



Towards a cleaner world

PCB PROJECTS IN EMERGING ECONOMIES: FEASIBILITY OF LOCAL TREATMENT, STOCKHOLM CONVENTION DEADLINE 2028, TRANSPORT OBSTACLES

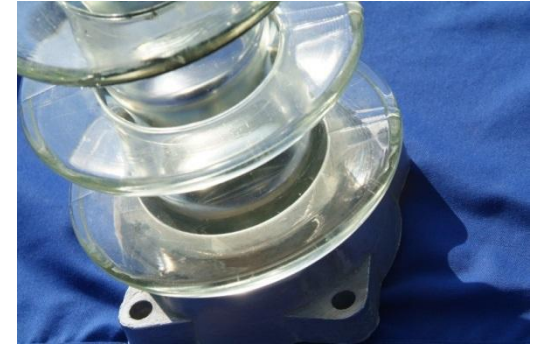
*The solution to the
pcb problem*

Your specialist for:

- treatment of PCB-materials
- PCB-related consultancy
- Pack & Transport



Content



- Philosophy
- 12 HCH & POP's forum KIEV – Summary PCB workshop
- PCB waste disposal deadline – 2028
- Transport / export obstacles
- Why Life Cycle Management?
- Technology: re-use vs. recycling
- Distribution of materials in a transformer
- International strategic partnerships and cooperation
- Conversation: what is real(istic)?
- Annex – Feasibility of local treatment

-

12 HCH & POP's forum KIEV – Summary PCB workshop: 1

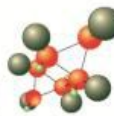


By using existing local capacity for licenced high temperature treatment of liquid PCB's and POP's in emerging economies **80% to 95% of the PCB problem can be treated local** in many countries, with only 5% of the remaining PCB waste to be exported for treatment abroad.

12 HCH & POP's forum KIEV – Summary PCB workshop: 2



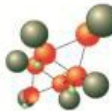
International HCH & Pesticides Association



Life cycle management and product re-use can be an important **additional positive effect** if inventory and sampling programs allow for additional oil quality analyses apart from PCB in oil testing.

- First of all in this way also PCB free transformers may benefit from the sampling efforts.
- Secondly the stability and the reliability of the electric distribution grid can be assessed and if necessary improved.
- Thirdly the low-PCB contaminated transformers with otherwise good technical conditions can be cleaned and re-used, thus moving the PCB treatment up on the Waste Hierarchy.

12 HCH & POP's forum KIEV – Summary PCB workshop: 3



Based on local and country specific needs the general preference for **100% local treatment of PCB waste is usually not the economic and environmentally sound solution.** However an important part of available budgets is spend on (studying and coordinating) these projects without always achieving results. Best practices and benchmarks are available for feasibility scans for organizations wishing to **use the available budgets effective and efficient.**

PCB waste disposal deadline – 2028

- PCB are listed in Annex A to the Stockholm Convention. The production and new uses of PCB are banned, and Parties to the Stockholm Convention must **eliminate the use of PCB in equipment by 2025** and to ensure the **environmentally sound waste management** of liquids containing PCB and equipment contaminated with PCB **by 2028**.
- How much PCB waste is not (yet) disposed of in emerging economies? Would 50% be a safe estimate? 80%?
- How much equipment in use (transformers, capacitors) is contaminated with PCBs? Typically at the first inventory we find 25% of equipment in use to be contaminated. Would 5% be a safe estimate? 10%?
- What can we do to achieve the PCB waste disposal deadline by 2028?

PCB waste transport and export obstacles

- Many shipping lines refuse PCBs
- A number of countries refuse transit
- It is sometimes impossible to find a shipping line and route, especially from Asia and South America to Europe.
- If shipping lines accept PCBs the routes / itineraries are changed every 6 months
- When a shipping route changes a new TFS (Trans Frontier Shipment) Basel notification must be done. This can take 6 to 9 months to be processed by the competent authorities. By that time the routes may have changed again

Why Life Cycle Management? - 1

- A PCB inventory study takes many efforts and cost
- Why not use this effort to properly manage the capital equipment involved (transformers) by collecting additional data?
 - Physical condition of the transformer
 - Quality of the oil

Why Life Cycle Management? - 2

Deliverables:

- Remaining **thermal life** for sampled transformers can be assessed
- Based on PCB contamination, technical condition and remaining thermal life expectancy a **comprehensive life cycle management plan** can be drafted
- **Re-use of “healthy” PCB transformers** by PCB removal and reconditioning
- **Phase out** or recondition of “bad” (non) PCB transformers

Why Life Cycle Management? - 3

Advantages:

- Complies with the **needs of the transformer owners** (“Why destroy a good transformer just because it is PCB contaminated?”)
- Not only a PCB inventory, also a **quality and reliability assessment** of all sampled transformers in the electrical grid
- **Save money** by re-use, better capital equipment management and improved reliability
- **Never waste a good crisis ;-)**

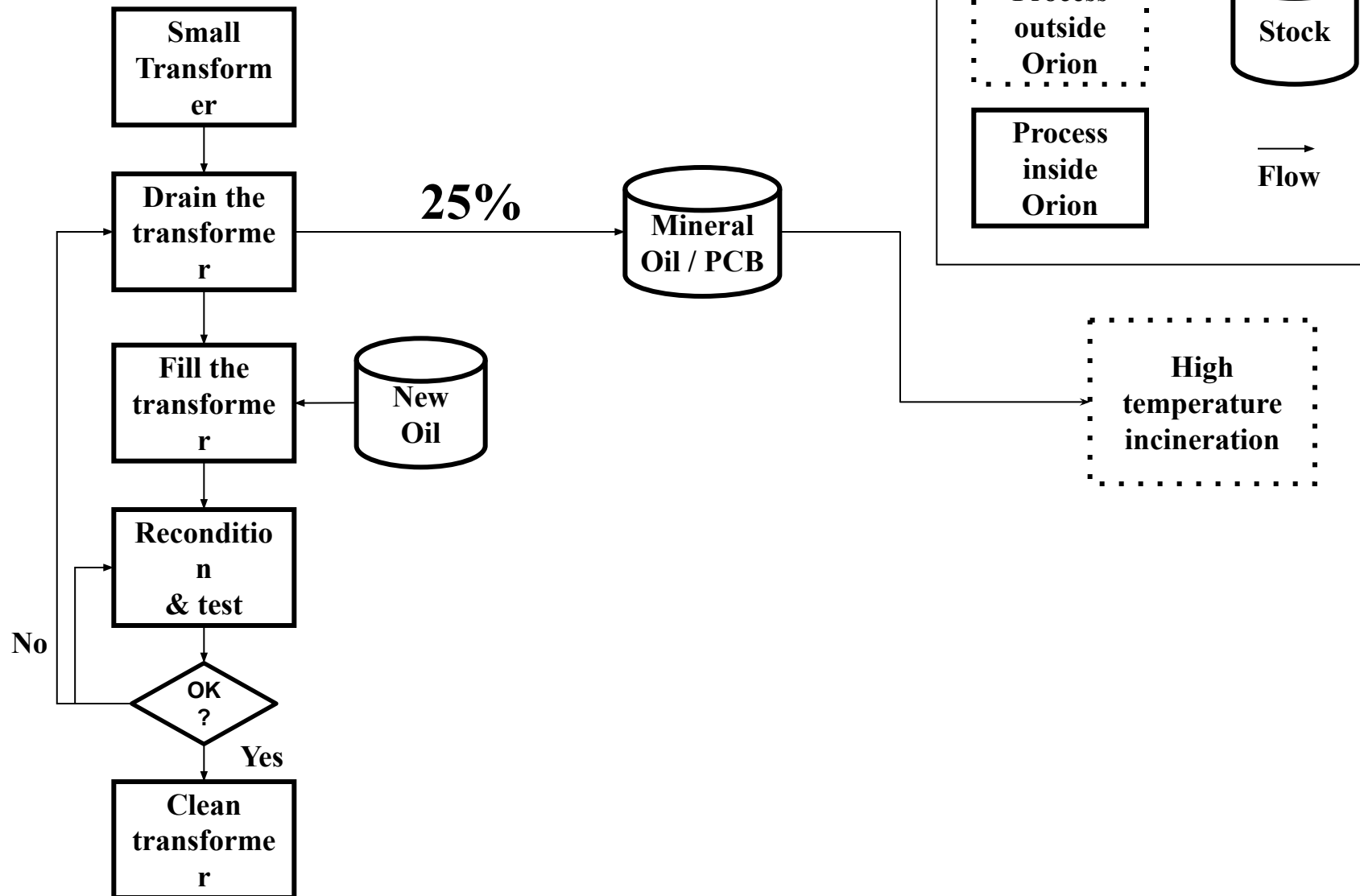
Why Life Cycle Management? - 4

- Better performance on “Lansink’s ladder” also known as “Waste hierarchy”: **Re-use instead of recycling** of PCB transformers



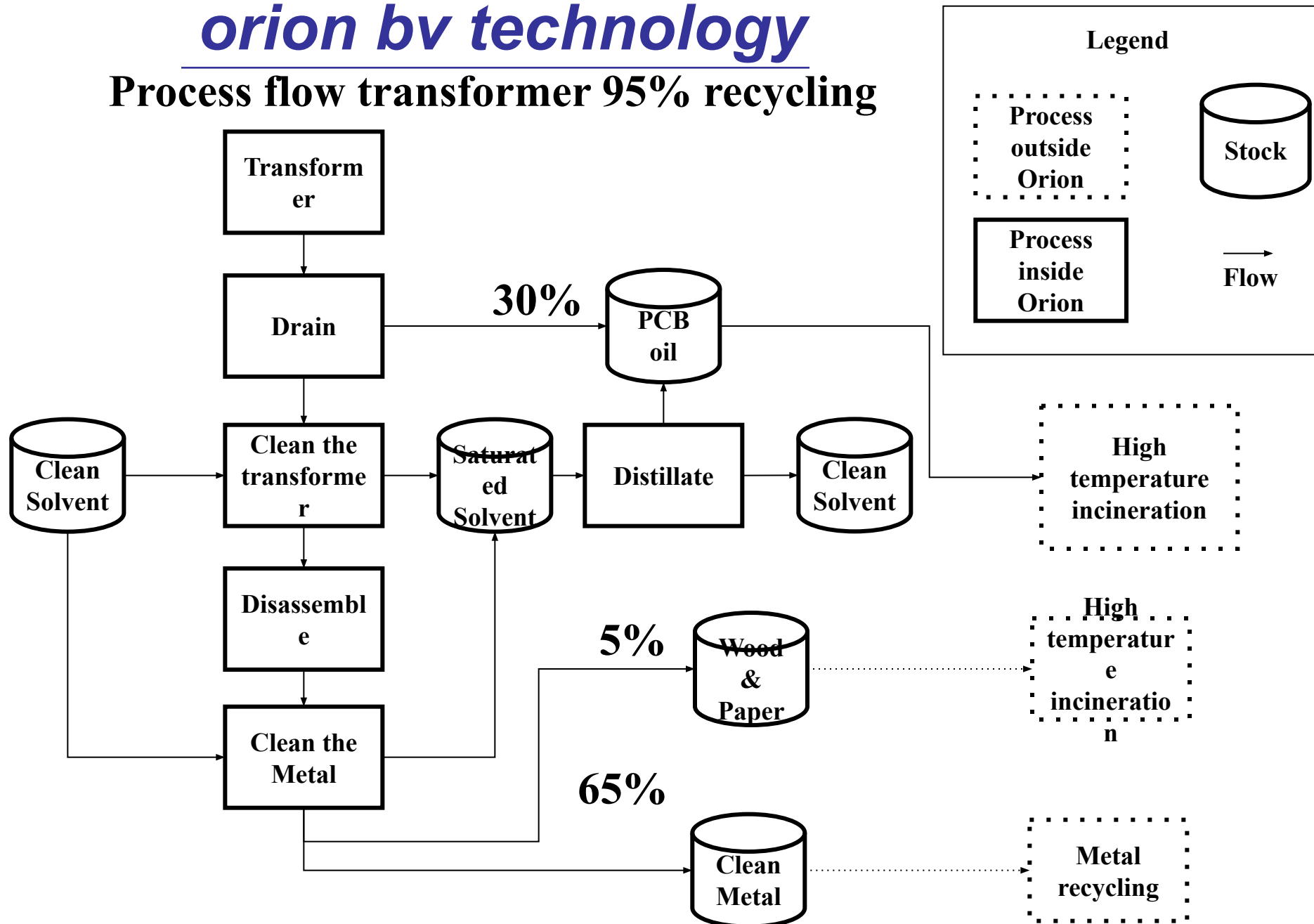
orion bv technology

Process flow distribution transformer re-use



orion bv technology

Process flow transformer 95% recycling



Distribution of materials in a transformer-1

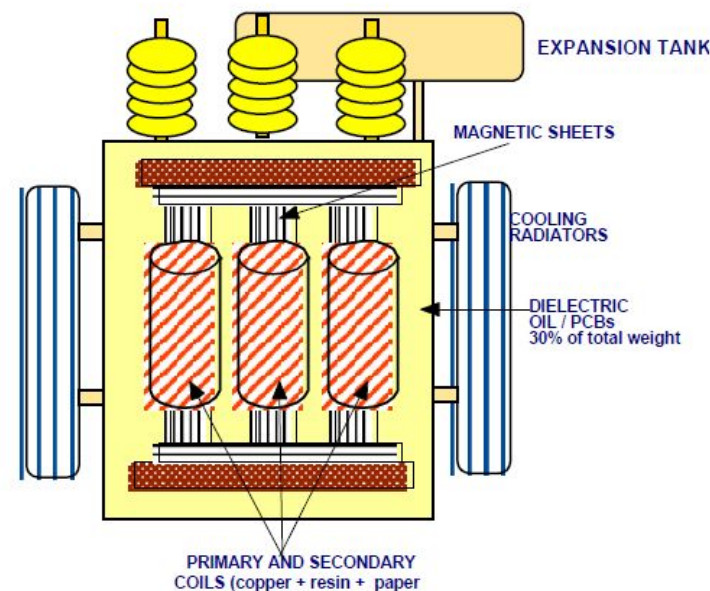
The magnetic circuit is totally immersed in the dielectric. After 20 and more years of use, all the porous materials in the magnetic circuit are impregnated with dielectric. These porous materials include the following*:

- The wooden chocks, which absorb 50% of their own weight (thus, a block weighing 10 kg can absorb up to 5 kg of dielectric);
- Insulating cardboard and paper;
- Resins coating the copper wires.

* According to Training Manual

“Preparation of a National Environmentally Sound Management Plan for PCBs and PCB-Contaminated Equipment” Page 16 by Secretariat of the Basel Convention

**DISTRIBUTION OF MATERIALS
IN A TRANSFORMER**



Distribution of materials in a transformer-2

Statistics compiled on the decontamination of Transformers show that 5% of the initial PCB content on manufacture is impregnated into the transformer's porous components. Thus, a transformer with a total weight of 1,500 kg is made up of:

- 10 %: 150 kg of tank (metal mass)
- 60 %: 900 kg of magnetic circuit
- 30 %: 450 kg of dielectrics



of which 5% of the dielectrics are impregnated in the magnetic circuit – 5% of 450 kg, or 22.5 kg of PCBs. If this quantity is presented as a ratio of the dielectric mass in a PCB transformer, the PCB constitute a weight ratio of 22.5 kg / 900 kg, or a contamination level of 25,000 ppm.

Given that the maximum level allowed is 50 ppm, this is 500 times higher than the norm. Accordingly, the entire metal parts should be considered as PCB wastes and should be destroyed on the basis as the PCBs themselves.

International cooperation

- Partnerships and cooperation with:
 - Local partners
 - Local waste treatment by co-processing in approved cement kilns
 - EU based solution providers for transformer oil analyses
- **Flexible and optimal solutions for each country and project**
- **Minimize waste export**
- **Maximize revenues and re-use**



Feasibility of local treatment - 1

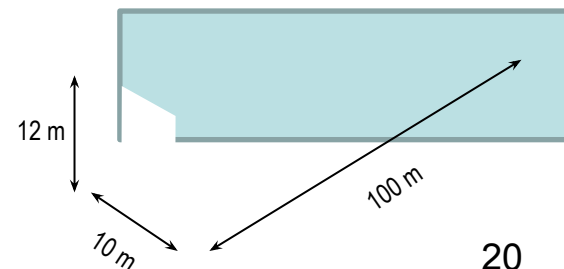
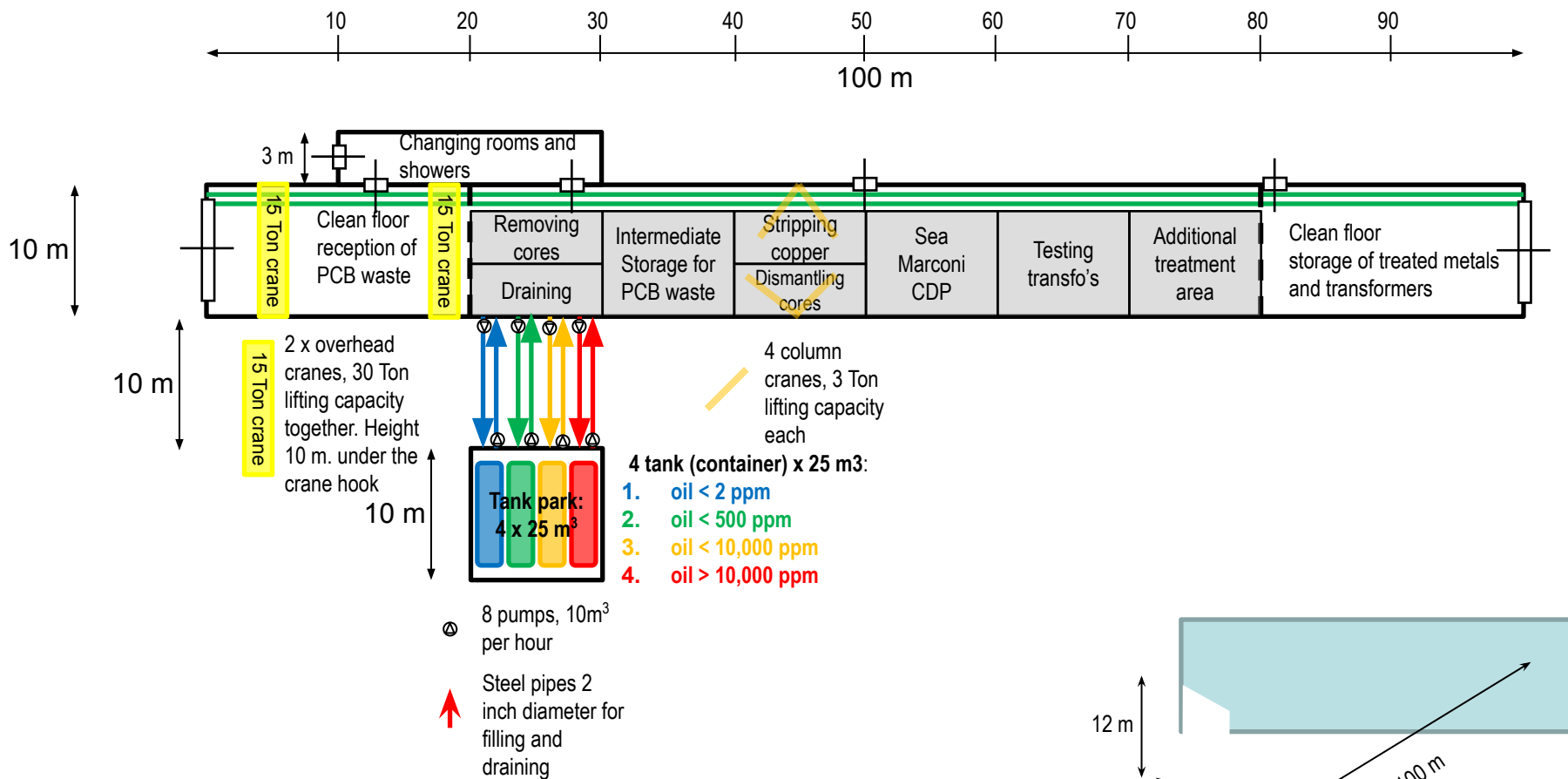
Typical estimated local treatment cost - summary	Amount	
Capital expenditure	€	3.500.000
Fixed cost	€	830.000
Variable cost per kg	€	0,23
Profit		30%
Total cost per kg, annual volume 500 000 kg typical project guarantee	€	2,46
Total cost per kg, annual volume 1 000 000 kg	€	1,38
Total cost per kg, annual volume 1 500 000 kg	€	1,02
Total cost per kg, annual volume 2 000 000 kg	€	0,84
Typical estimated export treatment cost	€	0,50
Typical estimated sea transport cost	€	0,35
Total cost per kg for export	€	0,85

Feasibility of local treatment - 2

- The conclusion is that local treatment cost can match the cost of export at an annual treatment volume of transformers for disposal (out of use) of 2 000 000 kg for 10 years.
- However the typical capacity building project for PCB waste (out of use transformer disposal) has a size of 500 000 kg transformers for 1 or 2 years with no guarantee or budget for the following 8 years required to earn back the capital expenditure.

Feasibility of local treatment - 3

PCB treatment plant layout



Feasibility of local treatment - 4

How to avoid the capital expenditure and get 95% local treatment of the PCB waste instead of 100% local treatment?

The strategy to avoid a euro 3 500 000 investment in a treatment facility for PCB transformers and still have 95% of all the PCB's treated locally consists of three approaches:

Feasibility of local treatment - 5

How to avoid the capital expenditure?

1. Re-use of low PCB contaminated oil transformers
2. The use of local cement kilns for co-processing the PCB containing oils
3. Export the metallic parts (drained transformers) that contains only 5% of the PCBs

Notes

Contact

If you would like to know more about the way we work, or if you would like us to give you a detailed quotation for dealing with your contaminated materials safely and quickly, please contact us at the following address:

Orion b.v.

De Steven 25
9206 AX Drachten
The Netherlands

Telephone: +31 512 - 532515
Fax: +31 512 - 541130
Website: www.orionUN2315.nl
E-mail: info@orionUN2315.nl

Towards a cleaner world

14th HCH forum PCB block 13, 23 February 2023

