A

PROJECT REPORT

ON

AUTOMATIC SCRAP REMOVING

IN PARTIALFULFILLMENT OF THE REQUIREMENTS

FOR THE AWARD OF THE DEGREE OF

BACHELOR OF ENGINEERING
in
Mechanical Engineering

SUBMITTED BY

SHAIKH ABID IQBAL

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UNDER THE GUIDENCE OF

PROF.JAWED KAZI

ANJUMAN-I-ISLAM
Kalsekar technical campus
Institute of engineering and technology

Affiliated to
UNIVERSITY OF MUMBAI

Department of mechanical engineering

Academic year 2016-2017

CERTIFICATE

This is to certify that project entitiled

AUTOMATIC SCRAP REMOVING TROLLEY

Subimitted by

SHAIKH ABID IQBAL

SHAIKH JAVEDHASSAN MOHAMMED SHARIF

SHAIKH JUNAID JAMIL

To the kalsekar technical campus, new panvel is a record ofbonafied work carried out by him under over supervision and guidance, for partial fulfillment of the requirement for the award of the degree of bachelor of engineering in mechanical engineering as prescribe by **university of Mumbai**, is approved.

Project co-guide **Internal**

Examiner **External Examinar**

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Head of department

Principal

(prof.----------)

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SHAIKH ABID IQBAL

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ABSTRACT

The world is looking for an automation in almost every field to cope up with the ever Increasing demand of automation andthe government and companies are spending huge money for the development in all over the world.

Test automation plays vital role in enterprise applications implimentation majority of the enterprises run their business by using packaged applications like sap, oracle, peoplesoft, etc. This business processes are highly customized depending on the organizations business and objectives.

As Development and Testing these implementations and deploying within in the budget and timeframes are crucial for an Organization business commitment drives IT departments at these Organizations to looks for accelerators of testing process. These accelerators are in the form of Test Automation tools available in market and also Frameworks to deploy these tools.

The problem is to identify the ways and means to enhance and improve such Test Automation Framework. The present work is concerned with a more realistic industrial process control and automation course for engineering. Topic is concerned with automation in trolley as well in sliding door. With the help of rack and pinion mechanism with motor the door will slide and electronic motor is used to run trolley further improvise the automation by using sensors for completion of process and to avoid risk of accidents which plays a major role in automation.

INTRODUCTION

Automation is the ability to orchestrate and integrate tools, people and processes through workflow. Benefits of ITPA include: reduced human errors, faster response to mission-critical system problems and more efficient allocation of resources. I**ndustrial automation** is the use of control systems, such as computers or robots, or by mechanism and information technologies for handling different processes and machineries in an **industry** to replace a human being. It is the second step beyond mechanization in the scope of industrialization.

Industrial automation deals primarily with the automation of manufacturing, quality control and material handling processes. General purpose controllers for industrial processes include Programmable logic controllers, stand-alone I/O modules, and computers. Industrial automation is to replace the decision making of humans and manual command-response activities with the use of mechanized equipment and logical programming commands. One trend is increased use of Machine vision to provide automatic inspection and robot guidance functions, another is a continuing increase in the use of robots. Industrial automation is simply done at the industrial level.

Energy efficiency in industrial processes has become a higher priority. Semiconductor companies like Infineon Technologies are offering 8-bit micro-controller applications for example found in motor controls, general purpose pumps, fans, and ebikes to reduce energy consumption and thus increase efficiency.

The objectives of thisProject is to study, analyze, and develop a new mechanism that is cheap, safe easily available and installation is simple as well. Here, different types of mechanism are used to operate door. Those methods are finite element modeling and mechanical design concept and theories. So we have to analyze a stress, load, and other things related to deign to select material, size of material. Therefore, the durability assessment results are significant to reduce theCost and improve the product reliability. In order to improve the designed mechanism, vibration factor are consider and more featuresprovided. .

Though the normal door may face problem related to clear opening and stability. This situation can be resolved by providing an automation in sliding door therefore,The objective of this project is to design an automatic door mechanism for industries with sliding door having weight of 80kg. Cost reduction and ease of installation are also considered for this mechanism,doors are mainly made with one door wing or two door wings in special versions. Sizes range from about 800 mm to 2000 mm, with a varying standard height from 2100 mm to 2300 mm, the door wings weight can vary in one wing solution from 150 kg up to a maximum weight of 200 kg, reached with automation, doors are made according to ISO 9001 procedures and quality certifications.

In **trolley conveyor**s an overhead rail carries a series of load-bearing containers (trolleys) that are coupled together on an endless propelling medium such as cable, chain, or other linkage. The trolleys may be hooks, magnets, or various carriers designed for the particular load to be handled. Here electric motor is used to slide the trolley.

LETRATURE REVIEW

1. RACK AND PINION

1.1. INTRODUCTION:-

Rack and pinion drives (RPD) are linear actuators commonly found in feed axes of machine tools and handling systems. Distinguishing features are virtually unlimited maximum length of travel and constant dynamic characteristics along the travel, making them recommended for feed drive systems with long travel distances.

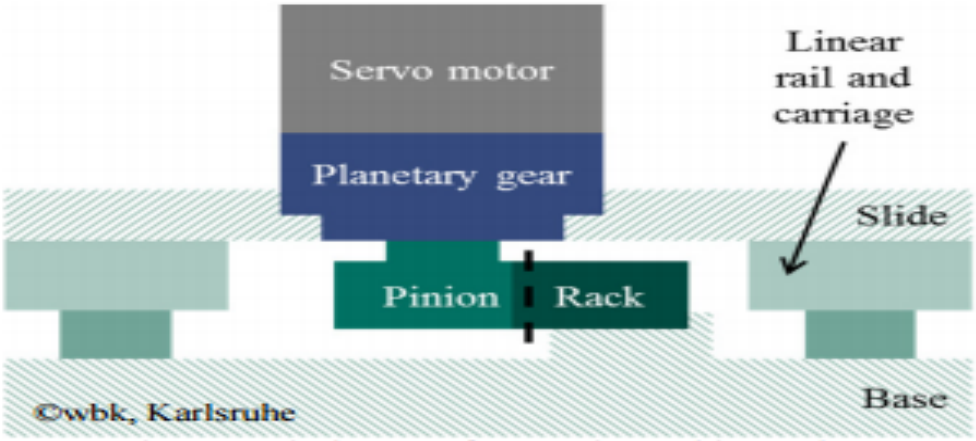
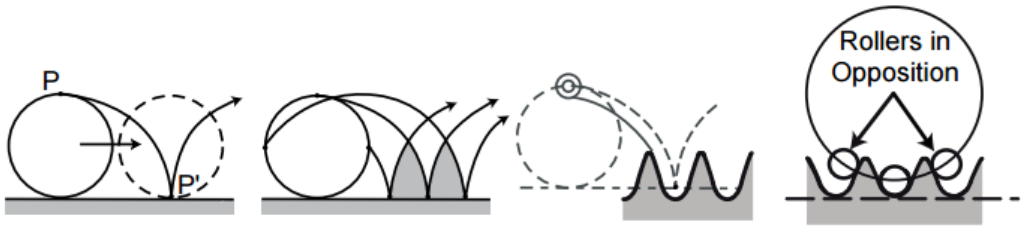


Fig. 1. Typical setup of a RPD in machine tools

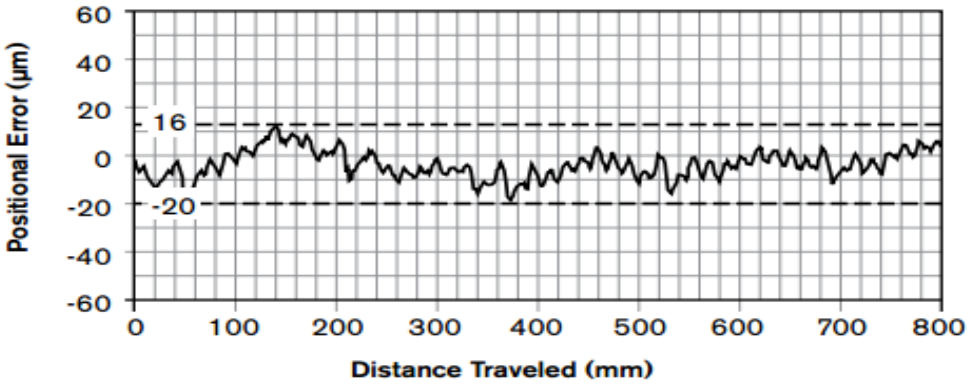
1.2. WORKING:-

The RPS system achieves its incredible performance by using a pinion consisting of bearing-supported rollers that engage a unique tooth profile. Two or more rollers engage the teeth in opposition at all times, eliminating backlash. There is no tooth slap as with traditional rack and pinion or gearing, instead the RPS rollers approach the tooth face in a tangent path and then roll smoothly down the tooth face. This provides a smooth, quiet, low-friction, fatigue-free, high-efficiency rotary-to-linear or rotary-to-rotary motion conversion. The RPS tooth design is conceptually different from traditional gearing. It behaves like a cam and follower versus the typical sliding spur gear used with traditional rack and pinion or gear sets. As illustrated in the figures below, a cycloidal curve is created when a point drawn on a circle at point P rolls on a flat plane to point P' without slipping. When multiple points are placed on the circle at regular intervals, the cycloidal curves are repeatedly created on the flat plane, and develop into a tooth-like profile. A roller then is placed at each point P to act as pinion teeth and modifies the tooth profile to create the rack teeth. Normally, this concept will not provide zero backlash, but a technical innovation was developed to modify the tooth geometry allowing two rollers to remain loaded in opposition at all times, eliminating the backlash as the rollers engage the teeth. The rollers meet the tooth with a tangent path and smoothly roll down the tooth face. This eliminates tooth slap, sliding friction, fatigue, noise, and low precision associated with traditional gearing.



1.3. ROTARY TO LINEAR TRANSMISSION PRECISION:-

The variations shown in the graph below represent minor errors occurring throughout the pinion's travel. The individual waves indicate each roller/tooth meshing error, and larger wave patterns show pinion rotational error. As the horizontal limits illustrate, there is no cumulative error. This pattern continues regardless of distance, even when crossing joints due to the way the RPS alignment tool transfers the system accuracy from section to section.



1.4. REQUIREMENT AND CHALLENGES:-

The rack and the pinion are susceptible to damages generally seen on gears; the damages that occur during operation can be briefly categorized as [7, 8]:

- Pitting caused by fatigue failure of the surface.
- Wear: material loss caused by the relative movements of the gears and abrasive particles in the lubricant.
- Breakage caused by fatigue failure of the teeth or excessive loads.
- Scoring caused by breakdown of the lubrication film and local solid phase welding at the contact points. Rack and pinion drives are open gears.

Rack and pinion are not enclosed in a gearbox. Hence RPDs are prone to specific failure causes additional to those seen in cyclic gears. Together with users of RPDs the following points could be identified:

- The possibility of installation errors and improper design: The axial distance and the angular alignment are not fixed by a gearbox. In addition, the compliance of the mechanics is determined by the construction of the machine the drive is installed into. This can lead to adverse conditions at the gear contact.

- Contamination: The system can be contaminated by dust or chips from the production environment and the process.

2. AUTOMATION IN TROLLEY

2.1 INTRODUCTION:-

Many large container terminals make use of diesel-powered automated guided vehicles (AGVs) to transport containers between quay cranes and container storage, thereby ensuring a high degree of productivity. However, battery-powered AGVs (B-AGVs) appear to have several economic, environmental, and technical advantages compared to conventional transport fleets.

In this study, we use data from a large-scale electric mobility project conducted in a container terminal using B-AGVs in combination with a battery-swapping station to assess the cost efficiency of this emerging transport technology based on a total cost of ownership analysis. Furthermore, we adapt research methodologies from the fields of operations research (optimization) and informatics (simulation) to improve the profitability of B-AGVs. Our findings indicate that the use of B-AGVs is economically beneficial in closed transport systems while several strategies can be used to further increase their profitability. Most promising from an economic perspective is shifting charging processes to off-peak hours, yielding lower energy procurement costs. In this context, terminal operators can achieve savings in total expenditures of more than 10% compared to a diesel-powered transport fleet.

ADVANTAGE & DISADVANTAGES OF SLIDING DOOR AND TROLLEY:-

Advantage:-

1. This system determines the accurate position then the normal method
2. This system reduces the manufacturing lead time.
3. This system eliminates the manual work in both sliding door as well in trolley.
4. Highly accurate and more efficient.
5. Compact and quick response.

Disvantage:-

1. Maintenance cost is higher.
2. Electronics system may failure at any time.

CALCULATIONS

RACK & PINION DESIGN:-

1. Load (w) = m = 80 kg

2. Load acceleration (a) = velocity(v)/Time(t)
   = 0.1(m/sec)/ 0.1(sec)
   = **1 m/sec^2**

3. Force due to acceleration(fa) = mass(m)*acceleration(a)
   = 80*1
   = **80 N**

4. Force due to gravity(fg) = m*g*sin(α)
   = 80*9.81*sin60
   = **679.656 N**

5. Force due to friction(ff) = m*μ*g*cos(α)
   = 80*0.01*9.81*cos60
   = **3.924 N**

TOTAL FORCE = fa + fg + ff

= 80 + 679.656 + 3.924

= **763.58 N**

TOTAL FORCE WITH SHOCK FURTHER

Ft = 763.58*1.2

= **916.296 N**

1. Required pinion torque(tp) = ft* meshing pitch circle diameter

   = 916.29*79.6

   = **36.468 N-m**

2. Pinion RPM = 60,000*0.1/250

= **24 RPM**

3. Motor power required(P) = (tp*RPM)/9549

   = (36.468*24)/9549

   = 0.09165 kw

   = 91.65 watt

   =92 watt (aprox)

4. Daily travel distance(Td) ={Travel dist.*(cycle/day)}*2

   = 1.3*1000(cpd)*2

   = **2600 m**

5. Estimated rack life(Lr) = {Tooth contact life/(cycle/day)}/2

   = {30,000,000/1000}/2

   = **150000 days**

6. Estimated pinion life (Lp)={pinion rev. life*(dist./rev.)}/Td

   = {60,000,000*0.25}/2600

   = **57692.30 days**

TROLLEY CALCULATION:-

INPUT:-

1. Power = **0.5 kw**
2. Gear reduction ratio = **1:180**
3. Rpm = **1440**
4. Final RPM = 1440/180
   = **8 RPM**

From power to torque calculation

$$P = 2\pi NT/60$$

$$0.5*10^{-3} = 2\pi*8*T/60$$

$$T = (0.5*60*10^{-3})/(2\pi*8)$$

$$= \mathbf{596.83\ N\text{-}m}$$

Torque (T) = F*r

$$596.83 = F*0.16$$

$$F = 596.83/0.16$$

$$= \mathbf{5968.3\ N} \qquad \textbf{……. (1)}$$

Cross Verification From Load

- Total load to be carried by **5** wheel
- **4** wheel for main structure &**one** wheel is for cable support
- Total load = **3000 kg**
- Force = 3000*9.81

= **29430 N**

Force/wheel = 29430/5

= **5886 N** **…… (2)**

From eq. (1) & (2) our equation is satisfied hence,

The **0.5 kw** motor & gear ratio **1:80** is satisfied thus our design is **safe**

Wheel diameter should be **200 mm**

PROBLEM DEFINE

WORK IS DIVIDED IN TO TWO STAGES

1. SLIDING DOOR:-

Currently door slides manually by push & pull. Aim is to provide automation to the sliding door via rack and pinion operation with the help of electric motor.

1.1 SENSOR:-

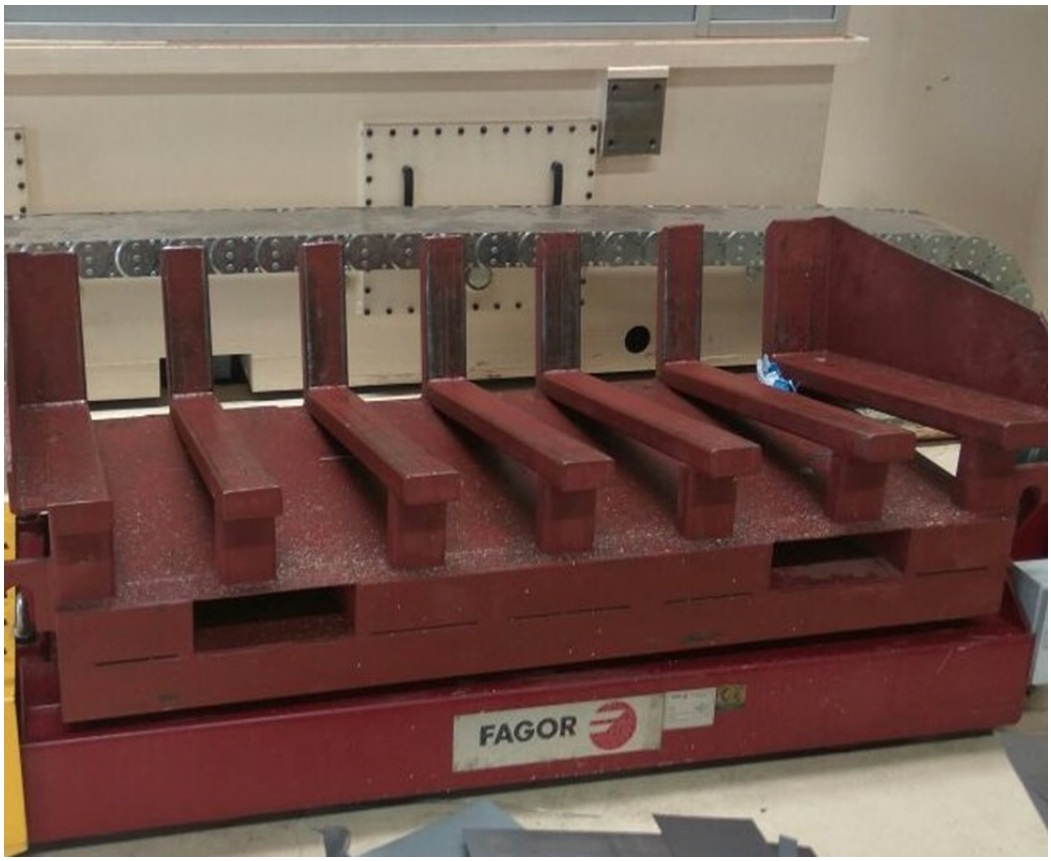
The current position of lock is not suitable for operating process, as it is being located inside the m\c compartment.

Our aim is to move its current position form inside to outside of m\c compartment in order to avoid risk of accidents and ease in operation.

2. TROLLEY:-

Trolley is provided for scrap collection. Currently working on manual basis.

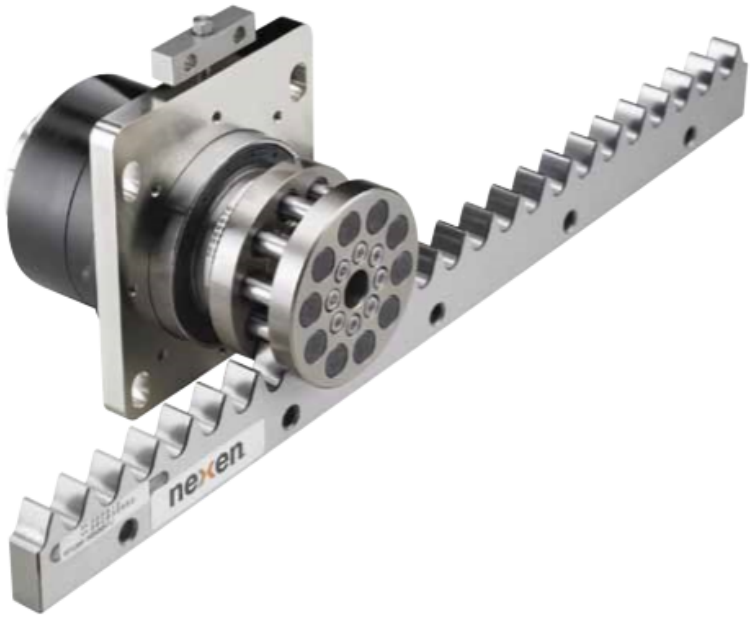
Aim is to provide automation using an electric motor and also using AGV (Automatic Guided Vehicle) technique for more smooth operation.



WORKING

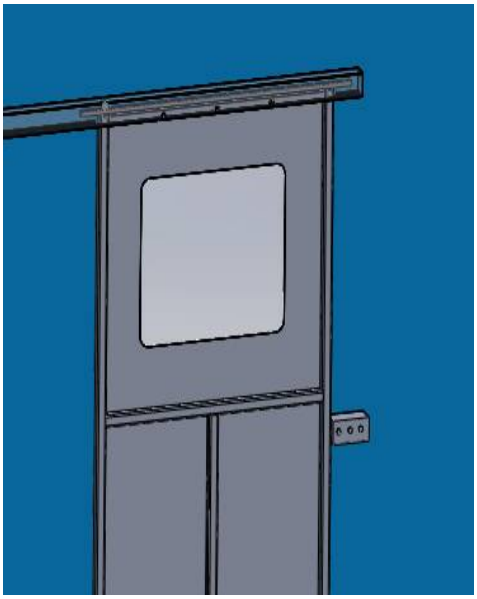
1. SLIDING DOOR:-

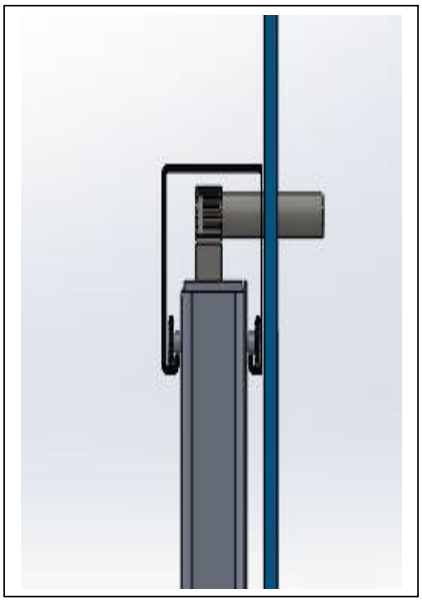
A rack and pinion is a type of linear actuator that comprises a pair of gear which convert rotational motion into linear motion. A circular gear called "the pinion" engages teeth on a linear "gear" bar called "the rack"; rotational motion applied to the pinion causes the rack to move relative to the pinion, thereby translating the rotational motion of the pinion into linear motion with the help of servo motor of about **92 watt** (i.e. 0.1233 HP) as per the requirements.



Thanks to an innovative track, in the final phase of sliding, the moving door wing performs a combined movement of sliding, crushing and vertical translation on the perimeter canopy. The gaskets are sealed on the frame and the floor of the door, which closes at 45° evenly, thus exploiting the weight. The opening and closing movement is sliding and therefore the occupied space is rationalized and the air blast is highly reduced, with limitation of turbulences. With this system it is possible to control the requirements of the air conditioning and pressuring system of the operating room.

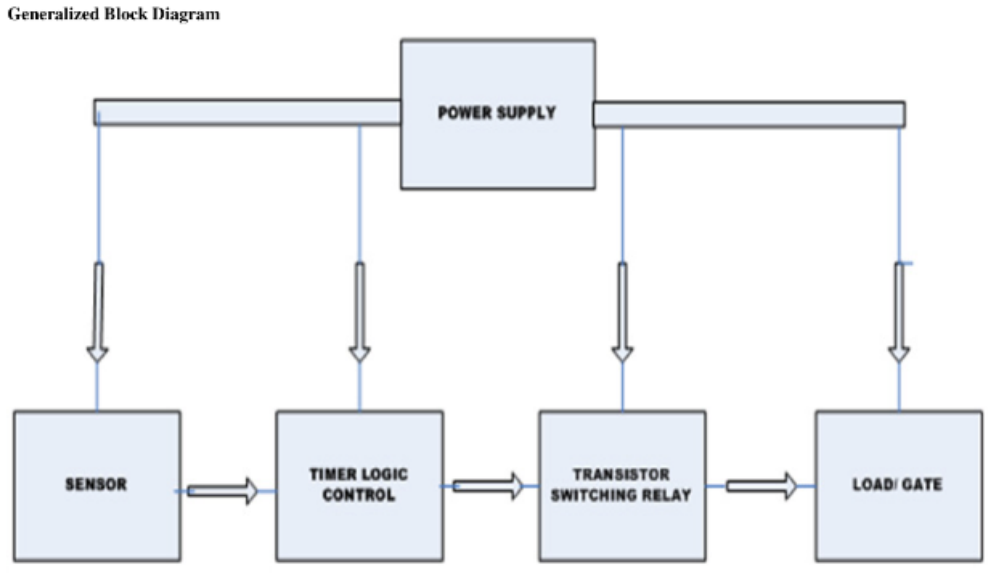
The door is fixed with rack and the rack is supported by the roller bearing which helps to slide the door.





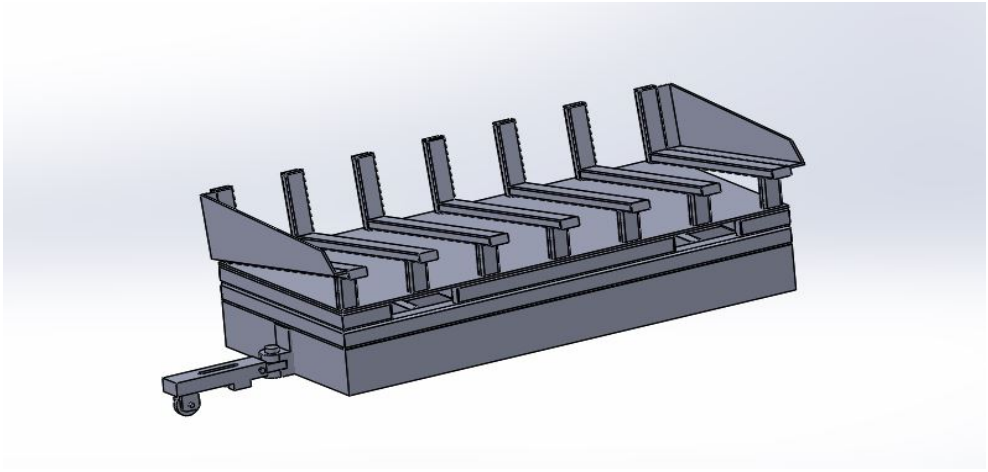
Door sensors have one reed switch and one magnet, creating a closed circuit. If someone opens an armed door or window, the magnet is pulled away from the switch, which breaks the circuit and triggers an event. Depending on your setup and what mode your system is in, this could be a discreet text, a chime alert, or a full-blown alarm.

Generalized block diagram for the function of trolley,



2. TROLLEY:-

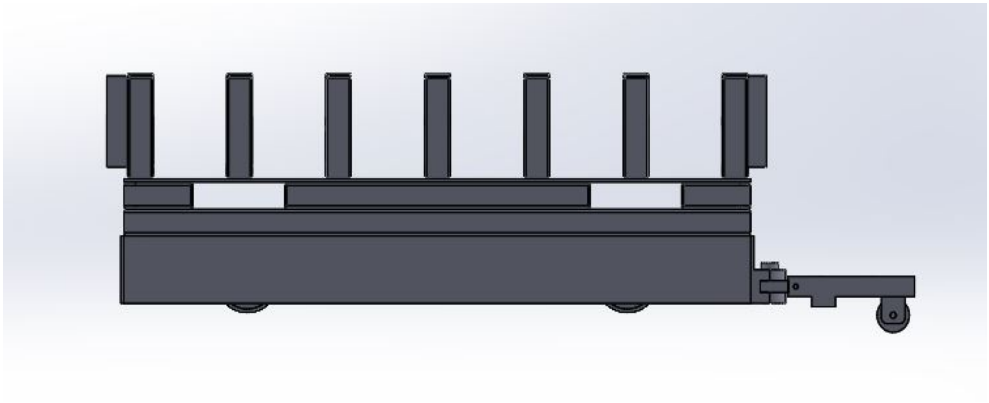
The trolley is used for removing the scrap out of the pressing line. Before the automation the trolley was been manually pulled in and pushed out by an individual labour.



But with help of out automation that is been provided lately it's done with lots ease and all the labour work is removed.

The trolley carries a weight of 2-3Tonnes of scrap. This trolley is been pulled and pushed with a help of a motor whose r.p.m is 1440 with a gear reduction ratio of 1:180 and a power of 0.5 KW. The trolley takes 2-2.5 minutes to come out of the compartment of pressline with a velocity of 7-8 m/s.

The trolley is supported with 5 standard wheels, which carries the load of the trolley. A guide path is provided for an electrical cable\wire which provides the current to the trolley via motor. This cable unwinds when the trolley is pushed out and gets winded when pulled in.

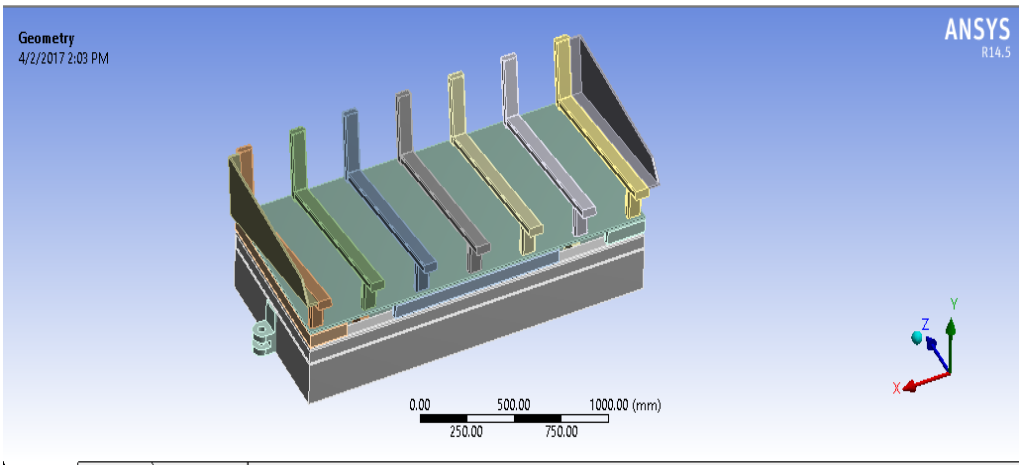


The operation of trolley with a help of software is now been centralised with the other operations. We also have done analysis on trolley so as to verify whether the done calculations are going correct or not, but the analysis have comes out to be safe in every aspect.

With the current automation we save "Right here all the time savings and that we have reduced the risk of accidents and the workers are now satisfied and happy"

TROLLEY ANALYSIS

Geometry:-



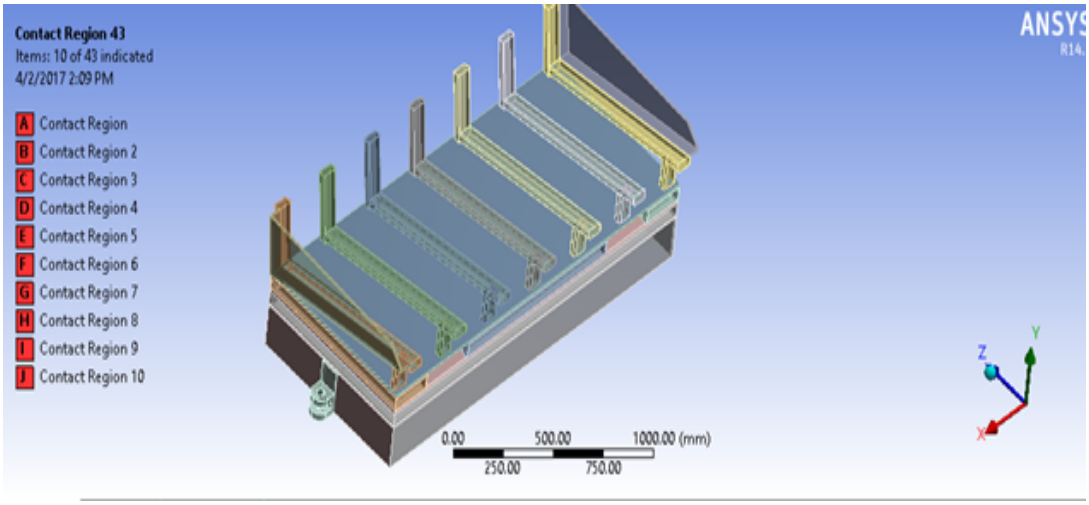
Material properties:-

	A	B	C	D
1	Contents of Engineering Data		Source	Description
2	Material			
3	Structural Steel			Fatigue Data at zero mean stress comes from 1998 ASME BPV Code, Section 8, Div 2, Table 5-110.1
*	Click here to add a new material			

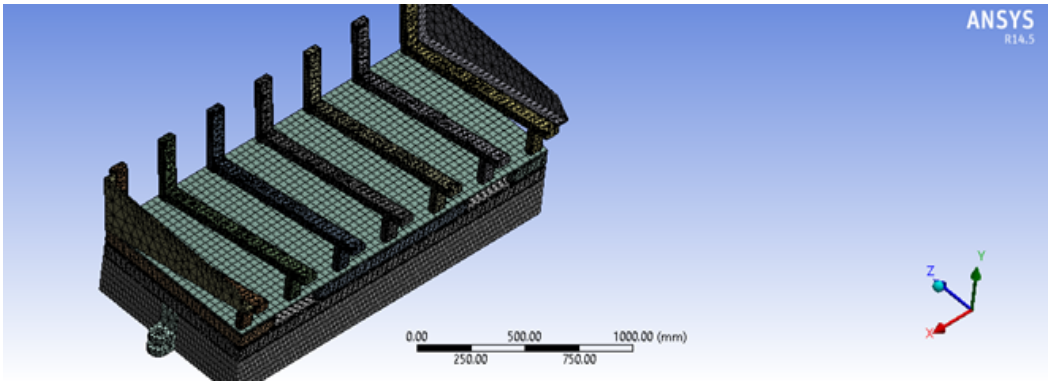
Properties of Outline Row 3: Structural Steel

	A	B	C	D	E
1	Property	Value	Unit		
2	Density	7850	kg m^-3		
3	Isotropic Secant Coefficient of Thermal Expansion				
4	Coefficient of Thermal Expansion	1.2E-05	C^-1		
5	Reference Temperature	22	C		
6	Isotropic Elasticity				
7	Derive from	Young's Modulus and Poi...			
8	Young's Modulus	2E+11	Pa		
9	Poisson's Ratio	0.3			
10	Bulk Modulus	1.6667E+11	Pa		
11	Shear Modulus	7.6923E+10	Pa		
12	Alternating Stress Mean Stress	Tabular			
16	Strain-Life Parameters				
24	Tensile Yield Strength	2.5E+08	Pa		
25	Compressive Yield Strength	2.5E+08	Pa		
26	Tensile Ultimate Strength	4.6E+08	Pa		
27	Compressive Ultimate Strength	0	Pa		

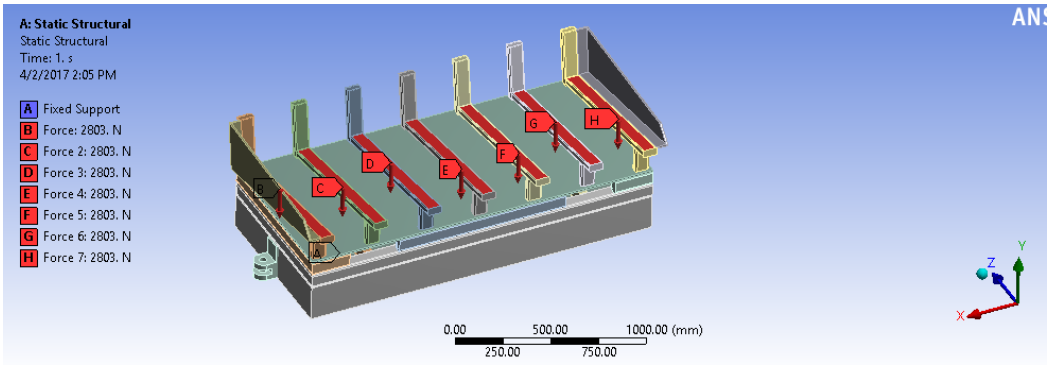
Connection Between Part-Bonded:-

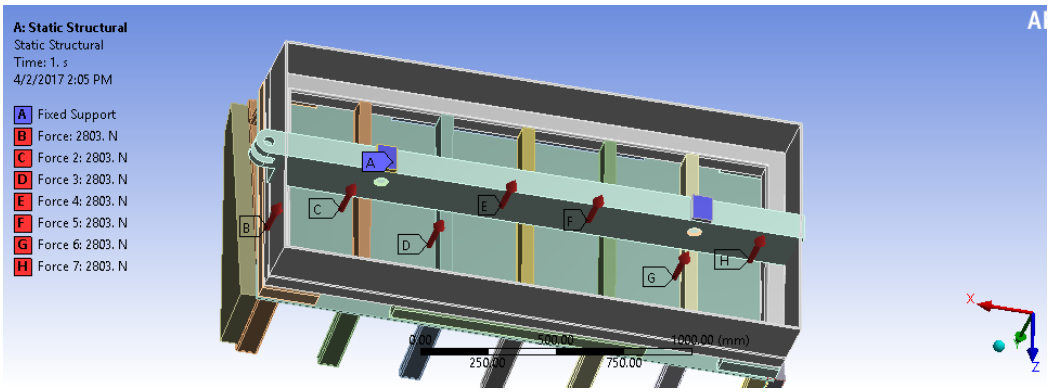


Meshing-Type Fine Default:-

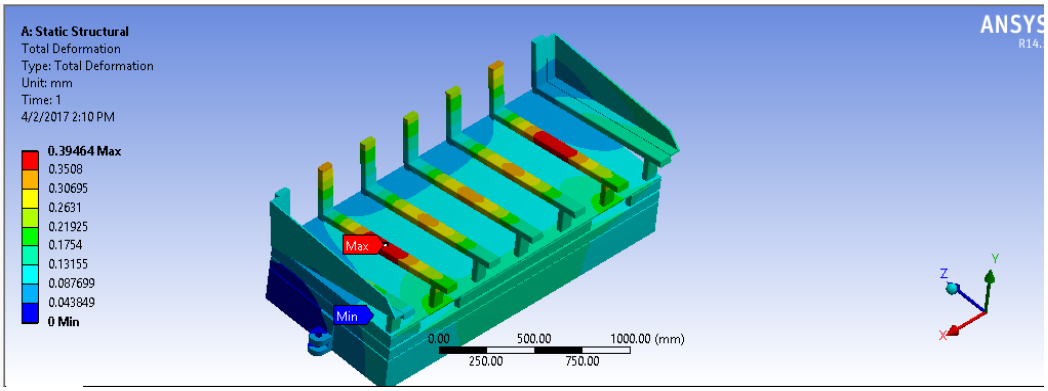


Boundary Condition:-

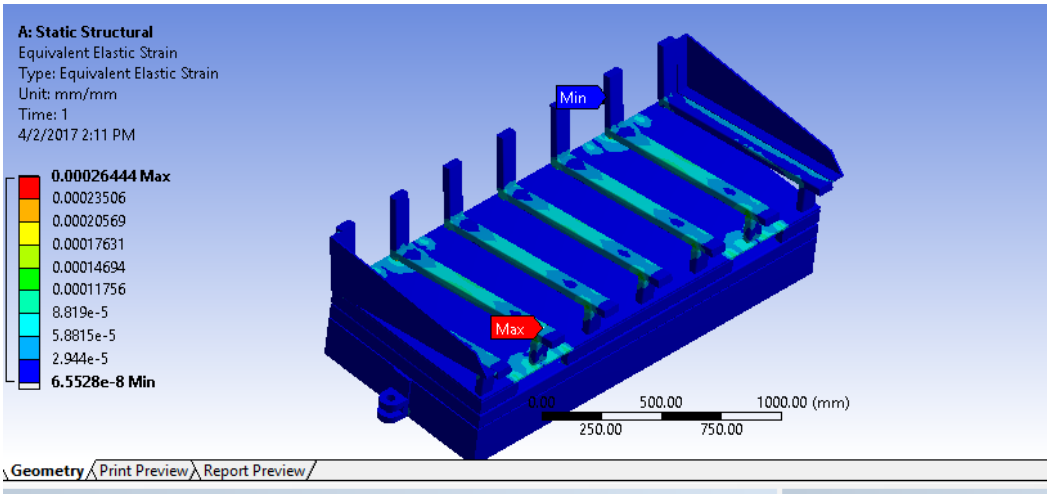




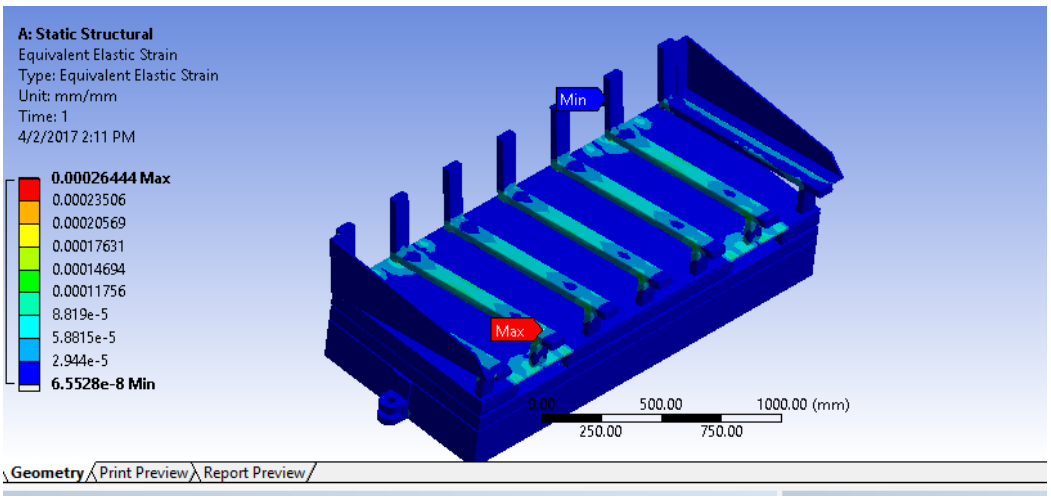
Total Deformation:-



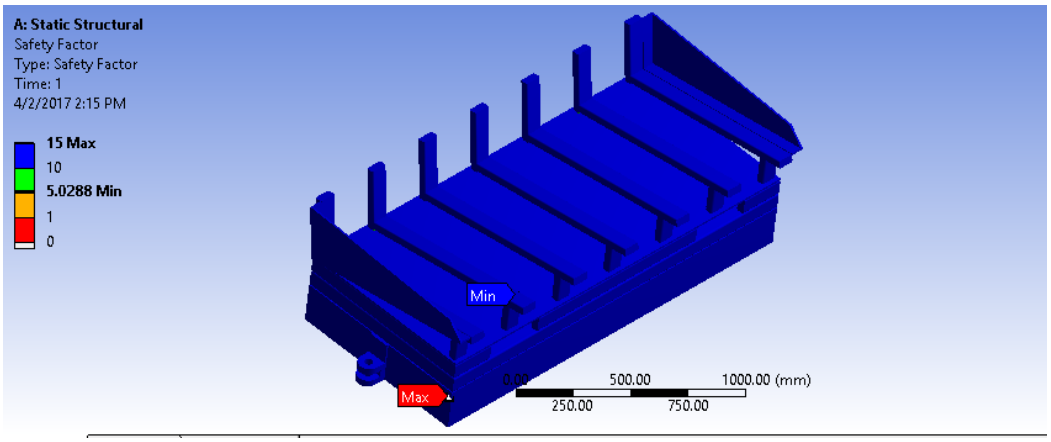
Equivalent Elastic Strain:-



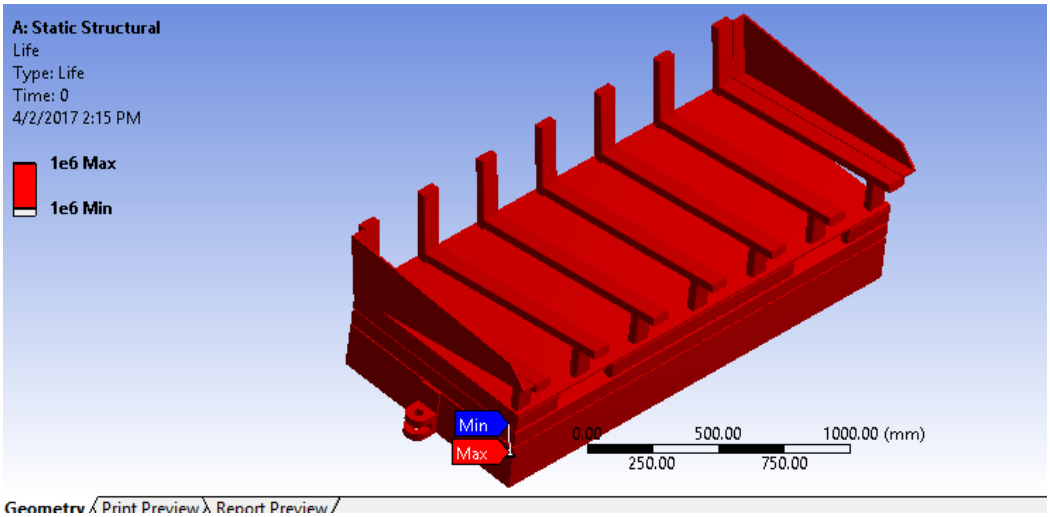
Stress:-



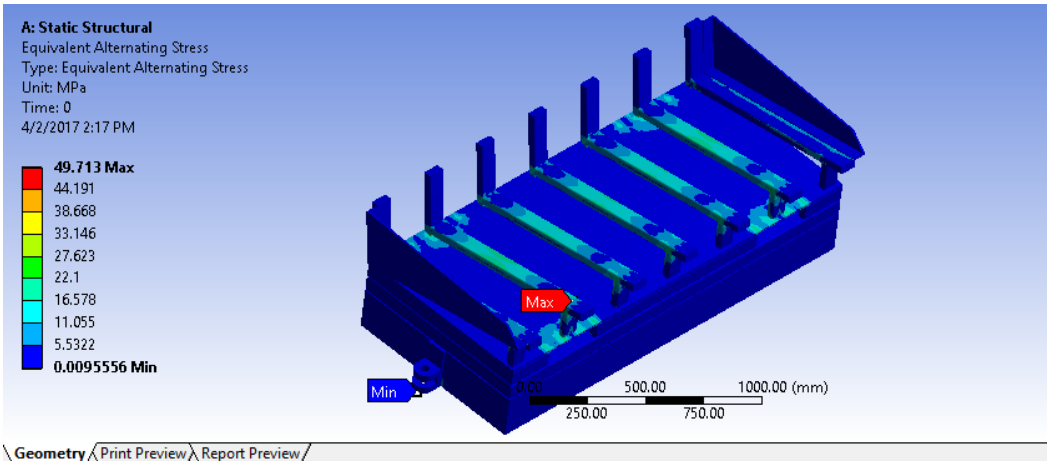
Safety Factor:-



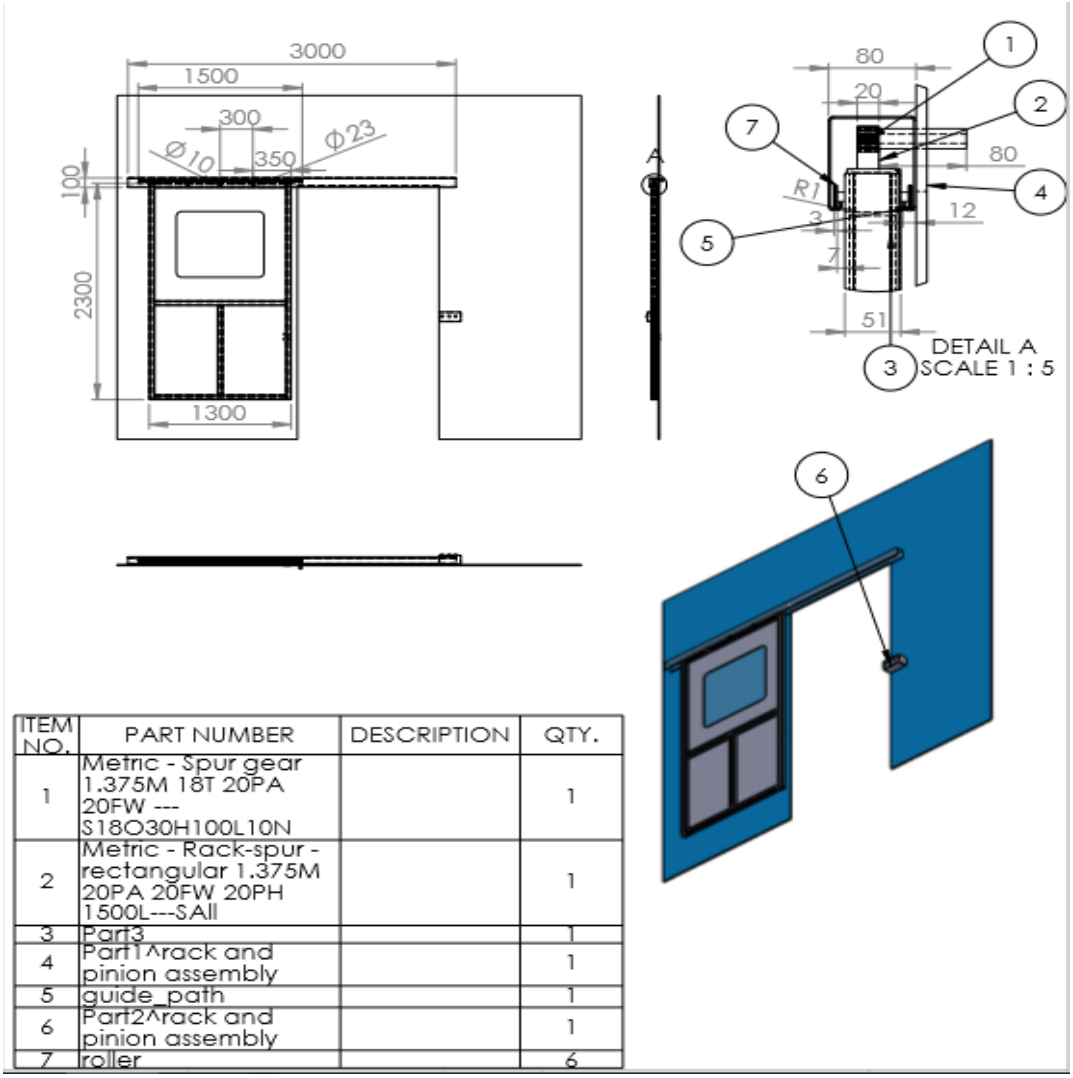
Fatigue Life:-



Alternating stress:-

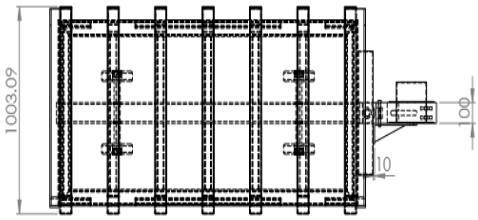


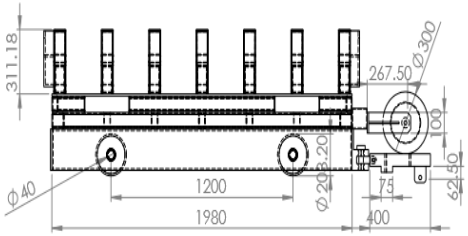
DOOR LAYOUT

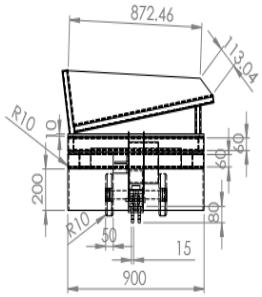


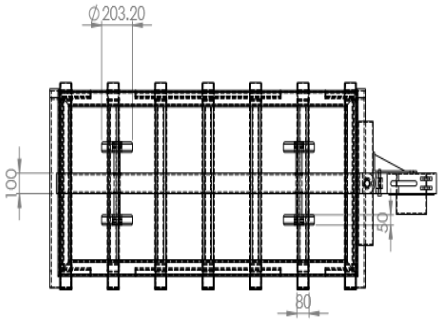
ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	Metric - Spur gear 1.375M 18T 20PA 20FW --- S18O30H100L10N		1
2	Metric - Rack-spur - rectangular 1.375M 20PA 20FW 20PH 1500L---SAll		1
3	Part3		1
4	Part1^rack and pinion assembly		1
5	guide_path		1
6	Part2^rack and pinion assembly		1
7	roller		6

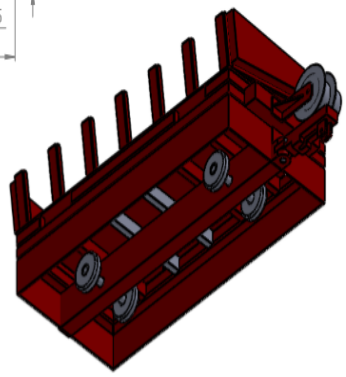
TROLLEY LAYOUT











CONCLUSIONS

The speed of a dc motor has been successfully control by using chopper as a converter and proportional integral type.

In hardware implementation, the mosfet is used as switching device. By using this technique,the pulse width hence than voltage across armature is changed and hence speed varies.

First the alarm is triggered and then the door is operated.

In order to extend the lifetime, the manufacturing process must be given much attention. It includes material selection, motor selection, etc.

Upgrading the system using higher bit microprocessor for speed optimization in door as well in trolley.

Improved efficiency of production system by ensuring the right quantity of materials delivered at the right place at the right time with most economically. And reduce damage of materials during storage and movement hence avoid risk of accidents.

Hence we promote safety and improve working conditions.

FUTURE SCOPE

1. There's so much scope in this project, if succeeded making this project then this project will also be implemented in the various branches of Mahindra Intertrade i.e. in Igatpuri , Pune and Bhopal.

2. Working in plant with skillful employees will help to get fruitful knowledge that can help in our future.

3. While working in plant we are getting to know, how management is being done, how coordination plays a vital role in plant's success, how quality check is being done, what software's are utilized in plant management and operations etc.

4. So the project has wide scope, it just depends upon us on how much knowledge do we grasp from it.

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