

#EU
GREEN
WEEK

6 June 2025

EU Green Week Partner Event

Channeling metals of low grade PCBA to
the right metallurgy: **the NOVA process**



Printed Circuit Boards Assemblies (PCBAs)

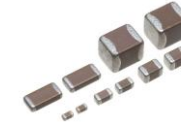


Integrated circuit



Au, Cu, Si

Multilayer ceramic capacitor (MLCCs)



Pd, Ag, Ni

Tantalum and niobium capacitor



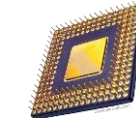
Ta, Nb

Vibration motor (mobile phone and smartphone)



Nd

Central Processing Unit (CPU)



Au, Cu, Si

Printed Circuit Board (PCB)



Cu

Solders



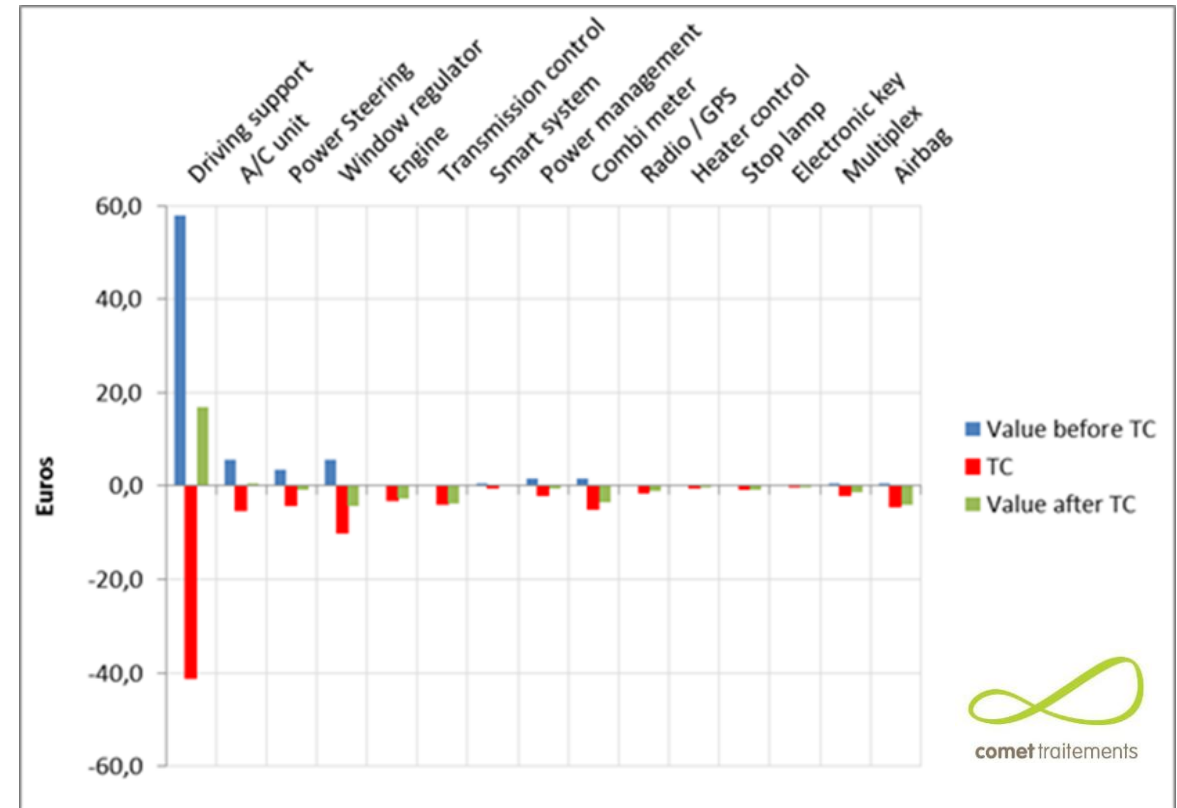
Sn, Ag, Pb

Getting a hand at PCBAs

Dismantling is not always economical.

- Depends on
 - Dismantling cost
 - PMs grades
 - Current metal prices
 - ...

If not, PCBs are collected after ELVs and WEEE shredding



From 15 Electronic Control Units (ECU) of the Toyota Prius Plug-in, only 2 could be dismantled economically (*Comet Traitements*).

Recycling PCBAs

Computers - Smartphone

CRT and LCD TVs

ELVs

Dismantling / Shredding / No pretreatment

*Based on
economic
evaluation*

High-grade
PCBAs

Mid-grade
PCBAs

Low-grade
PCBAs

Pyrometallurgy
Smelter

Exported outside EU -
Sub-economic for direct smelting

Recycling PCBAs

Computers - Smartphone

CRT and LCD TVs

ELVs

Dismantling / Shredding / No pretreatment

*Based on
economic
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High-grade
PCBAs

Mid-grade
PCBAs

Low-grade
PCBAs

Pyrometallurgy
Smelter

NOVA process

Reverse
Metallurgy

LIÈGE
université

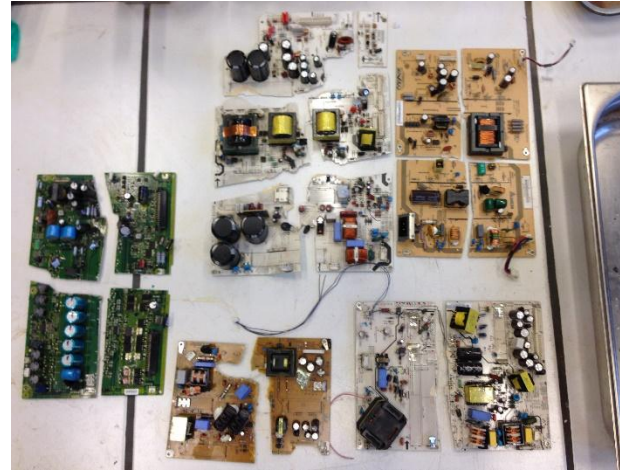
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The NOVA process

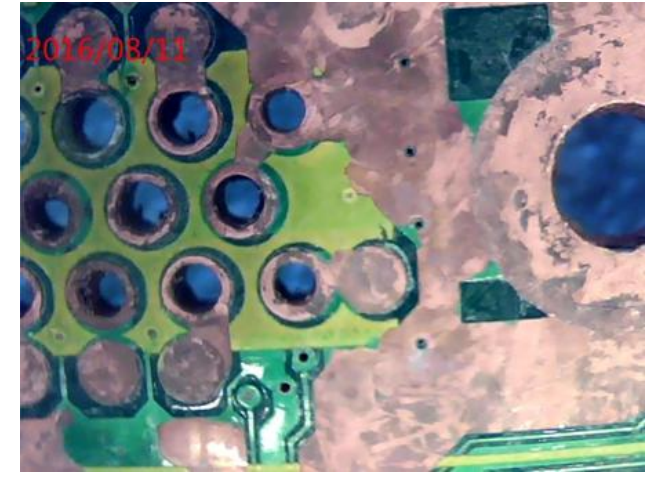
Aims at unlocking the value of PMs, tin and copper by electrochemistry and mechanical activation



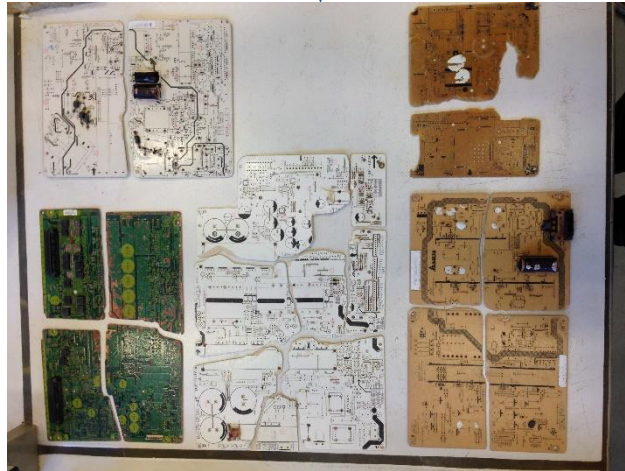
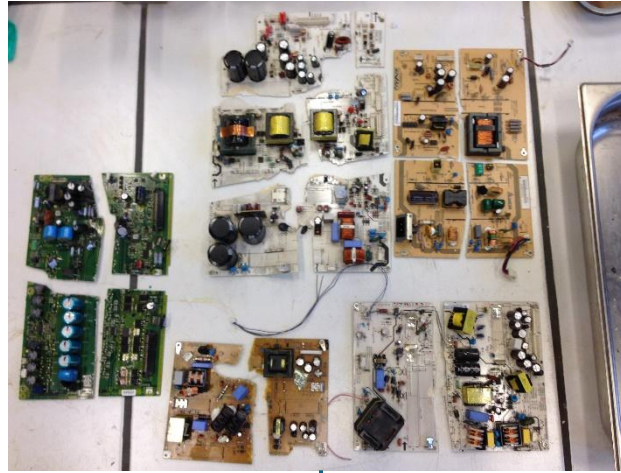
Before



After



The NOVA process



Depopulated PCBs



Electronic components



Sn concentrate

The NOVA process

2016

3 kg/batch

2017

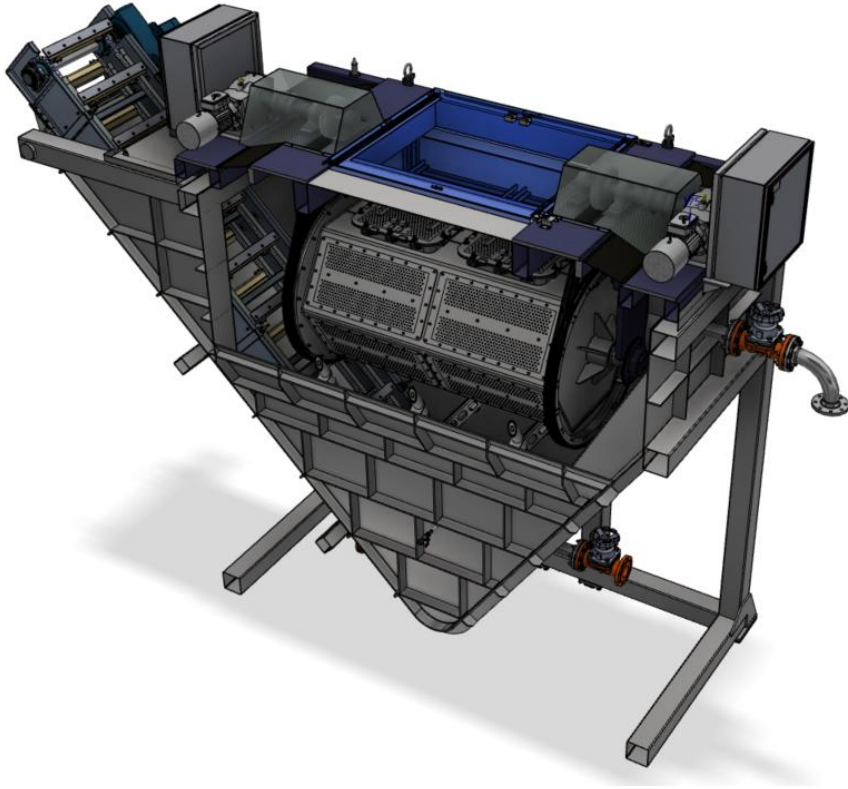
15 kg/batch

2024

150 to 400 kg/batch



PEACOC project and upscaling of NOVA



NOVA process – Where is the added value?

PCBAs from LCD TVs

NOVA process

Depopulated PCBs
(53% mass)



	<i>Metal distr. (%)</i>
Ag	14%
Au	5%
Pd	14%
Sn	3%

Electronic components
(44% mass)



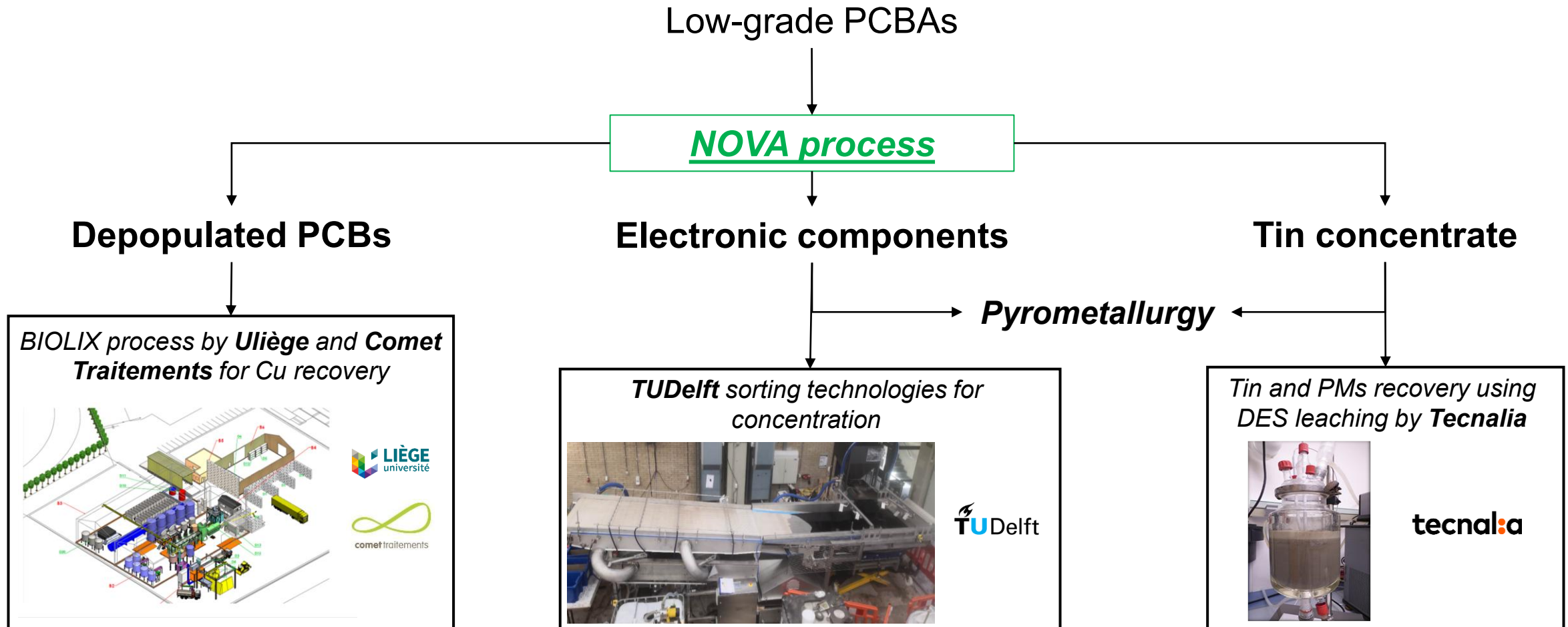
	<i>Metal distr. (%)</i>
Ag	59%
Au	94%
Pd	85%
Sn	35%

Tin concentrate
(3% mass)



	<i>Metal distr. (%)</i>
Ag	27%
Au	1%
Pd	1%
Sn	62%

The NOVA process applied to PCBAs



Thank you for your attention!