

honda atlas cars pakistan limited

Internship Report 2018



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GROUP C

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## **Assembly Final**

### **Station 1:**

* Two post lift is used to lift the body and underbody piping is done which includes brake oil pipes, extending from front to back wheels axle are. These pipes carry brake pressure fluid to move the brake piston.
* Fuel pipe is installed. It will carry fuel from fuel tank to the engine.
* In case of a model with sunroof, water draining pipes are bolted at rear side ends. Fuel tank air evacuator pipe is placed. It will evacuate any air present inside the fuel tank, hence reducing chances of air bubbles in the fuel.
* Insulating bed is bolted at front inside. It will prevent engine heat from entering interior, hence reducing cooling load.

### **Station 2:**

* Body is taken off of lift and placed on a trolley.
* Doors are immediately removed and are sent for their sub assembly. It becomes easier for associate to work on interior this way.
* Insulating bed for inside front is bolted. It will stop any engine or outside air from conducting into the interior, cooling load will reduce hence. Door opening sides are coved with sheet so scratches may not be made.
* Several holes are there on floor and interior sides, made to hold the body with jigs for welding. They are hence covered with black stickers and sometimes with rubber.

### **Station 3:**

* Hood stand is installed.
* Transmission mounting is bolted. Firstly it holds the transmission side of engine, connects it with body, and controls vibrations from transmission side. How?
* Several brackets are installed in hood section for piping and wire harnesses.

### **Station 4:**

* Master cylinder or master power is installed. It creates vacuum for the brake fluid to travel efficiently.
* Hood opening wire is installed from inside.
* Complete wire harness for hood section is bolted.
* Fuse box is installed. It prevents electronic devices to blow out in case of shortage. It includes fuses for every electronic component including lights bulbs, LEDs, wipers, motors, audio control and etc.

### **Station 5:**

* Two post lift lifts the vehicle and fuel tank with capacity of 50 liters is bolted at rear from underbody. Its connections are made.
* Brake hoses are installed from steel piping to brake clipper.
* Rear insulation bed is bolted. It will prevent outside heat from entering interior. Independent four door close sensors are installed. They tell us if all four doors are closed.
* Door locking hock is bolted.
* Floor wire harness, making electrical connections from front to rear is placed and installed. It makes connections for tail lights, reverse lights, speakers, rear door electrical connections.

## **Door sub assembly:**

* Runner rubber is installed at window sides and overall door
* Sides. It prevents inside air to move out and outside air to enter inside. It also stops water from entering inside the car and it reduces door closing noise.
* Glass windows are installed for each door.
* Weather slip or outer seal is installed. Glass window regulator is bolted, with its connections.
* Door exterior and interior handles are bolted and connections are made along with auto lock connections.
* Side mirrors are joined with their wire harness.
* Front door speakers are bolted and connections are made.
* Plastic covers and runners are applied for appearance.
* Plastic sheet is attached on inside of doors before interiors covers are installed, after applying sealer.
* Now interior door covers are bolted.
* After door pre assembly, they are not immediately bolted to the body. They are kept as it and installed later at a station during assembly line, when all interior work is completed.

### **Station 6:**

* Seat belt magazine is bolted.
* At hood side, left damper and holder for engine is attached.
* Side bumpers are installed.
* Trunk opening cable is placed and connections are made to open trunk from driver seat. Tail lights wire harness is spread and connections are made with main interior wire harness.
* Rear seats air ducting is bolted. It’s a brand new feature in this model. It is used to provide heated air to the rear seats area.
* Battery base is attached. It holds the battery in its place. Floor carpet is placed and joined.

### **Station 7:**

* Fuel cap harness is bolted. It comprises of cover opening cable.
* Roof interior is attached, along with plastic side panels.
* Security horn is bolted at the fuel cap area, from the inside of trunk. Sunlight shield is bolted at its place.
* Fuses are installed.
* Front screen water sprayers are pressed on the hood.

### **Station 8:**

* Resonator is bolted beyond the air blower. Its function is to clean the outside air before passing it to the blower, which throws it towards the passengers. What happens when we turn on the air conditioner is that this air exchanges its heat with the refrigerant coming from the compressor and hence cools down.
* Pedals for brakes, acceleration and clutch are bolted. Both clutch and brake pedals are mechanical, working by pulling the respective cable for cutch or brakes. But a new feature introduced by honda omits conventional acceleration cable and introduces sensors. A sensor placed inside the pedal senses the amount of displacement in the pedal and sends signal to the coupler which increases the acceleration rate respectively.

### **Station 9:**

* Rear trunk lights are bolted.
* Air conditioning pipes made of aluminum are bolted.
* Water hoses are installed for screen wiping and water flow inside of engine.
* Tail lights comprising of brake, turn indicator and reverse light is bolted.
* Trunk hook is installed; wire connection is made for opening from driver seat.

## **Dashboard sub assembly**

It consists of four operations, mounted on a circular rotating station.

### **Station a:**

Aluminum frame, consisting of a rod with groves at specific places and attachments in put on the station. Complete dashboard wire harness is attached and pressed at different places. Fuse box and BCM (body control unit) is bolted.

### **Station b:**

* Speedometer is passenger is bolted.
* Other plastic covers are installed inspected and bolted at its place.
* Steering rod is installed.

### **Station c:**

Air bag for front

### **Station d:**

Steering hub consisting of car key (depending on model) is bolted. Wire harness connections are made. Navigator or media player (depending on variant) is installed.

Now the dashboard is ready to be bolted at its place by lifting with raku raku arm.

### **Station 10:**

Rubber is applied on trunk edges, opening and closing is inspected. Trunk is then carpeted. Rear speakers are installed. Hook for hood opening is bolted. Rear speakers’ area is covered with plastic attachments. Motor for water sprayers is bolted.

### **Station 11:**

Doors edges rubbers are pressed. Front indicators are bolted. Rear sides’ plastic interior is pressed

### **Station 12:**

Shifter is bolted. Cupboard and its cover are installed and bolted, connections are made.

Bumpers are first sub assembled in which bottom tail lights; plastic attachments, front grill etc are attached then bolted to the vehicle.

### **Station 13:**

Radiator is bolted. Condenser is installed ahead of radiator. Radiator size is slightly larger than the condenser. Condenser pipe connections are made.

### **Station 14:**

Brake fluid bottle and clutch fluid bottle (in case of manual transmission) are installed and connections are made. Head lights are bolted, whose power rating is 55wstts for city, and 220volts.

Rear seats bench frame is bolted, seats will be later bolted onto them.

### **Station 15:**

Vehicle is again lifted with two post lift. Fuel cluster is bolted, which filters and pressurize the fuel.

**Dampers sub assembly**

In a separate room, dampers are assembled from start. It consists of following stations:

### **Station a:**

Dampers rods are carefully inspected for any crack, scratch or any other physical defect.

### **Station b:**

Bottom piece is assembled completely. Comprising of around 9 small parts, mostly bearings and washers, is fits at the bottom end of the damper rod.

### **Station c:**

Rod and bottom piece are assembled after inspection.

### **Station d:**

After assembling the rod, it’s washed with cleansing material along with the bottom tube, in which the rod will fit latter.

### **Station e:**

Rod assembly, consisting of bottom piece and rod, is riveted with a riveting machine, and is hence locked.

### **Station f:**

Damper oil by the name of SS 17 s is filled into the bottom tube after inserting the rod assembly inside of it. Its quantity is as follows:

220ml for front 202 ml for rear

### **Station g:**

Now nitrogen gas (n2) is filled inside the bottom tube by following amount:

* 3. 25 units for front
* 8. 5 units for rear
* And the tube is covered with a cup.

This oil and gas will together produce the damping force.

### **Station h:**

Now the damping force for specific damper is tested with force testing machine.

### **Station i:**

This is called stacking operation. It includes completely locking the oil and gas inside the bottom tube by punching a cover.

### **Station j:**

In case of rear dampers, a bush is punched for nut joint.

Now dampers are ready for installation.

# Rear suspension-frame sub assembly

### **Station 16:**

Suspension frame is inspected. Rear brakes depending on model i. E. Drum brakes for city and br-v and disc brakes for civic are attached to the frame. Clipper are first bolted to the disc or in other case, brake shoes are bolted and wired.

### **Station 17:**

Rear suspension, consisting of damper and spring is bolted to the frame. Hand brake wire and brake oil pipes are arranged on the frame. Complete structure is lifted with jig and installed at its place in rear with high strength bolts. Initial ground is the length from damper top to the center of wheel. It is adjusted by compressing damper-spring to the specific limit.

### **Station 18:**

Fuel tank is inspected. Fuel tank to fuel cap pipe connections is secured. A metal cover is bolted under the fuel pipes connections so that it may not be damaged by hitting any unnecessary material on road.

Heat plates are used to insulate exhaust pipe heat from vehicle floor hence interior. It has a very high temperature which can damage the floor.

Two of the 3 heat plates are bolted at read and mid.

### **Front suspension-rack sub assembly**

Steering gear hub is bolted onto the rack or suspension frame. All the models and variants now use EPS(electric power steering), which bolted on rack; it connects to the engine at bottom rear side, absorbs vibrations and keeps the engine at its place.

## **Disc- drive shaft sub assembly**

Knuckle, acting as a rack for clipper, and frame as a cover along with bearing are pressed. Clipper and disc are assembled to the knuckle. This complete assembly is bolted to the drive shaft. The drive shaft has gear connection on one end for transmission insertion. It consists of two links, joined with universal joint and covered with rubber boot filled with grease. For automatic transmission, both drive shafts are of same length, but in case of manual transmission, right drive shaft is of longer length because of the difference in position of transmission. Also at drive shafts have dampers along the length.

## **Engine, drive shafts and suspension assembly**

First, after receiving engine from ae section, it’s inspected. Fuel feeding pipe is clipped. Catalytic converter extension is bolted. It has an oxygen sensor, used in catalytic converting operation. Drive shafts are then installed to the transmission, and jerked to lock them. Then suspension rack is bolted to engine-transmission and dampers are bolted.

At or mt fuel depending on variant is filled. Mtf is filled up to 1 liter whereas 2. 9 liters of atf is filled. 2. 5 liters of cvt fuel is also filled for br-v and civic.

## **Power train-body mating**

One of the most important operations in the whole manufacturing

Process is this one, where power train is installed into the body of vehicle. 4 high strength bolts are used on each side for bolting rack, and suspension to the body. Engine and transmission are bolted to their respective mountings. Dampers are bolted at the top.

### **Station 19:**

Under body panels are bolted. 1st heat plate is bolted at the start of exhaust pipe. Transmission wires are inserted inside the body from available hole.

### **Station 20:**

Now comes the tires section. Tires are first mounted on to the rims. Then

They’re filled with air up to 45 psi, this value is fixed for all models and variants. Wheels are then balanced by balancing machine. Weights are added on each side for this. Wheels are then bolted to the vehicle and it’s taken off of the two post lift. Step knee is also placed.

### **Station 21:**

Steering rod is centered by steering centering equipment. The equipment is bolted to the rod, it’s turned full right and is reset, then full left and reset and then it tells you the exact center for the steering handle. Steering handle is then immediately bolted. Abs (antilock braking system) oil is filled.

### **Station 22:**

Roof rubber is pressed. Rear seats are bolted. It is in two parts, base and rest. Rear mirror is bolted. Shifter side panels, cup holders are bolted. Connections are made for lighter.

### **Station 23:**

Hand brake lever is bolted and connections are made with two independent brake wires coming from each rear brakes. Roof light is bolted.

Ecu (electronic control unit) is bolted under the hood and connections are made. Dressing of front and rear screen is done. Inner dam and outer rubber is applied. Then sealer is applied and both screens are pasted on their places. Connections for rear screen heating are made. It also has the abs sticker, in case of civic, vsa (vehicle stability assist), which stabilize the car during braking, is there.

### **Station 24:**

Mid-section consisting of arm rest and cupboard is bolted.

32 and 48 amh ags battery for city and civic respectively is bolted. Air filter for engine intake is bolted. Trunk carpeted board is placed after placing the tool board consisting of spanner, lever and jack is placed onto the step knee.

### **Station 25:**

Front seats are bolted by lifting through raku raku arm. Doors are also bolted back, brought from door sub assembly. Wipers water is filled. Model, engine technology and variant emblem are pasted on the trunk.

### **Station 26:**

5 liters of coolant is pumped into the radiator. Coolant has advantages over water that it has better heat transfer coefficient and anti-rusting properties than water. R134a refrigerant or otherwise air conditioning gas is filled into the system by amount of:

* 420g for city
* 440g for civic 1. 8
* 470 g for civic 1. 5 turbo
* Parallel to this operation, 6 liters of unleaded petrol is pumped into the fuel tank.

### **Station 27:**

Decoding is done at this station. A device by the name of aft is used to assign a specific code to the ecu and the key chip of the vehicle. Which means that the car will start only and only when the key of the same code as of ecu will be inserted into the key hole. Let test, same as done in vq (vehicle quality) is also done. Vehicle is then started for the first time.

### **Station 28:**

Overall inspection of the vehicle is done including exterior and interior. Lights, media or navigator, speakers, blower etc are all checked. Doors are especially inspected and their alignment is done carefully.

# Paint Shop

Every Metal Needs Paint For Its Protection As Well As Better Appearance.

Rain, Humidity and High Temperature Can Be Very Harmful for the Vehicles Body If It’s not coated With Necessary Paint.

Paint Department Consists Of The Following Sections:

1- Pre-treatment and Electro-deposition

2- Sealer Application

3- Middle and Top Paint Coating 4- Inspection and Repairs

## **Pre-treatment and Electro-deposition**

Frame Parts Are Brought From Other Parts Of World By Sea. Chemicals Coatings Are Applied Before Shipping To Prevent Any Damage Due To Intense Humidity And High Temperature. Therefore Just After Welding, Body Frame Is Wiped With Kerosene Oil To Remove Those Chemical Coatings, As Well As Any Other Dust, Weld Powder And Grease.

Now Body Frame Is Mounted On A Lift, Secured And Ready To Be Dipped Into Solutions Tanks In Following Order.

## **Pre-degreasing:**

Body Frame Is Dipped Into Industrial/city Water, To Remove Any Dust, Grease and Kerosene Oil from It. The Parameters Are As Follows:

* Temperature 45c To 50c
* Tact Time 72 Seconds
* Water Type City Water
* Tank Volume 15. 6 Cubic Meter

## **Degreasing**

After Pre-degreasing, Degreasing Is Done For Approximately Two Times The Pre-degreasing Tact Time, For Better Operation. Certain Chemicals Are Also Added For Enhancement Of This Operation.

* Temperature 45c to 50c
* Tact Time 159 Seconds
* Water Type City Water
* Tank Volume 50 Cubic Meter
* Ph Greater Than 11
* Chemical Ec-90-r8 0. 8w/v%
* Chemical Ec-90-l2 1. 6w/v%

## **Water Rinse Tank # 1:**

After Proper Degreasing, Body Frame Is Rinsed With City

Water With Nozzles Directed Carefully. This Operation Is Done To Just Clean The Body Frame And Remove Any Previous Solution From It.

* Temperature **Room Temperature**
* Tact Time **26 Seconds**
* Water Type **City Water**
* Tank Volume **47 Cubic Meter**

### **Surface Conditioning:**

* Because Of Washing and cleaning again and again, surface of the body become rough. Therefore it’s Smoothened Here with Ro (reverse Osmosis) Water and Certain Chemicals.
* Temperature **Room Temperature**
* Tact Time  **26 Seconds**
* Water Type **Ro Water**
* Tank Volume **51 Cubic Meter**
* Ph.  **9.5 To 11**
* Chemical **Surfine, Np-9, Primer-40**

## **Phosphate Coating:**

Body is suspected to rust all its lifetime. If this happens, it will corrode away. So to prevent this, body is coated with Zinc Phosphate. It Also enhances adhesiveness for Electro-deposition.

* Temperature **40c-45c**
* Tact Time **140 Seconds**
* Water Type **Ro Water**
* Tank Volume 52 **Cubic Meter**
* Bath Concentration **2. 95 W/v %**
* Chemical **Surfdine, Toner and Starter**

### **Water Rinse Tank # 2:**

Body is rinsed with Ro water once again to wash away any unnecessary deposition on it.

* Temperature Room Temperature
* Tact Time 26 Seconds
* Water Type Ro Water
* Tank Volume 48 Cubic Meter

### **Water Rinse Tank # 3:**

De-ionized water I. E. with oxygen and hydrogen ions separated, is used to cleanse and remove and charged particles or solution from the body.

* Temperature  **Room Temperature**
* Tact Time **26 Seconds**
* Water Type **De-ionized Water**
* Tank Volume **49 Cubic Meter**

## **Preparation Area:**

Body is again rinsed with de-ionized water but this time for a longer time period. This is the preparation for Electro- Deposition. Surface is made 100% dust free and charge free.

* Temperature **Room Temperature**
* Tact Time **120 Seconds**
* Water Type **De-ionized Water**
* Water Sprayed **50 Liters**

## **Electro-deposition Tank:**

Electro-deposition is basically done to prevent rusting on the body including small holes, under body and inner sections. It uses paint, which is positively charged and body is negatively charged. Its thickness is around 15 To 25 microns. Tank solution has 45% paint and 55% permeate, which is that paint that has been separated from water in upcoming 2 stations.

* Temperature **27c to 30c**
* Tact Time  **180 Seconds**
* Voltage **250v to 350v**
* Current **600a to 800a**
* Conductivity **1200 to 1800 Us/cm**
* Ph. **5. 5 To 6. 1**
* Tank Volume **66 Cubic Meter**
* Ash **21 To 25**
* Meq **26 To 32**

## **Ultra-filtration Tank # 1:**

After Electro-deposition, extra paint is removed from the body by dipping it into water. Once the paint is separated from the water, it is given a new name as permeate. This permeate or basically Paint, is pumped back to electro deposition Tank.

* Temperature **Room Temperature**
* Ph **5. 5 To 6. 5**
* Tank Volume **51 Cubic Meters**
* Tact Time **26 Seconds**
* Water **De-ionized Water**

**Ultra-filtration Tank # 2:**

Same Is Previous Operation Is Repeated in This Section and Again Permeate Is Pumped Back to Electro-deposition Tank.

* Temperature **Room Temperature**
* Ph. **5. 5 To 6. 5**
* Tank Volume **50 Cubic Meters**
* Tact Time **26 Seconds**
* Water **De-ionized Water**

**Water Rinse Tank # 4:**

Body is washed and cleansed in De-ionized water tank, before taking it off the lift.

* Temperature **Room Temperature**
* Tank Volume **50 Cubic Meters**
* Tact Time **26 Seconds**
* Water  **De-ionized Water**

After all tank operations, body is taken off of the lift to put it on the table and is sprayed with distilled unionized water.

## **Baking Zone:**

After Electro-deposition and other necessary solution dipping, body is baked for 37 min. at 200 C temperature. This is done to dry the paint completely on the body.

### **Sealer Application**

The purpose of sealer is to make the body rust proof, water proof and sound proof. The size of the sealer beam is different at different places, specified to 5mm, 2mm and 1mm. After baking, body is brought into sealer section and is cooled down with high speed air fans door, trunk and hood holding jigs are installed.

### **Station 1:**

Air pressured pump nozzles are used to apply a beam of sealer. Sealer is applied at the inside of doors, engine room, trunk are, wheels area, tail lights inside area. Note that a specific thickness of sealer beam is to be maintained.

### **Station 2:**

Now the applied sealer is brushed down with paint brushes and is finished. This is done in order to smooth and give the final thickness to the sealer. Meanwhile beam is also applied on the roof edges, inside floor and mudguard are floor cups are also put on.

**Station 3:**

This time, beam is applied on dashboard area, side mirrors area, trunk floor and additional places inside the engine room. Previously applied sealer is brushed and finished.

### **Station 4:**

Brushing and finishing is done at dashboard, trunk floor, side mirrors, and floor and engine room area.

### **Station 5:**

Melt sheets are fixed at trunk and interior floor. Their purpose is to reduce and stop noises from coming into the interior.

### **Station 6:**

Now body is taken into underbody working area. Here, sealer applied on wheels is brushed caps are installed at side bumpers area and sealer is applied. Paper tape is applied for protection at this are.

### **Station 7:**

Previously applied sealer is brushed same composition sealer now called PVC is sprayed at underbody, particularly at bumpers inside area, trunk area, wheels area, spare wheel place and mid-section.

### **Baking Zone:**

Body Is Sent Into Oven And Is Heated For 14-15 Minutes At 165c. Its’ Purpose Is To Completely Dry Off the Sealer and PVC. Melt Sheets Are Also Melted Here and Pasted On the Floor.

## **Middle Coating**

After the sealer has been applied and dried, middle coating is next. Before applying the middle coating, body goes through the following stations:

### **Station 1:**

Sanding is done at the areas where needed, especially at corners, edges and areas where dust, grease and weld remains can be located. For sanding, sand papers of number 800 and air sanders of number 400 are used.

### **Station 2:**

High speed pressurized air is blown thought out the body to remove all dust and sanding remains. Body is wiped with naphthalene thinner.

### **Station 3:**

Now comes the paint booth. Here middle coating is applied on the visible areas of the body like doors, hood, trunk, and roof, front, rear and side panels. Light grey middle coating is used for lighter top coatings like blue, grey, silver and red. Dark grey middle coating is done for dark top coatings like black, blue etc.

### **Baking Zone:**

After middle coating, body is sent to the baking zone where temperature is around 1700 c for 15 minutes. After baking, body is wiped again and sanded for the top coat.

## **Top Coating**

Just like middle coating, top coat is also applied only at visible areas of the body. Pipes are changed for different colors. Distance of around 25 to 30 cm is maintained and specific numbers of rounds are done on specific areas. The nozzle of the gun charges the paint to –ve, whereas the body is charged +ve. Through this technique most of the paint coming out of the nozzle hits the body and very less amount is wasted. For metallic coatings, clearance is done after to coating, to make it last long and give sine.

Areas with small clearance are painted with conventional guns. This is because the electrostatic gun starts to sag the paint spray when the clearance distance is kept low such as 10cm.

## **Baking Zone:**

Body is then sent to the oven to bake it at 170 c for around 15 minutes.

## **Inspection and Repairs**

### **Station 1:**

After baking, body is brought into the inspection zone and is inspected for flaws at such as dust marks, weld marks, hair marks, flying marks etc. Flaws are marked.

### **Station 2:**

Paint zone trolley is changed with final assembly line trolley. Two post lift is used for this purpose.

### **Station 3:**

Marked areas are sanded with water and number 200 sand papers. It removes the flaw completely, but damages the top coating.

### **Station 4:**

Now the treated areas are again top coated, this time with Conventional gun. Body is then heated with heat guns on painted areas to dry the paint, instead of sending the body to the baking zone.

Bodies with major and larger flaws are taken off of the line and put aside on another line where they are worked on properly.

### **Station 5:**

Polish is applied on the whole body, and it makes the whole body look alike.

# Welding

Welding Zone Comprises Of Five Zones As A, B, C, D And E. We Will Discuss Each Zone In Detail Separately. First Let Us See The Types If Welding Being Used In All Zones.

**Types of Welding:**

## **Spot Welding:**

Also known as electric resistance welding, this is the most widely

Used welding in all zones. It uses a jig, c or x type, with two electrodes at the end, when these electrodes are brought into contact with the two sides of the sheets, heavy current passes through that point, melting the metal. Immediately cold chilled water is passed through the electrodes cooling the joint and making a weld. The temperature ranges from 400 c to 1600 c.

## **MIG Welding:**

Places where spot welding cannot be done because of the areas needed for two electrodes, mig welding is used. It uses stainless steel wire coated with cooper for rust protection, 1mm thick. It uses 25 v to 30 v, and 100 a to 150 a. Carbon dioxide gas is also used for cooling and protection from other gases from environment.

## **TIG Welding:**

It uses argon gas for melting purpose because it can reach a very high temperature and carbon dioxide for cooling purpose. It requires 6kva and 220 v. The flame is really harmful for eyesight, hence this welding s done with robots.

## **Stationary Welding:**

It is just spot welding but is don’t on stationary stations.

## **Projection Welding:**

Nuts are to be welded for joining parts in further assembly. These nuts are welding with projection guns. It uses 15000 a.

## **Stud Welding:**

Just like projection welding, but this time it is for bolts.

# ZONES OF WELDING DEPARTMENT

## **D-zone**

In this zone, doors, hood and trunk sub-assemblies are welded. All of these consist of respective panels and skins. Sealers of two types, adhesive and mastic are used. Adhesive sealer is used for adhesiveness, whereas mastic sealer absorbs dust, water leakage and noise. Upon heating, adhesive sealer hardens whereas mastic sealer swells. Press machine with 150 tones load is used, with different dies to mate the skins and panels. They are then spot welded, grinded and inspected for flaws. Dies are changed for each door, hood and trunk. Nut projection is done at doors, and trunk.

Catalytic converters are tig welded with robots. Function of these is to convert carbon monoxide into carbon dioxide, which is far less harmful.

Steering hanger is sub assembled. Two rods are placed on the jig, hinges and brackets are placed and mig welding is done at joints.

## **E-zone:**

At This Zone, Following Assemblies Are Made:

Dashboard upper, wind shield lower, dampers housings left and right, cross members for mid floor and rear floor, parcel shelf (rear area for speakers), front and rear bumpers, frame center tunnel and frame number punching. Frame number is of 14 digits which id punched on the left side doors mid frame. Spot welding is used for all these operations.

## **A-zone:**

Here, front comp, front floor, mid floor and rear section all are spot welded together. Front comp is the under hood area. Sills are thick strong and long members that are used on the floor and on each side to provide strength. Floor also has members to provide strength. Spot welding is used for all these operations.

## **B-zone:**

* After the complete base i. E. Floor is completed, now moving upwards, inner side frames are welded, mid pillars are joined. Now outer side frames are welded, which includes side bumpers rear and front.
* Now roof is placed in a very complicated jig and is manually spot welded. Parcel is also welded here.
* Side lower body panels are welded.
* Grinding is done on the spot welds where excess material is found especially at the inside of side frames called burr.

## **C-zone:**

Front And Rear Bumper Panels Are Mig Welded. Hood, Doors And Trunk Hinges Are Bolted. Then Hood, Trunk And Doors Are Bolted On The Hinges. Buffing And Wiping Is Done And Then Frame Is Finally Inspected.

# Production Control

This department consists of two sections:

• Production planning

• Ms ware house

## **Production Planning**

This section is responsible for the planning of production. They make a monthly production plan which is followed by the whole department. This plan is made almost three to four months ago before its execution. Monthly plan is further divided into daily production plan. They also use a document named nigari which is actually a marketing document and shoes how much parts we need, how much we have, how much we have to purchase and when we have to purchase so that parts delivery will be on time.

## **MS Ware House**

This Section Is Further Divided Into Following Sections

• Supply Chain

• Inventory

• CKD

• Local

## **Supply Chain**

This section is responsible for the availability of parts on time. Also they are responsible for the ordering and management of local parts.

## **Inventory**

This section is for records. Means it is responsible for the records of incoming parts (both local and ckd), parts stock and parts delivery to different departments.

## **CKD**

CKD Stands For Complete Knock Down. These Are Imported Parts. Their Main Vendors Are Japan And Thailand. CKD Parts Are Ordered And Managed By Logistics Department. CKD Parts Are Further Divided Into:

• CKD AF

• CKD WE

## **Local**

This section deals the locals parts. Their main vendors are volta, procon, mga etc. Local parts are ordered and managed by supply chain. They are further classified as

• Local AF

• Local WE

## **1st Ware House**

In This Ware House There Are Four Things

• CKD AF Delivery

• Local AF Delivery

• Local WE Delivery & Keeping

• CKD WE Delivery

## **2nd Ware House**

In This Ware House Following Operations Are Done

• Local AF Keeping & Delivery

• CKD WE Keeping

• CKD AF Keeping

# Quality Control

These two are one of the most significant departments in any industry, which insure proper receiving and excellent delivery of the car, in our case.

Talking about quality control first, it has following sub divisions:

• Parts Receiving Inspection.

• Line Trouble Shooting.

• Calibration of Measuring Instruments.

• Quality Inspection.

• Problem Solving.

## 

## **1- Parts Receiving Inspection:**

* It insures that all the parts bought from local market are without any fault and can be further used.
* Parts are graded as a, b or c. A grade parts are always inspected, because if any of these parts fails, it can be a reason to fatal or major incident. For example brake parts, water pipes and etc.
* B and c grade parts are not inspected at receiving because their failure won’t be a cause to major problem.
* Note that ckd (complete knockdown) parts or in simple words imported parts are never inspected.
* If a faulty part is found, trouble part slip is prepared and quality control department makes sure to let the vendor know about it. The present stock is checked, meeting with the vendor is called if needed, and correct parts are demanded.
* Vendors are rated in terms of gqi points ranging from best (0-22), good (23-89) and worst (89and above).
* Japanese techniques like 5s are used in stock department. These are:
* Sorting, simplifying, systematic cleaning, standardizing and sustaining

## **2- Line Trouble Shooting:**

If a part doesn’t fail at the inspection but shows failure at somewhere on the process line, then the respective department contacts the quality control office and a quality control engineer pays a visit to that department.

In situations like this one, Japanese use following techniques:

#### **1: 5w2h**

What, When, Who, Why, Where, How and How Many

#### **2: 3a**

Actual Problem, Actual Place and Actual Situation

#### **3: 5why**

Why, Why, Why, Why and Why

Upon reaching the respective department, the quality officer asks these questions to the corresponding person. These are specific set of questions, who’s answers leads the quality officer to the root cause of the problem, hence a solution is suggested. Let’s keep one thing in mind that the solution is found for the root cause only, not for an interlaying problem. For example the problem is that the car isn’t starting. Why? Because the battery is short of charge! Why? Because it’s dry! Why? Water wasn’t filled! Why?

Now the stock of batteries is checked and it’s found that all batteries were dry. Note that the 4th why has led us to the root cause of the problem. In this case vendor is contacted and is told about the problem with his batteries. In case that the battery was filled with water but was discharged (keep in mind that batteries from vendor came in charged, as per inspecting stock), then it’s obvious that it has discharged by one of the workers by mistake. Then the department will handle this problem, quality officer will leave the matter to them.

## **3- Calibration of Measuring Instruments:**

Calibration schedule for all the instruments used in the factory is made, on yearly basis. All the instruments are brought into the calibration lab and tests are carried out.

Calibration Is Either:

1: In House, Carried Out In The Factory.

2: Out Source, Getting It Done From Specified Companies.

This decision is made on the basis of the question if the calibrating devices for the specific instrument are available in the calibration lab or not.

Calibrating schedule shows instruments of corresponding departments with the following characteristics:

1: Range of the Instrument.

2: Frequency of Use.

3: Date of Last Calibration.

4: Tolerance.

5: Least Count.

There are around 700+ instruments in the factory, of which only around 30 are calibrated by out sources. Major instrument that are calibrated are vernier calipers, scales, weight scales and torque wrenches. For example vernier calipers are calibrated in the calibration lab by the use of block gauges. These are steel block of dimension between 0. 1mm to 300mm. These are

100% Precise and Are Kept With Great Care. Vaseline Is applied on the Surface to Stop Deposition of Dust, Upon Use It’s Washed Away with Gasoline.

**4: Quality Inspection:**

A monthly schedule is made for inspection of the quality of materials that are used in the production including metal, paints and etc.

Then corresponding metals are brought into material testing lab and different tests are performed. Tests are performed as per HES (Honda Engineering Standards) and JIS (Japanese Industrial Standards). Any part is selected randomly from the stock.

Following steps are used in order:

Design, specifications, HES and JIS

Following tests are performed on the parts:

**1: Tensile Or Compression** test is performed on metals to find out their tensile strength.

Gauge And Parallel Lengths Are Selected as per HES (Honda Engineering Standards) And JIS (Japanese Industrial Standards). It May Be Performed On Chassis Rods.

**2: Profile Projector Test** Is Used To Check The Dimensions And Profiles Of Smaller Parts Like Nuts And Bolts High Frequency Light Is Projected On The Part, And Its Profile Is Observed Through A Projector. Comparison Between Standard And Under Test Parts Can Be Done.

**3: Rockwell Hardness Test** is used to test the hardness of material let’s say the wheel rim.

Ball or diamond indenter is made to penetrate the rim. Diamond is used for very hard materials like titanium; ball is used for material of medium hardness. Materials are grades As: A: a For Soft

B: B for Medium

C: C For Hard

**4: A Surface Roughness Test** is performed to test the roughness of any part let’s say disk brake. For proper function of brake, the disk should be as smooth as possible because in this way they are of contact between the clipper and disk will be maximum and brake will be most effective.

**5: Ultrasonic Harness Test** is performed to test the hardness at ultrasonic level by the use of diamond indenter.

**6: Microscope** is used to look for scratches, cracks or spots inside the part. for example piston, it should be spot free, crack free and scratch free for its proper and defect less movement inside the cylinder. presence of cracks and spots weakens the metal and its toughness decreases.

**7: Paint Thickness Test** is performed to check the thickness of the paint on the body or surface. It’s different for ferrous and non ferrous materials. Usually the thickness on ferrous materials comes out to be 23-25 microns.

**8: Salt Spray Test** is used to check the quality of the paint on a part. A salty foggy and moist atmosphere is created artificially inside a salt water tank; corresponding part is placed inside it for 24 hours or more, depending on the grade of part. After this much time, part is taken out and observed for blisters and other paint defects. Note that a small cross is made on the surface with a sharp object. This is done in order to let the moist penetrate the part inside and see what happens and to what extent. Scotch tape is attached then pulled off forcefully, in order to see the effect on paint

# Vehicle Quality

This department deals with the final quality and pre delivery inspection checks of the vehicles and the feedbacks from the dealer. QTS (Quality Insurance Sheets) are there for each vehicle and are delivered to the dealer and hence to the customer. There are three conditions:

1: 0-day Claim Is There When There Is a Fault in the Car before It Is Delivered to the Customer but When It’s At the Dealer.

2: 1-90 Days Claim.

3: Normal Claims Are As Follows For Three Models:

A- City 3 Years Or 70,000 Km.

B- Civic and Br-v 2 Years Or 50,000 Km.

At The End Of Assembly Line We Have 4 Stations Reserved For Quality Checks.

1- At First Station, Following Checks Are Made With Sensors:

A-wheel balancing

B-wheel Alignment

C-headlight Angle Adjustment

D-side Slip Test

E-steering Handles Alignment

2-at This Station, Followings Are Tested:

A-speedometer Calibration by Accelerating Car Up To 100km/h

B-braking Force

C-handbrake Force

D-door Locking at 15 Km/h

E-door Unlocking at Parking

F-high Beams

G-air Conditioner

H-other Dashboard and Speedometer Lights and Functions

I- Steering Lock

J-cruise Control

3-at This Station, We Look for Defects In:

A- Doors Opening Closing. B- Trunk Opening Closing. C- Hood Opening Closing D- Pipes Connections E- Pipes Caps F- Interior Surface G- Cleanliness H- Windows Functions I- Side Mirrors Functioning J- Wipers And Water Jet Function K- Underbody

4-final Inspection:

This Is the Last Assembly Line Attached Station of Vehicle

Quality. Here Associates Look For Exterior Defects Such As Scratches, Paint Misses, Spots, Missing Or Additional Bends And Curves.

Test Drive

After This Station, The Vehicle Is Taken On The Test Drive Course.

A device named let is connected to the ecu and is used to check all the sensors present in the vehicle like brake sensor, abs sensor, temperature sensor, fuel level sensor, acceleration pedal, air bags, security horn, vsa (vehicle stability assist), meter indications and etc.

Vehicle is then driven at a speed up to 110km/h for civic and 100km/h for br-v and brakes are applied and it’s noted if the car stops within specific distance. Then car pull and wheel alignment is checked at 40km/h. Abs is tested practically on a wet marble floor at 15km/h. Vehicle is made to pass over speed breakers of different sizes, to check if it touches any one of them. Extremely rough terrain is there to check if any type of unnecessary sound is heard when vehicles is driven over it. At 40km/h, full brakes are applied to check if the vehicle stops within the distance of 17m at max.

Shower test is done inside a shower room; with around 100 nozzles at top, each side and even bottom. Water at 1600 liter per minute is sprayed for 4 minutes with car standing inside the room with engine at start condition. At the same time speaker, charging and usb connections and led functions are checked. After 4 minutes, car is driven out and leaks are checked under hood, inside doors and other openings.

**PDI**

At Last Comes the PDI (pre Delivery Inspection). We Make Sure That At This Station All The Faults And Mistakes Are Cancelled Out On The Sheet. Interior And Exterior Are Again Inspected Under Bright Light. Under Hood Is Also Checked and Car Is Rolled Out.

# Engine Assembly:

Engine Assembly Department Is Sub Departments:

A: sub Assembly

B: assembly Line

C: engine Firing Room

D: repair Section

E: Pre-delivery Inspection

## **Sub Assembly:**

In This Section, Major Large Sections Of Engine Are Pre Assembled Before Delivering Them To The Main Assembly Line. There Are 3 Sub Assembly Stations:

### **A -mission Assembly:**

**Station 1:**

First, transmission case and clutch case are cleaned and identified. Oil drain

Bolt is installed and tightened. Plate oil gutter is attached, whose function is to supply oil to gear shafts. Clutch release fork with its bearing are placed with press fit machine. Release fork boot is installed to avoid dust from entering inside. Seals are installed at different joints by hammering to avoid oil leakage. A magnet is joined to catch unnecessary metallic objects.

### **Station 2:**

Here, differential is installed with its bearings. Gear shafts, to be specific, main shaft and counter shaft are installed along with their bearings with the help of hydraulic bearing press machine.

Gears arrangement is as follows on the shafts:

1-r-2-3-4-5

Reverse lock is installed to avoid shifting from 5th to reverse gear. Digital shim selection unit is used to select the specific size of shim. Idle gear, for reverse gear, is installed and tightened.

## **Station 3:**

Sealer is applied; clutch and transmission cases are joined together with 14

Bolts. Shims are installed. Their function is to complete the required clearances in corresponding parts and to avoid case-differential connection, as case is of softer material ant it may be damaged if comes in contact with the differential. Differential oil seals and oil caps are installed.

## **Station 4:**

Gear shifting pedal is bolted and checked. The main test at this station is the air/oil leak test. A device with specific settings is used, hose connection is made and test is initiated. If leak is within +-5 mmh2o, then it’s good to go. Mission sticker number is applied. Appearance is checked.

## **B -Piston and Water Pump Assembly:**

### **1: Piston Assembly**

Piston is identified, cleaned and inspected. Piston rings are

Then applied turn by turn with the help of jigs (only in case 1st and 2nd ring). 3rd piston ring consist one spacer and two rail rings. Spacer is placed between the rail rings, by hand. Rings have an id on one side; this side should be placed towards top.

### **2: Connecting Rod Assembly:**

Connecting Rod Is Cleaned And Assembled To One Piece.

### **3: Piston Connecting Rod Matting:**

Piston Pin Is Hydraulically Pressed at Piston connecting Rod Connection and Is Checked and Forwarded.

### **4: Water Pump:**

It is used to pump the cooling water inside the cylinder, one of

The most important functions. Mechanical sealer is adjusted with press fit machine, along with bevel pins, which holds it inside the engine. Impeller made of hard plastic is installed with press fit machine. Flanges are installed and then their run out test is carried out. If a problem is faced with impeller installation, check for bearings if they’re not misplaced.

## **C: Head Assembly:**

Cylinder head code is identified and inspected. Rocker arm shaft and cam shaft are installed carefully without scratching any surface and bolts are tightened. Both shafts are cleaned with pressurized air then local oil is applied. Plastic and steel attachments are scrapped separately. Tdc sensor is attached, which checks which piston is at top. Water rotation inlet and outlet attachment is bolted. Cam shaft oil pressure sensor i. E. Tw is attached.

## **D: Water Outlet:**

Hot water coming out from engine needs to be cooled by radiator. This attachment is press fitted in this section.

# Assembly Line:

Starting From Engine Block to a Fully Functional Engine, This Assembly Line Comprises Of Following Stations;

## **Station 1:**

A: Confirm Engine Block For Corresponding Model.

B: Look For Dust, Scratch And Pin Holes.

C: Separate The Cap Bearing And Place It On Trolley For Later. Place Its 6 Bolts On Trolley In Available Slots. This Is Done To Install The Crankshaft Later.

D: Punch 7 Digit Engine Number With Dies. Engine Number is available On A Sheet.

E: Knock Sensor Is Bolted. It Produces Its Own Current By Friction.

F: Clean Cylinders with Gasoline.

### **Station 2:**

A: Plate Partition Is Installed. It’s A Rubber Structure Placed in Water Gallery outside the Cylinders, Whose Function Is to Direct Water and Make Its Flow Turbulent.

B: Clean Area for Breather Cover with Gasoline, Apply Sealer Then

Bolt The Breather Cover In Its Place. It’s An Outlet Passage for unnecessary Gases and Air Which Is Present inside the Engine.

C: Clean Pistons with Pressurized Air, Confirm Presence and Direction of Rings, Apply Oil And Punch Piston-connecting Rod inside the Cylinders.

### **Station 3:**

A: “metal Bearing”, Used Between Connecting Rod- Crankshaft Connections, Crankshaft-block Connections, Are Selected By Using Block Number, Crankshaft Number And Connecting Rod Number. Upper Bearings Have Hole For Oil Flow. Civic Has Oil Jets For This.

B: Water Pump Is Bolted At Its Place.

C: Crankshaft Inspected, Cleaned, Bearings Are Oiled and crankshaft is installed. There Is a Degree of Play in Connecting Rod-crankshaft Connection, For Oil Flow.

### **Station 4:**

A: Rpm Sensor Is Bolted.

B: Cap Bearing Already Present on Trolley Is Installed Back On, With Its 6 bolts.

C: Bearings And Oil Seals Are Installed.

D: Starter Motor Is Bolted.

E: Crank Rotation Is Checked

### **Station 5:**

A: Flywheel Installed.

B: Friction Disc Bolted.

C: Clutch Plate Installed.

D: Engine Oil Pump Bolted With Crankshaft.

E: Oil Strained Is Installed, Which Strains Unnecessary Metal or Any Particles Present In Oil.

### **Station 6:**

A: Transmission From Mission Assembly Is Jigged And Joined.

B: Sealer Is Applied On Oil Pan; it’s Then Bolted on Block.

### **Station 7:**

A: Bracket Is Bolted, As A Holder For Wires.

B: Starter Motor Installed.

**Station 8:**

A: Surface Is Cleaned And Cylinder Head Gasket Is Placed. Its functions are to Avoid Water Fuel Mixing and to Stop Emission of Toxic Gases.

B: Head Is Jigged And Installed With 8 Bolts. Bolts Are Tightened

With Nut Runner Machine.

C: Sprockets on Crankshaft and Camshaft Are Installed, Whose

Crankshaft: camshaft Ratio is 1:2. Respective Teeth Ratio Is

23:46.

D: Crankshaft Position Sensor Is Bolted.

E: Clutch Case or Torque Converter Cover (in Case Of Automatic

Transmission) Is Installed After Applying Sealer.

### **Station 9:**

A: chain Cover Is Bolted after Cleaning and Sealer Application. Oil

Leakage Was Observed To Sealer Thickness Was Increased From 3m

To 5mm.

B: Crank Pulley, Made Of A Grade Rubber Is Installed Joined. It Is

Tightened With Carefully Calibrated Wrenches And Is Turned At An Angle Of

93. 2 Degrees.

### **Station 10:**

A: tappet adjustment is done at this station. It is one of the most important

Jobs to be done on assembly line. It determines the dimension for the

Opening of the intake and exhaust valves. For all exhaust valves, dimension

Is 0. 35mm. Dimension for first 3 cylinders intake valve is 0. 25mm and for

Fourth cylinder it’s 0. 27mm. Reason is that the forth cylinder is closest to

The flywheel, load is maximum there, so more fuel is needed. All these

Adjustments are done by creating 0. 068 mpa pressure inside cylinders.

B: hence firing order of engine is adjusted and is as

1-3-4-2

For 3 cylinder engine, it will be

1-3-2

Tappet test is done in same order. If tappet is set hard, noise is produced in

Engine.

### **Station 11:**

A: cylinder head plug is installed as a seal.

B: oil pressure increasing switch is bolted.

C: thermo case is attached and pipes connections are made. It contains

Thermostat inside of it, when temperature is below 70 degrees Celsius, it

Remains closed. Thermostat valve opens only when temperature is above

80 degrees Celsius and hot water from engine goes to radiator for cooling.

D: spark plugs are bolted.

### **Station 12:**

A: water bypass connection is made. This is done in order to let same water

Run in engine block, without letting it enter radiator to cool off, when

Waters temperature is below 70 degrees.

B: engine head cover is installed after applying sealer to prevent leakage.

C: oil level gauge attachment and oil filler cover on the head is installed.

D: filter is bolted.

## **E: electronic fuel injector is joined.**

### **Station 13:**

A: wire harness is attached but not connected.

B: water and oil leak tests are performed; whose reading should be less

Than 0. 4mmh2o and 0. 7mmh2o respectively. Both tests are conducted at

Corresponding engine areas.

### **Station 14:**

A: now connections are made for coil plug, knock sensor, fuel injectors, oil pressure sensor and starter motor.

B: 12v ac generator is attached and connections are made.

C: auto tensional is attached. It is used to provide tension to crankshaft belt if it ever loosens.

D: transmission fuel, which is different for manual, automatic and cvt transmissions, is pumped into transmission, 1. 1 liter for city and 1. 5 liter for civic.

E: oil level gauge in inserted.

F: engine oil is pumped.

### **Station 15:**

A: gasket is placed and intake manifold attached with throttle body is bolted.

B: connections for mission sensors are made which include reverse light sensor, position sensor and couple sensor.

C: exhaust gases recirculation valve is bolted.

D: inspections are made on harness connections and other connections. E: engine moved from assembly line and put on the dressing trolley. Dressing line: a: water pump pulley and air conditioner compressor are bolted.

B: belt is put on, by moving auto tensional aside.

C: catalytic converted and its cover is installed. It’s used to avoid toxic gases from rejecting into the air with exhaust gases.

## **3: Engine firing room:**

According to a schedule, engines after dressing are

Bought into engine firing room, where connections for fuel, coolant, starter motor and exhaust are made and engine is started for the first time.

## **4: Repair room:**

If any mistake is found in engine during inspection or firing

Test, it’s brought into repair section. Here, repairs are done and engine is declared ready for final assembly line.

## **5: Pre –delivery inspection:**

Before taking engine into the final assembly line

Of vehicle, it’s inspected for the last time. All joints and connections are visually checked. Paper work is done and then it’s ready for final assembly line.

Right after paint shop and its final inspection, vehicle body come into final assembly section. This is where the vehicle takes its final appearance and shape. From exterior to interior, engine to suspension, wheels and fuel everything is completed at this assembly line.