



# International Conference on Safe & Secure Management of Hazardous Materials in Sri Lanka

## ***Hazardous Waste Management PCB Safe Handling & Disposal***

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*September 17th & 18th 2015  
at Blue Hilton Colombo*



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கைத்தொழில் மற்றும் வணிகம் புறநில அமைச்சு  
Ministry of Industry and Commerce



ORGANISATION FOR THE  
PROHIBITION OF CHEMICAL WEAPONS

# Topics of Presentation

- Introduction Alternate Resource Partners
- Hazardous waste management
- Waste hierarchy
- Incineration versus co-processing
- Hazardous characteristics
- Working safely with PCB's & PCB Equipment
- General Information on PCB's and their risk
- PCB disposal
- Take home messages

# Main Activities Alternate Resource Partners (ARP)

## Consulting - Training - Coaching & Interim Management

- ✓ (Support &) Set up of Organizations for waste co-processing services
- ✓ Training & coaching of Managers and their staff in operational skills including HS&E procedures & work instructions
- ✓ Support & set up or maintenance of ISO 9001/14001 & OHSAS 18001 management systems for Resource & Waste Management activities
- ✓ Support & set up of Contractor Safety & Environmental systems according to CSS (Contractor Safety Standard – Standard accredited by Dutch board of accreditation)
- ✓ Safety audits & reviews of waste and resource management activities according to international standards and by ARP developed “scan” methods
- ✓ Co-ordinate PCB removal activities for owners of PCB equipment
- ✓ Technical & Commercial support with set up of pre-processing activities (= to process waste so it's chemically & physically suitable for co-processing)
- ✓ Measuring customer satisfaction and performance of M & S organization and customer services group

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# Hazardous waste management

- Hazardous waste is any unwanted material the disposal of which poses a threat to the environment, i.e. it is explosive, flammable, oxidizing, poisonous/infectious, radioactive, corrosive and/or toxic/ecotoxic.
- Sources of hazardous waste include hospitals, timber treatment, petrol storage, metal finishing, paint manufacture, vehicle servicing, tanneries, agriculture/horticulture, electricity distribution and dry cleaning.



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# The Waste Management Hierarchy

- In deciding on the best method for managing any waste there is a hierarchy for decision making which addresses issues such as sustainability, cleaner production, health, safety, and environmental protection. It is applied to existing or proposed practices, examining and testing these at each level
- Starting at the top of the hierarchy.



# Waste Hierarchy





# Hazardous waste management

- If recycling, re-use, minimization aren't possible hazardous waste need to be treated
- The waste can be treated chemically (i.e. by neutralization, oxidation, reduction, hydrolysis, precipitation), physically (encapsulation, separation), biologically (using microorganisms) or thermally (incineration & co-processing).

Most treated waste is then deposited in landfills .

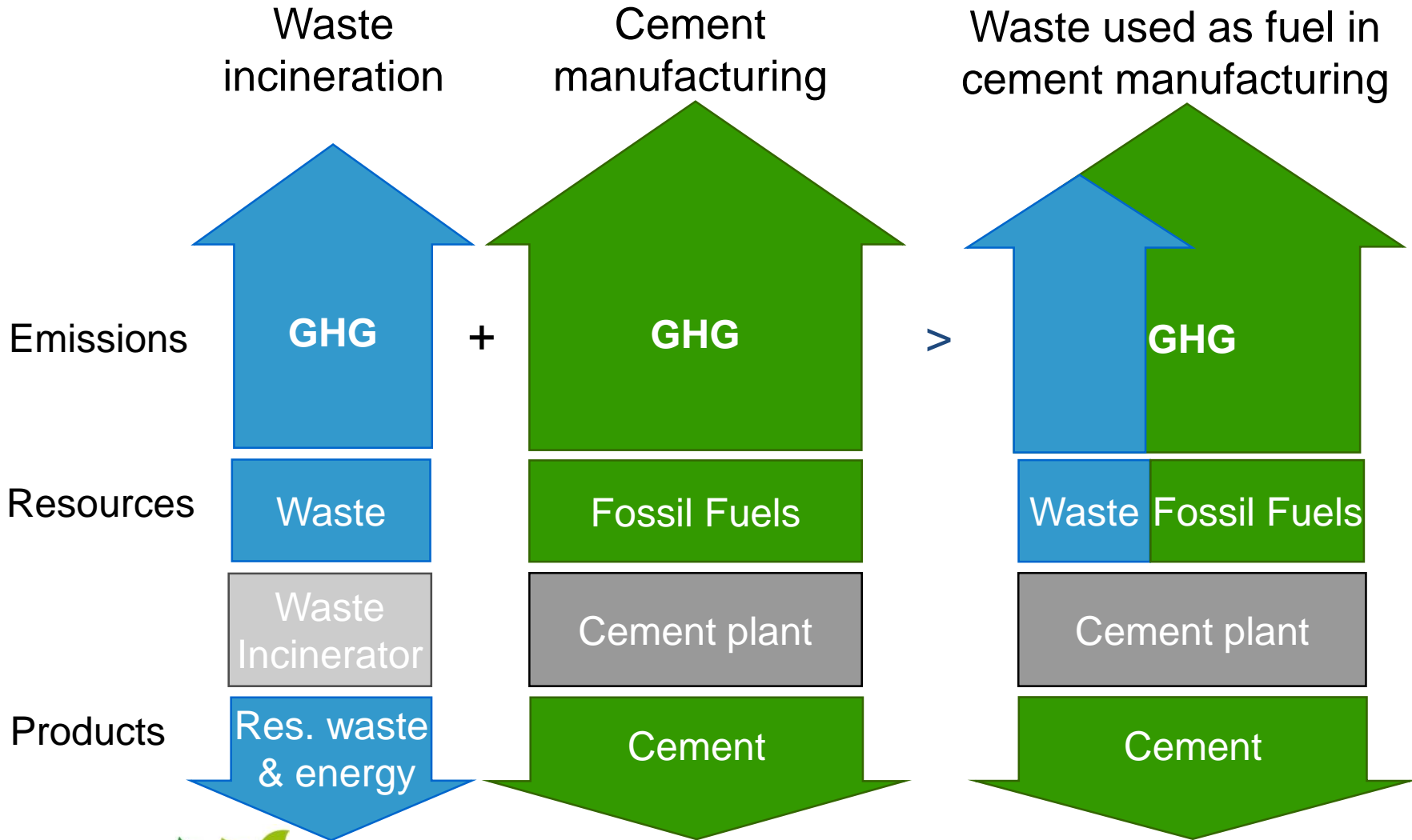
To prevent landfills themselves being environmental hazards, generally control the types of waste that can be deposited in them and the landfill design



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# Incineration versus Co-processing



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# Hazardous Characteristics

U.N. Class Number	Hazardous Characteristic
1	Explosive
3 - 4	Flammable
5	Oxidizing
6	Poisonous/Infectious
7	Radioactive
8	Corrosive
9	Toxic (Delayed or Chronic)/Ecotoxic



# Hazardous Characteristics

## Globally Harmonized System of Classification & Labelling of Chemicals (GHS)

	<i>Exploding bomb</i> <b>Explosives</b>		<i>Flame</i> <b>Flammables</b>		<i>Flame over circle</i> <b>Oxidisers</b>
	<i>Gas cylinder</i> <b>Gases under pressure</b>		<i>Corrosion</i> <b>Corrosives</b>		<i>Skull and crossbones</i> <b>Acute toxicity</b>
	<i>Environment</i> <b>Environmental hazard</b>		<i>Exclamation mark</i> <b>Harmful/irritant</b> <b>Harmful to ozone layer</b>		<i>Health hazard</i> <b>Severe health hazards</b>

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# Working safely with PCB's & PCB Equipment

## General Information on PCB's and their risk

Following slides describe activities with their risk and measurement to mitigate these risks

This presentation is used as an on-site instruction 'Working safely with PCB's' at the start of a PCB Project for personnel on site (of the customer)



# Scope of PCB activities & safety measurements

1. General
2. Operational PCB risk
3. Technical/safety measurements forklift, crane & truck activities
4. Personal protective measurements employee involved
5. Emergency Response



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Colombo 2015

# General Scope of PCB activities

- Draining of PCB liquid from transformers
- Packing of PCB liquids in 200 ltr steel drums or 1000 ltr Intermediate Bulk Containers (IBC's)
- Safely conditioning and packing of drained transformers and drums into 20/40 open top box containers
- Transport of packaged containers to Infrastructure
- Dismantling & decontamination of transformers at Infrastructure of Consortium at El Gara
- Final Destruction of PCB oils and equipment with a > 95 % recycling and valorization value, remainder will be incinerated in a High temperature incineration facility



## 2. Operational risks PCB

Disconnected transformers will be removed from their actual positions and placed in liquid tight box containers

In essence PCB-transformers are classified as closed phase

In other words: free PCB's will not present

### 3. Technical/safety measurements forklift, crane & truck

During the handling and transport phase of PCB transformers following risks must be considered

#### Use of forklift truck

- Damaging transformers through forks
- Collision of transformers with forklift truck, walls substation, other transformers and equipment
- Stowing of transformers into box containers

### 3. Technical/safety measurements forklift, crane & truck

#### Use of crane and truck

- Hoisting activities on/off truck
- Transport between substation and box containers



### 3. Technical/safety measurements forklift, crane & truck

#### Working area

- Create enclosed working area for the handling and loading space around the stored transformers and truck, landmark this area with signalling tape
- Create HDPE floor covering in the marked working area



### 3. Technical/safety measurements forklift, crane & truck

- Make sure sufficient amount of sand (bags) or absorption materials in case of leakage or incidents are available
- Make sure a fire extinguisher is available in case fire accidents

**PCB oil is non flammable**

# 3. Technical/safety measurements forklift, crane & truck

## - Hoisting and transport phase

- Keep truck on HDPE covering during hoisting of PCB transformers onto truck



- Adjust a steel tray on the truck and place transformer into steel tray accordingly



### 3. Technical/safety measurements forklift, crane & truck

- Ensure transformers are stowed and secured in a proper manner (tie rope!!!)



### 3. Technical/safety measurements forklift, crane & truck

- Drive to 20" box container (storage)
- Remove roof from "open top" container
- Adjust HDPE foil on floor of working area (between truck and container)
- Make sure absorption material and fire extinguisher are available

### 3. Technical/safety measurements forklift, crane & truck

- Hoist transformer into the box container via the door
- Close open top containers by re-installing removable roof



## 4. Personal protective measurements (PPE) employees

Although the activities of employees involved are based on a 'closed phase' approach, the full risk of PCB contamination cannot not be excluded

Because of potential PCB transformer surface contamination, the operators involved must follow (safety) guidelines

In addition, the employees must be prepared for potential increase of safety measurements in case of incidents and/or “free PCB's” during the operation

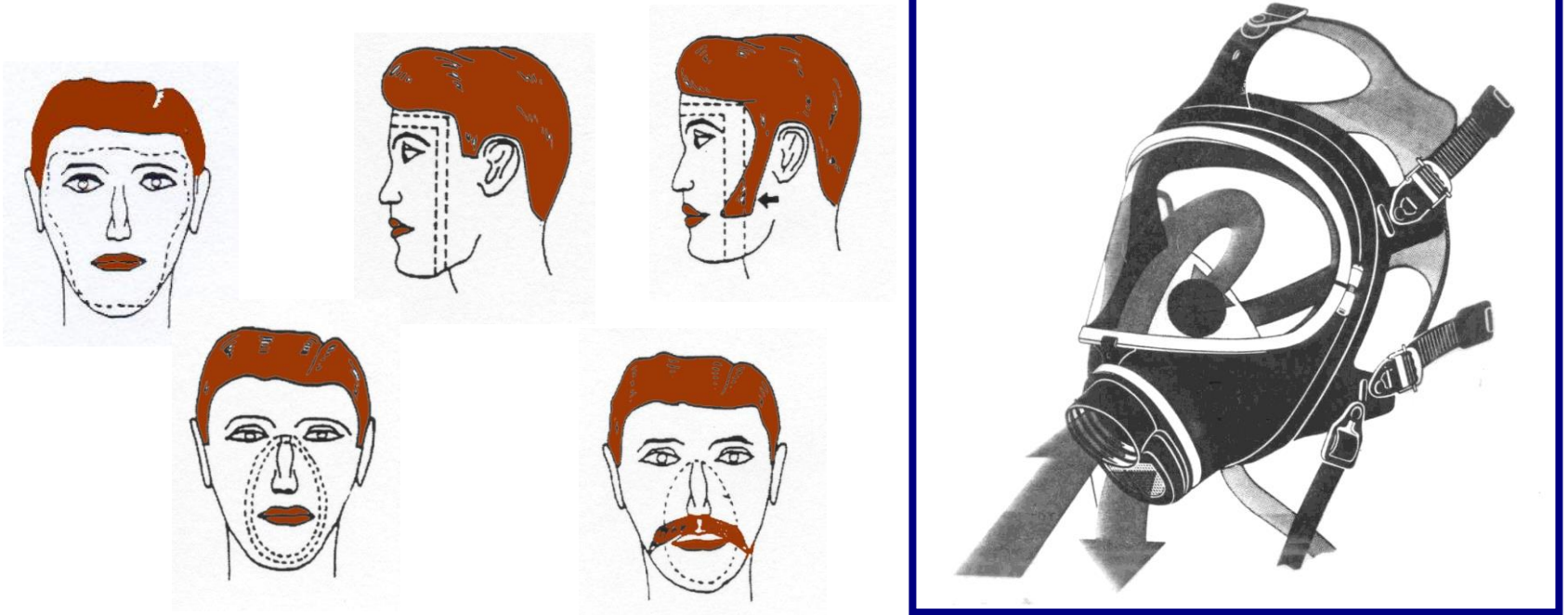
## 4. Personal protective measurements (PPE) employees

### Working with PCB transformers

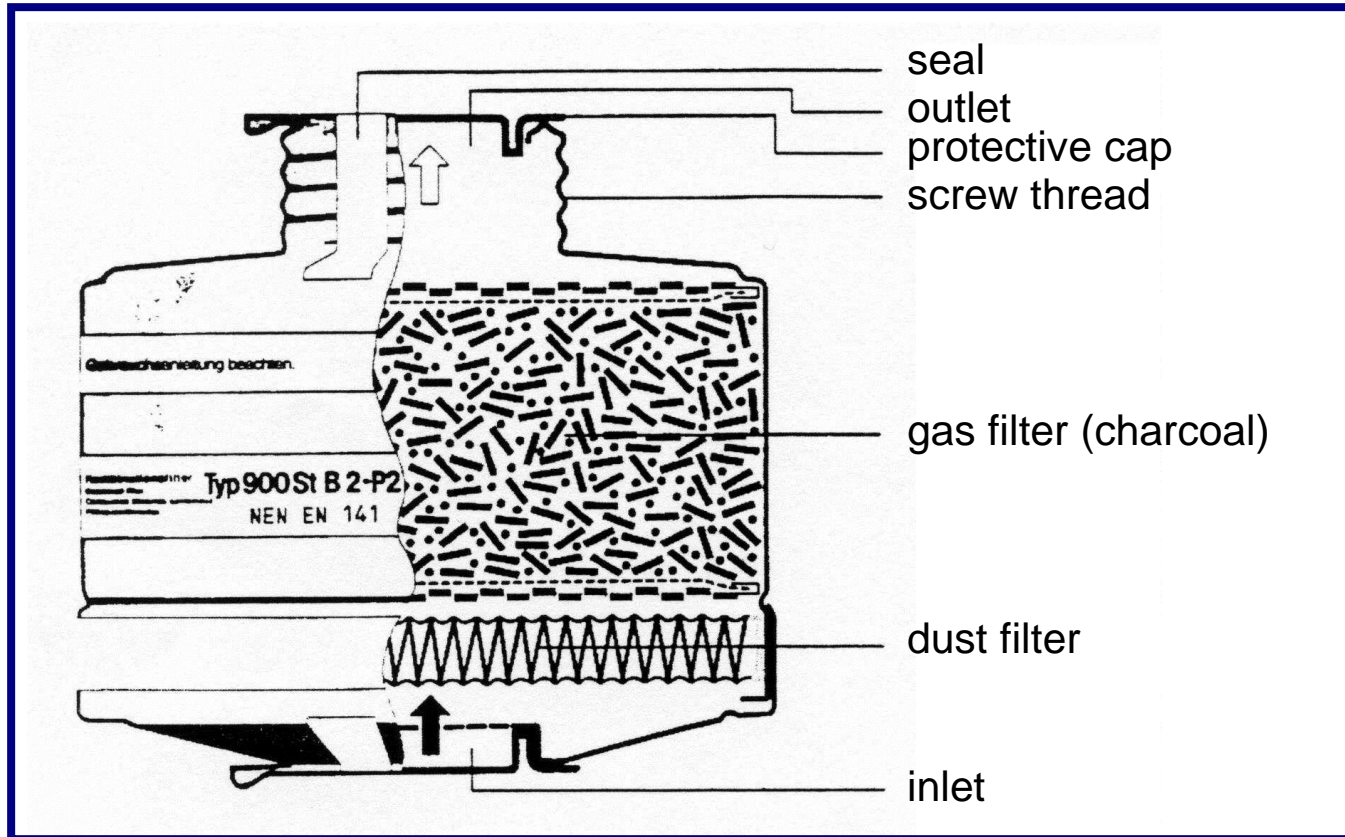
- Employees who enter and work within the marked area and have physical contact with the transformers may only enter the working area provided they use the following personal protective equipment
  - cotton overall
  - Tyvek coverall
  - safety boots
  - safety helmet
  - PVC gloves
  - cotton working gloves

## 4. Personal protective measurements (PPE) employees

- Employees who work with 'free PCB's' must wear:
  - full face masks



... and these employees must wear filters



## 4. Personal protective measurements (PPE) employees

### Packing of transformers into box-containers

- For these activities the same safety measurements apply as mentioned under 'Working with PCB transformers'



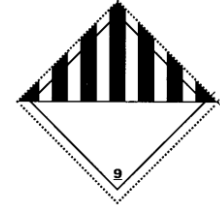
## 4. Personal protective measurements (PPE) employees

### Additional measurements

- Used personal protective equipment, such as Tyvek coveralls, rubber boots and PVC gloves, must remain within working area
- The project manager may decide to use coveralls and gloves for future activities within PCB working area
- If coveralls and gloves appear to be PCB contaminated they must be disposed off and packed into a waste drum near or inside working area

#### 4. Personal protective measurements (PPE) employees

- The waste drums must be labeled "solid PCB waste" and label class 9



These drums will be considered as PCB waste and disposed off accordingly

- Smoking, hot work, open flames in or around the working area is strictly forbidden

## 4. Personal protective measurements (PPE) employees

### Personal hygiene

- All employees who work with PCB transformers in the working area, handle transport and container packing, must wash their hands and face:
  - before eating and drinking
  - at the end of the working day
- A first aid kit needs to be near working area

## 5. Incident control & emergency control

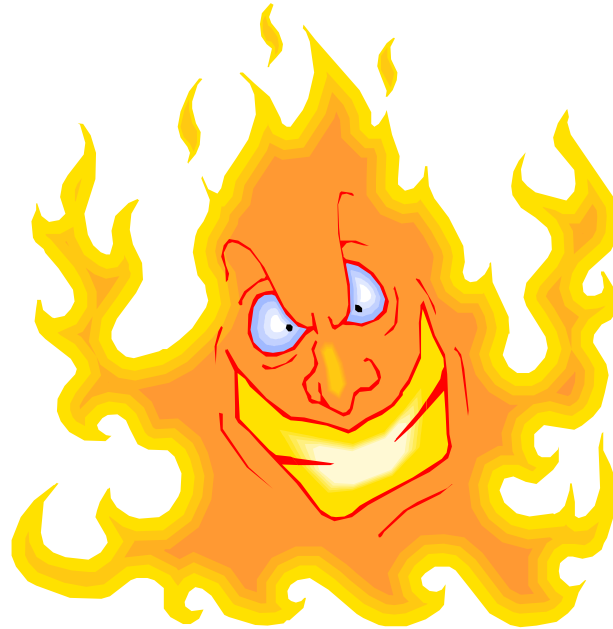
### *a. Leakage during handling*

- Increase safety measurements (full face masks, filters)
- Keep employees without a mask at safe distance (above wind)
- Keep PCB transformers on HDPE foil at all times
- Place leaking equipment in steel tray
- Use sufficient amount of absorbents and sand
- Remove absorbents and sand from HDPE foil and pack into drums
- Clean contaminated equipment (tyres forklift truck and tools) with 1.1.1. trichloroethane or methylene chloride

**Inform Project management in time!**

## 5. Incident control & emergency control

### b. Fire



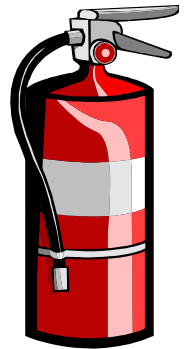
Transformers are disconnected

Fire can start only through naked flame or hot work  
(which are strictly forbidden during PCB activities)

## 5. Incident control & emergency control

In case a fire starts in close vicinity of, or in working area following actions need to be taken immediately:

- Inform Project management
- Increase safety measurements (full face masks)
- Use fire extinguisher for first approach
- Demobilize uninvolved persons
- Stay above wind
- Do not enter the area after the fire has been extinguished
- Report to authorities for further inventory of potential dioxin or furan contaminations



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# PCB Disposal - Unep / Basel Convention



The Basel Convention on the Control of Trans-boundary Movements of Hazardous Wastes and their Disposal is the most comprehensive global environmental treaty on hazardous and other wastes. Basel Convention was negotiated in the late 1980s, and entered into force in 1992.

## **Basel Convention acts is based on :**

- ✓ International and validate agreements, facilitating sound waste management.
- ✓ Technical Guidelines submission, to promoting regulation and control of sound technologies for waste treatment/disposal.





# PCB disposal - Unep / Basel Convention

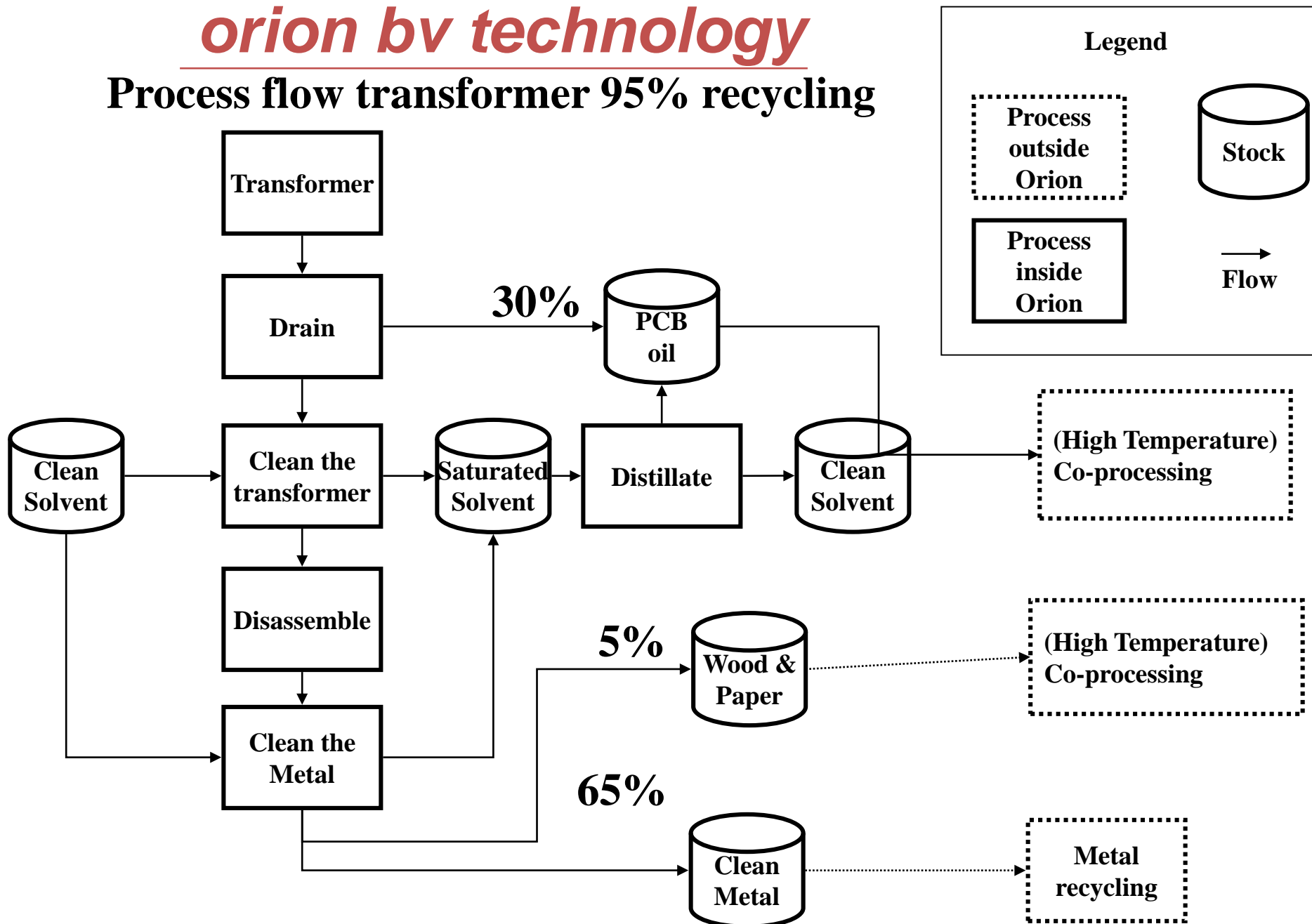
Co-processing Technical Guidelines are now **OFFICIAL RECOMMENDATION** of United Nations:

- Co-processing is officially validated as a sound and recommended technology for hazardous and non-hazardous waste management, pop's related wastes included
- Co-processing is consolidated as recovery operation in the waste management hierarchy,
- International and technical criteria / references are now available for local legal frames,
- Minimum standards are now defined, limiting informal and non-low standard players.



# *orion bv technology*

## Process flow transformer 95% recycling



# Take home messages



# Take home messages

- Waste management should be according waste hierarchy principles
- Waste management means good identification of risks
- Cement kiln co-processing is a proven concept; part of waste management structure, higher on the waste hierarchy, local solution in emerging countries
- PCB oil & -equipment can be safely handled with energy and material recycling





***Questions?? – Remarks!!***  
***Thank You for Your attention***

For more information

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**[WEBSITE: www.alternateresourcepartners.nl](http://www.alternateresourcepartners.nl)**



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*A member of the Holcim Group*



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# BACK UP SLIDES



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