

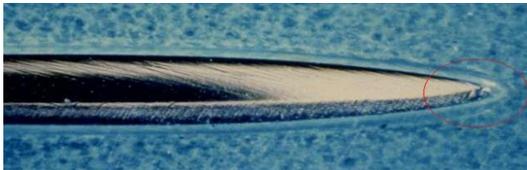
Parylene

A superior coating

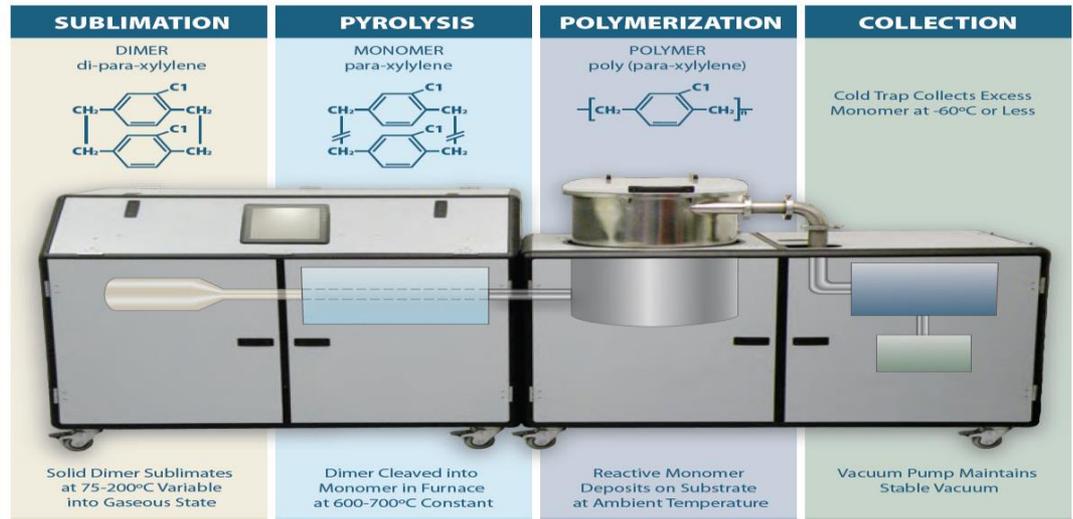


- ✓ A polymer coating superior to all other conventional coatings
- ✓ When reliability is your highest priority
- ✓ Chemical resistant
- ✓ Biocompatible
- ✓ Complete Surface Conformability
- ✓ Pore free, thickness 1-50µm

Parylene
on the tip of a pencil



Conventional coating



Parylene History

*"It is well known that huge investments made in technology during the exciting days of space exploration in the late 1960s through the 1970s led to unprecedented breakthroughs in many scientific and ancillary areas. One of the **latter was the use of a thin, vacuum-deposited polymer known as Parylene** to protect electronics assemblies and other components from the rigors of operation beyond the earth's atmosphere".*

The parylene film was isolated and qualified in the **late 1940s** by **Michael Mojzesz**, University of Manchester in England.

William Franklin Gorham, Union Carbide Corp. , proposed an industrial vapour deposition process to produce Parylene film.

In February 1965, Union Carbide announced the commercial availability of the new polymeric coating together with a unique vacuum method for film application.



Background

ParaTech Coating INC. CA USA



Est.. 1968 in California.

*License and material from Union Carbide
Cores, PCB for space and aviation.*

Union Carbide patent ends 1986.

Himont introduces Galxyl®

1988 exclusive distributor of Galxyl ®

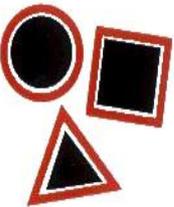
*Previously part owner of Paratech Scandinavia,
from 2015 co-operation, no ownership*



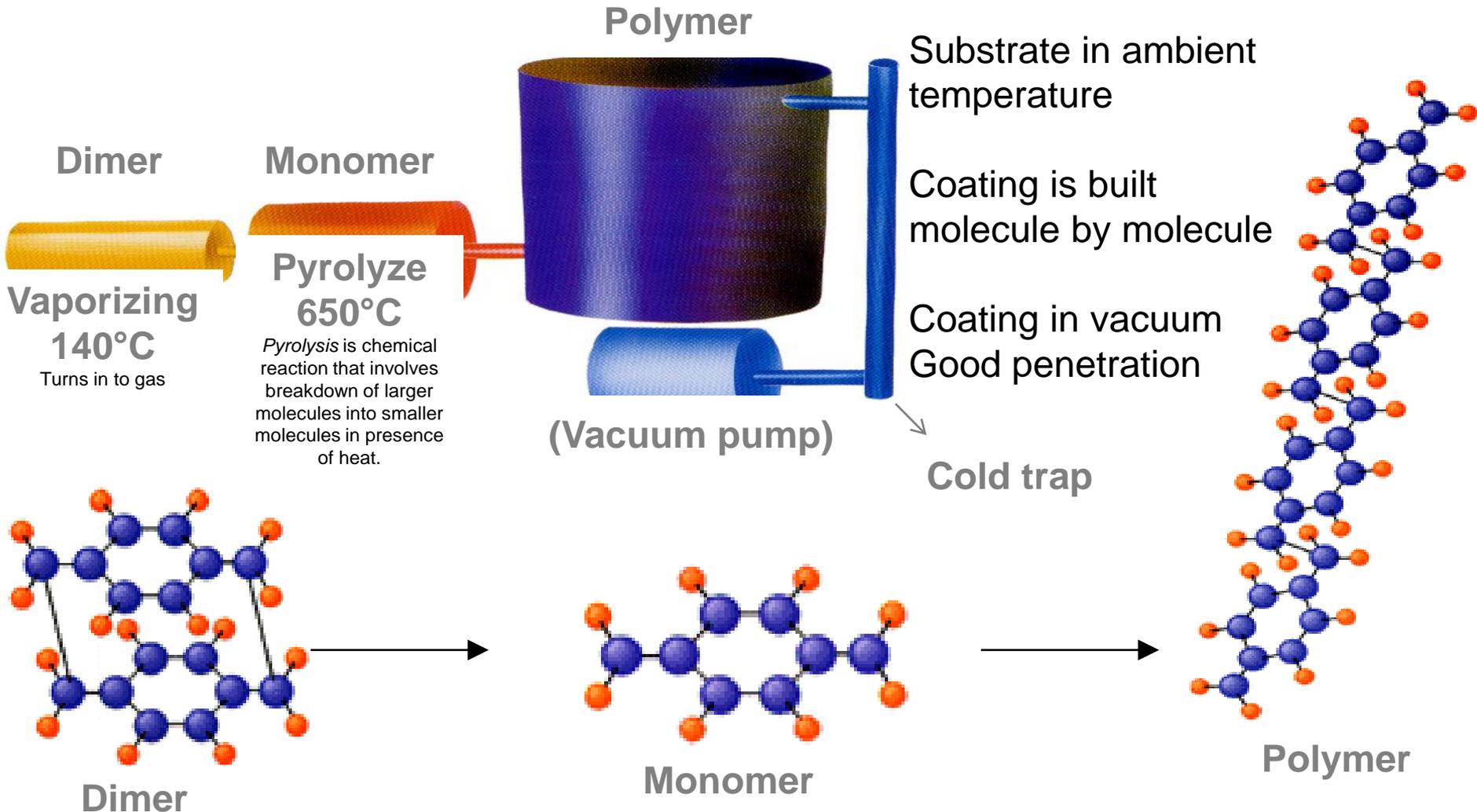
*Factory in Järfälla, outside of Stockholm Sweden.
In Sweden since 1999, today: 6 employees.
ESD protected production area (EPA)*

*Supplier of coating service, equipment, and raw material.
Until today supplier of coating service to over
400 customers in Europe.*

Owner and mother company HP Etch AB, Järfälla Sweden

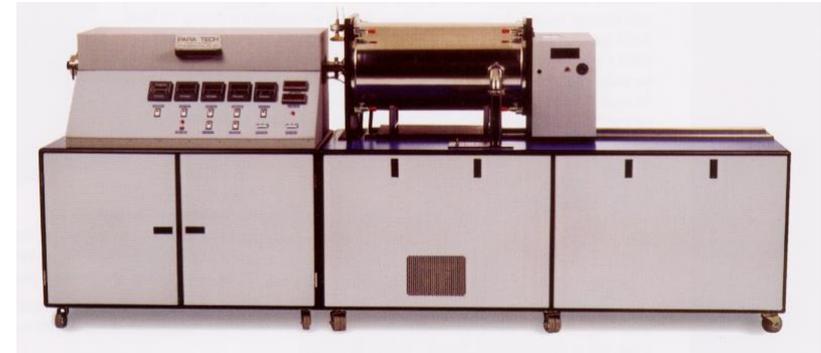


The Parylene Process

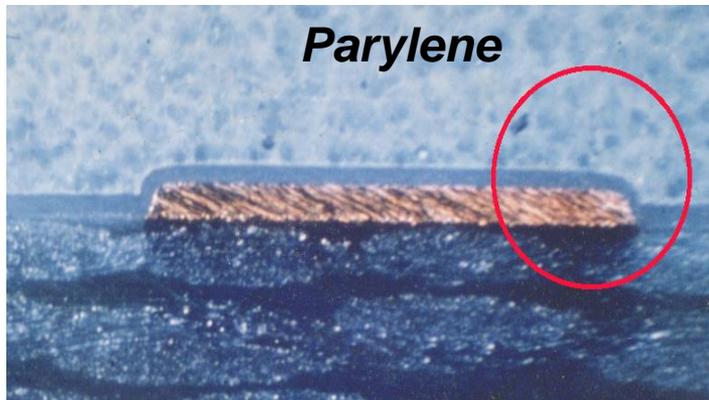
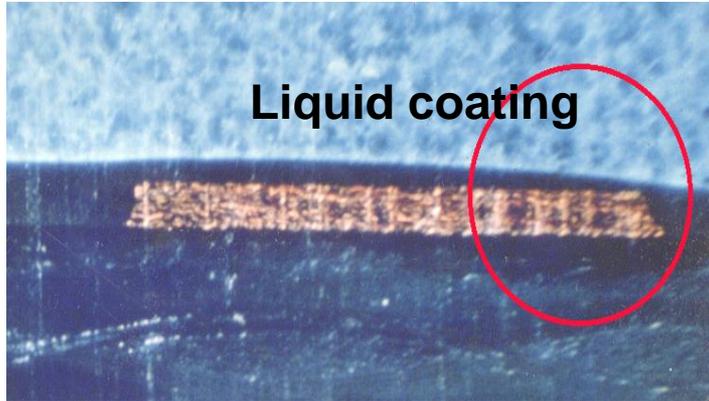


PTC Equipment

- *Service Coating*
- *Manufacturing, sales of equipment and parylene raw material*



Parylene Properties



- *Uniform and Pinhole Free*
- *Stress Free, Elastic*
- *Dielectric Strength (200V/μm)*
- *Wear Resistant*
- *Bio compatible*
- *Resistant to Chemicals and Solvents*
- *Good Protection from Moisture, Water and Gases*
- *No Contaminants or Solvents that Effects the Substrates During the Process*
- *Low weight*
- *Low friction*
- *Transparent - film of optical quality*
- *Particle retention*
- *Low out gassing*
- *Fungus and bacteria resistant*
- *Radiation Resistant*
- *Resists high and low temperatures (-200° to +200°C)*
- *RoHS Compliant*
- *MIL-I-46058C Approved*
- *USPXXII, Class VI Biocompatibility rating*
- *IPC-CC-830B Compliant*
- *FDA approval of parylene-coated devices is well documented*
- *UL approval*



Service Coating



Pacemaker

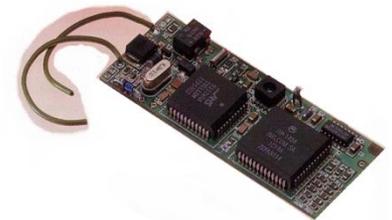
- *Outdoor Electronics*
- *Sensors in Hostile Conditions*
- *Space and Military Electronics for High Reliability*
- *Corrosion Protection of Metal Surfaces*

- *Bobbins*
- *Catheters*
- *Ferrite cores*
- *Flow meter components*
- *Relays*
- *Chemical Resistance for Rubber and Plastics*
- *Reducing friction on Rubber*

- *Semiconductors*
- *Transformers*
- *Thermistors*
- *Pacemakers*
- *Probes*
- *Electrical Isolation*
- *Wear Resistant Layer for Rubber Keypads*



Application examples



Coca cola machine

Conformal Coating Comparison

PROPERTY	PARYLENE	ACRYLIC	URETHANE	EPOXY	SILICONE
Uniform, very thin, conformal layer	E	G	G	G	G
Low stress, pin-hole free layer	E	M	M	M	M
Dielectric properties	E	G	M	M	VG
Physical strength	E	G	VG	VG	M
Flexibility	VG	M	VG	L	VG
Wear and abrasion resistance	E	M	VG	VG	L
Thermal coefficient of expansion	E	G	M	VG	L
Water absorption	E	G	G	VG	M
Chemical, solvents, fungus resistance	E	L	VG	VG	M
Barrier to moisture, gases, liquids	E	VG	G	VG	M
Adhesion to substrates	G	VG	G	VG	M
Repairability	G	VG	G	L	M
No contaminating ingredients	E	G	G	G	L
Particles immobilization	E	L	L	L	L

Ratings:

E = excellent

VG = very good

G = good

M = moderate

L = low

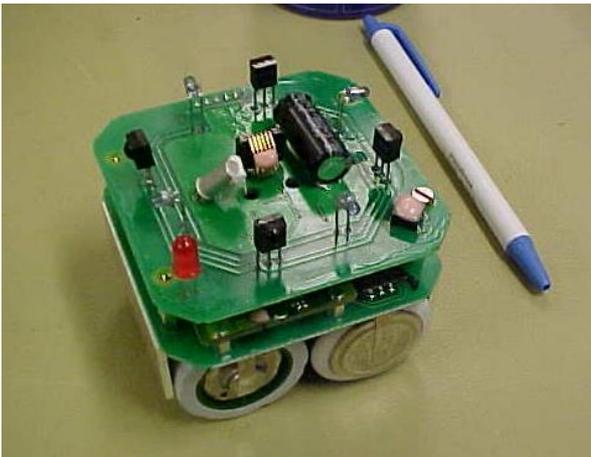
Application examples

GSM/SMS unit with motion detectors

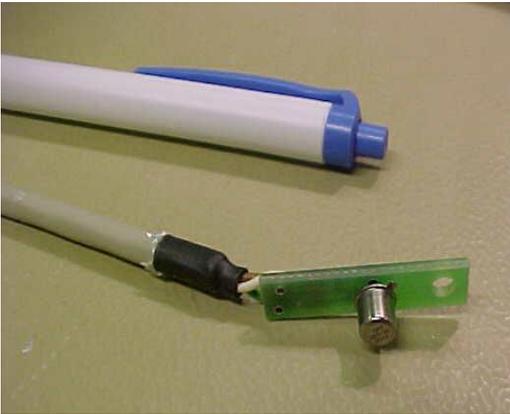


The unit is be mounted in a paper recycling bin without service for 3 years. When the first units was put into service several units had problems with humidity during rainstorms.

Because of a tight time schedule there was no time for a redesign so by parylene coating the complete unit the original design could be kept.



Application examples



Temperature sensor for a respirator air pump

The temperature sensor fitted to the cold drier got very wet due to condensation when operating in a humid environment. (East Asia)

To ensure a problem free operation all 3 temperature sensors in the compressor was parylene coated with 17μ of parylene C.

In volume since Year 2000.

Application examples



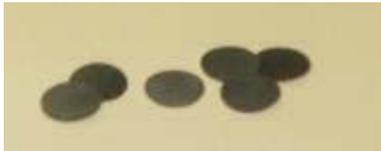
Inner sleeve for leg prosthesis

The inner sleeve for this leg prosthesis is made of a very sticky rubber material which made it almost impossible to slip the sleeve into position without lubrication.

With parylene coating on the outside no additional lubrication was needed



Application examples

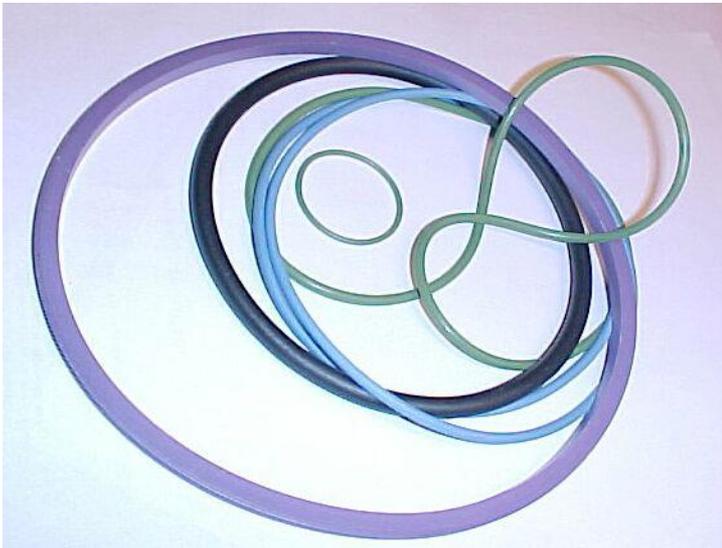


Valve membrane

A Viton valve membrane in a gas flow controller had problems with the viton sticking to the metal valve seat.

The sticking made the control of the gas flow less accurate.

A parylene coating of the viton cured the problem and gave the valve excellent characteristics.



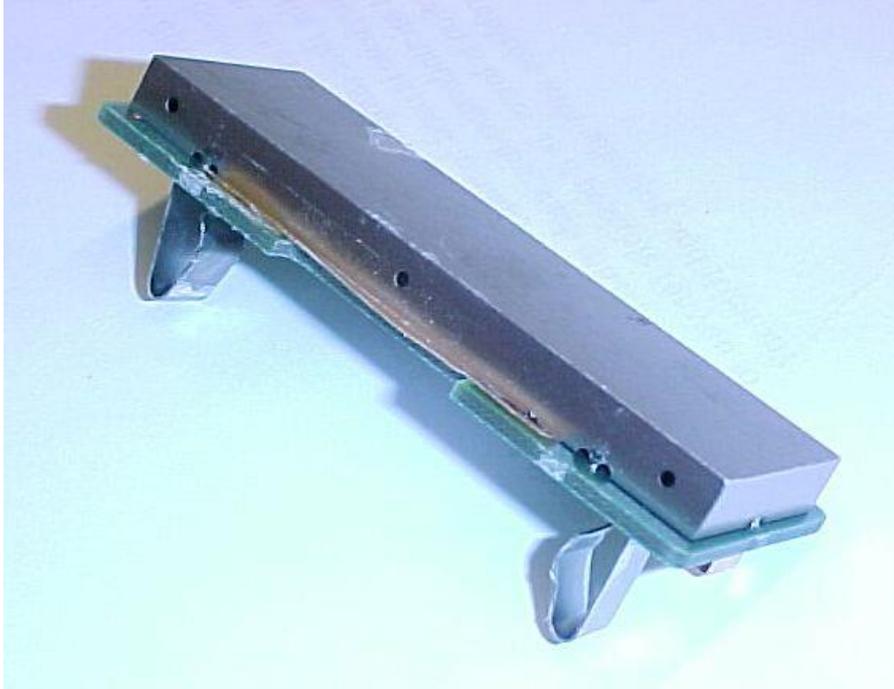
O-rings

O-rings has been Parylene coated for different reasons.

One is to **reduce friction** during assembly

Another is a need to **increase resistance to chemical attack.**

Application examples



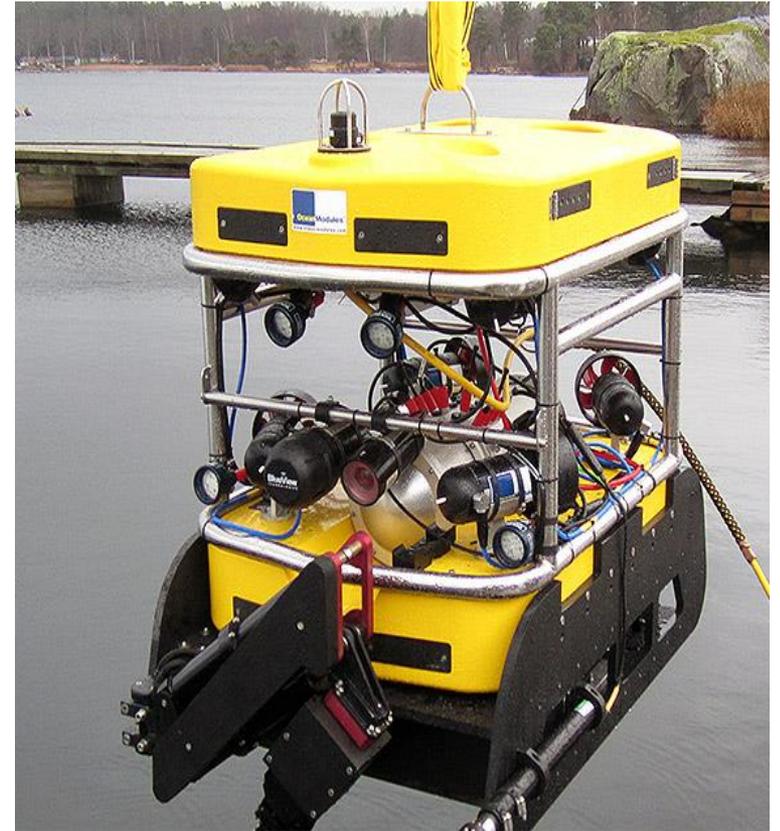
PCB with EMC shielding

A radio transmitter for very demanding outdoor use had to have the electronics protected from humidity. The electronics on the PCB is protected with a EMC-shielding.

Due to the parylene possibility to penetrate through small holes the thickness of the coating inside the EMC-shielding is approx. 90% of the outside thickness.

56 Kr/pcs, batch of 300

Sub marine motor electronic

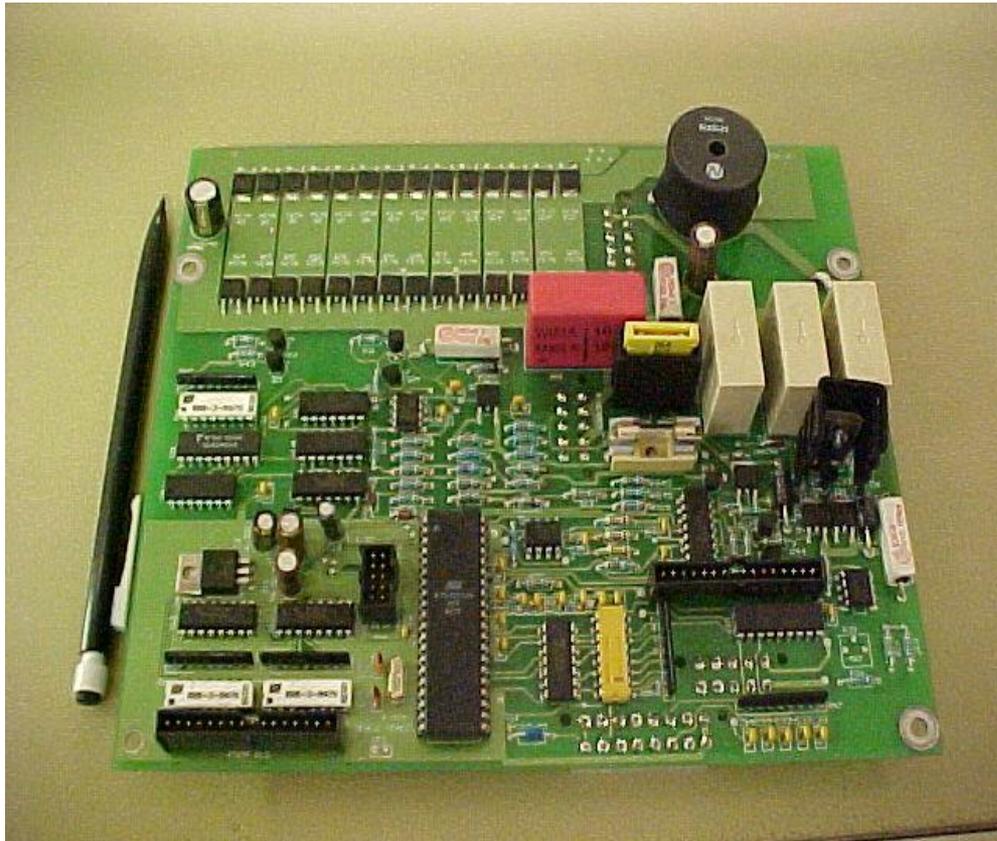


Cooling plate

This aluminium cooling plate is used in a device for biological cultivation



PCB for Cleaning Robot



This PCB is the control unit in a fully automatic cleaning robot for pig stables.

The environment is very harsh. Humidity and corrosive fumes from the manure attacks everything.

By Parylene coating the PCB operation is trouble free since 2003.

350 Kr/pcs, batch of 30-50

Diesel fuel tank optical level sensor

The plastic material in the sensor head could not withstand the diesel fuel.

By parylene coating the sensor head, the problem was solved



150 Kr/pcs, batch of 100-200
cable has to be masked

Power supply for portable concrete saw

This 24V power supply is used in a HF power supply for a portable concrete saw. Concrete mixed cooling water can reach the electronics which causes problems. The customer had tried potting compound to fill the whole power supply. This added weight, (which is critical for a portable machine) and limited heat transfer from the supply. And it was expensive!
By Parylene coating the power supply they can use a standard off the shelf supply in a very hostile environment



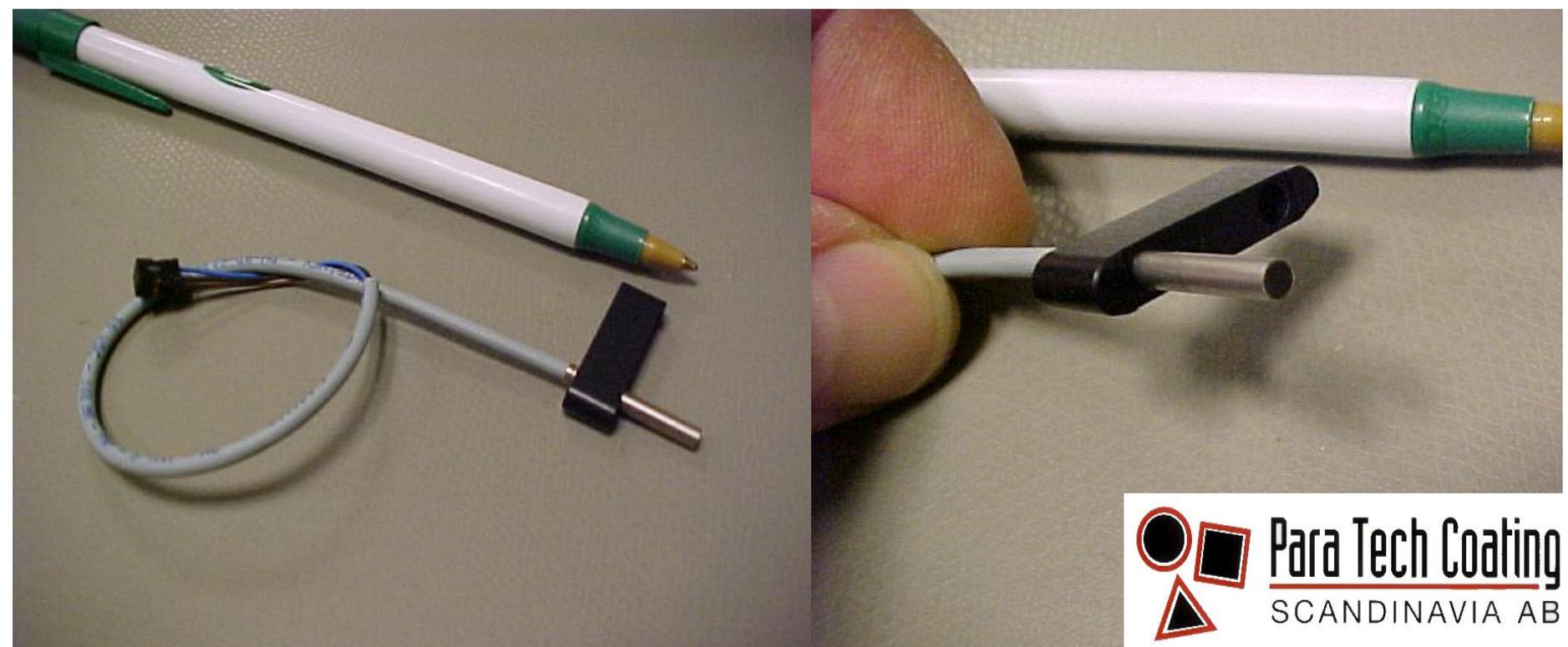
450 Kr/pcs, batch of 50

Position sensor in gear box

The tip of the position sensor is made of a plastic material that could not withstand the oil in the gearbox.

By using parylene coating the customer could still use their preferred sensor

60 Kr/pcs, batch of 300-500 cable has to be masked



Silicone rubber mebran, friction reduction

Silicone rubber is very sticky, making it hard during assembly or in contact with moving parts.

A 2 μ thin layer of parylene solves the problem by reducing the friction.

Parylene also protects from chemical attack.

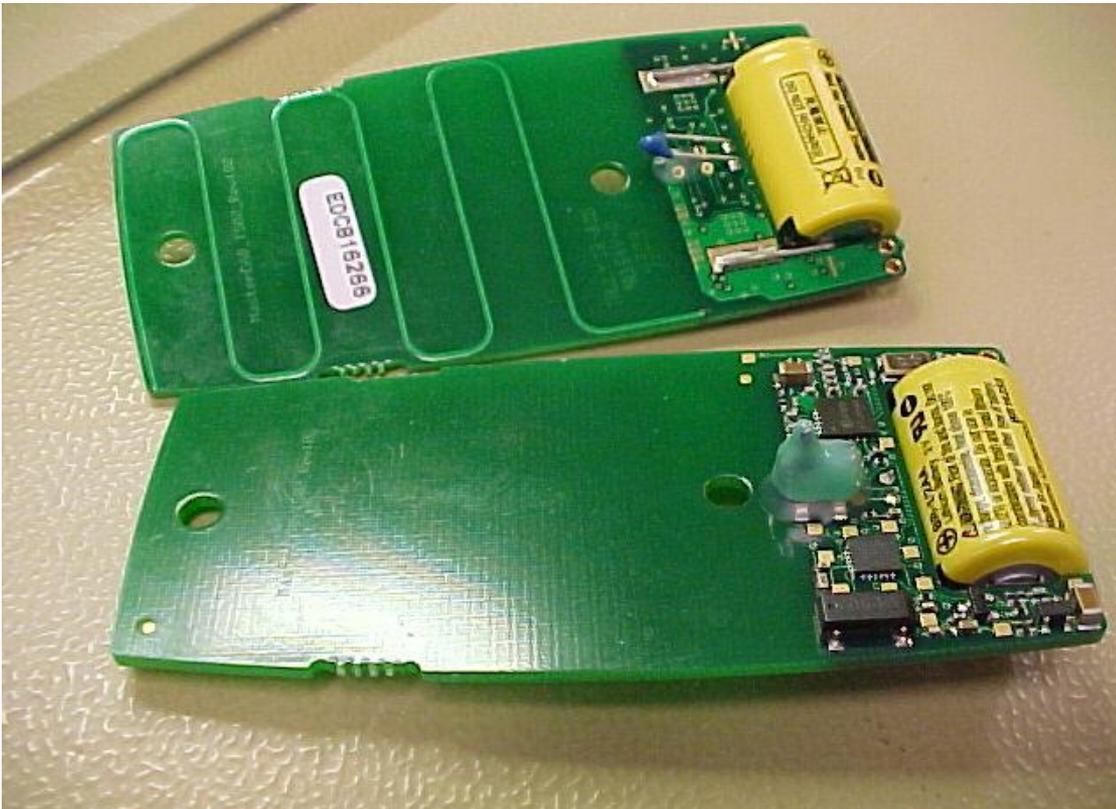


3 Kr/pcs, batch of 2000

Wireless stand alone water meter

This device is used to measure water consumption. It is a stand alone device which need no service for 5 years.

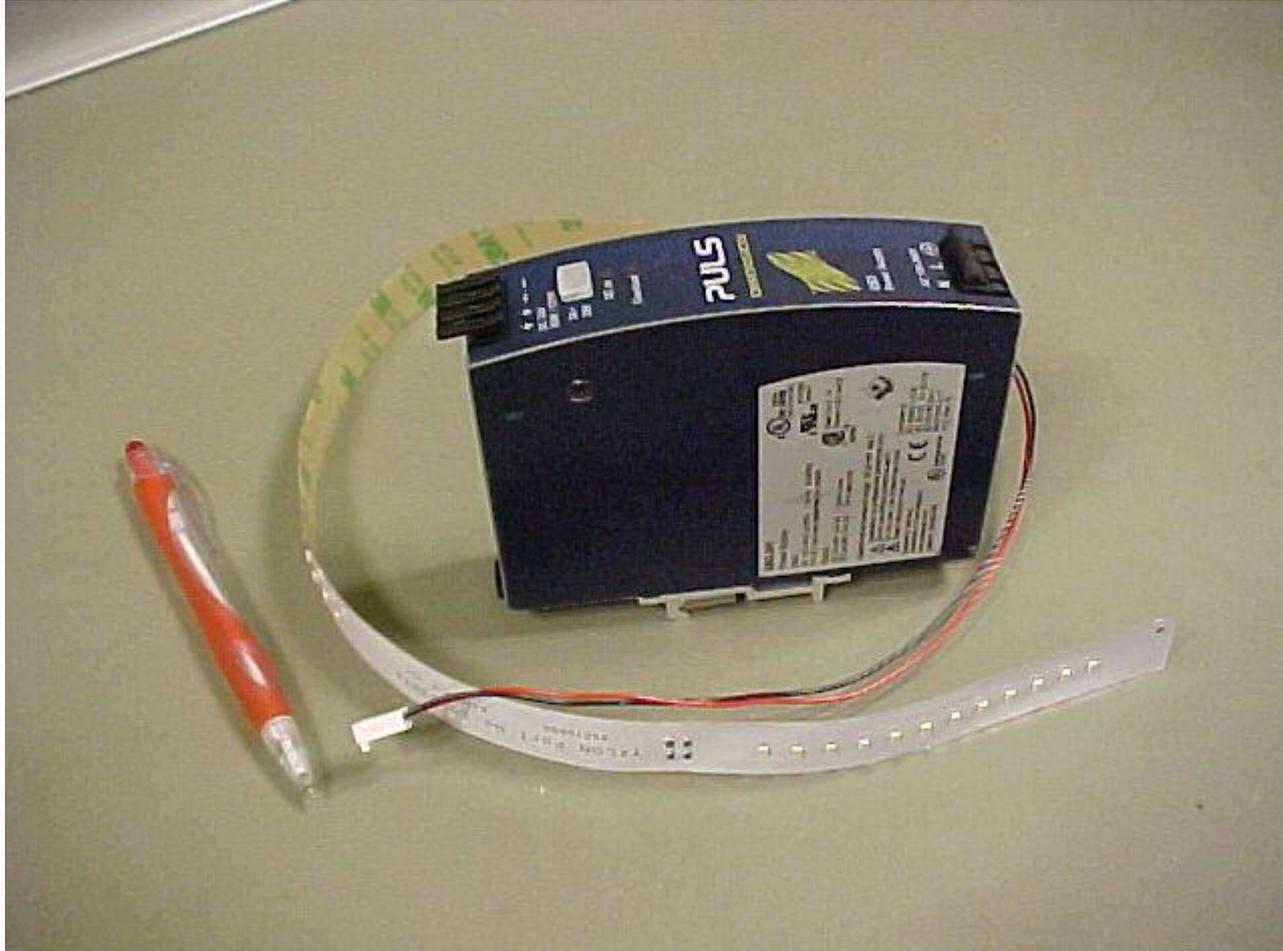
Our customer is providing the measurement service, problems sometimes occurred when fitted in bathrooms due to humidity, By parylene coating the PCB's original design could be kept.



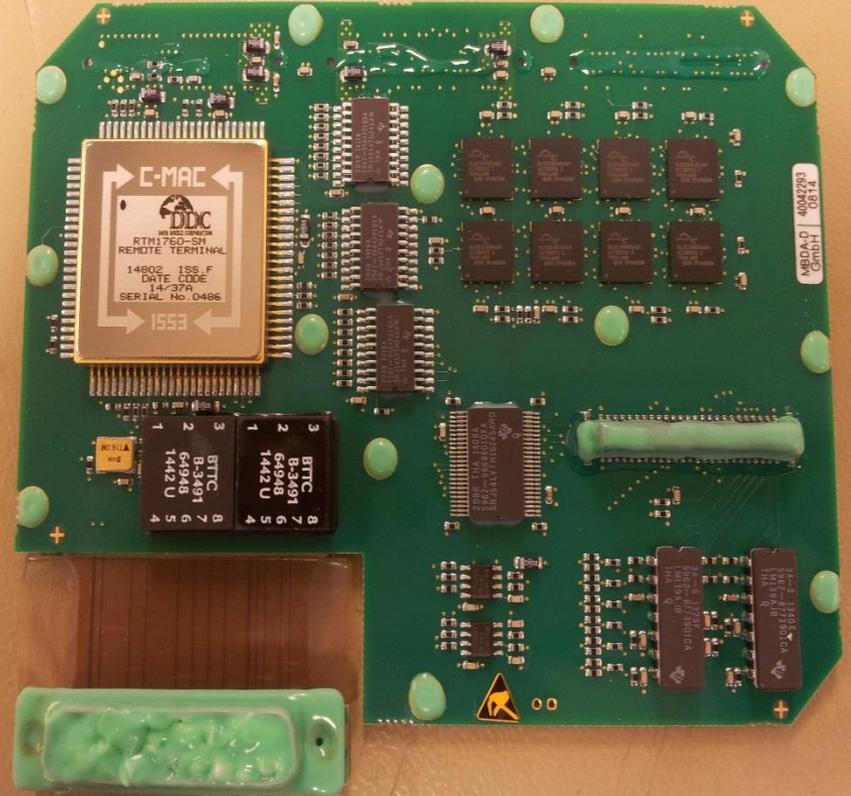
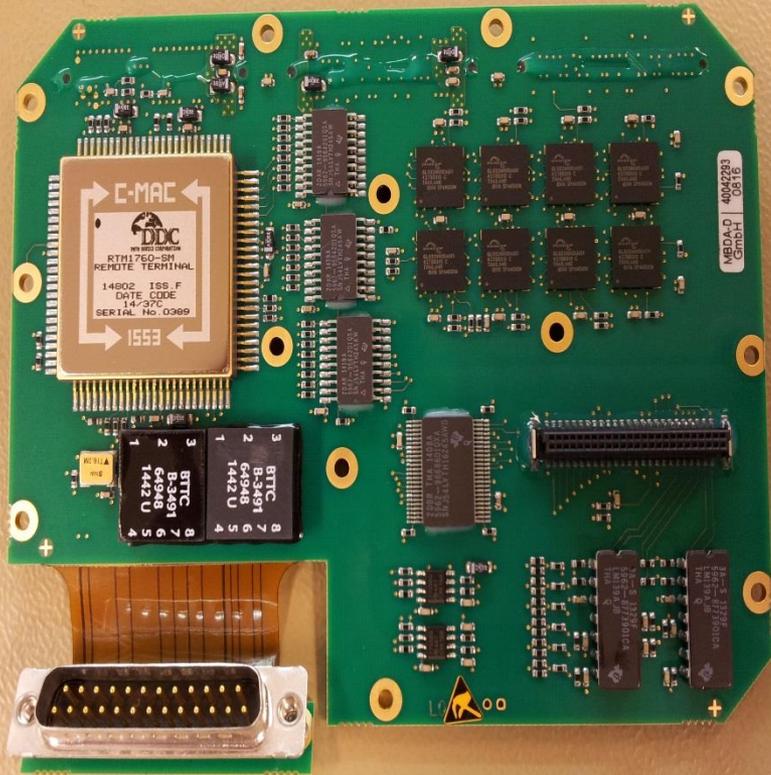
22 Kr/pcs, batch of 500
in panels with 5 pcs in each.

No masking or cleaning

Power supply and diods

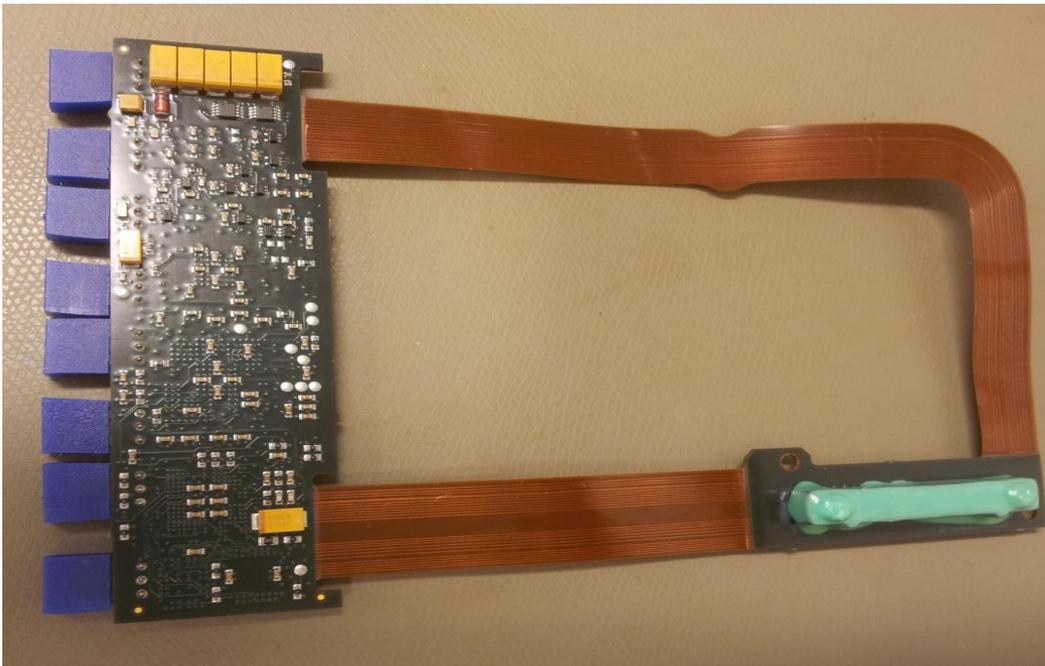
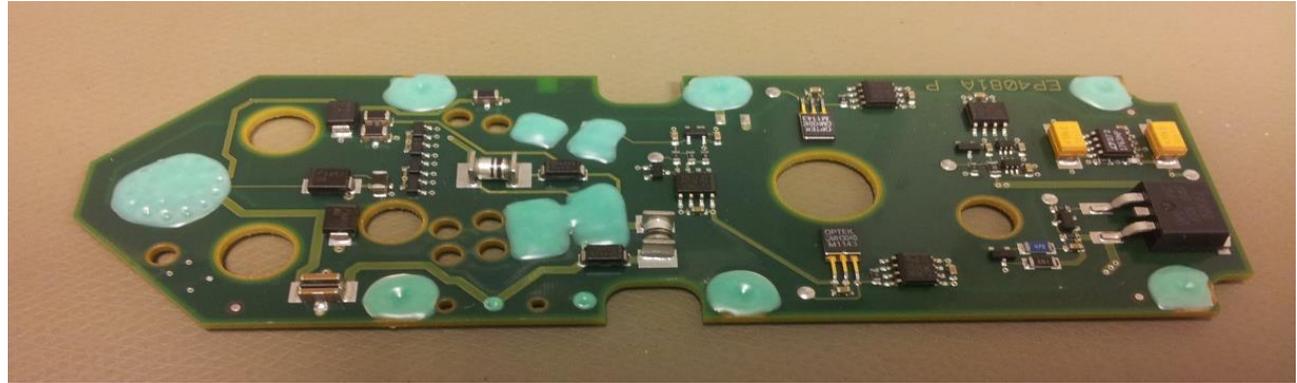


Masking of PCB Electronics



Para Tech Coating
SCANDINAVIA AB

Military Aircraft Electronics



What is the main advantages of using Parylene?

It provides a smooth, even and very thin effective layer of protection.
A very effective shield against corrosion, moisture, acid, oil, grease etc.
Often eliminates the use of potting or lacquering.

How thick / thin can you coat?

From 0,01 μ to 50 microns, normally max 25 μ m

How much voltage can parylene isolate?

5 kV / 25 μ m. It is not entirely linear, but approximately 200 V / microns

In what temperature can it be used?

Resists high and low temperatures from +200° to -200°C

What does it cost?

It depends on how much preparation that is needed. A circuit board can be masked at 1 min. or 1 hour.
The raw material and machine time is a significant factor, but usually it is the mask that is most expensive.

Can I coat basically anything?

A. In principle, yes. But adhesion can vary from different materials and that may require different types of pretreatment.
Also the surface texture will affect the adhesion. A matt surface gives better adhesion than polished.

Can I remove parylene for instance repair?

Parylene can not be resolved by conventional varnishes.
But can be removed mechanically with eg. micro-blasting.

Can I get parylene in different colors?

No.

Efficient coating with Paralyne Polymer

We offer a unique coating technique with a multipurpose, non-toxic item, developed to the space and military industry.

Paralyne coating has a thickness of only 1 -30 Microns, but provides a very effective shield against corrosion, moisture, acid, oil, grease etc. and often eliminates the use of potting or lacquering.

Further the polymer provides an effective insulation in limited spaces.

INNOVATIVE ASPECTS AND MAIN ADVANTAGES

The technique provides a smooth, even and very thin, but very effective layer of protection.

The polymer is completely non-toxic and therefore also very suitable for applications within the food industry.

MARKET APPLICATION

EMS, Automotive, Automation, Robotics, Machine Builders, Windmill Builders, Offshore Industry, Space, Food Industry etc.

Often used for pre treatment:

Isopropyl Alcohol

isomer of [propyl alcohol](#) with antibacterial properties