

# Design and Manufacture of Tunnel Checking Machine

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**Abstract**— The basic aim of the machine is to ensure that the butts are present at the part at their positions. This is typically done by with the help of sensors or physically, sensors are quite expensive so the method we use is that with electrical conductivity. Electrical conductivity in sense of positive and negative terminals with the circuit and indicating lights. The machine is fully automatic as it checks the presence of butts by self and shows it. Until the operator fix the part on stand after that the machine operate itself. It is basic combination assembly of Pneumatics, circuit board, mechanical frame, metallic and non metallic material; basically it is combination and made up with them. For automatic working of machine it has Delta PLC DI-DO-25 25 programmed. For checking the job positive supply is given to the backlite plate and negative is taken from Tunnel, 24V DC supply is given to the circuit as it is sufficient and safe to operating. The job is mounted on not metallic hubs and clamped with the pneumatics. The backlite plate made up of Nylon has Silver plated Copper bushes as the overall plate will not conducted and definite part will conducted. Tunnel has 21 butts on it welded the aim of the is to check whether they are present or not. To show they are present or not there is 22 LED lights on electric panel. If the butts are all presents all LED lights will be green, if some butts are absent the definite numbered light will Red. The part is OK and all butts are present the machine will stamp it OK mark and unlocks the fixture. If the part is. NOT OK in this case operator will turn the panel on.

**Keywords:** Tunnel Checking Machine, LED lights

## I. INTRODUCTION

Inspection is mandatory to the Industries even small or multinational companies Each customer wants accurate and perfect errorless product form their vendors. Dispatching the finalized product inspection is needed.

Errors caused in manufacturing process are checked in inspection whether the job is perfect or not. But inspection should be perfect, as inspection is mainly responsibility of the inspectors.

Inspection is checking of the material, products or components of products at various stages in manufacturing. The Inspection act involves:

- 1) The interpretation of a specification.
- 2) Measurement of the Product.
- 3) Comparison of the above two

Now a days it is necessary to increase production rate continuously in order to achieve higher production rate with minimal of human input, there is need to develop innovative machinery to cater the above needs. Inspection is done at the final dispatching line of production it is on line Inspection where 100% accurate and perfect job is dispatched to the vendor or customer. The customer needs perfect products from the supplier is minimal cost and at the given time.

We have successfully completed our project "Design and Manufacturing of Tunnel Assembly Part

Checking Machine". It was done in Presence with the staff members and the C.E.O. of M/S Yogeshwar Industries Nikhil Bhamre Sir. The company manufactures various machines, die, tools. Yogeshwar Industry is located at Satpur, Nashik 422007.

## II. PROBLEM STATEMENT

On this machines inspection basically the definite tunnel of the definite dimension, it check the different part on it. As the inspection is done by the program of PLC. This machine is able to check the all tunnel parts of the different vehicles, so it is inconvenient for sing different machine for the different tunnels.

Inspection is the process of the checking of errors cause due to manufacturing of the and eliminating the defected piece. The error caused to the Tunnel is due to improper yielding of stub, breaking of stub due to rough handling by worker, Improper drilling to the drilled hole or defective positioning of holes or stub on the tunnel.

Using the different inspection unit for the different part was also costlier since it is required to produce a new assembly. This much time consuming for making new assembly machine for new product which suits the requirement and once the inspection of that tunnel is done the whole machine is just a scarp just their special parts can reused for less wastage.

Time, cost, wastage of materials and a large manpower were the most highlighted problems with the inspection machine which is to be faced.

The machine operating speed and capacity is long as much your need. The machine operate 24 hours continuously with the accurate inspection but the worker can't. As the time and capacity was the problem.

## III. OBJECTIVE

In earlier stages we were using different inspection methods for the different parts at the different stages of the production or on line and once the machine is designed for one part not used for another type of part. So our main objective was to provide the convenient machine that if they want to inspect another part; no need to replace all the machine after some replacing parts and program the machine is used.

- 1) To make it portable.
- 2) Optimum time consuming.
- 3) Overall time of production is reduced.
- 4) Errorless.
- 5) Easy operation.
- 6) Providing convenient way for diameter adjustment

## IV. CONSTRUCTION OF MACHINE

Firstly we started with the frame to the work, the frame is of mild steel rectangular made with the welding, cutting. The frame provides the stability to the machine and bars, also gives desired height and provides support to the machine.

Then on the top of frame we assembled a thick cast iron plate, as strength of cast iron is high, the base plate provide solid base to the assembly and cast iron plate can bear large weight on it without bending in it. So cast iron base plate was used as base plate. The Base plate holds overall unit of machine on it.

On the cast iron plate mountings for the piston cylinders were fixed with their desired positioning. The mountings are designed as per the desired position of holes and stub position of the tunnel.

The Tunnel is given with positive charge for safety and for correct operation tunnel should not touch anything as all machine is made up of metal, so tunnel should be kept in air or as in hanging position to avoid metal to metal contact. For that we made a metallic stands of a height to give it height and on top of it fixed a nylon bush so the tunnel should not touch anything metallic. For clamping tunnel with pneumatic also used the nylon bush to prevent current flow. As if the tunnel touches anything that metallic the whole system will get conducted. As current flows from one metal to another.

Tunnel has stub and holes on its fixed position so the checking gauges should at same position where the holes are present on the tunnel. We measure the dimensions at how long the stubs and holes are and with calculating the size of gauges and place of the measuring gauges were set. For the pneumatics the holding fixture were given with the height. The gauges were placed at definite height for the easy pass through the holes or to the stub as the pneumatic piston cylinder only travel in single path. The Nylon plate has bush place where the nylon plate touches bush are present on plate as it detects it.

The pneumatics are automatically operated for that the PLC is used. The PLC is programmed so that it operates the definite program. The PIC program gives command to solenoid valves the convert the signal into the flow of air as the valve control the motion of all pneumatic operated components.

The pneumatics is divided into four sections as by their function. There are totally 9 pneumatic piston cylinders used. One used for stamping; when the tunnel is ok then it will mark it ok. Two used for the clamping purpose to hold the tunnel. Two used for movement of Nylon plate. Four used to check the holes 2 from each side.

The Nylon plate contains 16 copper bush for checking the stubs. The bush take negative charge as the output if the stub is absent then no output then the machine will show the resp. number light as red.

The PLC, relay, circuit board, LED lights, buzzer are combine in one circuit board. The output from holes and studs the output wires are given to the board. The board has ple inside the PLC gives signal to the all system.

The Alarm system is there if the fault in part is detected the buzzer will on

The LED lights are given by the numbers on circuit board as 1, 2, 3... format for the holes and shaft respectively. If the no. 10 stub is absent then the no. 10 light will be lightened as the red for the detailed error.

The operating of machine has two modes as Automatic and manual. For the Manual mode there are switchboard at right hand side of the machine. For manual

operation all pneumatic are operated manually as forward movement and backward movement of the piston cylinder.

As it can be used for all scale industries. The machine is not so expensive the machine can be The Assembly of total machine is in that way it is made compact and movable for it. Tunnel and shaft respectively. If the no. 10 stub is absent then the no. 10 light will be lightened as the red for the detailed error.

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## V. WORKING OF A TUNNEL ASSEMBLY CHECKING MACHINE

The main purpose of this machine is for final inspection. The machine inspects the Stubs and drilled holes of the Tunnel. The machine inspects it with the help of principle of electric conductivity phenomenon; with the help of pneumatic piston cylinder to check the holes are present or not it inspects 6 drilled holes.

And 18 stubs are checked by Nylon plate containing Copper bushes. The Nylon plate is divided in two parts as the dimension of the Tunnel; the nylon plate is connected to pneumatic piston cylinder to its up and down motion.

When the Tunnel is placed on the fixture, after starting the process firstly the tunnel is clamped by two pneumatics at the head it provided with Nylon bush as the system will not conducted by current. Later the Nylon plates will come down simultaneously the Pneumatics cylinder connected for checking of the holes are also goes for further inspection. The all system works automatically as per program of PLC; it gives command to solenoid valves and all system works on its command.

The pneumatics is arranged at that position where it clear passes the holes on the tunnel part. And respectively the Nylon plate comes down where it touches the stub. The pneumatic piston cylinders are placed on the fixtures the fixtures are designed at desired angles at desired height. The all components are arranged on the base plate.

The tunnel is supplied with 24DC current and the current is taken as output by copper bushes on Nylon plate. The Stubs get conducted as the copper bushes takes current the output is that stub is present there and on electric display it shows green light as ok. As tunnel is conducted by current to prevent the all system gets conducted on the base plate we made a non metallic stand as tunnel hangs on it and do not touches anything. And there are two pneumatics for holding at both ends as it doesn't moves. This piston cylinder mechanism also fixed on stand to obtain its height.

The main purpose of pneumatic piston cylinder is it checks with accuracy at desired dimensions with only to and fro motion.

Firstly the tunnel is provided with current for checking the stubs on it; when the Nylon plate comes in contact with stubs the copper bush acts as negative terminal

and takes charge from the stubs the charge given to the circuit board if all stubs are present there are numbered lights respected to number of stubs as red and green; as all stubs present the all lights at display will be green and if some stub is missing then the respected number light will be red and buzzer will on for attention.

Simultaneously for checking the o holes there are 4 pneumatic cylinders arrangement is there as at desired position by fixtures. The studs are connected to the piston which goes Inside to check holes. On display there are equal numbers of lights respected to the holes if the stud not passes then the respected number of light of hole will be red and buzzer will on. Otherwise all lights will be green.

The circuit board is designed at the right hand side of the machine which has operational switches of machine on the panel. The switches are of Cycle start, Auto/manual mode, Clamping and operation of each component for its operation. The machine has two modes auto and manual, basically automatic mode is preferred for operation.

The PLC is programmed on the computer for the definite operation it gives feedback to valves. The valve is placed for to regulate and control the flow for the direction and movement of pneumatic piston cylinder.

All the copper bushy are connected by wiring and each wire of definite stub are given to each light as red or green independently. All connections from operational panel are also given to there at display where indicating light, PLC and relays are placed.

If all stubs and butts are present then the all lights will green and there is one piston cylinder arrangement is placed for the stamping for Ok mark on the tunnel. The stamp is only of Ok not for the rejected place the rejected place should be acknowledged by worker itself. The stamp doesn't affect on the strength of the component and the mark removes or disappears after powder coating on it.

If the part is Ok then machine will stamp it Ok automatically, if stub or hole are absent on the tunnel then the buzzer will on and worker should switch the machine on manual model acknowledge the alarm and mark the rejected place and describes its fault as per the display which stub or hole is defective.

## VI. SYSTEM DESIGN

System design mainly concerns the various physical constraints and ergonomics, space requirements, arrangement of various components on frame at system, man-machine interaction, and number of controls, position of controls, working environments of maintenance, scope of improvement, weight of machine, and total weight of machine. Also the cost and efficiency factor was considered.

### A. System Selection based on constraints-

Our machine is used on inspection department of industry so space is major constrain. The system is to be very compact so that it can be adjusted in small space. The system is compact in size as it can be fitted in small space. The machine components are selected and fitted in that manner the machine is lighter and compact in shape.

### B. Arrangement of various components-

Keeping into view the space restrictions all components should be laid such that their easy removal or servicing is possible. Every possible space is utilized in component arrangements. The components are arranged in that way the all space machine covers is compact and free to inspect for the inspection of the machine.

### C. Man-machine interaction-

Machine is designed that the machine is easy and comfortable for operating as the operator should comfortable and satisfied with the machine. The operating panel of the machine is kept that ways it easily to the operator. And height is given in that way it is comfortable.

Failure is caused during working of machine the design criteria is important Factor of safety is kept high so that there are less chances of failure. Factor is required to keep unit healthy and for less breakdowns.



Fig. 1: Tunnel Assembly Checking Machine

## REFERENCES

- [1] S. R. Majumdar "Pneumatic Systems" January 1999
- [2] Fransis G. L. "PLC Systems: Quick reference guide" July 2016
- [3] S. R. Ingole "Metrology and Quality Control" tech max winter 2016 Edition.
- [4] "Fluid Mechanics and Machinery" Nirali Summer 2015
- [5] R. B. Mali "Industrial Fluid Power"
- [6] S. D. Ambatkar "Design of Machine Elements"