

Bio-Medical Waste Management







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Bio-Medical Waste definition

- Any waste which is generated during
 - Diagnosis
 - Treatment
 - Immunization
- Hospital or Laboratory has to define policy for segregate and disposal of General waste.

Source of Biomedical Waste

- Clinics
- Hospitals
- Medical laboratories
- Blood banks
- Mortuaries
- Medical research & training centers
- Animal houses etc.
- Such a waste can also be generated at home if health care is being provided there to a patient (e.g. injection, dressing material etc.)

Cat.	Type of Bag/ Container used	TYPE OF WASTE	Treatment /Disposal options
Yellow 	non-chlorinated plastic bags Separate collection system leading to effluent treatment system ←	a) Human Anatomical Waste b) Animal Anatomical Waste c) Soiled Waste d) Expired or Discarded Medicines e) Chemical Waste f) Micro, Bio-t and other clinical lab waste g) Chemical Liquid Waste	Incineration or Plasma Pyrolysis or deep burial*
Red 	non-chlorinated plastic bags or containers	Contaminated Waste (Recyclable) tubing, bottles, intravenous tubes and sets, catheters, urine bags, syringes (without needles) and gloves.	Auto/ Micro/Hydro and then sent for recycling. not be sent to landfill
White 	(Translucent) Puncture, Leak, tamper proof containers	Waste sharps including Metals	Auto or Dry Heat Sterilization followed by shredding or mutilation or encapsulation
Blue 	Cardboard boxes with blue colored marking	Glassware	Disinfection or auto/ Micro/hydro and then sent for recycling.

Chemical Reagent Discarded as Per MSDS

- What is MSDS (Material Safety Data Sheet)?
- MSDS Contain
 - Composition
 - Stability & Reaction
 - Transport , Handling & Storage information
 - Safety measures & Personal Protection
 - Safe disposal

For Example

Creatinine test reagent (R1 – NaOH & R2 Picric acid):

Disposal of NaOH reagent

- Neutralize it with dilute acetic acid.

Which colour bag is for chemical discard ?

How to handle mercury spillage?

- Wear rubber or latex gloves.
- Broken glass piece
 - Big glass with rubber brush & plastic supadi.
 - Small glass pick with forceps.
- Put in paper towel
- Fold it & place in zip locking bag.(label it)
- Use a rubber brush and Eye dropper to gather mercury beads.
- Squeeze mercury onto damp paper.
- Place it in a zip locking bag.(label it)
- Gloves used during process also sent with bag.



Handling of Needle and Syringe

- Do not recap the needle to avoid needle prick injury.
- Dispose needle into white puncture proof container.
- ~~Container should be filled with 1% Hypochloride solution.~~
- It should be leak proof and tightly packed.
- When container is **2/3** filled with needle ,change it with new container.
- It should be change at every 48 hours.





How to make 1% HOCl solution

$$N1V1 = N2V2$$

$$5\% V1 = 1\% \times 1000 \text{ ml}$$

$$V1 = \frac{1\% \times 1000}{5\%}$$

$$= 200 \text{ ml}$$

$$= 200 \text{ ml}$$

Liquid Chemical Waste

- Waste Tank of Instrument generate liquid Biomedical Waste
 - Fully Automated Haematology
 - Fully Automated Biochemistry Analyzer
 - Fully Automated Immunoanalyzer Analyzer
- Should be pre-treated with 1% hypochloride for 30 minutes

• Example

Haematology Instrument generated 5 litre (5000 ml) waste

Formula to Prepare 1% Hypochloride from 5% Hypochloride

4 part water (waste) = 1 part hypochloride

5000 ml waste = ??????????????

Hypochloride Volume = $1 * 5000 / 4 = 1250 \text{ ml} = 1.25 \text{ Litre}$

1250 ml , 5% hypochloride + 5 litre (5000 ml) waste

and

keep it for 30 minutes

Prepare 0.5 mmol/L HCL from Conc.HCL (Use Below Detail)

- **Specific Gr-1.018**
- **Conc.-38%**
- **Volume -100ml**

Category	Waste category (type)
Category No. 1	Human Anatomical Waste
Category No. 2	Animal waste
Category No. 3	Microbiology & Biotechnology Waste & their laboratory waste
Category No. 4	Waste Sharps

Category	Waste category (type)
Category No. 5	Discarded Medicine & Cytotoxic drugs
Category No. 6	Soiled waste
Category No. 7	Infectious solid waste (such as catheters, hand gloves, tubings, saline bottles etc.)
Category No. 8	Chemical Waste (disinfection, insecticides etc.)

Radioactive waste

Source

- Drugs (cancerous drugs)
- Dyes (Iodine & Barrium)
- Diagnostic kits (RIA)
- Excreta from patient treated with radionuclide substance.
- This type of waste has a **low level radioactivity**.

PACKAGING

1.WHITE I-Almost no radiation

max. 0.5 mrem/hr on package surface.

2.Yellow II-low level radiation

max.50 mrem/hr on package surface.

3.Yellow III-high level radiation

max.200 mrem/hr on packag surface.

Disposal management

- For disposal of radioactive waste in hospital **yellow II** type bag is used.
- Low level radioactive waste can be sent for landfill.
- Low level waste can be stored in depth sea until the radioactivity fallen to safe level.



Category I-WHITE



Category II-YELLOW



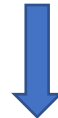
Category III-YELLOW

Steps for waste management

**Segregation
(As per BMW Guideline)**



**Collection and storage
+
With Bio-hazard Symbol
(Leak Proof & Not accessible to public)**



**Transportation
(As per BMW Guideline)**



Treatment and disposal (As per BMW Guideline)

TRANSPORTATION AND STORAGE

- Temporary stored at the central storage area of the hospital
- Than sent in bulk to the site of final disposal once or twice a day depending upon the quantity of waste.
- **Point to Care During transportation**
 - Every bag must have “ Bio Hazard Symbol”
 - Kept at Separate area (not accessible to unauthorized public)
 - Properly sealed and labeled.
 - Bags should not be filled completely
 - Bags can be picked up by the neck again
 - Hand should not be put under the bag.
 - At a time only one bag should be lifted.
 - Manual handling of waste bags should be minimized
 - **BMW shall not be kept stored for more than 48 hours**



TRANSPORT TO FINAL DISPOSAL SITE

- From health care establishment to the site of final disposal
In a closed motor vehicle (truck, tractor-trolley etc.)
- prevents spillage of waste on the way.
- Vehicles used for transport of BMW must have the **“Bio-Hazard” symbol**
- These vehicles should not be used for any other purpose.

Note: Label shall be non-washable & prominently visible.





Label for Transporting BMW bags

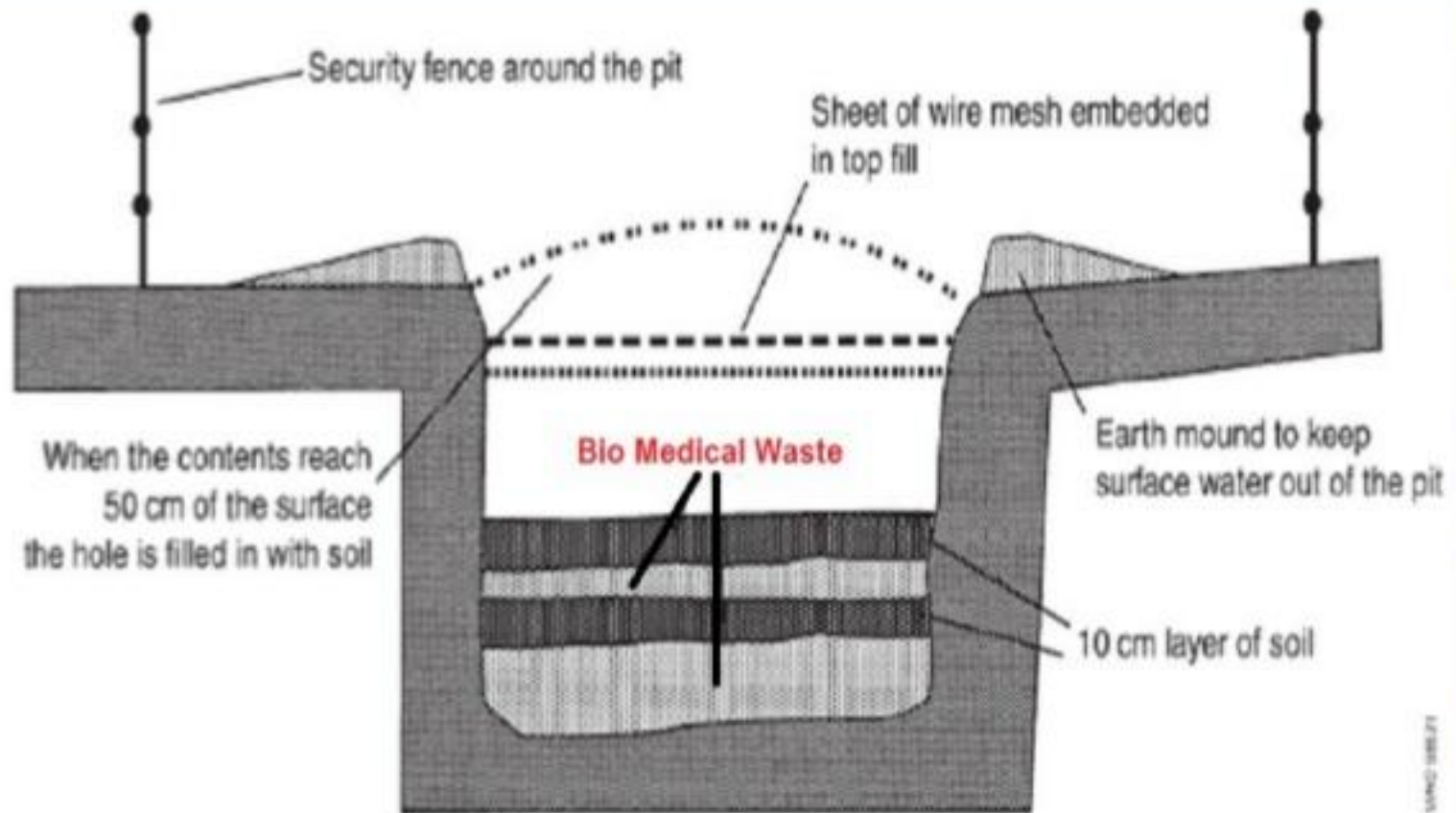
1. Date of Transport
2. Date of Waste generation
3. Waste category No
4. Waste quantity
5. Sender's Name & Address
6. Phone of Contact Person
7. In case of Emergency contact number of Sender:
8. Receiver's Name & Address
9. Phone number of Receiver

Final treatment(on site)

- ***Deep burial:***
 - Category 1 and 2 only
 - In cities having less than 5 lakh population & rural area.
 - In the deep burial ,pit depth is 2 meter.
 - Burial site secured with covers of wire mash.
 - After every burial in the same secured pit a layer of 10 cm. soil should be added.
 - There should be no well , river , lake close to the site.(300meter)

Schedule -V

DEEP BURIAL PIT for BMW



• ***Shredding:***

- Only after chemical treatment/autoclaving.
- The plastic (I.V. bottles, I.V. sets, syringes, catheters etc.), sharps (needles, blades, glass etc)
- Needle destroyers can be used for disposal of needles directly without chemical treatment.

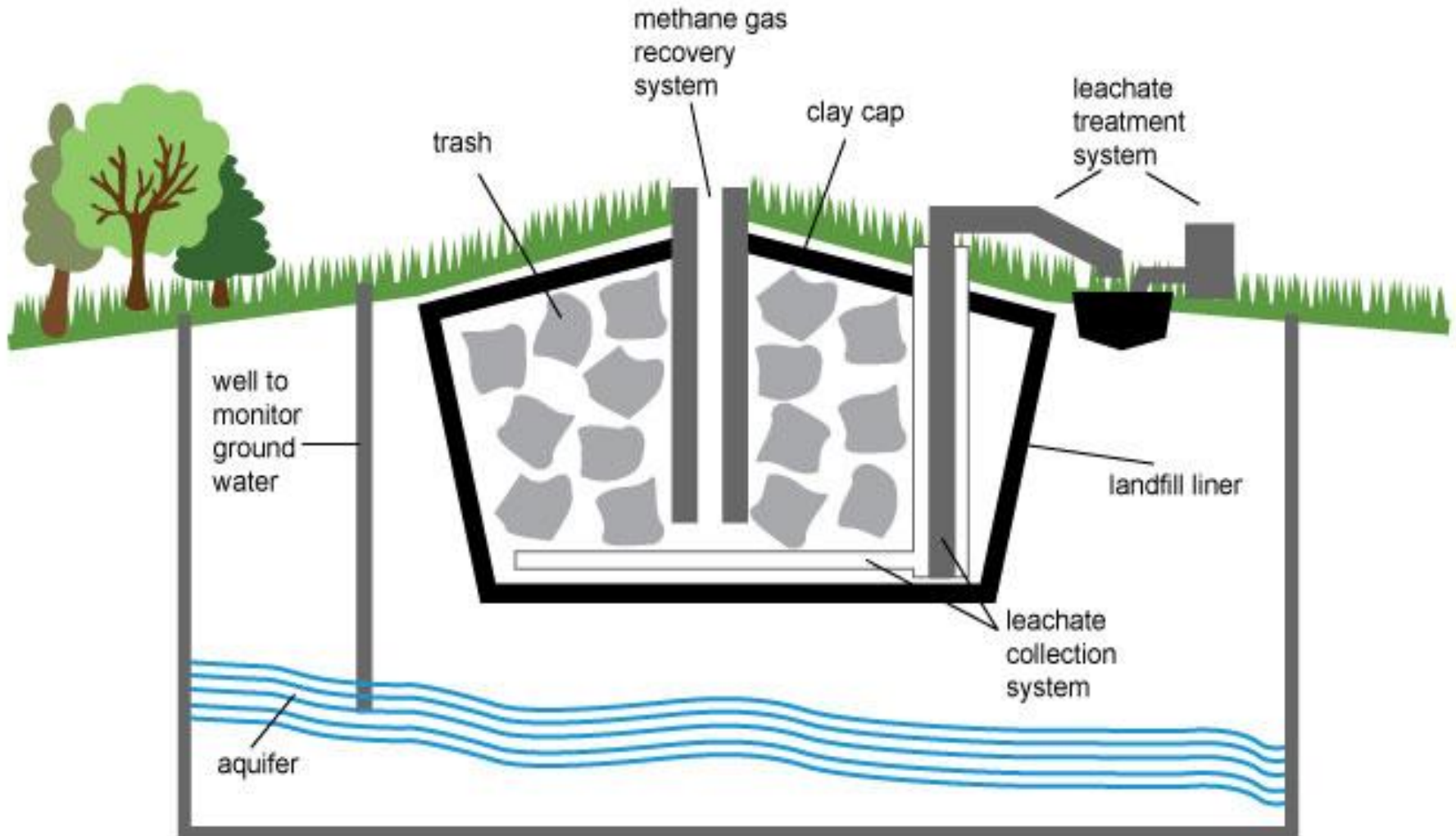
• ***Land disposal:***

- Pre - treatment is optional.
- ***Secured/Sanitary landfill***
- Incinerator ash, discarded medicines, cytotoxic substances and solid chemical waste .

Sanitary landfill Process

- Digging a large pit in ground.
- There must be at least 3 m gap between ground water and landfill.
- Site should be 250 meter away from river ,stream.
- Lined it with plastic layer (2-4 feet) or clay.
- For the collection of leachates plumbing of pipe at the bottom.

Modern landfill



Source: Adapted from National Energy Education Development Project (public domain)

Incineration

- Category 1, 2, 3, 5, and 6 can be incinerated.
- high temperature(110-850 C) dry oxidation process.
- Convert organic combustible waste to inorganic incombustible
- Generate Ash ,flue gas and heat.
- Used for the waste that can not be reused, recycled or disposed in landfill site.
- For this process certificate require from CPCB/State Pollution Control Board

Incinerator



Plasma Pyrolysis

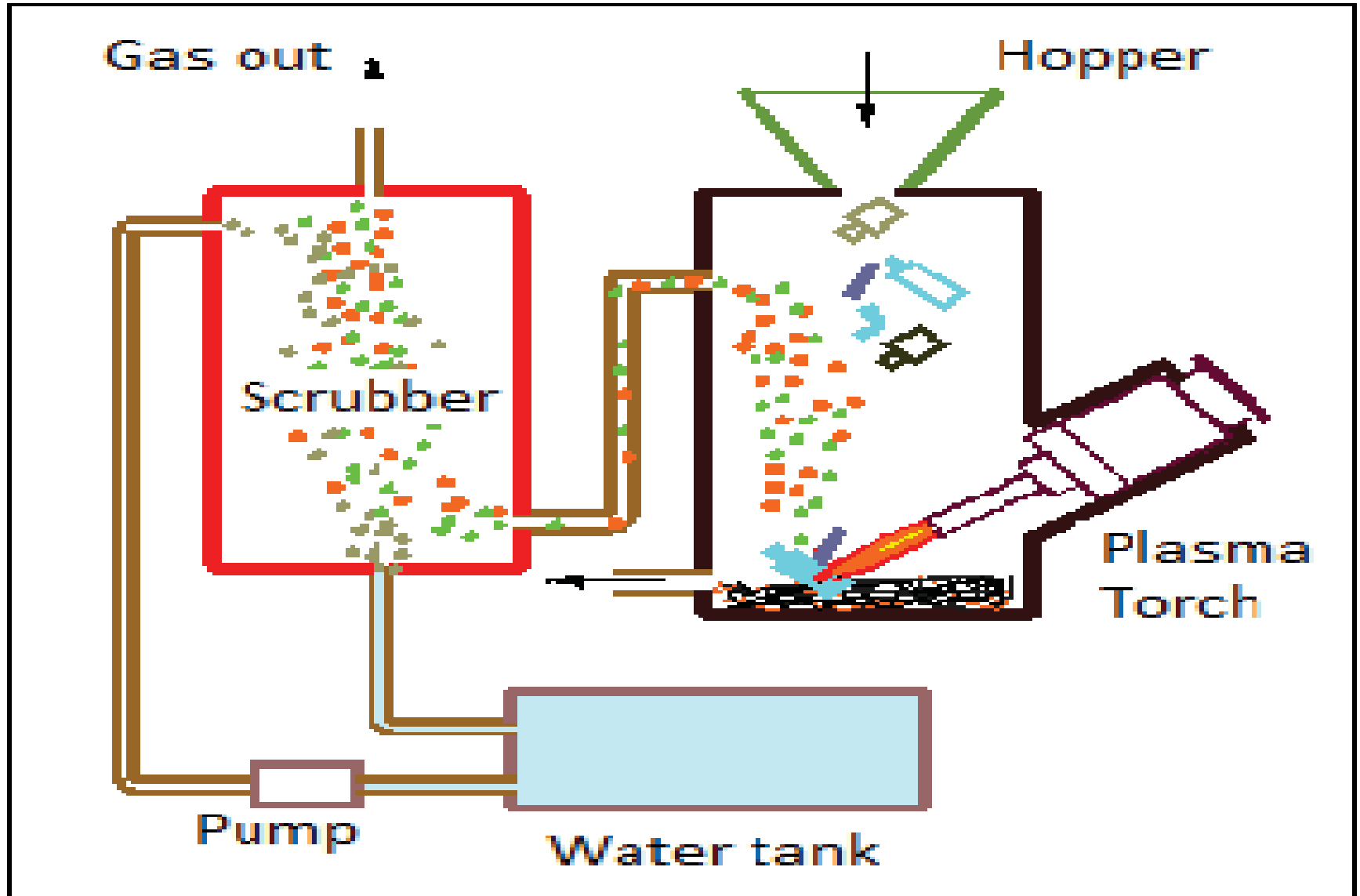
What is plasma ?

- Commonly 3 state liquid, solid & gas.
- Plasma is the fourth state of matter made of electric conductivity or electro-magnetic field.
- Every state changes due to HEAT
 - From Solid >>> Liquid >>> Gas >> Plasma
 - Plasma = (Ions + Atoms + Electrone)

Plasma Torch

- **Plasma torch**
 - **Instrument which generate plasma**
- Principle of Plasma Torch
 - Gas such as oxygen, nitrogen ,argon is forced through small orifice inside the torch.
 - An electrical current from external power supply is then introduced in that gas flow,
 - Which generate
 - heat of temp. up to 40000 F.
 - Electric conductivity
 - Electromagnetic field
 - This all three are consider as “Plasma”
 - This Plasma come out from small orifice of the torch
 - And through on object for welding , decontamination , cutting etc.

Plasma pyrolysis Principle



THANK YOU

