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DESIGN OF HYDRAULIC DOOR OPENER

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***Abstract*-hydraulic door opener is an equipment used to open latched or locked door internally or externally by using hydraulic energy we can overcome many drawbacks earlier used rescue tools. It is possible to generate large force to open metallic or wooden door. It can be used by military, fire fighter ,police .The reaction force exerted by hydraulic fluid is utilize to break door/latch. In the operation when cylinder piston is at retracted position. The sharp edges of movable jaw & base part are aligned. The sharp edges of movable jaw & base part both are inserted in to gap between door & frame/latched. The hydraulic pump is used to pressurized the fluid. As the hand pump is pumped, the fluid is pressurized which causes to extract the cylinder piston which is connected to movable jaw by means of piston rod. The hydraulic pressure is transmitted to movable jaw. As the movable jaw pushes the door, the reaction force acting on base part which causes the cylinder to move back & hence the gap between either door & latched or door & frame continuously increases. At the same time the operator has to push jaw in to the gap. When pressure applied reaches to maximum strength of the latch/door, it will fail at the weakest section. Thus door can be opened.**

Keywords- Hydraulic energy, Jaws, Pressure, latch.

I. INTRODUCTION

Hydraulic door opener is powered by a hydraulic pump, which can be hand, foot or engine-powered or even built into the tool. These tools may be either single-acting, where hydraulic pressure will only move the cylinder in one direction, and the return to starting position is accomplished using a pressure-relief valve and spring setup, or dual-acting, in which hydraulic pressure is used to both open and close the hydraulic cylinder.

It is used by military, police, or emergency services to force open closed and/or locked doors. A wide range of methods are available, one or more of which may be used in any given situation.

Previously Army or Fire fighters often used ballistic, thermal, mechanical or explosive methods to open or break the door/latch but these are suffered from many drawbacks. Mechanical saws can produce fire, make loud noise and often slow. The use of Ballistic firearms and handguns are underpowered and rifles are less effective than the shotgun and pose far higher risk of ricochet and collateral injury. Explosive breaching can be the fastest method, though it is also the most dangerous, to both the operator and the room occupants. And thermal method is one of the slowest methods. Hence the Hydraulic power is used to overcome all these drawbacks. This method can develop high pressure to break the door or latch. This is fastest and noise free method and economical.

II. OBJECTIVES

1) To open door at emergency as early as possible . .
2) To make system easy to handle to everyone.
3) To provide system more economical.
4) To provide the system with effective operation.

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III. EXPERIMETAL SETUP LAYOUT

HYDRAULIC DOOR OPENER CONSISTS OF :

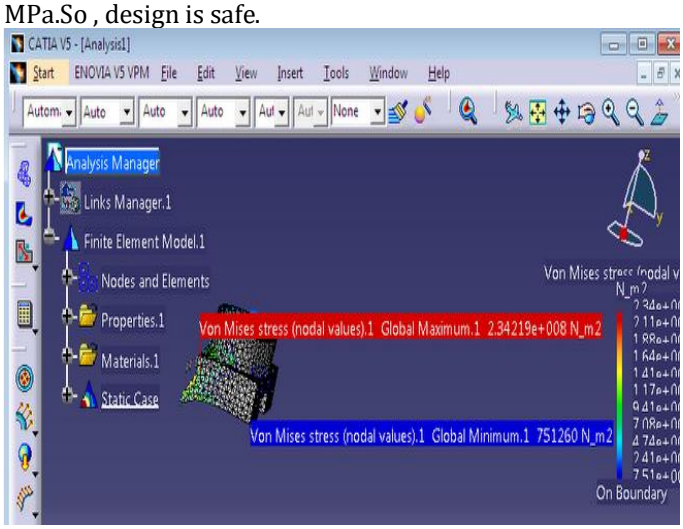
1. Cylinder body
2. Cylinder rod
3. Base part
4. Movable jaw
5. Pump
6. Hose

VI DESIGN ANALYSIS

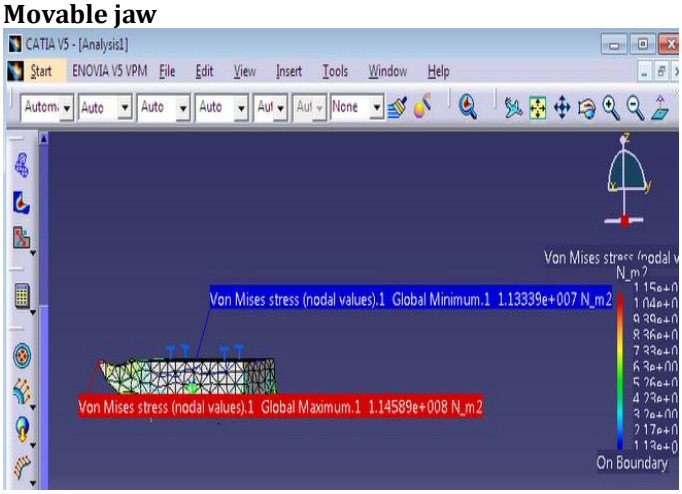
Design analysis of base part and movable jaw:-

Base part

From above diagram , we came to know that the maximum von mises stress is 234.21 MPa which is too smaller than yield strength of material considered (En 24 steel) i.e. 850 MPa.So , design is safe.

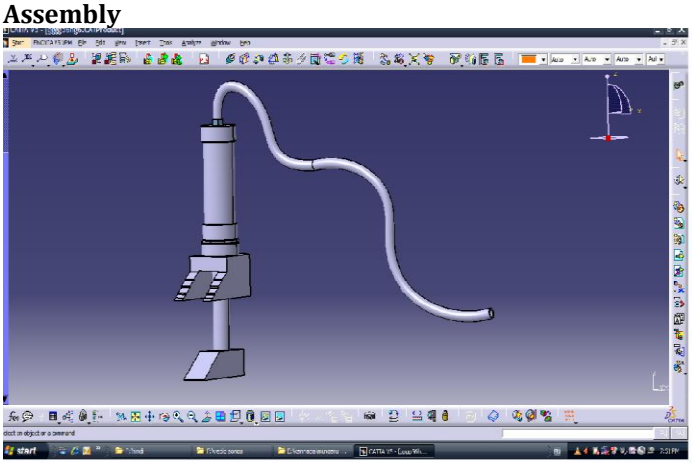


Movable jaw



From above diagram , we came to know that the maximum von mises stress is 114.58 MPa which is smaller than yield strength of material considered (En 19 steel) i.e.530 MPa.So, design is safe.

Assembly



V ADVANTAGES AND LIMITATIONS

Advantages:

- Can provide 10 tons collapsing force for opening the door; working with manual pump can be produced with self-locking functions.
- Safe to work in the explosive place
- Mini sized
- easy to handle
- can be stored in the metal cabinet
- Implementing rapid mobility aid.
- Smooth operation without making noise

Limitations:

- Higher initial cost
- Moderate weight
- Hose is not that flexible

VI APPLICATIONS AND FUTURE SCOPE

Application:

- Accident rescue,
- especially suitable for residential and commercial buildings,
- hotels & fire rescue to open the locked door in time
- Military, police, or emergency services.

Future scope:

- Can be made with compressed air means we can use pneumatic principle.
- We can make it lighter by using other material
- We can use different sensor with it to apply optimum pressure
- We can use screw mechanism also in it

VIII CONCLUSION

We can conclude from the project that we can apply enough pressure for opening closed door with the help of hydraulic force. It is the most economical, suitable and safe method for achieving it. We can improve or replace this method but in coarse of time. But, at this time this method is the most suitable method for opening door if we consider overview. We can open closed door with the help of hydraulic force with ease. We can get about 10 tones of force from this hydraulic door opener. And this is sufficient enough to open or break closed door. We can use this method more easily and conveniently in emergency and rescue situation that other method.

From the test held by us, we can conclude that closed door can be opened by hydraulic door opener successfully.

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