

DESIGN OF RECONDITIONING FIXTURE FOR THE GAS CYLINDER

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ABSTRACT

India is the second largest country to consumption of gas cylinder for the domestic purpose. So the production of the new cylinder is very difficult and also the cylinder may get damaged for a certain age so to overcome from this Indian Standard was adopted by the Bureau of Indian Standards (BIS) the gas committee had been approved by the Heavy Mechanical Engineering Division Council. The cylinder which is used after 5 years should be examination, reconditioning for the inspection, materials, procedure, testing and marking for reconditioning of used gas cylinders of capacity of 5 liters and up to and including 250 liters as to be done. So in this paper design of the fixture is made for the gas cylinder is made which help to hold the cylinder easily without any disturbance for the cylinder and it can be rotated easily in both the direction. The abrasive cut-off machine is used to remove Foot ring and VP ring from the cylinder without damaging the cylinder body. And also it helps to increases in the production rate in all the stations and it reduce the time and cost of the reconditioning of the gas cylinder.

INTRODUCTION

FUEL GASES

Fuel gas is one among the number of fuels that under ordinary conditions are gaseous. Most of fuel gases are composed of hydrocarbons (such as propane or methane), hydrogen, carbon monoxide, or mixtures thereof. Such gases are the sources of potential light energy or heat energy that can be readily distributed and transmitted through pipes from the point of started directly to the place of consumption.

LPG GASES

Liquefied Petroleum Gas (LPG) is defined in the Highly Flammable Liquids and the Liquefied Petroleum Gases Regulations 1972 as “commercial butane, commercial propane or any mixture of both”. This should also conform to the Indian Standards .Liquefied Petroleum Gas, LPG (propane or butane) is a colorless liquid which readily evaporates into gas.

LPG CYLINDER MANUFACTURING

A gas cylinder or tank is a pressure vessel which is used to store gases at above atmospheric pressure. High-pressure gas cylinders are also called as bottles. The LPG gas is stored in these cylinders.

The body of LPG cylinder is deep drawn in two pieces, later these are welded together to make a compact unit without any leak, defect etc. Gas cylinders are in use in 14.2 Kg. and 19 Kg. capacities. To maintain the quality, safety and performance certain regulations are applicable such as BIS standardization and Explosive Lenience etc. While all the cylinders are spray-painted with signal red color. In case of 19 Kg. cylinders, the top is painted in olive green. Cylinders carry their complete history with regard to their serial number, Gross/Tare weight, water capacity, ISE monogram test date, manufacturer identification and year of manufacturing.

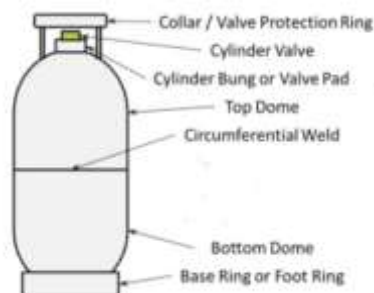
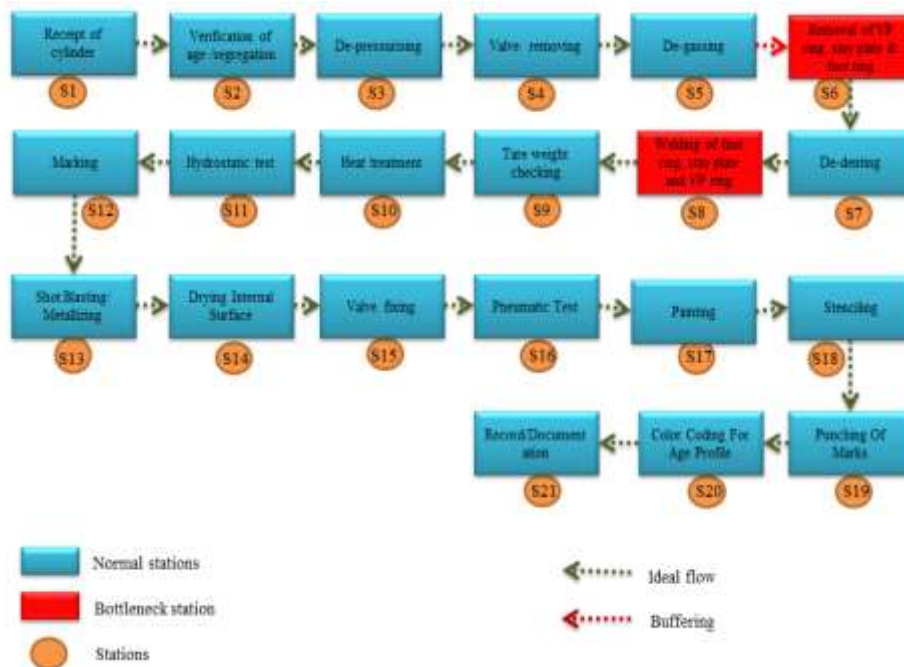


Fig 1: Two piece LPG cylinder

The cylinder manufacturing procedure, from crude material to completed item for two piece cylinder. Crude material according to Seems to be: 6240 or proportional either in curl or sheet structure can be utilized for creating cylinders. For two piece cylinders, roundabout spaces are cut from sheet top and base arches. Top vault further experiences puncturing operation for oblige bung. Valve insurance and foot rings are created by blanking, moving, joining and shaping operations. Uncommon evaluation steel made with Indian standard IS: 6240, Hot moved steel plate (up to 6 mm) sheet and strip for the production of low weight LPG chambers or identical is utilized for making barrel body Standard IS: 3196 indicates basic parameters of material specifically yield quality, rigidity, rate prolongation and the material piece. The bung or valve pad must affirms to class 1A or Class2 of IS: 1875, carbon steel billets, sprouts, pieces and bars for producing or IS: 2062, Steel is utilized for general basic purposes Valve Protection Ring, Foot Ring must affirm to Grade of IS: 1079, Hot moved carbon steel sheets and strip IS: 2062 or IS: 6240

HOT REPAIR PROCESS STATIONS



the production line of a hot repair process and its stations are shown in above flow chart it consists of a 21 stations in which the flow of the products (cylinder) are take place in all the stations.

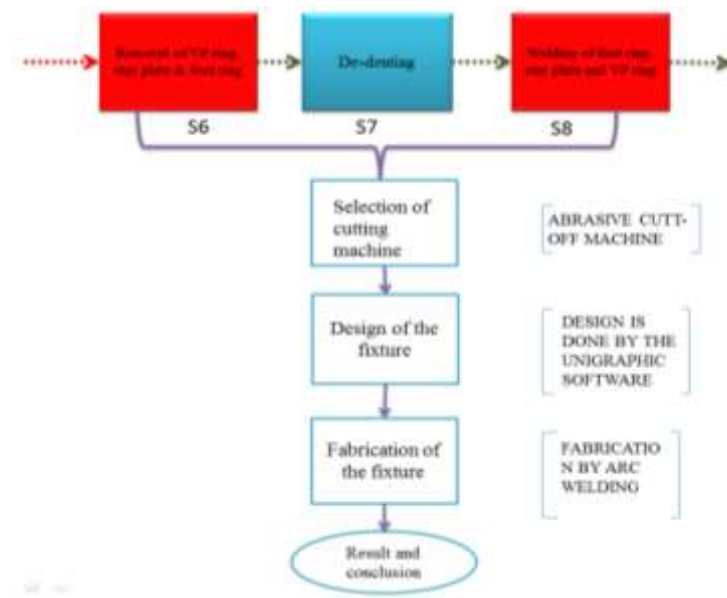
In the station one “S1”the receipt of cylinder takes place in which the cylinder are received from the IOC plant or from other plant are proper documents as to be checked for the given cylinder and also it should be made “gas free” prior for hot repairs, LPG cylinder must also confirmed BIS 3196 for the hot repair.

When the cylinder comes for a hot repair process the priority should be given for the cylinder which required both valve protection ring and the foot ring replacement. This operation is carried in station No “S6” the removal of valve protection ring and Foot ring has been carried through the chisel and hammer and This station is consider as a bottleneck station in which actual process should start from this station by the proper batch production of the cylinder for the next station if it carried very slowly by grinding machine then there is a buffering of the cylinder take place in the station and so this station has been showed in red color. If the possible outcome of the cylinder take place in the station means the continuous flow of the cylinder takes place in perfect time and possible batch production of the cylinder can be achieved. All other stations explained in the repair process.

MATERIALS AND METHODS

The methodology is the process that carries out in the project as shown in the above figure, considering the station S6 and S8 is the bottleneck station in the process to improve this proper arrangement as to be done. The remove VP ring his to be done by selection of the proper cutting machine and this is done by the abrasive cut-

off machine, to hold the cylinder proper fixture has to be made for this proper design is done by the unigraphic software, this fixture is fabricated according to the dimension of the design and it explained below chapter design and fabrication. Result and discussion as made in the further chapter.



ABRASIVE CUT-OFF MACHINE



Fig 2: Portable cut-off machine

The cut off machine is inclined and placed on the fixture as shown in the below figure. The wheel is placed such that it is 90 degrees from the base and is supported by two slanted bars and is placed such that it can be carried anywhere with the help of the wheel provided in the base.

This baseplate with cutting machine can be used for various cutting applications by the use of the vice which holds the material. It is also made in a portable type which can be moved anywhere easily and can be used for any type of cutting operation in a vertical direction.

The main advantage of the cutter machine is that it can be used easily and for other smaller applications; it requires less effort to operate and the maximum removal of the weld in the cylinder can be carried out without damaging the cylinder. The fast cutting process can be done. The cutting fixture, as provided with a wheel, can be moved everywhere in the plant, so it is portable inside the plant. The process is very safe to operate so that an accident can be avoided and the whole plant will get sufficient work to achieve the cutting process and also added advantage to the next station. It can cut a maximum of 100mm, it can be used with only half the amount of blade to cut for a better operation, it can be cut at a straight angle to gravity. While cutting it produces high sparks, so safety

measures are taken care like (goggles, hand gloves, and helmet) are used, the machine as high RPM so skilled operator as to be used, the cost of the machine is much higher and blade are changed after wear out, it can't be used directly to cutting process the proper fixture or vice are to be used.

DESIGN OF THE FIXTURE

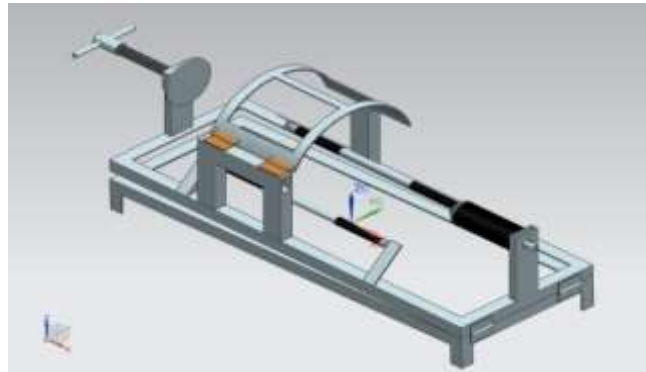


Fig 3: The full assembled fixture design

The above shown figure achieved by using the design software NX, formerly known as NX unigraphics, is an advanced high end CAD/CAM/CAE software package. is fully assembled design In this design the back side support has been given in which it has constructed like a circular disk which hold full back side position and it has made like locking system the treaded when it rotate the disk it tighten cylinder from the back and it has made to rotate the cylinder without any vibration. And the rod as given which are support the cylinder from the down and also help to rotate the cylinder in which rod are attached by the bearing. The front position is given by the rotating circular tube which is going to help the cylinder by holding the valve of the cylinder and the top position is given by the locking plate and it also have the small roller which help the cylinder to rotate.

METHOD OF OPERATION

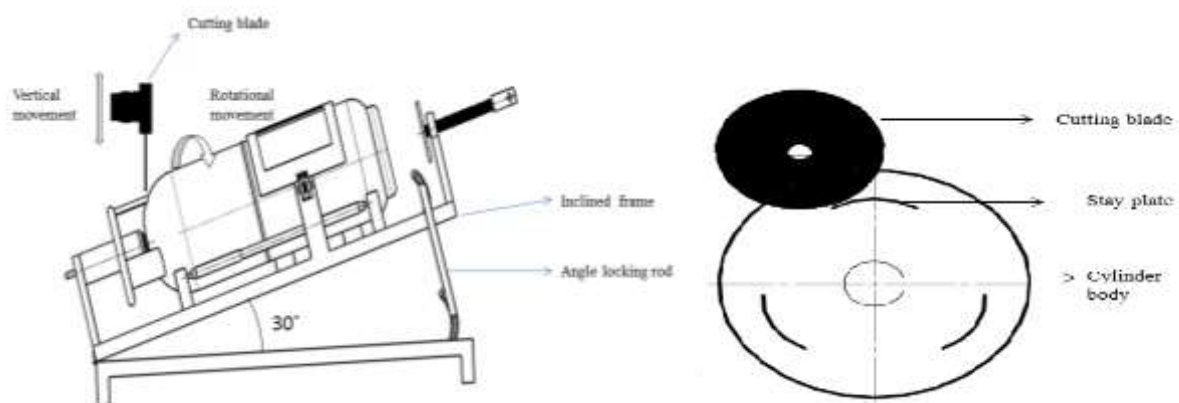


Fig 4: cutting operation

The above figure shows the cutting position of the stay plate in which the cylinder is inclined to 30 degree of the angle the abrasive cutting disc or blade brought near to the welded point of the stay plate vertically down word, it place in a correct position and start cutting of the stay plate by rotating small amount cylinder for the cut of stay plate. This operation carried easily without damaging the cylinder body by use of the fixture and fast work can be done by less number of the worker. The front view of the cutting operation is showed in the figure 5.16 in which the blade placed near to the stay plate and it move little for exact remove of the stay plate.



RESULTS AND DISCUSSION

With the design of the fixture to remove of the VP ring and FOOT ring is showed. With less effort and time work is carried easily without damaging to the cylinder body, by this fixture the production rate increases in the station without any buffer formation in the flow line. Comparison is made with the old method for the station

Type	Manual method (old method)	Presently Developed method
Shift	8hr shift/180day	8hr shift/180day
Production type	Batch production	Batch production
No. persons worked	Holding Cylinder and Revolving (2 helper) Hammering (2 skilled Workers)	Loading and unloading (2 helper) operating (1 operator)
Tools used	<ul style="list-style-type: none"> • Fixture • Chisel • Hammer • Grinding chisel for sharpness 	<ul style="list-style-type: none"> • Fixture • Cut-off machine • Abrasive cutter wheel
No. of cylinder worked/day	Around 120-150 Max of 150	Around 350-400 Min of 350
wage for worker/day 300rs for helper and 450 for skilled worker / operator	2 helper 300X2=600 2 worker 450X2=800 <hr/> Total =1400	2 helper 300X2=600 1 operator 450X1=450 <hr/> Total =1050

The table show the comparison b/w the old method and new method in which there is a lot of increment by the new method, there is a more increase in the production of the cylinder, worker reduced and cost can be minimized, reduced in the time for the overall capacity of the cylinder

CONCLUSION

The design of the reconditioning fixture is carried with the help of modeling software to get the dimensions to fabricate the fixture. The fixture fabricated which helps the reconditioning process faster by avoiding blocking and starving in respective stations. The fixture arrangement is arranged in such a way that no damage to the spherical shape of the cylinder and the cut of stay plate is very close which helps to the next station. the above mentioned facts helps to conclude reconditioning fixture is safer, cost effective and more efficient.

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REFERENCES

- [1] Bureau of Indian Standards (2012). IS 3196 (Part3):2012. Welded low carbon steel cylinders exceeding 5 liter water capacity for low pressure liquefiable gases Part 3 Methods of Test (Fifth Revision). New Delhi: Bureau Of Indian Standards.
- [2] Bureau of Indian Standards (2006): IS 13258 (part 1) it explain the welded low carbon steel cylinders exceeding 5 litre water capacity for low pressure liquefiable gases code of practice for inspection and



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reconditioning of used lpg cylinders. As per the above journal it explain the defects and the inspection of the lpg cylinder and recondition of the cylinder according to Indian standards

- [3] Nihal A Siddiqui&Akula Ramakrishna: they made the review on liquefied petroleum gas cylinder design and manufacturing process as per Indian standard, is 3196 (part1): 2006 which explain the cylinder manufacture and the material used for construction of the foot ring and VP ring and also the Cylinder Manufacturing Process flow diagram.
- [4] Akula Ramakrishna & Nihal A Siddiqui : they made the International Journal on Study on Hydro Testing of LPG Cylinders by this journal we can observe the manufacturing procedure and the material