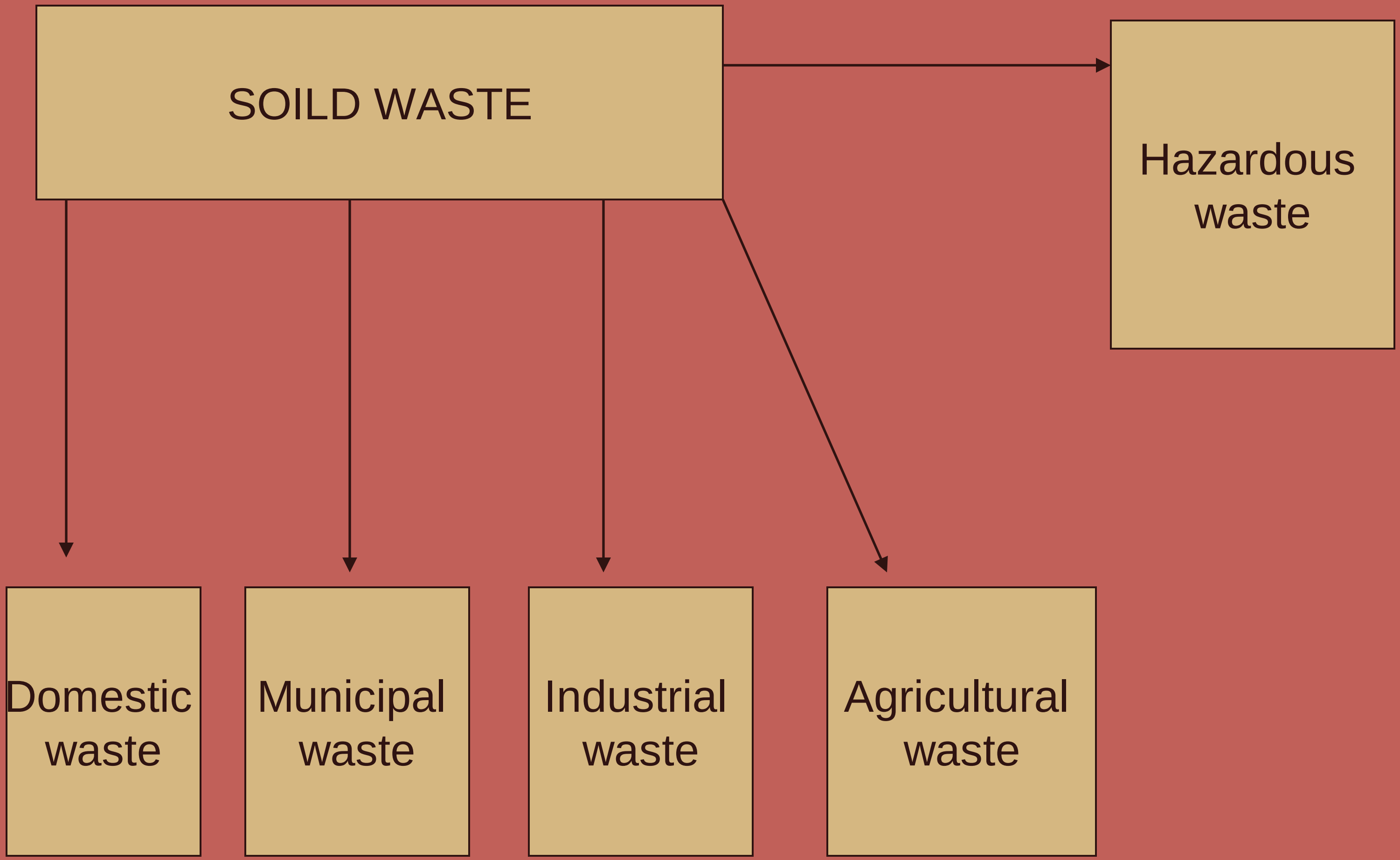
soil/solid waste analysis

- Anupama B.S
- SSA, CPCB, Bangaluru.

Soil and solid waste

- **Soil- complex physico - biological system containing water, mineral salts, nutrient and Dissolved oxygen**
- **Solid waste- Any unwanted or discarded material from residential, commercial, mining and agricultural activities that cause environmental problems may be termed as solid waste.**
- Solid waste means any garbage, refuse, sludge from a wastewater treatment plant, water supply treatment plant, or air pollution control facility and other discarded materials including solid, liquid, semi-solid, or contained gaseous material, resulting from industrial, commercial, mining and agricultural operations, and from community activities



SOILD WASTE

Hazardous waste

Domestic waste

Municipal waste

Industrial waste

Agricultural waste

Examples of solid wastes

- waste tires
- septage
- scrap metal
- latex paints
- furniture and toys
- domestic refuse (garbage)
- discarded appliances and vehicles
- uncontaminated used oil and anti-freeze
- empty aerosol cans, paint cans and compressed gas cylinders
- construction and demolition debris, asbestos

Hazardous Waste

- **Hazardous waste** is waste that poses substantial or potential threats to public health or the environment..
- They can be discarded commercial products, like cleaning fluids or pesticides, or the by-products of manufacturing processes. These wastes may be found in different physical states such as gaseous, liquids, or solidsIn the United States, the treatment, storage and disposal of hazardous waste is regulated under the Resource Conservation and Recovery Act (RCRA)

HW Characteristics

- Toxicity
- Reactivity
- Ignitability
- Corrosivity

Characteristics of HW

- **Ignitability** - Ignitable wastes can create fires under certain conditions, are spontaneously combustible, or have a flash point less than 60 °C (140 °F). Examples include waste oils and used solvents
- **Corrosivity** - Corrosive wastes are acids or bases (pH less than or equal to 2, or greater than or equal to 12.5) that are capable of corroding metal containers, such as storage tanks, drums, and barrels. Battery acid is an example

Cont

- **Reactivity** - Reactive wastes are unstable under "normal" conditions. They can cause explosions, toxic fumes, gases, or vapors when heated, compressed, or mixed with water. Examples include lithium-sulfur batteries and explosives

Hazardous waste

- Radioactive waste (nuclear power plants, lab, hospitals)
- Toxic substances (heavy metal sludge, pesticides, pharmaceuticals)
- Biological products (enzymes, antibiotics, pathological waste)
- Inflammable substances, corrosive material, explosive)

Sample receiving and registration

- Lab
- Sample registration, giving the date, coding(Lab code) and other relevent information furnished in the information sheet(sample register – imp permanent document os soil testing lab).

HW sampling criteria

- The physical and chemical characteristics of the soil system influence the transformation, retention, and movement of pollutants through the soil. Clay content, organic matter, content, texture, permeability, pH, Eh, and cation exchange capacity (CEC) will influence the rate of migration and form of the chemical found in leachate migrating from the waste.
- These factors must be considered by the investigator when designing a soil sampling effort for HW

- Oil-based paints
- Paints, inks and coatings with heavy metal pigments
- Fluorescent light bulbs and ballasts
- Degreasing solvents
- Chlorinated solvents
- Lead-acid vehicle batteries
- Pesticides
- Cleaning products
    - Vehicle fluids: spent antifreeze, engine oil, hydraulic oil, brake cleaners
    - Electronic wastes: computer monitors
    - Metal wastes: lead, mercury, copper, zinc

- Combined with site visits and interviews with local citizens,
- a good grasp of the situation can be gained by this preliminary background data collection.
- 4-I
- Libraries, museums, governmental agencies, public agencies, data bases, and researchers are
- all sources of information that can be accumulated prior to finalizing the study plan. Oftenlocal citizens can provide information that is not available in any of the normal researchchannels. The environmental scientist working on abandoned hazardous waste sites will findthat often the private citizen is one of the most useful resources of unpublished data. Theyhave often lived in the area and are familiar with the operation of the site and may evenprovide insight into the types of chemicals and the methods of disposal.The scientist workig in these cases must become a detective. Any piece of information that
- will help determine how and where the pollutants may migrate is useful in planning the soilsampling study. Each piece of information must be sifted, sorted, and evaluated in anattempt to determine how the soil system responds to such factors as flooding, movement, and use.

- There are two portions of the soil that are important to the environmental investigator. The
- surface layer (0-6 in) reflects the deposition of airborne pollutants, especially recently deposited pollutants and also pollutants that do not move downward because of attachment to soil particles. On the other hand, pollutants that have been deposited by liquid spills, by long-term deposition of water soluble materials, or by burial may be found at considerable depth.

If the TCLP extract contains any one of the TC constituents in an amount equal to or exceeding the concentrations specified in 40 CFR 261.24, the waste possesses the characteristic of toxicity and is a hazardous waste. If the TCLP extract contains constituents in an amount exceeding the concentrations specified in 40 CFR 268.40, the treatment standard for that waste has not been met, and further treatment is necessary prior to land disposal.

Sampling

Collection of representative samples from the fields

Materials required

Soil augers (screw type, post hole)

Stainless steel augers for micronutrient analysis

Soil tubes

Core sampler

Khurpi

Kassi or phawada (Spades)

Labels(outside and inside)(for wet soil use led pencil /permanent ink marker)

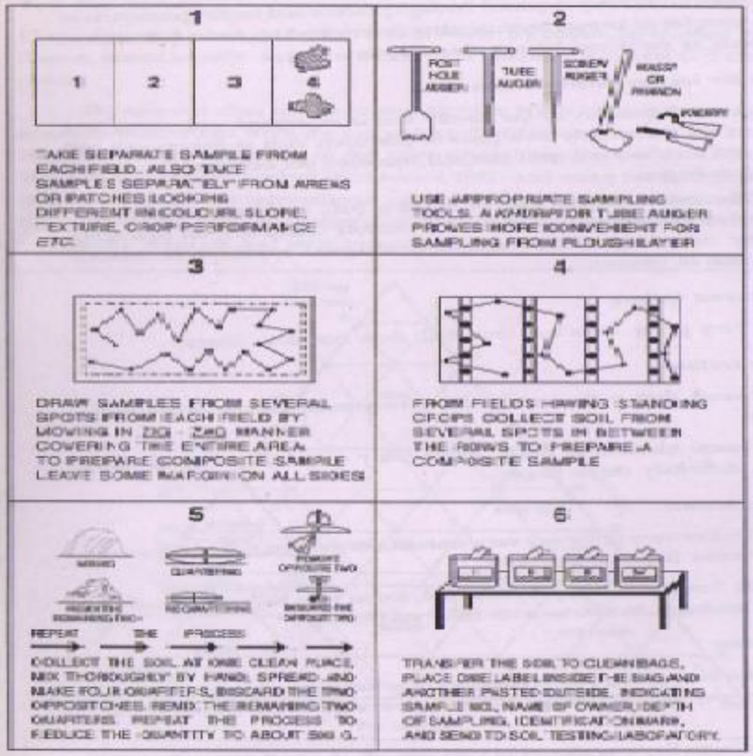
Marker,polythene covers,bags,

For long duration storage use glass, porcelain or polythene jar

Soil testing provides an index for the nutrient availability in soil and is a critical step in nutrient management planning

- Soil sampling

Types of tools used for soil sampling



TAKE SEPARATE SAMPLE FROM EACH FIELD. ALSO TAKE SAMPLES SEPARATELY FROM AREAS OR PATCHES LOOKING DIFFERENT IN COLOUR, SLOPE, TEXTURE, CROP PERFORMANCE ETC.

USE APPROPRIATE SAMPLING TOOLS. A KHURPI OR TUBE AUGER PROVES MORE CONVENIENT FOR SAMPLING FROM PLOUGH LAYER

DRAW SAMPLES FROM SEVERAL SPOTS FROM EACH FIELD BY MOVING IN ZIG - ZAG MANNER COVERING THE ENTIRE AREA TO PREPARE COMPOSITE SAMPLE LEAVE SOME MARGIN ON ALL SIDES

FROM FIELDS HAVING STANDING CROPS COLLECT SOIL FROM SEVERAL SPOTS IN BETWEEN THE ROWS TO PREPARE A COMPOSITE SAMPLE

COLLECT THE SOIL AT ONE CLEAN PLACE, MIX THOROUGHLY BY HAND, SPREAD AND MAKE FOUR QUARTERS, DISCARD THE TWO OPPOSITE ONES, REMIX THE REMAINING TWO QUARTERS, REPEAT THE PROCESS TO REDUCE THE QUANTITY TO ABOUT 500 G.

TRANSFER THE SOIL TO CLEAN BAGS, PLACE ONE LABEL INSIDE THE BAG AND ANOTHER PASTED OUTSIDE, INDICATING SAMPLE NO., NAME OF OWNER, DEPTH OF SAMPLING, IDENTIFICATION MARK, AND SEND TO SOIL TESTING LABORATORY.

Fig. 1. Procedure for drawing a representative soil sample

Sampling tools

soil Sampling tools

- soil probes

Soil auger

Steps in sampling

- Divide the field into sampling areas(SA to be uniform in soil type, slope, cropping pattern, fertilizer and manure use)
- Fix the sampling spot(10 to 12) at random to represent the entire area.
- Scrape away the surface litter, stones dig in V shape upto 15cms. And collect the soil in bucket
- Mix it on aplastic sheet and collect the req quantity into a polythene bags
- Reducing the bulk sample into 500

Quartering technique

In formation sheet

- Area of the field and Location
- Village, Taluk, District
- Survey no
- Date and time of sampling
- Depth of sampling
- Name of the farmer
- Relevent information slope, drainage, irrigation, previous cropping history, fertilizer used, manure etc.
- A
- field sampling summary table should
- be included for quick reference.

Processing of soil samples

- Break large lumps and spread it on a large sheet of paper and air dry(temp shold not exceed 35 degrees and relative humidity- 30 -70%)

- Air dry
- Grind(Pestle and mortar)
- Seiving (2 mm seive(10 mesh)

Most routine analysis

0.2mm- OC (for analysis requiring small amount of sample- <1gm)

Analysis of soil samples

- Physical parameters- Moisture content
- Chemical parameters- pH, EC, NPK, OC

  Heavy metal analysis (AAS)

Parameters analyzed

- pH-measure of hydrogen ion concentration, with pH meter

  Dil-1: 5 and expressed in 2 decimal unit

- EC- ionizable constituents in the solution

  Dil-1: 5 and expressed in 2 decimal unit

- OC-Potassium dichromate in presence of conc. Sulphuric acid(oxidation of organic matter)

Excess chromic acid left unutilized by OC is back titrated with Std FAS

Soil parameters

- TKN- is the sum of ammonia nitrogen and organic nitrogen present in the sample.

The nitrogen of organic matter and free ammonia is converted to ammonium sulphate on digestion at 360 – 410 ºC

- Alkali ued to liberate ammonia and distilled. Liberated ammonia is absorbed in boric acid solution(with mixed indicator) and TKN is found titrimetrically with standard Sulphuric acid

Phosphates – Organic P is converted to inorg P after digestiuon with Conc. Nitric acid follwed by Triacid mixture

Phosphorus as phosphates reacts with Ammonium Molybdate to form Phospho molydic acid which in presence of Stannous chloride gives blu colour complex

Spectrophotometer at 690 nm

Potassium

Heavy Metals- to assess the extent of Gwater contamination due to leaching of the wastes from the land fill sites

AAS

TOXICITY CHARACTERISTIC LEACHING PROCEDURE

- The Toxicity Characteristic Leaching Procedure (TCLP) is designed to simulate the leaching a waste will undergo if disposed of in a sanitary landfill. This test is designed to
- simulate leaching that takes place in a sanitary landfill only.

- The extraction fluid employed is a function of the alkalinity of the solid phase of the waste. A subsample of a waste is extracted with the appropriate buffered acetic acid solution for 18 + 2 hours. The extract obtained from the TCLP (the "TCLP extract") is then analyzed to determine if any of the thresholds established for the 40 Toxicity Characteristic (TC) constituents (listed in Table 7-1) have been exceeded or if the treatment standards established for the constituents listed in 40 CFR 268.40 have been met under the Land Disposal Restrictions (LDR) regulations.

TCLP-Toxicity characteristic leaching procedure

- The five basic steps of the TCLP are
- summarized below.
- 1. Separation Procedure
- For liquid wastes (i.e., those containing less than 0.5% dry solid material), the waste,
- after filtration through a 0.6 to 0.8 µm glass fiber filter, is defined as the TCLP extract.
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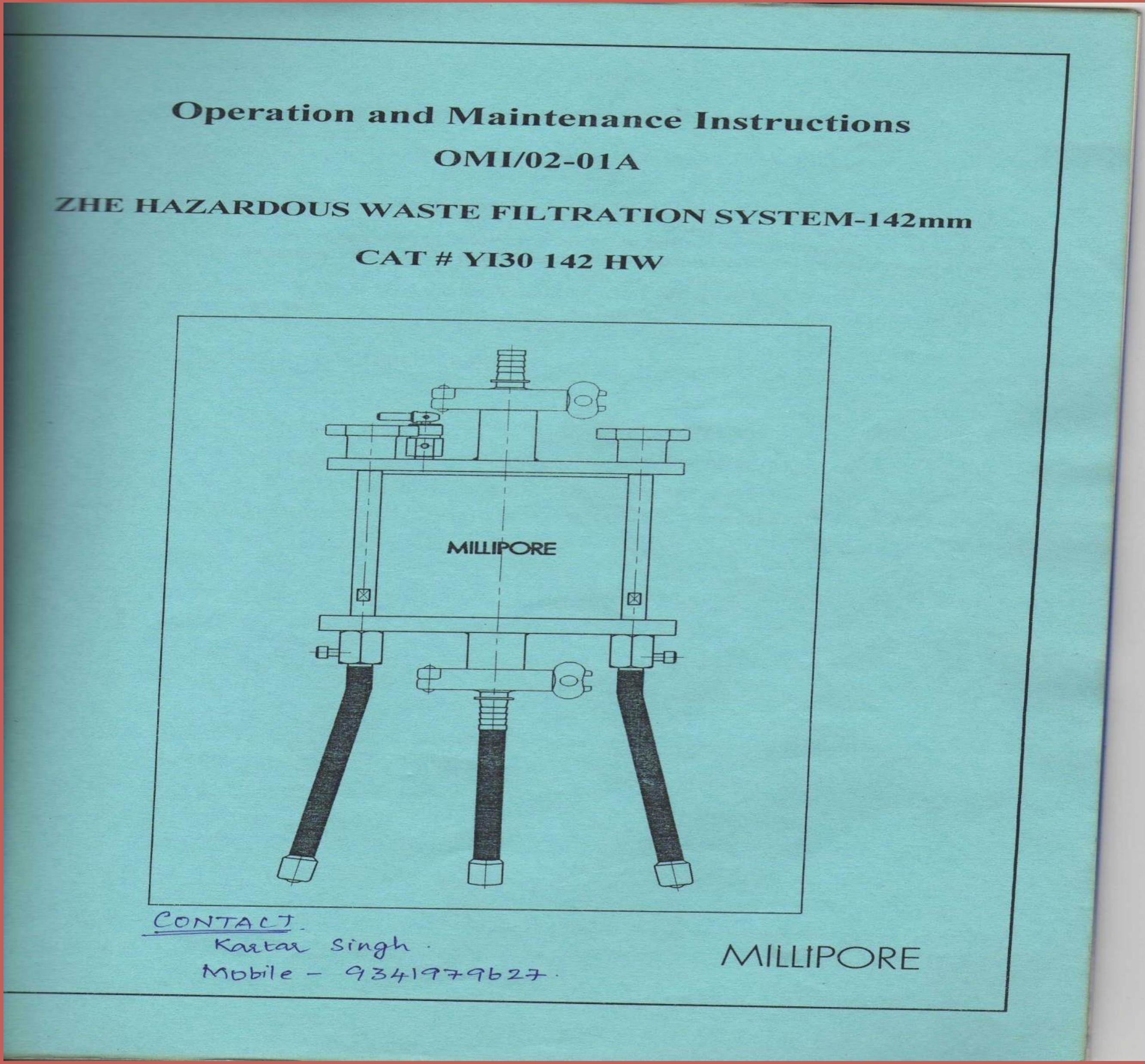


Operation and Maintenance Instructions

OMI/02-01A

ZHE HAZARDOUS WASTE FILTRATION SYSTEM-142mm

CAT # YI30 142 HW

CONTACT.
Kartar Singh.
Mobile - 9341979627.

MILLIPORE

- For wastes containing greater than or equal to 0.5% solids, the liquid, if any, is
- separated from the solid phase and stored for later analysis.
- 2. Particle Size Reduction
- Prior to extraction, the solid material must pass through a 9.5-mm (0.375-in.) standard sieve, have a surface area per gram of material equal to or greater than 3.1 cm2, or, be smaller

- than 1 cm in its narrowest dimension. If the surface area is smaller or the particle size larger than described above, the solid portion of the waste is prepared for extraction by crushing,
- cutting, or grinding the waste to the surface area or particle size described above. (Special precautions must be taken if the solids are prepared for organic volatiles extraction

- 3. Extraction of Solid Material
- The solid material from Step 2 is extracted for 18 + 2 hours with an amount of extraction fluid equal to 20 times the weight of the solid phase. The extraction fluid employed is a function
- of the alkalinity of the solid phase of the waste. A special extractor vessel is used when testing for volatile analytes.

- 4. Final Separation of the Extraction from the Remaining Solid Following extraction, the liquid extract is separated from the solid phase by filtration through a 0.6 to 0.8 µm glass fiber filter. If compatible, the initial liquid phase of the waste is added to the liquid extract, and these are analyzed together.

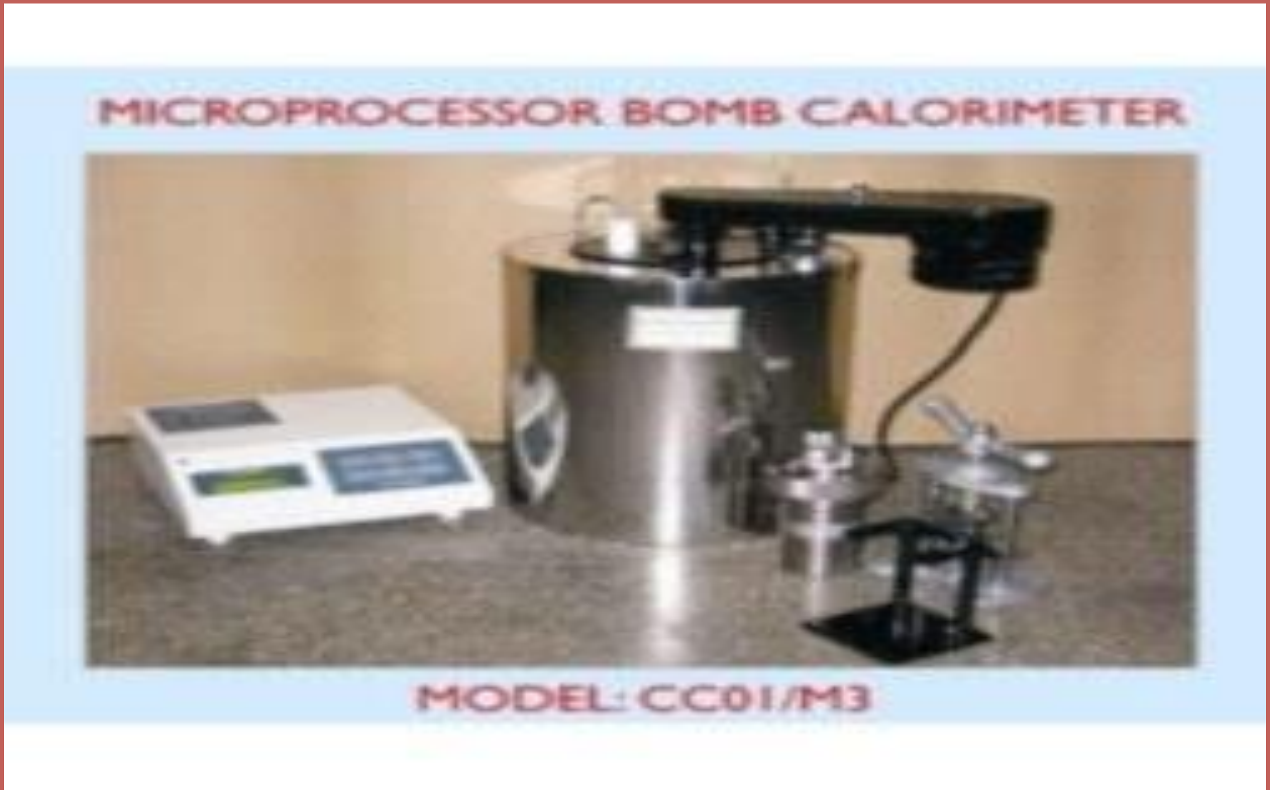
6.0 APPARATUS

All equipment with which the sample and extract come in contact should be made of inert materials that will not increase or reduce the concentrations of the analyses of interest in the sample. Glass, polytetraflouroethylene, (PTFE) devices may be used when evaluating both organic and inorganic components. Borosilicate glass bottles are recommended in preference to other glass types, especially when inorganics are being evaluated. Vessels made of high-density polyethylene (HOPE), polypropylene (pp) or poly vinyl chloride (PVC) may be used when evaluating only the mobility of metals.

MAXIMUM CONCENTRATION OF CONTAMINANTS FOR TOXICITY CHARACTERISTIC

- Arsenic 5.0
- Barium 100.0
- Benzene 0.5
- Cadmium 1.0
- Carbon tetrachloride 0.5
- Chlordane 0.03
- Chlorobenzene 100.0
- Chloroform 6.0
- Chromium 5.0

Bomb calorimeter


MICROPROCESSOR BOMB CALORIMETER
MODEL: CC01/M3

bomb calorimeter

- A bomb calorimeter is a type of constant-volume calorimeter used in measuring the heat of combustion of a particular reaction.
- Bomb calorimeters have to withstand the large pressure within the calorimeter as the reaction is being measured.

- Electrical energy is used to ignite the fuel; as the fuel is burning, it will heat up the surrounding air, which expands and escapes through a tube that leads the air out of the calorimeter. When the air is escaping through the copper tube it will also heat up the water outside the tube. The temperature of the water allows for calculating the calorie content of the fuel.[or kilojoules if using those units]

Flash point analyzer(Miniwin)

- determination of flashpoints of liquids and solids, using the Grabner flash point detection method of measuring the instantaneous pressure increase inside the continuously closed chamber due to a hot flame.

- The flash point is an indication of how easy a chemical may burn. Materials with higher flash points are less flammable or hazardous than chemicals with lower flash points.
- Liquids with a flash point less than 60.5 or 37.8 °C (141 or 100 °F)—depending upon the standard being applied—are considered flammable, while liquids with a flash point above those temperatures are considered combustible

Flash point of some fuels(º F)

- Ethyl alcohol- 55
- Xylene – 63
- Benzene -12
- Toluene - 40

Thank You