptural process that joins materials, usually metals or thermoplastics, by causing fusion, which is distinct from lower temperature metal-joining techniques such as brazing and soldering, which do not melt the base metal. In addition to melting the base metal, a filler material is typically added to the joint to form a pool of molten material (the weld pool) that cools to form a joint that is usually stronger than the base material.

ARC WELDING

It's generally known as stick or arc welding. Arc welding is the most basic of all welding types, is easy to master in a home welding situation.

Stick welding can be used for manufacturing, construction and repairs, very much well suited for heavy metal size 4 millimeters upwards. Thinner sheet metals and alloys are usually more suited to the MIG welding types.

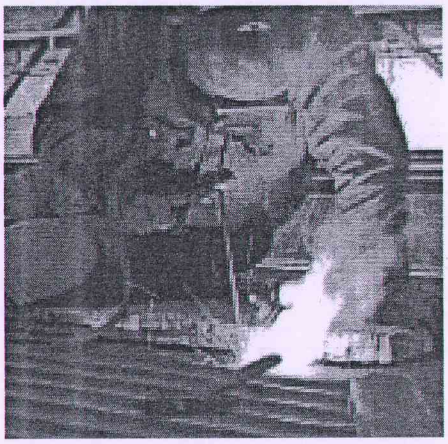


Fig. 6.3 Arc Welding

MACHINING PROCESS

DRILLING

Drilling is a cutting process that uses a drill bit to cut a hole of circular cross-section in solid materials. The drill bit is usually a rotary cutting tool, often multipoint. The bit is pressed against the work piece and rotated at rates from hundreds to thousands of revolutions per minute. This forces the cutting edge against the work piece, cutting off chips from the hole as it is drilled.

TYPES OF DRILLING

SPOT DRILLING

The purpose of spot drilling is to drill a hole that will act as a guide for drilling the final hole. The hole is only drilled part way into the work piece because it is only used to guide the beginning of the next drilling process.

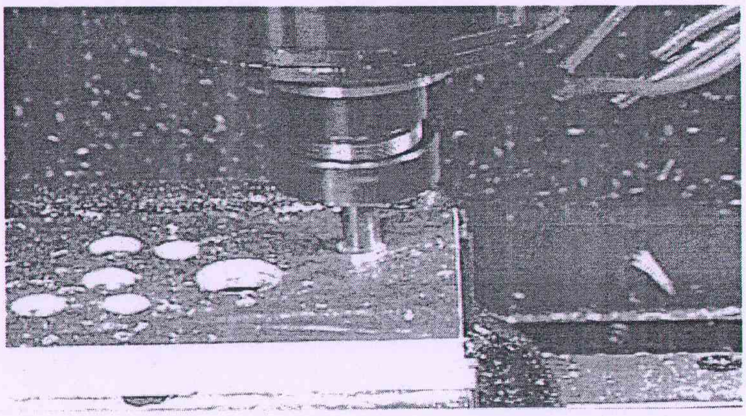


Fig.7.1 Spot Drilling

CENTER DRILLING

Center drill is a two-fluted tool consisting of a twist drill with a 60° countersink; used to drill countersink center holes in a work piece to be mounted between centers for turning or grinding.

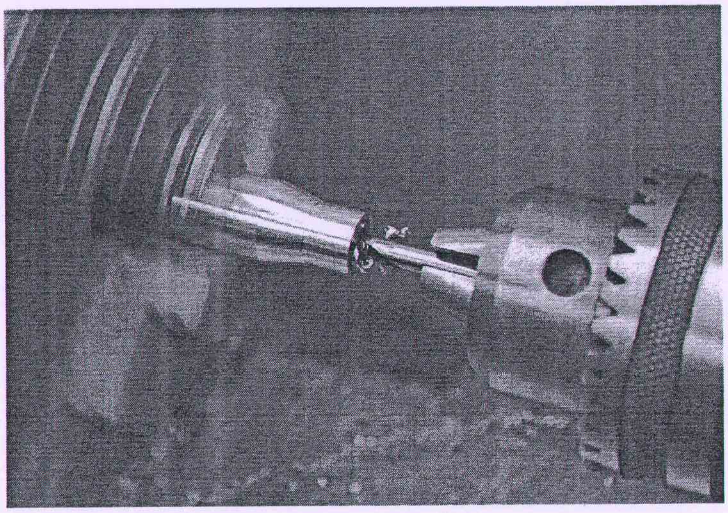


Fig. 7.2 Center Drill

DEEP HOLE DRILLING

Deep hole drilling is defined as a hole depth greater than ten times the diameter of the hole.These types of holes require special equipment to maintain the straightness and tolerances. Other considerations are roundness and surface finish.

GRINDING

Grinding is an abrasive machining process that uses a grinding wheel as the cutting tool.

A wide variety of machines are used for grinding:

- Hand-cranked knife-sharpening stones (grindstones)
- Handheld power tools such as angle grinders and die grinders
- Various kinds of expensive industrial machine tools called grinding machines

SURFACE GRINDING

The surface grinder is composed of an abrasive wheel, a work holding device known as a chuck, either electromagnetic or vacuum, and a reciprocating table.

CYLINDERICAL GRINDING

Cylindrical grinding (also called center-type grinding) is used to grind the cylindrical surfaces and shoulders of the work piece. The work piece is mounted on centers and rotated by a device known as a drive dog or center driver.

CENTERLESS GRINDING

When the work piece is supported by a blade instead of by centers or chucks. Two wheels are used. The larger one is used to grind the surface of the work piece and the smaller wheel is used to regulate the axial movement of the work piece. Types of center less grinding include through-feed grinding, in-feed/plunge grinding, and internal center less grinding.

WORKING

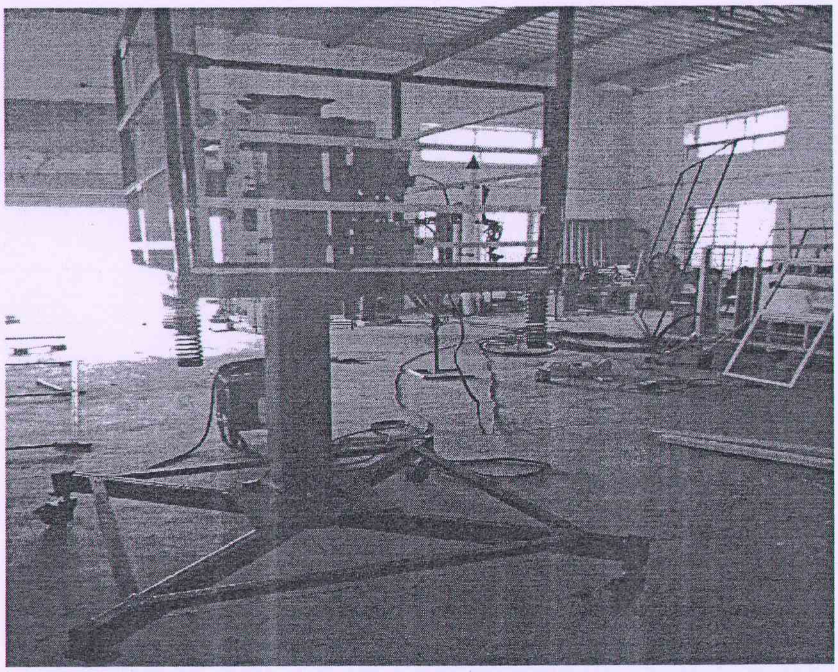
We have designed 5 different vertical columns each one is having 5 feet height. In assembly the 4 feet rack fixed in each column. This column is having two smooth ends to assemble one over another while we moving upward direction.

In our project 6 feet height column is fixed vertically with the help of welding. The weight lifting and operator platform is fixed in this portion itself.

If we need to go more than 6 feet height, we can assemble extra column as we required. This additional column is kept ion the weight lifting platform itself.

Entire platform is moving with the help of worm gear box and rack and pinion setup which is fitted in the platform.

The three phase AC motor is fixed in the platform to supply mechanical motion to worm gear box.In this gear setup we have assembly extra gear with chain sprockets and breaking system for improving the operator safety during operation.



CONCLUSION

We have designed and fabricated the power operated lift and we have checked that functional activities. All the operation as we checked was good.

In the future we have planned to reduce the overall weight of the lift about 100 kg by using aluminum material and planned to implement the extra safety device to improve the safety of the operator.

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Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai
Vadapudupatti, Annanji (po), Theni - 625 531,
Tamilnadu, India.

UTILISATION CERTIFICATE

1.	Title of the Project	: Electric Powered Lift for Construction
2.	Name of the Institution	: Nadar Saraswathi College of Engineering and Technology, Theni
3.	Name of the Principal Investigator	: Mr. B. Radhakrishnan, AP/Mech, Mr. V. Sivaganesan, AP/Mech

It is confirmed that a total of ₹ 5,50,000 in grants-in-aid was approved in the year 2019-2020 for Nadar Saraswathi College of Engineering and Technology for consultancy projects on 28/11/2019. An amount of ₹5,50,000 has been allocated for the development of an Electric Powered Lift for Construction, specifically for the aim of validating the results. I confirm that the full grant amount has been used prudently and solely for the purpose outlined in the study proposal.

30/05/20

PRINCIPAL INVESTIGATOR

30/05/20

PRINCIPAL

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Registered Structural Engineer - Grade I
SE/Gr I/MR/July2019/019,SE 008/2019

Date: 01/06/2020

To

The Principal,

Nadar Saraswathi College of Engineering and Technology,

Annanji (P.O),Vadapudupatti,Theni-625531.

Dear Sir,

Subject***: Electric Powered Lift for Construction***– reg.

Ref: *Utilization certificate dated on 30/05/2020.*

We thus recognize receipt of the project research team's report, led by Assistant Professor B. Radha Krishnan of the Department of Mechanical Engineering. This report has been reviewed by our expert team, and we are pleased to inform you that the project report results submitted are suitable for our production requirements, and we appreciate your cooperation on this understanding.

We hope to be able to participate in another research project in the future, and we are grateful to Nadar Saraswathi College of Engineering and Technology for the successful conclusion of the research project.

Thank you

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