GOVERNMENT OF INDIA

MINISTRY OF DEFENCE

ORDNANCE FACTORY VARANGAON

A TRAINING REPORT

Entitled

" TO STUDY MANUFACTURING PROCESS OF CASE 7.62 mm "

From 22/05/2023 **To** 06/06/2023

Guided By :

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Submitted By :

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CERTIFICATE

This is to certify that the training report entitled **"TO STUDY MANUFACTURING PROCESS OF CASE 7.62 mm "** submitted by **Mr. Gaurav Bharude** " Bachelor of Technology in Mechanical Engineering , of the Sardar Vallabhbhai National Institute of Technology, Surat " has successfully completed the vocational training in **Ordnance Factory Varangaon** is a record of their own work carried out under my supervision and guidance.

Date - /06/2023

Place – ORDNANCE FACTORY VARANGAON

05/06/23

JWM / HRD
O.F.VARANGAON

05/06/23

D.N.VISPUTE
JWM / CASESHOP
O.F.VARANGAON

ACKNOWLEDGMENT

I would like to express my deep gratitude and sincere thanks to The General Manager , Ordnance Factory Varangaon For allowing me for 15 days Vocational training and all the officers and sub ordinate staff who encouraged me with their help and cooperation during the completion of my report . It is a great pleasure for me to present my training report on **" TO STUDY MANUFACTURING PROCESS OF CASE 7.62 mm**". I would like to express my sense of immense gratitude towards my respected guide **D.N.Vispute** sir, for their guidance and constant perspective supervision as well as for providing necessary information regarding the training. This training course has upgraded my practical knowledge .

Signature

Gaurav Bharude _____

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Chapter

1

Introduction

Ordnance Factory Varangaon is bestowed with various IS/ISO certifications such as IS/ISO 9001:2015 (QMS), IS/ISO 14001:2015 (EMS), IS 1545001:2018 (OHSMS), IS/ISO 50001:2018 (EnMS) & ISO/IEC 17025:2017 NABL Accredited Lab unit is situated on the bank of river TAPI..

The Factory alongwith its residential estate with 2360 quarters spread over an area of 3037 acres. It is located about 20 KMS from Bhusawal on the northside of Mumbai-Nagpur Asian Highway No. 46. 390 kms from Nagpur and 450 kms from Mumbai. The nearest Airport is Jalgaon which is approximately 60 Kms away.

O.F.V is one of the proud members of 12 ordnance factory in MUNITIONS INDIA LTD, a Government of India Enterprise playing a vital role in production of small Arms and Ammunitions since its inception from Oct. 1964.

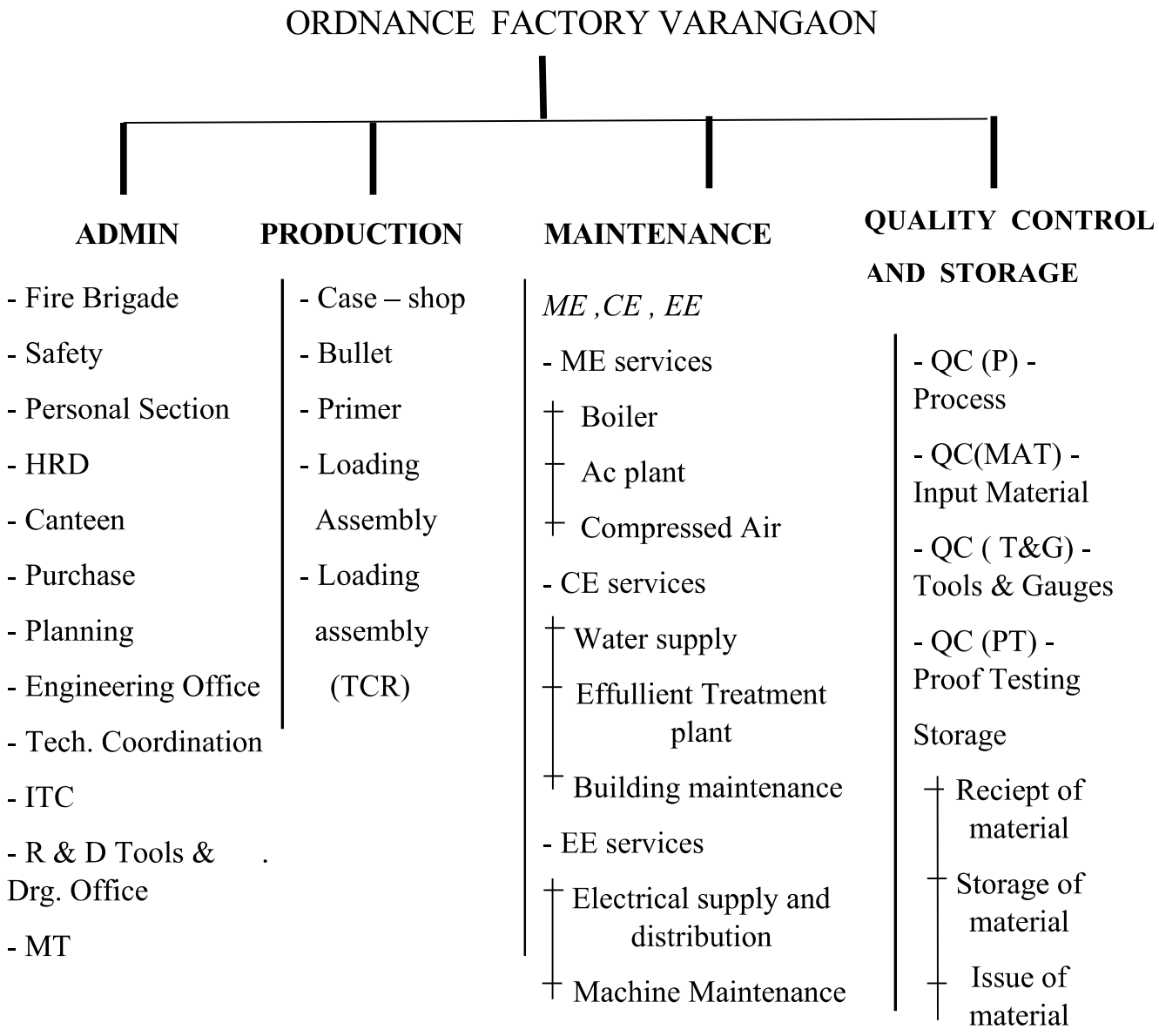
Products –

1. 7.62 mm cartg. Ammunition and its variant (M-80 , M-62 etc) .
2. 5.56 mm cartg. Ammunition and its variant .
3. 12.7 mm cartg. Ammunition – API and APIT
4. 7.62 mm A-7 Ammunition

The Indian Ordnance Factories is the oldest and largest industrial setup which functions under the Department of Defence Production of the Ministry of Defence. The ordnance factories form an integrated base for indigenous production of defence hardware and equipment, with the primary objective of self reliance in equipping the armed forces with state of the art battlefield equipments.

DEPARTMENTS

In Ordnance Factory Varangaon, there are near about 50 sections and they are mainly classified in following groups.

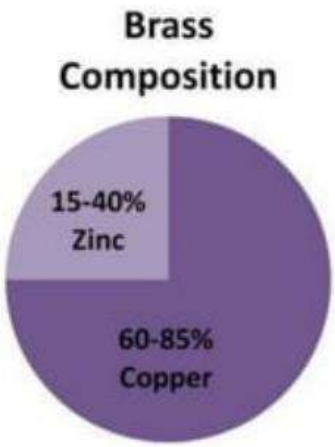


Out of which, I am posted to "**CASE-SHOP SECTION**" to complete the Training work. In which i studied the manufacturing process of 7.62 mm case formed from brass cup.

Chapter
2

BRASS CUP MANUFACTURING

Each cartridge casing begins its life as a brass "coil" formed when copper and zinc, along with a few trace elements, are combined to form brass. The particular type of brass our industry uses to form casings is called C260, or "Cartridge Brass". The picture to the right shows a few brass and copper coils ready to move onto the next step of their manufacturing processes.



Composition of Brass :

Brass is an alloy of copper and zinc 60-85% copper , 15-40% zinc

Brass Cup

Cups are very stout, and are a little wider than they are deep O.F.V purchase below brass cup from O.F.Ambernath .

Chapter 3

Brass Cup Washing

Speed of machine - 750 ppm

Brass Cup are then subjected for first operation as Brass cup washing.

Sequence of Operation Process

1. Pickling	-	Brass Cup Pickled in H2SO4 Sulphuric in Normal Water (10-15%)
⇩		
2. Cold Rinse	-	Run in Normal Water
⇩		
3. Hot Rinse	-	Run in Hot water Temperature at 60 C
⇩		
4. Lubricating	-	Run in Soap Curd solution in hot water (0.6-1.2%)
⇩		
5. Dripping	-	Empty tank
⇩		
6. Drying	-	Dry tank at 80 C

Chapter 4

Horizontal Press – Drawing and Triming Operation

Input for Horizontal press Machine is the segregated pickled , lubricated and dried brass cups .This machine also known as Multistation transfer draw press .working is it recieve pickled cup in the machine and undergoes 4 operations simultaneous at a time on two tracks .Operations are 1st Draw , 2nd Draw , Final Draw , Trim . elongation of cup increases with each draw due to brass ductility, material properties .Reciprocating motion provided by main ram and ejector ram . the punch draw the cup through die and diffrent trim die

and punch used for Drawing and triming process. The Recirculating coolant is used for cold drawing process.

Speed of m/c - 200 ppm

Parameter to be controlled by operator

- Dome thickness & Wall thickness variation
- Outside diameter

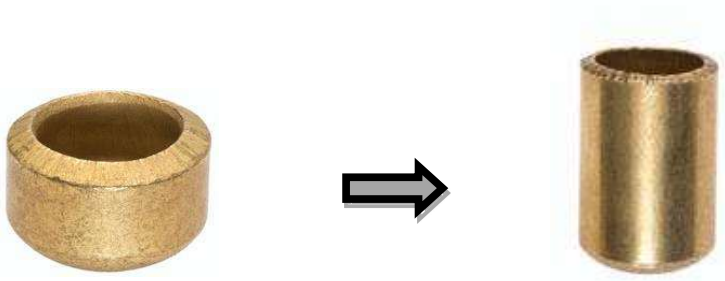
Gauges used :

- Dial indicator – for wall thickness
- Chember gauge
- Ring gauge – for outside diameter

- **1st Draw**

This is what a cup looks like after passing through the first of three draw presses. The cup is now a little taller, and considerably narrower.

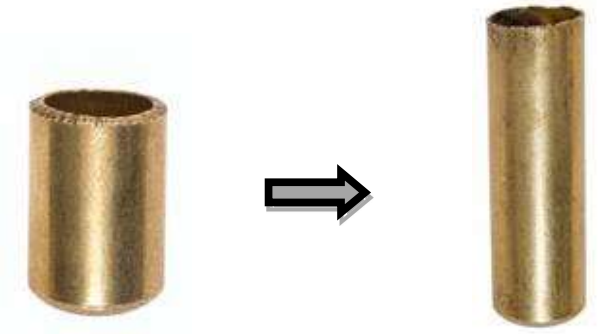
Tools used : 1) I draw punch
2) Top Die
3) Bottom Die



1st Draw

- **2nd Draw**

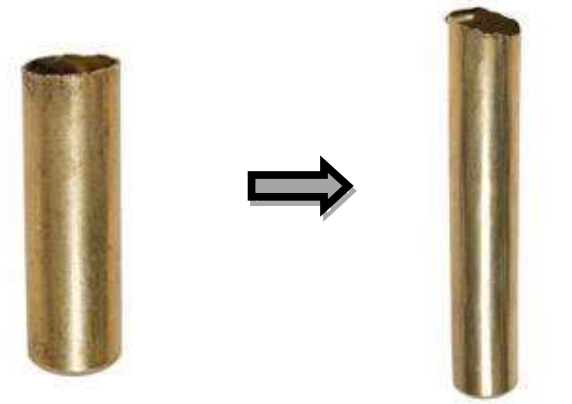
The cup passes to next operation (II draw) . The Fingercatcher and transferbar carries the Ist drawn component to II draw station .The cup is now much deeper than it is wide, and is starting to look like a close-ended tube.



1st Draw **2nd Draw**

3rd Draw

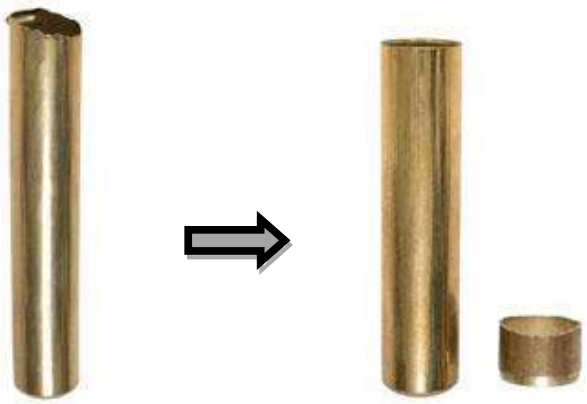
In this operation cup has now reached its total elongated length, and is now considered a casing. Notice how uneven the top of the casing is. This is partially due to the grain structure in the side walls of the cup, as well as cup side wall thickness variations.



2nd Draw **3rd Draw**

Pinch Trim

Here we have displayed the ring of brass trimmed off the top of the tube in the last step. “Pinching” off the extra material at the top of the tube provides us a perfectly trimmed-to-length tube ready for the next forming operation. The tube also has to be washed prior to being advanced onto the next step of the forming process.



Parameter to control by operator

1) Visual proper trimming.
2) Dimension – Total length

Gauge used – Vernier Calliper

After every 15 minutes operator/supervisor inspects the specified parameter of output components at each station .

Chapter
5

Degreasing Unit

Speed of m/c : 267ppm

Interstage washing operation consist of 5 stage continous washing unit . It has screwtype conveyer which transfers the material from one tank to next tank. It is a unit which is a Combination of detergents , and it has to effectively remove the lubricant used in draw processes after degreasing polished brass case is formed as an output .Wash chemicals are combination of detergents, and anti-tarnish compounds which effectively remove the lubricant used in our draw processes as well as clean off any tarnish which might have developed during our manufacturing operation.

1. **Degreasing** - Soda ash solution 70 C to degrease components
2. **Cold Rinse** - Run in Normal Water to rinse soda solution
3. **Hot Rinse** - Run in Hot water Temperatureat 65 C
4. **Dripping** - Empty tank to drip extra water
5. **Drying** - Dry tank at 85 C to dryoff the component

Parmeters to control :

1) Visual – components properly washed with brass luster.
2) To replace the soda solution at specific time interval or when cleaning quality deteriants

Chapter 6

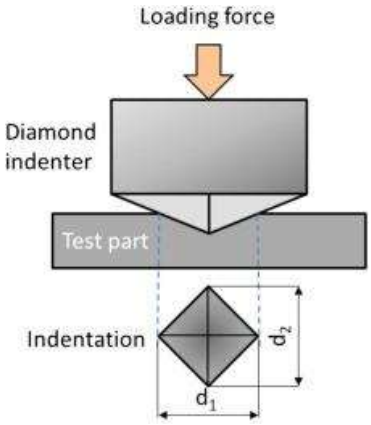
Body Annealing Operation

Speed of m/c: 160ppm

The Degreased , Dried , Drawn and trimmed components used in this machine as input and Heated by eddy current in induction annealing process. The voltage and current are maintained for getting required Hardness for next process. This use induction annealing for controlling temperature which makes the body soft for next operation that is tapering for providing the bottleneck profile for case .

Parameters to control by operator:

1) Specified Hardness Gradient of case surface.



This hardness is checked by hardness testing machine QC(p) . The Vickers hardness test method consists of indenting the test material with a diamond indenter, in the form of a right pyramid with a square base and The full load is normally for 10 to 15 seconds. The two diagonals of the indentation left in the surface of the material after removal of the load are measured using a microscope and their average is calculated. This average value is checked in (VPN) vickers pyramid number and hardness is determined .

Chapter 7

Interstage washing process

Speed of m/c: 160ppm

Sequence of Operation Process

1. Pickling	-	Pickled in H2SO4 Sulphuric in Normal Water (10-15%)
⇩		
2. Cold Rinse	-	Run in Normal Water
⇩		
3. Hot Rinse	-	Run in Hot water Temperature at 60 C
⇩		
4. Lubricating	-	Run in Soap Curd solution in hot water (0.6-1.2%)
⇩		
5. Dripping	-	Empty tank
⇩		
6. Drying	-	Dry tank at 80 C

Chapter
8

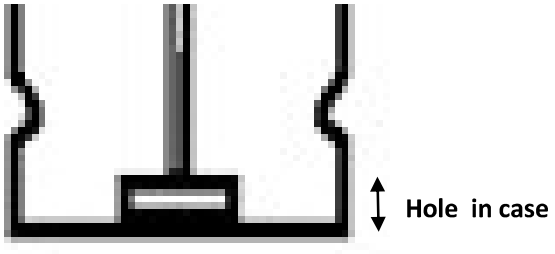
Vertical Press : Indenting , Heading , Fire hole piercieng , Taper necking

Speed of m/c : 200ppm

This vertical Press machine fritz werner takes input of Body annealed components and perform various operations as Indenting , Heading , Fire Hole piercieng , Taper necking I , Taper necking II in two seperate tracks at the same time .

Operations :

1) **Indenting**



2) Stamping and Pocket Dia and Collar

Forming the Primer Pocket & Heading . the Case forming of the primer pocket and applying the headstamp to the bottom of the casing are actually two separate steps. First, the casing is basically “rammed” against the pocketing tool. This step creates the primer pocket in the bottom of the casing where the primer is seated. Next the pocketed casing progresses to the bunter which flattens the bottom of the casing and applies O.F.V headstamp, or “heads” the case, by again “ramming” the case against the raised letters and numbers on the bunter.

3) Fire Hole Piercieng

Here we have a casing after the fire hole is punched. The precision used to punch the fire hole has a tremendous effect on the performance of the finished casing. A high-quality casing will have a precisely punched fire hole which is free of burrs and tearing. It is also important that the fire hole is uniform in size from casing to casing.

4) 1st Tapering and Necking

The casing displayed here has gone through the first taper press. As you can see, it is starting to show the profile of the neck and mouth. The casing has also begun to receive its body taper.

5) 2nd Tapering and Necking

Now the casing has been tapered to its final body, neck, and mouth dimensions. However, the overall casing length is still too long .

Parameter to control by operator :

Head diameter , Pocket depth , Pocket diameter , Shoulder length , Mouth wall thickness .

Gauges used :

1) Dial indicator
2) Plug gauge – for pocket diameter
3) Profile gauge – for profile

Tools used :

Stamping punch , Indenting punch , fire hole piercieng needle , dies , ejectors .

Chapter 9

Interstage washing process

Speed of m/c: 160ppm

1. **Degreasing** - Soda ash solution 70 C to degrease components
2. **Cold Rinse** - Run in Normal Water to rinse soda solution
3. **Hot Rinse** - Run in Hot water Temperatureat 65 C
4. **Dripping** - Empty tank to drip extra water
5. **Drying** - Dry tank at 85 C to dryoff the component

Chapter
10

Head Turning (HT) , Finish Trim Operation

Speed of m/c: 105 ppm

The pocketed and headed casing has its extraction groove cut. This operation is very similar to a horizontal lathe. The casing is clamped on a spindle and rotated at a high speed while the profile cutter is pressed against it. The rotation of the casing in combination with the contact of the profile cutter creates the casing's extraction groove. Prior to advancing onto the next process, the body of the casing has to be annealed again to relax the grain structure of the metal.

This is a advance type special purpose automatic lathe machine which perform two operations which are Head turning , finish trim . After operation the case is measured through comibnation gauge and dial gauges.

Trim to Length The casing now has to be trimmed to length. The use of specially designed cutters, combined with frequent cutter replacement, is what prevents the creation of burrs on the inside and outside of the casing mouth.

Parameter to control :

1) Head diameter
2) Head thickness
3) Groove diameter
4) Total length

Tools used **:**

1) Form cutters - Rim , Trim form .
2) Collet
3) Intro pusher
4) Ejector

Gauges used :

1) Dial indicator – For Head dia . Groove dia . Head thickness.
2) Combination Gauge
3) Go/No go gauge – For Total length .

Chapter

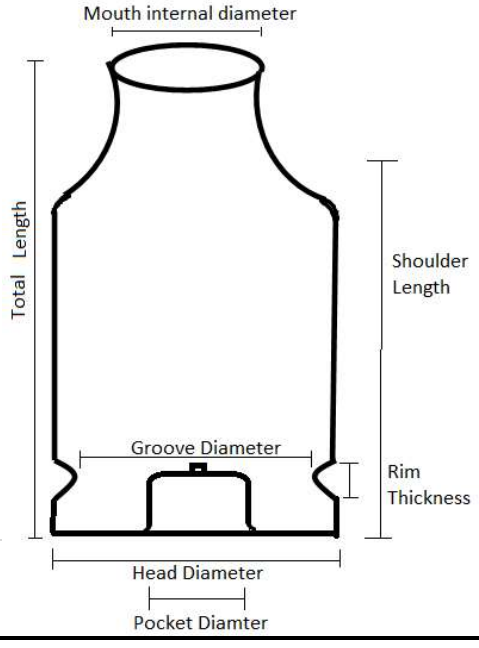
11

Gauging Operation

Speed of m/c: 160 ppm

Components from hoppers pass through different sensors disk containing 6 components checking if it is inverse , gauging firehole , Rim thickness , Head diameter , Head thickness , Groove Diameter and Shoulder length is pass through gauges if under low limit its scrap unusable . if above High limit , it can be made usable by triming and turning process and the correct dimension component is pass through outlet pipe .All this controlled is by PLC, monitor display where we can set limits , correction error factor reading is monitored for each component

The room temperature is maintained at 22 C – 25 C as friction between disks can generate heat and sensors can show different readings which create a Defect



Chapter
12

LOW TEMP. ANNEALLING (LTA)

Speed of m/c: 267 ppm

This operation carried out to release stress developed during cold draw process , forming and head turning process . Material is socked in three differnet temperature zones with help of flat bed conveyer . Socking period is one hour .

Pre heating zone – 190 C

Heating zone I – 250 C

II – 250 C

III – 250 C

Parameters to control

1) Maintain proper temperature.
2) Time of socking

Chapter
13

Brightening and Passivation

Speed of m/c: 200 ppm

This Process gives final brightening to the components . This operation does not alter any of the dimensions of components. This all process takes about 45-50 minutes. Components are washed in vibratory bowl washing system in following manner.

Degreasing	→	Rinsing	→	Brightening	→	Rinsing	→	Passivation	→	Drying
For removing grease or fatty acids		For washing / rinsing		For Brightening process consits critic powder and then H_2O_2 is put slowly over the components		For washing / rinsing		Passivation is useful for strengthening and preseving the golden metallic finish of case surface . It consits of Water + Chromium Trioxide + Sodium sulphate .		For removing grease or fatty acids

Parameter to check **:**

Proper cleaning and luster finish on case surface

Chapter
14

Tip Annealing Operation

Speed of m/c:
200 ppm

We Annealing the mouth and neck of each casing is important to ensure the casing “grabs” the projectile correctly and releases the projectile uniformly when the casing is fired. Our machinery utilizes induction annealing , we are able to control the temperature, applied to each casing, to the degree.

Parameter to control : Specified Hardness Gradient

Visual Quality Check

Last Process of case-shop plant is visual Quality check which is done manually

CONCLUSION :

DURING THIS INDUSTRIAL TRAINING . I LEARNED PRACTICAL USE OF VARIOUS ENGINEERING ASPECTS LIKE STRENGTH OF MATERIALS , ENGINEERING DRAWING , MANUFACTURING PROCESS AND MAINTENANCE , MANAGERIAL SKILL , QMS ,OHSMS , EMS ASPECTS .

ALONG WITH VARIOUS AUTOMATIC PLC MACHIES . THIS IS NEW AND VERY SPECIAL EXPERIENCED ADDED TO MY KNOWLEDGE TO CONTROL CONTINUOUS LINE PLANT.