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Design of Adjustable V Block

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Abstract— In various branches of industry (for example, in paper, electric, ship and power plant industry), large and heavy cylindrical elements play very important role. Two pipes are first supported by fixed v blocks before joining process. The main objective of the V block is to support the weight of the pipe headers that are being joined together. To overcome the drawbacks from using this method of adjusting the pipe headers, a new method of adjustable v block is developed to support the weight of the pipes and to adjust the height of the v block.
Key words— adjustable v block, static v block, screw attached v block

I. INTRODUCTION

V blocks are precious metal working jigs typically used to hold round metal rods or pipes for performing drilling or milling operations. It consists of a rectangular steel or cast iron block with a 90 degree channel rotated 45 degree from the sides forming a reshaped channel in the top of small groove is cut in the bottom of the v block. They often come with screw clams to hold the work, there are also versions with internal magnets for magnetic work holding, v blocks are usually solid pair.
A v block is a device used to hold a round piece of stock secured typically used in drilling and machining process v blocks offer round piece of wood or steel stock in a cradle like bed of support. The devices also have screw clams and locking devices fixed to lock the work piece once it is proper position.

A. Problem Identification

1) *Limitations on using roller support*: Roller supports are also used for supporting the two pipe headers for joining, but using roller support is being limited as it has large surface in contact with the pipe headers. Header pipes have large number of stubs in between so it will be difficult in using roller support as it will damage the stubs. By considering this roller supports cannot be used for pipes with stubs welded on them.
2) *Load acting on V blocks:* In roller the point of contact can be adjusted by adjusting the position of the rollers, but in V blocks it should be manufactured sufficiently to handle the particular size of pipes and it should not affect the rotation of pipes. It should be designed in minimizing the point of contact between the pipe and V block

II. MODELLING

The modelling was drawn using the Pro-E software. Each part is sketched and then extruded along an axis. All parts (screw thread, base plate, I section, closed frame plate, hollow pipe, plate with hole, handle base, bearing, side plate, handle rod, V block, square block) are modelled and assembled.

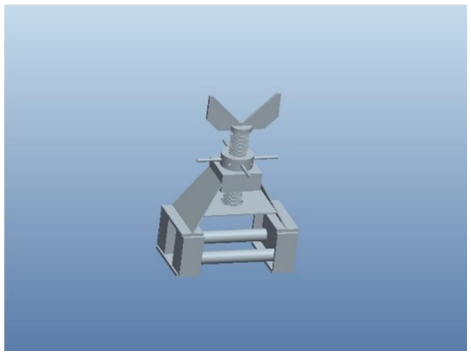
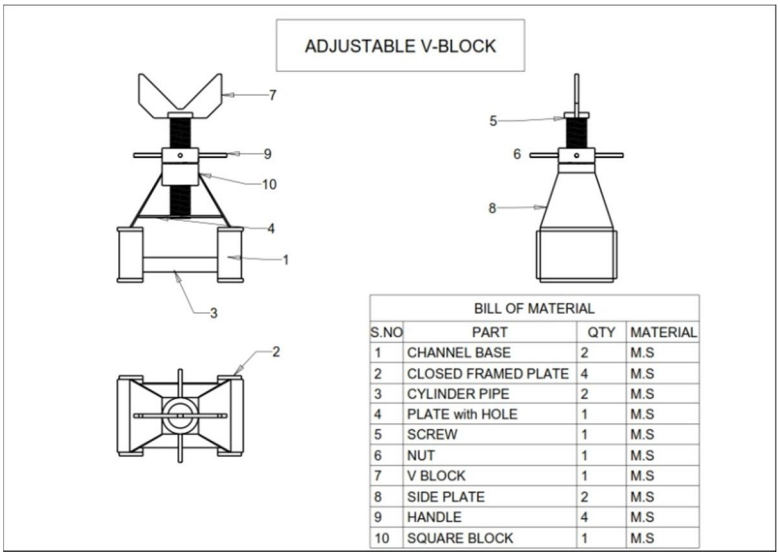


Fig 1: Assembled View

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BILL OF MATERIAL

S.NO	PART	QTY	MATERIAL
1	CHANNEL BASE	2	M.S
2	CLOSED FRAMED PLATE	4	M.S
3	CYLINDER PIPE	2	M.S
4	PLATE with HOLE	1	M.S
5	SCREW	1	M.S
6	NUT	1	M.S
7	V BLOCK	1	M.S
8	SIDE PLATE	2	M.S
9	HANDLE	4	M.S
10	SQUARE BLOCK	1	M.S

Fig 2: Drafting

III. PROCESS AND COST ESTIMATIONA.

A. Gas cutting

Gas cutting uses oxygen and acetylene as fuel to cut the materials to desired shape.It is used to cut the components like V block,Sideplate, plate with hole

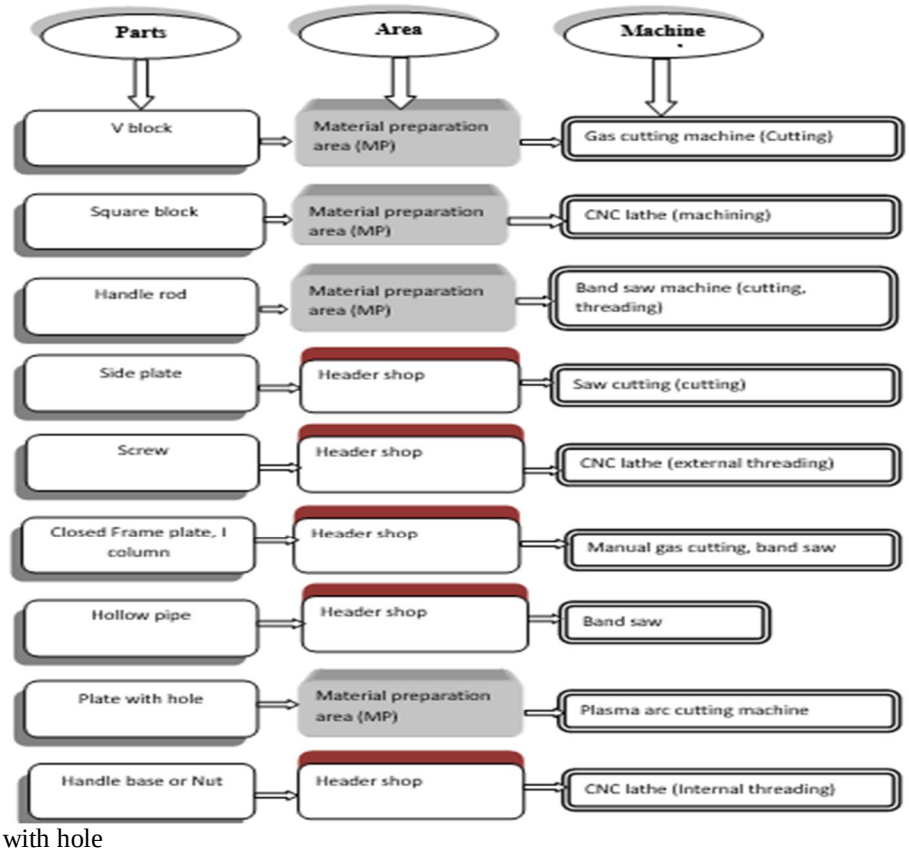


Fig 3: Process Planning

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B. CNC Lathe

The main component in the adjustable v block is screw rod and box nut these two are machining in the CNC lathe .Based on the drawing dimension initially programed then machined the screw. In this external thread was achieved and for box nut internal thread also be machined.

C. Welding

All the components are assembled and welded by using arc welding. The electrode rods which we are using for welding the whole components are **E7018.** Before welding we use the **heat treatment** method, because by heating the area to be welded, the atom particles in the material and electrode fusion together. Then the welding and material are tightly bonded together. This method reduces the cracks, and gives strong joining. It is the estimated cost for the proposed work. A cost estimate is the approximation of the cost of a program, project or operation. The cost estimation is the product of the cost estimating process.

Material Used= Mild Steel
Density= 7.85×10^{-6} kg/mm^3
Material Cost= Rs.38.70/kg
TOTAL MATERIAL COST
4-Labor cost
Labor cost for Machining: Rs.1350
Scrap material cost=Rs.10047.17
Welding rod cost=Rs.1315
Labor cost for Welding =Rs.1350
5-Power cost
Power consumed =103.2kw
Rate of power =Rs.6.50
Power cost=Rs.670.80

TABLE I
Material costing

Name of components	Material weight in kg	Cost of the individual parts.(material cost) in Rs
V block	7.23	279.80
Square block	23.49	909.06
Handle rod	1.6	61.92
Side plate	14.12	546.44
Screw thread	43.91	1699.32
Base materials (I section, closed frame plate)	(75.98+21.2)	(2940.42+820.44)
Hollow pipe	36.24	1402.49
Plate with hole	11.52	445.82
Handle base or nut	12.57	486.46
Bearing	1.5	455
Total weight of material=	249.36 kg	-
Total material cost=	-	Rs.10047.17

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TABLE II

Comparison between fixed and adjustable v block

COMPARISON BETWEEN FIXED V BLOCK AND ADJUSTABLE V BLOCK		
s.no	Before using adjustable v block	After using adjustable v block
1	Up and downward movement is not possible	Possible because screw jack were used
2	Solid type v block	Adjustable type
3	It has very low loading capacity .from(5tonns to 12tonns)	Capable for high loading above(10tonnes to 25tonnes)
4	Unsafe condition	Safety is ensured
5	During Loading ,unloading and aligning 2cranes were required	Single crane required
6	Required more electric power	Minimized
7	Required 4 to 6 workers	Required 2 workers

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G. Journal on Heat Treatment Effects on Steel Welds [7]

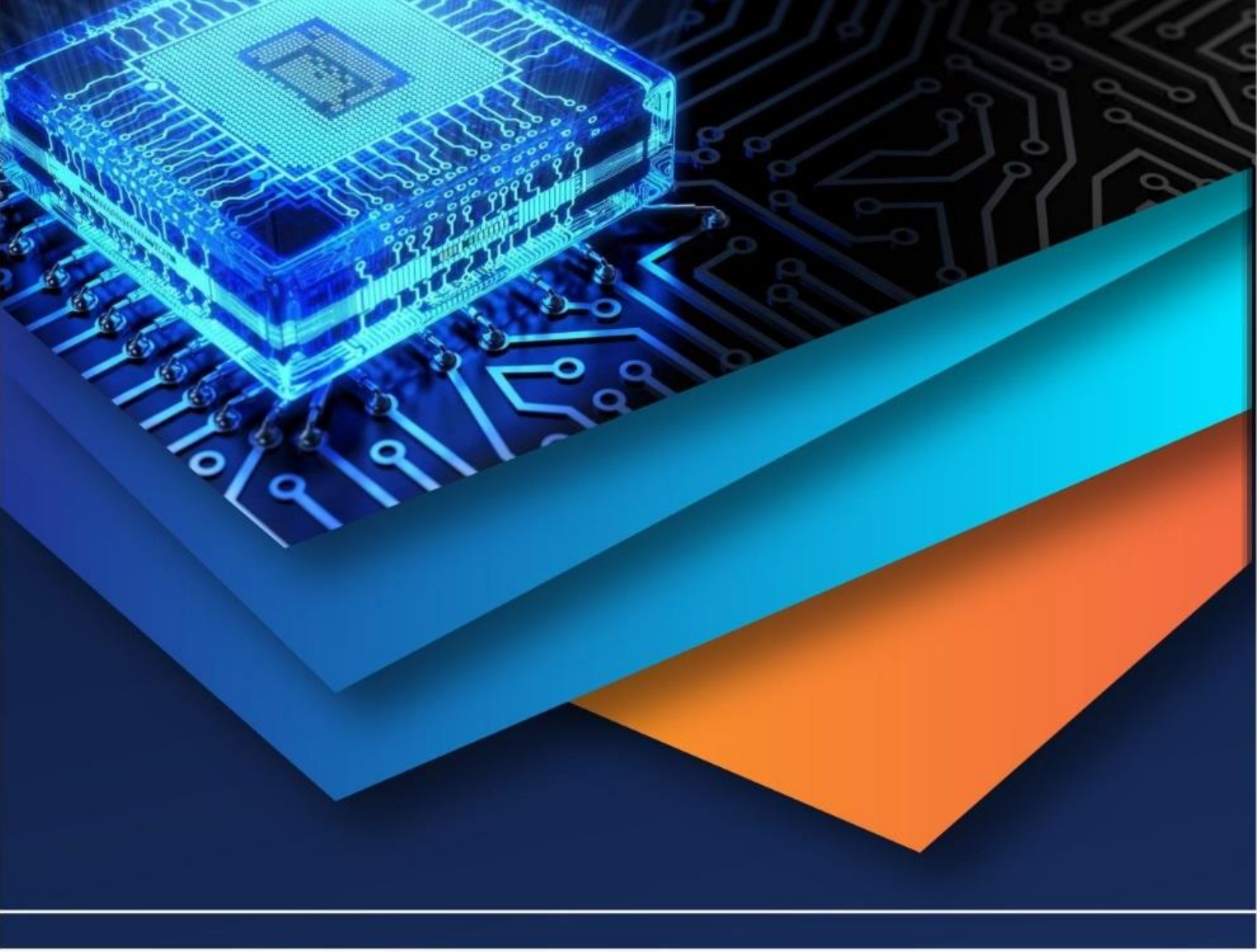
VI. CONCUSION

Adjustable v block reduces 45 percentage of labor cost in the loading and unloading period. As fixed v blocks are used for supporting the limited diameter header pipes, but not suitable for elbow, tee and matching reducers, so it is replaced with the adjustable v block. As a result adjustable v block will likely be a high priority for industries in coming years. Thus an efficient model is designed, machining process and cost analysis have been carried out for adjustable v block.

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