ISSN: 2277-9655
Scientific Journal Impact Factor: 3.449
(ISRA), Impact Factor: 2.114

IJESRT

INTERNATIONAL JOURNAL OF ENGINEERING SCIENCES & RESEARCH TECHNOLOGY

INSPECTION OF CNC MADE PARTS

Prof. Yogesh R. Falak*, Rahul Patil, Kalpesh Bhagat, Pawan Shewale, Amol Shelar
Mechanical Department, SITRC, Nashik,
Savitribai Phule Pune University ,Pune,India

ABSTRACT

Inspection is an important process of manufacturing system. It is means of rejecting error parts and assuring good quality parts. The advantages of technological innovation in inspection equipment helped to overcome the problems associated with traditional approaches. Such means that used of labour intensive method increase in total manufacturing time and production cost. Advanced sensor and inspection technologies, interfaced with computer based systems to automate the operations of the sensor systems.

KEYWORDS: Inspection, off-line inspection, PLC, Inductive Sensor, Automation

INTRODUCTION

Inspection can be defined as the activity of examining the products, its components, sub-assemblies, or materials. The current development of electronic interfacing technology had seen the rapid growth with electro-hydraulic and electro-pneumatic devices. Fluid, electric and solar power are some energy technologies used for driving modern automated system.

In process inspection, dimensions of parts are checked and classified as accepted and rejected. During online-post inspection, parts are manufactured and inspected.

Sensors are emerging nowadays in automation inspection process.

DESIGN PARAMETER OF BELT CONVEYOR

1.1 Specification of belt

- Belt material- Polyvinyl Chloride(PVC)
- Belt speed(V)- 0.05 m/s
- Belt width(b)-105 mm
- Belt length(L)- 1450 mm
- Belt thickness(t)- 2 mm
- Center distance between two roller- 660 mm
- Number of ply- 3
- Coefficient friction(μ)- 0.4
- Wrap angle(θ)- 180 degree
- Weight of material to be conveyed-800 gm.
- Density of belt material(ρ)- 1.5 gm./cm^3
- Diameter of Roller- 40 mm

Figure:

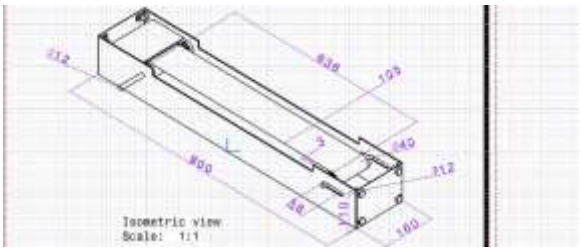


Fig. Basic drawing of the belt conveyor

1.2 Motor calculation

Mass per unit length of belt (m) = Density*Volume
=ρ*L*b*t
=1.5*100*10.5*0.2*0.001
=0.315 kg/m
Material on conveyor = 1.212 kg/m
Total=0.315+1.212= 1.527 kg/m
Now,
(T1-mv2/T2-mv2)= e^ (μθ)
T1-3.5135 T2 +9.576*10^-3 = 0 …..(1)
Maximum stress in belt (σ) = (Maximum tension in belt) / (Area of cross section of belt)
7.5=T1/ (b*t)
So, T1=1575 N
From (1);
T2=448 N
Power = (T1-T2)* 0.05 =56.33 watt

ISSN: 2277-9655
Scientific Journal Impact Factor: 3.449
(ISRA), Impact Factor: 2.114

1.3 Specification of Motor

So we select motor of following model;

- Model- Y type wiper motor(12 Volt)
- Power -60 watt
- Speed- 28 rpm

1.4 Gearbox selection

For gear box selection, we need to calculate the reduction ratio.

Reduction ratio =Input rpm /Output rpm

As the motor is of 28 rpm,

Input rpm = 28 rpm

The output rpm is calculated using the formula,

$$V = (\pi dN)/60$$

Where, d= Diameter of roller

$$0.05 = (\pi)\ (0.04)\ (N)/\ (60)$$

$$N = 23.87 \text{ rpm}$$

Therefore, Reduction Ratio =1.17:1

INDUCTIVE PROXIMITY SENSOR

Inductive sensor work on principle of signal generator that, without have contact with metallic object. Generally, this sensors used for inspection purpose.

2.1 Characteristics of Inductive sensor

- It sense electrically conductive metallic object which passes through the magnetic field of high frequency oscillator.
- Work without contact
- Do not require any mechanical sensing attachment (lever, arms)

2.2 Type of sensors

Following are two various diameter sensor used

2.2.1 8 mm Diameter Inductive Proximity Sensor

Output function	PNP NO
Operating Distance	1.5 mm
External Diameter	M 8×1
Power supply	10-30 V dc
Max. switching current	200 Ma max.
Power drain(24 V dc)	<12 mA
Voltage drop	<1.8 V
Short ckt. protection	Yes
Operating frequency	2 kHz
Case	Stainless Steel
Flush mounting	Yes
Operating temp.	-25 to 70 degree
O/p connection	PVC cable 2 m length

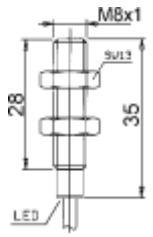


Fig. 8mm Inductive Proximity sensor

2.2.2 12 mm Diameter Inductive Proximity Sensor

Output function	PNP NO
Operating Distance	2 mm
External Diameter	M 12×1
Power supply	10-30 V dc
Max. switching current	200 mA max.
Power drain(24 V dc)	<15Ma
Voltage drop	<1.8 V
Short ckt. protection	Yes
Operating frequency	1 kHz
Case	Nickel plated brass
Flush mounting	Yes
Operating temp.	-25 to 70 degree
O/p connection	PVC cable 2 m length

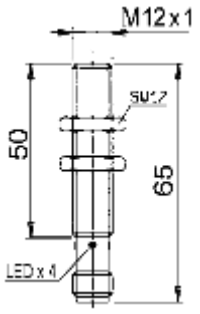


Fig.12 mm Inductive Proximity Sensor

ISSN: 2277-9655
Scientific Journal Impact Factor: 3.449
(ISRA), Impact Factor: 2.114

PROGRAMMABLE LOGIC CONTROLLER

PLC is an industrial computer control system that continuously monitor the state of input device and make decision based upon program to control the state of o/p device.

- Model- Delta make
- Language- Ladder Diagram

3.1 Input and output of PLC

	Input		Output
X0	>Max Height Prox.sensor	Y0	Conveyor motor
X1	<Min Height Prox.sensor	Y1	Feeder motor
X2	>Max Dia- A Prox.sensor	Y2	Ejector Solenoid valve
X3	<Min Dia- A Prox.sensor	Y3	Inductive Height > Max.
X4	>Max Dia- B Prox.sensor	Y4	Inductive Height < Min.
X5	<Min Dia- B Prox.sensor	Y10	Inductive Dia.A > Max.
X6	Cycle starts PB	Y11	Inductive Dia.A < Min.
X7	Emergency off push button	Y12	Inductive Dia.B > Max.
X10	Spare	Y13	Inductive Dia.B < Max.
X11	Spare	Y14	Spare

PNEMATIC DRIVE

The model is intended for experimentation with modern control methods applied to eject the error job after inspection of sensors.
In the case of the 2-chamber cylinder we have one valve per chamber and each valve has 2 ports, a supply port that connects to the compressor and an exhaust port that connects to the atmosphere.

4.1 Selection of Pneumatic Cylinder

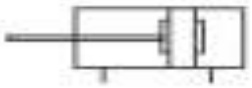
Weight of job- 0.488 kg
i.e Force Required- 4.7872 N

- Pressure= Force /Area
  Area= (π/4)(d1^2- d2^2)
  =(π/4)(0.025^2-0.001^2)
  =5×10^-4 m^2

Therefore, P=0.116 Bar

4.2 Specification

- Model-MAL25×80
  (Mini cylinder Aluminium)
- Type- Double acting
- Fluid- Air
- Operating pressure- 1-10 Bar
- Bore size- 25 mm
- Stroke- 80 mm
- Speed range- 30- 800 mm/sec
- Cushion type- Bumper
- Symbol-



JOB INSPECTION

5.1 Dimension

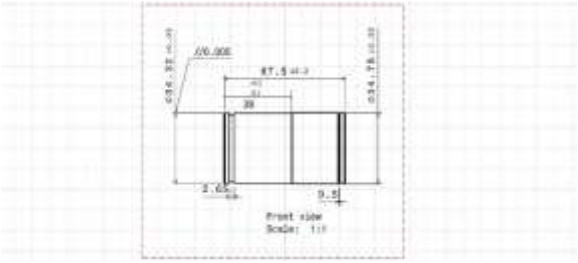
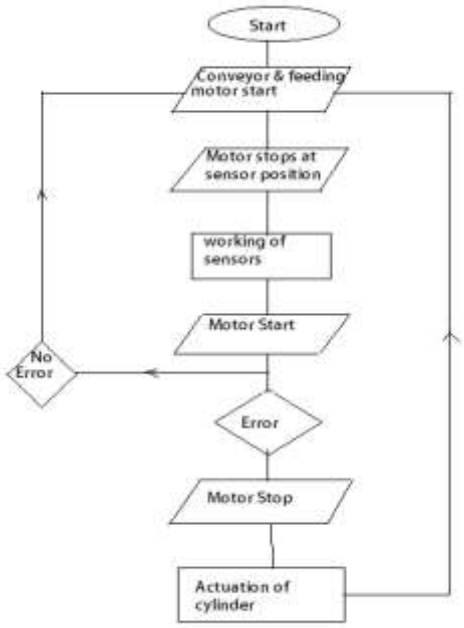


Fig. Sketch of job to inspect

5.2 Procedure for automatic inspection and rejection

- Conveyor motor(1) and Feeder motor(2) start
- Feeding of job
- Motor(1) stop at sensor position
- Working of sensor starts
- Check whether error in job or not
- Motor(1) stops at pneumatic cylinder
- Actuation of cylinder
- Motors(1)(2) starts

ISSN: 2277-9655
Scientific Journal Impact Factor: 3.449
(ISRA), Impact Factor: 2.114



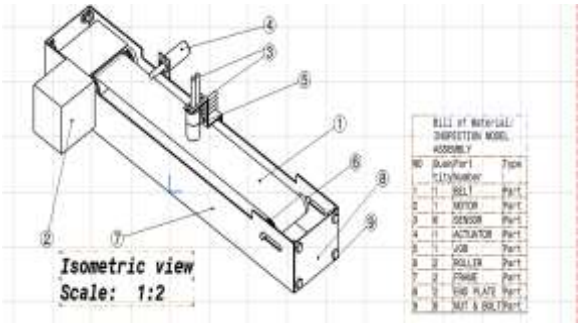


Fig. Inspection model assembly

CONCLUSION

The inspection of job by using sensors has been successfully achieved. This will reduce the time of manufacturing and production cost and make simplicity in process of inspection. So that it does not required skill operator for inspection.

REFERENCE

[1] V.B. Bhandari "Design of Machine Element," Tata McGraw Hill publishing company, eighth edition (2003).

[2] R.S. Khurmi & J. K. Gupta "Design of machine elements. "Eurasia publishing house (pvt.) Ltd, fifth edition.

[3] Design Data Book by PSG College of Technology.

[4] A non-contact proximity sensor with low frequency electromagnetic field Zhang Benniu, Zhang Junqian, Zhang Kaihong, Zhou Zhixiang

[5] A low-cost inductive proximity sensor for industrial applications Pavel Kejík , Christoph Kluser, Roger Bischofberger, Rade S. Popovic

[6] Designing Programmable Logic Controller (PLC)Experiment Set with Internal Experiment Blocks Erdal Yilmaz, Sevan Katranciogly