Optimization of various gases cutting process by changing various parameters

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Abstract - *Now* a days optimization is essential process of an industry whether it is in form of process, cost, equipment, etc. In the welding cutting process according to various material various gas is utilized & gas is one of the energy producer (generator) material & it is our conventional energy source so to reduce gas utilization is our motto for full fill our motto in this research world we are 3 parameter of gas cutting is apply for the optimization MRR our research going on material M.S., C.I. C-45 sheet(thickness vary 6mm, 8mm , 10mm)

Keywords: - Oxygen cylinder, LPG cylinder, Gun, Pressure gauge, M.S., C.I.,C-45.

1. INTRODUCTION

1.1 PRINCIPAL OF GAS CUTTING

In gas cutting, the metal is first preheated with the ox fuel flame to the ignition temperature. When the required temperature is reached, the cutting oxygen is turned on, and the stream of pure oxygen is directed against the heated metal. This ignites the iron or steel and starts the cut.[3]

1.2 OXYGEN GAS CYLINDER

Oxygen cylinder is drawn from a piece of high strength steel plate and is available in common sizes of:
244 cu ft. (for industrial plants);
122 cu ft.
80 cu ft.
Oxygen is stored within cylinders at a pressure of 2200 psi when filled @70°F and is capable of retaining a pressure of almost twice the fill pressure.
The oxygen volume in a cylinder is directly proportional to its pressure. In other words, if the original pressure of a full oxygen cylinder drops by 10% during welding, it means 1/10th of the cylinder contents have been consumed.
Oxygen cylinders are usually painted green and are screwed right handed. [1]

1.3 OXYGEN CYLINDER VALVES

The oxygen cylinder valve is made largely of brass with right hand threads. Its outlet is threaded and machined to comply with standards set by the Compressed Gas Association (CGA) and the American National Standards Institute (ANSI).
All oxygen regulators sold in the U.S and Canada for use on industrial oxygen cylinders carry a mating inlet nut and nipple.
The connection is designated "CGA 540". Every oxygen cylinder valve is also equipped with a bursting disk which will rupture and release the contents of the cylinder if cylinder pressure should approach cylinder test pressure.
In order to protect cylinder valve from getting damaged, a removable steel cap is screwed on the cylinder at all times when the cylinder is not in use. The cylinder valve is kept closed when the cylinder is not in use and even when cylinder is empty.[1]

1.4 ACETYLENE GAS CYLINDER

An acetylene cylinder is also a solid drawn steel cylinder and the common sizes are 300, 120 and 75 cubic feet. Cylinder pressure is 250 PSI when filled. An acetylene cylinder is painted maroon and the valves are screwed left handed.. Acetylene cylinders are packed with porous material that is saturated with acetone to allow the safe storage of acetylene. These porous filler materials aid in the prevention of high-pressure gas pockets forming in the cylinder.

Acetone, a colourless, flammable liquid, is than added to the cylinder until about 40 present of the porous material is saturated. Acetone is a liquid chemical that dissolves large portions of acetylene under

Pressure without changing the nature of the gas and is a liquid capable of absorbing 25 times its own volume of acetylene gas at normal pressure. Being a liquid, acetone can be drawn from an acetylene cylinder when it is not upright [1]

(Fig.1 oxygen& acetylene cylinder)

1.5 OXYGEN & ACETYLENE PRESSURE REGULATORS

The pressure of the gases obtained from cylinders is considerably higher than the gas pressure used to operate the welding torch. The purpose of using a gas pressure regulator is:

• To reduce the high pressure of the gas in the cylinder to a suitable working pressure, and

• To produce a steady flow of gas under varying cylinder pressures. [1]

(Fig. 2 PRESSURE REGULATORS)

1.6 GAS HOSES & CLAMPS

The hoses used to make the connections between the torch and the regulators must be strong, nonporous, light, and flexible enough to make torch movements easy. The most common type of cutting and welding hose is the twin or double hose that consists of the fuel hose and the oxygen hose joined together side by side.

Size is determined by the inside diameter, and the proper size to use depends on the type of work for which it is intended. Hose used for light work has a 3/1 6 or 1/4 inch inside diameter and one or two plies of fabric. For heavy-duty welding and cutting operations, use a hose with an inside diameter of 5/1 6 inch and three to five plies of fabric. Single hose is available in the standard sizes as well as 1/2-, 3/4-, and 1-inch sizes.

(Fig. 3 Gas hoses &clamps)

2. Experimental set-up

(Fig.4 Gas cutting setup)

(Fig.5 working of gas cutting on C-45 material)

(Fig.6 working of gas cutting on M.S. material)

3. Result table

3.1 M.S.

(Fig.5 Gas cutting by LPG)

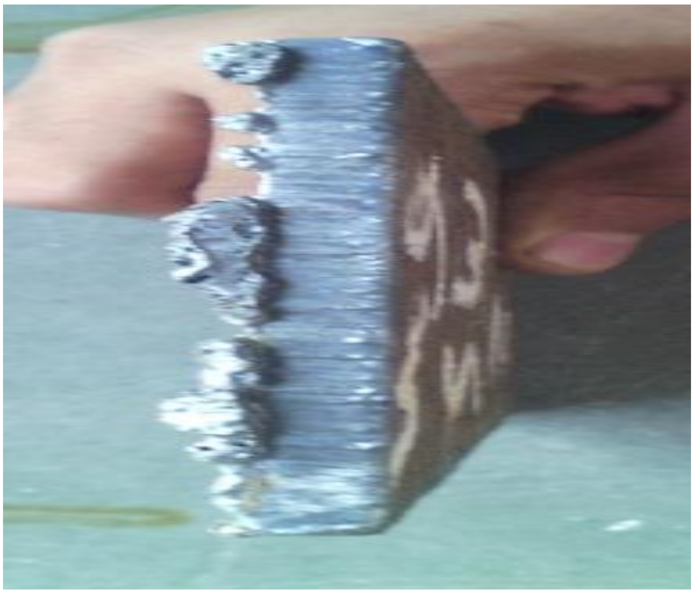
Thickness	6 mm
Standby distance	7 mm
Time	62 sec
M.R.R.	15 mm
Feed	2.5 m/s

(Table -1 Material –M.S., Thickness-6 mm)

(Fig. 6 Gas cutting by LPG)

Thickness	6 mm
Standby distance	3 mm
Time	25 sec
M.R.R	24
Feed	4 m/s

(Table -2 Material –M.S., Thickness-6 mm)



(Fig.6 Gas cutting by LPG)

International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395 -0056
Volume: 02 Issue: 02 | May-2015 www.irjet.net p-ISSN: 2395-0072

Thickness	6 mm
Standby distance	5 mm
Time	56 sec
M.R.R.	16.60 mm
Feed	2.76 m/s

(Table -3 Material –M.S., Thickness-6 mm)

(Fig.7 Gas cutting by LPG)

Thickness	8 mm
Standby distance	3 mm
Time	43 sec
M.R.R.	13.95 mm
Feed	2.32 m/s

(Table -4 Material –M.S., Thickness-8 mm)

(Fig.8 Gas cutting by LPG)

Thickness	8 mm
Standby distance	7 mm
Time	50 sec
M.R.R.	18.5 mm
Feed	3.5 m/s

(Table -5 Material –M.S., Thickness-8 mm)

(Fig.9 Gas cutting by LPG)

Thickness	8 mm
Standby distance	5 mm
Time	52 sec
M.R.R.	17.88 mm
Feed	2.90 m/s

(Table -6 Material –M.S., Thickness-8 mm)

(Fig.10 Gas cutting by LPG)

Thickness	10 mm
Standby distance	3 mm
Time	31 sec
M.R.R.	19.35 mm
Feed	3.22 m/s

(Table -7 Material –M.S., Thickness-10 mm)

(Fig.11 Gas cutting by LPG)

Thickness	10 mm
Standby distance	7 mm
Time	51 sec
M.R.R.	21.62 mm
Feed	3.03 m/s

(Table -8 Material –M.S., Thickness-8 mm)

(Fig.12 Gas cutting by LPG)

(Table -9 Material –M.S., Thickness-10 mm)

Thickness	10 mm
Standby distance	7 mm
Time	43 sec
M.R.R.	21.62 mm
Feed	3.60 m/s

C45

(Fig.13 Gas cutting by LPG)

(Table -10 Material –M.S., Thickness-6 mm)

Thickness	6 mm
Standby distance	3 mm
Time	45 sec
M.R.R.	13.33 mm
Feed	2.22 m/s

(Fig.14 Gas cutting by LPG)

Thickness	6 mm
Standby distance	7 mm
Time	54 sec
M.R.R.	17.22 mm
Feed	2.87 m/s

(Table -11Material –M.S., Thickness-6 mm)

(Fig.15 Gas cutting by LPG)

Thickness	6 mm
Standby distance	5 mm
Time	58 sec
M.R.R.	16.03 mm
Feed	2.67 m/s

(Table -12 Material –M.S., Thickness-6 mm)

(Fig.16 Gas cutting by LPG)

Thickness	8 mm
Standby distance	3 mm
Time	21 sec
M.R.R.	25 mm
Feed	4.16 m/s

(Table -13 Material –M.S., Thickness-8 mm)

(Fig.17 Gas cutting by LPG)

Thickness	8 mm
Standby distance	7 mm
Time	43 sec
M.R.R.	21.62 mm
Feed	3.60 m/s

(Table-14 Material –C-45 , Thickness-8 mm)

(Fig.18 Gas cutting by LPG)
(Table-15 Material –C-45, Thickness-8 mm)

Thickness	8 mm
Standby distance	5 mm
Time	34 sec
M.R.R.	27.35 mm
Feed	4.55 m/s

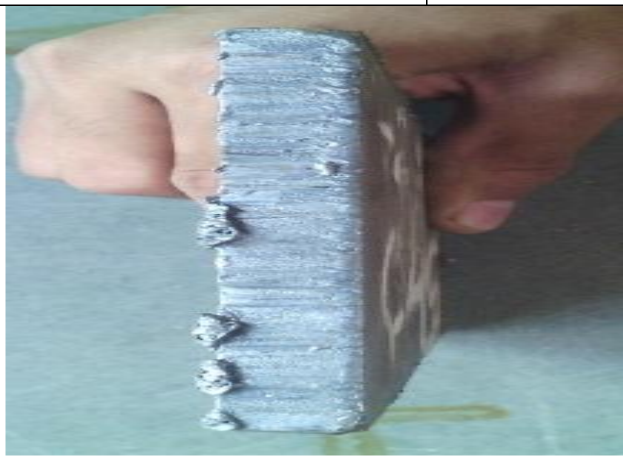
(Fig.19 Gas cutting by LPG)

Thickness	10 mm
Standby distance	3 mm
Time	19 sec
M.R.R.	31.57 mm
Feed	5.26 m/s

(Table-16 Material –C-45, Thickness-10 mm)

(Fig.20 Gas cutting by LPG)
(Table-17 Material –C-45, Thickness-10 mm)

Thickness	10 mm
Standby distance	7 mm
Time	64 sec
M.R.R.	14.53 mm
Feed	2.42 m/s



(Fig.21 Gas cutting by LPG)

Thickness	10 mm
Standby distance	5 mm
Time	44 sec
M.R.R.	21.13 mm
Feed	3.52 m/s

(Table-18 Material –C-45, Thickness-10 mm)

Conclusion

From this project, we can conclude that MRR is decrease, when we can cut the material of M.S with the help of LPG gas by increase the thickness of M.S (6,8,10 mm) & also increase the stand by distance between material plate &welding torch (3,5,7).

From this project, we can conclude that MRR is decrease, when we can cut the material of C-45 with the help of LPG gas by increase the thickness of M.S (6,8,10 mm) & also increase the stand by distance between material plate & welding torch (3,5,7).

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