VpCI Technology® – Advanced Corrosion Solutions in Automotive Industry

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EcoCortec / Cortec Corporation

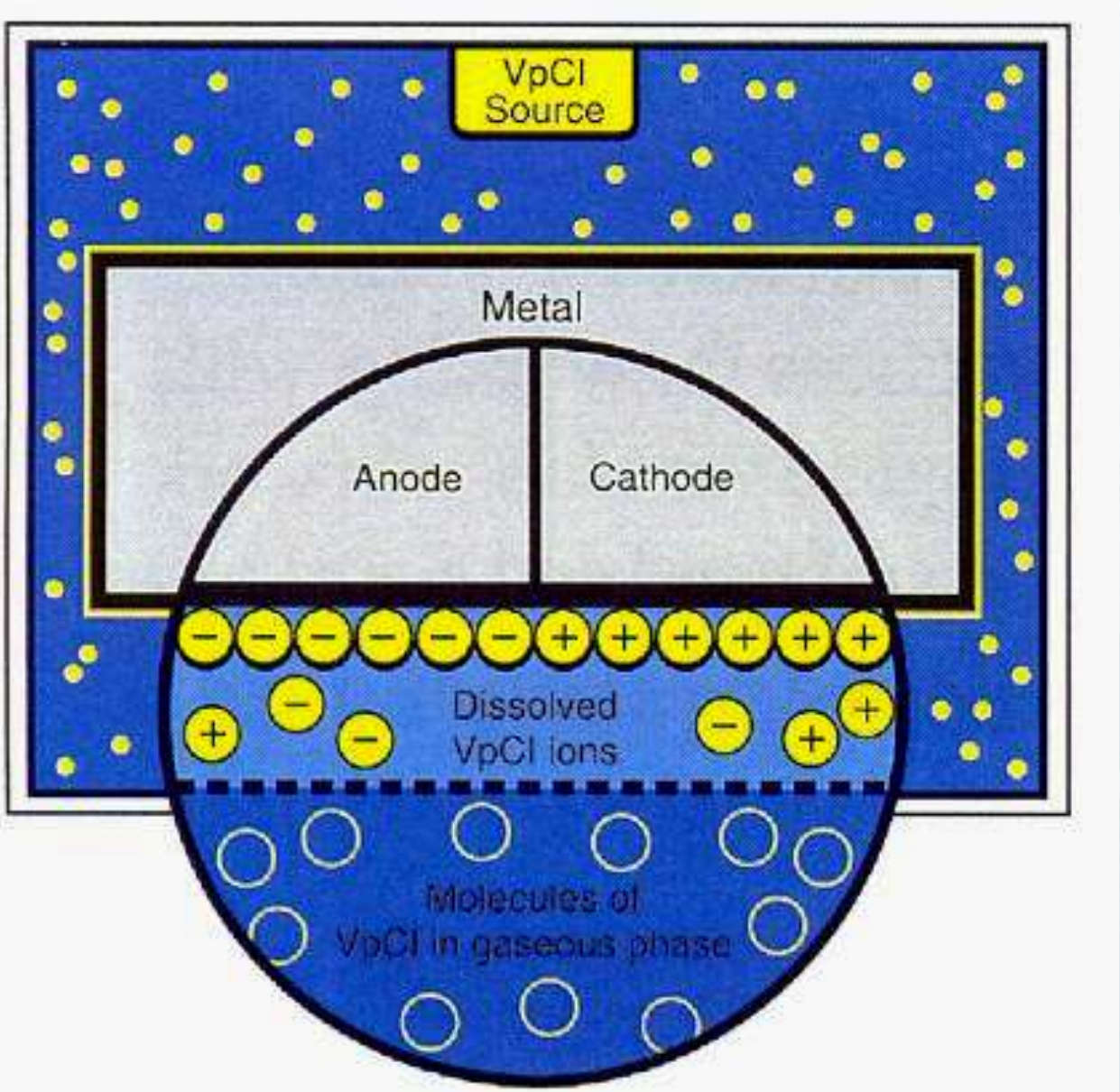
Outline

- VpCI® Concept for Automotive Industry
- Chemical Performance = Total Value
- Supplier Usage
- Auto Usage
- Services, Support

VpCI® Concept

- Clean, dry, rust free
- Chemistry matters
  - Safe
  - Effective
  - Multi-metal
  - Total Quality Control

- Proper VpCI chemistry allows lower total cost as protection is based on VpCI performance rather than just on barrier, desiccant or oily coatings.


VpCI
Source
Metal
Anode
Cathode
Dissolved
VpCI ions
Molecules of
VpCI in gaseous phase

Chemistry Matters

- Many VCI formulations have sub-par vapor characteristics
  - To compensate, others use oils, thicker films, redosing or barrier products
- Cortec VpCI® allows solutions to use optimized VpCI® chemistry that emits a vapor ***more effectively at lower dosages***.
- In the price-war, eventually a performance threshold is attained.
  - Using proper VpCI® allows lower total price at the threshold

Example: Biopad (20 cm^2) + VpCI® 126 ES (70 micron)

Key VpCI® Advantages

- Immediately ready for use
- Dry surfaces
  - Allow inspection
  - Allow handling
  - Minimize EHS exposures and risks
- 100% rust free, worldwide

Cortec Difference:
Trusted Globally since 1977

- 100% Global Quality Control
- Optimized corrosion inhibitor
- Innovative and Integrated Approach
- ISO 17025 Certified Laboratory for Testing
- ISO 9001/14001 Quality Process

“Customers call when they cannot afford rust.”

Cortec's Manufacturing & Global Presence

Headquarters:
Saint Paul, MN

Parkway Technology Campus:
Saint Paul, MN

Cortec Coated Products:
Eau Claire, WI

<u>World's Largest & Most Vertically-Integrated VpCI Facilities</u>

Cortec Advanced Films:
Cambridge, MN

CortecCros Warehouse:
Split, Croatia

Cortec Spray Technologies:
Spooner, WI

EcoCortec – Croatia
First Croatian bioplastics plant

Parts Banking Programs

- Ford Romeo Engine
- Ford Sharonville
- Ford Cleveland
- Ford Coyote Project
- GM Multiple Facilities
- GM Romulus Engine

Suppliers & Facilities Usage

- Steel Parts
- MPI
- GKN Sinter
- GKN Driveline
- Lake Park Industry
- Rawsonville
- GM Gas Houses
- Magna
- Kokomo Engine

Project ranges:

- Deep storage (5 year) single packs
- Service parts
- Mass Production parts
- Facility Capital Equipment (Clean, Protect, Preserve at GM Gas House)

Suppliers & Facility Usage Highlights

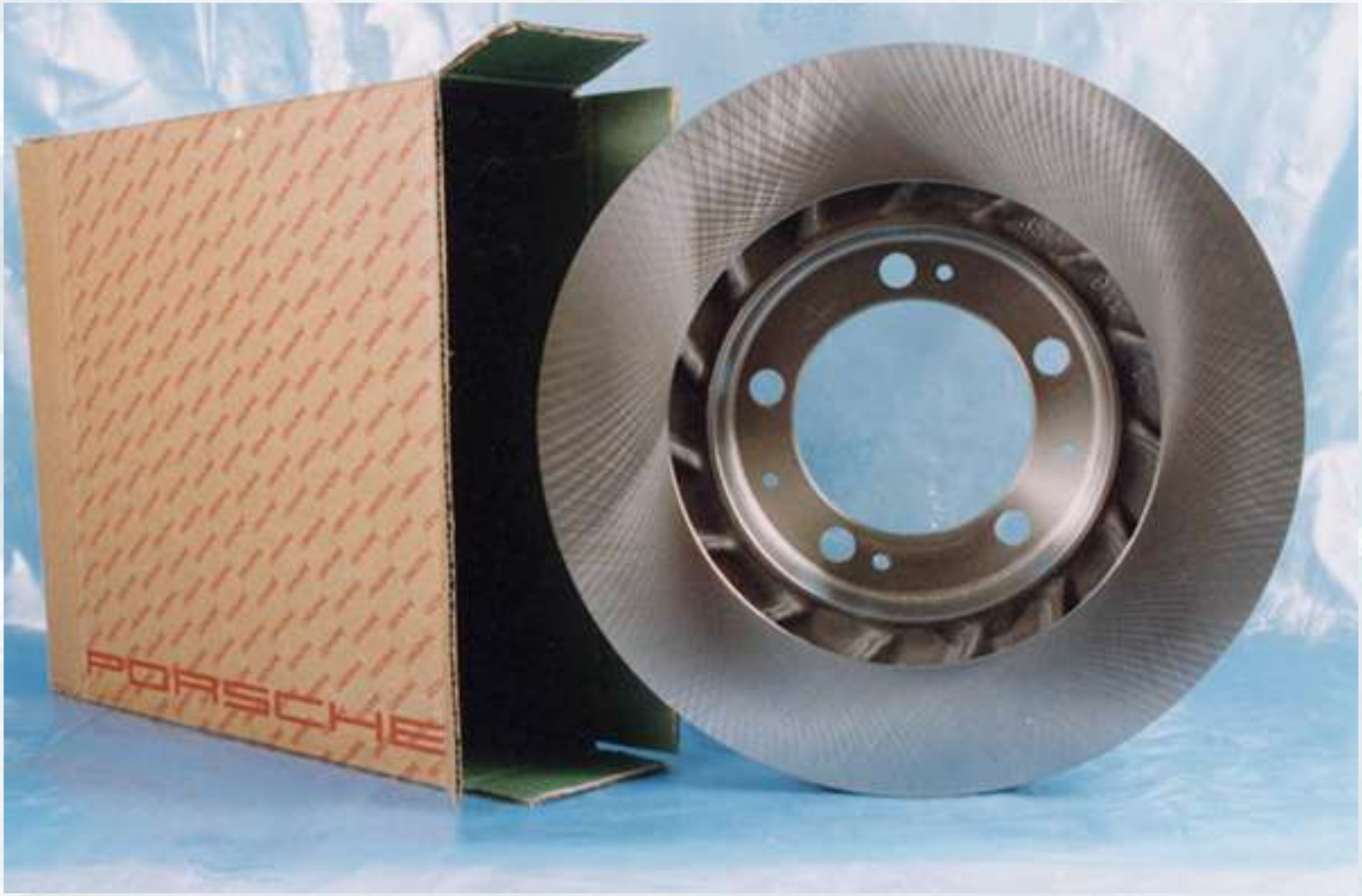
- Honda Anna engine
- Honda Alabama
- Nissan Tennesee
- Nissan Mississippi
- Nissan Japan
- Nissan UK
- Akebono (Bosch)

Project Example:

Biopad + VpCI 126 Blue bag allowed Honda Anna to eliminate refrigerated truck shipments. Huge cost savings due to transport and corrosion.

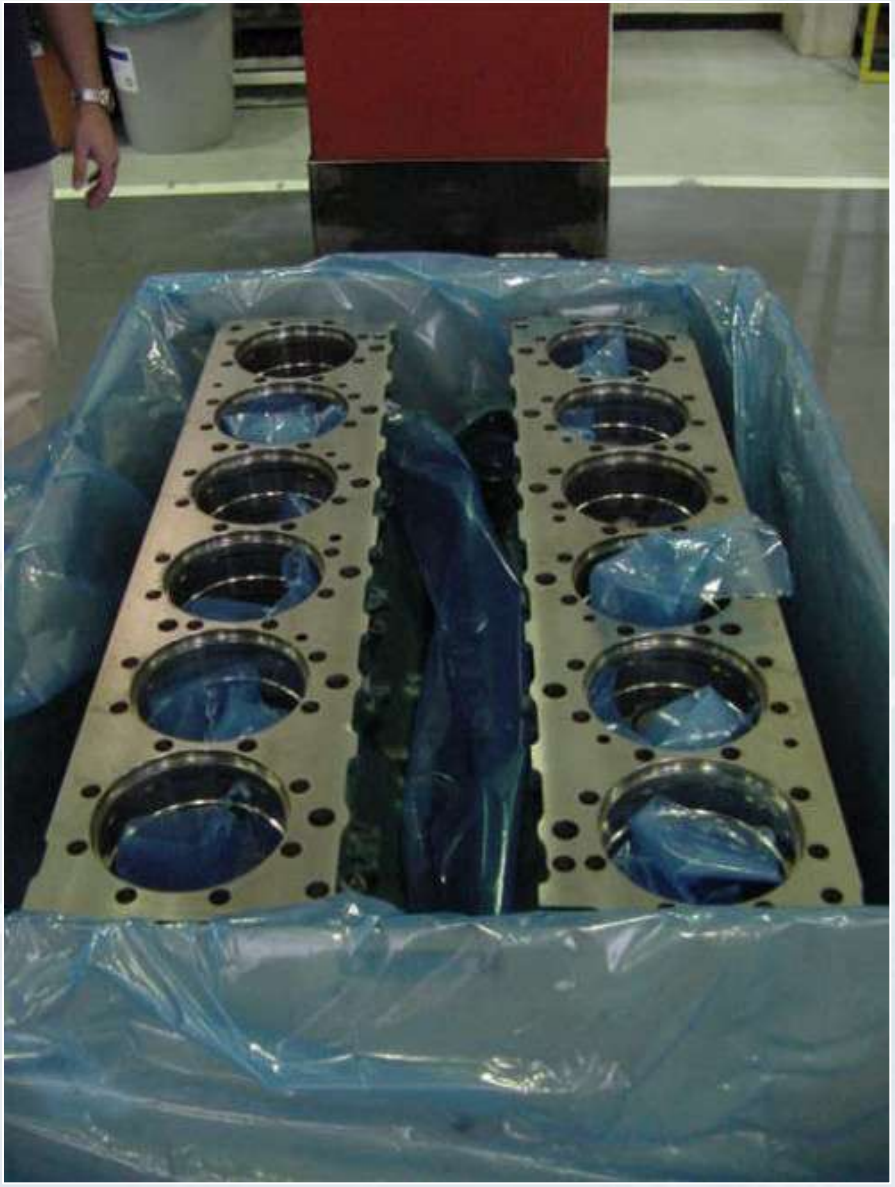
Other Users Worldwide

OEM Branding / Integrated Pack



OEM Branding

Volvo Power Train - Brasil



OEM Branding / Anti-counterfeit

General Motors Build Ahead - Mexico

General Motors Mexico

- Shipments of oil pumps from Mexico to China
- Actual situation (cost):
  - GM actually dipped in RP fluid, wrapped in oil-resistant paper, wrapped in stretch film, then individually bagged!
  - 4 minutes to package one part
- Benefits of Cortec System:
  - Eliminated paper, stretch film and oil RP
  - Changed HOW the RP was done
  - Cleaned the work station (ISO facility)
  - Reduced packaging time per part to less than 30 seconds
  - Test shipment using just 126 bag outperformed the previous system.
  - Ability to OEM brand the packaging

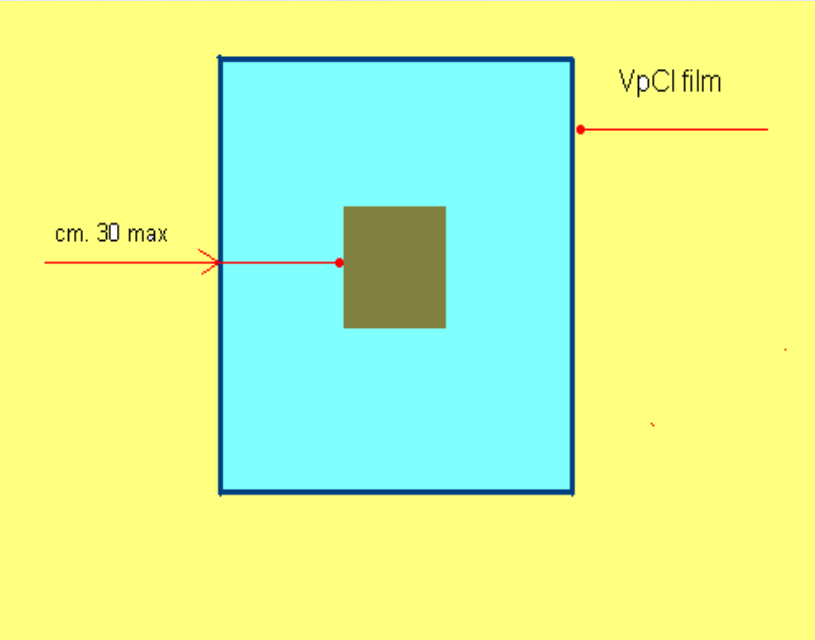
Peugeot Citroen - Brasil

Cortec products have been used by Renault since the beginning of the 90’s.

Renault facilities use :

- VpCI 126 bags for the packaging of all shipped parts – primarily by CKD facilities
- VpCI 130 foam in combination with VpCI 126 for extended protection of shipped parts
- VpCI 329D for long term protection in storage and extended protection in shipping

MAX. DISTANCE 30 cm



But sometimes is *More* than 30 cm !

VpCI® Foam

This is the second best product for an anticorrosive package

- Open-cell Polyurethane impregnated with VpCI
- High VpCI concentration
- Antistatic
- Static dissipative
- Desiccant action
- Long life

Federal Mogul

Conventional Rust Preventative
Oil based

VpCI® 377
Water based

Detroit Diesel

General Motors

OEM Branding / Supplier

Cummins

OEM Branding / Multifunction

OEM Branding / Instructions

Customer Testimonial

"[We] have experienced corrosion on our blocks and heads for over 7 years.... Right now, with VpCI 126 bags and Bio-Corr ***we have eliminated corrosion entirely from our operation***."

- John W., Cummins Inc

Importance of Laboratory Data

- Cortec Laboratories is 3rd Party ISO 17025 certified
- Use only Standardized Tests
- Open door policy for customers
- Allows different preservation methods to be compared side-by-side for DATA DRIVEN approach.

Example of Testing: Ford

Field Result: Entire Bank Used, Zero Defect

CORTEC Laboratories

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Evaluating Packaging Systems for Ford Engine Blocks

Background: Ford Motor Company sent eight engine blocks to Cortec for testing. Ford would like Cortec to determine the most effective corrosion inhibiting packaging system for these blocks to give them protection in shipment and storage.

Purpose: To compare and evaluate different packaging systems for engine blocks used by Ford Motor Company.

Method: ASTM D-1748 Humidity Cabinet (120°F, 95% relative humidity)

Materials: 8 – Eight cylinder engine blocks, provided by Ford
VpCI-126 Blue Film (4-mil)
VpCI-131 Emitters
BioPad Emitters
Non-VCI polyethylene (PE) stretch film

Procedure: The following procedure was used:

1) Eight engine blocks arrived on two layers of plastic dunnage.
2) Prior to testing, the engine blocks were divided as follows:
   a. 1 – Control (no protection)
   b. 1 – Individually wrapped in VpCI-126 blue film bag
      i. Bag was closed with a zip tie.
   c. 3 – On pallet with VpCI-126 blue film sheet, plastic dunnage, VpCI-131 foam pads (2), VpCI-126 shroud, and plain PE stretch film.
   d. 3 – On pallet with VpCI-126 blue film sheet, plastic dunnage, BioPad emitters (2), VpCI-126 shroud, and plain PE stretch film.
3) All engine blocks were allowed to sit overnight after packaging.
4) All engine blocks were then placed in ASTM D-1748 humidity cabinet.
5) All engine blocks were visually inspected periodically.
6) After 192 hours, all engine blocks were removed from ASTM D-1748 humidity cabinet.
7) All engine blocks were unwrapped, visually inspected and photographed.

Results: The following results were found:

Protection System	Time to Failure (Hours)
A	<24
B	192
C	24
D	24

Figure 3: BioPad system, prior to testing.

Figure 4: BioPad system packaged, prior to testing.

Cortec Solutions for Automotive

- Integrated approach
- Data-driven
- 100% Quality Control Worldwide
- Proven at all major automotive companies

Trusted Globally since 1977

THANK YOU!

www.cortecvci.com

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