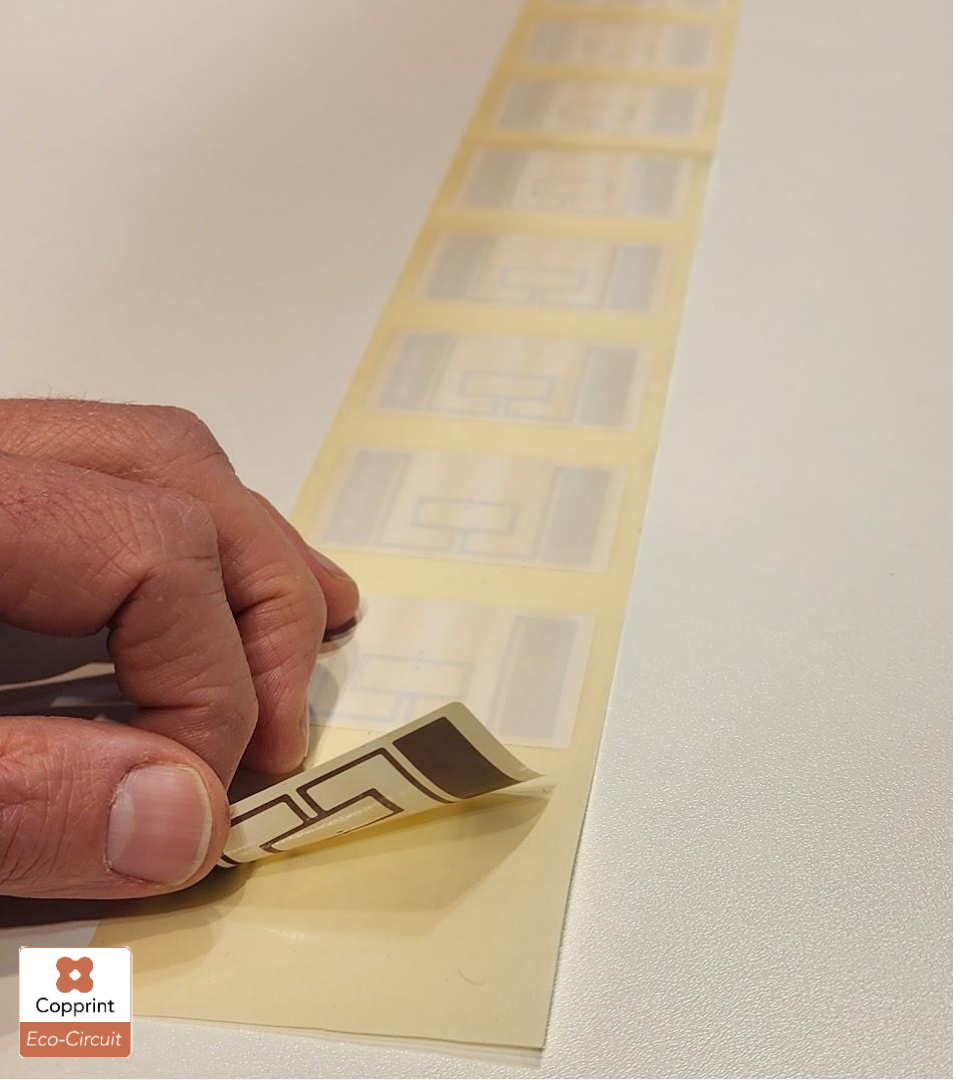


Copprint

Compostable printable RFID antennas for sustainable smart packaging

Dr. Ofer Shochet, CEO & Co-founder

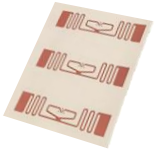
Improving CO_2 emissions
Cutting costs
Compostable and recyclable
Manufacture anywhere

Copprint: Transforming the foundation of conductive patterns

Founded in Israel
2016

Strong granted IP and trade-secrets

5000X manufacturing scaleup completed



Enabling compostable RFID antennas:
Copper on paper

Multi-ton production capacity

Disrupting PCB manufacturing:
Additive manufacturing of PCBs

Top strategic investors

Henkel hp TATSUTA

Transforming the PV industry from scarce/expensive Silver to Copper

Financially stable
Excellent traction and Significant pipeline

Global recognition

Copprint

logitech 2023 FUTURE POSITIVE CHALLENGE DISTINGUISHED HONOR

2024 GLOBAL CLEANTECH100 COMPANY

EDISON AWARDS GOLD

2025 GLOBAL CLEANTECH100

DEEP TECH PIONEERS

CLIMATE SOLUTIONS PRIZE

FOUNDERS GAMES

SET100 List

LOPEC

Winner of the LOPEC 2022 Start-up Forum Award Best Business Case

2023 GLOBAL CLEANTECH100 COMPANY

IDTechEx Printed Electronics AWARDS

RFIDs: Billions → Trillions

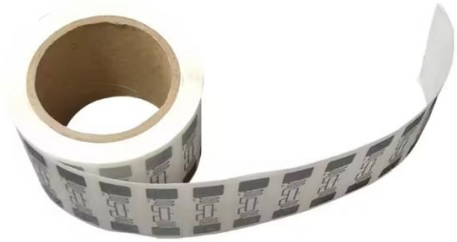
NEWS

RAIN Alliance Report Finds 2024 Tags Sales Approached 53 Billion

Published: March 4, 2025 Author: Claire Swedberg

RFIDs are bridging the physical and digital world

- ~53 Billion units in 2024
- 20-30% CAGR in recent years
- Significant benefit for supply chain management and goods sustainability
- It is expected to be on every package



Copprint

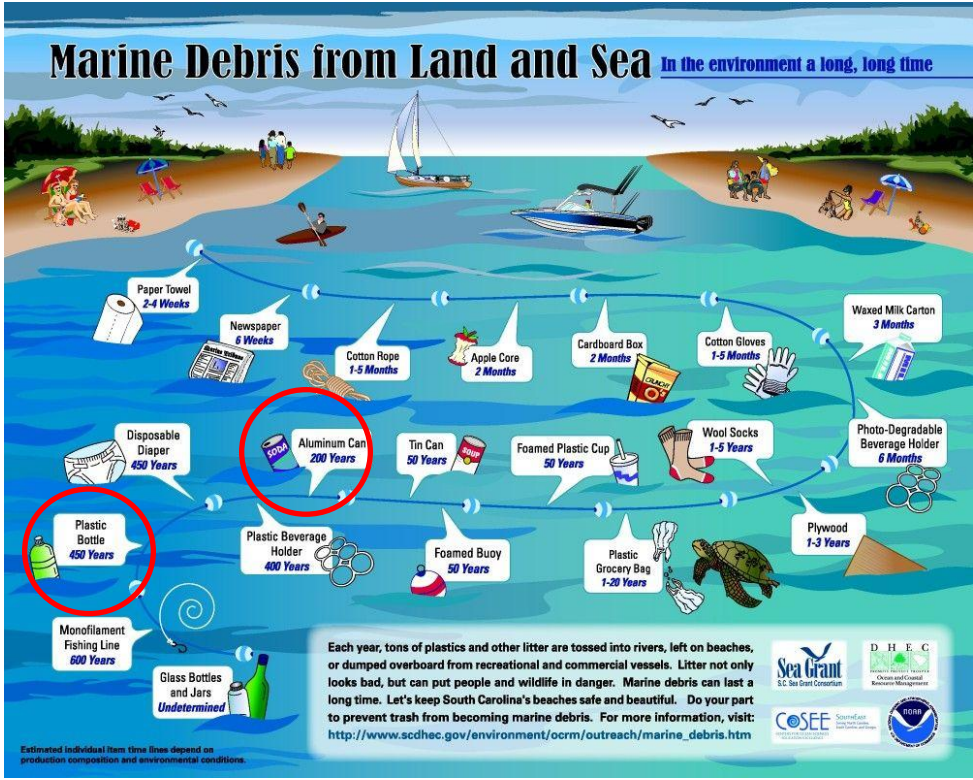
PROPRIETARY and CONFIDENTIAL

However – today's RFID are not environmentally friendly

Almost all RFID tags are made from Aluminum

Most RFID tags are made with PET plastics

Most RFID tags are made using a polluting chemical etching process



Copprint

PROPRIETARY and CONFIDENTIAL

RFID’s aluminum impact

- 53 Billion Aluminum RFIDs are equivalent to >2000 Tons Aluminum/year
- And equivalent to trashing 150 Million aluminum soda cans!
- In less than 10 years, this will be equivalent to trashing **1 Billion aluminum soda cans**.

Copprint

RFID’s PET impact

- 53 Billion Aluminum RFIDs are equivalent to >8000 Tons PET/year
- And equivalent to trashing >400 Million plastic bottles!
- In less than 10 years, this will be equivalent to trashing more than
- **1 Billion plastic bottles**.

Copprint

Zooming in on RFID production

UHF RFIDs are the simplest circuit board:

An antenna (one-sided PCB) and a single chip

RFID tags are usually laminated paper labels containing:

A Tiny Chip

Conductive adhesives – connecting the chip to the antenna

An Antenna

Adhesives – connecting the RFID antenna to the label

Copprint

PROPRIETARY and CONFIDENTIAL

RFID tags' Sustainability

- Chip – very small e.g. 125um x 250um in size – minimal impact on waste
- Conductive adhesive – sub-micro-gram level: minimal impact on waste
- Adhesive – environmentally friendly adhesives are available
- Antenna – the Achilles heel of RFID sustainability
    - Size cannot be reduced (frequency dependent)
    - High conductivity is needed -> metallic element
    - Today, most antennas are from Aluminum and echo-enemy PET

Copprint

PROPRIETARY and CONFIDENTIAL

The Antenna – the Achilles heel of RFID sustainability

- The conductive pattern – choosing the right metal
  - Copper
  - Aluminum
  - Silver
- The process of forming the conductive pattern
- The substrate

Copprint

PROPRIETARY and CONFIDENTIAL

Choosing the antenna metal: Copper/Silver/Aluminum

	Copper	Aluminum	Silver
Carbone footprint ($kgCO_2/kg$)	4	15	155

- Carbone footprint of the metals
- How much metal is used – the less the better
  - When printing very high conductive ink, ~6mg of metal
  - Standard etched antennas / cut antennas will have 20-50 mg
- Environmental and Health Impact
  - Is it a standard part of the human diet?
    - Copper is an essential ingredient to humans. About 1.5mg of Copper must be consumed per day (RDAs).
  - What is the environmental impact of these metals if they get into our water source
    - EPA recommendation – the maximum amount in drinking water (mg) – **Copper 1.0** ; Aluminum 0.05–0.2 ; Silver 0.1
    - Single RFID antenna Copper is equivalent to the amount of copper in 20 Oysters or ½kg of Kale or the amount of copper in the water of a single toilet water flush

Copper OUTPERFORMS!!!

Copprint

PROPRIETARY and CONFIDENTIAL

Making the antennas' Conductive Pattern

Subtractive Manufacturing

Copper/aluminum Etching – extremely high CO2 emmision

Aluminum Die Cutting

Material Waste / Hazardous / Limited Substrates

Subtractive Conductive Pattern + Material Waste

Additive Manufacturing (Printing)

Silver Inks (~$5B Mkt) Expensive / Hazardous

Copprint's Ink – the best alternative!

Additive Printing Conductive Pattern Only

Copprint

The substrate – paper vs. Plastic

- It is obvious that a paper substrate is superior to PET in terms of sustainability.
- Paper is also cheaper
- Of course PET is very important in terms of its durability but there are enough paper substrate that are durable enough for many applications

Biodegradability and Minimal Residual Waste

PET lasts forever in a landfill even if it breaks down to a molecule it is still PET. Biodegradable paper is decomposed by microbes and other natural processes into smaller molecules like water and carbon dioxide. Biodegradable FSC® (Forest Stewardship Council®) certified paper is recommended.

Additional R&D needs to be done on reducing the residual waste from the (mostly inorganic) components that remain after decomposition and/ or recycl. This will be accomplished by reducing the size and therefore the mass of the antenna and chip, for example.

Copprint

PROPRIETARY and CONFIDENTIAL

Sustainability & Cost

Substrate	Conductive metal	Extra layers	Chip attach	Design limitation and HF	Additional comments
PET	Etched Aluminum	Adhesive	DDA	Minimal design limitation HF is expensive	High CO_2e
Paper	Etched Aluminum	Coating + Adhesive	DDA	Minimal design limitation HF is expensive	High CO_2e
Paper	Die cut aluminum (low res)	Adhesive	PET Straps	Many designs are not possible	Cheap antennas and expensive additional PET Strap attach process
Paper	Die cut/laser (high res)	Adhesive	DDA	Higher cost process Not suitable for fine details.	
Paper	Silver printing	No adhesive	DDA	HF is possible	Expensive
Paper ✓	Copper printing ✓	No adhesive ✓	DDA ✓	No design limitations HF is inexpensive	**Cheapest and most sustainable** ,double side printing + additional components

Copprint

PROPRIETARY and CONFIDENTIAL

Compostability comparison - 30 days in a home composter

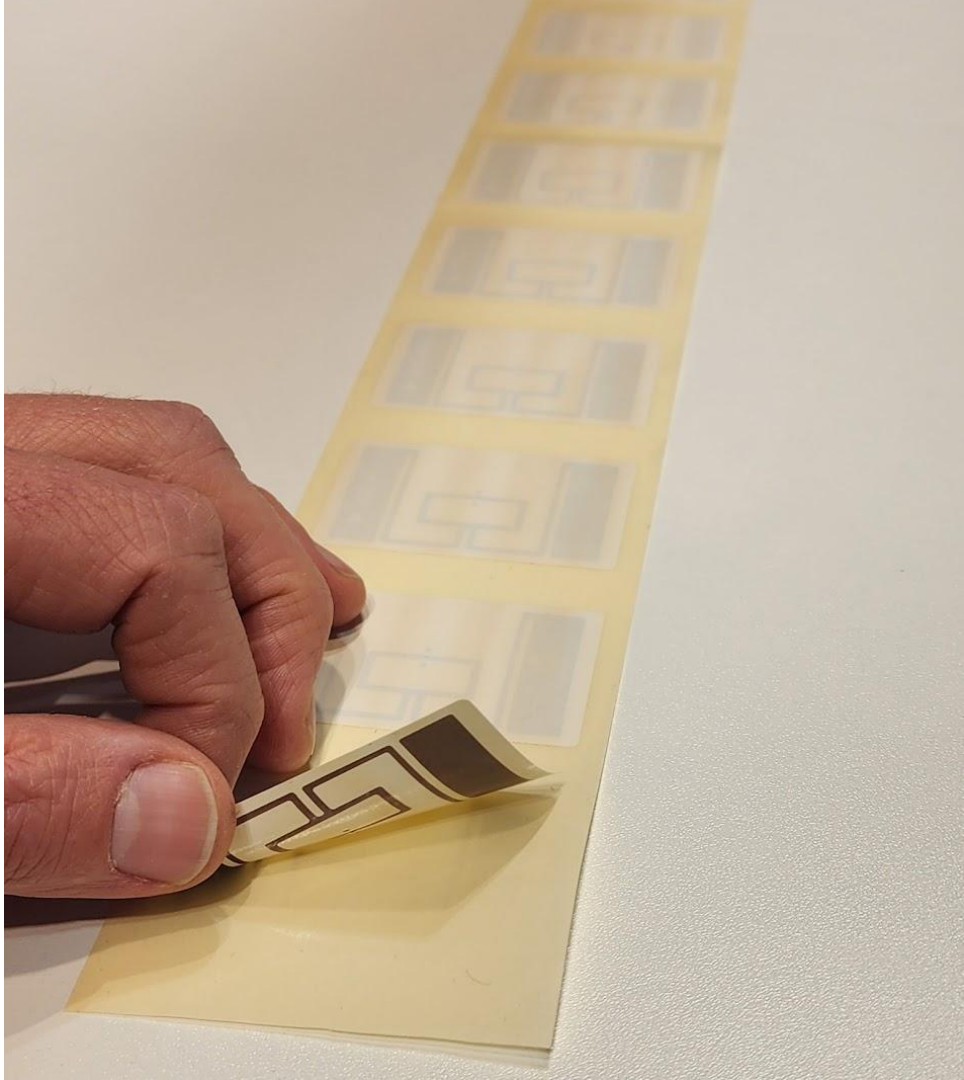
Antenna type	Before test	After 30 days in a home composter	
Aluminum on PET			No change
Aluminum on paper			Paper decomposes Aluminum – no change
Copprint			**Decomposes**

Copprint

PROPRIETARY and CONFIDENTIAL

Printed copper RFIDs - Spain

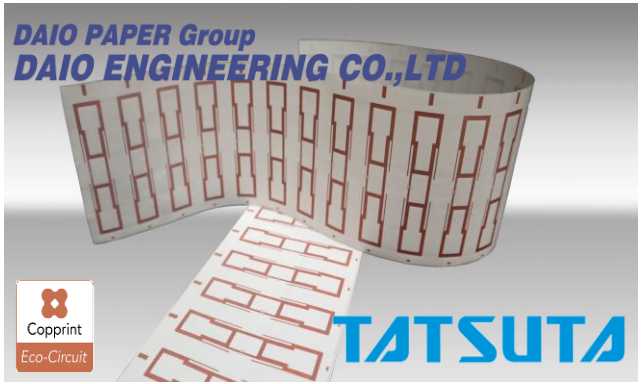
- 2024 - First 1M tags made by a Spanish company and delivered to their customer.
- Based on the Muhlbauer APS



Copprint

Printed copper RFIDs - Japan

- Daio Engineering (subsidiary of the largest Japanese paper company) announced their Nano Cu RFIDs
- OSRFID from China announced eco RFIDs (based on Tatsuta prints).
- Major Japanese company demonstrated printed Cu RFID in Tokyo

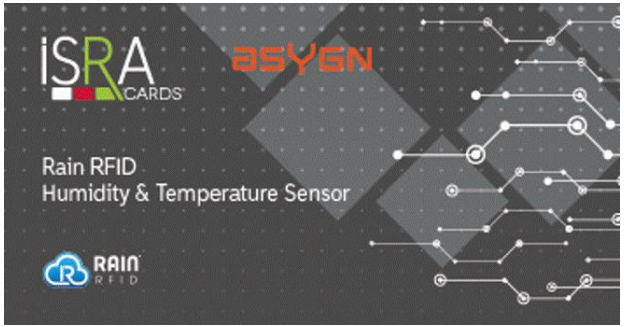


Copprint

PROPRIETARY and CONFIDENTIAL

Printed copper RFIDs - France

ISRA Cards (France) announced recently temperature & humidity RFIDs based on Copprint's ink



Copprint

PROPRIETARY and CONFIDENTIAL

Muhlbauer APS tailored to Copprint ink

Industrial Scale R2R Antenna Printing Solution

Muhlbauer is the largest equipment provider for RFID chip attachment systems

2024: completed the development of the Antenna Printing Solution APS:

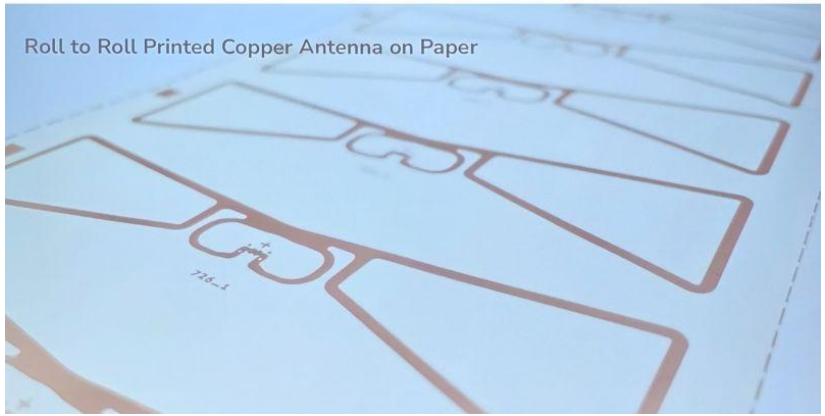
Tailored for Copprint ink

High-speed turnkey solution

Copprint

Key benefit of printed antennas

- Local manufacturing: Made in USA / Made in EU antennas
- Biodegradable and Compostable
- No Aluminum Tariffs
- Excellent for grocery applications



Copprint

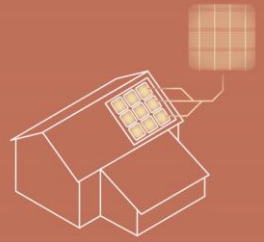
Copprint conductive copper, everywhere

- ✓ Proven & protected technology
- ✓ Adoption by top customers
- ✓ Lower costs & sustainable
- ✓ Make the switch to compostable RFID tags

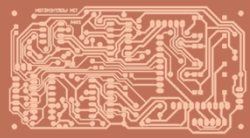
info@copprint.com

Copprint

on every roof…

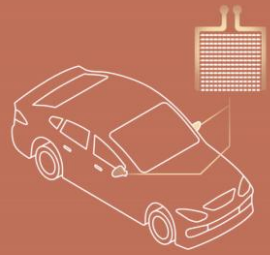


in every circuit board…



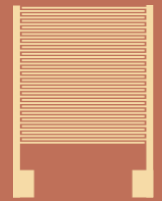
on every tag…

in every car…



in every device…

in every IOT sensor…



Copprint's Green printed electronics

Enabling sustainable RFID antennas and green (compostable) electrical circuits

2030 world market 1 Trillion RFID antennas:

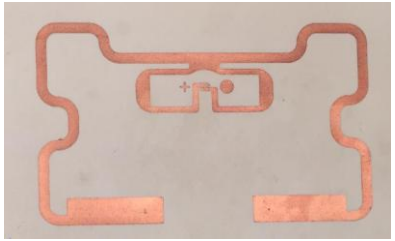
COPPRINT ANTENNAS	EXISTING ANTENNAS
Compostable antennas	Eco-enemy!!! Equivalent to the disposal of Billions of PET bottles and Aluminum cans.

https://youtu.be/obncn1XtWLU

Design for cost: intuition

- Etching vs Printing
  - Cost pf process
  - Cost of raw material

- Etching – cost depends on tag bounding box area -– prefer to etch as little as possible
- Printing – cost depends on ink coverage – proportional to the antenna footprint



Area = 4.9x3 = 14.4 cm^2
Ink coverage = 3.5 cm^2

Area = 6.8 x 1.4 = 9.5 cm^2
Ink coverage = 4.42 cm^2

Area = 6.8 x 1.4 = 9.5 cm^2
Ink coverage = 2.5 cm^2

Copprint

PROPRIETARY and CONFIDENTIAL