DUAL RAMSHAPER TO REDUCE LEAD TIME & INCREASE MATERIAL REMOVAL RATE

P. Muraleedharan, Assistant Professor, Department of Mechanical Engineering, Karpagam College of Engineering, Coimbatore 641 032, Tamil Nadu, India
Aravindraj. G, Student, Karpagam College of Engineering, Coimbatore 641 032, Tamil Nadu, India.
Vijay. D, Student, Karpagam College of Engineering, Coimbatore 641 032, Tamil Nadu, India.
Vediyappan. K, Student, Karpagam College of Engineering, Coimbatore 641 032, Tamil Nadu, India.
Venkateswaran .V.R, Student, Karpagam College of Engineering, Coimbatore 641 032, Tamil Nadu, India.

ABSTRACT: A shaper is a machine device used to machine a solitary occupation by utilizing a solitary point cutting apparatus and consequently it can't be utilized for high creation rates. This paper presents an examination on the shaper for high creation and looking at the material expulsion rate between traditional shaper machine and time decrease pneumatic shaper machine. The shaper machine has an inactive stroke during its bring movement back. This task will utilizes the inactive stroke as cutting stroke and henceforth increment the creation rate. This can be accomplished by expansion of clapper box with a device to such an extent that the course of action on apparatus holder has one instrument cinched on the clapper box independently. Return stroke would be a harsh eliminating stroke for the position contrasted with the forward stroke. The pneumatic wellspring of force with control embellishments is utilized to drive the slam to acquire the forward and bring strokes back.From the result it was found that using pneumatic in shaper machine material removal rate was increased and lead time was reduced.
.
Key Words: Pneumatics, Solenoidvalve, flowcontrolvalve, Electric control unit

I.   INTRODUCTION

An instrument is a worked on model, ordinarily as a line graph, which is utilized to recreate the movement happening in a machine. The reason for this proliferation is to empower the idea of the machine. The reason for this multiplication is to empower the idea of the movement to be explored without the encumbrance of the different strong bodies which structure the machine components the different pieces of the system are called connections or components. Where two connections are in contact and a general movement is conceivable, at that point they are known as a couple. A discretionary arrangement of a connections which structure a shut chain that is equipped for relative movement, and that can be made into an unbending construction by the expansion of a
solitary connection, is known as a kinematics chain. To frame a component from a kinematics chain one of the
connections should be fixed. Anyway as any of the connections can be fixed, it follows that there are however many system as there are joins in the chain. The strategy getting diverse instrument by fixing the different connections thusly is known as reversal.:

II.   LITERATURE SURVEY:

[1] RM Lathe et.al., Investigated that traditional machining measure devours extremely high time and builds the work cost, to beat these issues and challenges he utilized robotized electric pneumatic gadgets and PLCs in shaper machine. He made electro pneumatic circuit for performing shaping undertakings, which makes the movement self-loader by using a singular point cutting contraption.Mechanization of the machines are made with the assistance of pneumatic gadget, sensors, mechatronics and PLCs and so forth
[2] Anand Shukla: Investigated that improving of the cutting power and force utilization of shaper machine by fluctuating various boundaries during cutting activity utilizing PC interface. He built up a system to discover cutting power and force needed by the apparatus to perform forming procedure on work piece [3] Dharwa Chaitanya Kirtikumar: Investigated that energy is the most imperative viewpoint in the advancement of current innovative civilization. The ordinary fuel sources are in effect scant, so elective fuel sources are discovered which should be modest, effectively accessible and should fulfill the specialized prerequisites. Force needed for accelerating is well beneath the limit of a normal solid person [4] R.Maguteeswaran: Investigated that the different machining measure in assembling ventures are completed by isolated machining machine. It need more space necessity and time with high costs. Yet, the creation of multi activity machine, which contains three tasks in a solitary machine. The tasks are

specifically boring, opening and forming. [5] Devanand R. Tayade: Investigated that assessment of cutting and mathematical boundary is quite possibly the main components for quality and profitability which assume huge part in the present assembling market. From clients see point quality is vital in light of the fact that the degree of nature of the secured thing (or item) impacts the level of fulfillment of the shoppers during use of the acquired merchandise.[6]   S.Rajeshkanna et.al,,investigated that In his project, the problem statement was that material removal rate takes the most time. To overcome this, he used a dual ram shaping machine. While the first Ram moves forward in his initiative, the second Ram will move in the opposite direction at the same time. This dual ram shaper used to make or produce the two slots at one operation and also reduce the operation time.[7] Sibin babu et al,, investigated that Time Reduction Pneumatic Shaper System Material Removal Rate (MRR) Research During the return motion of the shaper machine, there is an idle stroke. To complete this mission, the idle stroke will be used as a cutting stroke, resulting in a higher output rate. In comparison to the forward stroke, the return stroke will be an uncomfortable removing stroke for the role. The pneumatic wellspring of force with control frill is utilized to drive the smash to acquire the forward and bring strokes back [8] Veldi Kanakaraju et al,, investigated that Manufacture of Twin Side Shaper Machine using Scotch Yoke Mechanism . A shaper is used to machine a single job with a single point cutting tool, so it can't be used for high production rates to overcome this limitation. This project makes use of the idle stroke as a cutting stroke, resulting in a higher output pace. [9] Kaleeswaran.J et al,, investigated that Design and Fabrication of Dual Ram Shaper Machine.Forming machine or essentially shaper is utilized to machine a solitary occupation by utilizing a solitary point cutting apparatus and subsequently it can't be utilized for high creation rates.To over come this The ram or the cylinder piston is powered by a pneumatic source of power with control accessories to achieve the forward and return strokes. As opposed to traditional devices, this arrangement reduces the machining time of a work piece by half..[10] P. Hamsika et al,, investigated Design and Fabrication Dual Side Shaper Machine The primary target is to lessen the time and to expand the creation rate. From the above task it tends to be reasoned that "Double side shaper machine and pounding wheel connection" is having acceptable machinability and it will be valuable in business industries.

III.   COMPONENTS AND DESCRIPTION :

The significant parts that are successfully utilized in the plan and the creation of the double slam shaper to decrease the lead time are portrayed underneath:

• Pneumatic chamber,

• Solenoid valve,

• Flow control valve,

• Electronic control unit.

3.1PNEUMATIC CHAMBER :

        Automation is extensively characterized as the substitution of manual exertion by mechanical force. Pneumatics is an appealing mode for minimal effort automation especially for consecutive or tedious activities. Numerous production lines and plants as of now have a packed air framework, which is fit for giving both the force or energy prerequisites and the control framework (albeit similarly pneumatic control frameworks might be financial and can be beneficially applied to different types of force).

The principle benefits of an all-pneumatic framework are generally economy and straightforwardness, the last decreasing support to a low level. It can likewise have extraordinary benefits regarding security.

figure 1. Pneumatic chamber

3.2SOLENOID VALVE :

The directional valve is one of the significant pieces of a pneumatic framework. Usually known as DCV, this valve is utilized to control the bearing of wind stream in the pneumatic framework. The directional valve does this by changing the situation of its inner mobile parts.

This valve was chosen for quick activity and to diminish the manual exertion and furthermore for the change of the machine into programmed machine by methods for utilizing a solenoid valve. A solenoid is an electrical gadget that changes over electrical energy into straight line movement and power.

These are additionally used to work a mechanical activity which thus works the valve component. Solenoids might be push type or pull type. The push type solenoid is one in which the unclogger is pushed when the solenoid is invigorated electrically. The force type solenoid is one in which the unclogger is pulled when the solenoid is stimulated.

The name of the pieces of the solenoid ought to be realized so they can be perceived when called upon to make fixes, to accomplish administration work or to introduce them.

The solenoid valve has 3 openings. This guarantee simple debilitating of 3/2 valve. The spool of the 3/2 valve slide inside the principle bore by spool position; the ports get associated and detached.

3.2.1.Position-1
At the point when the spool is activated towards external heading port 'P' gets associated with 'B' and 'S' stays shut while 'A' gets associated with 'R'.

3.2.2.Poisition-2
At the point when the spool is pushed the internal way port 'P' and 'A' gets associated with one another and 'B' to 'S' while port 'R' stays shut.
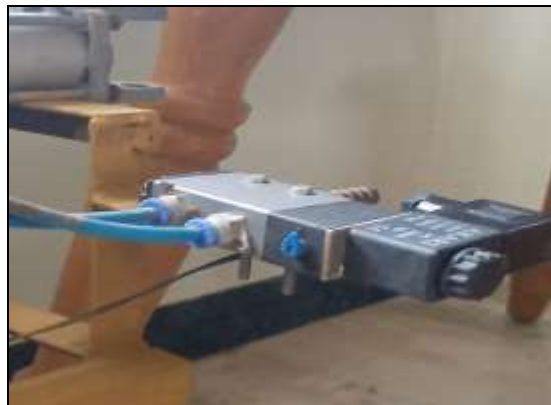
figure 2. solenoid valve

3.3FLOW CONTROL VALVE :
A stream control valve manages the stream or pressing factor of a liquid. Control valves typically react to signals produced by autonomous gadgets, for example, stream meters or temperature measures. Control valves are typically fitted with actuators and positioners. Pneumatically-impelled globe valves and Diaphragm Valves are generally utilized for control purposes in numerous enterprises, in spite of the fact that quarter-turn types, for example, (altered) ball, entryway and butterfly valves are additionally utilized.

Control valves can likewise work with water driven actuators (otherwise called water powered pilots). These kinds of valves are otherwise called Automatic Control Valves. The water driven actuators will react to changes of pressing factor or stream and will open/close the valve. Programmed Control Valves don't need an outside power source, implying that the liquid pressing factor is sufficient to open and close the valve. Programmed control valves include: pressure decreasing valves, stream control valves, back-pressure supporting valves, elevation valves, and help valves. A height valve controls the level of a tank. The height valve will stay open while the tank isn't full and it will close when the tanks arrives at its greatest level. The opening and shutting of the valve requires no outer force source (electric, pneumatic, or labor), it is done naturally, thus its name.

Interaction plants comprise of hundreds, or even thousands, of control entwines all arranged to deliver an

item to be offered available to be purchased. Every one of these control circles is intended to keep some significant interaction variable like pressing factor, stream, level, temperature, and so on inside a necessary working reach to guarantee the nature of the final result. Every one of these circles gets and inside makes aggravations that inconveniently influence the cycle variable, and association from different circles in the organization gives aggravations that impact the interaction variable
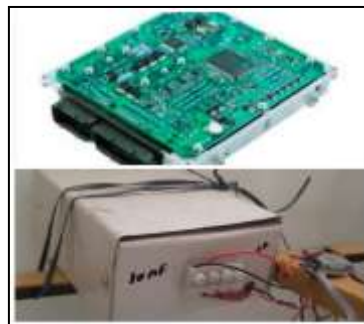
3.4 ELECTRONIC CONTROL UNIT :

In car hardware, Electronic Control Unit (ECU) is a nonexclusive term for any inserted framework that controls at least one of the electrical framework or subsystems in an engine vehicle.

Kinds of ECU consolidate Electronic/engine Control Module (ECM), Force train Control Module (PCM), Transmission Control Module (TCM), Brake Control Module (BCM or EBCM), Focal Control Module (CCM), Focal Planning ModuleCTM), General Electronic Module (GEM), Body Control Module

(BCM), Suspension Control Module (SCM), control unit, or control module.Taken together, these frameworks are once in a while alluded to as the vehicle's PC. Actually there is no single PC except for numerous ones. In some cases one gathering fuses a few of the individual control modules.

Some cutting edge engine vehicles have up to 80 ECUs. Implanted programming in ECUs keeps on expanding in line check, intricacy, and refinement. Dealing with the expanding intricacy and number of ECUs in a vehicle has become a vital test for unique gear producers (OEMs).

In our undertaking we utilize the control unit for controlling the DC engine that enacts/deactivates the vehicle slowing mechanism. It is basic in activity that, when the solenoid valve is associated with the electronic control unit the electronic control unit goes about as the impelling gadget for the solenoid valve and it controls the stream bearing of the air through Pneumatic chamber pneumaticchamber.

Figure 3. Electgronic control unit

IV.   METHODOLOGY & IMPLEMENTATION :

Table 1. Flowchart before implementation

```
        ┌─────────────────────────┐
        │     CASTING PROCESS     │
        └─────────────────────────┘
                    │
                    ▼
        ┌─────────────────────────┐
        │     FORMING PROCESS     │
        └─────────────────────────┘
                    │
                    ▼
        ┌─────────────────────────┐
        │   FABRICATION PROCESS   │
        └─────────────────────────┘
                    │
                    ▼
        ┌─────────────────────────┐
        │ MATERIAL REMOVAL PROCESS│
        └─────────────────────────┘
                    │
                    ▼
        ┌─────────────────────────┐
        │     ASSEMBLY PROCESS    │
        └─────────────────────────┘
          ↙         │         ↘
   ┌─────────┐  ┌──────────┐  ┌──────────┐
   │  chain  │  │ D.C Motor│  │ sprocket │
   └─────────┘  └──────────┘  └──────────┘
                    │
                    ▼
        ┌─────────────────────────┐
        │     QUALITY TESTING     │
        └─────────────────────────┘
                    │
                    ▼
        ┌─────────────────────────┐
        │   RESULT & CONCLUSION   │
        └─────────────────────────┘
```
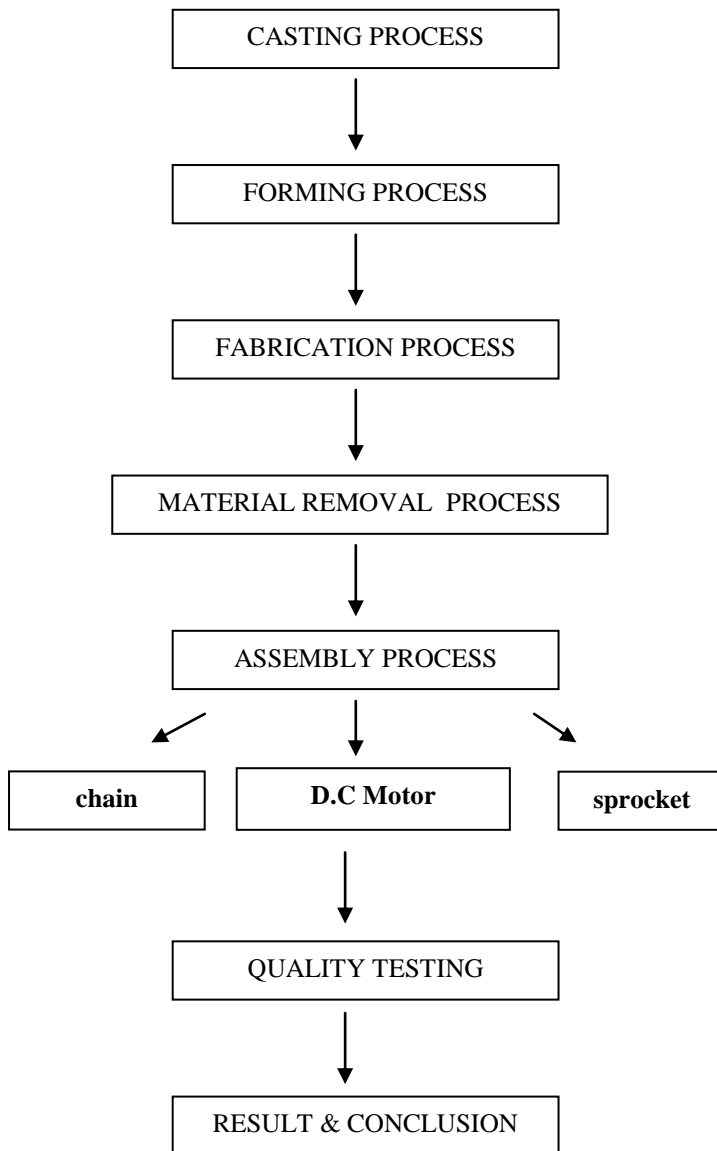
Table 2. Flowchart after implementation

```
            ┌─────────────────────────┐
            │     CASTING PROCESS     │
            └─────────────────────────┘
                        │
                        ▼
            ┌─────────────────────────┐
            │     FORMING PROCESS     │
            └─────────────────────────┘
                        │
                        ▼
            ┌─────────────────────────┐
            │   FABRICATION PROCESS   │
            └─────────────────────────┘
                        │
                        ▼
        ┌─────────────────────────────┐
        │  MATERIAL REMOVAL  PROCESS  │
        └─────────────────────────────┘
                        │
                        ▼
            ┌─────────────────────────┐
            │    ASSEMBLY PROCESS     │
            └─────────────────────────┘
              ↙         │         ↘
     ┌──────────┐  ┌──────────┐  ┌────────┐
     │Pneumatic │  │Flow      │  │  ECU   │
     │          │  │control   │  │        │
     │          │  │&Solenoid │  │        │
     │          │  │valve     │  │        │
     └──────────┘  └──────────┘  └────────┘
                        │
                        ▼
            ┌─────────────────────────┐
            │     QUALITY TESTING     │
            └─────────────────────────┘
                        │
                        ▼
            ┌─────────────────────────┐
            │   RESULT & CONCLUSION   │
            └─────────────────────────┘
```
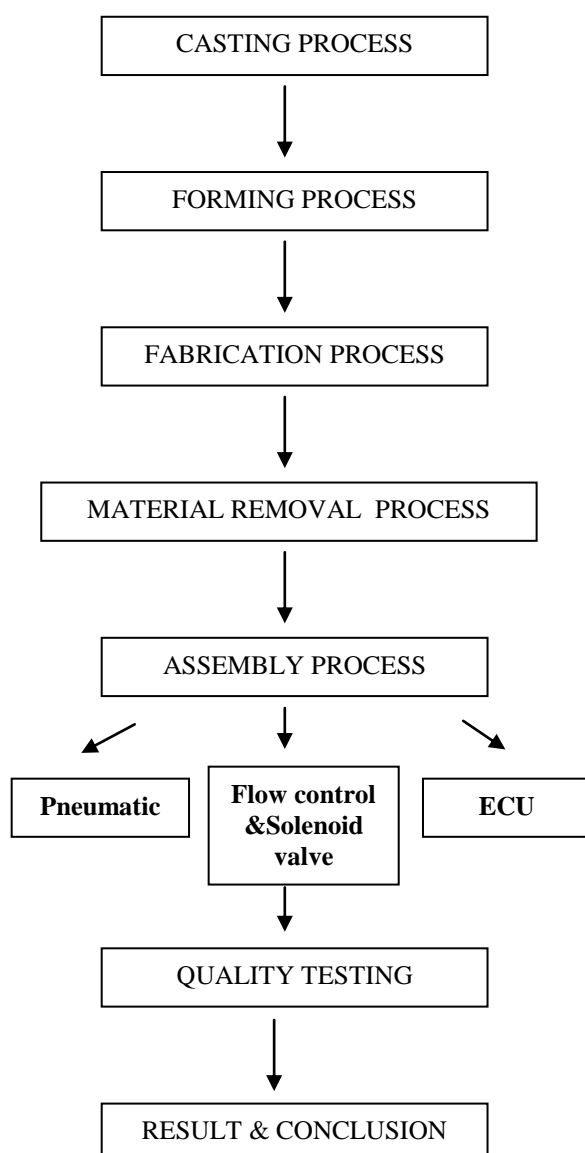
At first beginning with air packs, its capacity is to   pack air from a low delta pressure (generally air) to a higher pressing factor level. This is a cultivated by decreasing the volume of the air.

Air blowers are by and large certain removal units and are both of the responding cylinder type or the rotating screw or turning vane types. The air blower utilized here is a commonly little measured, two-stage blower unit. It likewise comprises of a packed air tank, electric rotor and pulley drive, pressure controls and instruments for fast attach and use. The pressing factor surpasses the planned pressing factor of the recipient a delivery esteem gave discharges the abundances air and along these lines remains a top of any perils to happen.

The compacted air goes to the solenoid valve through stream control valve. The stream control valve is utilized to control the sum wind current to the chamber. This stream is changed by physically by the snooze is fixed over the stream control valve. At that point this air goes to the 5/2 solenoid valve. The 5/2 solenoid valve is having one info port, two yield port and two fumes port.

The 5/2 solenoid valve is constrained by the electronic planning control unit. The speed of the on/off the solenoid valve is constrained by this planning control unit. The 2 outlet ports are related with an actuator (Cylinder). The pneumatic starts is a twofold acting, single shaft chamber. The chamber yield is coupled to additional reason. The cylinder end has an air horning impact to forestall abrupt push at outrageous finishes.

The compacted air from the blower arrives at the solenoid valve. The solenoid valve alters the course of stream as indicated by the signs from the circumstance gadget.

The compacted air go through the solenoid valve and it is conceded into the front finish of the chamber block. The air pushes the chamber for the cutting stroke.Toward the finish of the cutting stroke air from the solenoid valve arrives at the backside of the chamber block. The pressing factor stays as before yet the territory is less because of the presence of cylinder bar. This applies more prominent tension on the cylinder, pushing it at a quicker rate along these lines empowering quicker bring stroke back.

The screw joined is fixed to the clapper box outline gives consistent burdens which bring down the sapper to empower persistent cutting of the work.

The stroke length of the cylinder can be changed by making reasonable change in the clock.

Figure 4. Skeleton representation of the apparatus

4.1.Design Computation :

4.1.1Plan of Metal roller :

Bearing No. 6202

External Measurement of Bearing (D)   = 37 mm

Thickness of Bearing (B)   = 12 mm

Internal Distance across of the Bearing (d) = 15 mm

r_1 = Corner radii on shaft and lodging

r_1 = 1 (From plan information book)

Most extreme Speed =14,000 rpm (From plan information book)

Mean Measurement (dm) =   (D + d)/2

                    =   (35 + 15)/2

dm   =   25 mm

4.1.2Plan of Cylinder pole:

Burden because of pneumatic stress:

Width of the Cylinder (d) =   40 mm

Pressing factor acting (p)   =   6 kgf/cm^2

Material utilized for rod   =   C 45

Yield pressure (σy)   =   36 kgf/mm^2

Accepting element of safety =   2

Power following up on the pole (P) =   Pressure x Territory

=   p x ($\Pi d^2/4$) =   6 x {(π x 4^2)/4}

P =   73.36 Kgf

Configuration Stress (σy)   = σy/F0 S

= 36/2 = 18 Kgf/mm²

= P/($\Pi d^2/4$)

∴ d   = $\sqrt{}$ 4 p/Π [σy]

= $\sqrt{}$ 4 x 75.36/{π x 18}

= $\sqrt{}$ 5.33 = 2.3 mm

∴ Min dia of pole req for the load=   2.3 mm

We accept measurement of the rod = 15 mm.
4.1.3.Plan for chamber thickness:

Material used   =   Cast iron
Accepting interior measurement of the cylinder= 40 mm

Extreme ductile stress   = 250 N/mm² =2500 gf/mm²

Working Stress   =Ult. ductile pressure/factor of security

Accepting component of safety   = 4

Working pressure (ft) = 2500/4 = 625 Kgf/cm²

As per 'LAMES Condition'

Least thickness of chamber (t) = ri {$\sqrt{}$ (ft + p)/(ft – p) - 1}

Were,

ri = inner range of chamber in cm.

ft = Working stress (Kgf/cm²)
p = Working pressure in Kgf/cm²

∴ Subbing esteems we get,

t = 2.0 {$\sqrt{}$ (625 + 6)/(625 – 6) - 1}

t = 0.019 cm = 0.19 mm

We expect thickness of cylinder = 2.5 mm
Inward width of barrel = 40 mm

External breadth of barrel= 40 + 2t

= 40 + (2 x 2.5) = 45 mm

V.   RESULT & DISSCUSSION :

5.1.MATRIAL REMOVAL RATE USING CHAIN IN SHAPER MACHINE:

Workpiece Material : Nylon
Initial Weight Of Workpiece : 0.312kg
Final Weight Of Workpiece : 0.305kg
Machining Time : 20.15min
Density Of Workpiece: 1.15 X 10^-6 K

$$MRR = \frac{W1-W2}{T \times D}$$

Where,

    W1 = Initial weight of work piece
    W2 = Final weight of work piece
    T = Machining Time
    D = Density of work piece

Material Removal Rate (Mrr) = ((0.312-0.305))/(20.15 X (1.15 X 10^-6))
=302.0822 mm3/Min

5.2MATERIAL REMOVAL RATE USING PNEUMATICS IN SHAPER MACHINE:

Workpiece Material : Nylon
Initial Weight of Workpiece : 0.305kg
Final Weight Of Workpiece : 0.299kg
Machining Time :18.15 min
Density of Workpiece : 1.15X10-6 Kg/mm3

$$MRR = \frac{W1-W2}{T \times D}$$

Where,

    W1 = Initial weight of work piece
    W2 = Final weight of work piece
    T = Machining Time
 D = Density of work pieceMaterial Removal Rate (Mrr)=((0.305-0.299))/(18.15 X (1.15 X 10^-6))
= 287.45mm3/min

VI.   CONCLUSION :

Figure 5. Before implementation

Table 3: Output Before Implementation

OPERATING TYPE	Chain drive
MACHINING TIME	20.15 min
MATERAIAL REMOVAL RATE	302.0822 mm3/Min
FORWARD STROKE	Yes
RETURN STROKE	No (Idle)

Figure 6. After implementation

Table 4: Output After Implementation

OPERATING TYPE	Pnuematic
MACHINING TIME	18.15 min
MATERAIAL REMOVAL RATE	287.45 mm3/Min
FORWARD STROKE	Yes
RETURN STROKE	Yes

In chain drive shaper machine there is no return stroke only one stroke functions ie is Forward stroke return stroke is idle So it takes maximum lead time for removing the material To over come this Problem In this project we modified the existed conventional chain drive by installing Pneuamtic and ECU for operating the machine The main adavantage of this pneumatic shaper machine is for Good accuracy with minimum lead time and maximum material removal rate. As a result the material removal rate was increased and time was reduced using Pneuamtic in the shaper machine.

REFERENCE :

[1] R M Lathe, International Journal of Engineering Research and Development (IJERD), **Volume 8, Issue 2, August-2013.**

[2] Anand Shukla, International Journal of   Science and Management (IJESM), Volume 4, Issue 2, **April-June 2014.**

[3] Dharwa Chaitanya Kirtikumar, International Journal for Technological Research In Engineering, Volume 1, **Issue 1, Sep 2013**

[4] R.Maguteeswaran, International Journal of   Research In Aeronautical and Mechanical   Engineering, **Volume 2, Issue 2, Feb-2014.**

[5] Devanand R.Tayade, International Journal of   Innovative Research in Advanced Engineering (IJIRAE), **Volume 1, Issue 6, July-2014.**

[6] S.Rajeshkanna International Journal of Advanced Research in Basic Engineering Sciences and Technology (IJARBEST), Vol.3 Special **Issue.38 May 2017**

[7] Sibin babu International Research Journal of Engineering and Technology (IRJET) Volume: 05 **Issue: 11 | Nov 2018**

[8] Veldi Kanakaraju International Journal of Engineering Research & Technology (IJERT) http://www.ijert.org ISSN: 2278-0181 IJERTV8IS070088 (This work is licensed under a Creative Commons Attribution 4.0 International License.) Published by : www.ijert.org Vol. 8 **Issue 07, July-2019**

[9] Kaleeswaran.J International Research Journal of Engineering and Technology (IRJET) Volume: 07 **Issue: 05 | May 2020**

[10] P. Hamsika International journal of innovative research in technology IJIRT 149680 June 2020 | IJIRT | Volume 7 Issue 1 | ISSN: 2349-6002