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Design and Simulation of Pneumatic Clamping Fixture to Minimize the Idle Time and Maximize the Production Rate in Welding Process

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Abstract:

The objective of this paper isthe design and simulation of beam and clamping fixture. The welding beams are main parts used in pallet storage systems for the purpose of load carrier. Clamping fixture uses two pneumatic cylinders which enables more accurate than manual effort. The two cylinders are used to support the beams according to our welding specifications with the help of solenoid control equipment by using pneumatic power, so that human effort is reduced and minimizes the idle time and optimizing the production rate. We introduced guide rails for the purpose of adjusting fixtures according to changing the beam lengths.

Keywords: PCF,DESIGN, ANSYS,STRESSES .

1.Introduction:

This paper is about the design and simulation of MIG welding fixture. The design will be different from the existing MIG welding fixture in the market as this fixture was design especially for the use of the MIG welding machine in welding research lab. The same thing applies to the companies such as automotive company who have their own welding jig which is customized for their products. This MIG welding jig is fabricated by using stainless steel block, aluminum bar, screws, and steel ruler by the mean of several mechanical processes. These processes are welding process, milling process, drilling, and cutting. This paper will be beneficial for the MIG welding researcher who going to use the welding machine in the welding research lab ast will save the time for align the work pieces, reduce thermal stress and able to hold a variety of sheet metal and plate thickness as well as ,The jigs and fixtures are the economical ways to produce a component in mass.

iSo jigs and fixtures are used and serve as one of the most important facility of mass production system. These are special work holding and tool guiding device. Quality of the performance of a process largely influenced by the quality of jigs and fixtures used for this purpose. What makes a fixture unique is that each one is built to fit a particular part or shape. The main purpose of a fixture is to locate and in the cases hold a work piece during an operation. A jig differs from a fixture in the sense that it guides the tool to its correct position or towards its correct movement during an operation in addition to locating and supporting the work piece.

Basic Components of PCF:

The main components of a PNEUMATIC CLAMPING FIXTURE are shown in below table.

Table1: Pneumatic clamping fixture parts

PARTS	DIMESIONS	MATERIAL	NO. OF ITEMS
TABLE	5000×1500×850	1023 CARBON STEEL SHEET	1
RAILGUARDS	5000×65×75	LONGSTEEL A36	2
UPRIGHTS	250×90×65	MILD STEEL	2
PNEUMATIC CYLINDERS	STROKELENGTH: 75-150	EN9 STEEL	2
SOLENOID CONTROLL VALVE	100×50	MILD STEEL	1
BEAMS	SIZES: (75×1000)-(150×5000)	MILD STEEL	5

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WELDING TABLE:

The welding table is very important part of this paper because it acts as bed for the total welding line . the table is provides good storage device of all structural members , also providing good wear resistance characteristics for welding spatters sticking on the table. andit also can be exhibiting good thermal, fatigue and creep properties. If we selecting table materials for metals and alloys because it can be store further structural steel members and impact loads.

PNEUMATIC CYLINDERS:

Cylinders are used in the majority of applications to convert fluid energy into straight line motion. For this reason, they are often called linear actuators.Cylinders are manufactured in a variety of diameters, stroke lengths, and mounting styles. They may be classified, according to construction, into four types: tie-rod, threaded, welded, and flanged.

BEAMS:

Beams are main Structural steel is one of the basic materials used in the construction of frames for most industrial buildings, bridges, and advanced base structures. Therefore, you, as a Seabee Steelworker, must have a thorough knowledge of various steel structural members.

2.Modeling and Analysis of Pneumatic clamping fixture:

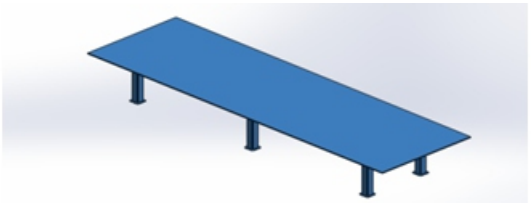

Fig2: design of the welding table

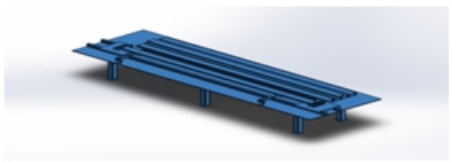

Fig3: design of the welding Pneumatic clamping fixture table

The design of the Pneumatic clamping fixture is done in SOLID WORKS Software.

MECHANICAL PROPERTIES:

Elastic Modulus:		204 Gpa
Poisson's Ratio:		0.29
Shear Modulus:		799Gpa
Mass Density:	7858	kg/m^3
Tensile Strength:		425Mpa
Yield Strength:	282Mpa	
Thermal Expansion Coefficient : 1.2e-005 /K		
Thermal Conductivity		52 W/(m•K)
Specific Heat:		486 J/(kg•K)

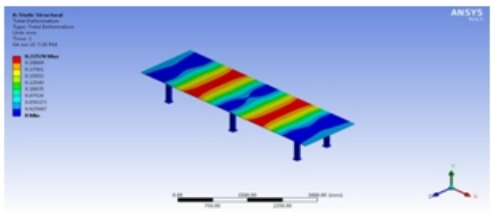

Figure4: simulation of welding Table for deformations

3.1 Process involved in PCF:

1.The new process reduce difficulties achieve in present process.
2.The new process also depends up on the human involvement moderately and pneumatic air partially.
3.The process will convert as flexible, in sudden changes occur in product design.
4.The present process of beams welding sector consists of 3lines(workbenches).
5.For every line 2-members working is necessary for complete the production of welding beams.
6.Here two types of beams are welded they are Box beams and Inno beams.
7.The production rate of welding beams are moderate range (1000-1500) items /per day.
8.Here welding thickness achieve +/- 3mm.

Current Process:

1.This process achieving moderate accuracy.
2.It is a time taken process during welding beams.
3.Material handling is huge time impact of this process.

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4.Minimizing human errors in-efficiently.
5.It doesn't convert flexible automation.
6.Moderate production rate achieve.

3.2. Load and Deformation Calculation:

Y= distance of the newtral axis from the bottom edge
I_XX =Total Moment of Inertia
M = Bending Moment
σ= Bending stress
E= Young's Modulus
W= Load appied on Beam

$$Y = \frac{\sum ay}{\sum a}$$

$$I_{XX} = I_1 + I_2 + I_3$$

$$\frac{M}{I} = \frac{\sigma}{Y} = \frac{E}{R}$$

$$M_{max} = \frac{wl^2}{8}$$

$$W = \frac{M_{max} * 8}{l^2}$$

$$B.M = \frac{wl^2}{24}$$

$$y_{max} = \frac{wl^4}{384\,EI}$$

Fig5: Boundary conditions for beam

Boundary conditions:

Bothe ends of beam are fixed and uniform load applied throughout the beam

Fixture name	Fixture Image	Fixture Details
Fixed-1		Entities: 13 face(s) Type: Fixed Geometry

Resultant Forces

Components	X	Y	Z	Resultant
Reaction force(N)	1.15E-05	0.104238	6.80E-06	0.104238
Reaction Moment(N.m)	1.24E-05	-1.24E-05	-2.28E-07	1.75E-05

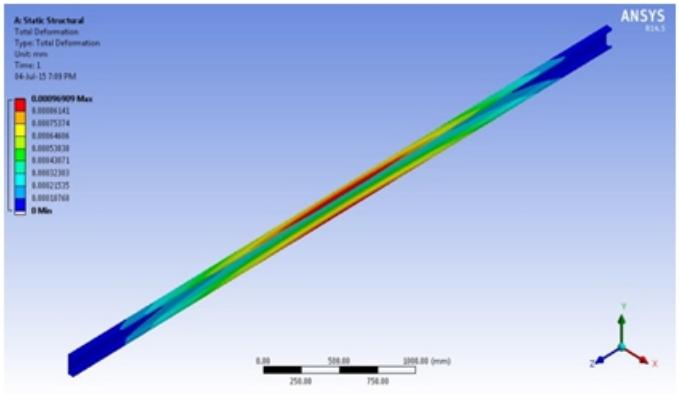

Fig: Deformation of beam

3.3 Analysis Results:

Beam	Beam Size	Von mises Stress	Deformatio
		N/mm^2	Mm
Inno beam	75×50×5000	0.00835974	0.00141477
Inno beam	150×50×5000	0.00750212	0.00010486
Box beam	75×50×5000	0.00219448	0.00025619
Box beam	150×50×5000	0.00320947	0.00028562
Welding Table	1500×850×5000	6.8973	0.222062

Table2:Von-mises Stress and deformation results in Ansys14.5

4.Conclusion:

Thus we have designed and simulate a "Pneumatic Clamping Fixture" which helps to overcomethe shop floorproblems. When Compared to the present welding process, new process is easy to modeling and optimizing the production rate. Pneumatic Clamping Fixture minimizes process ideal time and reducing human errors encounter in welding manufacturing unit.

5. References:

1.http://www.imao.biz/.

2.http://www.aerocaddesign.com/.

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3.http://www.pioneerindsys.com/.

4.http://www.dbminnovation.com/.

4.http://www.improvesolutionsllc.com/.

5.Lindgren, L.E., 2001, Finite element modelling and simulation of welding, part2: improved material modelling, J. Thermal Stresses5.\Camilleri, D., 2005, Support tools for the design and manufacture of thin-plate welded structures, PhD thesis, Department of Mechanical Engineering,University of Strathclyde, Glasgow, UK.

6.Strength of materials by E.r.R.K Rajput

7.Strength of materials by Dr.R.KBansal

8.Massonnet C. Buckling of thin-walled bars with open cross section. In: Thone G., editor. Hommage Fac. of Sci. Appl. Univ. Liege

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