PNEUMATIC FIXTURE IN VERTICAL MILLING CENTRE

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. The main aim of this concept is Mass production at high productivity to reduce unit cost and the interchangeability to facilitate easy assembly. This necessitates production devices to increase the rate of manufacture and inspection device to speedup inspection procedure.The main process to Design and evaluation fixture which will hold six valvebody parts with thickness of 32 mm and also Design a fixture for vertical machining center to perform milling, drilling, and threading operation in top and bottom side, Design of fixture drawing using Solid Works 2010. Analysis of stress and deformation of the design using ansys14.0 software

.**Keywords**: *Vertical Milling Machine, ,fixture, FRL Unit, compressor, pneumatic set up, blackening process.*

I. INTRODUCTION

Fixture is special purpose tools which are used to facilitate production like machining, assembling and inspection operations. The mass production of work piece is base on the concept of interchangeability according to which every part produced within an established tolerance. Fixture helps for manufacturing interchangeable parts since they establish a relation with predetermined tolerances, between the work and the cutting tool. Once the fixture is properly setup, any number of parts can be produced without additional set up.

Fixture is use to do drilling, reaming, milling and tapping operations. There are many advantages for using fixture in a production line. Fixture eliminate individual marking, positioning and frequent checking. This reduces operation time and increase productivity. There is no need for selective assembly.

To increase production in drilling and milling and threading process for valve body, it is a challenge to hold six valve bodies in one time.

APPLICATION

- To achieve mass production
- To reduce man power
- To increase the efficiency of the plant
- To reduce the production cost

COMPARISION TABLE OF PNEUMATIC SYSTEM WITH HYDRAULIC SYSTEM WITH VARIOUS FACTORS

FACTOR	PNEUMATICS	HYDRAULICS
Availability of Medium	Air is freely available	Obtaininand disposing oil is a costly affair
Linear Force	Forces limited due to low	Full torque, even during. Stoppage

	Pressure and cylinder dia	
Storage	only limited quantity	expensive
Transport of medium	Up- to 1000m	Up- to 100m
Power Costs	Not expensive	High pressure storage & Oil cause costs
Overloading	Loadable till stand- still No energy consumption when Idle	Highest Energy consumption when standing still
Leakage, risk of injury	No negative consequences except for loss of energy when compressed air is exposed to the atmosphere	Due to high pressure extremely dangerous when leakage occurs and risk of fire.

II. METHODOLOGY

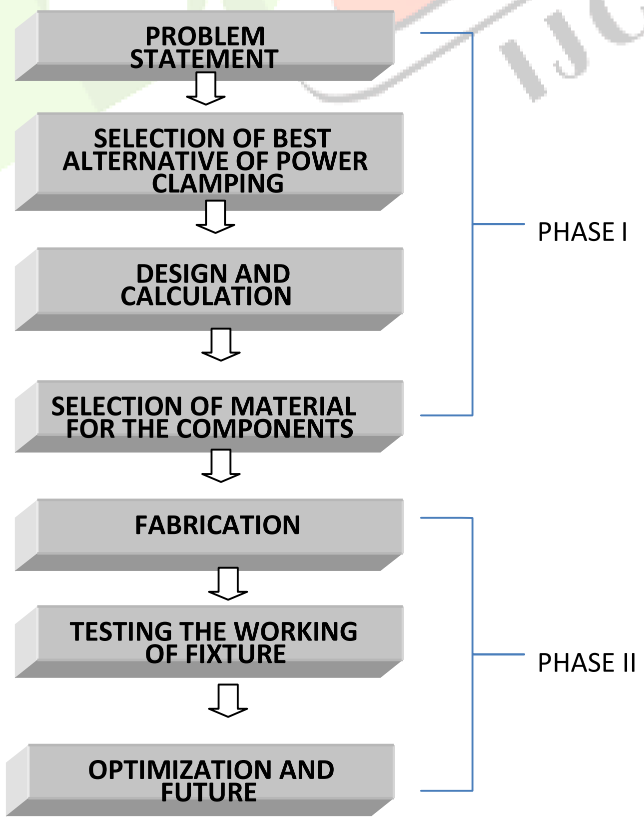

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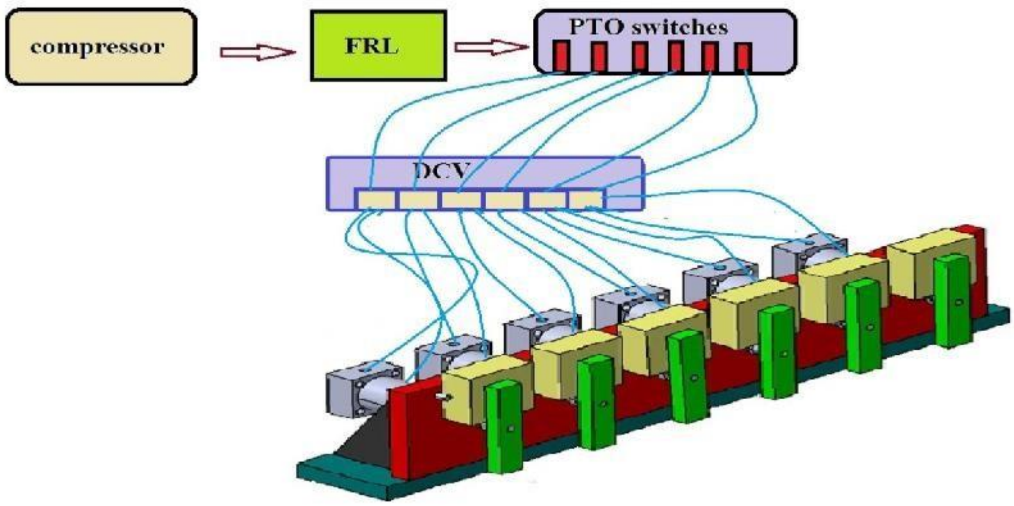
Fig no3.1

III. EXPERIMENTAL SETUP

The atmospheric air is compressed with the help of compressor. From the compressor air passes through the FRL Filter, Regulator, Lubricator unit. In the FRL unit first the air gets filtered, next the air is regulated and then lubricated. The air is passed to direction control valve where the direction of the air is controlled. The lever from the direction control valve is actuated then the compressed air flows into the blind end of the cylinder and hence the cylinder extends.



The work piece is placed in between the clamp and vertical plate with the help of locating pin. After setting the work piece the lever from the direction control valve is deactivated then the compressed air flows into the rod end of the cylinder and hence the cylinder retracts. So the work piece gets clamped rigidly. After the machining gets over the lever from the direction control valve is actuated then the compressed air flows into the blind end of the cylinder and hence the cylinder extends. Then the work piece is taken out for inspection.

IV. FIGURES.

Fig 1:(fixture of mild steel under completion

fig 2: (overall pneumatic setup of fixture)

of blackening process)

Fig 3: (clam setup on fixture)

V. RESULTS:

FORCE CALCULATION FOR DOUBLE ACTING CYLINDER Forward stroke

Cylinder bore =40mm

Rod dia =16mm

Forward stroke force F_{fwd}=A*p

Where;

A=Piston area (m^{2}) p=operating pressure (Pa)

=6bar F=A*P

$A= (\prod/4)*D^2$

$A= (3.14*/4)*(40*10^{-3})^2$

$A=1.25*10^{-3}m^2$

F=A*P

$F= (1.25*10^{-3})*(6*10^5)$

F=753.9N

Frictional Resistance =10%=75.39N

Force extend =753.9-75.39

Force extend =678.5 N

Return Stroke

Return stroke force F_{fwd}=A*p Where;

` A=Piston area (m^{2})

p=operating pressure (Pa)=6bar

F=A*P

$A= (\prod/4)*(D^{2-}d^2)$

$A= (3.14*/4)*((40*10^{-3})^2- (16*10^{-3})^2)$

$A=1.055*10^{-3}m^2$

F=A*P

$F= (1.055*10^{-3})*(6*10^{-5})$

F=633N

Friction 10% =63.3N

Force return =633-63.3N

= 569.7N

CALCULATION OF FORCE ACTING ON THE WORK PIECE

Recommended cutting speed V_c=250sfm or 76.27 m/min

Spindle speed (n): N= (V_{C*}1000 / ∏*D_C)

Where,

$V_{C=}$Cutting speed

D_C=diameter of the drill

N = (76.27*1000/∏*16)

N=1518 rpm

Recommended feed per revolution for aluminium material f_n=0.2-0.25mm/rev we can take 0.2 mm/rev

Feed per minute : Vf (mm/min)

$V_{F=}f_n$*N

=0.2*1518

$V_{f=}$303.6mm/min

Metal removal rate:Q(cm^3/min)

Q= ($D_{C*}f_{n*}v_c$ / 4)

= (16*0.2*76.27/4)

Q=61.01 cm^3/min

Machining time (T_c) min:

$T_c = I_m/v_f$

=52/303.6

T_c = 0.171min

Recommended specific cutting force for aluminum = 700 N

Pc= fn*vc*dc*kc/240*10^3

Pc= 0.2*76.27*16*700/240*10^3

Pc= 712w (or) 0.712kw

Torque (mc) = pc*30*10^3/∏*n

= 0.712*30*10^3/3.14*1518

=4.47 N-m

Thrust force=k'*kc*d*f/2

=0.5*700*16*0.2/2

=560N

VI. CONCLUSION

1. Thus we have designed a pneumatically operated fixture
2. This fixture will reduce the time and cost of manufacturing product.
3. Main Procees is reducing the time required for locating and clamping. Reducing setup expenses offers manufacturer additional benefits.
4. In addition to lower production costs, benefits include lower tooling expenses, reduced lead time, increased production time, higher production volume, and faster production changeovers
5. . From this we can conclude production will be increased by easily locating and clamping of the work piece.

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