PROJECT REPORT

on

DESIGN AND FABRICATION OF PROTOTYPE OF AUTOMATIC THREE WAY PNEUMATIC DUMPER MECHANISM

Submitted By

AJINKYA RANGARI

ROSHAN MOHURLE

LOKESH KAWADKAR

RUSHABH GANVIR

NOMESH CHAKOLE.

SWASTIK HANOTE.

PALASH DONGARWAR

for the Degree of Bachelor of Engineering

Guide

Prof. S.G.BAWANE
(ASST.PROFESSOR)

DEPARTMENT OF MECHANICAL ENGINEERING

K. D. K. COLLEGE OF ENGINEERING, NAGPUR

2021-2022

DECLARATION

The project titled **DESIGN AND FABRICATION OF PROTOTYPE OF AUTOMATIC THREE WAY PNEUMATIC DUMPER MECHANISM** is our own work carried out under the guidance of **Prof. S.G.Bawane ,**Department of Mechanical Engineering at K.D.K.C.E,Nagpur. As far as our knowledge, this work in the same form or any other form is not Submitted by us or anyone else for award or any degree.

PROJECTEES
Ajinkya Rangari
Nomesh Chakole
Roshan Mohurle
Swastik Hanote
Lokesh Kawadkar
Palash Dongarwar
Rushabh Ganvir

ACKNOWLEDGEMENT

With profound feeling of immense gratitude and affection, we would like to thank our guide **Prof. S.G.Bawane** Department of Mechanical Engineering for his continuous support, motivation, enthusiasm and guidance. His encouragement, supervision with constructive criticism and confidence enabled us to complete this project.We also wish to extend our reverences to

Dr. C. C. Handa, Head of Mechanical Engineering for providing necessary facilities to complete our project.We express our admirations for **Dr. A. M. Badar**, Vice Principal, for his valuable advice and support throughout this venture.We also put forth our deepest sense of gratitude towards **Dr. D. P. Singh**, Principal for constant motivation and providing necessary infrastructure. Finally, a special thank to Class In-charges and all the faculty members of the department for their cooperation throughout the project work.

Projectee

Ajinkya Rangari

Nomesh Chakole

Swastik Hanote

Roshan Mohurle

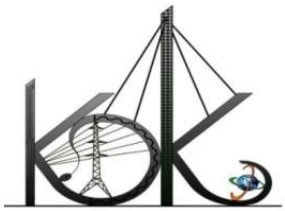
Lokesh Kawadkar

Palash Dongarwar

Rushabh Ganvir

K. D. K. COLLEGE OF ENGINEERING, NAGPUR
DEPARTMENT OF MECHANICAL ENGINEERING

Rashtrasant Tukadoji Maharaj Nagpur University
(2021-2022)



CERTIFICATE

Certified the project work entitled **"DESIGN AND FABRICATION OF PROTOTYPE OF AUTOMATIC THREE WAY PNEUMATIC DUMPER MECHANISM"** is submitted by **Ajinkya Rangari, Nomesh Chakole, Lokesh Kawadkar, Roshan Mohurle, Swastik Hanote, Palash Dongarwar, Rushabh Ganvir** students of VIIIth Semester B.E. Mechanical Engineering is Bonafide work done under my supervision is recognition to the partial fullfillment of the requirement for the award for the degree of **Bachelor of Engineering in Mechanical Engineering** under the Faculty of Science and Technology, **Rashtrasatnt Tukdoji Maharaj Nagpur University, Nagpur** during the academic year **2021-2022.**

Prof. S.G.BAWANE
(Assistant Professor)

Dr. Chandrahas C. Handa
(Professor & Head)
ME Department

Dr. Devendra P. Singh
(Principal)
KDKCE, Nagpur

SESSION 2021-22

.

ABSTRACT

There can be seen a rapid growth in the development of infrastructure nowadays, but still the conventional dumpers are used to dump the materials like sand, gravel, grid etc. On construction sites, in conventional, dumper, hydraulic system is used to push the dumper and the material only in rear side of the vehicle.

As per our survey, many people found it inconvenient regarding the unloading of vehicle. In everyday life conventional dumper is not suitable to dump the material in compact spaces. Also vehicle is unable to get sufficient turning radius at small streets. The process of unloading the dumpers become more critical, obstructing and time consuming.

To deal with the problem of turning vehicle and also unloading of a vehicle, a mechanism could be used which will manage to dump the material in three different directions. In this project we are introducing a system that will make the unloading very convenient, smooth and easy to operate. This project will be basically focused on dumping of materials in three different directions which will be operated by pneumatic system. The compressed air from the compressor is used to actuate the cylinder and the forward and return stroke is controlled by pneumaticdirection control valve.

INDEX

CHAPTER 1
INTRODUCTION

CHAPTER 1
INTODUCTION

1.1 OVERVIEW:

A dumper is a vehicle designed for carrying bulk material, often on building sites. Dumpers are distinguished from dump trucks by configuration: a dumper is usually an open 4-wheeled vehicle with the load skip in front of the driver, while a dump truck has its cab in front of the load. The skip can tip to dump the load; this is where the name "dumper" comes from. They are normally diesel powered. A towing eye is fitted for secondary use as a site tractor. Dumpers with rubber tracks are used in special circumstances and are popular in some countries.

Early dumpers had a payload of about a ton and were 2-wheel drive, driving on the front axle and steered at the back wheels. The single cylinder diesel engine (sometimes made by Lister) was started by hand cranking. The steering wheel turned the back wheels, not front. Having neither electrics nor hydraulics there was not much to go wrong. The skip was secured by a catch by the driver's feet. When the catch is released, the skip tips under the weight of its contents at pivot points below, and after being emptied is raised by hand.

Modern dumpers have payloads of up to 10 tones (11 short tons; 9.8 long tons) and usually steer by articulating at the middle of the chassis (pivot steering). They have multi-cylinder diesel engines, some turbocharged, electric start and hydraulics for tipping and steering are more expensive to make and operate. An A-frame known as a ROPS (Roll-Over Protection) frame may be fitted over the seat to protect the driver if the dumper rolls over. Some dumpers have FOPS (Falling Object Protection) as well. Lifting skips are available for discharging above ground level. In the 1990s dumpers with swivel skips, which could be rotated to tip sideways, became popular, especially for working in narrow sites such as road works. Dumpers are the most common cause of accidents involving construction plant. A dumper is an integral part of any construction work and hence its role is important for completion of any constructional site. One of the problem are cited with dumper in the time and energy for setting the huge dumper in the proper direction to dump the material it in carrying and hence the need of the project work riser which is about 3 way dropping dumper which can dump the material in any direction except the rental one without moving the truck in any direction.

1.2 AIM / OBJECTIVE:

Our aim is to design and develop this project in such a way that, the dumper is able to dump the material in all three possible direction in a very less time & available space in a convenient way with a minimum cost and maximum output.

- To achieve high safety
- To reduce man power
- To increase the efficiency of the vehicle
- To reduce the work load
- To reduce the fatigue of workers
- To get maximum output with minimum cost
- Low maintenance cost

1.3 THESIS STRUCTURE:

The Thesis structure consist of ten Chapters & References. The various description related to the individual chapters and a brief information about it have been included in the structure. The thesis structure contains the following chapters.

CHAPTER 2
LITERATURE REVIEW

CHAPTER 2
LITERATURE REVIEW

2.1 BACKGROUND STUDY:

The very first version of a dump truck used to haul and dump material was nothing more than a simple dump body style cart drawn by horses. It would have consisted of a two-wheeled cart hinged to the axle with the center of gravity, when loaded, just behind the axle. The loaded front body was hooked, and when unlatched, would dump. These carts were used in open mines and pulled by horses along a railway track. After 1900, a four-wheeled horse-drawn flatbed wagon with a rectangular body lifted with a hand hoist in the front was employed. In the book, 500 Years of Earthmoving, Heinz- Herbert Cohrs cites that before the first dump trucks appeared, excavated materials were being removed and hauled by locomotives and trolleys known as box tip wagons, dump bodies, and scoop tippers.

1. **Truck Mounted Dump Bodies:** The earliest versions of truck mounted dump bodies relied on the principle of gravity for dumping. The dump body pivoted off centre and, when level, would be locked in place. Releasing the lock would activate the body to dump to the rear. The dump body, when empty, remained locked in a non-dumping position. When loaded, the dump body's center of gravity would shift, activating it to dump. Some of the first trucks with dump bodies designed on this principle appeared as early as 1904 when the Mann gravity dump was built in England.

2. **Hydraulic Dump Bodies**: Hydraulics were being incorporated into truck mounted dump bodies relatively early on. Records show that one of the first hydraulic dump bodies was the Robertson Steam Wagon with a hydraulic hoist that received power from the trucks engine or an independent steam engine. Alley & Mc-Lellan of Glasgow developed another early hydraulic dump body in 1907 that was power-driven by steam. The dump body was elevated with struts and beams located on the underside in a scissor like pattern. Pulling the beams close together automatically elevated the dump body. Elevating the dump body allowed the free flow of material by gravity along chutes and for some distance from the truck. Four screws in each corner that were powered by the trucks power take-off could also elevate the dump body. Gravity pitch would be designed into the body so that coal would feed out from the hopper into the chute. A gate at the bottom of the chute controlled the outpouring of coal.

3. **Crawler Tractor-Trailer**: In the middle of the 1920s, crawler tractors pulling heavy dump trailers mounted on wheels or tracks were becoming increasingly popular. Sometimes crawlers would pull two to five attached trailers. Companies began developing wagons specifically designed for attachment to crawler tractors. The first versions were mounted on tracks; however, when speed restrictions posed a problem, the wagons were mounted on wheels to improve speed. Manufacturers of such trailers and haulers included Euclid, James Hagy, LaPlant-Choate, Rex-Watson, and Streich and Western.

4. **Euclid Dump Trucks:** Euclid was a pioneer in the development of dump trucks. George Armington Jr., son of founder George Armington, was a hydraulics designer and made two significant contributions to the world of dump trucks. These included the modern heavy duty off-highway truck and the wheel tractor bottom dump wagon. In 1934 the company introduced its 10/11-ton

dump truck called the "Trak Truck." It was the first rear-dump truck that was designed for heavy-duty off road service. This was followed up in 1936 with the company's 15-ton Model IFD truck that featured a diesel engine, modern drive line, planetary final drives, leaf-spring suspension, and pneumatic tires. The truck replaced heavy, gasoline powered chain drive Mack trucks that had previously been used for standard work in construction and mining operations. Another prominent development was the launch of Euclid's wheel tractor bottom dump wagon combination. The wheel tractor bottom dump had haul road speeds of 30 miles per hour (48 km) and extended haul distances beyond what was ever considered economically feasible. Along, with LeTourneau_s Tourna pull, the Euclid bottom dump was a major advancement in earthmoving.

5. **Dump Trucks in the 1950s**: By the 1940s the technological development of dump trucks had reached its peak. In the U.S., bottom dump trucks were already dominating earthmoving sites by the 1950s. As the industry moved away from a reliance on rail operations to haul material, the need for domestically produced construction site tippers began to emerge. One of the heavy-duty dump trucks manufactured during this time was by Faun.Was powered with a 180 horsepower engine. The dump trucks were considered ―off-highway‖ dump trucks because of their width and axle weights.

6. **Saint John First:** The dump truck was first conceived in Saint John, New Brunswick when Robert T. Machinery attached a dump box to a flatbed truck in 1920. The lifting device was a winch attached to a cable that fed over sheave (pulley) mounted on a mast behind the cab. The cable was connected to the lower front end of the wooden dump box which was attached by a pivot at the back of the truck frame. The operator turned a crank to raise and lower the box. Today, virtually all dump trucks operate by hydraulics and they come in a variety of configurations each designed to accomplish a specific task in the construction material supply chain. This invention was instrumental in the development of our present trucking industry. To create this first dump truck, a mast was mounted between the cab of the vehicle and the dump box. A cable was threaded over a sheave at the top of the mast and was connected to a winch at the base of the mast and to the lower front end of the dump box. The dump box was pivoted at the rear end of the truck frame. A simple crank handle was used to operate the winch, which raised the front end of the dump box, dumped the load and then lowered the box. A hydraulic system has since replaced the crank handle, but the basic, concept has remained unchanged.

2.2 LITERATURE REVIEW:

2.2.1 "Design and Development of 3-way Dropping Dumper"

International Journal of Emerging Technology and Advanced Engineering ,ISSN 2250-2459,
ISO 9001:2008 Certified Journal, Volume 4, Issue 9, September 2014
Ganesh Shinde , Prachi Tawele , Laukik Raut

Studied the "Design and Development of 3-way Dropping Dumper" which has been conceived by observing the difficulty in unloading the materials mainly at construction sites. Survey for this paper revealed the fact that most of the construction sites and garages use difficult method to unload the material, so by focusing mainly on the above difficulty they have designed a prototype of suitable arrangement to dump the material in three different direction by using hydraulic power. This concept saves time and effort to dump the materials. Further modification will make it more efficient to use.

2.2.2 "Design and Fabrication of Three Way Tipper Mechanism"

INTERNATIONAL JOURNAL OF RESEARCH IN ADVENT TECHNOLOGY, 2(4), 2014, 2321-9637.

Amboji Sudhakar R, Humane Yogesh A,Chavan Rohan R,Patil Jyotsna C, and Kshirsagar Prashant R.

Studied that Tipper has lots of applications in today's world. In industrial and domestic considerations, tippers can haul a variety of products including gravel, potatoes, grain, sand, compost, heavy rocks, etc. By considering wide scope of the topic, it is necessary to do study and research on the topic of tipper mechanism in order to make it more economical and efficient. In existing system, tipper can unload only in one side by using hydraulic jack or conveyor mechanism. By this research it is easy for the driver to unload the trailer and also it reduces time and fuel consumption. For making tipper mechanism with such above conditions both mechanisms namely hydraulic jack and conveyor mechanism can be used. But eventually it comes with question that how both systems can arrange in single set up? Answer to this question is nothing but this research work.

2.2.3 "Three Directional Dumping System for trolley/dumper"

IOSR JOURNAL OF COMPUTER ENGINEERING. (IOSR-JCE) E-ISSN: 2278-0661, P-ISSN: 2278-8727 PP 69-71.

Waghmare S. N.,Kamble N. J., Dhamankar A. S., ShindeA. A.,Vishwasrao A. D.,

Suggested that the trolley's sideways movements would be very useful in applications where there is space constraint. by using this mechanism, blocking of the road is prevented and it also results in time saving and increased productivity. Three way dumping trolley is very useful for farmers, site garbage collectors as well for sand, dumping gravels, etc. It does the work in less time as compared to traditional dumpers.

2.2.4 "Modification And Fabrication Of Three Axis Modern Trailer"

INDUSTRIAL APPLICATION. INTERNATIONAL RESEARCH JOURNAL OF ENGINEERING & TECHNOLOGY. (IRJET). E-ISSN: 2395 -0056, VOLUME:4 ISSUE:5, 2017

Bhoite Swapnil E., Bhosale Kunal N., Jadhav Rahul B., Gadge Ashutosh S.

Has come up with the concept of tipper trolley and it is partitioned in two parts, namely Rotation and Dumping. Worm and gear mechanism is used for rotation of tipper. Worm is coupled at horizontal position with the electric motor. Electric motor is powered by using Double Pole Double Throw switch to complete the circuit of battery and motor. Spur gear is having 40 teeth on its profile. When 10 teeth of spur gear are moved forward then trolley gets rotated by 90̊ from its initial position in 20 second. When the trolley completes its required angle then material is dumped with the help of pneumatic cylinder.

2.2.5 "Three Axis Pneumatic Modern Trailer By Using Single Cylinder"

INTERNATIONAL JOURNAL OF RECENT RESEARCH IN CIVIL AND MECHANICAL ENGINEERING (IJRRCME), VOL. 2, ISSUE 2, MARCH 2016, ISSN 2393-8471.

Deshmukh S.A., LonkarPradip P, Bhong Tushar H, Kale Dadaso

Studied the ''Three Axis Pneumatic Modern Trailer" which has been conceived having studied the difficulty in unloading the materials from the trailer. It is difficult to dump the material in all the directions and also dumping cannot be small compact streets. In this project the above problems are rectified to unload the material in all three directions without any impact force. Further this can be modified and developed based on the required application.

2.2.6 "Design and Fabrication of Unidirectional Dumper"

INTERNATIONAL JOURNAL FOR SCIENTIFIC RESEARCH & DEVELOPMENT, Vol. 3, Issue 02, 2015,

ISSN (online): 2321-0613

Tupkar R. S., Aditya R. Malewar, Rohit A. Ramteke, Harshal S. Lakhade, Shubham R. Navghare,

Used a system consisting of electric motor, worm & worm gear mechanism to rotate the dumper horizontally in required direction. They used two chassis frames where the first frame is attached to the worm and worm gear that rotates the trolley horizontally and the second chassis frame is hinged to the pneumatic cylinder which provides the vertical movement.

2.2.7 "Development of Three Axes Lifting Modern Trailer"

INTERNATIONAL JOURNAL OF EMERGING TECHNOLOGYAND INNOVATIVE ENGINEERING, Vol. I, Issue 5, MAY 2015 (ISSN: 2394 – 6598).

Prasath N.E., Shanmugam S., Mathalai Sundaram C., Vembathu Rajesh A.

Used hydraulic jack mechanism to unload the trailer in the three axes without applying any impact force. They used control valves to activate the ram of the cylinder and by a suitable arrangement of knee joint in the trailer and universal joint in the hydraulic cylinder they could dispatch the load in the trailer in the three axes. The design of this research makes it easier for the driver to unload the trailer and helps in reducing time and fuel consumption

2.2.8 "Design and Fabrication of Three Way Trolley Mechanism"

INTERNATIONAL JOURNAL OF INNOVATIONS IN ENGINEERING AND TECHNOLOGY (IJIET), Vol. 5 Issue 3, JUNE 2015, ISSN: 2319 – 1058.

Pachpore A. , Gharote A. , Paulzagade V.

Designed and fabricated a trolley mechanism in which they used a hydraulic jack to lift the trolley for unloading. They used a system of ball and socket joint for lifting the trailer in the required direction. For unloading the goods on a particular side the pins of the other two sides are removed and the hinge of that side is fixed with pin.

2.2.9 "Modelling and Analysis of container chassis using FEM"

International Organization of Scientific Research IOSR JOURNAL OF ENGINEERING, Vol. 04, Issue 01 JANUARY 2014.

Reddy C M.M., Reddy M.L.K.

Designed a container chassis and analysed bending stress and deflection to improve its load carrying capacity. To reduce the failure of chassis by bending they added stiffeners between the cross members of the chassis by means of bolts.

2.2.10 "Design and Fabrication of Three Axis Modern Pneumatic Tipper"

INTERNATIONAL JOURNAL OF RESEARCH IN MECHANICAL ENGINEERING, Vol. 2, Issue 1, 2015, ISSN: 2349-3860.

Praveen A.K., Gowtham R R, Gruraam V, Prabhakaran G.

Designed and fabricated a tripper where they have placed a pneumatic cylinder longitudinally at one end of the truck and connected the piston end of the hydraulic cylinder by a pivot joint to the chassis of the trunk. in the foreword stroke the cylinder pushes the truck body upwards and thus the truck gets unloaded.

2.3 SUMMARY:

We have gone through the above literature reviews on three way pneumatic dumper mechanism. They have proposed many different ideas and procedures to design and develop three way dumper mechanism, here they are using many different methods to lift the dumper in all three direction to unload the material in very less time & space. From this literature reviews it is clear that the main aim is to reduce the efforts and cost while unloading the material with the help of dumper. Currently there are so many limitations while unloading a material either it may be the degree of freedom of dumper or it may be restriction of unloading sites. So this literature helped us to analyse and design the dumper for application in various fields.

CHAPTER 3

MATERIALS/TOOLS &METHODOLOGY

CHAPTER 3
MATERIALS & METHODOLOGY

3.1 MATERIALS

The selection of material is one of the most importance processes. It should be considering the application of product, efficiency, environment, and cost. So, we had been selected the materials most suspiciously. Fig 1 shows that the Iron carbon relation related with temperature it's one of the most considerable factors.

3.1.1 Mild steel

Mild steel iron containing a small percentage of carbon, strong and tough but not readily tempered, also known as plain-carbon steel and low-carbon steel, is now the most common form of steel because its price is relatively low while it provides material properties that are acceptable for many applications. Mild steel contains approximately 0.05–0.30% carbon making it malleable and ductile. Mild steel has a relatively low tensile strength, but it is cheap and easy to form; surface hardness can be increased through carburizing.

In applications where large cross-sections are used to minimize deflection, failure by yield is not a risk so low-carbon steels are the best choice. Low-carbon steels contain less carbon than other steels and are easier to cold-form, making them easier to handle. Typical applications of low carbon steel are car parts, pipes, construction, and food cans.

Mild steel has most strong material due to low carbon contained. It has more resistance capacity and strength. For that we can avoid the breakage. And, it's having high impact strength and tensile strength.

Physical Properties of Mild Steel

- High tensile strength.
- High impact strength.
- Good ductility and weldability.
- A magnetic metal due to its ferrite content.
- Good malleability with cold-forming possibilities.

3.1.2 Components

The components used to operate the dumper in successive way are as follows.

a. Pneumatic Cylinder
b. Direction Control Valve
c. Flow Control Valve
d. Air Compressor
e. Switch mode power supply
f. Centre lock actuator
g. Connecting hoses
h. Pneumatic Connector
i. Pneumatic Muffler
j. Toggle switch

3.1.2.a Pneumatic Cylinder

Normally pneumatic cylinder can be operated by compressor air. It's comes from the compressor. Cylinder used to convert the pressure energy to mechanical energy. That mechanical energy used to dumper operation.

Type of cylinder

- Double acting cylinder
- Telescoping cylinder

Double-acting Cylinders

Double-acting cylinders (DAC) use the force of air to move in both extend and retract strokes. They have two ports to allow air in, one for outstroke and one for instroke. Stroke length for this design is not limited, however, the piston rod is more vulnerable to buckling and bending. Additional calculations should be performed as well.

Fig 3.1.2.a:- Double Acting Cylinder

Telescoping Cylinder

Telescoping cylinders, also known as telescopic cylinder can be either single or double-acting. The telescoping cylinder incorporates a piston rod nested within a series of hollow stages of increasing diameter. Upon actuation, the piston rod and each succeeding stage "telescopes" out as a segmented piston. The main benefit of this design is the allowance for a notably longer stroke than would be achieved with a single-stage cylinder of the same collapsed (retracted) length. One cited drawback to telescoping cylinders is the increased potential for piston flexion due to the segmented piston design. Consequently, telescoping cylinders are primarily utilized in applications where the piston bears minimal side loading.

3.1.2.b Direction control valve

Directional control valves (DCVs) are one of the most fundamental parts of hydraulic and pneumatic systems. DCVs allow fluid flow (hydraulic oil, water or air) into different paths from one or more sources. DCVs will usually consist of a spool inside a cylinder which is mechanically or electrically actuated. The position of the spool restricts or permits flow, thus it controls the fluid flow.. It can be classified by the application such that 2/3, 3/2,4/3 etc.

Fig 3.1.2.b. Direction Control Valve

3.1.2.c Flow control valves

A flow control valve regulates the flow or pressure of a fluid. Control valves normally respond to signals generated by independent devices such as flow meter or temperature gauge.

Control valves are normally fitted with actuator and positioners. Pneumatically -actuated globe valve and diaphragm are widely used for control purposes in many industries, although quarter-turn types such as (modified) ball and butterfly valve are also used.

Control valves can also work with hydraulic actuators (also known as hydraulic pilots). These types of valves are also known as automatic control valves. The hydraulic actuators respond to changes of pressure or flow and will open/close the valve. Automatic control valves do not require an external power source, meaning that the fluid pressure is enough to open and close them.

Fig 3.1.2.c:-Flow control Valve

3.1.2.d Air Compressor

An air compressor is a pneumatic device that converts energy (using an electric motor, diesel or gasoline engines, etc.) into protentional energy stored in pressurized air (i.e., compressed air). By one of several methods, an air compressor forces more and more air into a storage tank, increasing the pressure. When the tank's pressure reaches its engineered upper limit, the air compressor shuts off. The compressed air, then, is held in the tank until called into use. The energy contained in the compressed air can be used for a variety of applications, utilizing the kinetic energy of the air as it is released and the tank depressurizes. When tank pressure reaches its lower limit, the air compressor turns on again and re-pressurizes the tank. An air Compressor must be differentiated from a pump because it works for any gas/air, while pumps work on a liquid.

Fig 3.1.2.d:- Compressor

3.1.2.e Switch mode power supply

A switched-mode power supply (switching-mode power supply, switch-mode power supply, switched power supply, SMPS, or switcher) is an electronic power supply that incorporates a switching regulator to convert electric power efficiently.

Fig.3.1.2.e:- Switch mode power supply

3.1.2.f Centre lock actuator

An actuator is a part of a device or machine that helps it to achieve physical movements by converting energy, often electrical, air, or hydraulic, into mechanical force. Simply put, it is the component in any machine that enables movement.

Fig.3.1.2.f. Centre lock actuator

3.1.2.g Connecting hose

The basic function of pneumatic tubing and hose is to convey pressurized air to actuators, valves, tools and other devices. Pneumatic hose generally consists of an inner tube, one or more layers of reinforcing braided or spiral-wound fibre, and an outer protective cover.

Fig 3.1.2.g Connecting Hose

3.1.2.h Pneumatic connector

Pneumatic fittings are parts used to connect sections of pipe, tube, and hose in pneumatic (pressurized gas) systems. Compared to hydraulic fittings, pneumatic fittings are typically characterized by tighter seals and lower pressure requirements.

Fig 3.1.2.h Pneumatic connectors

3.1.2.i Pneumatic Muffler

Pneumatic mufflers, also called silencers, safely and quietly vent pressurized air to atmosphere. They are commonly installed on air valves, cylinders, manifolds and fittings. These miniature pneumatic mufflers use porous sintered bronze mesh to reduce air exhaust noise.

Fig 3.1.2.i :- Pneumatic muffler

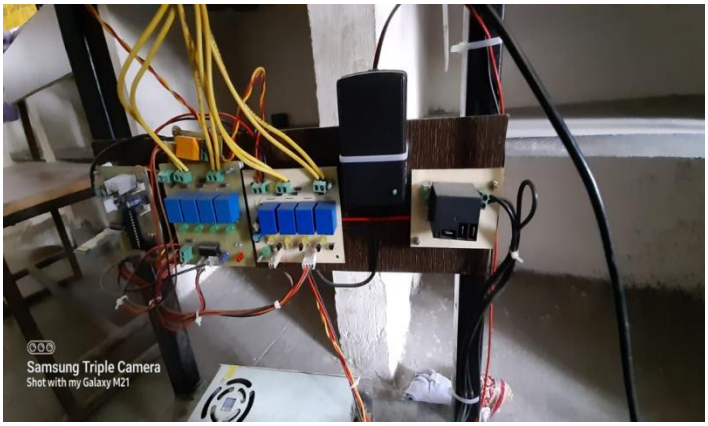
3.1.2.j Aurdino Crcuit

Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino boards are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, publishing something online.

, - Arduino is programmed with a c/c++ 'dialect'. Most c/c++ will work but much of the standard libraries will not work. Many of the restrictions is made because of the little available RAM on the Arduino hardware.

- With Arduino it is possible to automate anything to make autonomous agents (if you want we cancall them Robots). To control lights and devices, or anything else you can think of, you can go for an Arduino-based solution, especially in developments of devices connected to the Internet.

- Arduino is a technology that has a fast learning curve with basic knowledge of programming and electronics, which allows developing projects in the field of Smart Cities, the Internet of Things, wearable devices, health, leisure, education, robotics, etc …



3.1.2.j Aurdino Circuit

3.2 METHODOLOGY

Structural steel fabrication can be carried out in shop or at the construction site. Fabrication of steel work carried out in shops is precise and of assured quality, whereas field fabrication is comparatively of inferior in quality. In India construction site fabrication is most common even in large projects due to inexpensive field labour, high cost of transportation, difficulty in the transportation of large members, higher excise duty on products from shop. Beneficial taxation for site work is a major financial incentive for site fabrication. The methods followed in site fabrication are similar but the level of sophistication of equipment at site and environmental control would be usually less. The skill of personnel at site also tends to be inferior and hence the quality of finished product tends to be relatively inferior. However, shop fabrication is efficient in terms of cost, time and quality.

Sequence of Operation

a. Surface cleaning
b. Cutting and machining
c. Punching and Drilling
d. Rolling
e. Fitting and Reaming
f. Fastening (bolt tightening and welding)
g. Finishing
h. Quality control
i. Inspection

3.2.a Surface Cleaning

Structural sections from the rolling mills may require surface cleaning to remove mill scale prior to fabrication and painting. Hand preparation, such as wire brushing, does not normally conform to the requirements of modern paint or surface protection system. However, in some applications manual cleaning is used and depending on the quality of the cleaned surface they are categorised into Grade St-2 and Grade St-3.Blast cleaning is the accepted way of carrying out surface preparation in a well-run fabrication shop.

3.2.b Cutting and Machining

Following surface preparation, cutting to length is always the first process to be carried out, and this is done by any of the following methods: -

3.2.b.i Shearing and cropping

Sections can be cut to length or width by cropping or shearing using hydraulic shears. Heavy sections or long plates can be shaped and cut to length by specialist plate shears. For smaller plates and sections, machines featuring a range of shearing knives, which can accept the differing section shapes, are available.

3.2.b.ii Oxy acetylene gas cutting

Oxy-fuel cutting are processes that use fuel gases (or liquid fuels such as gasoline) and oxygen to weld or cut metals. Pure oxygen, instead of air, is used to increase the flame temperature to allow localized melting of the workpiece material (e.g. steel) in a room environment. A common propane/air flame burns at about 2,250 K (1,980 °C; 3,590 °F), a propane/oxygen flame burns at about 2,526 K (2,253 °C; 4,087 °F), an oxyhydrogen flame burns at 3,073 K (2,800 °C; 5,072 °F) and an acetylene/oxygen flame burns at about 3,773 K (3,500 °C; 6,332 °F).

3.2.c Punching and Drilling

Most fabrication shops have a range of machines, which can form holes for connections in structural steel work. The traditional drilling machine is the radial drill, a manually operated machine, which drills individual holes in structural steel work. But this method has become too slow for primary line production.

3.2.d. Rolling

In metalworking, rolling is a metal forming process in which metal stock is passed through one or more pairs of rolls to reduce the thickness, to make the thickness uniform, and/or to impart a desired mechanical property.. If the temperature of the metal is above its recrystallization temperature, then the process is known as hot rolling. If the temperature of the metal is below its recrystallization temperature, the process is known as cold rolling.

3.2.e. Fitting and Reaming

Before final assembly, the component parts of a member are fitted-up temporarily with rivets, bolts or small number of welds. The fitting-up operation includes attachment of previously omitted splice plates and other fittings and the correction of minor defects found by the inspector.

A reamer is a type of rotary cutting tool used in metalworking. Precision reamers are designed to enlarge the size of a previously formed hole by a small amount but with a high degree of accuracy to leave smooth sides. There are also non-precision reamers which are used for more basic enlargement of holes or for removing burns. The process of enlarging the hole is called reaming.

3.2.f. Fastening Methods

The strength of the entire structure depends upon the proper use of fastening methods. There are three methods of fastening namely bolt tightening and welding. A few decades back, it was a common practice to assemble components in the workshop using bolts or rivets. Nowadays welding is the most common method of shop fabrication of steel structures.

3.2.f.i Welding

Welding is used extensively for joining metals together and there is no doubt that it has been a most significant factor in the phenomenal growth of many industries. A welded joint is made by fusing (melting) the steel plates or sections along the line of joint. The metal melted from each member of the joint unites in a pool of molten metal, which bridges the interface. As the pool cools, molten metal at the fusion boundary solidifies, forming a solid bond with the parent metal. When solidification completes, there is a continuity of metal through the joint.

3.2.f.i. Electric Arc welding

Arc welding is a welding process that is used to join metal to metal by using electricity to create enough heat to melt metal, and the melted metals, when cool, result in a binding of the metals. It is a type of welding that uses a welding power supply to create an electric arc between a metal stick and the base material to melt the metals at the point of contact. Arc welders can use either direct (DC) or alternating (AC) current, and consumable or non-consumable electrodes.

3.2.g Finishing

Structural members whose ends must transmit loads by bearing against one another are usually finished to a smooth even surface. Finishing is performed by sawing, milling or other suitable means. Several types of sawing machines are available, which produce very satisfactory finished cuts. One type of milling machine employs a movable head fitted with one or more high-speed carbide tipped rotary cutters.

3.3 Working

Due to the fact that pneumatic circuit plays a essential role on this device, it is very vital to provide an explanation for the operating of this circuit. To begin with beginning with air compresses, its feature is to compress air from a low inlet strain (normally atmospheric) to a higher-pressure degree. This is an done with the aid of decreasing the quantity of the air. Air compressors are usually advantageous displacement gadgets and are both of the reciprocating piston type or the rotary screw or rotary vane sorts. The air compressor used here's a typically small sized, two-stage compressor unit. It also includes a compressed air tank, electric rotor and pulley drive, pressure controls and units for brief hook up and use.

The spool valve used here is 5 ports, 3 positions. There are exhaust ports, outlet ports and one inlet port. The 2 outlet ports are linked to an actuator (cylinder). The pneumatic turns on is a double performing, single rod cylinder. The cylinder output is coupled to in addition cause. The piston cease has an air horning effect to prevent sudden thrust at extreme ends.

-: AURDINO WORKING

-The Arduino is a board based on an ATMEL AVR microcontroller. Microcontrollers are integrated circuits where instructions can be recorded , which you write with the programming language that you can use in the Arduino IDE environment. These instructions allow you to create programs that interact with the circuitry on the board.

- The most used microcontrollers on Arduino platforms are the Atmega168, Atmega328, Atmega1280, ATmega8 for their simplicity, but it is being expanded to Atmel microcontrollers with 32-bit ARM architecture and also to Intel microcontrollers.]

- The Arduino microcontroller has communication ports and input / output ports. with which we can connect different types of peripherals on the board. The information of these peripherals that you connect will be transferred to the microcontroller, which will be in charge of processing the data that comes through them.

3.4 Pneumatic Circuit

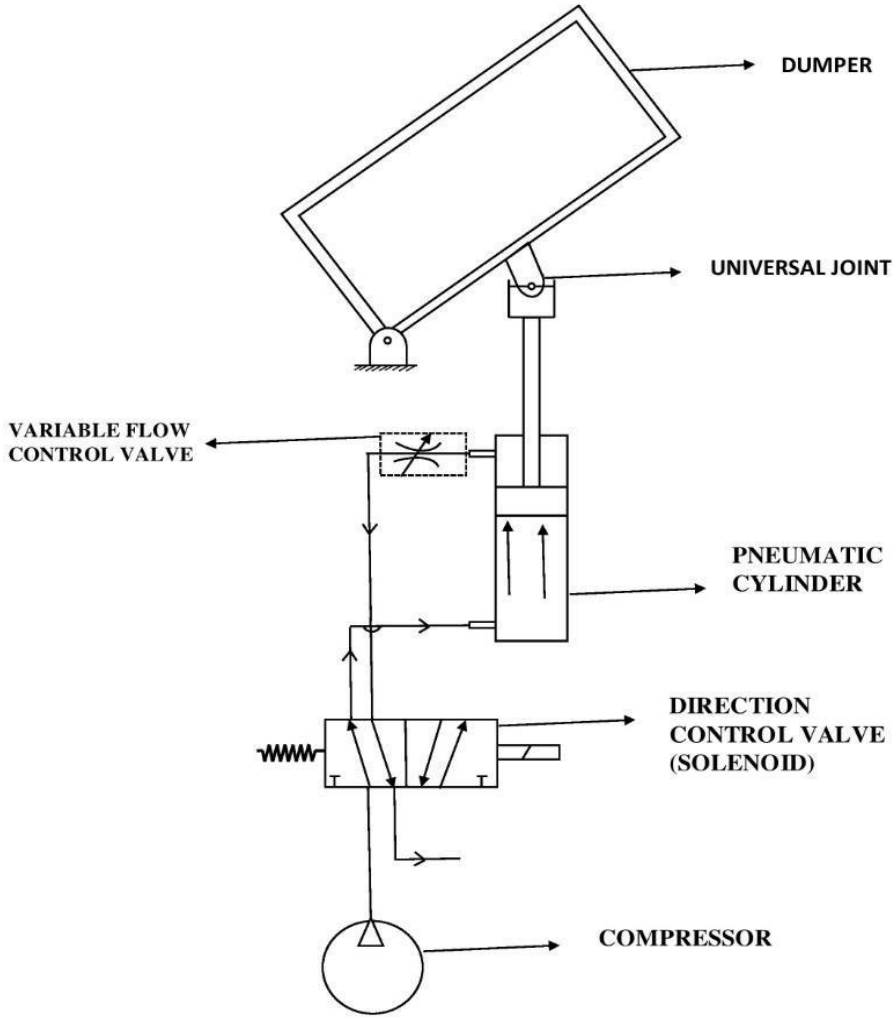


Fig 3.4(a) Forward Stroke

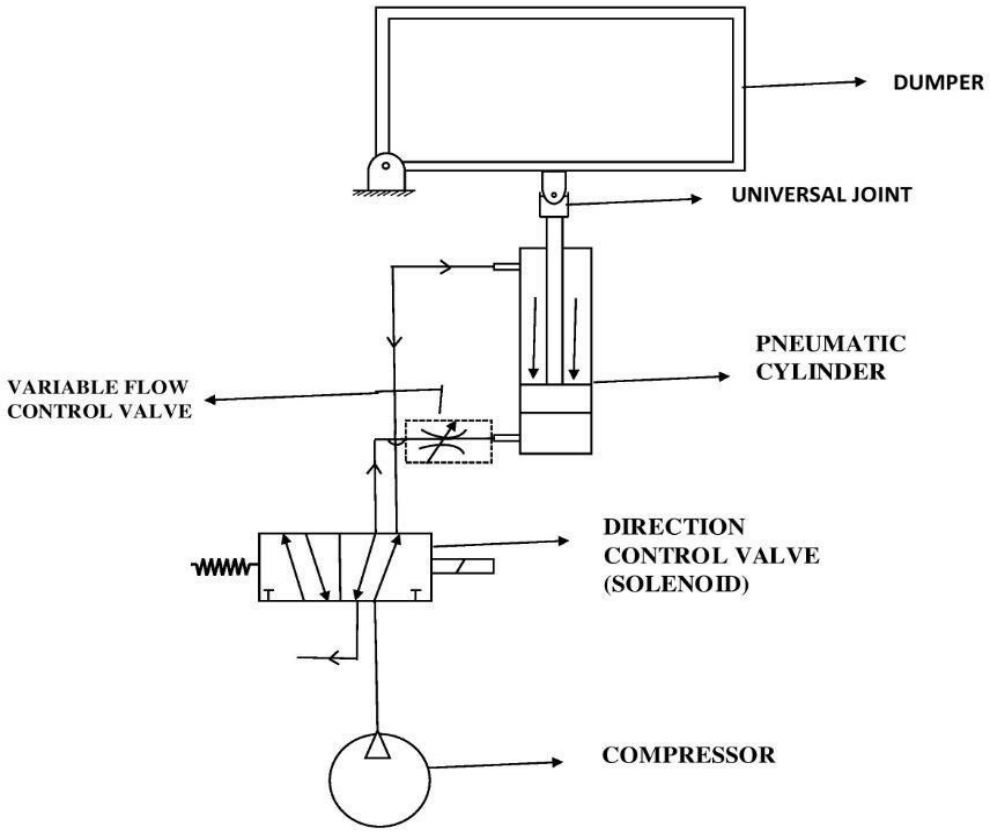
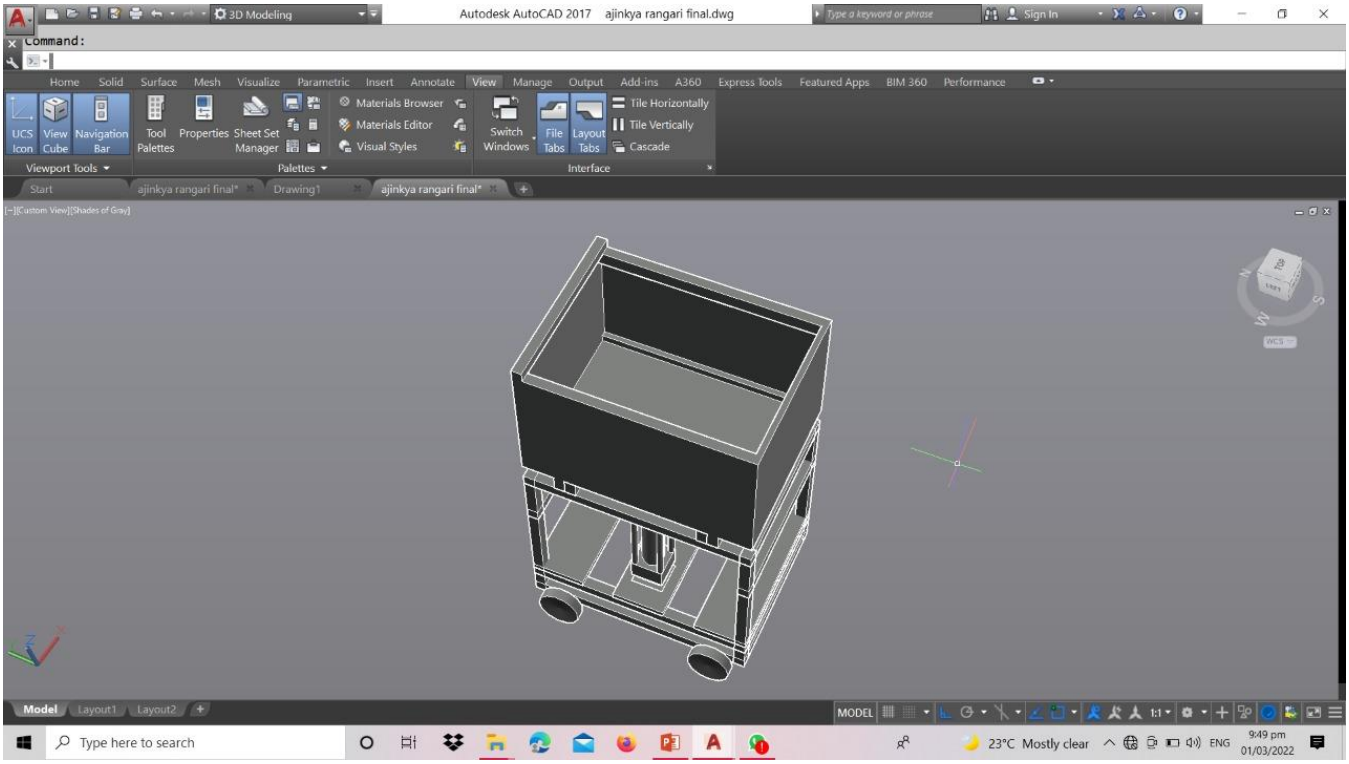
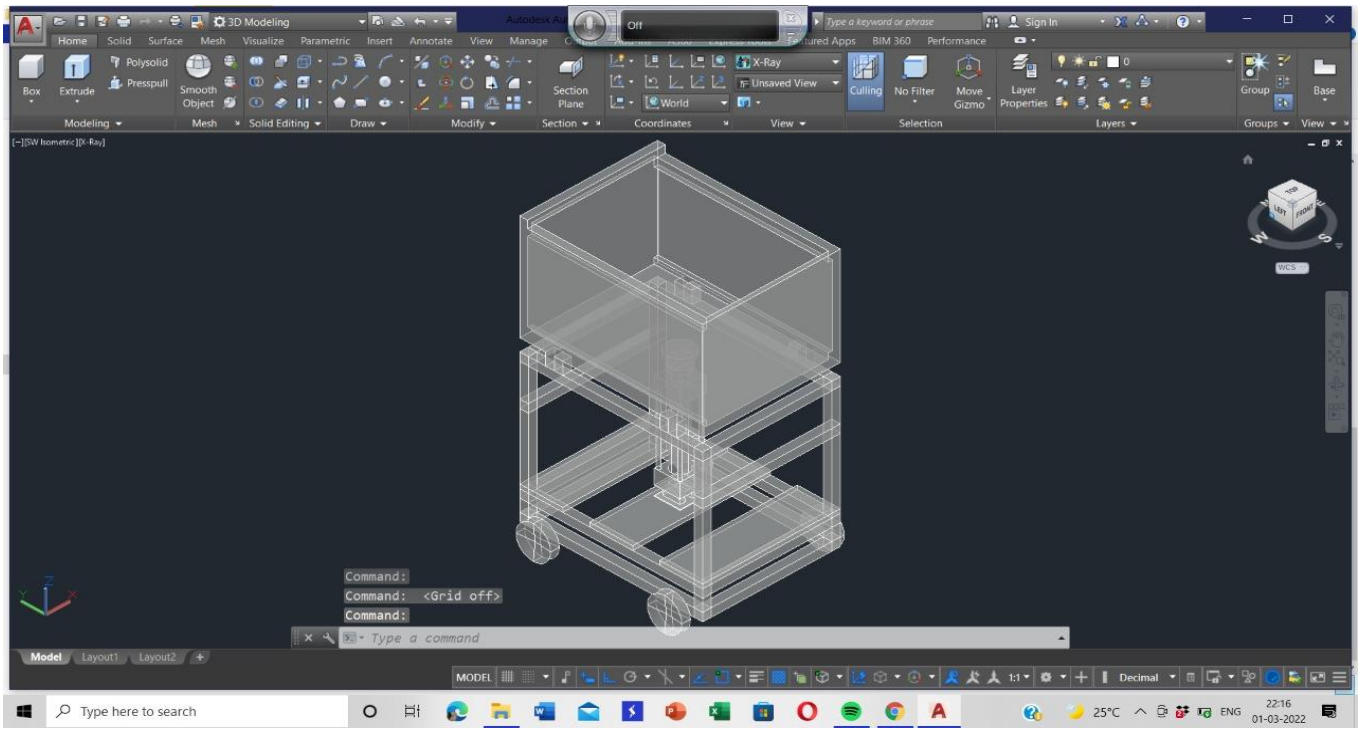


Fig 3.4(b) Return Stroke

3.5 Cad Model


Autodesk AutoCAD 2017 ajinkya rangari final.dwg
Command:
Home Solid Surface Mesh Visualize Parametric Insert Annotate View Manage Output Add-ins A360 Express Tools Featured Apps BIM 360 Performance
Materials Browser
Materials Editor
Visual Styles
Tile Horizontally
Tile Vertically
Cascade
Viewport Tools
Palettes
Interface
Start
ajinkya rangari final*
Drawing1
Model
Layout1
Layout2
Type here to search
23°C Mostly clear
ENG
9:49 pm
01/03/2022


3D Modeling
Home Solid Surface Mesh Visualize Parametric Insert Annotate View Manage Output Add-ins A360 Express Tools Featured Apps BIM 360 Performance
Box
Extrude
Polysolid
Presspull
Smooth Object
Section Plane
X-Ray
Unsaved View
World
Culling
No Filter
Move Gizmo
Layer Properties
Group
Base
Modeling
Mesh
Solid Editing
Draw
Modify
Section
Coordinates
View
Selection
Layers
Groups
Command:
Command: <Grid off>
Command:
Type a command
Model
Layout1
Layout2
Type here to search
25°C
ENG
22:16
01-03-2022

CHAPTER 4

CALCULATION

CHAPTER 4
CALCULATION

1. Dumper

Length = 24" = 0.6096 m

Width = 14" = 0.3556 m

Height = 11" = 0.2794 m

Volume = l × b × h

V = 0.6096 × 0.3556 × 0.2794

V = 0.0605 m^3

Sand to be filled inside the dumper of Density

δ = 1600 kg/m^3

Mass of sand to be carried

m = δ×V

m = 1600 × 0.0605

m = 96.8 kg ≅ 100 kg

Force = mass × acceleration

F = 100 × 9.81

F = 981 N

Pressure provided by the cylinder

P = 5 bar = 0.5 Mpa

2. Diameter of Cylinder (D)

A = Area of cylinder

$$A = \frac{F}{P}$$

$$\frac{\pi}{4} \times D^2 = \frac{981}{0.5}$$

***D* = 50 mm**

Minimum Rod Diameter ($d_{min.}$)

Assuming FOS = 4 (FOS = Factor of Safety)

Material of Rod = C 45 SAE 1045

Yield stress (σ_y) = 306 Mpa

Endurance limit for Bending

$\sigma_{B_{Max}}$ = 286 N/mm^2

Design stress (σ) = $\frac{\text{Yield stress}}{\text{FOS}}$

$$\sigma = \frac{\sigma_y}{FOS}$$

$$\sigma = \frac{306}{4}$$

σ = 76.4 N/mm^2

$$\frac{\pi}{4} \times d^2 = \frac{981}{76.4}$$

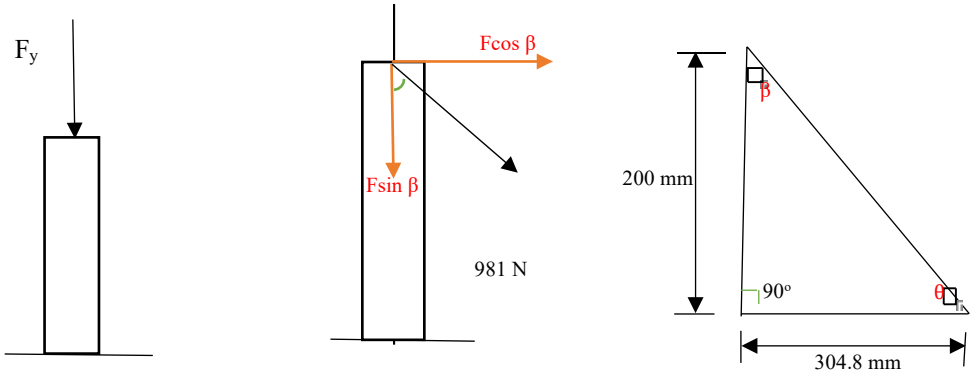
d = 4.04 mm

Available size of Pneumatic Cylinder

Bore Diameter (D) = 60 mm

Rod Diameter (d) = 20 mm

3. Bending stress in Rod



β = Angle between rod and dumper
θ = Angle between frame and dumper
Stroke = 200 mm

$\tan\theta = \frac{\text{opposite}}{\text{adjecent}}$

$\theta = \tan^{-1}(\frac{200}{304.8})$

$\theta = 33.27^{o}$

$\beta = 90 - 33.27$

$\beta = 56.73^{o}$

3.1 Axial stress (σ_a)

$\sigma_a = \frac{Fy}{A}$

Area of Rod

$A = \frac{\pi}{4} \times d^2$

$A = \frac{\pi}{4} \times 20^2$

$A = 314.15\ mm^2$

Axial Force acting on Rod (F_y)

$F_y = F\sin\beta$

$= 981 \times \sin(56.73)$

$F_y = 820.2\ N$

$\sigma_a = \frac{Fy}{A}$

$= \frac{820.2}{314.15}$

$\sigma_a = 2.62\ N/mm^2$

3.2 Bending stress (σ_b)

$\sigma_b = \frac{M}{z}$

σ_b =Bending Stress

M = Bending moment

Z = Polar moment of inertia

Bending moment (M)

M = Fcos β × perpendicular distance

M = 981 cos (56.73) × 200

M = 104188 Nmm

Polar moment of inertia (z)

$z = \frac{\pi}{32} \times D^3$

$z = \frac{\pi}{32} \times 20^3$

z = 785.39 mm3

Bending stress (σ_b)

$\sigma_b = \frac{M}{z}$

$= \frac{104188}{785.398}$

σ_b = 132.65 N/mm2

Total Bending Stress

$\sigma_B = \sigma_a + \sigma_b$

= 2.52 + 132.65

$\boldsymbol{\sigma_B}$ = 135.179 N/mm2

$\sigma_{B_{Max}}$ = 286 N/mm2

$\Rightarrow \quad \boldsymbol{\sigma_B} < \sigma_{\mathbf{B_{Max}}}$

Rod of diameter 20 mm, Force exerted 981 N will not fail under Bending.

Assumption

Factor of safety

(FOS)= 4

Calculated Parameters

Diameter of Cylinder

(D) = 49.17 mm

Diameter of Rod

(dmin) = 3.97 mm

Axial stress on road

(σ_a) = 2.52 N/mm 2

Bending stress

(σ_b) = 132.65 N/mm2

Total Bending stress

(σ_B) = 135.17 N/mm2

Angle of Lift

(θ) = 33.27 o

Selected parameters

Diameter of Cylinder

(D) = 60 mm

Diameter of Rod

(d)= 20 mm

Pressure inside the cylinder

(P) = 0.5 N/mm2

4. Power during extension

$(P_{in})_e$ = Input Power during extension
$(P_{out})_e$ = Output Power during extension
F_e = Force developed during extension
F_n= Packing Friction
Q_e= Flow rate during Extension
V_e= Velocity of piston during extension
F_{net}= Net force during extension

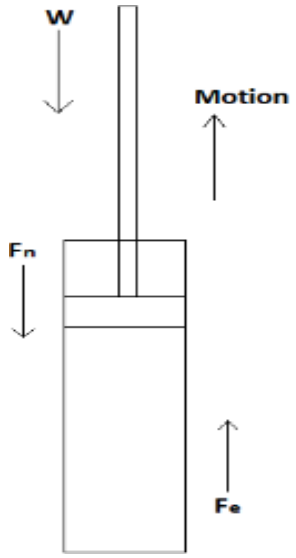


Fig 4.5.a Extension

Packing Fraction

$F_n = F_e - W$
$F_n = (Pe \times A) - W$
$P_e = 0.5$ Mpa
$A_e = \frac{\pi}{4} \times 60^2$
$= 2827.43\ mm^2$
$W = 981$ N
$F_n = (0.5 \times 2827.43) - 981$
F_n = 432.71 N

Flow rate (Qe)

$Q_e = 35$ lit/min
$=5.83\times10^{-4}\ m^3/s$
Velocity (V_e)

$$V_e = \frac{Qe}{A}$$

$$= \frac{0.000583}{0.000028274}$$

V_e = 0.206 m/s

Net Force Developed (F_{net})

$F_{net} = (Pe \times A) - F_n$
$= 1413.71 - 432.71$
F_{net} = 981 N

Input Power $(P_{in})_e$

$(P_{in})_e = P_e \times Q_e$
$= 5\times10^5 \times 5.83\times10^{-4}$
$(P_{in})_e$ = 291. 5 Watt

Output Power $(P_{out})_e$

$(P_{out})_e = F_{net} \times V_e$
$= 981 \times 0.026$
$(P_{out})_e$ = 202.086 Watt

Efficiency (η)

$$\eta = \frac{Pout}{Pin}$$
$$= \frac{202.086}{291.5}$$
η = 69.3 %

Efficiency during extension

5. Power during Retraction

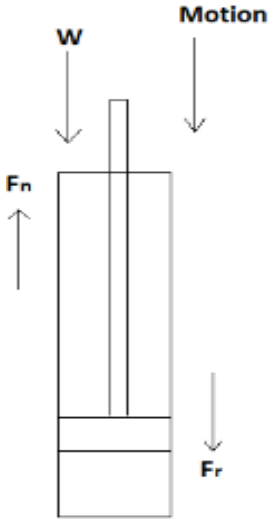


Fig 4.5.b Retraction

$(P_{in})_r$ = Input Power during retraction
$(P_{out})_r$ = Output Power during retraction
F_r = Force developed during rectraction
F_n= Packing Friction
Q_r= Flow rate during rectraction
V_r= Velocity of piston during rectration

F_{net}= Net force during retraction

Velocity of Piston during retraction

$V_r = 0.01176$ m/s

Area during retraction

$A_r = \frac{\pi}{4} \times 0.06^2 - \frac{\pi}{4} \times 0.02^2$

$= 2.827\times10^{-3} - 3.141\times10^{-4}$

$A_r = 2.5229\times10^{-3}$ m^2

Flow rate (Qr)

$Q_r = A_r \times V_r$

$= 2.5229\times10^{-3} \times 0.01176$

$Q_r = 2.955\times10^{-5}$ m^3/s

$F_r = 490.5$ N

Packing Friction (Fn)

$F_n = W + P_r(A-a)$

$= 490.5 + 0.25(2.5229\times10^{-3})$

$F_n = 1118.81$ N

Net Force developed (Fnet)

$F_{net} = P_r(A-a) - F_n$

$= 628.31 - 1118.81$

$F_{net} = -490.5$ N (over running load)

Input Power (Pin)r

$(P_{in})_r = P_r \times Q_r$

$= 2.5\times10^5 \times 2.955\times10^{-5}$

$(P_{in})_r = 7.387$ W

Output Power(Pout)r

$(P_{out})_r = F_{net} \times V_r$

$= 490.5\times 0.01176$

$(P_{out})_r = 5.7682$ W

Efficiency (η)

$(\eta) = \frac{Pout}{Pin}$

$= \frac{5.7682}{7.387}$

η = 78 %

Efficiency during retraction

CHAPTER 5
RESULT & CONCLUSION

CHAPTER 5
RESULT & CONCLUSION

This project work has provided us an excellent opportunity and experience, to use our limited knowledge. We gained a lot of practical knowledge regarding, planning, assembling and machining while doing this project work. We feel that the project work is a good solution to bridge the gates between institution and industries.

We are proud that we have completed the work with limited time successfully. The "**DESIGN AND FABRICATION OF PROTOTYPE OF AUTOMACTIC THREE WAY PNEUMATIC DUMPER MECHANISM"** is working with satisfactory conditions. We can understand the difficulties in maintaining the tolerances and quality. We have done to our ability and skill making maximum use of available facilities. In conclusion remarks of our project work, let us add a few more lines about our impression project work.

Thus, we have developed a "**DESIGN AND FABRICATION OF PROTOTYPE OF AUTOMATIC THREE WAY PNEUMATIC DUMPER MECHANISM"** which helps to know how to achieve low- cost automation. The operating procedure of this system is very simple, so any person can operate. By using more techniques, they can be modified and developed according to the application.

A prototype which exhibits the expected results is developed. With analysis of working and with the help of pneumatic system, lifting operations can be easily carried out without much effort. This mechanism is not only applicable in dumping trucks but also for various manufacturing industries. Thus we have developed a Three Axis Pneumatic Modern Trailer which helps to know how to achieve low cost automation. The operating procedure of this system is very simple, so any person can operate. By using more techniques, they can be modified and developed according to the applications. Further modifications and working limitations will put this work in the main league of use

CHAPTER 6
FUTURE SCOPE

CHATPER 6
FUTURE SCOPE

Three axis pneumatic trailer on current system can be possible. Providing ball and socket joint or universal joint at the tip of pneumatic cylinder piston, using external compressor, introduction of single hydraulic cylinder of pneumatic can make the system a little more efficient. Another change that can be made is to introduce some rollers in between the load cabin and the body of the vehicle. This setup will make the rotation of the load cabin easier and thus the rotating disc will no longer have to experience the complete load.

a. Precision control over the site of the cylinder may be executed through installation of proper sensor arrangement.
b. As opposed to one cylinder we will use two small cylinders of same capability to lift better loads with higher balancing.
c. We can automate the whole system using microprocessors and transformer arrangement.
d. Air Pressure booster can be used to make the system efficient and stable.

CHAPTER 7
FABRICATION PHOTO

CHAPTER 7
FABRICATION PHOTO

Fig 7.1 Base Frame

Fig 7.2 Base frame with pneumatic cylinder

Fig 7.3 Final Model

CHAPTER 8
PAPER PRESNTATION & CERTIFICATES

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 10 Issue III Mar 2022- Available at www.ijraset.com

Review Paper on Automatic Three-Way Pneumatic Dumper Mechanism

Prof. S. G. Bawane[1], Nomesh Chakole[2], Ajinkya Rangari[3], Roshan Mohurle[4], Swastik Hanote[5], Palash Dongarwar[6], Lokesh Kawadkar[7], Rushabh Ganvir[8]

[1]*Project Guide,* [2, 3, 4, 5, 6, 7, 8]*Students, Dept. of Mechanical Engineering ,K.D.K. College of engineering. Nagpur, Maharashtra, India*

Abstract: ***In construction sites there is a use of dumper for loading and unloading a material like sand, gravels, and other infrastructure materials. But they still used manual operated conventional dumper to dump the materials. they are dump material only in one side only that is rear side and that's the reason sometimes it's quite difficult to dump material in some compact places where the convention dumper is difficult to used. And this research paper mainly focused on above mentioned difficulty. To deal with this we are making a automatic three way pneumatic dumper mechanism so that they can be dump material in rear side as well as left and right direction also. and with the help of Arduino software the motion of the dumper can automated instead of manual use. It can be reduce labour work, save time, and increase the workability.***

Keywords: Arduino software, conventional, automated, pneumatic dumper, compact.

I. INTRODUCTION

A dumper is a vehicle designed to transport a large amount of material, mostly on a construction site. A dumper is usually an open 4-wheeled vehicle with a load skip in front of the driver, while a dump truck is in front of a taxi load. They are usually diesel powered. The site is fitted with towing eye for secondary use as a tractor. Dumpers with rubber tracks are used in special situations and weigh more uniformly than tires.

The payload of the early British dumpers was about a ton and it was 2-wheel drive, running on the front axle and running on the rear wheels. Single cylinder diesel engine (sometimes made by Lister) started by hand cranking. The steering wheel turned the rear wheel, not the front. There wasn't much wrong with not being electric or hydraulic.

Modern dumpers have payloads up to 10 tons and they usually run clearly in the center of the chassis (pivot steering). A-frame, also known as ROPS (Rollover Protection) frame, can be mounted on the seat to protect the driver if the dumper overturns.

II. LITERATURE REVIEW

The study of S. N. Waghmare et al declared that during their study of the conventional mechanism of dumper that are use not that much active and there is lacking of new invention and the technology. The study is taken into consideration of several automobile workshop. They are shows on their study some difficulties while unloading the material. This review paper mainly focused on above difficulty. That's why the prototype of such suitable arrangement has been designed. The dumper can and unload material entire the three direction. The mechanism of three way dumper can be controlled by with the help of providing side ways to the mechanism. This mechanism can be usable in compact areas also.

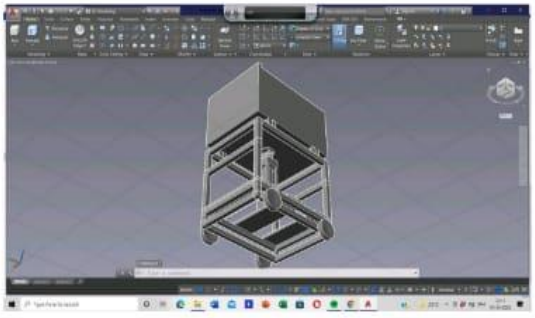
Prof . R. S. Ambade et al has started this project work and they named their project "Universal Modern Trailer" . they can seen difficulties in unloading of the material. The mechanism can unload material only in one direction. And its face some difficulties In compact areas . to overcome this problem the three directional dumper mechanism has designed.

III.METHEDOLOGY

The production of structural steel can be carried out in a shop or on a construction site. Steel production the work in the shops is precise and of high quality, and the field work is proportionate of inferior quality. In India, construction site construction is also most common on large projects cheap field work, high transport costs, difficulties in transporting large members, higher excise duty on products from trade. Favourable taxation for on-site work is a major financial incentive to create a website. The methods used in making the site are similar, but at the level of sophistication on-site equipment and environmental control would normally be less. Also the skill of the staff on site is inferior, so the quality of the final product is also relatively poor. But In-store manufacturing is efficient in terms of cost, time and quality.

1) *Three ways Tipper Mechanism:* The compressor reaches the compressed air by the direction control valve. The direction of flow changes according to the valve position handle. The compressed air passes through the direction control valve and enters the front end of the lifting stroke. At the end of the lifting stroke, air from the valve reaches the rear end of the cylinder block. The pressure remains the same, but the surface is smaller due to the presence of a piston rod. This puts more pressure on the piston, it pushes faster so a faster return stroke is enabled. The stroke length of the piston can be changes by making suitable by adjustment in the hand liver valve operating position.
2) *To Automate the System:* An Arduino is the circuit device which is used to create a connecting module. And get the command as the electronic signal and process the signal into the command to the device work as the command given by the user. An Arduino programming is mainly done in the Arduino software also known as (Arduino uno).
3) *Components used:* The automatic three way dumper mechanism can includes following components

a) Arduino Circuit
b) Pneumatic Cylinder
c) Direction Control Valve
d) Flow Control Valve
e) Air Compressor
f) Switch mode power supply
g) Centre lock actuator
h) Connecting hoses
i) Pneumatic Connector
j) Pneumatic Muffler
k) Toggle switch



IV. APPLICATIONS

A. Construction sites.
B. Infrastructure work
C. Landscaping and Ground Maintenance

V. FUTURE SCOPE

A three-axle pneumatic trailer is possible on the current system. Having a ball and socket or universal joint at the piston end of a pneumatic cylinder using an external compressor, the introduction of a single hydraulic tire cylinder can make the system a little more efficient. Another change what can be done is to insert a few rollers between the cargo cabin and the vehicle body. This setting will make it easier to rotate the cargo cabin and thus the rotating disk will no longer be there experience the full load.

1) It can be fully automated by using microprocessor circuit.
2) The direction of the dumper and controlling its unloading condition can be controlled by using various sensors.

VI. CONCLUSION

The operation of this system is very simple, so anyone can manage it. Author using several techniques, they can be modified and developed according to the application . The automatic three way pneumatic dumper mechanism are used to unload the material. It can be used for variety of purposes such as construction sites, infrastructure work, ground maintenance etc. This mechanism can save time and electricity.

CERTIFICATES


iJRASET
ISSN No. : 2321-9653
International Journal for Research in Applied Science & Engineering Technology
IJRASET is indexed with Crossref for DOI-DOI : 10.22214
Website : www.ijraset.com, E-mail : ijraset@gmail.com
ISRA Journal Impact Factor: 7.429
45.98
INDEX COPERNICUS
THOMSON REUTERS
doi cross ref
TOGETHER WE REACH THE GOAL
SJIF 7.429
Certificate
It is here by certified that the paper ID : IJRASET40724, entitled
Review Paper on Automatic Three Way Pneumatic Dumper Mechanism
by
Ajinkya Rangari
after review is found suitable and has been published in
Volume 10, Issue III, March 2022
in
International Journal for Research in Applied Science & Engineering Technology
Good luck for your future endeavors
Editor in Chief, iJRASET


iJRASET
ISSN No. : 2321-9653
International Journal for Research in Applied Science & Engineering Technology
IJRASET is indexed with Crossref for DOI-DOI : 10.22214
Website : www.ijraset.com, E-mail : ijraset@gmail.com
ISRA Journal Impact Factor: 7.429
45.98
INDEX COPERNICUS
THOMSON REUTERS
doi cross ref
TOGETHER WE REACH THE GOAL
SJIF 7.429
Certificate
It is here by certified that the paper ID : IJRASET40724, entitled
Review Paper on Automatic Three Way Pneumatic Dumper Mechanism
by
Roshan Mohurle
after review is found suitable and has been published in
Volume 10, Issue III, March 2022
in
International Journal for Research in Applied Science & Engineering Technology
Good luck for your future endeavors
Editor in Chief, iJRASET


ISSN No. : 2321-9653
iJRASET
International Journal for Research in Applied Science & Engineering Technology
IJRASET is indexed with Crossref for DOI-DOI : 10.22214
Website : www.ijraset.com, E-mail : ijraset@gmail.com
ISRA Journal Impact Factor: 7.429
45.98 INDEX COPERNICUS
THOMSON REUTERS
Certificate
It is here by certified that the paper ID : IJRASET40724, entitled
Review Paper on Automatic Three Way Pneumatic Dumper Mechanism
by
Palash Dongarwar
after review is found suitable and has been published in
Volume 10, Issue III, March 2022
in
International Journal for Research in Applied Science & Engineering Technology
Good luck for your future endeavors
TOGETHER WE REACH THE GOAL
SJIF 7.429
Editor in Chief, iJRASET


ISSN No. : 2321-9653
iJRASET
International Journal for Research in Applied Science & Engineering Technology
IJRASET is indexed with Crossref for DOI-DOI : 10.22214
Website : www.ijraset.com, E-mail : ijraset@gmail.com
ISRA Journal Impact Factor: 7.429
45.98 INDEX COPERNICUS
THOMSON REUTERS
Certificate
It is here by certified that the paper ID : IJRASET40724, entitled
Review Paper on Automatic Three Way Pneumatic Dumper Mechanism
by
Lokesh Kawadkar
after review is found suitable and has been published in
Volume 10, Issue III, March 2022
in
International Journal for Research in Applied Science & Engineering Technology
Good luck for your future endeavors
TOGETHER WE REACH THE GOAL
SJIF 7.429
Editor in Chief, iJRASET


ISSN No. : 2321-9653
iJRASET
International Journal for Research in Applied Science & Engineering Technology
IJRASET is indexed with Crossref for DOI-DOI : 10.22214
Website : www.ijraset.com, E-mail : ijraset@gmail.com
ISRA Journal Impact Factor: 7.429
45.98
INDEX COPERNICUS
THOMSON REUTERS
TOGETHER WE REACH THE GOAL
SJIF 7.429
Certificate
It is here by certified that the paper ID : IJRASET40724, entitled
Review Paper on Automatic Three Way Pneumatic Dumper Mechanism
by
Nomesh Chakole
after review is found suitable and has been published in
Volume 10, Issue III, March 2022
in
International Journal for Research in Applied Science & Engineering Technology
Good luck for your future endeavors
Editor in Chief, iJRASET


ISSN No. : 2321-9653
iJRASET
International Journal for Research in Applied Science & Engineering Technology
IJRASET is indexed with Crossref for DOI-DOI : 10.22214
Website : www.ijraset.com, E-mail : ijraset@gmail.com
ISRA Journal Impact Factor: 7.429
45.98
INDEX COPERNICUS
THOMSON REUTERS
TOGETHER WE REACH THE GOAL
SJIF 7.429
Certificate
It is here by certified that the paper ID : IJRASET40724, entitled
Review Paper on Automatic Three Way Pneumatic Dumper Mechanism
by
Rushabh Ganvir
after review is found suitable and has been published in
Volume 10, Issue III, March 2022
in
International Journal for Research in Applied Science & Engineering Technology
Good luck for your future endeavors
Editor in Chief, iJRASET

e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
(Peer-Reviewed, Open Access, Fully Refereed International Journal)
Volume:04/Issue:05/May-2022 Impact Factor- 6.752 www.irjmets.com

DESIGN AND FABRICATION MODEL OF AUTOMATIC THREE WAY PNEUMATIC DUMPER MECHANISM

Prof. S.G Bawane*1, Nomesh Chakole*2, Ajinkya Rangari*3, Roshan Mohurle*4, Swastik Hanote*5, Palash Dongarwar*6, Lokesh Kawadkar*7, Rushabh Ganvir*8

*1Assistant Prof. Dept. Of Mechanical Engineering, KDK College Of Engineering, Nagpur, MH, India

*2,3,4,5,6,7,8Students Dept. Of Mechanical Engineering, KDK College Of Engineering, Nagpur, MH, India

ABSTRACT

This Dumper is most probably used in construction sites, infrastructure work, etc. usually dumper used to unload a material from any particular location. Without dumper its difficult to unload large amount of material in construction sites. Generally they are used manual operated conventional dumper and by using hydraulic system dumper can dump the material. But they are only dump material only in rear side they can not be able to dump material either left or right. Sometimes due to critical situation where the space are to compact such time manual operated dumper has not work. To deal with this problem we are making a three way pneumatic dumper so they can able to dump the material in rear side as well as both left and right side also. And its can be usable in compact area with higher efficiency than manual operated dumper. And by the help of Arduino software the motion of the dumper can be automated.

Keywords: Pneumatic, Conventional. Manually, Critical Situation, Hydraulic, Mechanism.

I. INTRODUCTION

Dump trucks, also known as dump trucks, dump trailers, damper trailers, dump lorries, damper lorries, or dampers for short, are used to transport construction materials (soil, gravel, dismantled waste, etc.) and coal. .. A typical dump truck is equipped with an open box bed with a hinged rear and a hydraulic ram to lift the front, depositing the material in the bed on the ground behind the truck ("Dump") You can. Delivery location. In the united kingdom, Australia, South Africa and India, this term applies only to off-road construction plants, road vehicles are chip lorries, tipper lorrie, tipper truck.

It is thought that the dump lorry was first invented on a farm in western Europe in the late 19th century. Thornycroft developed a steam dust card in 1896 with a tipper machine. The first motor dump trucks in the United States were developed by small equipment companies such as The Fruehauf Trailer Corporation, Galion Buggy Co. and LauthJuergens among many others around 1910. Irrigation dump beds were introduced by Wood Hoist Co. shortly thereafter. Such companies prospered during the First World War due to high demand during the war. August Fruehauf had secured military contracts for his semi-trailer, built in 1914 and later created the companion vehicle, the half-truck for use in the First World War. They offered hydraulic lifting gates, water onions and a dump trailer for sale in the early 1920s. Fruehauf became a major supplier of dump trucks and their famous "bathtub dump" was considered the favorite of heavy haulers, road construction companies and mines.

A conventional dump truck is a truck with a dump body attached to the frame. The bed is constructed with a water ram directly mounted under the front of the body (known as the front post hoist arrangement), or a horizontal watering ram and lever arrangement between the frame rails (called the hoist railing -body), and the back of the bed has a hinge on the back of the truck. The tail gate (sometimes called an end gate) can be arranged to go up the high hinges (and sometimes also to fold down on low hinges) or it can be arranged in the form of a "High Lift Tailgate" where there are pine rams or aquatic lifting the gate open and up above the dump body. Some groups have outboard swing doors to enter the box, usually for hauling grain, and a gauge gate / grooves in the middle for more controlled dumping.

II. METHODOLOGY

The Structural steel can be manufactured in stores or at construction sites. Steel production is accurate and high quality in-store work, and fieldwork is inferior in quality. Construction of construction sites is most common in large projects in India. Inexpensive field work, high transportation costs, difficulty in transporting

large members, high excise tax on goods from trade. Favorable taxation on field work is a major financial incentive for creating websites. The methods used to create a site are similar, but at a high level of on-site equipment and environmental control, they are usually less. In addition, the quality of the final product is relatively inferior due to the inferior skills of the on-site staff. However, in-store manufacturing is cost-effective, time-consuming, and quality-efficient.

Three-way tipping mechanism: The compressor reaches the compressed air by means of a directional control valve. The direction of flow depends on the valve position handle. Compressed air passes through the directional control valve and enters the front end of the ascending / descending stroke. At the end of the lift stroke, the air from the valve reaches the rear end of the cylinder block. The pressure remains the same, but the surface is smaller due to the presence of the piston rod. This puts more pressure on the piston and pushes it faster, allowing for a faster return stroke. The stroke length of the piston can be changed by adjusting the operating position of the liver valve of the hand

To Automate the system

Arduino is a circuit device used to create connectivity modules. It then takes the command as an electronic signal, processes the signal into a command to the device, and makes it function as a user-specified command. Arduino programming is mainly done with Arduino software, also known as (Arduino uno).

Fig: arduino uno circuit

Components Used

The automatic three way dumper mechanism can includes following components :

- Arduino Circuit
- Pneumatic Cylinder
- Direction Control Valve
- Flow Control Valve
- Air Compressor
- Switch mode power supply
- Centre lock actuator
- Connecting hoses
- Pneumatic Connector
- Pneumatic Muffler
- Toggle switch

e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
(Peer-Reviewed, Open Access, Fully Refereed International Journal)
Volume:04/Issue:05/May-2022 Impact Factor- 6.752 www.irjmets.com

III. DESIGN CALCULATIONS

Calculations For Dumper

Length = 24 " = 0.6096 m

Width = 14 " = 0.3556 m

Height = 11" = 0.2794 m

Volume = l × b × h V = 0.6096 × 0.3556 × 0.2794 V = 0.0605 m

Sand to be filled inside the dumper of

Density δ = 1600 kg/m3

Mass of sand to be carried

m = δ×V m = 1600 × 0.0605 m = 96.8 kg ≅ 100 kg

Force= mass × acceleration

F = 100 × 9.81

F = 981 N

Pressure provided by the cylinder

P = 5 bar = 0.5 Mpa.

Diameter of cylinder

A = Area of cylinder

$A = FP\ \pi 4 \times D2 = 981\ 0.5$

$\boldsymbol{D}$ = 50 mm Minimum Rod Diameter (dmin.)

Assuming FOS = 4 (FOS = Factor of Safety)

Material of Rod = C 45 SAE 1045

Yield stress (σy) = 306

Mpa Endurance limit for Bending

σBMax = 286 N/mm2

Design stress (σ) = Yield stress FOS σ = σ y FOS σ = 3064 σ = 76.4 N/mm 2 π4 × d 2 = 981 76 · 4 d = 4.04 mm

Available size of Pneumatic Cylinder Bore Diameter (D) = 60 mm Rod Diameter (d) = 20 mm

Bending stress in Rod

β = Angle between rod and dumper

θ = Angle between frame and dumper

Stroke = 200 mm

tan θ = opposite/adjecent

θ = tan-1(200/304.8)

θ = 33.27 o

β = 90 – 33.27

β = 56.73 o

3.1 Axial stress (σa)

σa =Fy/A

Area of Rod

$A = \pi/4 \times d^2$

$A = \pi/4 \times 20^2$

A = 314.15 mm2

Axial Force acting on Rod (Fy)

Fy = Fsin β

= 981 × sin(56.73)

e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
(Peer-Reviewed, Open Access, Fully Refereed International Journal)
Volume:04/Issue:05/May-2022 Impact Factor- 6.752 www.irjmets.com

(Pout)e = Output Power during extension

Fe = Force developed during extension

Fn= Packing Friction

Qe= Flow rate during Extension

Ve= Velocity of piston during extension

Fnet= Net force during extension

Packing Fraction

Fn = Fe – W

Fn = (Pe × A) – W

Pe = 0.5 Mpa

Ae = $\pi/4 \times 60^2$

= 2827.43 mm2

W = 981 N

Fn = (0.5 × 2827.43) – 981

Fn = 432.71 N

Flow rate (Qe)

Qe = 35 lit/min

=5.83×10-4 m3/s

Velocity (Ve)

Ve = Qe/*A*

= 0.000583/0.000028274

Ve = 0.206 m/s

Net Force Developed (Fnet)

Fnet = (Pe × A) – Fn

= 1413.71 – 432.71

Fnet = 981 N

Input Power (Pin)e

(Pin)e = Pe × Qe

= $5\times10^5 \times 5.83\times10^{-4}$

(Pin)e = 291. 5 Watt

Output Power (Pout)e

(Pout)e = Fnet × Ve

= 981 × 0.026

(Pout)e = 202.086 Watt

Efficiency (η)

η = Pout/Pin

= 202.086/291.5

η = 69.3 %

Efficiency during extension

Power during Retraction

(Pin)r = Input Power during retraction

(Pout)r = Output Power during retraction

Fr = Force developed during rectraction

Fn= Packing Friction

(Pout)e = Output Power during extension

Fe = Force developed during extension

Fn= Packing Friction

Qe= Flow rate during Extension

Ve= Velocity of piston during extension

Fnet= Net force during extension

Packing Fraction

$Fn = Fe - W$

$Fn = (Pe \times A) - W$

$Pe = 0.5$ Mpa

$Ae = \pi/4 \times 60^2$

$= 2827.43$ mm2

$W = 981$ N

$Fn = (0.5 \times 2827.43) - 981$

$Fn = 432.71$ N

Flow rate (Qe)

$Qe = 35$ lit/min

$=5.83\times10\text{-}4$ m3/s

Velocity (Ve)

$Ve = Qe/A$

$= 0.000583/0.000028274$

Ve = 0.206 m/s

Net Force Developed (Fnet)

$Fnet = (Pe \times A) - Fn$

$= 1413.71 - 432.71$

Fnet = 981 N

Input Power (Pin)e

$(Pin)e = Pe \times Qe$

$= 5\times10^5 \times 5.83\times10^{-4}$

(Pin)e = 291. 5 Watt

Output Power (Pout)e

$(Pout)e = Fnet \times Ve$

$= 981 \times 0.026$

(Pout)e = 202.086 Watt

Efficiency (η)

$\eta = Pout/Pin$

$= 202.086/291.5$

η = 69.3 %

Efficiency during extension

Power during Retraction

(Pin)r = Input Power during retraction

(Pout)r = Output Power during retraction

Fr = Force developed during rectraction

Fn= Packing Friction

e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
(Peer-Reviewed, Open Access, Fully Refereed International Journal)
Volume:04/Issue:05/May-2022 Impact Factor- 6.752 www.irjmets.com

Qr= Flow rate during rectraction

Vr= Velocity of piston during rectration

Fnet= Net force during retraction

Velocity of Piston during retraction

Vr = 0.01176 m/s

Area during retraction

$Ar = \pi/4 \times 0.06^2 - \pi/4 \times 0.02^2$

$= 2.827 \times 10\text{-}3 - 3.141 \times 10\text{-}4$

$Ar = 2.5229 \times 10\text{-}3\ m^2$

Flow rate (Qr)

$Qr = Ar \times Vr$

$= 2.5229 \times 10\text{-}3 \times 0.01176$

$Qr = 2.955 \times 10\text{-}5\ m^3/s$

Fr= 490.5 N

Packing Friction (Fn)

$Fn = W + Pr(A\text{-}a)$

$= 490.5 + 0.25(2.5229 \times 10\text{-}3)$

Fn= 1118.81 N

Net Force developed (Fnet)

$Fnet = Pr(A\text{-}a) - Fn$

$= 628.31 - 1118.81$

Fnet= – 490.5 N (over running load)

Input Power (Pin)r

$(Pin)r = Pr \times Qr$

$= 2.5 \times 10^5 \times 2.955 \times 10^{-5}$

(Pin)r=7.387 W

Output Power(Pout)r

$(Pout)r = Fnet \times Vr$

$= 490.5 \times 0.01176$

(Pout)r=5.7682 W

Efficiency (η)

$(\eta) = Pout/Pin$

=5.7682/7.387

$\eta = 78\ \%$

Efficiency during retraction

IV. FUTURE SCOPE

Current systems allow for 3-axis pneumatic trailers. If you have a ball and socket or universal joint at the end of the piston of the pneumatic cylinder using an external compressor, you can make the system a little more efficient by introducing a single hydraulic tire cylinder. Another possible change is to insert some rollers between the cargo cabin and the car body. This setting makes it easier to rotate the cargo cabin and prevents the rotating disk from experiencing full load.

- It can be fully automated by using microprocessor circuit.
- The direction of the dumper and controlling its unloading condition can be controlled by using various sensors.

e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
(Peer-Reviewed, Open Access, Fully Refereed International Journal)
Volume:04/Issue:05/May-2022 Impact Factor- 6.752 www.irjmets.com

V. CONCLUSION

The operation of this system is so easy that anyone can manage it. It can be created using several techniques and modified and developed depending on the application. Use the automatic 3-way pneumatic damper mechanism to unload the material. It can be used for various purposes such as construction sites, infrastructure construction, and ground maintenance. This mechanism saves time and power.

VI. REFERENCES

[1] Design data book, for stimulated by prof. G. R. Damodaran's intellectual, inspiration, and support then faculty member Dept. mesh, come out compilation of the Design Data Book 1968 to provide a realistic understanding of the Engineering. design process, ISBN 978-81-927355.

[2] Strength of material for the shape and size of various structures are designed by knowing the strength of materials by R.S. Khurmi, ISBN 978-81-920485-1-2

[3] Khurmi gupta , 14th edition stress, strain, analysis, m/c design s.chand and company.

[4] "Development of Modern Three-Axle Lifting Trailer" INTERNATIONAL JOURNAL OF EMERGING AND INNOVATIVE TECHNOLOGIES ENGINEERING, vol. I, Number 5, MAY 2015 (ISSN: 2394 – 6598). Prasath N.E., Shanmugam S., Mathalai Sundaram C., Vembathu Rajesh A. Hydraulic jack mechanism used to unload the traileron all three axles without applying any impact force. They used control valves to activate the ram of the cylinder and through a proper arrangement of the knee joint on the trailer and the universal joint on the hydraulic cylinder could dispatch the load on the trailer in all three axes.

[5] P. Ganesh Prabhu, D. Ambika, "Study on Behaviour of Workers in Construction Industry to Improve Production Efficiency", International Journal of Civil, Structural, Environmental and Infrastructure Engineering Research and Development (IJCSEIERD), Vol. 3, Issue 1, Mar 2013, 59-66.

International Research Journal Of Modernization in Engineering Technology and Science
(Peer-Reviewed, Open Access, Fully Refereed International Journal)
e-ISSN: 2582-5208

Ref: IRJMETS/Certificate/Volume 4/Issue 05/40500060078 Date: 10/05/2022

Certificate of Publication

*This is to certify that author "**Prof. S.G Bawane**" with paper ID "**IRJMETS40500060078**" has published a paper entitled "DESIGN AND FABRICATION MODEL OF AUTOMATIC THREE WAY PNEUMATIC DUMPER MECHANISM" **in International Research Journal Of Modernization In Engineering Technology And Science (IRJMETS), Volume 4, Issue 05, May 2022***

Editor in Chief

IRJMETS Impact Factor 6.752

We Wish For Your Better Future
www.irjmets.com

International Research Journal Of Modernization in Engineering Technology and Science
(Peer-Reviewed, Open Access, Fully Refereed International Journal)
e-ISSN: 2582-5208
Ref: IRJMETS/Certificate/Volume 4/Issue 05/40500060078 Date: 10/05/2022

Certificate of Publication

This is to certify that author "**Rushabh Ganvir**" with paper ID "**IRJMETS40500060078**" has published a paper entitled "DESIGN AND FABRICATION MODEL OF AUTOMATIC THREE WAY PNEUMATIC DUMPER MECHANISM" **in International Research Journal Of Modernization In Engineering Technology And Science (IRJMETS), Volume 4, Issue 05, May 2022**

Editor in Chief

IRJMETS Impact Factor 6.752

We Wish For Your Better Future
www.irjmets.com

International Research Journal Of Modernization in Engineering Technology and Science

(Peer-Reviewed, Open Access, Fully Refereed International Journal)

e-ISSN: 2582-5208

Ref: IRJMETS/Certificate/Volume 4/Issue 05/40500060078 Date: 10/05/2022

Certificate of Publication

This is to certify that author "**Lokesh Kawadkar**" with paper ID "**IRJMETS40500060078**" has published a paper entitled "DESIGN AND FABRICATION MODEL OF AUTOMATIC THREE WAY PNEUMATIC DUMPER MECHANISM" **in International Research Journal Of Modernization In Engineering Technology And Science (IRJMETS), Volume 4, Issue 05, May 2022**

Editor in Chief

IRJMETS Impact Factor 6.752

We Wish For Your Better Future

www.irjmets.com

International Research Journal Of Modernization in Engineering Technology and Science

(Peer-Reviewed, Open Access, Fully Refereed International Journal)

e-ISSN: 2582-5208

Ref: IRJMETS/Certificate/Volume 4/Issue 05/40500060078 Date: 10/05/2022

Certificate of Publication

This is to certify that author "**Ajinkya Rangari**" with paper ID "**IRJMETS40500060078**" has published a paper entitled "DESIGN AND FABRICATION MODEL OF AUTOMATIC THREE WAY PNEUMATIC DUMPER MECHANISM" **in International Research Journal Of Modernization In Engineering Technology And Science (IRJMETS), Volume 4, Issue 05, May 2022**

Editor in Chief

IRJMETS Impact Factor 6.752

We Wish For Your Better Future

www.irjmets.com

International Research Journal Of Modernization in Engineering Technology and Science

(Peer-Reviewed, Open Access, Fully Refereed International Journal)

e-ISSN: 2582-5208

Ref: IRJMETS/Certificate/Volume 4/Issue 05/40500060078 Date: 10/05/2022

Certificate of Publication

This is to certify that author "**Swastik Hanote**" with paper ID "**IRJMETS40500060078**" has published a paper entitled "DESIGN AND FABRICATION MODEL OF AUTOMATIC THREE WAY PNEUMATIC DUMPER MECHANISM" **in International Research Journal Of Modernization In Engineering Technology And Science (IRJMETS), Volume 4, Issue 05, May 2022**

Editor in Chief

IRJMETS Impact Factor 6.752

We Wish For Your Better Future

www.irjmets.com

International Research Journal Of Modernization in Engineering Technology and Science

(Peer-Reviewed, Open Access, Fully Refereed International Journal)

e-ISSN: 2582-5208

Ref: IRJMETS/Certificate/Volume 4/Issue 05/40500060078 Date: 10/05/2022

Certificate of Publication

This is to certify that author "**Roshan Mohurle**" with paper ID "**IRJMETS40500060078**" has published a paper entitled "DESIGN AND FABRICATION MODEL OF AUTOMATIC THREE WAY PNEUMATIC DUMPER MECHANISM" **in International Research Journal Of Modernization In Engineering Technology And Science (IRJMETS), Volume 4, Issue 05, May 2022**

Editor in Chief

IRJMETS Impact Factor 6.752

We Wish For Your Better Future

www.irjmets.com

International Research Journal Of Modernization in Engineering Technology and Science

(Peer-Reviewed, Open Access, Fully Refereed International Journal)

e-ISSN: 2582-5208

Ref: IRJMETS/Certificate/Volume 4/Issue 05/40500060078 Date: 10/05/2022

Certificate of Publication

This is to certify that author "**Nomesh Chakole**" with paper ID "**IRJMETS40500060078**" has published a paper entitled "DESIGN AND FABRICATION MODEL OF AUTOMATIC THREE WAY PNEUMATIC DUMPER MECHANISM" **in International Research Journal Of Modernization In Engineering Technology And Science (IRJMETS), Volume 4, Issue 05, May 2022**

Editor in Chief

IRJMETS Impact Factor 6.752

We Wish For Your Better Future

www.irjmets.com

International Research Journal Of Modernization in Engineering Technology and Science

(Peer-Reviewed, Open Access, Fully Refereed International Journal)

e-ISSN: 2582-5208

Ref: IRJMETS/Certificate/Volume 4/Issue 05/40500060078 Date: 10/05/2022

Certificate of Publication

This is to certify that author "**Palash Dongarwar**" with paper ID "**IRJMETS40500060078**" has published a paper entitled "DESIGN AND FABRICATION MODEL OF AUTOMATIC THREE WAY PNEUMATIC DUMPER MECHANISM" **in International Research Journal Of Modernization In Engineering Technology And Science (IRJMETS), Volume 4, Issue 05, May 2022**

Editor in Chief

IRJMETS Impact Factor 6.752

We Wish For Your Better Future

www.irjmets.com

CHAPTER 9

PLAGIARISM REPORT

Chapter9
Plagiarism report

Dupli Checker

PLAGIARISM SCAN REPORT

7%
Plagiarised

93%
Unique

Date	2022-03-07
Words	985
Characters	6479

Content Checked For Plagiarism

REVIEW PAPER ON AUTOMATIC THREE WAY PNEUMATIC DUMPER MECHANISM

Prof. S.G. Bawane1, Nomesh Chakole2, Ajinkya Rangari3 ,Roshan Mohurle4
1Assistant Professor, Dept. of Mechanical Engineering ,K.D.K. College Of Engg. Nagpur ,Maharashtra, India
2,3,4 BE Student , Dept. of Mechanical Engineering, K .D.K . College Of Engineering ,Nagpur, MH, India

---

Abstract - In construction sites there is a use of dumper for loading and unloading a material like sand, gravels, and other infrastructure materials. But they used still manual operated conventional dumper to dump the materials . they are dump material only in one side only that is rear side and that's the reason sometimes its quite difficult to dump material in some compact places where the convention dumper is difficult to used. And this research paper mainly focused on above mentioned difficulty. To deal with this we are making a automatic three way pneumatic dumper mechanism so that they can be dump material in rear side as well as left and right direction also . and with the help of Arduino software the motion of the dumper can automated instead of manual use. It can be reduce labour work, save time , and increase the workability.

Key Words: Arduino software, conventional dumper, automatic, pneumatic dumper.

1. INTRODUCTION

A dumper is a vehicle designed to transport a large amount of material, mostly on a construction site. Dumpers are distinguished by configuration: a dumper is usually an open 4-wheeled vehicle with a load skip in front of the driver, while a dump truck is in front of a taxi load. They are usually diesel powered. The site is fitted with towing eye for secondary use as a tractor. Dumpers with rubber tracks are used in special situations and weigh more uniformly than tires
The payload of the early British dumpers was about a ton and it was 2-wheel drive, running on the front axle and running on the rear wheels. Single cylinder diesel engine (sometimes made by Lister) started by hand cranking. The steering wheel turned the rear wheel, not the front. There wasn't much wrong with not being electric or hydraulic.

Modern dumpers have payloads up to 10 tons and they usually run clearly in the center of the chassis (pivot steering). A-frame, also known as ROPS (Rollover Protection) frame, can be mounted on the seat to protect the driver if the dumper overturns.

2. LITERATURE REVIEW

The study of S. N. Waghmare et al stated that during their study of the conventional mechanism of dumper that are use not that much active and there is lacking of new invention and the technology. The study is taken into consideration of several automobile workshop. They are shows on their study some difficulties while unloading the material. This review paper mainly focused on above difficulty. That's why the prototype of such suitable arrangement has been designed. The dumper can and unload material entire the three direction. The mechanism of three way dumper can be controlled by with

CHAPTER 10

REFERENCES

CHAPTER 10
REFERENCE

1) *Patent US4711461 - Three-axis trailer hitch having improved rotatable coupling between vehicle.*
2) *Ganesh Shinde, Prachi Tawele, and Laukik Raut, Design and Development of 3-Way Dropping Dumper, International Journal of Emerging Technology and Advanced Engineering, 4(9), 2014, 2250-2459*
3) *Amboji Sudhakar R., Humane Yogesh A. Chavan Rohan R. Patil Jyotsna C., and Kshirsagar Prashant R., Design and Fabrication of Three-Way Tipper Mechanism, International Journal of Research in Advent Technology, 2(4), 2014, 2321-9637.*
4) *Dubey and V. Dwivedi, ―Vehicle chassis analysis: load cases and boundary conditions for stress analysis. ‖ in 11th National Conference on Machines and Mechanisms. IIT, Delhi, India, December 2003*
5) *Design data book, for stimulated by prof. G. R. Damodaran's intellectual, inspiration, motivation and support then faculty member Dept. mesh. PSG college of tech, comeout compilation of the Design Data Book 1968 to provide a realistic understanding of the Engg design process, ISBN 978-81-927355.*
6) *Strength of material for the shape and size of various structures are designed by knowing the strength of materials by R.S. Kurmi, ISBN 978-81-920485-1-2*
7) *Manufacturing Technology, Prof. serope kalpkji*
8) *Machine tool design handbook, central machine tool institute, Bangalore*.

ANNEXURE – I
PROGRAM OUTCOMES & PROGRAM SPECIFIC OUTCOMES

PROGRAM OUTCOMES

1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. Problem analysis: Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

PROGRAM SPECIFIC OUTCOMES

PSO1 To acquire and apply knowledge in various domains like Design, Thermal, Production and allied areas through theory / practical / industrial visits.

PSO2 To acquire Engineering knowledge, Computational, Management, Soft skills and Entrepreneurship skills for the betterment of Industrial and Social requirement.

ANNEXURE – II
RESUME

ANNEXURE – II
RESUME

NAME :- AJINKYA RANGARI
E-mail :- ajinkyarangari.734@gmail.com
Mob.No :- 7304095436

NAME :- NOMESH CHAKOLE
E-mail :- nomeshchakole@gmail.com
Mob.No. :-9763327325

NAME :- SWASTIK HANOTE
E-mail :- swastikhanote4@gmail.com
Mob.No. :- 9359257032

NAME :-ROSHAN MOHURLE
E-mail :- rmohurle571@gmail.com
Mob.No. :- 7218253998

NAME :- LOKESH KAWADKAR
E-mail :- lokeshkawadkar210@gmail.com
Mob.No. :- 9370483537

NAME :- PALASH DONGARWAR
E-mail :- dongarwarpalash7@gmail.com
Mob.No. :- 9130101820

NAME :- RUSHAB GANVIR
E-mail :- rushabhganvir15@gmail.com
Mob No. :- 8669392640