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¹ PU = Public

PP = Restricted to other programme participants (including the Commission Services)

RE = Restricted to a group specified by the consortium (including the Commission Services)

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Summary

The report aims to highlight the extensive efforts in scientific and technological dissemination undertaken within the SALEMA project. Through a variety of events, including cross-fertilisation gatherings and active engagement in the aluminium sector's activities, the project has been thoroughly disseminated among a wide range of stakeholders, spanning from the industrial sector to academic and the general public. The report meticulously outlines the objectives, backgrounds, content and outcomes of these dissemination activities, demonstrating the project's strong commitment to advancing sustainable practices within the aluminium industry and beyond.



Disclaimer

This publication reflects only the author's view. The Agency and the European Commission are not responsible for any use that may be made of the information it contains.

Abbreviations

Abbreviation / Acronyms	Description
BEV	Battery Electric Vehicle
CRM	Critical Raw Materials
CRMA	Critical Raw Materials Act
DG R&I	Directorate General for Research and Innovation
EC	European Commission
EU	European Union
ERMA	European Raw Materials Alliance
ELV	End-of-Life Vehicle
EV	Electric Vehicle
RMI	Rocky Mountain Institute



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1. Introduction and Background

This report provides a comprehensive overview of the SALEMA project, detailing progress and key achievements across various platforms and events aimed at disseminating and enhancing sustainable aluminium usage in e-mobility. Key events and initiatives include:

- Two major workshops: The first, a virtual event to foster dialogue on sustainable use of aluminium, and the second, an in-person workshop focused on aluminium recycling and the role of Critical Raw Materials (CRM).
- A cross-fertilisation event: This half-day webinar showcased innovative research projects funded by the EU, focusing on the utilisation of aluminium in vehicles, demonstrating the project's collaborative approach.
- Participation in the Aluminium Exhibition: A globally recognised trade fair that significantly contributed to the project's dissemination efforts.
- Two targeted information sessions: Specifically designed and accessible only to members of European Aluminium to share insights, project progress, and emerging innovative practices.
- General conference participation: The SALEMA project was actively presented at various national and international conferences, contributing significantly to the dialogue surrounding sustainable materials and manufacturing processes.
- Academic contributions: Including an array of academic papers, Master's theses, and PhD theses that helped foster the outcomes of the SALEMA project.

The scope of this report is to communicate the extensive efforts and contributions of the SALEMA project, emphasising its pivotal role in promoting sustainable practices and technologies within the aluminium industry and e-mobility sector.

Objectives of task and deliverable

- Catalogue dissemination activities showcasing the project's progress in sustainable aluminium for e-mobility.
- Detail engagement efforts with stakeholders in and outside the aluminium industry across various platforms.
- Summarise academic contributions, including papers, Master's theses, and Ph.D. theses, stemming from SALEMA.



2. First workshop, 8/9 November 2022

2.1. Workshop Background

The workshop, entitled "*Driving Sustainable Aluminium: Recycling and Critical Raw Materials for Aluminium Alloys in E-Mobility*," took place on 8–9 November 2022. Its primary aim was to share the latest insights and achievements of the SALEMA project, along with related critical discussions on sustainable aluminium usage in the context of e-mobility. Organised virtually by European Aluminium, the event was carefully structured into two half-day sessions to offer a balanced and comprehensive exploration of the topics at hand without overwhelming the attendees. This workshop aimed to address the challenges and opportunities of CRM reduction for aluminium alloys in e-vehicles. As detailed in the agenda, which can be found in **Annex A**, these aspects were addressed from policy (Session 1), market (Session 2), and technological (Sessions 3 & 4) perspectives. Additionally, synergies with other EU projects were analysed in Session 4.

The initial session concentrated on European Union policy and market dynamics, delving into the intricate regulatory landscape, challenges and opportunities influencing the aluminium industry's pivotal role in e-mobility. Session 2 focused on technological advancements, showcasing innovative approaches and methodologies to enhance aluminium recycling and craft high-performance aluminium alloys suitable for electric vehicles (EVs).

Session 3 centred on moving towards smarter recycling of aluminium for vehicles. This session explored advancements in recycling technologies and methodologies tailored specifically for the automotive industry.

Session 4 examined the challenges and opportunities regarding aluminium alloys in e-mobility. This session delved into the development of end-of-life recycled aluminium alloys for automotive applications and explored innovative design considerations for low carbon footprint aluminium EV battery housings. Additionally, speakers discussed the potential of new high-performance aluminium alloys for lightweight battery packs, emphasising the importance of innovation in materials for the advancement of e-mobility.

2.2. Overview of the first day

The SALEMA workshop's inaugural day featured two pivotal sessions aimed at exploring the critical role of the aluminium industry in fostering sustainability and supporting the transition to e-mobility. These sessions, adeptly moderated by Chris Heron and Pia Alina Lange, provided a comprehensive overview of European policies concerning CRM, aluminium and mobility, while also delving into the challenges and opportunities surrounding key materials in electric EVs. Throughout the discussions, esteemed speakers offered valuable insights and perspectives, shedding light on various aspects of sustainable practices and policy frameworks.

In the first session, **Massimo Gasparon** delivered a keynote speech outlining the **European Raw Materials Alliance's (ERMA)** mission to secure access to CRMs and advanced processing know-how for EU Industrial Ecosystems. Gasparon underscored ERMA's focus on rare-earth magnets, motors and materials for energy storage and conversion, highlighting its significant impact on policy formulation and investment strategies within the realm of CRMs. Gasparon's remarks resonated with the overarching theme of aligning industry efforts with the EU's ambitious RePowerEU strategy, emphasising the importance of collaboration and strategic initiatives in achieving sustainability goals.



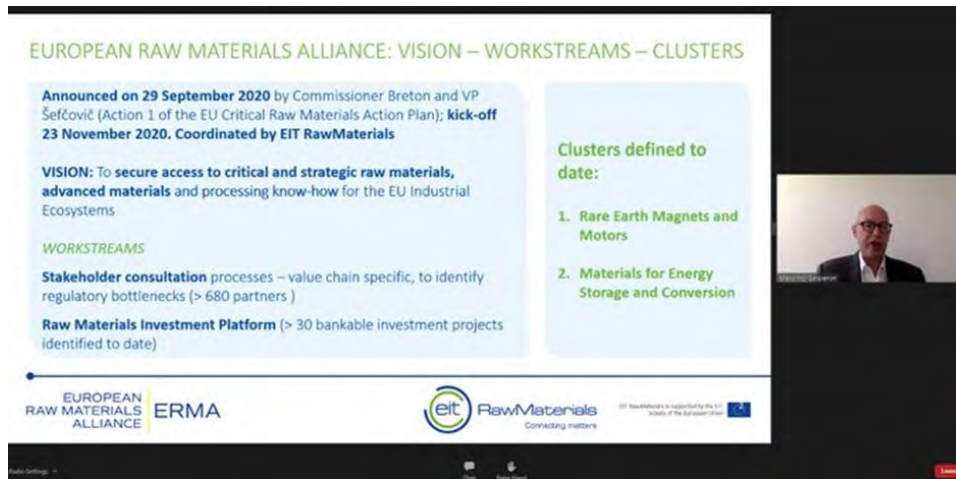


Figure 1 Massimo Gasparon from ERMA presenting at the Workshop on Driving Sustainable Aluminium: Emphasising Recycling and Critical Raw Materials for Aluminium Alloys in E-Mobility, conducted on 8 November 2024

Following Gasparon's keynote, **Benedetta Nucci from European Aluminium** provided valuable insights into the implications of the End-of-Life Vehicle (ELV) Directive for the aluminium industry. Nucci elaborated on the growing aluminium content in cars, driven primarily by the electrification trend and ambitious CO₂ reduction targets. She emphasised the imperative of enhancing aluminium recycling from ELVs, advocating for increased dismantling before shredding and the utilisation of post-shredding technologies to improve scrap quality. Nucci's presentation underscored the significance of sustainable recycling practices in mitigating environmental impacts and promoting circular economy principles within the automotive sector.

Continuing the discussion on policy interventions promoting circularity, **Cecilia Mattea from Transport & Environment** highlighted the transition to e-mobility and its environmental benefits compared to traditional vehicles. Mattea emphasised the importance of regulating the extractive industry for CRMs essential for EV production, advocating for high social and environmental standards and stringent due diligence laws to mitigate environmental degradation. Mattea's insights underscored the urgent need for holistic approaches to sustainability, emphasising the role of policy frameworks in driving industry-wide transformation towards greener mobility solutions.

Transitioning to the second session, **Hao Wu and Wenjian Liu from the Rocky Mountain Institute (RMI)** shared perspectives on emissions transparency and sustainable practices across the automotive supply chain. They emphasised the critical role of data-driven approaches in fostering sustainability, particularly within the aluminium and steel sectors. RMI's engagement with automakers on developing harmonised product carbon footprint methodologies reflects a concerted effort to mitigate environmental impacts associated with material sourcing and utilisation in EV production.

Subsequently, **Romain Billy from the Norwegian University of Science and Technology (NTNU)** presented findings from the BATMAN² project, highlighting the environmental footprints and material demands associated with the automotive industry's electrification. Billy underscored the necessity for sustainable material sourcing and recycling practices, especially concerning CRMs essential for battery production.

² BATMAN (Lithium ion BATteries – Norwegian opportunities within sustainable end-of-life MANagement, reuse and new material streams), <https://ife.no/en/project/batman/>





Figure 2 Daniele De Caro of Stellantis delivering a presentation at the Workshop: Driving Sustainable Aluminium: Focusing on Recycling and Critical Raw Materials for Aluminium Alloys in E-Mobility, held on 8 November 2024.

Following Billy's presentation, **Daniele de Caro from Stellantis** outlined the company's strategic shifts towards sustainability, emphasising their commitment to incorporating recycled materials into vehicles. De Caro detailed ambitious goals for green material integration, emphasising collaboration with suppliers and recyclers to advance circular economy principles within the automotive sector.

Concluding the session, **Ronald Gillner from Hydrovolt** spotlighted emerging challenges and innovations in EV battery recycling. Gillner emphasised the significance of circular solutions in addressing resource recovery challenges posed by the rapid growth of the EV market, underscoring the critical need for industry-wide collaborations to ensure environmental sustainability.

The inaugural day of the workshop offered invaluable insights into the prevailing regulatory landscape and industry viewpoints on raw materials within the EV sector. Despite the intricacy of the legislative framework discussed, there was unanimity among the panellists regarding the critical need for cohesive collaboration throughout the supply chain. The sessions underscored the significance of practical initiatives like SALEMA in addressing industry challenges and enhancing engagement. Additionally, the outcomes of this policy session were incorporated into the Deliverable 8.1 Report on policy recommendations, which also includes feedback from the first stakeholder workshop.

2.3. Overview of the second day

The SALEMA workshop's second day, on 9 November 2022, featured two key sessions: Session 3, focusing on smarter recycling techniques for aluminium in vehicles, and Session 4, exploring the challenges and opportunities of aluminium alloys in e-mobility. These sessions highlighted cutting-edge developments and strategies for the automotive sector's sustainable use of aluminium.

The day began with **Manel da Silva from Eurecat** providing an in-depth summary of the SALEMA project, outlining its ambitious objectives, progress in scrap sorting technologies and early successes in formulating new alloys to lessen dependence on CRMs. This set the stage for in-depth discussions on innovative recycling methods and the creation of eco-friendly aluminium alloys for automotive use.

Philippe Meyer from Novelis and co-chair of the Innovation Hub of European Aluminium, introduced Session 3, where **Professor Franco Bonollo from University of Padova**, presented on developing low



CRM aluminium alloys, aligning with SALEMA's goals. Following, **Ruggero Zambelli from Raffmetal** shared insights on refining recycling processes for automotive alloys, contributing towards SALEMA's targets. **Gregory Lewis from COMET** presented "The Multipick Technology for More Circular Aluminium," introducing a novel sorting technology that significantly contributes to enhancing recycling efficiency and supporting the circular economy. This sorting technology is an integral part of SALEMA strategy.

Furthering the theme of technological advancement, **Dillam Diaz Romero from KU Leuven and Jonas Petersson from Swerim AB** delved into the potential of Deep Learning to revolutionise sorting efficiencies in recycling processes, showcasing how cutting-edge technology could significantly impact the field by presenting the AUSOM³ project.

In Session 4, moderated by **Patrik Ragnarsson of European Aluminium**, the focus shifted towards the integration of aluminium alloys in e-mobility, spotlighting both the current challenges and the inventive solutions being forged to aid the automotive industry's transition to EVs.

Prof. Geoff Scamans from Brunel University and Innoval Technology presented compelling evidence on the environmental and sustainability advantages of using recycled aluminium alloys in vehicle manufacturing, with the AA6110 alloy's development from 100% TT scrap serving as a prime example of substantial CO₂ emissions reduction. Innovations in design for aluminium EV battery housings were shared by **Claudio Mus from Endurance Overseas**. He presented the IPCEI batteries⁴, emphasising the potential for design to reduce environmental impacts significantly. **Sylvia Andreas Cruz Torrez from Eurecat** concluded the session with insights into developing new sustainable aluminium solutions for EV battery packs, highlighting Eurecat's contributions towards sustainable advancements in e-mobility by introducing the Marbel⁵ project.

Deliverable *D9.8-Report on the interaction with other EU projects and EC events* contains more details on the presentation about the project AUSOM, IPCEI Batteries and Marbel, as it delves into efforts that were taken within SALEMA to establish and deepen connections with other EU-funded projects that share a focus on EVs, recycling and the substitution of CRMs in aluminium alloys.

2.4. Participation

The "*Driving sustainable aluminium: recycling and critical raw materials for aluminium alloys in e-mobility*" webinar on 8–9 November 2022 attracted 151 unique viewers, as detailed by the attendance report generated by the Teams online meeting platform. This diverse group, encompassing industry experts, researchers and academics, engaged deeply in discussions about aluminium's sustainability and e-mobility applications. The majority of participants hailed from Europe—specifically countries like Belgium, Norway, Italy and the UK—showcasing Europe's leadership in the sustainable aluminium sector. Additionally, contributions from international attendees, including those from the US and Canada, highlighted the global commitment to advancing eco-friendly aluminium practices.

³ Automatic Sorting of mixed scrap Metals, <https://ausomproject.eu/>

⁴ Important Project of Common European Interest, Batteries, <https://www.ipcei-batteries.eu/about-ipcei>

⁵ Manufacturing And Assembly Of Modular And Reusable Ev Battery For Environment-Friendly And Lightweight Mobility, <https://marbel-project.eu/>



3. Cross-fertilisation event, 6 October 2023

3.1. Workshop Background

On 6 October 2023, the Innovation Hub of European Aluminium organised a cross-fertilisation workshop as part of the EU-funded project SALEMA. The workshop, held as a half-day webinar, showcased innovative research projects funded by the EU, focusing on the utilisation of aluminium and advanced materials in vehicles. The agenda featured presentations from various speakers representing projects such as Fatigue4Light⁶, FLAMINGo⁷ and Flexcrash⁸, beside SALEMA. Topics ranged from the importance of aluminium in cars to the development of novel alloys for electric mobility and crash-tolerant structures. Moderated by industry experts Philippe Meyer from Novelis and Carla Barbatti from Constellium, the workshop provided a platform for discussions on weight reduction, crash resistance and sustainability in automotive manufacturing. The comprehensive workshop agenda is detailed in Annex B. Additionally, presentations and videos from the workshop are available for viewing on the SALEMA website at the link reported in the footnote⁹.



Figure 3 The sponsored banner utilised across LinkedIn and X social media platforms to promote the workshop event

3.2. Content overview

The workshop commenced with an educative presentation by **Martin Tauber**, representing the **International Magnesium Association**. He delved into the intricate dynamics of the global magnesium industry, intricately intertwined with the aluminium sector. He articulated the pressing need for a sustainable paradigm shift, elucidating the nuances of primary production processes, trade dynamics and recycling methodologies. By meticulously exploring avenues to curtail dependency on primary

⁶ Fatigue modelling and fast testing methodologies to optimise part design and to boost lightweight materials deployment in chassis parts, <https://fatigue4light.eu/about-fatigue4light/>

⁷ Fabrication of Lightweight Aluminium Metal matrix composites and validation In Green vehicles, <https://www.flamingo-project.eu/>

⁸ Flexible and hybrid manufacturing of green aluminium to produce tailored adaptive crash-tolerant structure <https://flexcrash-project.eu/>

⁹ The circular metal revolution: aluminium driving innovation for sustainable mobility, <https://salemaproject.eu/the-circular-metal-revolution-aluminium-driving-innovation-for-sustainable-mobility/>



magnesium and advocate for circular practices, Tauber's presentation resonated deeply with the workshop's overarching mission. Attendees gained invaluable insights into the challenges and opportunities inherent in reducing reliance on primary magnesium for aluminium alloys in the context of electric mobility, aligning with the core spirit of SALEMA. The second presentation, **by Patrik Ragnarsson from European Aluminium**, focused on a study carried out within the Automotive and Transport group of European Aluminium. This revealed insights into the evolving landscape of aluminium usage in vehicles. His presentation offered compelling data, including projections indicating a significant increase in aluminium content per vehicle by 2030, reaching approximately 256 kilograms. These findings underscored the pivotal role of aluminium in addressing key industry challenges such as weight reduction and sustainability, echoing the objectives of the SALEMA project.

At the conclusion of the first session, **Manel da Silva of Eurecat** presented on behalf of the SALEMA project. He discussed the project's structure, including pilot processes and demonstrators for assessing the new alloys, as well as the consortium involved in the project. He highlighted the importance of scrap-sorting technology developed by the University of Liège and COMET for improving aluminium recycling rates. Additionally, da Silva provided insights into the development of high-performance alloys for high-pressure die casting, focusing on reducing critical element content and increasing recycled content. He shared results from testing of different alloy variants and outlined the next steps for the project, including the production and testing of demonstrators. He also addressed the potential integration of project outcomes into industry standards.

In the second session, the projects Fatigue4Light⁶, FLAMINGo⁷ and Flexcrash⁸ were presented. More details about these presentations can be found in the Deliverable *D9.8-Report on the interaction with other EU projects and EC events*.



Figure 4 Manel da Silva presents the key findings of SALEMA at the cross-fertilisation workshop on 20 October 2023.

3.3. Participation

The audience for the webinar titled "*The Circular Metal for Future Mobility*" comprised over 60 participants from various sectors, including industrial, academic and technical fields. These participants represented expertise in European aluminium and automotive industries, highlighting a collaborative effort towards sustainable mobility solutions.



4. Final event: 21 March 2024

4.1. Event background

On 21 March 2024, the "Driving Sustainable eMobility: Improving Aluminium Recycling and Use of Critical Raw Materials" conference unfolded at the Autoworld Museum in Brussels, Belgium. Against the evocative backdrop of automotive history, attendees delved into discussions vital for shaping the future of sustainable transportation. The agenda encompassed a comprehensive exploration, commencing with a policy dialogue session focused on the integration of recycled aluminium alloys and CRMs in EVs. This session provided a platform for policymakers, industry representatives and technical specialists to assess current initiatives and delineate strategic advancements within the realm of CRMs.

Following this, an overview of the main outcomes of the SALEMA project illuminated pathways toward reducing dependence on primary CRMs and bolstering recycling practices. Subsequently, a dedicated session on automotive circularity delved into strategies employed by leading automotive companies to enhance sustainability throughout their operations. Through compelling case studies and collaborative examples, attendees gained insights into the importance of holistic approaches and cross-value chain collaboration in achieving circularity goals within the automotive sector. Moreover, discussions on enhancing the quality of recycled aluminium post-consumer scrap underscored the importance of technological innovation and advanced sorting methodologies. By exploring methodologies such as the 'Pick-It' technique, investigated within the SALEMA project, participants gained valuable insights into optimising recyclability and purifying aluminium alloys.

Throughout the day, participants capitalised on numerous networking opportunities, explored the museum's exhibits and engaged directly with SALEMA partners. Notably, attendees had the invaluable opportunity to witness first-hand the demonstrator pieces developed within the project, which were used to assess the performance of the new SALEMA alloys in the most relevant processing routes for the automotive industry, providing tangible validation of SALEMA's innovative solutions. The event culminated in a panel debate on leveraging EU innovation, wherein experts scrutinised the potential and challenges in translating project outcomes into practical applications, particularly within the context of CRMs. In essence, the conference facilitated a dynamic exchange of insights, fostering collaborative efforts toward a sustainable future for transport.



Figure 5 Engaged participants explore the SALEMA demonstrators showcased as part of the project's final event.



4.2. Content overview

After a brief introduction, the day opened with a panel discussion titled "*Driving Sustainability: A Policy Dialogue on Challenges and Opportunities in Expanding Recycled Aluminium in Electric Vehicles*," moderated by **Giulia Forgnone**, Director of Public Affairs and Communications at **European Aluminium**. This session featured: **Gaël de Rotalier from DG Environment**; **Martin Tauber of the International Magnesium Association & President of the Critical Raw Material Alliance**; **Chris Heron**, Communication & Public Affairs Director at **Eurometaux**; and Francesca Cavezza, Innovation Project Manager at European Aluminium and representing the SALEMA's consortium. They engaged in a critical discussion on enhancing recycling practices and ensuring the availability of CRMs for EVs, against the backdrop of EU legislation like the Critical Raw Materials Act and the End-of-Life Vehicle regulation. This dialogue aimed to bridge the gaps in current policies and foster sustainable and equitable production within the European automotive sector. The outcomes of this insightful discussion have been documented in *Deliverable 8.2 Policy-brief*.



Figure 6 Panellists during the opening panel discussion '*Driving Sustainability: A Policy Dialogue on Challenges and Opportunities in Expanding Recycled Aluminium in Electric Vehicles*'.

Following the panel discussion, SALEMA's main outcomes were presented, with **Manel da Silva from EURECAT** opening the session. He provided a general overview of the project's objectives and achievements, focusing on the development of new aluminium alloys that reduce dependence on CRMs like silicon (Si) and magnesium (Mg). The focus then shifted to **Tutku Özen from ASAŞ** and **Andrea Bongiovanni from Stellantis**, who went deeper into specific aspects of the project such as the industrial validation in extrusion processes and the role of Stellantis's contributions to demonstrators and activities across various work packages respectively. At the end of the presentation, all responsible for the SALEMA demonstrators were invited on stage. This gesture was an open invitation for participants to view the demonstrators during the lunch break and interact, ask questions and gain insights about them directly from those who were intricately involved in their development.





Figure 7 Representatives from SALEMA's partners, responsible for the project's demonstrators, take the stage to engage with attendees.

After lunch, the day progressed with a session titled “Empowering Europe’s Green Transition: the crucial role of Critical Raw Materials”, moderated by **prof. Franco Bonollo from the University of Padua**. This highlighted Europe's push towards sustainable CRM use in eMobility. **Chris Heron from Eurometaux** discussed Europe's raw materials challenge, emphasising the growing demand for essential metals like aluminium and lithium for green technologies. He stressed the need for the Critical Raw Materials Act to bolster Europe's resilience and self-sufficiency by advocating for increased domestic mining, refining, sustainable imports, recycling and innovation to meet 2030 Green Deal goals. **Mark Pohlmann of Magnesium for Europe GmbH** then presented a vision for eco-friendly magnesium production in Europe. He pointed out the risks of relying on imported magnesium, primarily from China, and proposed a clean, green and competitive magnesium production using the Al-thermic process in Bosnia-Herzegovina. This method promises significant reductions in CO₂ emissions and waste, aligning with Europe's sustainability objectives.

The session on “Design for Circularity in the Automotive Sector” showcased initiatives by Volvo Cars and the Catena-X alliance to advance sustainability and circularity. **Benedetta Nucci of European Aluminium** moderated the discussion, highlighting the industry's efforts to integrate circular economy principles. **Simon Buckingham from Volvo Cars** presented the company's sustainability strategy, emphasising a significant push towards electrification and CO₂ reduction. Volvo aims for a 40% CO₂ reduction per car by 2025 and a full transition to battery electric vehicles (BEVs) by 2030, with sustainability as a core strategic objective. Buckingham stressed the importance of aluminium in this transition, advocating for global access to low-emission aluminium and the necessity for a transparent, certified supply chain to meet Volvo's ambitious environmental goals. The **Catena-X initiative**, presented by **Carolin Tröster of T-Systems** and **Cagdas Tekin of BMW**, focused on the role of digital technologies in achieving a circular economy. They discussed the challenges of innovation costs, supply resilience and sustainability that no single market player can tackle alone. Catena-X proposes a collaborative data space to enable interoperability across the automotive value chain, emphasising the



importance of Digital Product Passports for regulatory compliance, product transparency and circularity. The initiative highlights the Battery Passport as a key tool in this digital transformation, aiming to streamline the transition towards more sustainable automotive manufacturing and lifecycle management.

Following this, the "*Aluminium Recycling: Enhancing Quality for a Sustainable Future*" session, chaired by **Prof. Geoff Scamans of Brunel University and Innoval Technology Limited**, delved into pioneering aluminium recycling technologies crucial for advancing sustainability in the automotive sector. **Gregory Lewis of COMET and Robert Baudinet of University of Liège** showcased the **Multipick** system, a core component of the SALEMA project, demonstrating its innovative approach to sorting a wide array of metals from shredder residues. This system is pivotal for enhancing the recovery and quality of non-ferrous metals, thereby supporting the EU's circular economy and sustainability goals. **Prof. Bernd Friedrich** from **RWTH Aachen** further expanded on the theme by introducing various aluminium melt purification techniques. Highlighting the importance of these technologies, Friedrich addressed the need for ongoing research to overcome operational and efficiency challenges.

The day concluded with a dynamic panel discussion "*Navigating the Future of EU Innovations and Sustainable Technologies*," moderated by **George Karkampasis** from **European Aluminium**, offered a deep dive into the EU's innovation landscape, especially regarding sustainability in technology. The panel brought together: **Garbiñe Guiu Etxeberria** from **DG Research and Innovation**; **Àngels Orduña** from **A. Spire**; **Christian Leroy** from **European Aluminium**; and **Claudio Mus** from **Endurance Overseas** and representing the SALEMA consortium. Each panellist shared their unique perspective on the direction of EU research and innovation as outlined in the DG R&I's Foresight report for Horizon Europe, emphasising the critical role of inter-industry collaboration and the aluminium sector's contribution to environmental sustainability, with specific examples from the SALEMA project, as highlighted by Claudio Mus. The conversation expanded to cover the EU's strategic approach to innovation funding, collaboration vs. competition in Horizon projects, and potential shifts in funding strategies post-election. The panel closed with a dynamic Q&A session, focusing on actionable strategies to amplify the impact of EU-funded innovations, providing a fitting conclusion to the day's forward-looking discussions.





Figure 8 Presentation of the MultiPick system during the final event of SALEMA

4.3. Participation

The conference successfully hosted 74 individuals, including speakers. Predominantly drawing from Europe, the gathering was a focal point for experts and executives, particularly from the aluminium and automotive industries. The event showcased the influence of the automotive sector, with premier entities like Toyota Motor Europe, Volvo Cars and DENSO AUTOMOTIVE Deutschland GmbH in attendance, underscoring the sector's eminent status. The aluminium metal industry was also well-represented, with sector giants such as TRIMET Aluminium SE, Novelis and Alcoa lending their weight to the discussions, thereby accentuating the event's significance in the metal industry. Key industry associations, notably the European Recycling Industries' Confederation (EuRIC), participated actively, further enriching the dialogue. The event schedule facilitated extensive networking opportunities, including two coffee breaks and a lunch break, which provided the perfect backdrop for fostering discussion and exchanging innovative ideas.

5. Other dissemination activities within the aluminium sector

In addition to the aforementioned dissemination activities, the SALEMA project has also actively engaged in various other dissemination endeavours within the aluminium sector. These efforts included participating in prominent industry events and numerous meetings, such as board meetings in relevant industry associations or consortia, to share crucial updates and insights with stakeholders. Notably, during each board meeting—especially those focusing on Innovation and Automotive & Transport—the latest developments of the SALEMA project were presented. These gatherings, taking



place at least 4 times per year and including the main representatives of the member companies, served as crucial moments to gain insights into the project's progress and its alignment with strategic objectives. Additionally, informational sessions, held in July 2022 and January 2024, served as crucial platforms for disseminating project outcomes, methodologies, and future directions to a diverse range of stakeholders within the aluminium sector. These information sessions were only addressing the Automotive & Transport and the Innovation Hub members of European Aluminium. Therefore, compared to workshop events open to everyone, they represented a closer platform of experts in the field that could give their feedback on outcomes and market application of SALEMA results.

5.1. Aluminium Exhibition 27–29 September 2022

Promotion of the SALEMA project took place as well at the Aluminium Exhibition in Düsseldorf on 27–29 September 2022. Held every 2 years, this is globally recognised as the leading trade fair for the aluminium industry and its major application areas. It provides a comprehensive platform for exhibitors to showcase their products and expertise, covering significant industry topics, trends and developments. The event includes special shows, themed pavilions, and formats like the Aluminium Conference and Speakers Corner, focusing on personal exchange and networking alongside knowledge transfer. Across three days, attendees engage with pressing industry issues and emerging trends. European Aluminium showcased the SALEMA project at its booth, where attendees could access informative leaflets and engage with representatives to learn more about SALEMA's objectives, progress and potential impacts on the aluminium sector. This presence provided a valuable opportunity to reach a wide audience of industry stakeholders, including manufacturers, suppliers, researchers and policymakers, and to raise awareness about the innovative solutions being developed within the framework of the project. By leveraging the platform of the Aluminium Exhibition, European Aluminium effectively contributed to the dissemination and visibility of the SALEMA project within the aluminium industry, fostering collaboration and knowledge exchange among key stakeholders.





SALEMA EU
@SalemaEu

Our partners from @EU_Aluminium are right now at the @ALUMINIUM_SHOW, meet them at booth 4F48. Feel free to walk by and get some fresh information about the @SalemaEu project!

#aluminium #ElectricVehicles



Figure 9 Twitter (now X) Post published on 27 September 2022 showing SALEMA participation in the Aluminium World Fair

5.2. Info Session - 7 June 2022

On 7 June 2022, a first informative session was convened online for the Innovation Hub and Automotive and Transport members of European Aluminium. The session was organised in response to inquiries from various members of the Innovation Hub regarding the project. The agenda featured insightful presentations aimed at providing clarity and updates on the project:

- An Introduction and general description of SALEMA
- A Technical overview of the SALEMA project and the main milestones achieved, delivered by Eurecat - Hannah Arpke and Manel da Silva
- Insights on low CRM alloys for foundry, extrusion and stamping, presented by University of Padova, by Prof. Franco Bonollo

The session concluded with a 30-minute questions-and-answers session, offering participants the opportunity to engage and seek clarification on any pertinent issues. Members were encouraged to participate actively and intervene as deemed necessary.



5.3. Info Session - 7 February 2024

This informative session organised by European Aluminium for its members, signified a crucial milestone as the SALEMA project was nearing its conclusion. The online session, scheduled for two hours and with more than 50 people joining, delivered an insightful agenda focused on key outcomes and demonstrators of the SALEMA project. **Manel da Silva from Eurecat** and **Juan Jose Palomo from Gestamp** started with a comprehensive summary of SALEMA's achievements. Following this, **Robert Baudinet from University of Liege** and **Gregory Lewis from Groupe COMET** delved into the Pick-It sorting system, elucidating its significance within the project. Additionally, **Violeta Vargas from Eurecat** explored the critical aspects of Life Cycle Assessment in SALEMA.

6. Other scientific and technological dissemination activities

6.1. Participation in events not organised by SALEMA

Table 1 below lists the externally-organised events in which partners participated to disseminate SALEMA's results.

Table 1 SALEMA Consortium Members' Participation in Disseminating Project Results and Promoting the Project at Conferences and Fairs

Conferences				
Partner Involved	Description	Target group	Date	Event Name
EUT	Oral presentation: <i>Jaume Pujante, Eduard Garcia-Llamas, Ahmed Boulajaaj</i> ; Localised Heat Treatment on 6000-series Aluminium Alloys.	Scientific community	3/11/2021	LightMAT 2021, online
EUT	Oral presentation: <i>Jaume Pujante, David Frómeta, Eduard Garcia-Llamas, Maria Giménez</i> ; Hot Stamped Aluminium: Process Viability and Implications on Crashworthiness.	Industry	2/06/2022	8th International Conference, Hot Sheet Metal Forming of High-Performance Steel , Barcelona Spain
PROFILGLASS	Oral presentation: <i>Matteo Paci</i> ; Il Progetto SALEMA e lo sviluppo di leghe "sostenibili" per lo stampaggio a caldo e a freddo	Industry	10/06/2022	METEF 2022 , Bologna, Italy



IMN	Oral Presentation: The conference was organised by the Society of Non-Ferrous Metals Engineers and Technicians (STIMN) and the Institute of Non-Ferrous Metals (IMN) on the occasion of the Institute's 70th anniversary. The session entitled 'IMN in the international arena' presented projects that are currently being carried out at the institute, including SALEMA where information about the project, the consortium, the purpose of the project and IMN's participation in the project was presented.	Industry	14/09/2022	70th Anniversary of the Łukasiewicz Research Network - Institute of Non-Ferrous Metals Wisła, Poland
CRF	Oral Presentation: general presentation about Salema goals and contribution for automotive	Industry	10/05/2023	NeMMo 2023 , Nantes, France
PROFILGLASS	Oral Presentation, presenting SALEMA project scope and status.	Industry	21/09/2022	39° Convegno Nazionale AIM- Leghe di alluminio sostenibili per componenti automotive stampati , Padova, Italy
ENDURANCE	Oral Presentation, presenting SALEMA project scope and status.	Industry	29-31/03/2023	MECSPE 2023 , Bologna, Italy
EAA	Oral Presentation, presenting SALEMA project scope and status.	Scientific Community	25-05-2023	Aluminum Surface Science & Technology Symposium 2023 , Stockholm, Sweden
IMN, COMET, EUT, ASAS	Oral Presentation: <i>S. Boczka, J. Hrabia – Wiśnios, B. Augustyn, D. Kapinos, S. Savelli, G. Lewis, M. da Silva, T. Özen</i> ; Metallographic quantitative analysis of inclusions on the Prefil Footprinter® filter using the example of SALEMA alloys from 100% scrap	Industry	5/06/2023	Light metals - activities of companies for the development of the non-ferrous metals industry and the 50th anniversary of the professional work of Director Andrzej Kłyszewski , Wisła, Poland
RAF	Oral Presentation		6-7/06/2023	NorCast 2023 , Arendal, Norway
UNE, EUT	Oral Presentation: <i>Manel da Silva, Isabel Linares</i> ; Presentation of the Salema Project and the CWA proposal to CEN/TC 132		14/06/2023	CEN/TC 132, CEN Documents <sd.cen.documents@iso.org>



CRF, EUT, PROFILGLASS	Oral Presentation: <i>D. de Caro, J. Pujante, E. Garcia-Llamas, G. Sbrega, J.J. Matarranz, M. da Silva</i> ; Effect of recycling on the formability of 6000-series aluminium alloy sheet	Scientific community	23/06/2023	LightMAT 2023 Conference , Trondheim, Norway
EUT, IMN	Oral presentation: <i>Manel da Silva, Jaume Pujante, Sonia Boczkal</i> . Analysis of inclusions and impurities present in typical HPDC, stamping and extrusion alloys produced with different scrap levels".	Scientific community	23/06/2023	LightMAT 2023 Conference , Trondheim, Norway
EUT, UNIPD	Oral presentation: <i>Manel da Silva, Alessio Trabuio, Franco Bonollo</i> . Effect of addition of different elements in microstructure and properties of EN AB-43500 aluminium alloy "	Scientific community	23/06/2023	LightMAT 2023 Conference , Trondheim, Norway
CRF, EUT	Oral presentation: <i>Andrea Bongiovanni, Manel Da Silva, Alberto Castellero</i> ; HPDC parameters optimisation and assessment on end of life secondary aluminium alloy for automotive structural components	Scientific community	6/09/2023	FEMS EUROMAT 2023 , Frankfurt am Main, Germany
IMN, EUT, COMET, ASAS	Oral presentation: <i>S. Boczkal, B. Augustyn, J. Hrabia-Wiśnios, D. Kapinos, G. Lewis, P.-F. Bareel, S. Savelli, M. da Silva, T. Özen</i> ; Preparation of High-Quality 6xxx Aluminium Eco Alloys Cast in Billets	Scientific community	11/10/2023	The 15th International INALCO Conference , Quebec City, Canada
CRF, EUT	Oral presentation: <i>Andrea Bongiovanni, Manel Da Silva, Alberto Castellero</i> ; Comparison of As Cast and T6 heat treatment on high end-of-life-scrap secondary aluminium alloy for High-Pressure Die Casting automotive structural components	Scientific community	17/04/2024	4th Mediterranean Conference on Heat Treatment and Surface Engineering , Lecce, Italy
EUT	Accepted for oral presentation: <i>Sylvia A. Cruz, Manel da Silva</i> Sustainable aluminum alloys to extrusion process, with high scrap content and low Critical Raw Materials	Scientific community	23-27/06/2024	ICAA19 , Atlanta, USA
Fairs				
Partners Involved	Description	Target group	Date	Event Name, Place
FAGOR	Booth	Industry	08-10-09/2022	EUROGUSS 2022 , Nuremberg, Germany
EUT	Technical round table in Industrial fair EXPOQUIMIA/EUROPCAR; titled "Raw Materials and Recycling in the Automotive Sector"	Industry	31/05/2023	EUROSURFAS , Barcelona, Spain



RAF	Booth with SALEMA brochures	Industry	12-16/06/2023	GIFA 2023, Dusseldorf Germany
RAF, ENDURANCE, FAGOR	Booth	Industry	13-15/01/2024	Euroguss 2024 - International Trade Fair for Die casting: technologies, Processes, Products , Dusseldorf, Germany
EUT	Booth	General Public	9-11/04/2024	ADVANCED FACTORIES , Barcelona, Spain

6.2. Press-release Scientific dissemination and

In Tables 2 and 3, scientific papers, along with Ph.D. and Master's theses conducted within SALEMA, are listed.

Table 2 List of Academic Publications and Theses produced under SALEMA.

Paper Title	Authors	Journal/Conference Name (proceedings)	Publication submission) date (or	DOI or URL
Effect of Recycling on the Mechanical Properties of 6000 Series Aluminum-Alloy Sheet	Daniele De Caro, Michele Maria Tedesco, Juame Pujante, Andrea Bongiovanni, Giovanni Sbriga Marcello Baricco Paola Rizzo	Materials (MDPI)	20 October 2023	https://doi.org/10.3390/ma16206778
Comparison of As Cast and T6 heat treatment on high end-of-life-scrap secondary aluminium alloy for High-Pressure Die Casting automotive structural components	Andrea Bongiovanni, Manel Da Silva, Alberto Castellero	Metallurgia Italiana	Paper submitted and accepted	
Analysis of inclusions and impurities present in typical HPDC, stamping and extrusion alloys produced with different scrap levels	Manel da Silva, Jaume Pujante, Joanna Hrabia-Wiśnios, Bogusław Augustyn, Dawid Kapinos, Mateusz Węgrzyn, Sonia Boczkal	Metals (MPDI)	Paper submitted (12 April 2024) and already available as preprint	https://www.preprints.org/manuscript/202404.0783/v1
Preparation of High-Quality 6xxx Aluminium Eco Alloys Cast in Billets	Sonia Boczkal, Bogusław Augustyn, Joanna Hrabia-Wiśnios, Dawid Kapinos, Gregory Lewis, Pierre-François Bareel, Stéphane	Engineering proceedings/INALCO 2023	15 September 2023	https://doi.org/10.3390/engproc2023043023



	Savelli, Manel da Silva, Tutku Özen			
Investigation of the effect of thermo-mechanical process orientation on final material performance in 6xxx aluminum alloys produced at high recycling rates.	Melih Caylak, Zeynep Tutku Ozen, Ilyas Artunc Sari, Irem Yaren Siyah, Gorkem Ozelik, Berat Bayramoglu	International Metallurgy and Materials Congress 2024	11 March 2024 (submission) Accepted (publication 8 October 2024)	NA
Investigation of the effect of thermo-mechanical process orientation on final material performance in 6xxx aluminum alloys produced at high recycling rates.	Zeynep Tutku Ozen, Irem Yaren Siyah, Ilyas Artunc Sari, Melih Caylak, Gorkem Ozelik, Burak Kardesler, Ibrahim Bat	International Metallurgy and Materials Congress 2024	11 March 2024 (submission) Accepted (publication 8 October 2024)	NA
Investigation of the effect of increasing the recycling rate on the mechanical properties of 6082 and 6063 alloys for low carbon footprint for use in the automotive industry."	Irem Yaren Siyah, Zeynep Tutku Ozen, Ilyas Artunc Sari, Gorkem Ozelik, Ibrahim Bat	International Metallurgy and Materials Congress 2024	11 March 2024 (submission) Accepted (publication 8 October 2024)	NA

Table 3 List of academic activities carried out within SALEMA

Master thesis within SALEMA					
University/Institution	Supervisor(s)	Start Date	Expected End Date	Thesis Topic	Link within SALEMA
University of Liège	Charles Baudinet & Gilles Louppe	1-Sep/23	12/31/2023	Classification of aluminium alloy scraps via spectral analysis: A deep learning approach to laser-induced breakdown spectroscopy https://matheo.uliege.be/handle/2268.2/19558	Classification of aluminium scraps from COMET
University of Padova	Franco Bonollo & Manel Da Silva	Mar-22-	Oct-22	Micro addition on HPDC aluminium alloys: effect on microstructure and properties https://thesis.unipd.it/handle/20.500.12608/36649	Effect of alloying elements and impurities on properties (WP1)
University of Padova	Franco Bonollo	Jan-22	Jul-22	Sustainability and innovation in the automotive industry: study and analysis of the chemical compositions of aluminum alloys. https://thesis.unipd.it/handle/20.500.12608/31721	Models & Criteria to design low CRM Al alloys (WP2)
Ph.D. thesis within SALEMA					
University-[company affiliated]	Supervisor(s)	Start Date	Expected End Date	Thesis Topic	Link within SALEMA
University of Turin, Italy [CRF]	Alberto Castellero	1/11/2021	10/31/2024	Study of secondary aluminium alloys for structural HPDC automotive components	Alloys studied are developed and produced in the SALEMA framework
Polytechnic University of Catalonia [EURECAT]	Francesc Pérez Ràfols	1/16/2023	Retired in 28/07/2023	Effect of composition variations in alloy flowability for HPDC alloys	Assessment of alloy flowability test to predict HPDC alloy castability



Istanbul Technical University [ASAS]	Assoc. Prof. Necip Unlu	02/09/2023	31/01/2025	Recycling of 6xxx Aluminium Alloys By Substitution of CRM's with Validation of Structural Parts and Battery Components of Next Generation Electric Vehicles	Alloys studied are developed and produced in the SALEMA framework
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Conclusions and Outlook

In summary, this report comprehensively outlines the activities and accomplishments of the SALEMA project, focusing on its efforts to promote the use of sustainable aluminium in EVs. The project facilitated critical workshops and information sessions, effectively bringing together industry professionals to discuss advancements in aluminium recycling and the utilisation of CRMs in a more sustainable manner.

Beyond facilitating discussions, the project significantly contributed to the academic field, inspiring a range of scholarly articles, Master's theses and Ph.D. theses. This highlights SALEMA's role in advancing research and innovation in sustainable e-mobility.

Overall, the report demonstrates the substantial effort of the whole SALEMA project consortium in disseminating the results of SALEMA and advertising the project on numerous and frequent occasions.

Next steps

While the SALEMA project is finish on 30 April 2024, the members are keeping advertising the outcomes of SALEMA's project in events.

On May 8, SALEMA will be presented at METEF in Bologna¹⁰.

¹⁰Electric Mobility and the Aluminium supply chain: results of the European SALEMA project, <https://www.metef.com/en/mobilita-elettrica-filiera-alluminio-salema/>



Annex: A

Agenda of the workshop “Driving Sustainable Aluminium: Recycling and Critical Raw Materials for Aluminium Alloys in E-Mobility” , 8-9 November 2022, online

First Day of Virtual Workshop, 8th November 2022	
09:00	Welcome and introduction Paul Voss, Christian Leroy, European Aluminium
09:10	Introduction to the SALEMA project Francesca Cavezza, European Aluminium
<hr/> 09:20 - 10:30 - Session 1: European policy landscape for CRM, aluminium and mobility Moderator: Chris Heilm, EuroMaterials <hr/>	
09:20	Welcome and introduction by moderator
09:25	Towards a CRM policy strategy supporting e-mobility in Europe Massimo Gasparon, Director of the European Raw Materials Alliance (ERMA)
09:50	End-of-life vehicle directive (ELV) and its implication for the aluminium industry Benedetta Nucci, European Aluminium
10:10	Moving to e-mobility: opportunities and challenges in terms of EU policy Cecilia Mattea, Transport & Environment
10:30	<i>Online networking & coffee break</i>
<hr/> 11:00 - 12:25 - Session 2: Challenges and opportunities for key materials in e-vehicles Moderator: Pia Alina Lange, European Aluminium <hr/>	
11:00	Welcome and introduction by moderator
11:05	Collaboration with Automakers on Carbon Transparency Hao Wu & Wenjuan Liu, RMI
11:25	Carbon footprint & circularity challenges for e-vehicles: main outcomes from the BATMAN project Romain Billy, NTNU
11:45	Sustainability in the automotive sector: an OEMs prospective Daniele de Caro, Stellantis
12:05	The challenges in batteries recycling Ronald Gillner, Hydrovolt
<hr/> 12:25 Final remarks: Comments and wrap up by moderators <hr/>	
12:35	<i>Online networking & coffee break</i>
13:15	<i>End of the first day</i>



Second Day of Virtual Workshop, 9th November 2022

09:00 Welcome and introduction

Christian Leroy, European Aluminium

09:10 Introduction to the SALEMA project

Manel da Silva, Eurecat

09:25 - 10:50 - Session 3: Moving to smarter recycling of aluminium for vehicles

Moderator: Philippe Meyer, Novelis and Co-chair of the Innovation Hub

09:25 Welcome and introduction by moderator

09:30 On low CRMs alloy for foundry, extrusion and stamping

Prof. Franco Bonollo, University of Padova

09:50 Aluminium recycling challenges for aluminium automotive alloys: an industrial perspective

Ruggero Zambelli, Raffmetal

10:10 The Multipick technology for more circular aluminium

Gregory Lewis, Comet Belgium

10:30 The AUSOM project and deep learning methods for LIBS-based sorting

Dillam Diaz Romero, KU Leuven and Jonas Petersson, Swerim AB

10:50 Online networking & coffee break

11:20 - 12:25 - Session 4: Aluminium alloys and e-mobility: challenges and opportunities

Moderator: Patrik Ragnarsson, European Aluminium

11:20 Welcome and introduction by moderator

11:25 End-of-life recycled aluminium alloys for the automotive sector: challenges and opportunities

Prof. Geoff Scamans, Brunel University and Innoval Technology

11:45 Low carbon footprint aluminium EV battery housings require innovative design for disassembling

Claudio Mus, Endurance Overseas

12:05 New partially recycled high-performance aluminium alloys for extruded lightweight battery packs

Sylvia Andreas Cruz Torrez, Eurecat

12:25 Final remarks: Comments and wrap up by moderators

12:35 Online networking & coffee break

13:15 End of the workshop



Annex: B

Agenda of the final event/second workshop: *“Driving Sustainable eMobility: Improving Aluminium Recycling and Use of Critical Raw Materials”*, 21 March 2024, Brussels

08:30 On-site registration
Opening
09:00 Welcome remarks: Manel da Silva & Hannah Arpke, Eurecat; Paul Voss & Christian Leroy, European Aluminium
09:15 - Driving Sustainability: a policy dialogue on challenges and opportunities in expanding recycled aluminium in electric vehicles
Introduction by moderator: Giulia Forgnone, Director of Public Affairs and Communications, European Aluminium
<ul style="list-style-type: none"> Panel Discussion <ul style="list-style-type: none"> Gaël de Rotelier, DG Environment, Head of Unit Martin Tauber, European Representative, International Magnesium Association & President Critical Raw Material Alliance (CRM-A) Chris Heron, Communication & Public Affairs Director, Eurometaux Francesca Cavezza, Innovation Project Manager, European Aluminium
10:15 Networking coffee break & Exhibition
10:45 - The SALEMA Project Journey: main outcomes, challenges and possibilities
<ul style="list-style-type: none"> Manel da Silva, Technical Coordinator SALEMA, Unit of Metallic and Ceramic Materials, Eurecat Tutku Ozen, R&D Projects & Incentives Executive, ASAS Andrea Bongiovanni, PhD Researcher, Centro Ricerche Fiat
12:15 Networking lunch & Exhibition
14:00 - Empowering Europe's Green Transition: the crucial role of Critical Raw Materials
Introduction by moderator: Franco Bonollo, professor of Metallurgy, Università di Padova
<ul style="list-style-type: none"> Metals for Clean Energy: pathways to solving Europe's raw materials challenge - Chris Heron, Communication & Public Affairs Director, Eurometaux Sustainable Magnesium Production in Europe - Mark Pohlmann, Managing Director, Magnesium for Europe
14:45 - Design for Circularity in the Automotive Sector: Strategies for Improved Sustainability
Introduction by moderator: Benedetta Nucci, Senior Manager Mobility & Life Cycle Assessment, European Aluminium
<ul style="list-style-type: none"> Volvo Cars, Sustainability, Circularity & Aluminium: a great combination? - Simon Buckingham, Technical Leader for Sustainable Materials, Volvo Cars Catena X: enabling circular economy and sustainability through digital product passports - Carolin Tröster, Expert Business Consultant, T-Systems; Cagdas Tekin, Project Engineer, BMW
15:30 Networking coffee break & Exhibition
16:00 - Aluminium Recycling: enhancing quality for a sustainable future
Introduction by moderator: Prof. Geoff Scamans, Brunel University and Innoval Technology Limited
<ul style="list-style-type: none"> Multipick: ultimate robotic sorting for greener metals - Gregory Lewis, Research & Development Engineer, Groupe Comet, Robert Baudinet, Research Engineer, Université de Liège State-of-art technologies in purifying aluminium melt from scrap - Prof. Karl Bernhard Friedrich, RWTH Aachen
16:45 - Leveraging EU Innovation: from Horizon project to market impact
Introduction by moderator: George Karkampasis, Director – Circular Economy & Raw Materials, European Aluminium
<ul style="list-style-type: none"> Panel Discussion <ul style="list-style-type: none"> Garbiñe Guiu Etxebarria, DG Research and Innovation Ángels Orduña, Executive Director, A.SPIRE Christian Leroy, Director Innovation, European Aluminium Claudio Mus, Technical - R&D Director, Endurance Overseas
17:45 Final remarks & closing
18:00 End of the event

