EC COMMUNICATION ON ADVANCED MATERIALS

Friday 26 April 2024

13h30 – 15h00 Lunchtime Debate
Antall Building, European Parliament

Organised in partnership with GE Aerospace

INTRODUCTION BY PARLIAMENTARY HOST

Professor Danuta HÜBNER MEP, (Poland EPP) Chair, Parliamentary Delegation US Relations; Member, International Trade Committee; Member, Economic & Monetary Affairs Committee

Welcome to this European Forum for Manufacturing Lunchtime Debate on the EC Communication on Advanced Materials, organised in partnership with GE Aerospace.

We start with a presentation from the European Commission on the Communication on Advanced Materials which will then be followed by one from GE on their perspective on Advanced Materials for a Competitive & Innovative Europe

There will then be a discussion off the record.

EC COMMUNICATION ON ADVANCED MATERIALS

Sofie NORAGER, EUROPEAN COMMISSION, DG Research & Innovation, Deputy Head of Unit for Industrial Transformation

Javier SANFELIX, EUROPEAN COMMISSION, DG Research & Innovation, Policy Officer, Advanced Materials for Industrial Leadership

- Introduction
  Advanced Materials are intentionally designed and engineered materials that have new or enhanced properties and/or targeted or enhanced structural features for specific or improved functional performance. These materials can be both new materials from innovative manufacturing processes, known as high tech materials, and materials that are made from traditional materials, referred to as low tech materials.

- Examples of Advanced Materials
  There are numerous examples of Advanced Materials, including:
  - Thermochromic microcapsules, which absorb and reflect light, changing color due to temperature changes. These materials are useful in applications such as smart windows and temperature-sensitive packaging.
  - Sodium-ion based batteries, which store energy using more abundant materials than lithium-ion batteries. These batteries offer a more sustainable and cost-effective option for energy storage.
  - Bio-based materials, which have increased insulation and circularity capacity. These materials are derived from renewable biological resources, promoting a more sustainable and circular economy.

- Policy Context
  Advanced Materials offer a wealth of solutions for the Green Deal and the Digital Transition. They have applications across various sectors, including new clean energy technologies for the Net-Zero Industry Act. Advanced materials can also substitute certain Critical Raw Materials, reducing dependency on non-renewable resources.

  Increasing demand is expected for Advanced Materials in areas such as renewable energy, batteries, zero-emission buildings, and semiconductors due to improved efficiency, performance, and customer demand for circular, safe, and sustainable products.

- EU Global Positioning
  The EU's industrial R&I investments on Advanced Materials are not even half of those in the United States, South Korea, Japan, and China. The EU ranks fifth in industry-owned patents, behind the US, Japan, South Korea, and China.

  To strengthen the EU's resilience and open strategic autonomy and to deliver on the Green Deal, Europe must accelerate its Advanced Materials research, technology development, scale up innovation and manufacturing capacity, and step up industrial uptake of Advanced Materials.

- Action Plan
  To achieve these objectives, the EU has proposed a comprehensive action plan, which includes the following:

  - Pillar 1. European R&I: Co-creating common R&I objectives and priorities with Member States, with regular updates via the Technology Council, and identifying R&I needs for the substitution of critical raw materials with Advanced Materials.

  - Pillar 2. Lab to Fab: Establishing a European Digital Infrastructure for Advanced Materials R&I, building on national initiatives like Diadem (France) and Material Digital (Germany), and providing access to technology infrastructures through a single-entry catalogue.

  - Pillar 3. Capital Investment & Finance: Investing in Horizon Europe partnerships, IPCEIs, European Innovation Council, and European funding instruments to support Advanced Materials research and development.

  - Pillar 4. Production & Use: Working with public procurers to boost the use of Advanced Materials and launching the Advanced Materials Academy to promote the use of Advanced Materials in the industry. Improve standards in collaboration with CEN/CENELEC/ETSI & ISO and analyse production, use & patent landscape of advanced materials in Europe.

  - Pillar 5. Governance: Establishing a Technology Council composed of Member States representatives, R&I stakeholders, and linking with relevant organizations to identify common objectives and priorities for Advanced Materials R&I, facilitate collaboration, and provide advice and steer in the implementation of the overall strategy.

In conclusion, the importance of Advanced Materials in achieving the goals of the Green Deal and the Digital Transition, as well as their potential to substitute critical raw materials, cannot be overstated. The EU's commitment to accelerate its Advanced Materials research, technology development, and industrial uptake is crucial in maintaining its global position and ensuring a more sustainable future.

Robert Dean, GE ADDITIVE – A GE Aerospace Company, Global Manager Collaborative R&D

Introduction

I will start by briefly introducing GE Additive and then continue with providing our perspective on why we think targeted investment in product development and setting up clusters and ecosystems for innovation in advanced manufacturing is key for boosting uptake of advanced materials and, subsequently, for securing Europe's industrial leadership. Especially at a time of intense global competition.

About GE Additive & GE Aerospace

GE Additive was established in 2016 and is a GE Aerospace company, and one of the world leaders, I am proud to say, in metal additive manufacturing technology. GE Additive develops the materials, processes, and machines serving multiple European manufacturing industries, such as aerospace and defense, medical, as well as oil and gas, industrial, automotive and toolmaking.

Whilst we also support GE Aerospace in the manufacturing of additive parts for serial production for aerospace, including at our facilities at Avio Aero in Italy, most of our machines are sold outside the GE business.

The company is managed out of Lichtenfels, Germany, where our production is centred, which also boasts a dedicated engineering and R&D centre (with a second R&D centre in Gothenburg, Sweden). Lichtenfels is the single manufacturing location for all of GE Additive's production machines globally, including those destined for the US and Asia-Pacific (APAC).

Our work builds on General Electric's decades of experience in advanced manufacturing, more specifically additive manufacturing, material science and associated R&D. We benefitted tremendously from GE Aerospace's learnings as an early adopter, and super-user, of metal additive technologies in jet engine manufacturing.

The continued improvement and development of new, advanced manufacturing technologies is at the core of our business and our ambition to support the creation of a

more sustainable, competitive, innovative, and resilient European manufacturing industry.

Our View on the Communication on Advanced Materials

It will come as no surprise that we welcome the European Commission's renewed focus on advanced manufacturing outlined in its most recent Communication - especially in the current context in Europe.

Advanced materials are used across the globe in a wide array of industries and applications.

Beyond the apt definition provided by the European Commission in its Communication, I want to make an important clarification which, I think, sheds light on why this is important for the next generation of manufacturing.

The final properties of "advanced materials" are determined by both their physical composition, but also the process through which they are produced.

So, when we say, "advanced materials", we also mean the advanced processes by which we manufacture the final part with these materials, such as additive manufacturing or 3D printing.

An example of advanced material in engine manufacturing are "superalloys" – high-performance metal alloys used in engine components, which can be manufactured using these novel processes and which, as a result, can have potentially critically different properties, which yield truly differentiated results in product performance such as efficiency, durability etc.

What is Europe's competitive advantage, unlike APAC, the Americas or China, is that we also own, develop, and lead the world in the technology and machinery to manufacture our products with these advanced materials. No more so that in additive manufacturing technologies.

And we should capitalize on this leadership position.

Success Stories

Europe has plenty of industrial success stories that have built leadership and excellence.

An example I want to highlight comes from outside our GE Aerospace business, and can be found in the public domain:

- Premium AEROTEC, a German aerospace company and a subsidiary of Airbus, developed – with GE Additive – a process for additively manufacturing a family of parts relevant for a broader number of applications within the Premium Aerospace Group (PAG) portfolio of Airbus.

This collaboration enabled us to:

- understand and close the gaps between the material lab capability and the real-world application.

- provide a high potential and improved capability to their factory.

The result? Not just a(nother) way to process metal, but a validated process and parts in production.

The project focused exclusively on:
- characterizing applicable processes to the required regulatory standards
- ensuring application needs were met
- establishing a manufacturing capability that enabled the theoretical benefit of these materials to be realizable, and to be realized, in production.

By focusing on the application or solution outcome we not only got:
- advanced capabilities.
- processes to make them - but also
- the quality assurance capability that our industries need to make things at an industrial scale.

This approach also helps anticipate, and subsequently mitigate the risks to success that stop many of our European industries from trying.

It also helps us understand that scoring high on manufacturing advanced materials does not enhance our leadership.

But what does is to focus on the application outcome and the ability for the material or component to realize the results in real life in an industrial process at scale, regardless of if we are talking about incubating a new material or finishing the final product release.

Challenges That Lie Ahead

This brings me to my next point which is: this is not without challenges.

The European Commission has done a thorough work to identify challenges in a comprehensive manner.

We have probably experienced most of these to varying degrees.

But out of these identified challenges, I would like to focus on two specific barriers to the uptake of advanced materials.

- The first single most testing issue for advanced manufacturing is that advanced materials will not be effectively used by our industries if we do not have the process and the knowledge to scale up.

  Establishing and following new manufacturing and quality processes has been one of the biggest barriers to the rapid adoption of these technologies, not their lack of existence or any missing capability or future potential.

  If we invest in providing industrialized processes, we enable multiple businesses to adopt these technologies with far lower barriers to deliver the next generation of

solutions and compete on the global scene, as opposed to requiring each to make this investment, that adds nothing to a material advanced capability, individually.
For those of you who fly in Europe on single-aisle aircraft, your plane was powered by an array of 3D printed metal fuel nozzles. Having made and demonstrated the first one, it famously took GE Aerospace 6 years, and with it, significant cost, to develop and qualify the process to demonstrate that all the fuel nozzles met their requirements, i.e., that the advanced material and performed as intended in an industrial setting.

The reason – the developed technology did not have the necessary industrialization completed, so the Original Equipment Manufacturer (OEM) was left to create this knowledge. We see this repeatedly across multiple industries trying to adopt advanced materials and their associated processes.

- The second most urgent issue is indeed the disconnect between innovative research and uptake in industrial applications and processes.

  To industrialize a technology can be a multi-year project that one business often cannot hope to take on alone.

  And more importantly, the cost of this i.e., finishing processes, quality assurance, especially for advanced materials, can be the largest contributor to product cost.

  Our industries are aware of this, and this also drives reluctance to integrate and use advanced materials. We cannot expect industry to adopt a theoretical performance potential if they cannot guarantee performance nor quantify the cost and time of adoption.

  This has an impact on European industry's ability to fulfil the EU's goals to decarbonize through green technology and next generation solutions, and the flexibility to realize supply chain resilience.

  This is not just our experience but also that of users of our technology across multiple European industries.

- Our Recommendations

  We are aware that these challenges are common across various sectors and industries but remain hopeful and optimistic that they can be addressed.

  Connecting advanced materials with real-life applications and solutions should come first.

  Starting from a solid foundation that consists of identifying common objectives and priorities that can drive and direct - both public and private - R&I investments in product development related scalable solutions.

  For advanced manufacturing to realize its full potential and enable the EU to compete globally, we need:

- Targeted investment in scalable product development.

  In addition to supporting the development of advanced materials, we need to support our industries to bring these materials into their products, into their factories and to properly equip them to use these materials and their potential.

  This can be done via identifying common projects of European interest.

  Once this is done once, a competent business will be able to integrate and expand the use of advanced materials. We see once the first part is successfully in production, volumes and part numbers increase without further assistance.

  An alternate approach, to achieve a comparable outcome, would be to ensure that scalability and industrialization are identified amongst the R&I priorities, and objectives set by the European Commission and Member States as concrete ways to achieve this.

- Creating an ecosystem of clusters and sandboxes to boost development, testing and innovation.

  This requires engagement of industrial partners with the material R&D projects, and with the rigor to ensure an end-to-end process is represented.

  This does not mean that one must burden innovative and agile research with industrialization and quality processes in every project, but in the consortium, participation must be ensured such that interfaces to, or requirements of, critical upstream or downstream functions (i.e., of industrialization) are appropriately considered, so the outcomes can be used by our industries.

A Final Word on Standards

There is an assumption that if there is a standard for an advanced material, then industry can simply start making parts following this standard.

However, I do not think this applies.

In many cases, when one looks to the most advanced materials and standards, the actual materials and processes are not standardizable. They exist in small pockets of technical excellence, oftentimes specific to, or dependent on supplier specific equipment.

No one standard can be applied blanket across an industry for such a technology.

There is reliance on unique intellectual property or know-how and often dependency on the process inside specific equipment, which today (and for the foreseeable future for any advanced manufacturing process) may be dependent on the machinery supplier.

This is the case in the highest performing materials in traditional manufacturing, such as casting, forging, and machining.

Even with a standard, the priority often goes to building to the maximum and most advanced capability of a material or process, and deviating from standards governing them is the norm.

Standards can drive harmonization for certain parts of the process but are not the silver bullet.

Conclusion

What we need is to drive a stronger connection between the development of our advanced materials and an explicit application, not a theoretical one, that will use this in the real world, at industrial scale.

To enhance Europe's sustainable competitiveness and industrial leadership, we must ensure that we are able to industrialize these materials as this will lead to faster delivery to, and adoption by, our industries of the next generation of advanced materials.

This will not be easy.

But, with the appropriate investment, collaboration, and laser-sharp focus on the solutions we want to deliver, this is not impossible.

It will enable us to learn more and equip industry with processes and capabilities to use advanced materials in real-world applications and the ability to scale independently and immediately, as fast as business can adapt.

As GE Additive and GE Aerospace, we stand ready to cooperate with the European Commission and other industry partners to ensure the potential of advanced manufacturing is realized.

Antony Fell, EUROPEAN FORUM FOR MANUFACTURING, Secretary General

In concluding this EFM lunchtime debate, I would like to thank Professor Danuta Hubner for her excellent chairing of the discussion on the EC Communication on Advanced Materials.

My thanks also to the European Commission for their presentation and to GE Aerospace for their presentation and partnership for the meeting.

I now formally close this European Forum for Manufacturing event.

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