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The Advancement of Powder Coatings (HPNPC)

What does that mean?

Joseph H. James, Presenter



Today's Agenda

- What is High **Power** Niche' Powder Coatings
- Why are they important
- High-Power Coating must meet a "Special Niche"
- Why/We Pison Focused on with developing High Power Niche Powder Coatings
- Previous legacy formulation challenges/restraints
- Pison Stream Solutions rationale for developing and Patenting disruptive coatings for niche market segments



What does HPNPC mean?

It is a created umbrella term not a standardized industry classification. This is what it means to us here at Pison.

It's a define class of advance powder coatings engineered to deliver superior functional performance (e.g., durability, corrosion/chemical/UV resistance, wear resistance, thermal stability) and reduce burdens relative to liquid coatings.



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Where it Begins

High Power Niche Powder Coatings



1

Innovation begins through outside the box collaboration



2

Executions begins in the laboratory



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3

Pison Core Value Propositioning



4

Product achievements and advancements



5

Scientific Foundations & Advancements



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(HPNPC) Defined

- **Next-generation engineered powder coating class**
- **Superior mechanical, chemical, UV, and thermal performance**
- **Multi-temperature curing capability**
- **Designed for high-demand industrial sectors**



Defining Characteristics of HPNPC

- **Measurable improvements in corrosion, chemical, UV, and wear resistance**
- **High crosslink density and film integrity**
- **Operational stability from 250°F to >1500°F**
- **Reduced ionic permeability and enhanced adhesion**
- **Other.....**



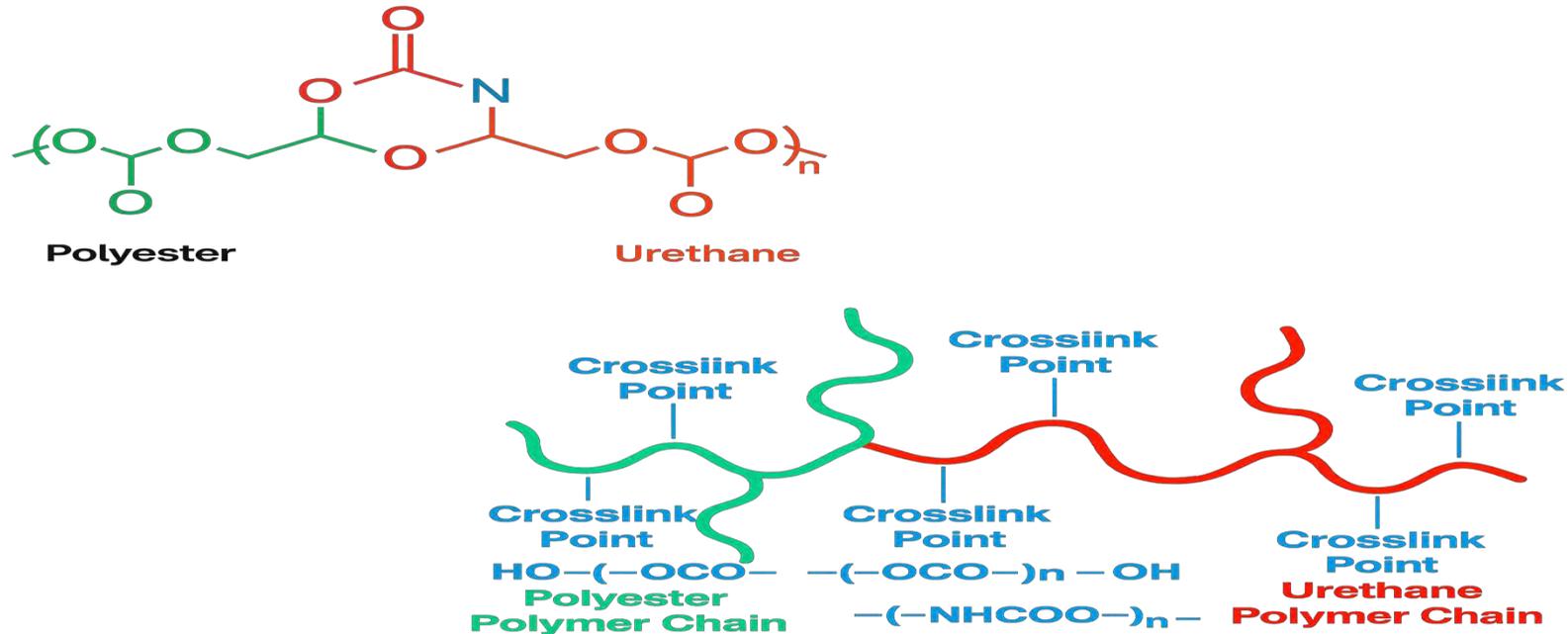
Material Advancements

- **Advanced polymer systems: super durable polyester, epoxy hybrids, fluoropolymers**
- **Solar-active and conductive resin matrices**
- **Nano-additives for flow, mar resistance, flexibility, antimicrobial properties**
- **Functional materials enabling energy-active solutions at surfaces**



Basic Polyester Urethane

Where it started as an example



This diagram shows the basic chemical “backbone” of a **polyester-urethane powder coating**.

In simple terms: The **green section** is the **polyester** part. This is the flexible portion of the molecule — it provides some basic **durability**, *some basic weather resistance*, and **overall stability**. The **orange section** is the **urethane** part. This part acts like a strong connector or “bridge,” giving the coating, *some basic adhesion*, and *some basic impact resistance*. When you attach these two parts together repeatedly, you build a long repeating chain



Evolution of Powder

Early Powder Coatings

Early powders featured solvent-free processing, minimal waste, and superior hardness compared to liquid coatings, making them ideal for diverse industrial uses.

Limitations in UV and Chemical Resistance

Initial formulations suffered from limited UV resistance causing fading and poor chemical resistance against fuels and solvents in harsh environments.

Flexibility and Precision Challenges

Early powder coatings had flexibility constraints and struggled to meet aerospace and military precision, impact, and mar resistance requirements.

Innovation Driving Next Generation

Enhanced research for resin chemistry and additives, enabling multifunctional, durable powder coatings for extreme industrial applications.

Multifaceted powder coatings capable of liquification, engineered for various substrate types, and multifunctional performance.



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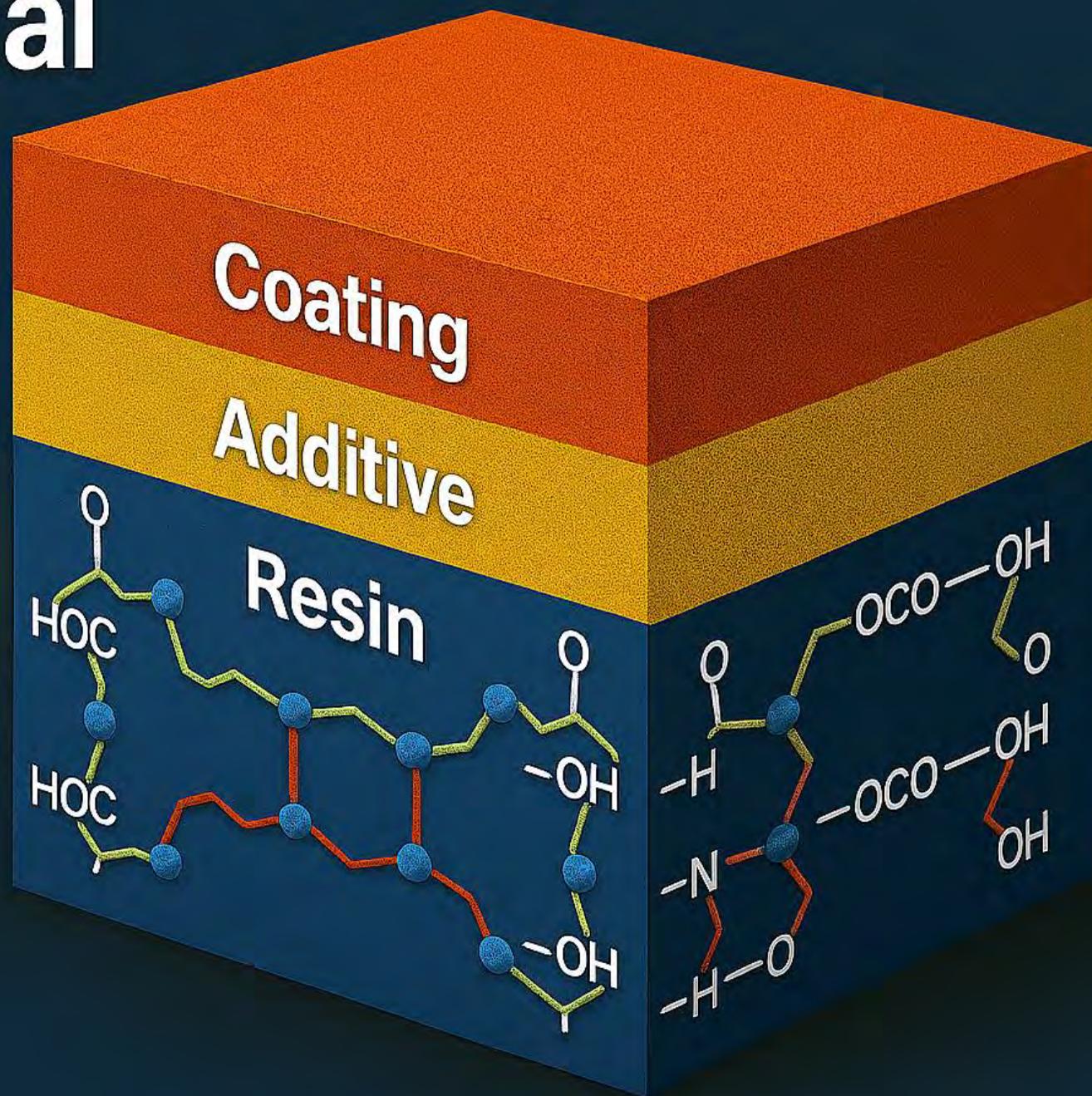
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Multifaceted Powder Coatings



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Bifunctional Coating Platforms



Cross-Sector Applications

- **Aerospace & Defense: CARC-compatible, UV-resistant coatings**
- **Industrial & Heavy Equipment: long-life wear-resistant systems**
- **Architecture & Infrastructure: corrosion-resistant structural protection**
- **Renewable Energy: solar-active and environmental-resistant technologies**
- **Healthcare: antimicrobial functional surfaces**



Architectural Applications of Powder Coatings



Powder Coating of Nuts and Bolts



PSS U.S. Patented Innovations

- **Solar-active coatings (photovoltaic pigment integration)**
- **Advance Defense Coatings “CARC” Direct to Metal, AIR, LAND, SEA, Other...**
- **Multifunctional flow/leveling additives (PisonPF45)**
- **Hybrid liquid–powder dual-mode coatings**
- **High-performance antimicrobial and scratch/mar-resistant systems**
- **Advance Antimicrobial Coatings in Powder & Liquid with 5-6 log R > 99.9999**



Antimicrobial Surface Coating

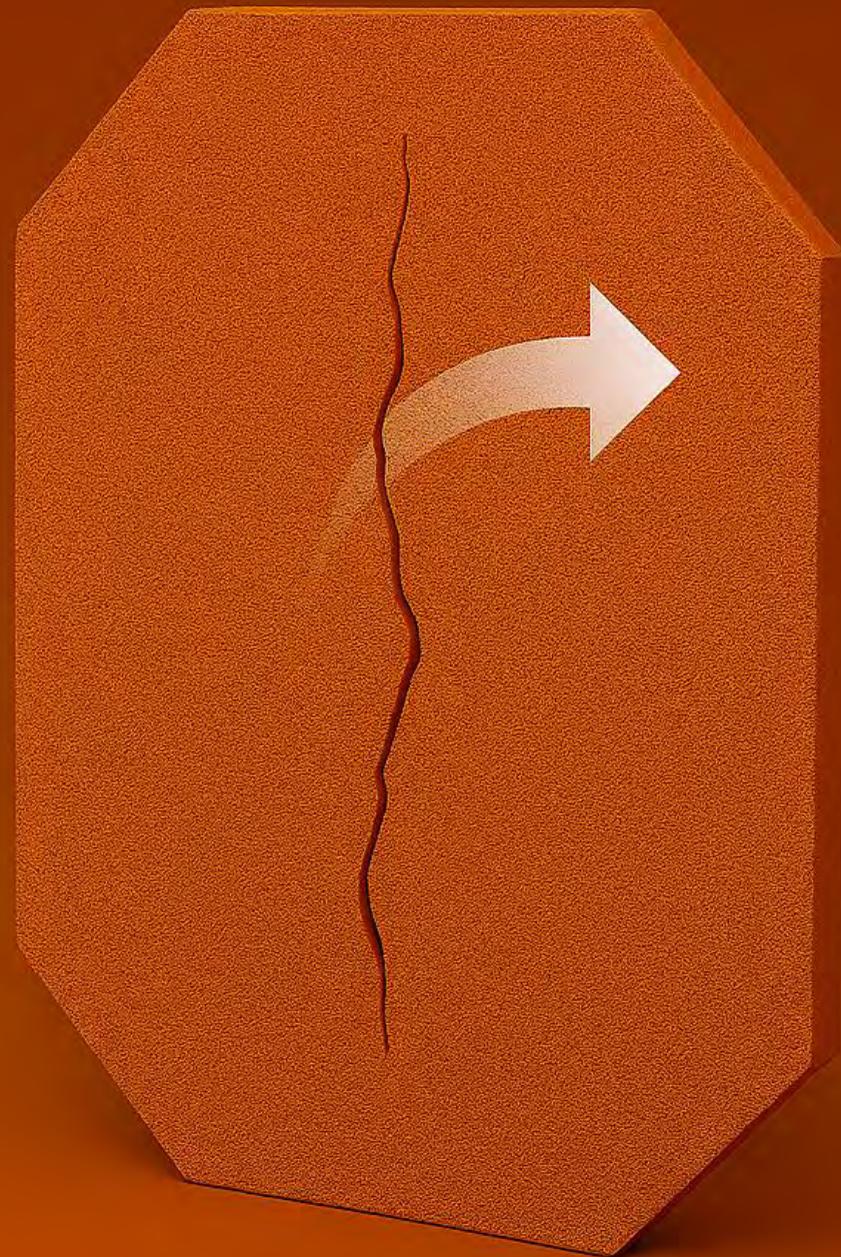


Pressing the accelerator

- **Continuation of Energy-active coatings (photovoltaic, thermoelectric)**
- **Continuation of Self-healing and autonomous protective systems**
- **Continuation of Bifunctional and antimicrobial material chemistries**
- **Continuation of Smart surfaces with adaptive and responsive behaviors**
- **Continuation of Marine Coatings Platforms & Anti-Fouling Additives**
- **Continuation of defense and marine advance coating platforms beyond multiple granted U.S. patents, encompassing advance coatings, additives, solar, and antimicrobial technologies.**



Self-Healing / Smart Coating





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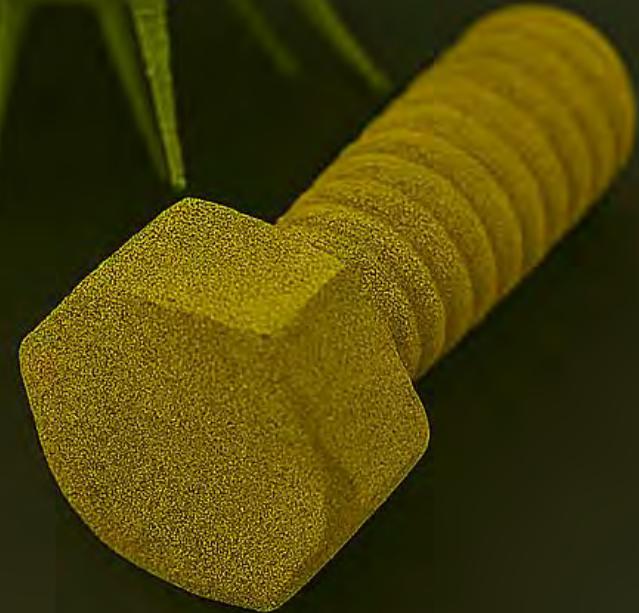
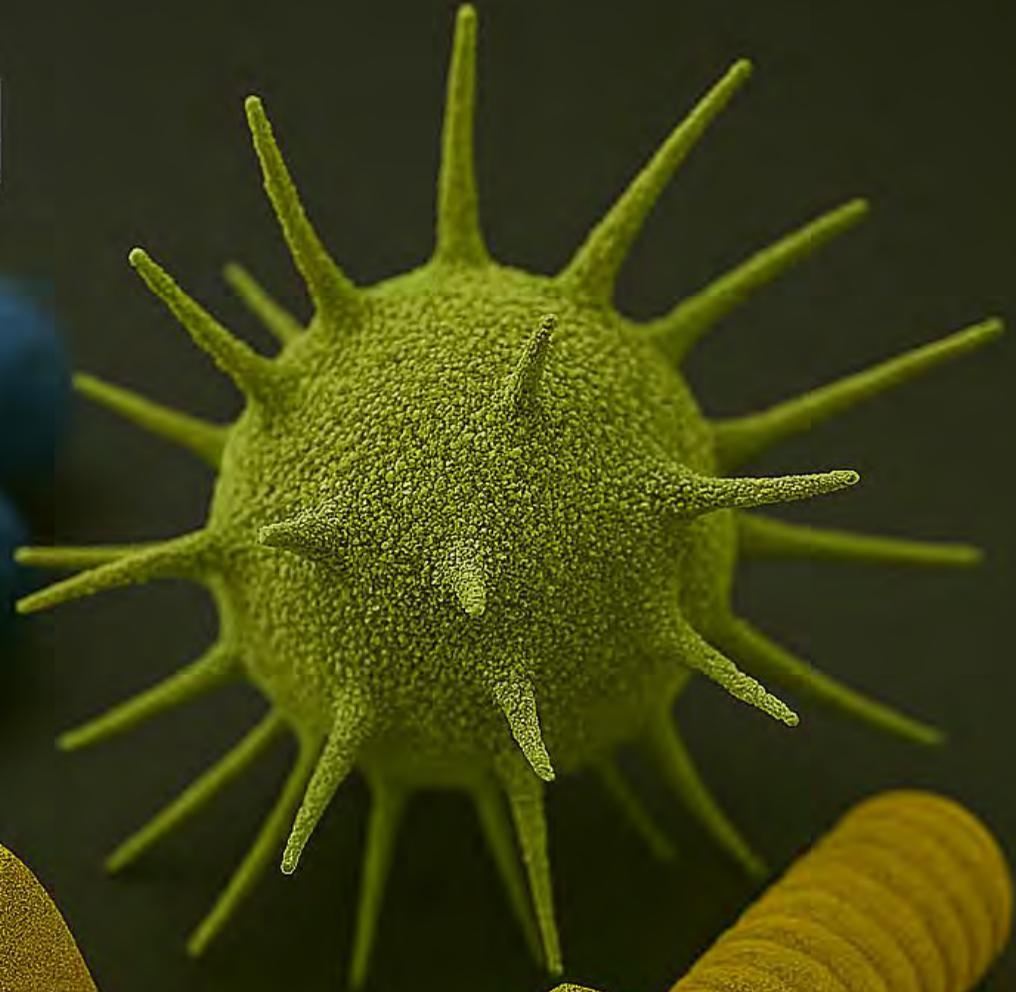
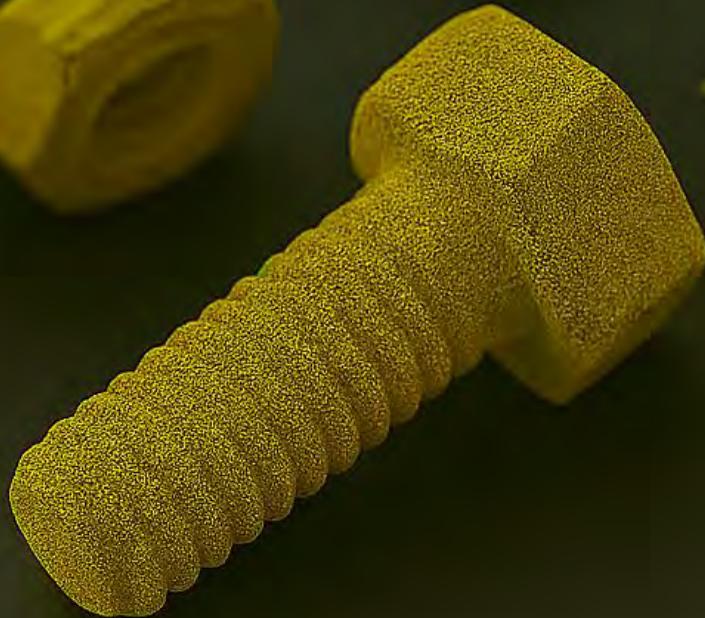
ADVANCEMENT OF ANTIFOULING COATINGS



Marine Anti-Fouling Powder Coating



Anti-Fouling Additives



Closing Statement

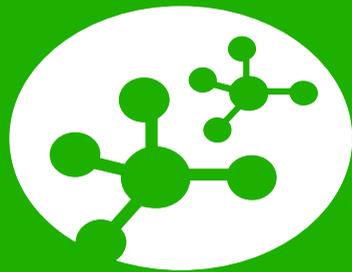
The Advancements presented today position High-Power Niche Powder Coatings (HPNPC) as more than an incremental improvement in surface-engineer science – They represent a fundamental shift towards multifunctional, materials-driven coating architectures. As demonstrated, HPNPC technologies arise from the convergence of advance polymers science, multifunctional chemistry, and application-specific engineering, enabling performance capabilities that exceed the structural, chemical, and environmental limitations characteristics if traditional Coatings.

Driven by continuous innovations from resin chemists, additive scientists and material engineers and Industry the Industry has reached an unprecedented degree of technical maturity

Pison Stream will continue to advance disruptive, innovation-driven platforms across the sectors most critical to our strategy and globally use. We remain focused on building scalable, high-impact solutions that deliver measurable value across priority markets.



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