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Productivity Improvement using Automation in Conveyor Roller Welding

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Abstract: In the industrial workplace, automation enhances productivity and quality while reducing errors and waste, boosting safety, and providing greater flexibility to the manufacturing process. Industrial automation, in the end, results in enhanced safety, dependability, and profitability. Increased productivity is achieved by automating the welding machine for conveyer rollers. Many departments are included in this project like design, fabrication, testing, etc. The movement of welding torch with respect to workpiece can be automated with the help of pneumatics along with use PLC control system. Accuracy is the key factor on which the rate of success of the project can be measured. Hence, tried to standardized the project as much as possible by using standard data and equipment. Automation systems are increasingly displacing humans in the workplace. One of the advantages is that the human workforce will have more time to focus on more innovative projects as a result of the transition. All the required parameters are to be considered while designing the machine components. According to design, fabrication is done with the guidance of experts from the company as well as project guide.
Keywords: Automation, Flexibility, Accuracy, Design, Rollers, Welding.

I. INTRODUCTION

Automation is used in modern manufacturing as a result of increased product quality standards and the trend to automate production processes, as well as increased profitability. Welding is one of the most significant materials shaping and processing processes in modern manufacturing. Automated systems are important for achieving higher quality and efficiency at a lower cost. Automation is being adopted by an increasing number of businesses these days. The use of an advanced automatic control system based on industrial controllers allows us to programmatically operate a main handling system efficiently. The production costs and processing time are both decreased by using an automated system. Automation is a technology that enables a process or operation to be completed without the need for human intervention. Conveyor Roller Welding Automation Solutions were developed as part of the project. These machines are equipped with pneumatic clamping systems and GMA welding systems, making them extremely simple to operate and increasing efficiency. The roller conveyor's dependable physical performance and long-term throughput make it feasible in a variety of manufacturing, distribution, and processing applications. Roller conveyors can also move goods uphill; on the one hand, this improves roller conveyor room planning; on the other hand, it keeps production factors improving.

The roller conveyor may also be made up of two rollers to minimise the load's working pressure as well as the roller conveyor's actual operating pressure. Completely automatic electric welding with metal active gas welding, is a welding process in which an electric arc forms between a consumable wire electrode and workpiece metal, which heats the workpiece metal, causing it to melt and join, is a welding process in which an electric arc forms between a consumable wire electrode and workpiece metal, which heats the workpiece metal, causing it to melt and join. A shielding gas is fed through the welding gun along with the wire electrode, shielding the process from pollutants in the air. The most obvious advantage of automation is that it saves labour; however, it is often used to save energy and materials, as well as to increase efficiency, precision, and accuracy.

II. PROBLEM DEFINITION

A leading manufacturer of various parts had requirement of some transportation system for moving the parts from one place to another place. For this most often they were using conveyor system. Conveyors are particularly useful in applications where heavy or bulky materials must be transported. Conveyor systems are very common in the material handling industries because they allow for easy and efficient transportation of a wide range of materials. But while Doing this work some parts of conveyor may get damaged due to overloading of materials, parts get stuck in the belt, which develops large amount of pressure on Rollers and it may get damaged. We repair them with help of welding and again use it in system but manual welding may not be perfect every time so it may create again same problem.

While doing this the life of roller reduced due repetitive welding or improper welding. This caused employees to become extremely tired, and the quality of their work suffered as a result of the system's repeated failures. Hence there is need to design Automated Welding system for rollers which will do perfect welding every time, which will reduce the lead time require for welding, increase the life of conveyor system and Efficiency of work and reduce the fatigue of workers**.**

III. OBJECTIVE

The major aim of the present research is to develop and construct a low-cost automated roller welding setup. The design of welding machine should be such that it offers least technical errors and rejection rate in its application phase. Also, various factors should be considered in design phase so that the welding setup can be manufactured in cost efficient way. Second objective of this research project is to minimize the welding lead time. As manual welding operation causes delay in the welding process due to manpower inefficiencies, automating the welding process will decrease the lead time and improve the overall productivity of the process. One of the objectives behind development of automated welding system is to minimize the risk caused due to conveyor system failure. As manual welding of rollers can cause errors leading to conveyor system failure, automating the welding process will help to avoid the risky situations arising due to sudden conveyor system failures. Due to high quality welds and less error due to lack of human intervention objective of risk prevention can be achieved in the research project under consideration. Through this increased quality of welded rollers inefficiencies will greatly reduce which are caused due to system failure.

IV. METHODOLOGY

Once the problem statement of research project was defined, first step in the project methodology is to start with the design phase of the automatic co_2 welding machine for conveyor rollers. The designing phase considers three main issues associated with manual welding which are wastage of time, higher error rates leading to low productivity and high labour cost. Design of the machine is done in order to eliminate these three problems which make the setup more efficient in its working and cost effective as well. The design phase includes determining the structure of setup and various components, modelling of all the parts and calculating whether all components can sustain at working condition or not. All the material selection in design phase, manufacturing process specifications listed are always set so that the welding setup can be manufactured within available machining capabilities. Fabrication process consists of development of required component according to the process specified, dimensions and tolerances machined in design stage. Fabrication process can also pose some flexibility when certain manufacturing limitations occur, but the changes in process were done while making sure that there is no significant change in desired output or cost of manufacturing. Once the welding setup is manufactured, initial testing phase begins where all the components being manufactured are checked whether they meet design requirements or not. Weld quality is also checked and improvements are done according to the desired end results. Once improvements are made in welding setup, testing process is once again repeated until final conveyor rollers are made as per the design specifications.

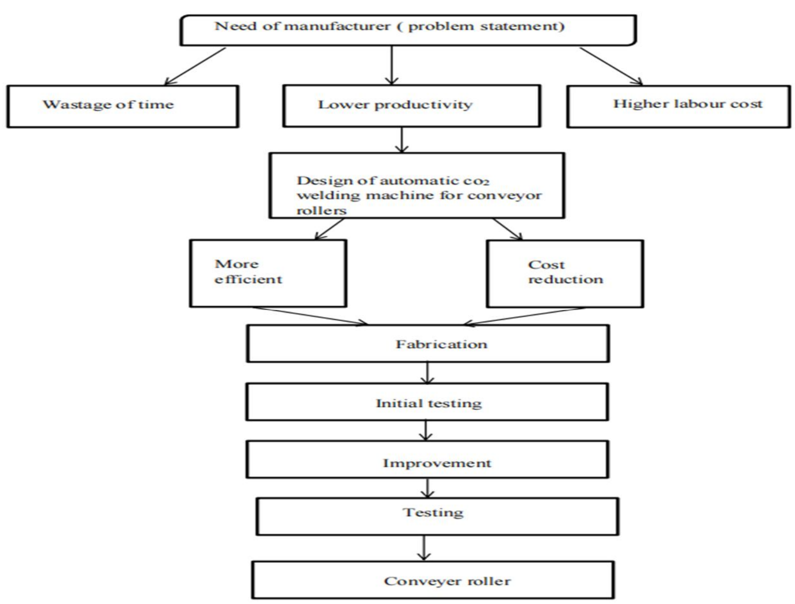

Figure No 1: Methodology of Project

V. DESIGN CALCULATIONS

Every mechanical system has a design process, and we all know which are the most important things to design for the system, and this design provides acceptable results based on calculations. Now, various dimensions of parts are determined based on the requirements needed for optimal machine operation. Various design calculations are taken into account to achieve the necessary rigidity.

A. Design of Shaft

According to the ASME code the maximum allowed Stress T max for a shaft without key ways is 30 percent of the yield strength in tension or 18 percent of the ultimate tensile strength of the material, whichever is greater,

$$Tmax = 0.30Syt$$

OR

$$Tmax = 0.18Sut$$

ASME code is based on the maximum shear stress theory of failure. Therefore, equation is,

$$T_{max} = \frac{16}{\pi \times D3} \sqrt{(kb \times Mb)^2 + (kt \times Mt)^2}$$

Table No 1: ASME Standard Value

Applications	Kb	Kt
1. Load gradually applied	1.5	1.0
2. Suddenly Applied	1.5-2.0	1.0-1.5

Power = V×I

= 370 Watt

So

P= 2πNT / 60

T= Px60 / 2 π N

T= 370x60 / 3x2π

T = 1177.74 KN .mm

Now,

Mt = 125×1177.34

=147.21× KN .mm

Figure No 2: Load on shaft

Now Finding Minimum shear stress,

Syt = 770 N /mm^2

Sut = 580 N /mm^2

Kb = 1.5

Kt = 2

τ =0.3 syt =0.3×580 =174 N /mm^2

τ=0.18 syt = 0.18×770 = 138 N /mm^2

So, taking minimum from both τ

τ = 138 N /mm^2

$\tau_{.max}$= 0.75×138= 103.95 N /mm^2

Mb = 20×2= 40 N.mm

Now,

$$D^3 = \frac{16}{\pi \times \tau max} \sqrt{(kb \times Mb)^2 + (kt \times Mt)^2}$$

$$= \frac{16}{\pi \times 103.95} \sqrt{(1.5 \times 40)^2 + (2 \times 147210)^2}$$

D =38.42 mm

We get the standard sizes of the shafts in the market. So,

D= 40 mm.

B. Design of Pneumatic Cylinder

Cylinder used for torch actuation

Design pressure = 5 bar

$=5 \times 10^5$ N /mm^2

Force on the cylinder =weight of transformer

=18×9.81

=176.058 N

We know,

Pressure on the cylinder,

P=F/A

$5 \times 10^5 = 176.58 / A$

$A= 3.53\times 10^4 \ m^2$

$\pi/4 \times d^2= 3.53\times 10^4$

d=21.2mm

The cylinder bore diameter is 21.2 mm.

But, as per the standard chart of Genetic pneumatic. We select

Std. bore dia. = 32 mm

Dia. of piston rad =10mm

Stroke length = 200 mm

C. Cylinder Used at Tailstock

Design pressure = 5 bar

$P=5\times 10^5$ N /mm^2

Force on the cylinder =weight of transformer

F=30×9.81

F=294.3 N

We know,

Pressure on the cylinder,

P=F/A

$5\times 10^5= 294.3/A$

$A= 5.886\times 10^4 \ m^2$

$\pi/4 \times d^2= 5.886\times 10^4$

d = 41.06mm

The cylinder bore diameter is 41.06 mm.

But, as per the standard chart of Genetic pneumatic. We select

Std. bore dia. = 50 mm

Dia. of piston rad =16mm

Stroke length = 150 mm

D. Bearing Calculation

d= 12 mm
L 10h =60000
N= 3 rpm

$L10h = 60 \times L_{10} h\ n/10^6$

$= 60 \times 60000 \times 35/10^6 = \quad 10.8$

$C = P\ (L\ 10\ h)^{1/3}$

$= 1200 \times (10.8)^{1/3}$

From table[9] ,

d	D	B	C	C_0	DESIGNATION
12	21	5	1430	695	61801
	28	8	5070	2240	6001
	32	10	6890	3100	6201
	37	12	9750	4650	6301

Bearing No. is 6001 is selected.

For 6001 C = 5070 N

E. Design of Power Screw

Pitch = 8 mm

Lead = 16 mm

D = 40 mm

Dm= D- 0.5×p = 36 mm

For the self-locking of screw,

Friction angle must be greater than helix angle.

$\beta \geq \alpha$

where,

β – Friction angle
α – helix angle

We know,

$\text{Tan}\ \alpha = \frac{l}{\pi m}$

$= \frac{16}{\pi\ x 36}$

$\alpha = 8.05^0$

Friction angle calculate,

$\tan \beta = \mu$

were,

μ = coefficient of friction = 0.16

$\beta = 9.09^0$

Hence friction is greater, screw is self-locking

VI. DRAWING OF COMPONENTS

CONICAL CENTRE

Function: Centre is used to hold the rollers during welding.

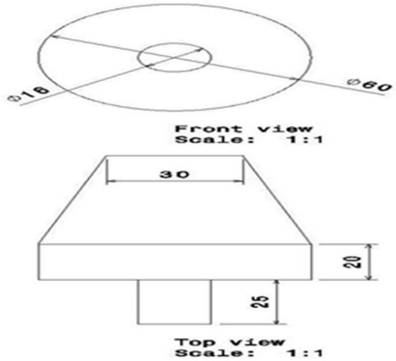

Figure No 3

TAILPOST CENTRE

Function: It is used to hold the roller in position during welding

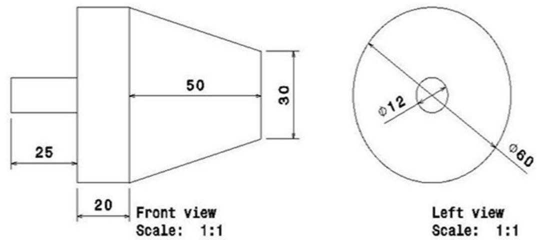

Figure No 4

BASE FRAME

Function: Base or frame is the structure on which the whole assembly rests

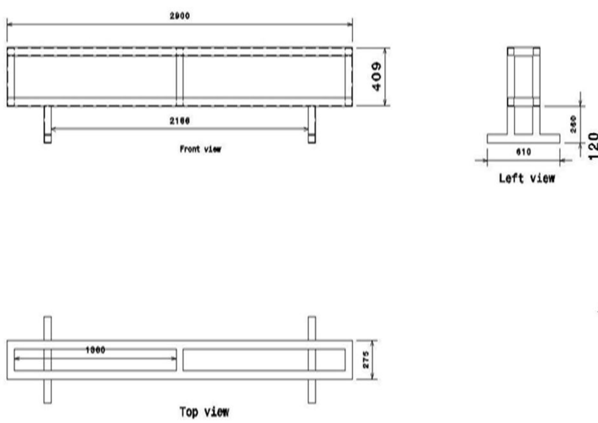

Figure No 4

BASE PLATE

Function: Whole torch and stand assembly rest on this plate

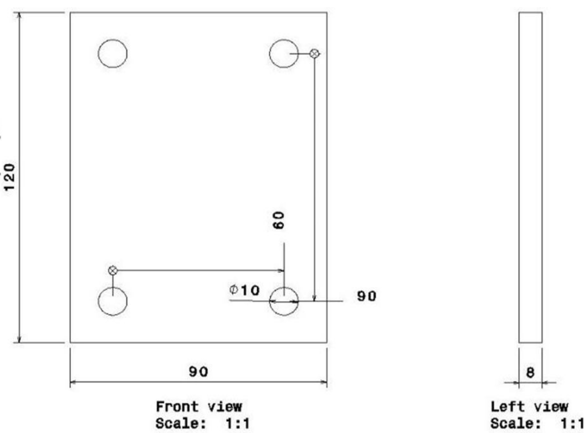

Figure No 5

SUPPORT PLATE

Function: It is supporting member of Roller while welding.

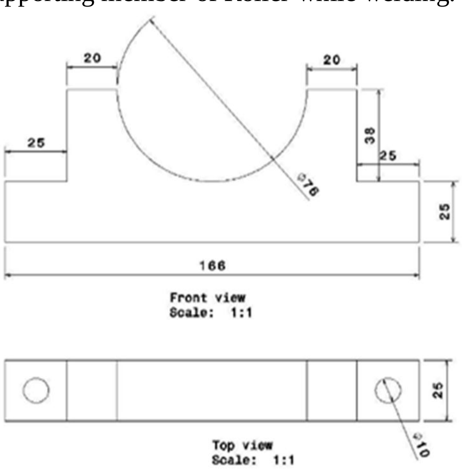

Figure No 6

MOTOR FLANGE

Function: This flange connects motor to the centre and its assembly.

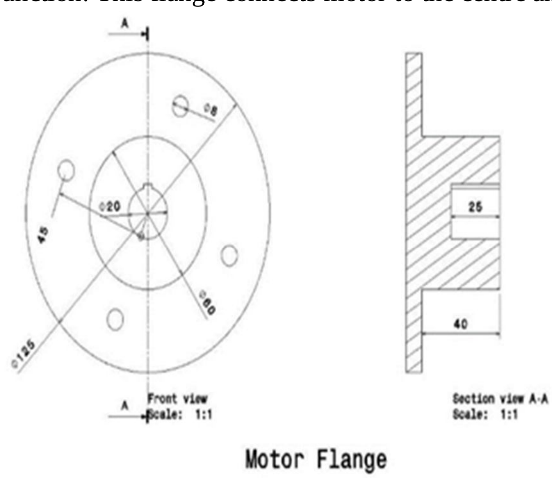

Figure No 7

GUIDE SUPPORT PIPE

Function: It is used for height adjustment of torch assembly

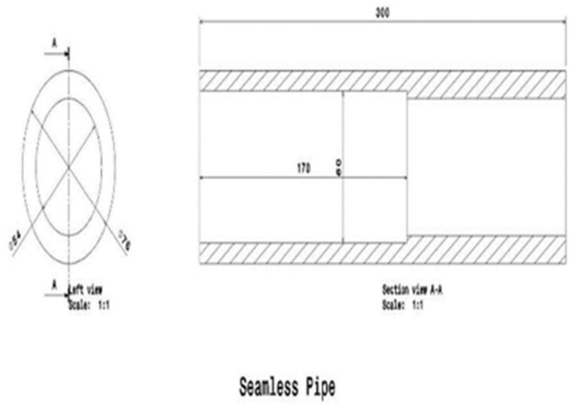

Figure No 8

CENTRE TORCH BLOCK

Function: Torch holding pin rests on centre torch block to slide.

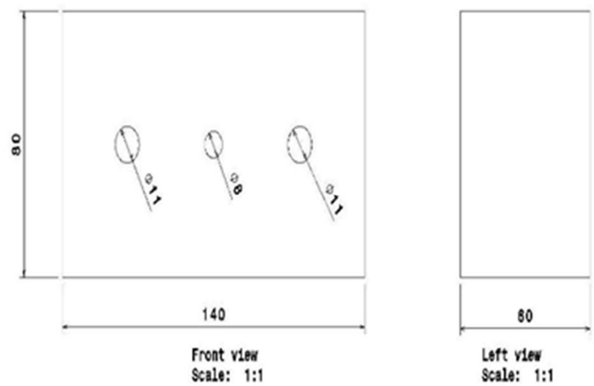

Figure No 9

A. Torch Attachment

WELD TORCH PLATE

Function: It is used to support the Welding torch assembly.

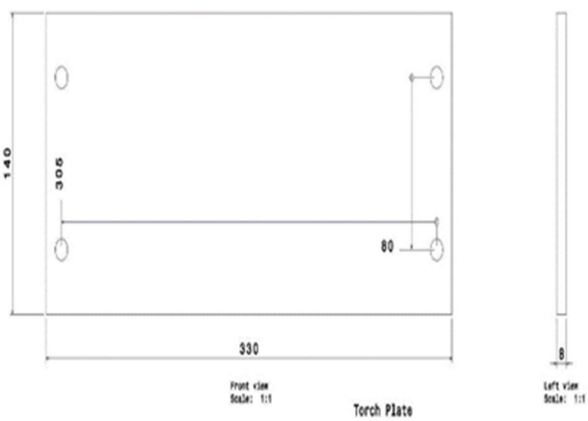

Figure No 12

WELD TORCH END PLATE

Function: Whole torch and stand assembly slides on this plate.

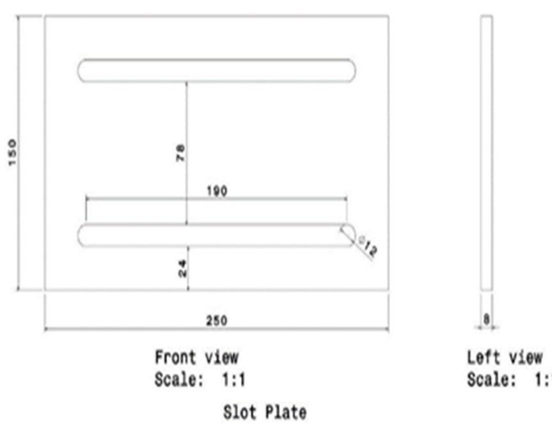

Figure No 1

TAILSTOCK FLANGE

Function: It connects pneumatic cylinder with tailstock assembly

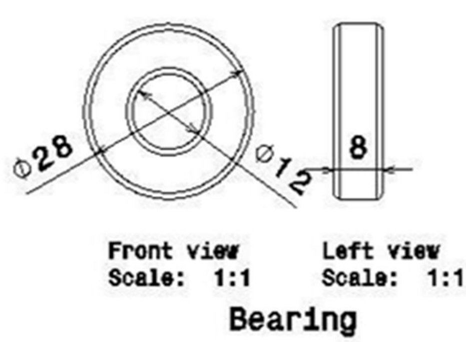

Figure No 10

BALL BEARING

Function: It helps the tailstock side centre to rotate freely.

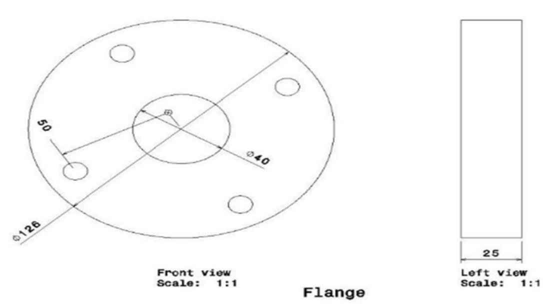

Figure No 11

B. CAD Model of Setup

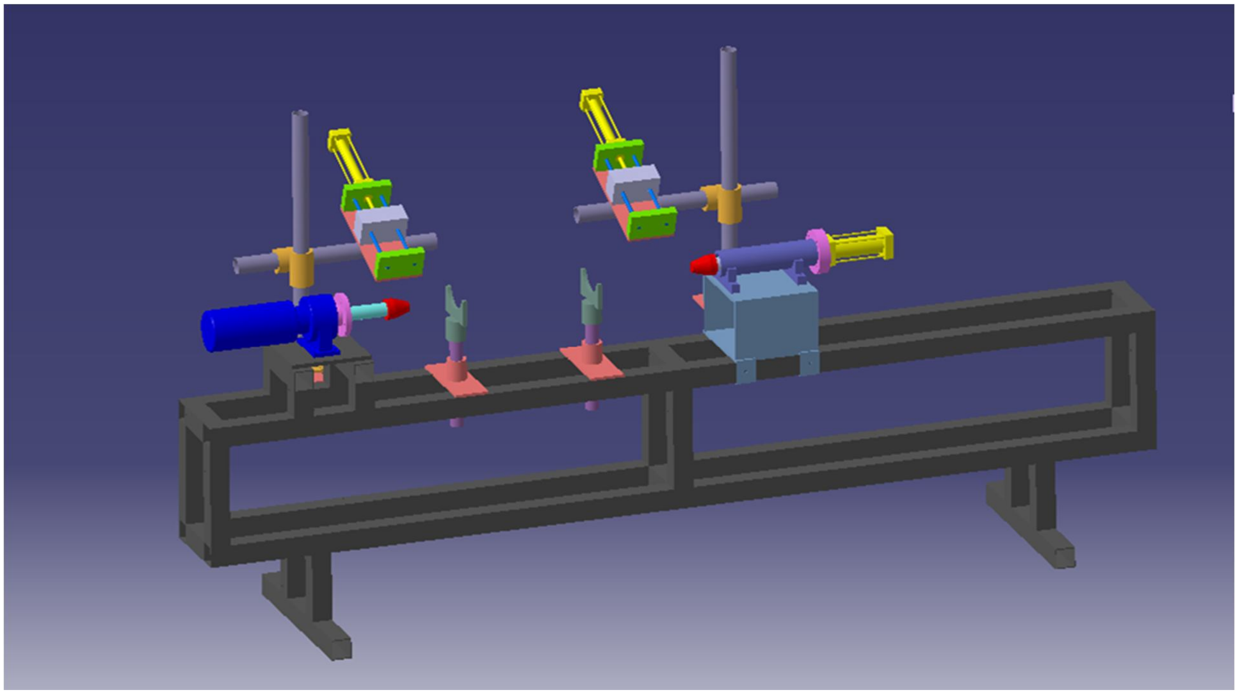

Figure No 14 CAD DRAWING

VII. INFORMATION ABOUT OF COMPONENTS

A. Base Frame

Base frame of the machine is made up from Mild Steel square Pipe. The structure of base frame is made in rectangular shape. On this base Frame all other equipment like motor assembly, Roller guide, tail stock assembly are mounted. It provides rigid support our Automated setup. Details of Base frame.

Technical Details

1) Area of pipe: 1-Squre Inch
2) Length: 2030mm
3) Width: 320mm
4) Height: 520mm

B. Motor Assembly

We use an induction motor for this machine. The induction motor operates on the principle of induction, in which an electro-magnetic field is induced in the rotor when the stator's revolving magnetic field cuts the stationary rotor. The chosen motor has a standard speed of 800 rpm and a gear system. The purpose of this gear arrangement is to reduce the speed. Motor selected is of standard speed of 800 rpm having gear arrangement. This gear arrangement is provided to achieve the speed reduction. For the welding operation very small rpm rotation of motor is needed. In order to achieve this gear box of gear ratio 68 is used which reduces the speed of the motor to 20 rpm

Motor specification

1) Three phase induction AC motor
2) Rpm = 600
3) Power = 0.5 HP
4) Current = 1.1 amp
5) Frequency = 50 Hz
6) No. of Pole = 8
7) Weight = 12 Kg

C. Roller Guide

This are made from metal. Roller guide have 180 deg. semi- circle. This guide provide support to the rollers while rotating when welding going on. For our project we use 2 roller guides.

D. Tail stock Assembly

The tail stock assembly is used to support the roller from another end so the roller can be rotate safely without any runout. The pneumatics cylinder assembly is mounted behind the tailstock assembly the pneumatic system moves the assembly towards motor. Conical head is provided Infront of pneumatic Cylinder Shaft which gets fitted in Roller diameter.

E. Pneumatic Cylinder

Actuators such as air cylinders are used to achieve the needed movements of mechanical elements in a pneumatic system. Actuators are output devices that turn compressed air energy into the desired action or motion. Three 32 mm diameter pneumatic cylinders are used in the system. In addition to the compressor and other pneumatic system components.

F. Welding Arrangement

Welding is a fabrication technique that requires heating two or more pieces to their melting temperatures, with or without the application of pressure, and with or without the inclusion of filler metal to create a high-strength junction. The melting point of the filler metal is similar to that of the base metal. We employ Metal Arc welding and Inert Gas welding on this machine. We have two Welding electrode which weld the roller from two side. This welding rod mounted on pneumatic cylinder assembly which adjust the welding rod position according to roller requirement.

1) RATED INPUT AC :220+15%
2) RATED OUTPUT: 170A/26.8V
3) WELDING CURRENT: 10−170A
4) EFFICIENCY (%): 85
5) POWER FACTOR: 0.93
6) WEIGHT(Kg): 5kg

G. Programmable Logic Controller (PLC)

PLCs can be built to perform in a broad range of temperatures, being electric noise proof, and be vibration and impact resistant to fit their working conditions. Non-volatile memory with battery backup is being used to store the software that control the machine's function. Allen Bradley Micrologic 1200/1762 Series C PLC with 16 digital inputs and outputs was used for the project. SCADA, HMI, and PLCs employ built-in ports like USB, Ethernet, RS-485, RS-232, and RS-422 to communicate with external devices like sensors, actuators, and systems like programming software. We used the MicroLogix 1200 controllers' built-in RS-232-C interface for communication. Communication is carried over various industrial network protocols which are vendor specific, like Modbus, or Ethernet/IP.

VIII. PNEUMATIC SYSTEM

Pneumatic devices are used in a wide range of applications in our daily lives. In order to transfer and control energy, a pneumatic device uses compressed air. There are lot of advantages to using pneumatic controls for machine automation, particularly in the industrial and manufacturing industries. Pneumatic systems are prevalent in automated processes in various industries. In pneumatic system it should be make sure that the air supply provided for system having sufficient pressure, temperature and air flow. By providing Correct Parametric values will ensure the long and efficient life of the devices and the maintenance of system also reduced. For this research project pneumatic system is utilized.

This system is Automated by the use of PLC. The pneumatic circuit shown in figure uses components like Compressor, Air receiver tank, FRL unit, Solenoid operated 5/2 Directional Control Value, Double side operated pneumatic cylinder, Variable flow control value with check value. Mechanically operated Compressors take atmospheric air from inlet port, compress it and increase its pressure. After that this pressurized air is stored in air receiver tank. This air then passes from FRL unit FRL means Filter, Regulator, Lubricator unit

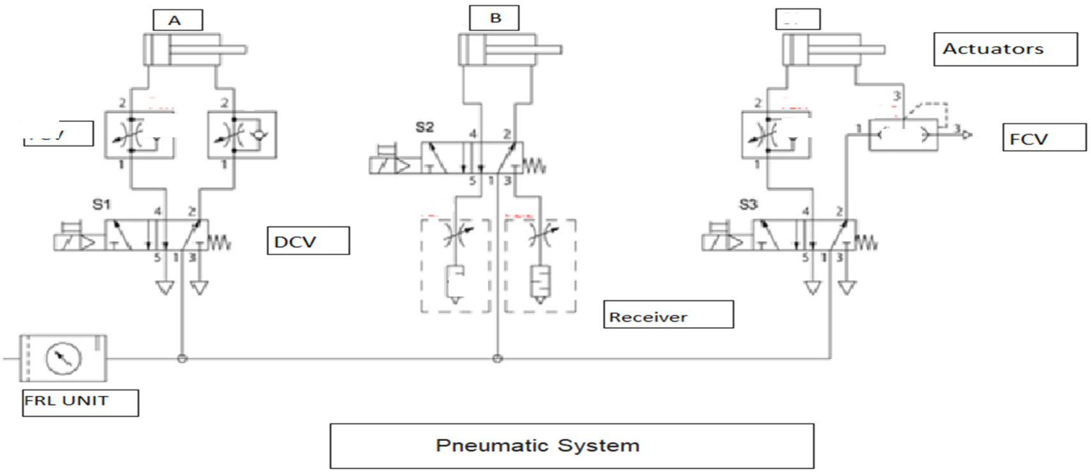

Figure No 15 Pneumatic Circuit

This unit filters the air, removes unwanted particular dust, dirt from compressed air. Regulator & Lubricator lubricate the air. The research project includes 5/2 Solenoid DCV which gives direction to the cylinder's operation. The DCV has 2 position, 1st position provides extension of cylinder and 2nd position Retract the cylinder. Variable Flow control value with check value (FCV) are used to control the speed of cylinder. When PLC is switched on then compressed air is passed through FRL unit then it goes to DCV. In figure DCV is on 2nd position. When Directional Control Value changes its position of actuation then cylinder A, B, C extension as per the defined sequence. The sequence of this circuits for extension is C^+ then $A^{+,}$ B^+. As per this sequence cylinder C extends first. The cylinder C is fitted in front of Tailstock assembly this assembly moves along with cylinder extension; the conical head is fitted Infront of cylinder shaft which is get fitted inside the roller and hold it while welding operation is going on. Now the sequence moves forward and Cylinder B and A extend on cylinder A, B we provide welding arrangement and welding rod after extension of cylinder this rod comes near roller for welding operation. The welding operation start when we press Switch on PLC the welding operation is automated after this the pneumatic circuit follow the retraction sequence as per stated. In this the air is passed from 1 to 2 through meter in circuit which controls the speed of retraction of cylinder A. In the same way cylinder B and C also retract. The sequence of retraction is A^-, B^- then C^-. As per this sequence cylinder A and B retract first on which welding rod are mounted which retract first. After this the cylinder C retract when C retract then the welded roller is free take out from the welding machine. The welding Quality is excellent by using this Automatic system Production quantity and quality improved as per our expectation

IX. PROGRAMMABLE LOGIC CONTROLLER

A programmable logic controller (PLC) is an industrial computer control system that has been adapted for the control and regulation of manufacturing processes such as production lines, robotic systems, or any operation requiring high reliability control, ease of programming, and process fault diagnosis. It's really a digitalized, industry-based electronic computer system that is technologies in the field to be used in the industrial and manufacturing environments. Automation, assembly lines, control systems, and robotic systems all use PLCs. Practically, any operation relating to high-reliability control, fault diagnosis, and processing are used this automation. The PLC generates data from electronic sensor or input devices, analyses it, and then triggers outputs based on pre-set criteria. System performance and operating temperature can be monitored and recorded by PLC. It can be also used to start and stop processes automatically, for generating alarm in case of machine malfunction with many more application depending on input and output. PLC are very flexible and robust in their operation that they can be applied to almost any application to automate the process. PLCs are composed of a set of instructions, either in text and graphics, that represent the logic for tracking and reporting real world data such as machine productivity, operating temperature, as well as other various manufacturing real-time applications. A software program entirely dedicated to PLC programming is generated from PLC hardware from a big product. User software product can be accessed and developed to use the programme, which can then be downloaded to the PLC hardware. This application integrates a Human Machine Interface (HMI), which would be a software and hardware interface that transforms user inputs into computer signals. PLCs have replaced the original relay logic control system, during which a community of relays is engrained to perform a specific function not only by switching but also by executing multiple functions including such processing analogue signals, counting, sequencing, evaluating, and so on.

A. Power Supply Module

The input and output models in a PLC require a 24V DC supply, whereas the processor requires a 5V DC supply. The power supply is usually an inherent aspect of the PLC. Various conventional rectifier circuits are used in the power supply unit to convert 230V AC electricity to 24V and V DC.

B. Input Module

Many input devices, such as push buttons, sensors, potentiometers, and pressure switches, have high voltage output. This high voltage from these devices is converted by the input module to low level voltages that may be processed by the CPU. Both analogue and digital inputs can be processed by the module. Digital inputs are preferred in industry.

C. Analog Input Module

It is used to convert analogue signals from temperature sensors or pressure sensors to digital signals using an ADC converter. The primary signal from these sensors is analogue, with a voltage range of 0-12 V and a current range of 5 to 20 mA. Signal digital input is converted to 5V digital signals, which the CPU uses internally to execute a user programme.

D. Central Processing Unit

This brain of the PLC controls and processed all the operations within the PLC. Various arithmetic and data manipulation functions can be performed by CPU of PLC even when input or output device are remotely located from CPU. All the communication between input-output devices, personal computer and other peripheral devices is also done by CPU of the programmable and logical control unit.

E. Output Module

Output modules are required to amplify the low-level signals generated by CPU to feed them into various output devices such as contractor coil, solenoid coils, lamps etc. Hence the amplified signal generated from low level logic signals is sent to final control system to operate various output devices.

F. Software

The operating system and the user programme are the two software components of a PLC. The operating system in a PLC allows for the design of project structures, user programmes, and other functions. This operating system is controlled via the main window, which is a graphical user interface. The primary window houses all of the functions required to customise and set up the project. User programs are usually written with standard PLC programming language like ladder logic or statement list.

X. PLC LADDER AND WIRING DIAGRAM

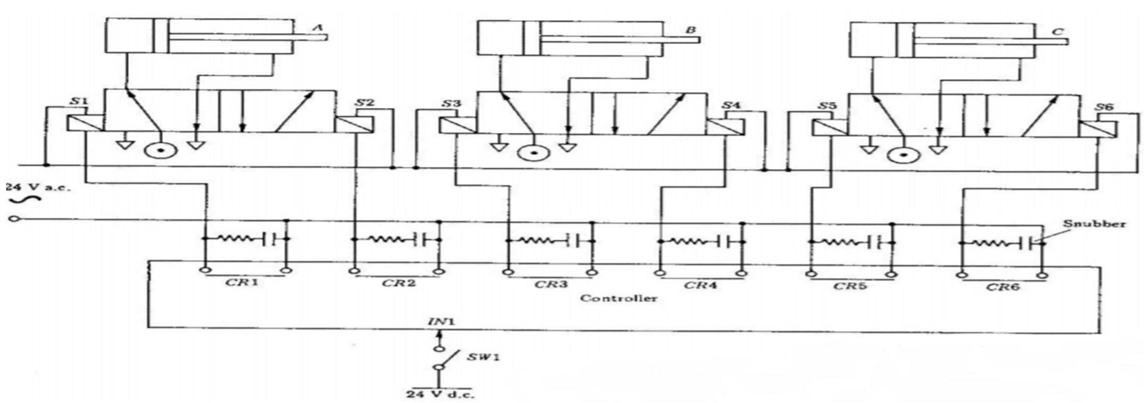

Figure No 16 Wiring Diagram

Above figure shows the wiring diagram for Pneumatic circuit used for automated setup for roller conveyors welding machine. In the figure we supply 24-volt AC power supply to the whole system. In this we use three solenoid operated direction control value. We supply electrical signal through Contact relay.CR1, CR3 & CR5 this relay is use to supply electrical signal to extend the cylinder through DCV. Other three relay CR2, CR4 & CR6 are used to retract the cylinder through changing DCV Position. The SW1 is Switch which connects 24 Volt DC supply to Contact Relay.IN1 is Input switch for lower circuit.

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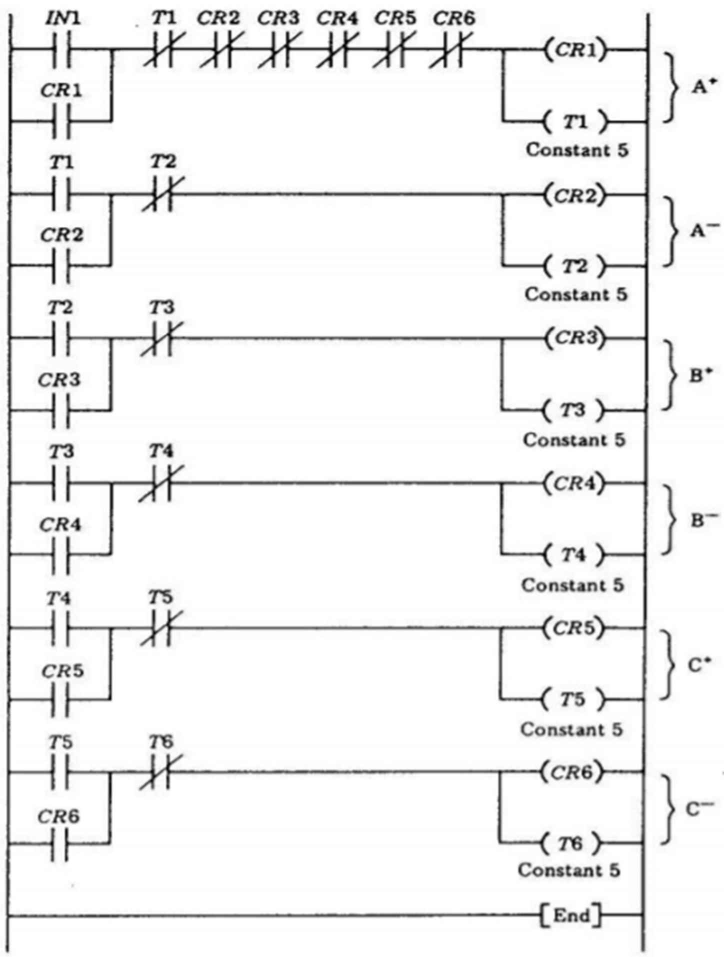
XI. LADDER DIAGRAM

Ladder diagrams are a frequent kind of electrical notation and symbols used to describe how electromechanical switches and relays are connected. The two vertical lines, known as "rails," connect to the opposite poles of a power supply, which is typically 24 volts AC. In a ladder diagram, horizontal lines are referred to as "rungs," with everyone else indicating a separate parallel circuit branch between the poles of the power source. Contacts and coils run the length of the rungs, replicating the contacts and coils found on mechanical relays. The contacts function as inputs and are frequently used to represent switches or pushbuttons, while the coils function as outputs, such as a light or a motor. When employing While logic, contacts are placed in series, and when utilising OR logic, contacts are arranged in parallel. There are normally open and normally closed connections, just like in genuine relays. Below figure shows the ladder diagram used for sequencing of pneumatic system. The circuit is on when Input 1(IN1) actuated which activate all Contact relay (CR). For our project first we extend cylinder C. The CR5 is get activated which send signal to S5 solenoid value which operate position 1 because of this cylinder C is extend which hold the roller on the mounting.



Address	Instruction	Data
0	LOAD	IN1
1	OR	CR1
2	AND NOT	T1
3	AND NOT	CR2
4	AND NOT	CR3
5	AND NOT	CR4
6	AND NOT	CR5
7	AND NOT	CR6
8	OUT	CR1
9	OUT	T1
10	CONSTANT	5
11	LOAD	T1
12	OR	CR2
13	AND NOT	T2
14	OUT	CR2
15	OUT	T2
16	CONSTANT	5
17	LOAD	T2
18	OR	CR3
19	AND NOT	T3
20	OUT	CR3
21	OUT	T3
22	CONSTANT	5
23	LOAD	T3
24	OR	CR4
25	AND NOT	T4
26	OUT	CR4
27	OUT	T4
28	CONSTANT	5
29	LOAD	T4
30	OR	CR5
31	AND NOT	T5
32	OUT	CR5
33	OUT	T5
34	CONSTANT	5
35	LOAD	T5
36	OR	CR6
37	AND NOT	T6
38	OUT	CR6
39	OUT	T6
40	CONSTANT	5
41	END	

Circuit for sequencing the pistons.

Figure No 17 Ladder Diagram

Now we operate another two cylinders for this CR1, CR3 get energized they send electrical signal to solenoid value S1 and S3 which operate position DCV from this we get output T1 and T3 which extend cylinder A & C. On Cylinder A & C we mount welding rod they extend after this circuit complete and welding operation start. After Welding operation, we retract the cylinder to its original position. For this CR2, CR4 contact relay energised this send electrical signal to solenoid value S2 and S4 which change position DCV from 1 to 2 which start retracts the cylinder like this both cylinder A& B get its original position. After that CR5 get Input signal from IN1 and it energized this send electrical signal to the two solenoid value S6 it slides position 2 which retract cylinder C now we can remove the welded roller from system. Now our PLC system follow sequence C+ A+B+ after that A-B- and C- here "+" sign is for extension of cylinder & "-" sign for retraction of Cylinder.

XII. CONSTRUCTION AND WORKING

This research project's automation is based on the execution of instructions in the form of a programme in conjunction with a control system. This machine is strongly related with manufacturing while being automated. To avoid a lack of process and measurement, the project is controlled through automation, employing a PLC with input-outputs based on the process requirements. For this project we use Allen Bradley MicroLogix 1200/1762 series. Figure shows structure of machine this machine include base frame structure upon that whole system is mount This frame is manufactured by MS 1-inch square pipe this make rigid and strong structure for the welding machine. On base frame we mount motor assembly, Infront of motor shaft we attach round centre flange to hold the roller. We use three phase AC induction Motor to rotate the roller for proper welding, speed of motor can vary according to the need of weld.

Figure No 18: Actual Welding operation

The use two semi-circle structured guide below the rollers height of this guiding is varied according to size of rollers they guide the roller while it rotates by using motor. On other end pneumatic operated roller holding system mounted which can moved by pneumatic system as per the length of roller. On these frames we attach two pneumatic cylinder having flange mounting in front of this cylinder. In this flange we provide two holes in that we hold the welding rod. The height of this pneumatic cylinder can be varying this type attachment provided for the system. Gas metallic arc welding system provided near the machine. The PLC panel and other connection of pneumatic and electrical system arranged according to the system. When We start machine, PLC gets started executing the program. We mount roller on motor shaft from another end the pneumatic system moves towards roller and it hold the roller properly, after this motor start rotating roller slowly.

Now the two double acting pneumatic cylinders extend along with this welding rod come near to the rollers, now we switch on Gas metallic arc welding this start the welding process of rollers while these rollers are rotating so we get 360 deg. Welding of rollers. In the actual operation of the internal welding, we select the welding method of single-sided welding and double-sided welding to ensure that the welding root can be penetrated without welding defects. The actual operation standard of the roller conveyor is a matter that manufacturing industry attach importance to, which concerns the roller conveyor's transportation efficiency and service life.

A. *Actual Setup of Project*

Figure No 19: Actual Setup of Project

XIII. CONCLUSION

This is an automated set up for welding of idler conveyor roller, we replaced manual welding by automated set up, so the welding is done automatically it results in an increase the productivity. The implementation of this project removes the need for a certain number of welders to weld the rollers. It cuts down on cycle time. It provides a concept that is both functional and cost-effective. Often guarantees precise and effective roller welding.

A. Time Required for manual welding of 1 conveyor roller is approximately: 10 minutes. {Both Side}
B. By using Automated setup time required for welding of 1 conveyor rollers is approximately: 2 minutes. {Both Side}

BY using Automated Setup for Conveyor Rollers welding, we save 8 minutes for two rollers welding it increase the efficiency and productivity.

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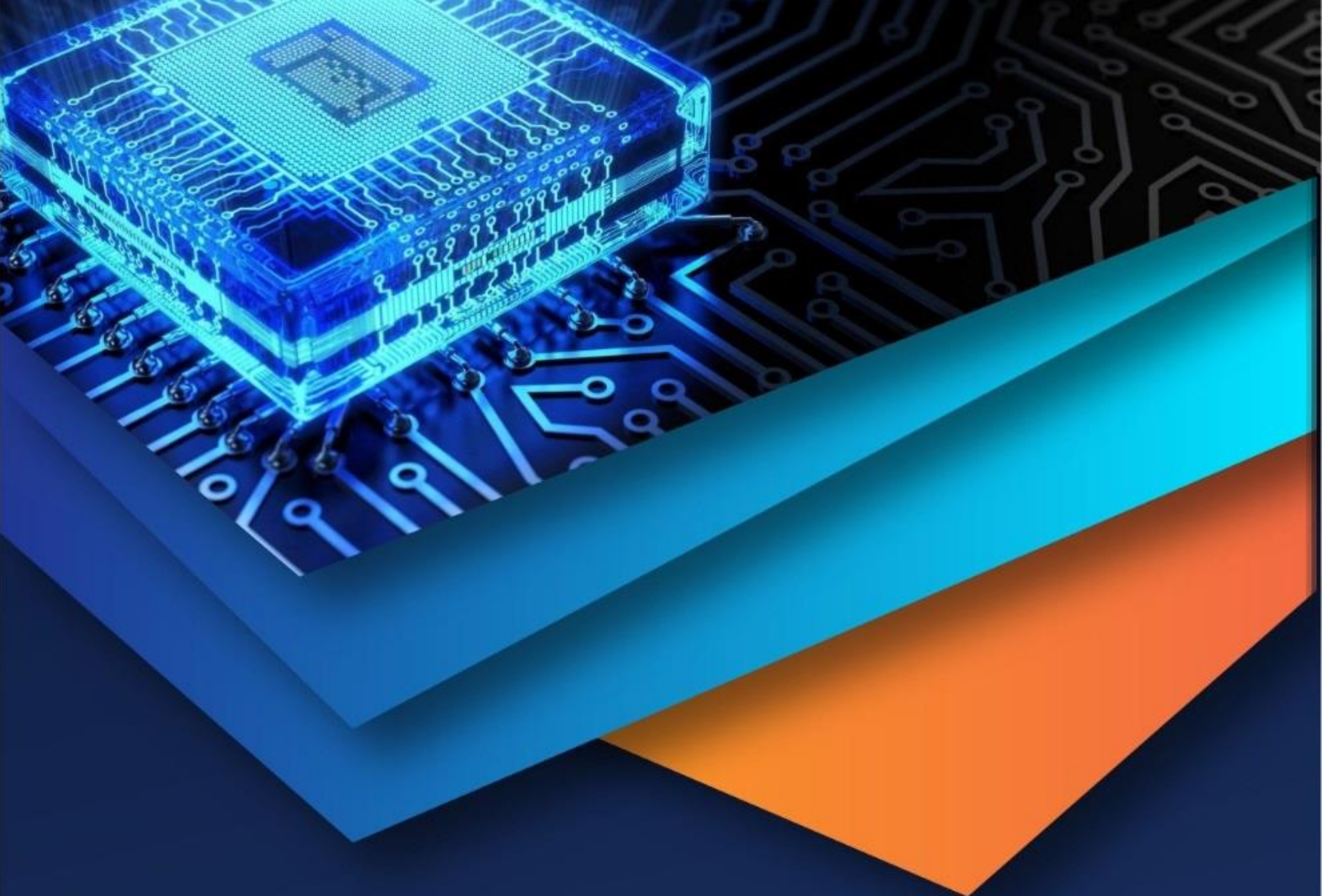

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