Invibio
BIOMATERIAL SOLUTIONS

THE AIMD INDUSTRY HAS A PROBLEM - 10 EXPERTS JUST GAVE US THE BLUEPRINT

a victrex company

THE STAKES ARE HIGH. THE SOLUTIONS ARE FEW.

Active implantable medical devices (AIMDs) are transforming lives - from neurostimulators to cardiac pacemakers. But behind the scenes, engineers, marketers, and operations leaders face mounting pressure: smaller devices, smarter systems, tighter regulations, and rising costs.

WHAT ARE THE CURRENT INDUSTRY CHALLENGES?

This eBook distils insights from 10 industry experts - from global OEMs - into a clear narrative: the AIMD industry is at a tipping point.

We asked:

- **Director of Applications Engineering**, US - Industry Expert 1
- **Principal Mechanical Engineer / Project Manager**, US - Industry Expert 2
- **Director of Manufacturing and Operations**, Medical Device OEM, Europe - Industry Expert 3
- **Device Operations Manager, Digital Health / Life Sciences Subsidiary**, Europe - Industry Expert 4
- **Product Marketing Manager, Medical Device OEM, Europe** - Industry Expert 5
- **Vice President, Strategic Marketing and Product Management**, AIMD OEM, Europe - Industry Expert 6
- **Consulting Design Engineering Manager,** Independent Consultant, US - Industry Expert 7
- **Engineering Manager, Medical Device OEM**, US - Industry Expert 8
- **Senior Technical Contributor**, US - Industry Expert 9
- **Engineering or Product Development Lead**, Unknown Region - Industry Expert 10

SECTION 1:
THE PROBLEMS

1.1 Power vs. Size: The Impossible Trade-Off

> We've hit a wall with traditional materials. They're not optimised for the thermal and spatial constraints we're now facing."
>
> **Engineering Manager,** Medical Device OEM, US, Industry Expert 8

> We're constantly being asked to reduce device size - but the laws of physics haven't changed. Smaller batteries mean shorter life or reduced functionality. Something has to give."
>
> **Senior Technical Contributor**, US, Industry Expert 9

> "Everyone wants smaller devices, but you can't shrink the battery without compromising performance. We need smarter chips and better energy management."
>
> **Engineering or Product Development Lead**, Industry Expert 10

Miniaturization is pushing the limits of power and performance, with smaller batteries compromising device functionality. Experts call for smarter energy management and materials optimized for thermal and spatial constraints.

SECTION 1:
THE PROBLEMS

1.2 Regulatory Drag and Reimbursement Fog

> We've shelved promising concepts simply because the reimbursement pathway was unclear. That's a loss for patients and for innovation.
>
> **Device Operations Manager,** Digital Health/Life Sciences Subsidiary, Europe, Industry Expert 4

> The regulatory burden is growing faster than our ability to innovate. It's not just about safety - it's about proving value in a system that's slow to adapt.
>
> **Product Marketing Manager,** Medical Device OEM, Europe,Industry Expert 5

> Innovation is stifled when the path to market is murky. We need clearer frameworks that reward meaningful innovation.
>
> **Vice President,** Strategic Marketing and Product Management, AIMD OEM, Europe Industry Expert 6

Regulatory complexity and unclear reimbursement pathways are stifling innovation. Promising technologies are being shelved due to uncertainty, delaying patient access and market progress.

SECTION 1:
THE PROBLEMS

1.3 Manufacturing Complexity

> **Yield loss is a silent killer in AIMD production. Every failed unit is a cost - and a delay."**
>
> **Director of Applications Engineering**, US, Industry Expert 1

> **Miniaturisation is sexy until you try to build it. We're talking about tolerances in microns, and materials that weren't designed for this scale."**
>
> **Principal Mechanical Engineer/ Project** Manager, US, Industry Expert 2

> **We're pushing the limits of miniaturisation, but that creates real headaches in production. Tolerances are tighter, and the cost of failure is higher."**
>
> **Director of Manufacturing and Operations,** Medical Device OEM, Europe, Industry Expert 3

Manufacturing AIMDs at micro-scale introduces high risk and cost, with tight tolerances and material limitations causing yield loss. Experts stress that miniaturization is far more challenging in practice than in concept.

SECTION 2:
WHAT INDUSTRY LEADERS ARE ASKING FOR

2.1 More Material Options

> Design freedom is limited by material choice. Give us more options, and we'll give you better devices.
>
> **Director of Applications Engineering,** US, Industry Expert 1

> We're stuck in a titanium mindset. It's time to expand the palette.
>
> **Principal Mechanical Engineer/Project Manager**, US, Industry Expert 2

> We need more tools in the toolbox. Right now, it's titanium or bust.
>
> **Director of Manufacturing and Operations**, Medical Device OEM, Europe, Industry Expert 3

Industry leaders are calling for more material options beyond titanium to unlock design freedom. The current reliance on legacy metals is limiting innovation and device performance.

SECTION 2:
WHAT INDUSTRY LEADERS ARE ASKING FOR

2.2 Better Education

> We need more case studies, more data, more confidence. That's how adoption happens."
>
> **Senior Technical Contributor** (title not specified), OEM, US, Industry Expert 9

> There's a gap between what's possible and what's understood. Most engineers don't know how to design for polymers like PEEK."
>
> **Engineering or Product Development Lead** (title not specified), OEM or Unknown Region, Industry Expert 10

> Many decision-makers still don't fully understand the material science behind AIMDs. That slows down adoption."
>
> **Engineering or Product Development Lead** (title not specified), Unknown Region, Industry Expert 10

A lack of understanding around advanced materials like PEEK is slowing adoption. Experts emphasize the need for better education, more data, and real-world case studies to build confidence.

SECTION 2:
WHAT INDUSTRY LEADERS ARE ASKING FOR

2.3 Collaboration from Day One

> We've had projects derailed because the material couldn't meet the spec - and no one flagged it early enough.
>
> **Vice President,** Strategic Marketing and Product Management, AIMD OEM, Europe - Industry Expert 6

> We need open innovation models where suppliers, OEMs, and regulators work together from day one.
>
> **Consulting Design Engineering Manager,** Independent Consultant, US - Industry Expert 7

> Material suppliers should be in the room from the first sketch. That's how you avoid late-stage surprises.
>
> **Engineering Manager,** Medical Device OEM, US - Industry Expert 8

Collaboration must start early—material suppliers, OEMs, and regulators should work together from the initial design phase. Late-stage surprises can derail projects when materials don't meet specifications.

SECTION 3:
THE OPPORTUNITY NOBODY IS TALKING ABOUT

3.1 PEEK: The Polymer That's Been Hiding in Plain Sight

> **PEEK is promising, especially for structural components. But in active enclosures, it's still not trusted - yet."**
>
> **Engineering Manager,** Medical Device OEM, US - Industry Expert 8

> **There's a cultural barrier. Many engineers are trained on metals. Switching to polymers like PEEK requires a mindset shift."**
>
> **Consulting Design Engineering Manager,** Independent Consultant, US - Industry Expert 7

> **PEEK has been around for decades, but it's still treated like a newcomer in AIMDs. That's a missed opportunity."**
>
> **Consulting Design Engineering Manager,** Independent Consultant, US - Industry Expert 7

> **We've used PEEK in structural components, but there's untapped potential in active enclosures - especially where weight and imaging matter."**
>
> **Senior Technical Contributor** (title not specified), US - Industry Expert 9

PEEK is underutilized in AIMDs due to cultural biases toward metals. Experts see untapped potential in active enclosures, especially where weight, imaging, and chemical resistance matter.

SECTION 3:
WHAT INDUSTRY LEADERS ARE ASKING FOR

3.2 What PEEK Brings to the Table

> We've used PEEK in spinal and orthopaedic implants. It's time to explore its potential in active devices.
>
> **Device Operations Manager,** Digital Health / Life Sciences Subsidiary, Europe - Industry Expert 4

> The chemical resistance of PEEK is a game-changer for long-term implants. It holds up where metals corrode or degrade.
>
> **Product Marketing Manager,** Medical Device OEM, Europe - Industry Expert 5

> We're seeing more interest in radiolucent materials. Surgeons want better imaging. PEEK delivers that - and more.
>
> **Vice President,** Strategic Marketing and Product Management, AIMD OEM, Europe - Industry Expert 6

PEEK offers radiolucency, chemical resistance, and proven performance in orthopedic applications. Surgeons are increasingly interested in materials that improve imaging and reduce long-term complications.

SECTION 3:
WHY MATERIAL CHOICE MATTERS TO PATIENTS

PEEK's biocompatibility combined with chemical resistance reduces the risk of revision surgeries due to metal corrosion or polymer degradation due to environmental stress cracking. This means fewer interventions.

PEEK's MRI compatibility and radiolucency allow clearer imaging, helping clinicians monitor healing and device placement without interference from metal artifacts.

PEEK enables, RF-transparent casings, reducing the need for bulky antennas and allowing for potentially thinner, smaller implants.

> **PEEK is (in devices that are) FDA-approved for cardiology and neurovascular applications, but still underutilized in AIMDs due to legacy bias toward metals."**
>
> Engineering Product Development Lead

SECTION 3:
WHY MATERIAL CHOICE MATTERS TO PATIENTS

Property	PEEK	Titanium	Why
Biocompatibility	Excellent	Excellent	PEEK is highly biocompatible, reducing the risk of inflammation or rejection compared to titanium.
MRI Compatibility	Compatible	Not compatible	PEEK allows safe, clear MRI imaging; titanium can cause artefacts & obscure scan results.
Radiolucency	Yes	No	PEEK enables clear X-ray and CT images; titanium may block or distort important details.
Chemical Resistance	High	Moderate	PEEK resists corrosion & degradation, lowering device failure risk compared to titanium implants.
Hermeticity	Moderate	High	PEEK can seal against fluids, protecting electronics & preventing leaks that could harm patients.
Mechanical Strength	Strong but less than metal	Very strong	PEEK offers reliable strength and flexibility, providing durable implants lighter than titanium alternatives.
Thermal Insulation	Good (protects battery)	Poor	PEEK insulates better than titanium, protecting tissues from heat and improving patient comfort.
Electrical Insulation	None conductive	Conductive	PEEK dielectric properties, allow for less battery leakage, leading to a longer battery life vs metals.
Manufacturability	Highly machinable	Requires specialized tooling	PEEK is easier to mould and machine, enabling precise, innovative device designs for patients.
Hypersensitivity	Bio inert	Metal sensitivity	PEEK is bio-inert, avoiding metal allergies & suitable for patients sensitive to titanium.
Attenuation	Minimal	High	PEEK has minimal attenuations so RF signals can pass through without interuption.

SECTION 4:
THE PATH FORWARD

4.1 Rethink the Material Stack

Start with the problem - not the legacy material.

Ask: what properties does the application demand? Then explore whether PEEK or other advanced polymers can meet those needs.

4.2 Prototype, Test, Learn

Use rapid prototyping and simulation to evaluate new materials early. Don't wait until verification to discover a better option.

Check-list	Strategic Impact
✓ **Biocompatibility**	Ensures long-term safety and regulatory approval
✓ **MRI/Radiology Compatibility**	Enables better post-op imaging and monitoring
✓ **Mechanical & Chemical Resistance**	Reduces failure rates and revision surgeries
✓ **Hermeticity**	Protects battery and electronics, and cost efficiency
✓ **Manufacturability**	Impacts yield, inspection time, and cost efficiency
✓ **Regulatory Pathway**	Affects time-to-market and ease of approval
✓ **Reimbursement Potential**	Supports claims of improved outcomes and reduced costs
✓ **Portfolio Differentiation**	Enables innovation in form factor, performance, and patient

SECTION 4:
THE PATH FORWARD

4.3 Partner with Experts

More than just a supplier. We have decades of PEEK-focused experience in technical, manufacturing, regulatory, applications and materials development. Leverage our expert service and support to help you solve your problems. We can even collaborate deeply with you as a strategic innovation partner if you want our support to help you bring a next generation platform to market.

CONTACT US TODAY to speak with an expert, sample materials and begin to explore.

Time-to-Market: PEEK enables earlier prototyping and design flexibility, especially when integrated early in development.

Reimbursement Success: Materials that improve imaging, reduce complications, and support less invasive procedures strengthen value-based care claims.

Portfolio Differentiation: PEEK opens the door to thinner, smarter, and more patient-friendly devices—setting your platform apart in a crowded market.

CONCLUSION

The Future of AIMDs is Smaller, Smarter - and More Materially Diverse.

The AIMD industry is evolving fast. But to keep pace, we need to expand our material mindset. PEEK isn't a silver bullet - but it's a powerful option that's been overlooked for too long.

If you're designing the next generation of active implants, it's time to ask:

WHAT IF THE MATERIAL IS THE INNOVATION?

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