

1. What is Battery.
2. Method of Battery Manufacturing.
3. What is Heat Sealing Method.
 - a. Container Punching
 - b. Short Ckt.
 - c. Welding
 - d. Short Ckt
 - e. Heat Sealing
 - f. Pole Burning
 - g. Air Leakage Testing
4. Servicing of Battery

What is Battery?

- The first possible evidence of batteries in history are the *Baghdad Batteries* from sometime between 250 BC and 640CE
- In 1748, Benjamin Franklin coined the term *battery* to describe the simple Capacitor he experimented with, which was an array of charged glass plates. He adapted the word from its earlier sense meaning *a beating*, which is what an electric shock from the apparatus felt like. In those days, the entertaining effect of an Electric Shock was one of the few uses of the technology.
- The modern development of batteries started in 1800 by Alessandro Volta.
- **The battery is a device that simply stores energy in the form of chemical energy and supplies in the form of electrical energy for your need when & where you require in the convenient way.**
- **Like any other instrument it also requires your attention to look after well.**

How to Suggest Battery to your Customers.

- Customers' need of Electrical Energy required.
- Flow of Electrical Energy (Discharge Rate) required.

➤ Charging of battery.

- The capacity of a battery to store charge is often expressed in **ampere hours** (1 AH = 3600 **coulombs**). If a battery can provide one ampere (1 A) of current (flow) for one hour, it has a *real-world* capacity of 1 A.H. If it can provide 1 A for 100 hours, its capacity is 100 AH. Likewise, 20 A for 2 hours equals 40 A·h capacity.
- A battery can be simply modelled as a perfect voltage source (i.e. one with zero internal resistance) in series with a Resistor. The voltage source depends mainly on the chemistry of the battery, not on whether it is empty or full. When a battery runs down, its internal resistance increases. When the battery is connected to a load which has its own resistance, the resulting voltage across the load depends on the ratio of the battery's internal resistance to the resistance of the load.
- When the battery is fresh, its internal resistance is low, so the voltage across the load is almost equal to that of the battery's internal voltage source. As the battery runs down and its internal resistance increases, the proportion of its internal voltage that gets through the internal resistance to appear at the load gets smaller, so the battery's ability to deliver Power to Load decreases.

Peukert's Law Demonstrates the efficiency of Battery.

- The efficiency of a battery is different at different discharge rates. When discharging at 5% an hour, the battery's energy is delivered more efficiently than at higher discharge rates.
- To calculate the 5% discharge rate of a battery, take the manufacturer's ampere-hour rating and divide it by 20.

Terms used for automobile battery power ratings

- **Cranking amps(CA)** is the electric current in amperes a battery can provide at 32° F. Defined as the numbers of amperes a lead-acid battery at 32 degrees F (0 degrees C) can deliver for 30 seconds and maintain at least 1.2 volts per cell (7.2 volts for a 12 volt battery).
- **Cold Cranking Amps (CCA)** is the amount of power a battery can provide at (0° F). Defined as the number of amperes a lead-acid battery at 0 degrees F (-17.8 degrees C) can deliver for 30 seconds and maintain at least 1.2 volts per cell (7.2 volts for a 12-volt battery).
- **Reserve Capacity Minutes(RCM)** is a battery's ability to sustain a minimum stated electrical load; it is defined as the time (in minutes) that a lead-acid battery at 80° F will continuously deliver 25 amps before its voltage drops below 10.5 volts. The value is calculated by

Peukert's Law: $C = I^n T$

C being the theoretical capacity of battery, I is the current, T is time and n is the Peukert number, a constant for the given battery.

The equation captures the fact that at higher currents, there is less available energy in the battery. The Peukert number is determined empirically and reflects the internal resistance of the battery.

To calculate Peukert's exponent for a battery it is discharged twice using two different currents on and the time is taken for each. The two currents and the two times are entered into the following equation:

$$n = \frac{\log t_2 - \log t_1}{\log I_1 - \log I_2}$$

A value close to 1 indicates a well-performing battery with little loss. A higher number reflects a less efficient battery. The Peukert number of a battery is exponential and is between 1.3 and 1.4 for lead acid types.

- **Hot cranking amps (HCA)** is the amount of current a battery can provide at 80 °F (26.7 °C). The rating is defined as the amperage a lead-acid battery at that temperature can deliver for 30 seconds and maintain at least 1.2 volts per cell (7.2 volts for a 12-volt battery).

Types of Battery:

- Basically there are **two types of batteries**;
- Starting (cranking), and Deep Cycle (marine/Home lighting).
- The **starting battery (SLI starting lights ignition)** is designed to deliver quick bursts of energy (such as starting engines) and have a greater plate count in order to have larger surface area that provides high amperage for short period of time. The plates will also be thinner and have somewhat different material composition.
- The **deep cycle battery** has less instant energy but greater long-term energy delivery. Deep cycle batteries have thicker plates and can survive a number of discharge cycles.
- Starting batteries should not be used for deep cycle applications. The so-called **Dual Purpose Battery** is only a compromise between the 2 types of batteries.

There are 3 different components in a battery:

- Positive and Negative Plates - Plates are made from lead and they store the electrical energy in a battery. There are alternative positive

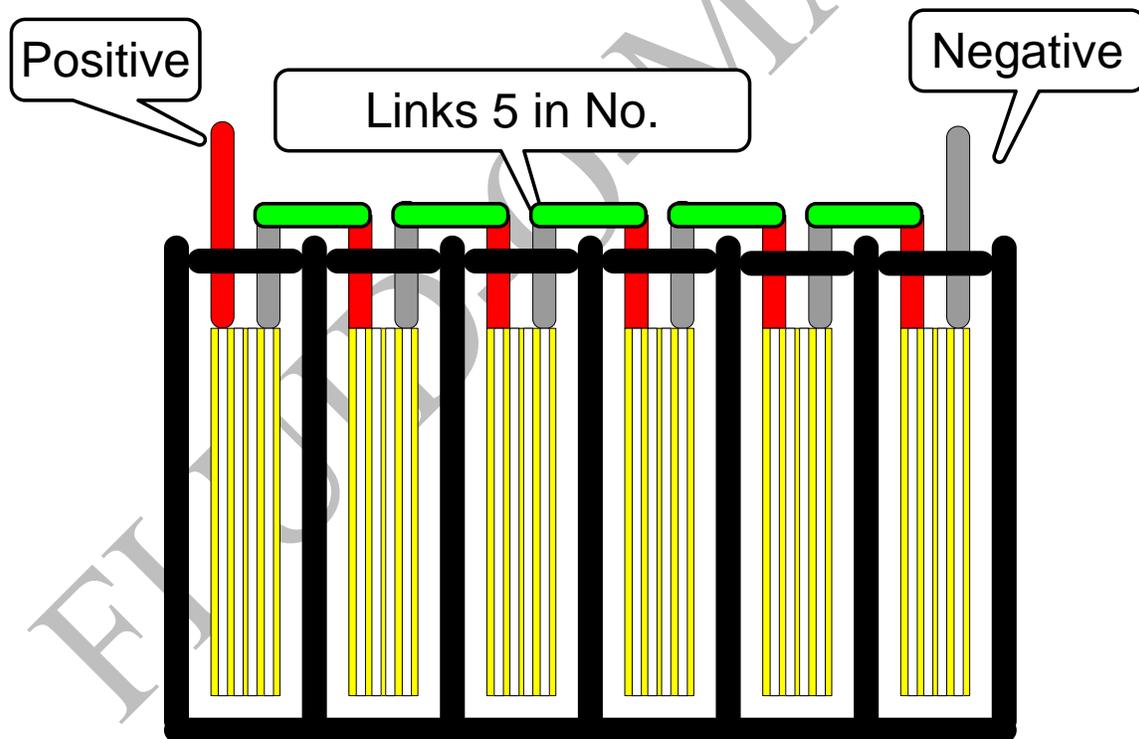
and negative plates and larger batteries have more plates and therefore more power.

- Separators - These separate the plates electronically to stop them shorting out. There is one between each positive and negative plate. They are made from polythene and contain very small holes (Porosity) to allow electrical ions of acid to pass through them.
- Sulphuric acid (electrolyte) - The acid conducts electricity between the positive and negative plates and also takes part in the discharge and charge reactions.

There are two types of assembling processes in India.

- **Assembly in Rubber Container**
- **Assembly in Polypropylene Container**

Assembly in Rubber Container



- Six Cells are Placed in different cells.
- Covering cells with cover & sealing these cells with compound.
- Then these cells are connected by five links.
- Hence completing circuit from negative to positive terminals.

Advantages to manufacture Battery in Rubber container:

- 1 Can be started with small investment.**
- 2 Lesser level of operation.**
- 3 Gives Employment to more people.**
- 4 Can be started in Remote areas with minimum machinery & Expertise.**
- 5 So, it is very good for Self-Employment.**
- 6 It is very good for Cottage Industry/ Shops.**
- 7 Easy to dismantle individual cells to replace due to Faulty raw-material, Abuses of the customer & Negligence of Labour.**
- 8 After Life time, maximum of the parts are Reused after Re-Working. So, Pollution created by Rubber Battery is minimized.**
- 9 As Battery manufactured per workman are low. So, Health hazards are lesser.**
- 10 Lesser prone to Vibration.**

Disadvantages to manufacture Battery in Rubber container:

- 1 Profit Margins are less due to lesser Production per Workman. So, in the present scenario, where every type of Industry is re-consolidating for a good entrepreneur it is not suitable. Considering Investment v/s Profit Ratio.**
- 2 For using same parts of the Battery in the New Battery reduces the BRAND Image of the Manufacturer. Customer always suspects that he has been cheated.**
- 3 As the parts are recycled without safety precautions, more environmental hazards are created if manufactured on a higher scale.**
- 4 Ratio of Energy stored V/s Weight is less. So, if mounted on a vehicle Fuel Cost is increased even of 2Kg, it consumes fuel to transport the Battery with the vehicle. In this progressive world fuel cost is sky rocketing.**
- 5 Vibration level of new generation vehicles has already reduced so it has become older technology.**
- 6 Availability of educated & expert workmen is increased.**

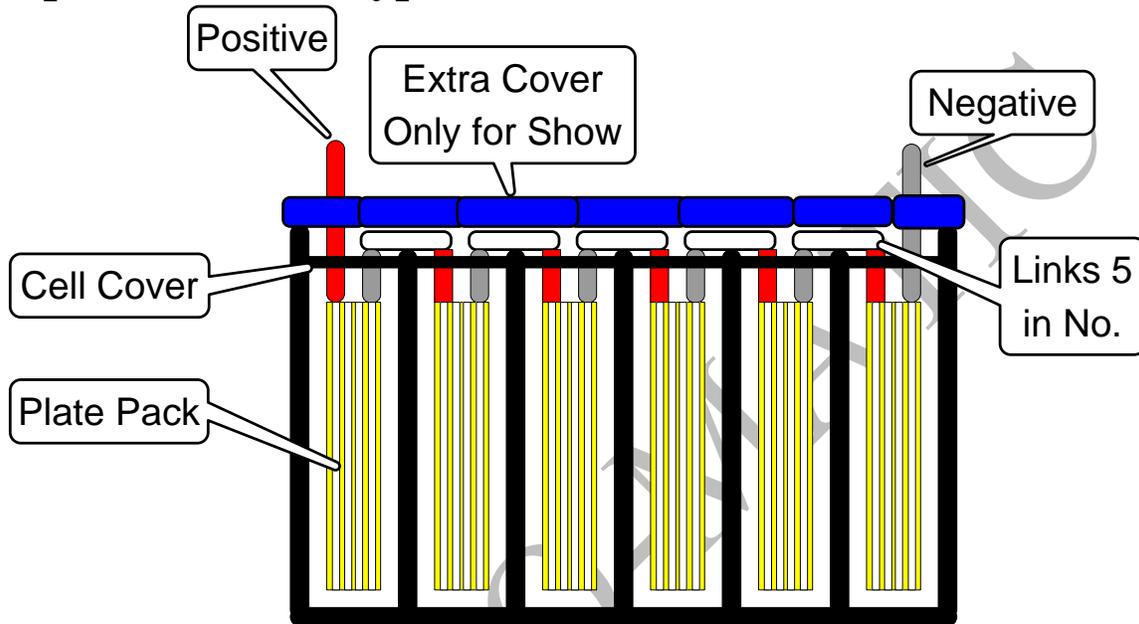
Assembly in Polypropylene Container

There are two ways to assemble battery in polypropylene containers.

- 1. Open Cum Seal Type.(Rubber container is replaced with polypropylene container).**

2. Heat Sealed Battery is made in polypropylene container and process is mechanized.

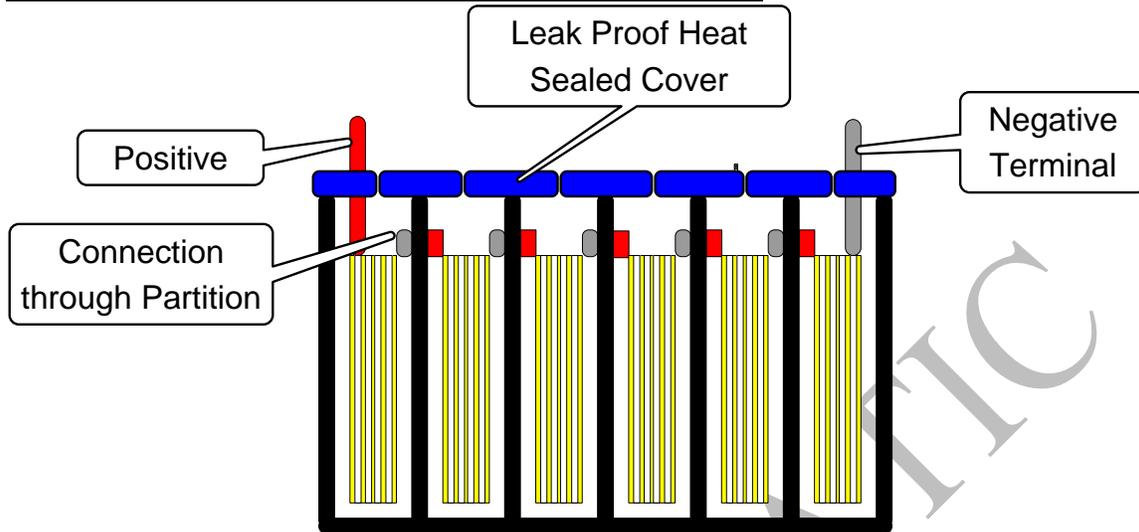
Open Cum Seal Type.



Advantages/Disadvantages to manufacture Battery by Open Seal Method:

In this process Rubber container is replaced with polypropylene container hence it enjoys Maximum advantages of Rubber Container with added advantage of looks.

Heat Sealed Type Battery



Advantages to manufacture Battery by Heat Sealing Process Method:

- 1 Battery has become commodity than the luxury so society needs large quantity with quality. So, bigger level of operation is required to suit the interest of society.**
- 2 Same workman is trained to produce more Battery hence Production Capacity per workman is increased.**
- 3 All the processes are mechanized so quality is assured, it becomes lesser dependent on the Expertise and experience on the workman.**
- 4 Can be started in Remote areas with Indianised Machinery.**
- 5 So, it is better for Self-Employment for the progressive Entrepreneurs.**
- 6 It is very good for Small Scale Industry.**
- 7 Shops can be used for distribution purpose only, hence reducing pollution.**
- 8 Considering the rising real estate rates the occupancy expenses are increased so smaller shops can be used for distribution.**
- 9 It is not easy to counterfeit the battery so Brand Image is increased.**
- 10 After Life time, Battery is bought back & sold to recycler who takes care of the pollution level during recycling. So, the involvement of Dealers in following pollution rules is reduced.**
- 11 Due to shorter path in current flow from one cell to another the capacity of the Battery is increased.**
- 12 Due to Lead saved from the links Profit Margin are increased.**

13 Once the path is shorter the capacity require to be supplied can be attained by reducing the Plate thickness, which reduces the weight of the Plate hence Lead is again saved.

14 Approximately, quantity of Lead saved per Battery is 15% which in turn increases the capacity to compete in the market at the same time increasing the profit.

Now, we should discuss the process of Heat Sealing Battery to enhance the level of expertise.

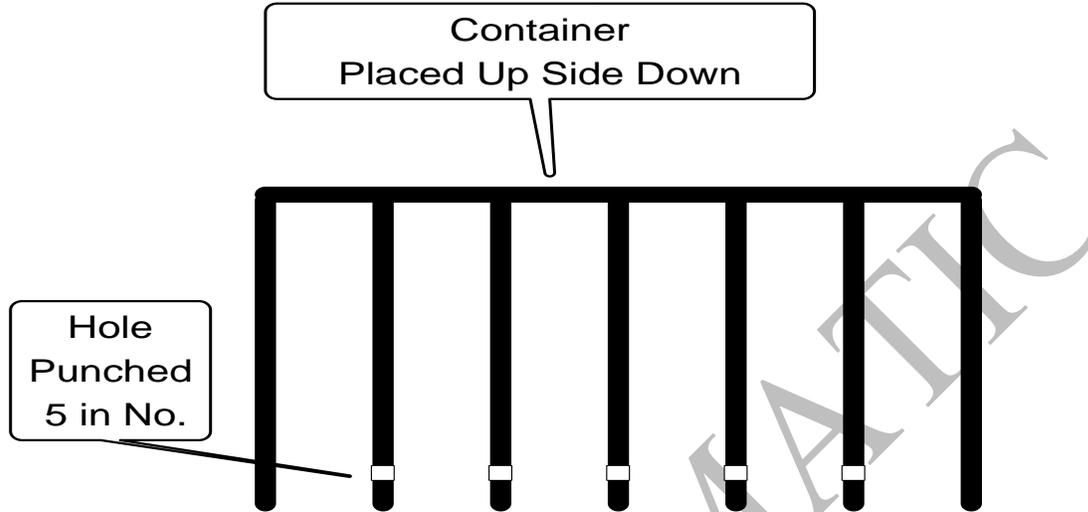
There are following steps to be followed to make Heat Sealed Battery:

- 1. Hole is punched with the help of Punching Machine.**
- 2. Plate packs are made with the help of special type of comb set.**
- 3. It is checked manually or with the help of machine that all the separators are placed in between the plates, so plate should not short to each other.**
- 4. After Plate packs are placed in individual cells of container Intercell welding is done through the partition hole.**
- 5. It is checked manually or with the help of machine that there is no flash out or drop of lead into the cells so plates or separators are not short to each other.**
- 6. Now cover is placed on container and Heat Sealed to each other with the help of Heat Sealing Machine.**
- 7. After brazing connection Pole of battery, Battery is ready for leakage testing, it is done with the help of Leakage Testing Machine.**
- 8. Battery is stamped with the help of Date/ Code Punching Machine to ascertain date of manufacturing.**

In this process we use machines to make fault free Batteries & at the same time in high volume so cost per battery per person is reduced. This is must in present time.

Let us discuss the function of each Machine so we can discuss detail about how to select best machine to suit our purpose.

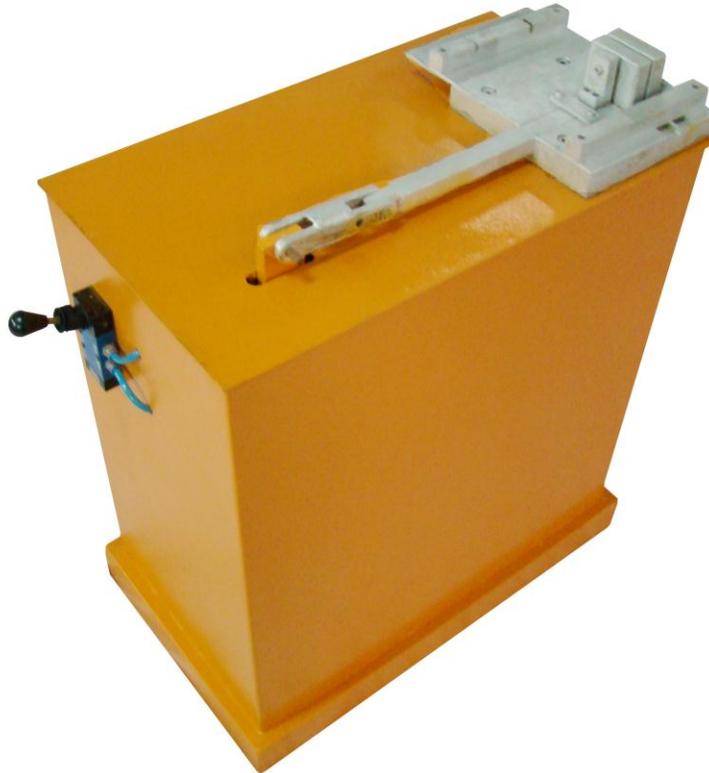
Function of Hole Punching Machine:



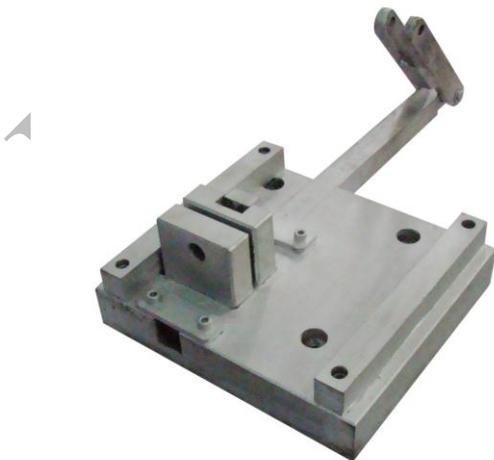
First of all, a hole is punched through the partition in such a way that it gives the way to the connecting path of two cells through the partition of the container. The size of the hole is very crucial because the cross section of the hole will determine quantity of current to pass through as Cross-Section of any conductor decides the flow of current depending upon its resistivity. This Diameter of the hole will vary depending upon the Discharge Rate of the Battery (Capacity of the Battery).

Hole should be sharp cut without Burrs & the Center distance of the hole from the partition & Bottom should be accurate. One hole can be punched in one go where lesser quantity of the Battery Production is required provided container is placed properly. Operator has to place the container in the up side down position **CAUTIOUSLY** container has to be placed properly so it fits into position made for it and pressed firmly every time to get hole at the same height. If it is not pressed properly then every time hole height will vary, which will show its faulty results in partition cell welding. By neglecting this operation to a lesser importance will be fatal to the

Battery. This hole is the foundation for the Heat Sealed Battery. Check all five holes punched without any extra material left. There are options to punch all the five holes in one go. But it requires more investment so break even between investment and production capacity has to be calculated.



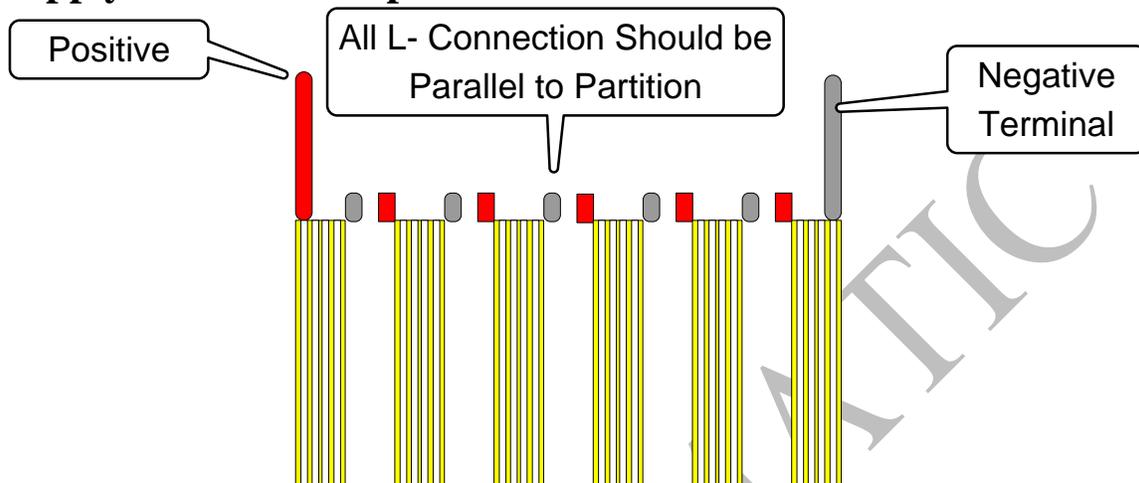
For the no. Sizes you want to make Punching Dies has to be changed.



So these will depends on no. of sizes Batteries, you want make.

Function of Comb Sets:

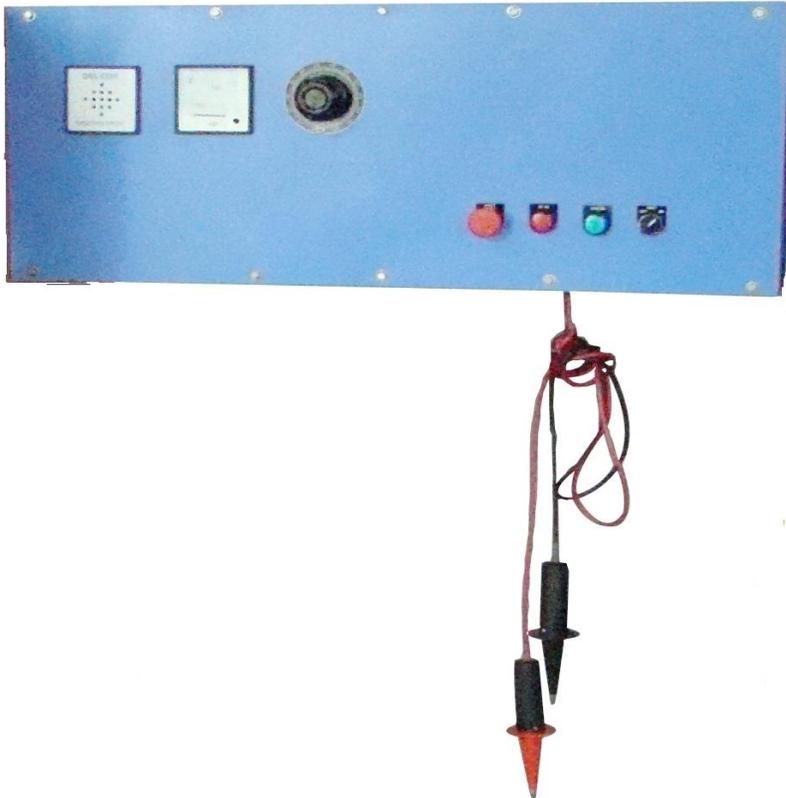
Plates are brazed together in pack to make parallel circuit of many plates. No. of plates will determine capacity of Cell to supply current in ampere.



Cells made for Rubber Container are made in this type that connecting pole is emerging from center. But connecting pole in heat sealed battery are side faced. This side faced poles are connected to another cell through the partition. There face should be parallel & touching partition. There should not be any gap so while Intercell welding, lead melted from Side faced L type pole connector should not fall below or should not flash out to any direction. Hence while brazing Operator should be very cautious about placement of L connector, these connectors should be vertical the base of container and parallel to partition in such a way that side connectors will perform as die plates and hole of partition will become the cavity of die which is filled by the melted lead which is taken from L connectors to fill the hole, if there is gap then lead will purge out from the gap and connection will become weak. Be cautious about placement of L Connector, Other wise Lead will flash out from the gap available to it, if L Connectors are not place in such a way that no gap should be available to molten Lead, connection will be weaker because lead has already come out from the gap in side of welded portion is hollow. Weak connection will not stand for required load or for required

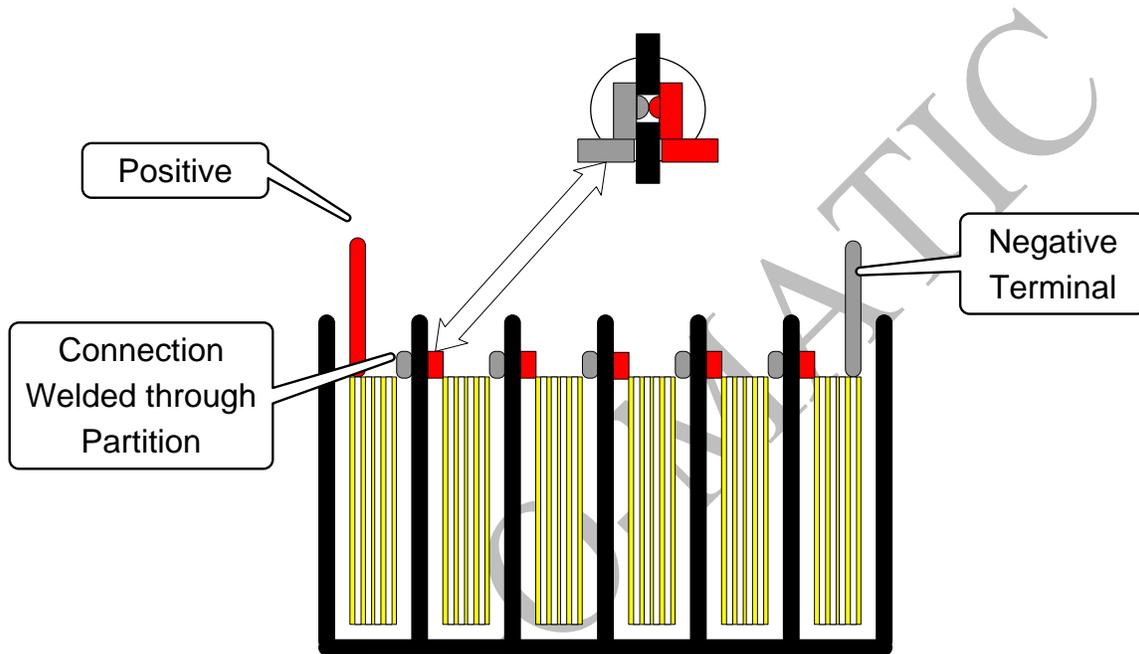
current flow because as mentioned earlier that current flow is directly proportional to the cross section area of the conductor through which current flows. So Comb Set is very important.

Short Circuit Tester: To make sure that Pack of negative plate should be insulated from Pack of positive plates, Separators are inserted in between negative & positive Plates. There are Probabilities are there, that there may be Pin hole in the separators or separator it self is missing. To make sure that if there is any of the case of abovementioned defects then operator should get alarm, So High voltage test is required to be done. It is checked that all the negative plates are insulated from positive plates. To save Material & Labour cost it is better to check before Intercell welding also and after drop in container.



Function of Intercell Welding Machine:

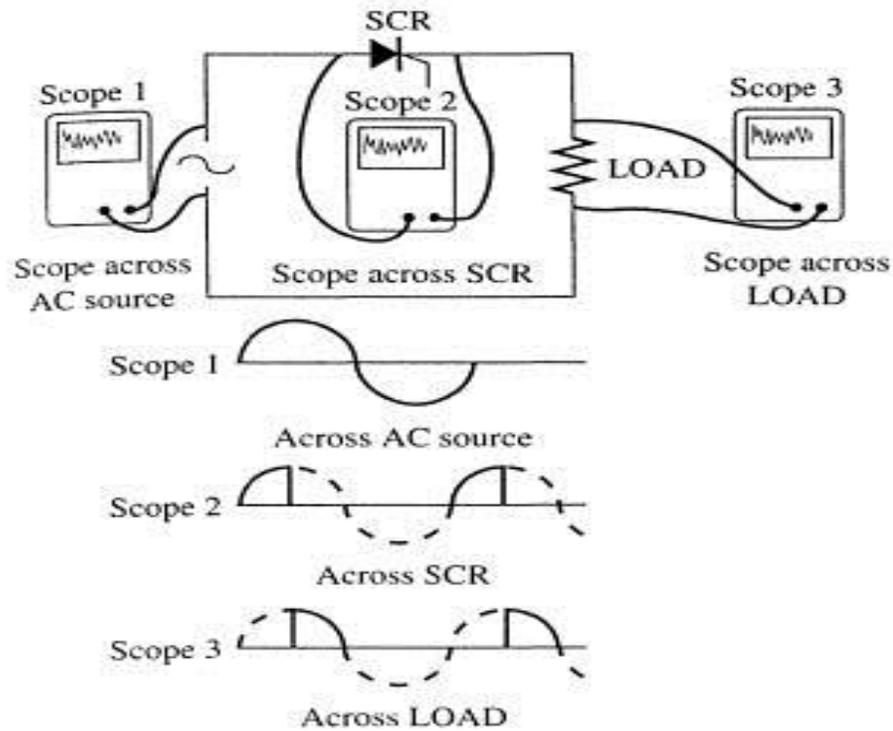
This machine welds L connectors through the partition. Basic function of this machine is to compress L connectors to form a dimple on both the connectors & make these dimples touch each other through the hole of partition.



Once these connectors touch each other a set amount of current at given amplitude (Voltage) is passed through these to melt & then current is stopped so molten lead is cooled to fill the hole which makes both the connectors to form a single identity.

We can take one example to demonstrate this operation in our older form of melting & connecting pole connectors, Current amplitude is taken as Regulator setting of brazing torch & current flow time is equivalent to holding time of torch flame to connector. This can be achieved with the help

of Thyristors which are fired for set period & set amplitude.



These settings are very accurate for individual connections. This can be set according to requirement depending upon size of Battery and lead Ductability. Total power required

which is multiplication of current & time, but at the same time both are not supplement to each other. Be cautious about Dry welding, this will be happen when current flow is lesser and lead is not melted properly. So, set it very precisely. Weld time & Current will vary depending on quality of lead, incoming voltage, force set by gap adjustment, Line air pressure. If lead is not tested properly then lead will have different properties in different Bars. This is also important when L connectors are casted, operator has to be very careful that he has to take lead not the dross floating on top of pot. Once welding is done battery is rechecked for flashing with the help of short circuit tester & continuity tester will check that all the connections are welded. Now Cells are connected which makes it pack of cells.



Function of Stress Testing Machine: After Welding/Connecting cells through the partition, Operator has to ascertain whether job is done properly or not. Operator checks every weld by Stress Testing Machine.



Function of Heat Sealing Machine: This machine

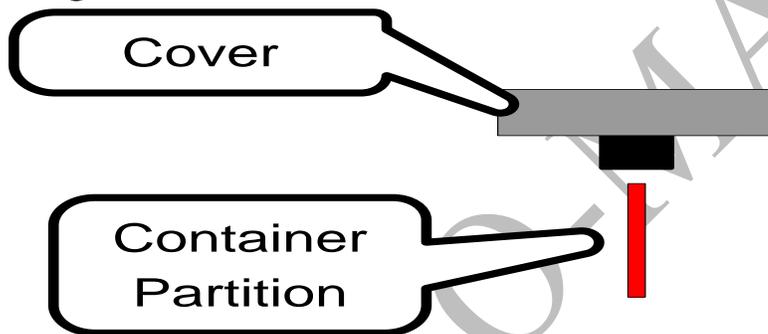


seals Lid with container.

Machine melts lid & container simultaneously & presses to seal together and form a single identity so acid does not leak out. This saves Labour cost and cost of adhesive material. In turn it reduces inventory cost which will be inherited when battery is holded for drying period and labour is involved in drying process.

We already know that cover is having more material to melt than container so accordingly time and temperature required for both are not equal. Best sealing is done once LIP JOINT is made as shown in following diagrams.

Stage No.1



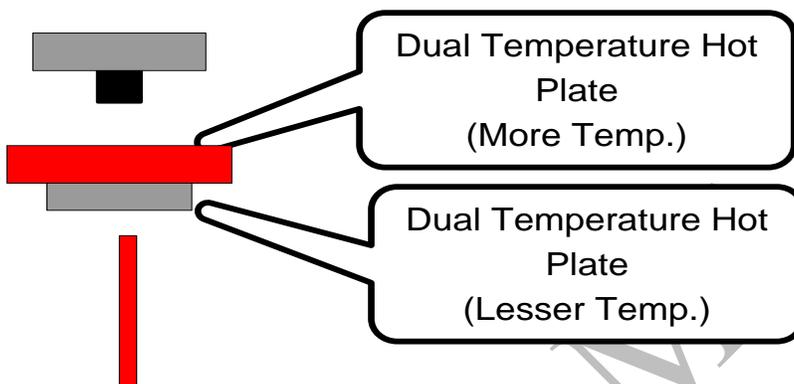
If this is not done, it will result in leakage. Best Heat Sealing is done in homogeneous material. If materials are different for cover & container then also it will leak at later stage.

How exactly it all functions this follows: Cover from battery is picked up by the top fixture either by vacuum or by hooks.

Vacuum cups are not preferred due to its recurring cost involved and at the same time vacuum pump will consume energy (Power). Life of vacuum Pump is also limited. So, Vacuum system is very old technology. Of course, This system can be used in one fixture to house different type of covers at the expense of accuracy.

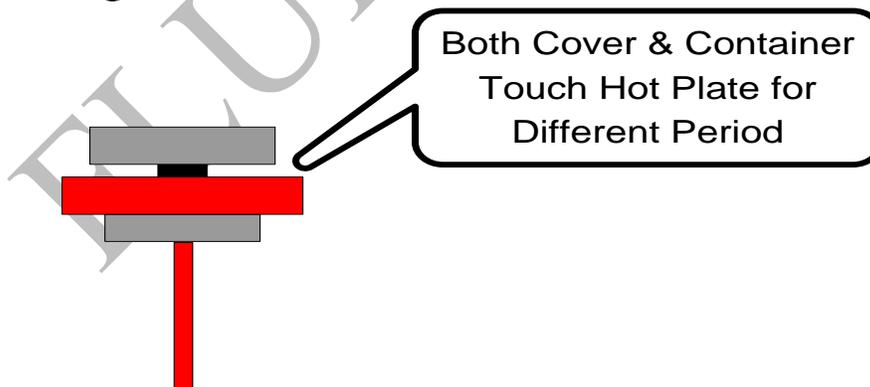
In Hook system we have to have different fixtures for different type & size of covers so it becomes more expensive to invest but in return we get more accuracy. Life of this system is equivalent to the machine. No extra expenditure on power to operate Vacuum Pump & its maintenance.

Stage No.2



Once cover is picked up Hot Plate comes forward. Top Platen moves downwards to touch with heated platen & make heating platen to touch container.

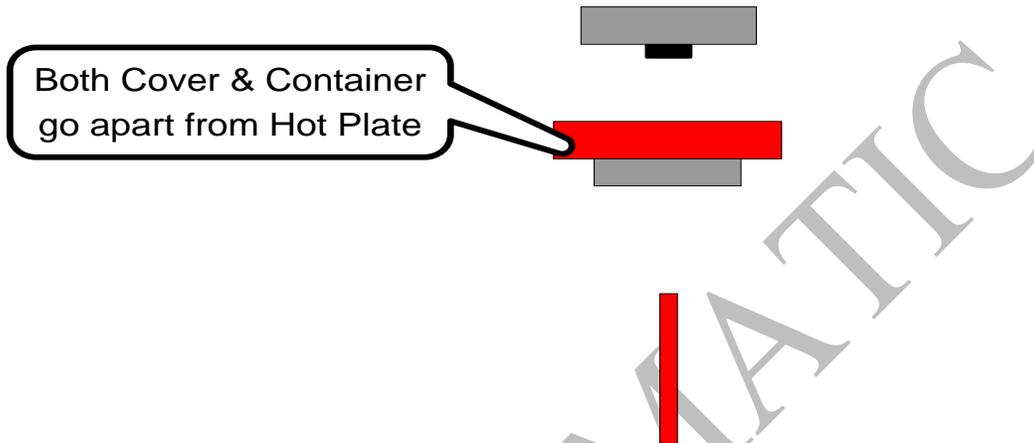
Stage No.3



Temperature has to set as per container manufacturer. Set point of Temperature will depend on the material and grade

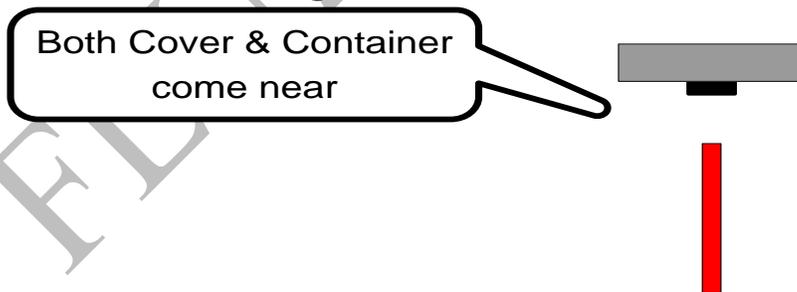
of plastic of container and its cover. It varies manufacturer to manufacturer. Once temp is attained, wait for another fifteen minutes for equalizing temp to full hot plate.

Stage No.4

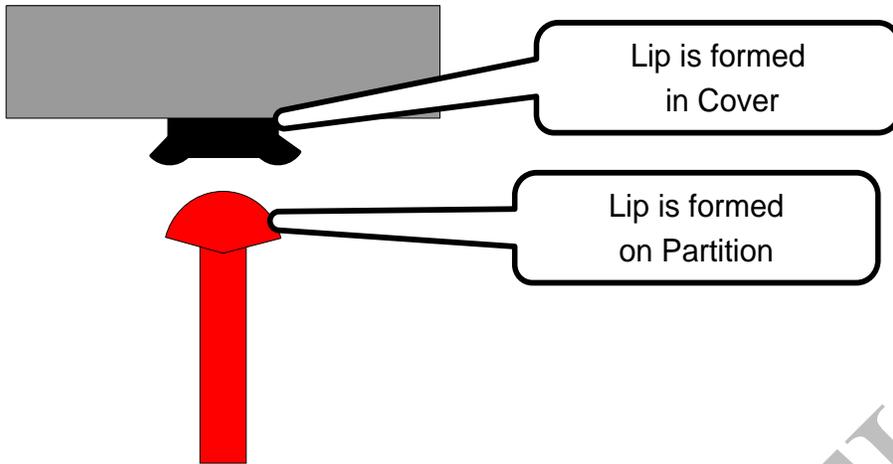


Once both are heated to certain temperature where plastic is not melts away but it remain there then these are operated to apart automatically. Heated platen will retract to its home position. Cover will be pressed against container in two cycles which are so fast that both the cycles can be not noticed with out high speed videography. This can be seen in drawing.

Stage No.5

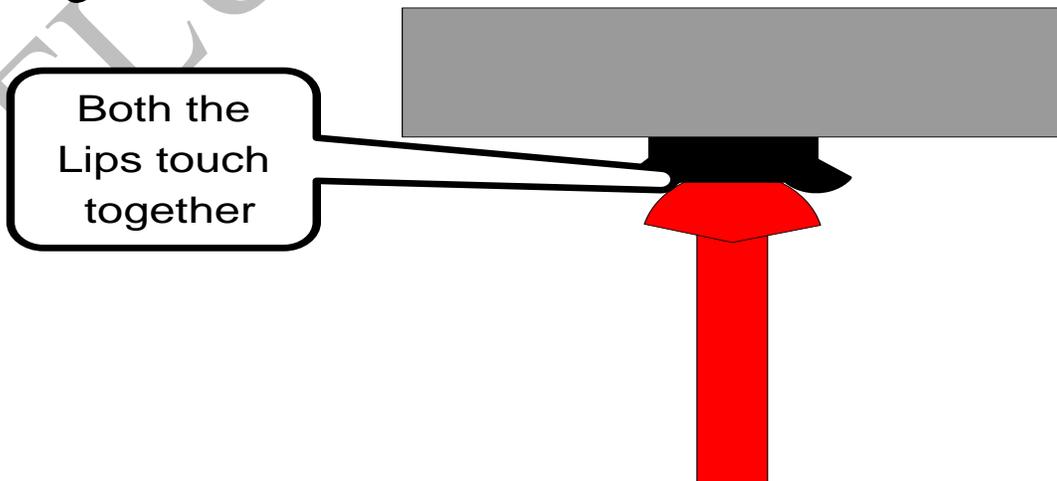


Stage No.6

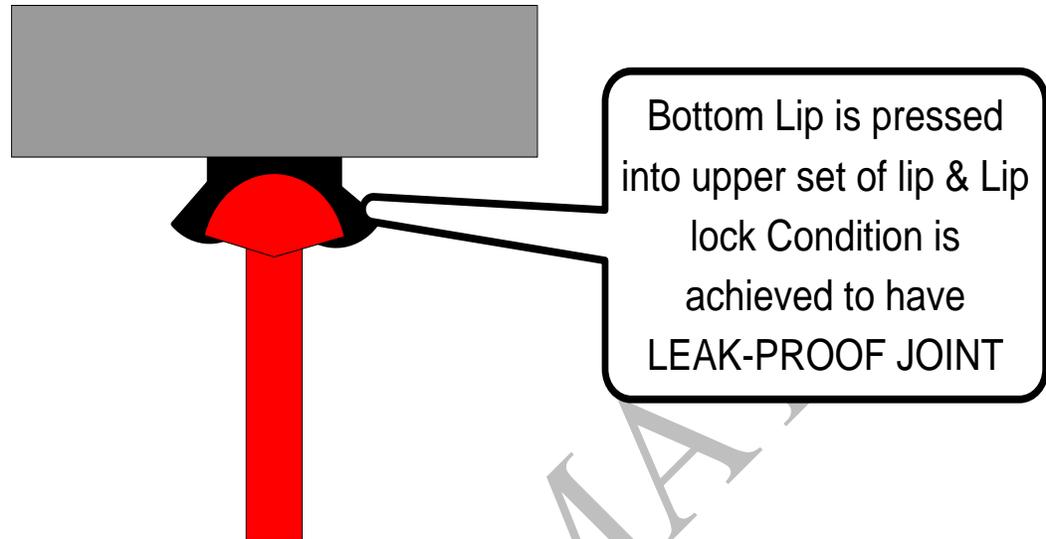


1. In first step, cover & container touches each other & then hard back of partition forces to insert itself into cover molted plastic under sealing force.

Stage No.7



Stage No.8



2. If force is less then also it will leak at low air pressure, when tested. If traveling (retracting) time is more, machine will not give jerk it will retract smoothly but by the time oxidation layer will be formed on molten plastic which will not allow to seal properly. So make sure oxidation layer is avoided to get best results. After sealing is done, Pole burning is done. In Pole burning pole post material should not be over heated otherwise it will be loose or vent will be created in between Post & PP Cover.

Few steps to be taken into consideration for best results:

1. Every time Fixture is replaced, make sure these are aligned in line center to center.
2. Proper Heat Control is required for proper Sealing. Heating Temp is the melting temp of particular plastics or it can be attained by hit & trail, Time for melting Plastics. These are interrelated but can't be taken as replacement for each other i.e. you increase time and reduce heat control or vice versa.

- 3. Proper Setting of these parameters will give best result.**
- 4. H for heat control.**
- 5. M for MELTING to be adjusted by ADJUSTERS mounted on outside Hot Plate for container & ADJUSTERS mounted on outside stoppers of COVER fixture for to increase/reduce MELTING height for CONTAINER & COVER RESPECTIVELY.**
- 6. T for heating time.**
- 7. Heat control will vary according to INCOMING VOLTAGE, QUALITY OF PLASTICS.**
- 8. Poles of cells should not be tight in the poles post of cover, these should have rubber washers to protect dropping of Lead while brazing pole.**

Air Leakage Testing:

When Sealing is done then we have to check if there is leakage in the sealing or welding connection or in pole post brazing. This can be done with the help of Air leakage Testing Machine.

This system functions on the principle to pressurize cell at certain air/inert gas pressure and this pressure is holded for certain period, if drops below required pressure setting then it is made certain that this cell is leak. This can be done by individual cell one by one or alternative cell i.e. cell no. 1,3,5 then 2,4,6. Rate of Pressure drop also determine extant of leakage.

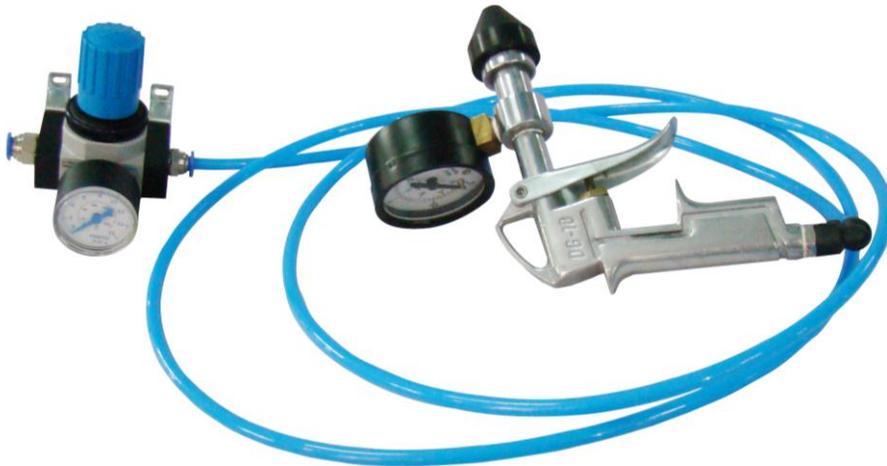
There are Three types of air leakage systems available mainly:

- 1. Manometer**
- 2. *Air Tester hand held***
- 3. *Air Leakage Testing Machine***

Manometer is very old technology & this can not be used for fast operation.

2. Air Tester hand held

- 1. Air Tester is used for small production capacity. This device is manually hand held and batteries are placed in line to get best results. Individual cells are checked by allowing air pressure to enter cell through venting of cell and stopping air pressure then holding the air pressure at venting of cell. If pressure is dropped below set value this is viewed in pressure gauge, Air Tester is held for certain period if it drops more than required pressure then there may be air leakage due to following reason.**



- a. Leakage in cover to container sealing in out side edge, this has to be ascertain by hand or soap water bubbles then sealing fixture or sealing machine has to be checked.**
- b. There may leakage in partition sealing to cover, this has to be ascertain by plugging of vent of adjacent cells then also sealing fixture or sealing machine has to be checked or partition may be twisted.**
- c. Air Tester may not be held properly either it is inclined or sealing washer be deteriorated.**



d. There may be leakage cell to cell leakage but not from sealing, it can be from welded L connection at partition.

3. Air Leakage Testing Machine:

This machine is used to perform air leakage testing automatically. In this machine, Battery is placed below the fixture, once cycle is initiated by a any form of electrical action either touching a limit switch or crossing a beam or by pressing a push button. In succession steps are performed, this operation initiate leakage fixture to close all the vents, system pressurizes 1, 3 & 5 cells to set pressure, & this pressure is holed for pre set period, pressure is switched off and monitored for drop in pressure by way of pressure switches if drops below set pressure respective pressure switch initiates fault signal by way of alarm or indication. If this section is found with out leakage (pressure does not

drop) then air pressure is released from 1, 3 & 5 cells and 2, 4 & 6 cells are pressurize and the same sequence follows.



In this automatic system so many discrepancies are avoided. In one go only, all above test are checked by viewing analogue meters.

Coding of Batteries: This will mark every battery made. If there is failure then responsibility can be marked to person who was responsible for failure of Battery.



Conveyors: This will make Battery movements easy and with only pushing efforts.



So Plant looks like this:

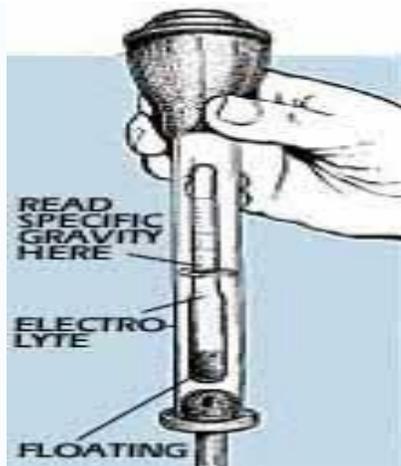


Servicing of Battery:

The battery should be cleaned regularly with Baking soda solution. Connection should be cleaned & tighten. Otherwise these connections will have more resistance which will heat connection in turn heated up.

- Low electrolyte level - battery plates exposed to air will immediately sulfate. Battery should be regularly top up with distilled water but not more than maximum level otherwise electrolyte will ooze out from vent plug. Connection should be coated with high temperature grease or Vaseline.

The hydrometer measures the amount of sulfuric acid in the electrolyte. A low reading means that sulfate is stuck to the battery plates. Upon recharge of the battery, the sulfate returns to the electrolyte. A proper battery hydrometer can detect an undercharged battery, as well as it will pinpoint a single bad cell.



- **The open circuit voltage, measured when the engine is off. It can be approximately related to the charge of the battery:**

Open Circuit Voltage	Specific Gravity	~ State-of-charge
12.65 V	1.265	100 %
12.45 V	1.225	75 %
12.24 V	1.190	50 %
12.06 V	1.155	25 %
11.89 V	1.120	0 %

The following is common for lead-acid batteries:

- Quiescent (open-circuit) voltage at full charge: 12.6 V
- Unloading-end: 11.8 V
- Charge with 13.2-14.4 V
- Gassing voltage: 14.4 V
- Continuous-preservation charge with max. 13.2 V
- After full charge the terminal voltage will drop quickly to 13.2 V and then slowly to 12.6 V.

The energy to weight ratio, or specific energy, is in the range of 108 kJ/kg (30 W·h/kg).

HOW MAINTENANCE- FREE BATTERIES WORKS

Like many things in life, the term “maintenance-free” is only partially true. Lead-acid batteries normally consume some of the water in their dilute sulfuric acid electrolyte during a normal charge-discharge cycle. It actually electrolyzes into hydrogen and oxygen and escapes as gas. So adding water periodically is necessary to keep the plates flooded. Maintenance-free batteries use a calcium alloy of lead instead of an antimony alloy, which reduces the amount of electrolysis. In addition, the amount of free-standing electrolyte above the plates is designed to be much higher in a new maintenance-free battery. This means that there’s enough electrolyte to keep the plates covered even after a few seasons of normal use. So, during the battery’s normal service life there should be no need to add water. Any abnormal electrical system condition or high ambient temperatures may boil off more than the normal amount of

water, however. Adding water may extend the service life of these supposedly maintenance-free batteries.

Think before buying Heat Sealing Plant

Main Characteristics of a good Heat Sealing Plant:-

It should serve existing customer and at the same time, earn market reputation for unbeatable Product Quality, buy a machine to produce Fault Proof Battery at minimum Owning & Operating Cost to earn profit in present competitive market.

1. Quality of Produced Battery

- ✓ **Produced Battery should not inherit any defect due to any inefficiency of the plant.**
- ✓ **It should weld cells through the partition rather connect these. Lead inter connections should be melted & forged together into single entity.**
- ✓ **It should seal Lid & container into LIP JOINT rather stick to each other.**

2. Safety

- ✓ **Machine should be designed in such a way that in spite of operators' mistake then also machine should function properly.**
- ✓ **Safety also depends on quality of parts used, Lower standard or so called Imported parts or duplicates of multinational companies leads to break down. Festo company Parts are replaced with Janatics company parts.**
- ✓ **Continues use of such faulty parts are also hazardous to labour force.**

- ✓ Our existing work force should be trained to have better acutance of machine which would result in better safety.

3. Main Structure or Body

- It should be Rugged, sturdy, heavy- duty & above all well built, so machine should be last for ten to fifteen years at least.
- It should be accessible from all sides for easy maintenance.
- Loading & unloading of battery should be labour friendly. So work force will feel lesser fatigue. Fatigue also invites break down may be due to human error.
- Labour involvement should be minimum, so operative cost of plant is reduced.
- Machine should not be cosmetically beautified because you have to make better performing battery for an extended period of time to get the maximum return on your hard-earned investment.

4. Spares Availability

- Spares should be available in local market, so dependency on the manufacture of plant is reduced.
- Break Down Time is reduced,
- Own personnel should be trained for maintenance.
- Parts used bought from multinational companies should be avoided because they may not provide spares & services in time, Many components could not be repaired hence you may forced to change full set in stead of few parts.
- Spares should be available with the manufacturer at reasonable price. If parts are not available readily then Plant manufacturer will black mail for spares cost and services.

5. Maintenance

- Machine supplier should give Preventive Maintenance chart & schedules, to follow it in time.
- Accessibility to parts should be easy for checking.

- **Machine Manual should describe about operating as well maintenance of machine. Replacement of parts should be very easy if required.**

6. Costing

- **Electricity consumption should be Minimum because rate per unit of electricity is rising day by day.**
- **Air Consumption should be Minimum because compressing Air also consumes electricity.**
- **Labour cost for the each battery produced should be Minimum, Machine should be designed in such a way that manual handling reduced to minimum.**
- **During process, operator should get maximum out put with minimum efforts, e.g. if jaw of welding machine is not self centering or both the jaws are not operating, then operator has to operate push button at least five times which consumes time of the operator. Every minute of operator is paid by the Battery Manufacturer or owner of plant. In the same period more production can be done if machine is automatic which welds one connection by one press of button. The cost of operation will be reduced because same operator can produce more Batteries with the one plant with minimum labour.**
- **Time of labour is wasted which can be utilized for other jobs or more production can be done in the same time.**
- **Maintenance cost for the year should be reduced to bare minimum.**
- **Hence cost of manufacturing has to be reduced in the interest of business.**

7. From where to buy

- **It should be ascertained that reputation of the manufacturer of plant is not tainted in any form.**
- **Company should have their own R & D Facilities.**
- **Company should have their own manufacturing facilities. Out sourced type of machine manufacturer could vanish any time leaving you to feel the heat.**

As you already know that FLUID-O-MATIC has achieved many firsts in Battery Industry. FLUID-O-MATIC has many qualities making it optimum performing machines. Our valuable customers satisfaction is the main driving force to attain further success. Only Your good self have only made us No. 1 Company in battery machine manufacturing in India. Main features of our machines are as follows:

○ Quality of Produced Battery

- **We designed First Successful & commercially viable Heat Sealing Plant in India in 1996. Our machines are being used by renowned Battery manufacturers as mentioned in (emerged from) the list of our customers. We make zero maintenance machine to produces zero defect Batteries.**
- **Our Intercell Welding Machines have Pneumatic cylinder which creates more force to forge cell connection into single entity.**
- **Our Thyristor Control is microprocessor (COMPUTER) based not EPROM based controller(a old Technology). In Our controller we use specific low temperature band as Selenium, Calcium, Antimony, Tin, Lead are main metals used in battery making, melts at Low Temperature. So controller which is designed for low temperature band will be more precise for welding than a general purpose controller which is used for lead as well as Iron, Stainless Steel.**
- **Even Parts procurement for replacement will take long period and the buyer of these machines is bound to suffer a heavy loss in terms of production, as well procurement cost. They are also in habit of changing their model time to time. So it may be very difficult to get same part for same type of machine after a period of time. In India, we use our machines for a long period. These imported machines or parts also does not have protection against Voltage Fluctuation, because voltage fluctuation is not found in other countries, where as in India it is part of day to day life**

- However, FLUID-O-MATIC Plants & machinery have flexibility to adopt any kind of matching parts or controllers which can be fitted as per customer choice.
- Our Heat Sealing Machine creates best LIP JOINT so it does not leak. Our machine melt Cover first, which has more material to be melted then container so we use differential temperature in Hot Plate to get dual temp. for melting Container & cover. We use different melting time for both.
- THIS RESULTS IN ZERO DEFECT BATTERY.
- WE ARE LEADER IN INOVATION AS WELL INSTALLED MAXIMUM NO. OF PLANTS EVEN MORE THAN THE TOTAL NO. OF PLANTS SOLD BY ALL OTHER MANUFACTURERS PUT TOGETHER ALL OVER INDIA.
- ALL MAJOR BATTERY MANUFACTURERS HAVE SHOWN FULL CONFIDENCE IN OUR PLANTS BY MANUFACTURING THEIR REPUTED BRAND BATTERIES.
 - Safety
 - Our machines are self designed which are best for our working environment; it results in zero percent rejection rate on shop floor.
 - We use parts which are approved by our quality control department & which are time tested.
 - We train your existing work force to get updated for new technology.
 - Main Structure or Body
 - Our main structure is Very heavy duty, sturdy above all it is time tested to last for very long period.
 - It is accessible from all sides for easy maintenance.
 - Loading & unloading of battery is labour friendly due to conveyor on welding machine as well as on sealing machine.
 - In inter partition welding machine welding head rotates so operator need not to rotate battery.
 - Heat sealing machine is side feeding & side out which avoids pushing in & pushing out of battery into machine. These major design & development reduces fatigue of operator. This also reduces labour involvement.

- **Once Battery manufacturing time is reduced this automatically reduces labour & Electricity cost. Over all operating cost is reduced but the production quantum is increased.**

- **Spares Availability**

- **Though FLUID-O-MATIC Plants & machinery would hardly require spares, these are readily available in local market, so dependency on the manufacturer of plant is reduced. This also reduces Break Down Time.**
- **We train layman to operate & maintain plant. They become fully capable to look after maintenance of plant.**
- **We use maximum of standard Indian Parts as & when required.**

- **Maintenance**

- **Our machine manual is so illustrative that it covers all Preventive maintenance chart & maintenance schedules.**
- **Machine Manual describes about operating as well maintenance of machine. Replacement of parts is very easy if required.**
- **It with stands voltage fluctuation from 380V to 450V across two phases.**

- **Costing**

- **As operational process requires lesser time it reduces Electricity & Air consumption. In turn, Labour cost per battery produced is also reduced.**
- **In our machine jaw movement is auto centering, this reduces manual operation and tearing load on partition of container, if you press push button once , this results in one connection welding in turn reduces manual labour & chances of failure to minimum.**
- **Time of labour is not wasted which can be utilized for other jobs or more production can be done in the same time.**
- **Annual Maintenance cost is reduced to bare minimum.**
- **Hence cost of manufacturing is drastically reduced.**

- **From where to buy**

- **FLUID-O-MATIC manufacturing Heat Sealing Plant for last Fifteen years continuously.**

- **FLUID-O-MATIC has its own R & D and manufacturing facilities**

Your valuable suggestions are welcomed in respect of improving our design, production & supplies because no one is perfect in this world, there are always chances of improvement.

Main Specialies of our machines :

Inter Partition Welding Machine: This machine has three Major Specialties, as follows:

Double Arms Movement - For forging, we have designed better Forging Head. This head has double arms movement and self-centering arms. It will exactly match the center of partition. Hence our design is far ahead of other machine available nationally or internationally.

Transformer - Current source of Machine is state of art heavy transformer of 65 KVA rating. We use best quality of copper, which dissipates lesser heat. So machine does not waste Costly electricity in the form of heat. Only Air-cooling is sufficient. If water-cooling is used it will increase running load of pump and wastewater, which is also becoming precious and harming to environment so our machine is environment friendly. At the same time reducing running cost of machine.

Welding Current Controller - It is designed indigenously as per need of our operator. Operator can set and see all parameters such as Squeeze Time, Weld Time, Cooling Time and required Current as per battery size, which can be programmed respectively for battery size and recall whenever that size of battery is made. Operator can also see which operating time has been lapsed which other controllers do not provide. He can also communicate if any of the problems so he could be guided directly without physically present on the machine. If any type of problem arises it can be replaced/ repaired at nominal cost even after warrantee period.

Terms & Conditions :

- 1. Prices are ex-works NOIDA.**
- 2. C.S.T. 4 % will be charged extra with Form 'C', U.P.T.T. 2.5% with form 3 B or as applicable.**
- 3. Delivery Period: 30 Days (From the date of advance & order received.)**
- 4. Payment: 50% in advance with order & Balance at the time of delivery before dispatch after satisfaction of operator & Party.**

5. **Erection charges: 10% of total cost of plant with the lodging & boarding to suitable standard. (If insisted by the Party) otherwise operator will be trained to erect the machine. Your operator will be trained for the same.**
6. **Training will be provided to the operator and its assistant for one week to operate the machines. Lodging & Boarding will be provided from our side in our factory.**

FLUID-O-MATIC