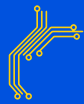


What's Printed Electronic?

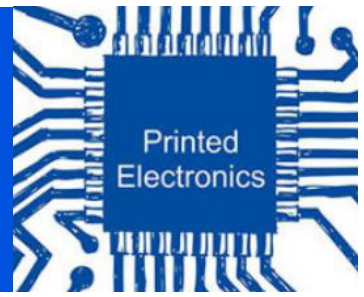


Printed electronics is a process to create the conductive line on the flexible substrates by printing process.

Normally, we can use many kinds of printing technology to print the printed electronic ink, such as screen printing, flexography, gravure, offset, and inkjet.

Nowadays, the market requirements are required the electronic devices lighter,

more slim, more flexible and integrate touch control function. So, the printed electronic are increase more and more and used in many industries for various applications.










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Printed Electronic Technology

The Benefits of Printed Electronic

-  **Attractive** and flexible designs
-  **Light weight** and space-saving
-  **Easy to integrate** into multiple applications
-  **Improve touch function**
-  **Durable** parts
-  **Cost-effective** manufacturing processes
-  **Less assembly** and reduce quantity of moving parts

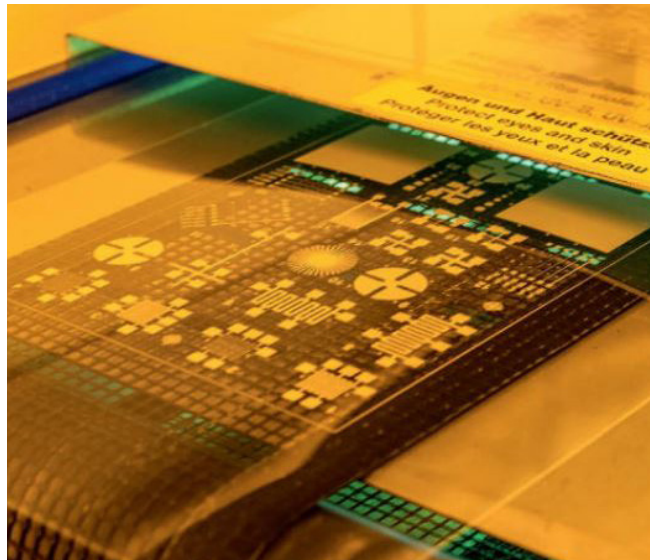
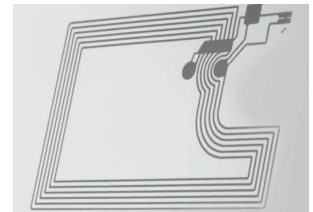


Image Source : Elantas

RFID antennas

Printed RFID antenna is already used in many devices, including smart cards for payment, transportation tools or access control, smart supply chains and logistics. It can also be used as a part of various sensors systems for tracking the goods during the manufacture, transportation and storage condition.

The printed antennas use for data transmission applications e.g. send and receive the data between RFID tags and readers



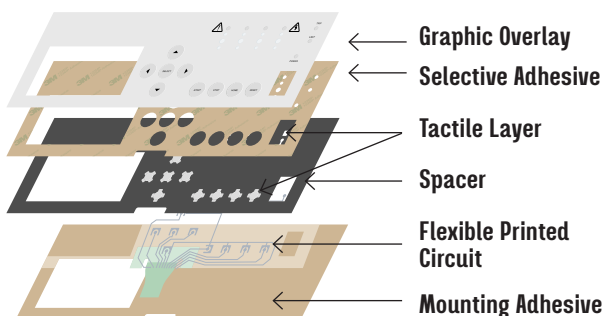
Where can printed electronics be applied?

Printed Electronics has a wide range of applications, from consumer electronics to medical devices to industrial sensors. One example is flexible displays, which can be used in everything from e-readers to wearable

devices. Printed Electronics can also be used to create sensors and transmitters that can be integrated into clothing to monitor heart rate, track movement, and measure other health-related data.

Membrane switches

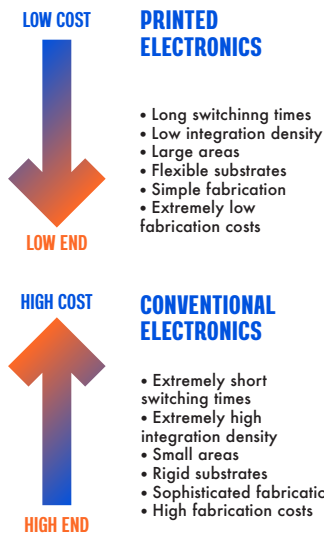
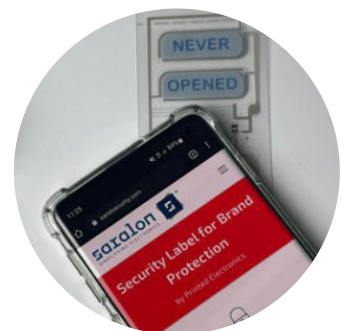
The printed circuit of membrane switches is mostly use screen printing with conductive inks which are normally designed with silver or carbon conductive and insulation ink.



RFID Labels (Headlight RFID - Toll payment)



Smart packaging & Labels



While the printed electronic technology is growing very fast the researchers and companies who develop the conductive inks, material and machine are also continue to develop the best solution for each application.

Image Source : Intenza.Fitness@unsplash.com

In-Mold Electronics (IME)

This process will integrate the electronic circuit in injection molded parts.

Example.

- Automotive Interior parts >>>
 Control panel (OHPC), Door trim

- Automotive Exterior parts >>>
 Emblem – LIDAR transmission in autonomous vehicles or ADAS systems

If compare In-Mold Electronics (IME) with conventional process.

The printed electronic can produce the parts more thin and reduce weight of parts. (as photo below)

How It Was Done Before

Overhead Control Panel
 Traditional electronics assembly

- 45mm assembly depth
- 64 parts + PCBA
- 650g. weight

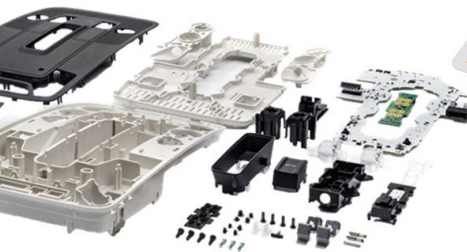
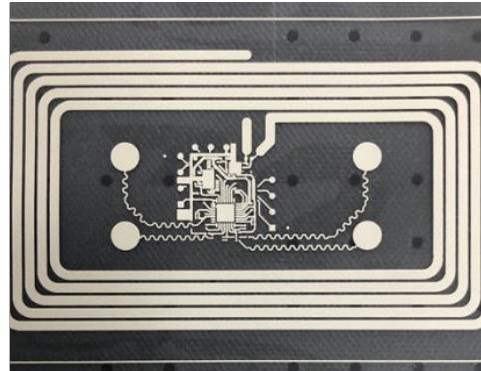


Image Source : TRACTOTEK



How It Is Done with Printed Electronic and In-mold Electronic Technology

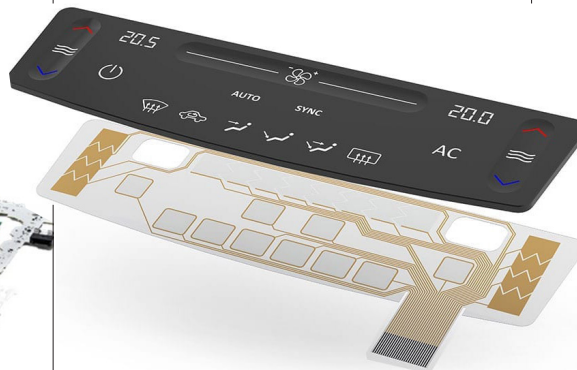
- 3mm molded material thickness
- 1 molded part + small PCBA
- 150g. weight



↑ Wearables (Health monitoring)

Capacitive Touch

Capacitive sensor technology is based upon the constant monitoring of the electrical capacity of the touch area, which is changed by a human finger. As the human body is an electrical conductor, touching the surface of the screen results in a distortion of the screen's electrostatic field.



Printed Sensors

Humidity, Temperature and Pressure, etc.

Electroluminescent (EL)

Luminous elements are known from many areas, e.g. the keypad lighting modules can be realized with printed electroluminescent surfaces or with LEDs on printed conductive silver tracks.

Photovoltaic cells (Solar cells)

The printed line in panel designed to take solar energy from the sun and convert it into electricity



Heating elements

Printed heating elements are found in many measuring and processing devices and also in other applications. In vehicles, these can even be integrated into textiles, for example as seat or steering wheel heating.

This requires that the sensors be heated directly on the sensor itself, and this is only possible with flat and flexible conducting tracks.

In conclusion, Printed Electronics is a promising technology that offers a range of benefits over traditional electronics. T.A.O. Bangkok Corporation Limited is one of the leading companies of printing inks, printing machines, and equipment for printed electronics, offering a range of solutions to meet different production needs.



T.A.O. Product solution for Printed Electronics

- 1 Screen Printing machine & Drying system
- 2 Screen printing Stencils & Squeegees
- 3 Printing Ink (Decorative ink & Printed Electronic ink)
- 4 Substrate (PC film, PET film)



The decorative on the product besides being beautiful It also *add values* and indicates *the identity of the brand*

As a result, the printing system plays a very important role today.

CAUSING MANUFACTURERS TO DEVELOP THE PRINTING PROCESS TO BE

- 1 convenient save costs
- 2 save time
- 3 reduce the use of consumables
- 4 safe for manufacturers and users
- 5 Importantly the design must be sharp
- 6 Beautiful colors

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Go Green Pad Printing

There are many different printing processes it depends on the selection to suit the work piece. The pad printing system is one of the most popular printing processes in various industries such as textile, apparel and footwear, electronic applications, automotive, baby products and medical equipment, etc.

The outstanding feature of the pad printing system,

in addition to being able to print on a variety of 3D-shaped materials,

THERE ARE OTHER ADVANTAGES.



- 1 low cost
- 2 high durability
- 3 small print size
- 4 space saving

most importantly, for lean process and environmentally friendly.



Image Source : unsplash.com / pexels.com



Environmentally friendly of the pad printing process

Nowadays, environmental protection campaigns are becoming the main concern for everyone as global warming, water and air pollution are affecting humanity. It is environmentally friendly as well.

In the process of pad printing, there are technologies that help to be safe for the environment and the health of workers in each aspect as follows.



- 1 Reduce plastic waste from the printing process



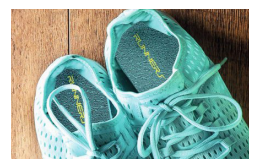
- 2 Reduce air pollution by a closed cup system

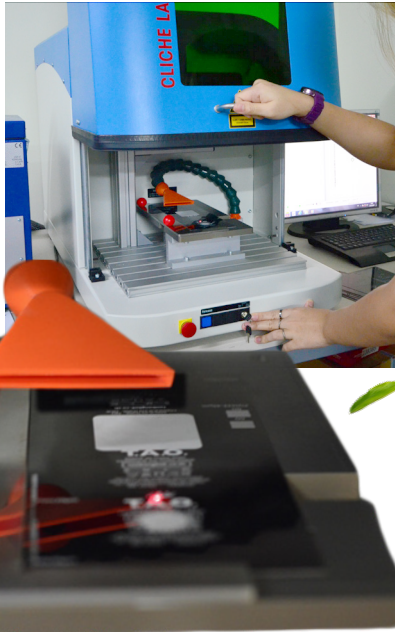
- 3 Reduce risk of hazardous chemicals from printing inks.

Reduce plastic waste from the printing process

Plastic waste is one of the contributors to global warming from the production process along to the sanitary landfill management process. Although there are efforts to reduce the use of plastic in all sides.

Printing and decoration is on products in many industries. Prepress is often used plastic film in the process before decorating on products such as stickers on electronic applications, vehicles, children's toys, heat transfer printing on textiles, apparels, shoes etc.





For pad printing process

it is a printing technology that can reduce the use of those plastics. Due to printing ink directly on various product materials. It also a hassle-free prepress process for plate making. In particular, the laser plate is made without use of plastics and chemicals. We can change the new design as needed within an hour. It saves a lot of time. This system is "Laser engraving".



Reduce air pollution by a closed cup system

In nowadays pad printing process, closed cup technology help to reduce solvent evaporation and odor in printing room. Not only significantly reduce health risk for operators, closed cup system also reduces VOC emission. Other advantages of the system includes, easy to control solvent filling, reduce frequency of solvent filling easy to clean and use less ink compared to other printing systems.

Reduce risk of hazardous chemicals from printing inks

Ink is the main component for the pad printing. Due to printing on different product materials, the adhesion properties of the inks directly affect to resistance of chemicals and abrasion. This provides quality and durability.

The manufacturers of pad printing ink must consider safety for operators, chemical requirements of each industry, environment.



That means pad printing ink in each industry must have appropriate chemical specifications that meet industry criteria, such as the ZDHC MRSLS that directive limiting all chemicals throughout the supply-chain for the textile and footwear industries, EN71-3 for the toys and baby products industry etc.

User-friendly and environmentally friendly solutions

Maqua® Pad MAP the water base ink that meets all the requirements of the textile and toy industries. and it has high safety standards for consumers which has advantages as follows

- 1 Nearly odourless
- 2 PAH Free
- 3 Halogen Free
- 4 Very low VOC values <10%, Standard solvent inks are approx. > 40%
- 5 Low level of solvent contamination
- 6 Less work safety measures required
- 7 None DG (dangerous goods)

Laser engraving is the computer to plate system. No chemicals and plastic film are required for plate engraving. It has the advantage of avoiding the use of chemicals, convenient and quick operation, and high accuracy that can print images as small as 0.04 mm.

T.A.O. provides sales and service for machines, equipment, including manufacturing laser plate engraving with this system from leading manufacturers such as Kent and Tampoprint.



Interested in more information please contact
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A powerful for change, connecting the global fashion industry

to enable sustainable chemical management.

- 1 Fashion is one of the polluting industries of the world.
- 2 ZDHC Manufacturing Restricted Substances List (ZDHC MRSL)
- 3 Environmental problems caused by the textile industry include.⁽¹⁾
- 4 Purpose of ZDHC MRSL
- 5 ZDHC MRSL Conformance level
- 6 How does T.A.O. attach importance to ZDHC MRSL?

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Zero Discharge of Hazardous Chemicals

Fashion is one of the polluting industries of the world.

The pollution produced by the textile industry

has a huge impact on the planet, and reasons are quite easy to understand. Clothes are probably the most common items that people buy in today's world, and the average number of clothes that an individual buys every year increased drastically in the recent years. ZDHC therefore plays a role in order to make the textile industry Clothing and shoes are aware of the reduction of pollution that will affect the environment.



ZDHC Manufacturing Restricted Substances List (ZDHC MRSL)

ZDHC MRSL is a list of chemical substances banned from intentional use during production

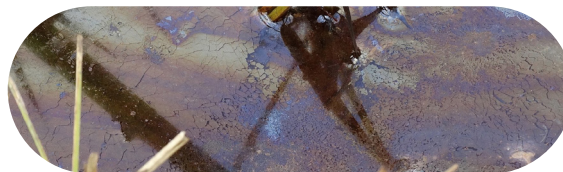
and related process within the supply chain of material used in textiles, apparel, and footwear industry. As the textile, apparel, footwear industry used more than 3,500 chemicals to produce materials to products. Chemicals used in the production of textiles, apparel and footwear pollutes water, air and produces large amounts of solid waste each year.

Image Source : unsplash.com / pexels.com



The main environmental problems caused by the textile industry include.

Water Pollution



The textile industry uses millions of gallons of water everyday. That's because to produce 1 kg of fabric, typically, 200 litres of water are consumed: washing the fiber, bleaching, dyeing and then cleaning the finished product.



Waste waters are not treated to remove pollutants before they are disposed in the environment.



20 percent of all fresh water pollution is made by textile treatment and dyeing.



The textile producing process are responsible for aquatic life toxicity.

Air Pollution



Apparel industry 10% of global carbon accounts for emissions



The second largest industrial polluter

air pollutants produced by textile industry include:



Nitrous Oxides and Sulphur Dioxide produced in the energy production stages;



Volatile Organic Components (VOCs) produced in coating, curing, drying, waste water treatment and chemical storage;



Aniline Vapours, carrier Hydrogen Sulphide, Chlorine and Chlorine Dioxide produced in dyeing and bleaching stages.

Solid Waste Pollution



The textile industry
**Produces lots
of solid waste**



**90 million items
of clothing
end up in landfills**



Waste ends up
in water bodies
**causing
environmental
issues**

The items of clothing end up in
landfills include:



Fiber lint, fiber
scraps, trimmings
and packaging
waste produced in
the fiber preparation



Wasted and retained
sludge in waste water
treatment



Flock, chemical and
dye containers used in
dyeing and finishing
of woven fabrics

This various kind of pollution
released in the environment by
the textile industry are becoming
dangerous, both for the planet and
for human being.

A new approach to the production,
consumption and disposal of apparel
has become absolutely necessary.



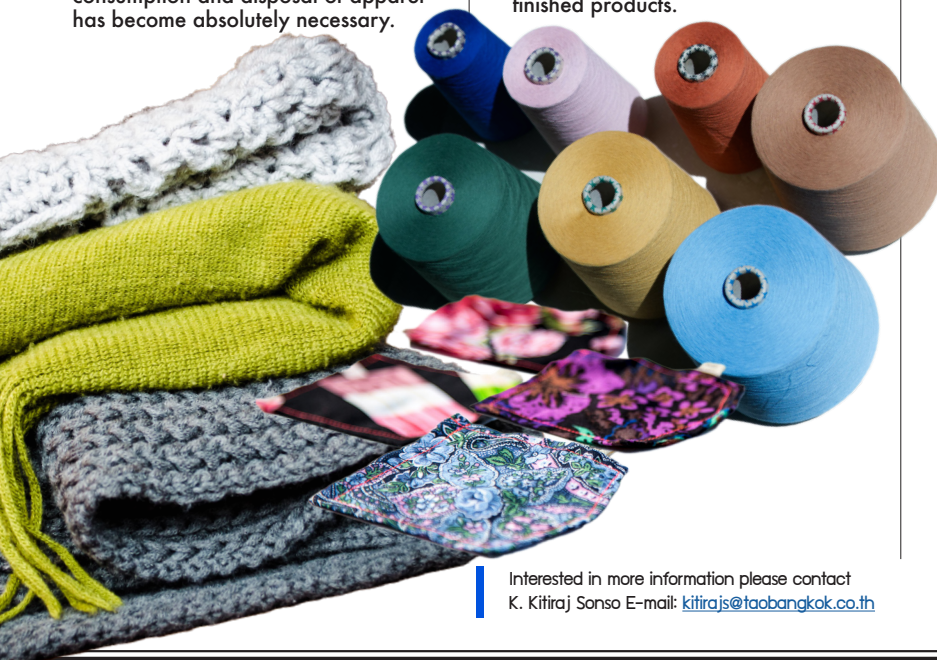
Purpose of ZDHC MRSL⁽²⁾

*The ZDHC MRSL offers brands and
suppliers a single, harmonised list
of chemical substances banned
from intentional use*

During manufacturing and related
processes in supply chains of the
textile, apparel, and footwear
(including leather, rubber and foam)
industries (the Industry).

Using chemical formulations that
conform to the ZDHC MRSL allows
suppliers to assure themselves,
and their customers, that banned
chemical substances are not
intentionally used during production
and manufacturing processes.

The ZDHC MRSL does not replace
legal or brand-specific restrictions on
harmful substances in materials or
finished products.



Interested in more information please contact
K. Kitiraj Sonso E-mail: kitirajs@taobangkok.co.th

ZDHC MRSL Conformance level

There are three levels of certification for
brands and suppliers that comply with the
ZDHC MRSL and must be verified by ZDHC's
3rd party certifier. Details of the three levels
of verification are as follows:

LEVEL 3:

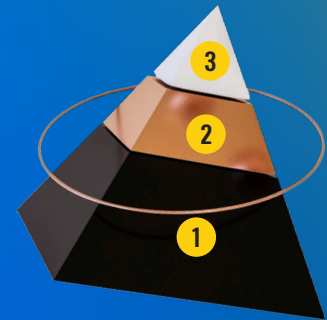
*Onsite assessment of chemical
hazard assessment capability.*

LEVEL 2:

*Onsite assessment of
management systems.*

LEVEL 1:

*Analytical testing, supported
screening and SDS review of relevant
MRSL substances information.*



How does T.A.O. attach importance to ZDHC MRSL?

T.A.O. Bangkok Corporation Limited as a service
provider for printing ink products for the textile industry,
we focus on selecting the most advanced products to
meet our customers' utmost satisfaction including to use
of fair business practices with good governance towards,
society in general and the environment.

Marabu is the printing inks brand chosen by T.A.O.
because it is a brand that has international certification
standards and specializes in the printing ink industry.
Printing ink sold to customers in the textile industry is pad
printing ink.

In the production process of apparels and shoes, there
are several applications to print pad printing on products,
such as information labels printing inside T-shirt, shirt, or
underwear. outside logo print or sockliner, etc.

Pad printing ink and auxiliary including cleaners that
contain chemicals, this is relevant to ZDHC's compliance
with prohibited chemicals. Therefore, Marabu, as
responsible ink manufacturer are working towards the
ZDHC MRSL level3 certification.

[1] [Impact of the Textile Industry on the Environment | greenofchange](#)
[2] <https://mrsl.roadmaptozero.com/>

Image Source : unsplash.com /