



Report on “Call announcement and Guide for Applicants - Open Call 2 ”

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Duration in months: 39

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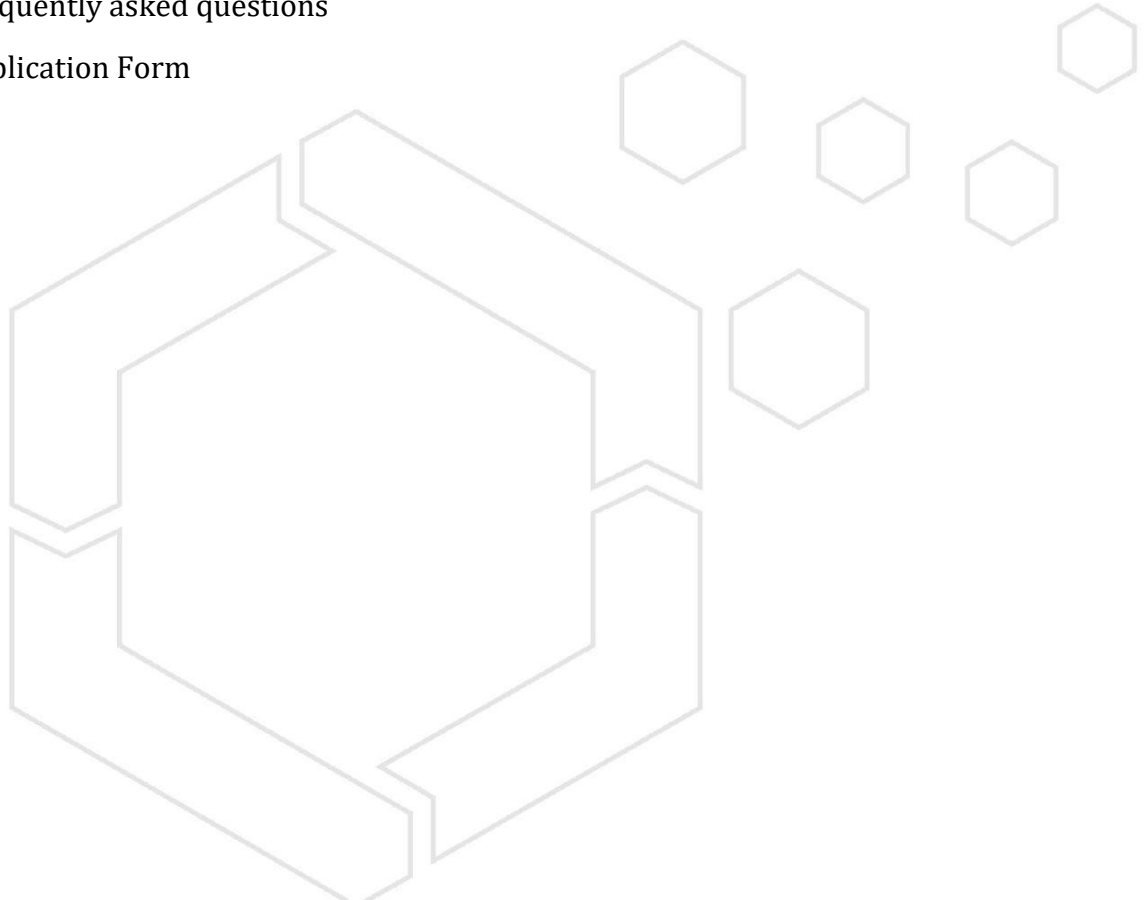
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GUIDE FOR APPLICANTS

AMULET 2nd Open Call

Submission of applications starts on the 10th of January, 2023, at 13:00 Brussels Time

Submission deadline: 22nd of March, 2023, at 17:00 Brussels Time

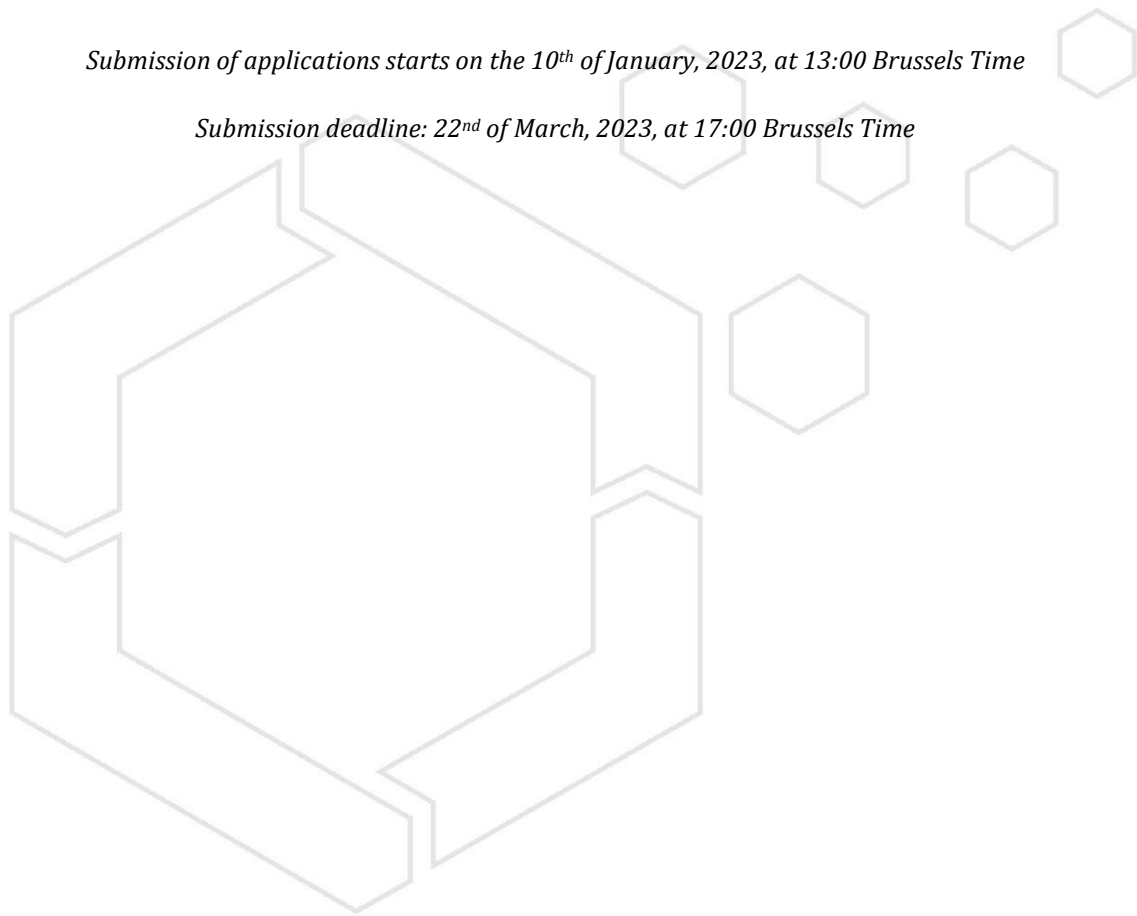


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1. Basic information about AMULET

The Advanced Materials & Manufacturing United for LightwEighT (AMULET) project is a HORIZON 2020 project that aims to exploit the innovation potential of small and medium-sized enterprises through a cross-sectoral and funded knowledge exchange. The goal of AMULET is to create new value chains by fostering the penetration of the three types of advanced lightweight materials in four sectors: automotive, aerospace and aeronautics, energy, and building. AMULET aims to do that through a cross-regional and cross-sectoral knowledge exchange approach.

Considered topics

4 Sectors



BUILDING



AEROSPACE & AERONAUTICS



ENERGY



AUTOMOTIVE

3 Advanced materials



POLYMER-BASED COMPOSITES



CERAMIC MATRIX COMPOSITES



LIGHT METAL ALLOYS

Figure 1 Sectors and materials addressed in AMULET

Three types of activities will be implemented to foster innovation in SMEs (Small and Medium-sized Enterprise), as summarised in Figure 2.

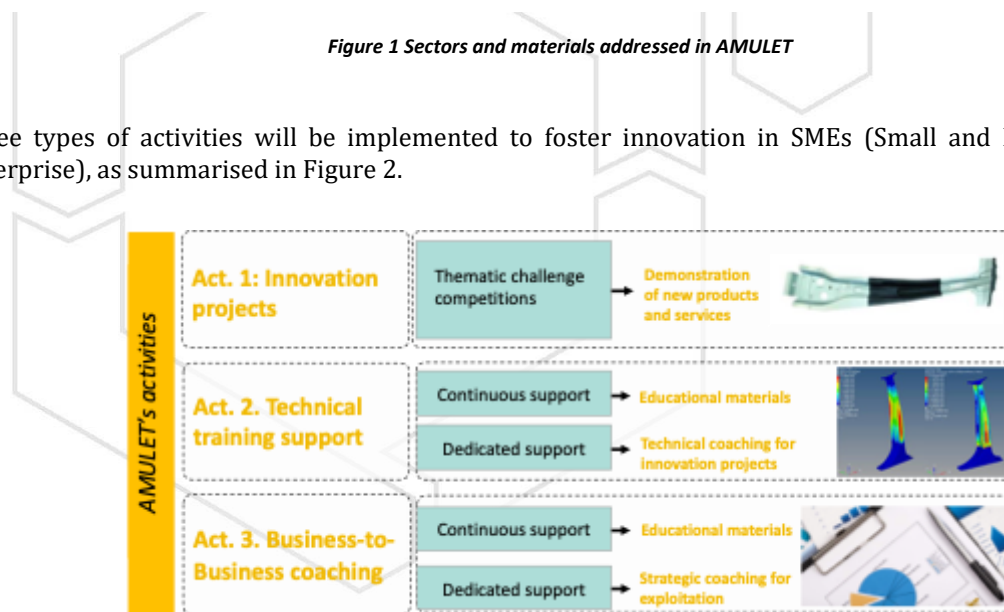


Figure 2 The three types of activities in AMULET

Firstly, innovation projects targeting current sectoral challenges will be developed to reach TRL7, following a competitive-based approach. Secondly, SMEs participating in the thematic challenge competitions will receive dedicated technical training support to develop their innovative projects. Thirdly, dedicated business-to-business coaching for accelerating the commercialization of their innovative solutions will be given to SMEs too. Besides supporting SMEs from the thematic challenge competitions, AMULET will also provide continuous support in technical and business topics through educational materials to SMEs interested in lightweight.

These activities will create a unique self-sustainable business framework in which end-users and SMEs from established and new industrial supply chains will explore innovative lightweight-driven market opportunities.

The ultimate goal of AMULET is to significantly contribute to the reduction of CO₂ emissions and improve resource efficiency in the EU by boosting the role of SMEs, in which their innovations are expected to be facilitated & supported by clusters.

The AMULET project has 13 partners and is coordinated by 'POLYMERIS' (FR) <https://amulet-h2020.eu/partners/>.

All partners in the AMULET Consortium comprise a joint network of 1717 SMEs, 341 large companies and 93 universities, research and innovation institutes which are going to be informed about the possibilities of taking advantage of AMULET during the duration of the project.

The total AMULET budget is **€4,952,732** out of which **€3,724,849** will be distributed to SMEs as financial and non-financial support and related supporting activities. The direct financial support to SMEs under two Open Calls has a budget of **€2,424,000**.

The total budget of the 2nd Open Call as a direct support to SMEs is up to **€1,193,000**.

2. AMULET – background and ambition

Background

The relevance of lightweight materials and technologies in decarbonisation & resource efficiency for circular economy cuts across different industries, having the most important impacts on the automotive, aerospace & aeronautics, energy, and building sectors. There are three main lightweight materials used in industry: polymer-based composites, light metal alloys, and ceramic matrix composites. However, their degree of penetration in these strategic sectors has been distributed unevenly.

For example, polymer-based composites have been used in aerospace & aeronautics for more than 30 years while in automotive their high costs have hindered a wider application. Their use in energy or building sectors has been limited, resulting in niche markets with few players, in which their potential is not fully exploited. The same can be said for light metal alloys and ceramic matrix composites. The former finds wide use as structural components in aircrafts (e.g. Al and Mg alloys) while the latter has been used in high temperature applications, e.g. aerospace.

AMULET will encourage the development of solutions to challenges that are currently blocking the penetration and market uptake of these three main advanced materials for lightweighting in the four strategic sectors mentioned above. Linking innovations from one sector into another value chain can effectively result in new solutions and opportunities, thereby building new industrial value chains.

In the case of **automotive**, new value chains might result from an increasing penetration rate of lightweight materials in varied auto applications by achieving important breakthroughs on processing technologies and recycling aspects. To develop a competitive edge in the automotive market, the industry needs to focus on the current challenges towards optimising lightweight performance. This includes: cost reduction from various ways e.g. raw material cost, labour cost, energy cost; increase productivity by developing manufacturing technologies with reduced cycle time for complex parts and mass customisation; improve robustness in supply chains for raw materials, design, tooling and manufacturing for composites; enhance simulation and prediction techniques with better software for manufacturing composite parts; improve repair and recycling technologies.

Aerospace & aeronautics have been at the front of lightweight innovation for decades. Introducing new advances in both industries will influence their entire supply chains, including manufacturers of aero components

which would lead to a better productivity. Aerospace & aeronautics could benefit as well from advances in automotive on mass manufacturing or eco-design principles in energy to ensure recyclability.

Lightweighting in the **energy** sector has been mainly driven by polymer-based composites for wind turbines. However, a variety of raw material products can meet a varied range of energy applications. AMULET aims to identify and prioritize big-volume applications based on synergy, capability, innovation potential, opportunity size, competitive intensity, profit potential, sustainability, and other factors to drive growth. Lightweight cuts across multiple applications to reduce costs and improve competitiveness along different value chains in the renewable energy sector.

In **building**, lightweighting offers advantages in terms of cost, time and energy intensity. The use of lightweight materials in the building sector can potentially reduce the cost of load-bearing structures, as well as those of energy and installation. However, the absence of cost-effective solutions is blocking their widespread use. Other areas of application that could benefit from lightweighting include roofing, building interior and exterior elements, facades, bridges and offshore structures.

Ambition

AMULET aims to consolidate **novel value chains for multi-sectoral industrial applications** enabled by advanced materials and their related manufacturing technologies as Key Enabling Technologies (KETs), **ultimately contributing to decarbonisation, resource-efficiency through lightweighting** and cost reduction.

In order to consolidate new lightweight industrial value chains in the automotive, aerospace & aeronautics, energy and building sectors, AMULET identifies current sectoral challenges per type of advanced material that are related to, e.g., decarbonisation, circularity, automatisisation, cost-effectiveness (following RIS3 - Research & Innovation Smart Specialisation Strategy).

The thematic challenge-based competitions of AMULET will be organized through two Open Calls (the 1st Open Call has already been closed) under a funnel approach (described in this GfA in sections 7.1 and 7.3), where SME consortia (consisting of 2 to 3 SMEs) will develop solutions to the industrial challenges coming from industrial end-users and suppliers.

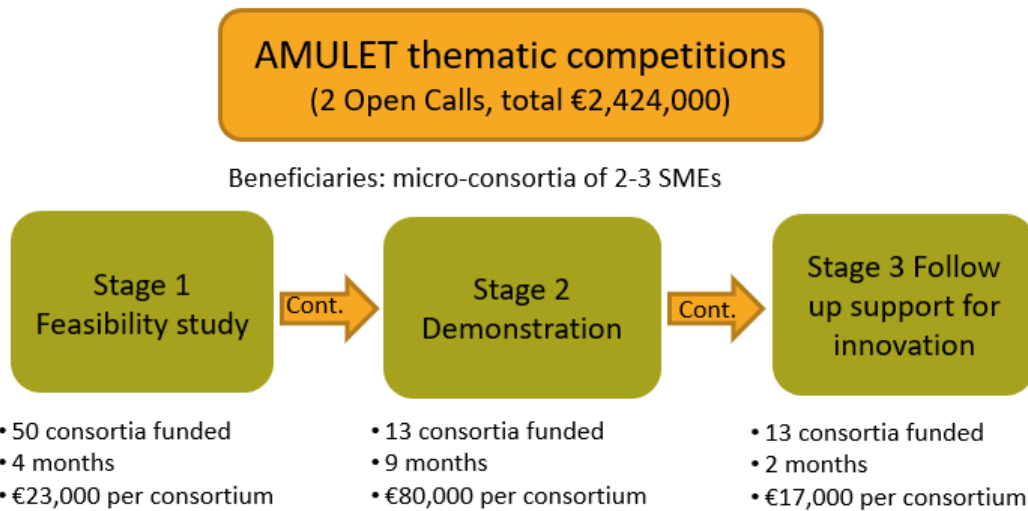


Figure 3 Overview of AMULET support actions for SMEs

3. 2nd Open Call - what do we offer?

The funding instrument will include a lump-sum grant of up to €120,000 per project whereas SMEs individually may not receive more than €60,000. The total duration of support provided will not exceed 15

months per project. Following a funnel system (from Stage 1 to Stage 2 of the Programme) up to **7 SME** consortia will have a chance to complete the full programme.

| <i>AMULET thematic competitions – 2nd Open Call</i> | |
|---|--|
| Application stage | <ul style="list-style-type: none"> ✓ SME consortia (2 to 3 SMEs) ✓ online matchmaking events ✓ up to 36 SME consortia invited to the online Jury Day to pitch their solutions |
| Stage 1 - Feasibility study | <ul style="list-style-type: none"> ✓ up to 26 SME consortia funded ✓ Duration: 4 months ✓ up to €23,000 lump sum (per micro-consortium) |
| Stage 2 - Demonstration | <ul style="list-style-type: none"> ✓ up to 7 SME consortia funded (passed from Stage 1) ✓ Duration: 9 months ✓ up to €80,000 lump sum (per micro-consortium) |
| Stage 3 - Follow up support for innovation | <ul style="list-style-type: none"> ✓ up to 7 SME consortia funded (consortia from Stage 2) ✓ Duration: 2 months ✓ up to €17,000 lump sum (per micro-consortium) |

Table 1 AMULET Thematic Competitions – 2nd Open Call

4. Support for the preparation of applications

Further information on the Open Challenges for the support of your proposal preparation will be available during the online matchmaking events. The events will explain AMULET support activities to SMEs and the opportunities and benefits it entails, answering questions that might arise from the audience:

- ✓ Explaining specific details on the process of the thematic competitions, the guidelines and criteria to compete,
- ✓ Presentation of the selected industrial challenges per theme,
- ✓ Promoting SMEs to network and start matchmaking, aiming at identifying relevant partners to work with on the development of solutions to thematic competitions.

The events will also count on the presence of external experts, end-users and other external stakeholders in the value chain.

The participation in the matchmaking events is not mandatory but recommended.

5. Eligibility criteria

We will check the eligibility of all applications which were submitted before the deadline via our online application form <https://amulet-2oc-h2020.fundingbox.com/>. All eligibility criteria are listed in this section of the Guide for Applicants. The projects that do not comply with those criteria will be excluded and marked as ineligible.

5.1 What types of activities can be funded?

The proposed activities should address the development and implementation of demonstration activities around technology and system applicable to exactly one of the Open Challenges publicly announced on 20th of December, 2022 (available in Annex 2 and on the [website](#)) coming from one of the three types of lightweight materials (polymer-based composites, ceramic matrix composites, and light metal alloys) for four industrial markets: automotive, aerospace & aeronautics, energy, and building.

The proposed activities should have a **cross-sectoral dimension**, linking innovations coming from one material value chain or one sector to another. The proposals aiming to **reach Technology Readiness Level¹ (TRL) 7, starting from TRL 4-5**, are preferred.

AMULET counts on the participation of European innovative SMEs with a clear commercial ambition and a potential for high growth and internationalisation. Innovation is needed to overcome the barriers faced by the advanced lightweight materials and technologies and enable their contribution to environmental and societal challenges. AMULET's financial support to third parties comes in the form of lump sum grants. These grants offer significant opportunities for SMEs by covering the financial risks of their breakthrough ideas and therefore accelerate the time to market their innovative products, services and processes. The SMEs' ideas will answer real industry challenges, which ensures the market's relevance and future uptake.

Open challenges

Please read the Annex 2 - Open Challenges description carefully (published on 23rd of December, 2022) to properly address the selected challenge and accurately fill out the application form. In the application form, you will need to mark the specific challenge that you will address in your proposal.

5.2 Who are we looking for?

The projects must be proposed by a **micro-consortium of a minimum of 2 and a maximum of 3 independent legal entities (preferably cross-border)**, including **exclusively SMEs²**, registered prior to the launch of the AMULET 2nd Open Call, established in:

- ✓ The Member States of the European Union and its Overseas Countries and Territories (OCT),
- ✓ [Associated Countries to H2020](#) or,
- ✓ The United Kingdom.

The AMULET partners CANNOT be involved in these consortia (or their affiliates or employees, permanent collaborators).

Also, the authors of challenges (challenge givers) CANNOT participate in the AMULET Open Calls.

The applicants from the AMULET 1st Open Call, who have not been selected as beneficiaries, are allowed to apply to the 2nd Open Call.

5.3 How to apply?

Proposals must be submitted through the AMULET Open Call microsite <https://amulet-2oc-h2020.fundingbox.com/>. Applications submitted by any other means will not be considered for funding.

¹ [link](#) to TRL as defined by Horizon2020

² An SME will be considered as such if it complies with the European Commission's Recommendation 2003/361/EC. As a summary, the criteria defining an SME are: * Headcount in Annual Work Unit (AWU) less than 250,* Annual turnover less or equal to €50 million OR an annual balance sheet total less or equal to €43 million. Note that the figures of partners and linked enterprises should also be considered as stated in the SME user guide. For detailed information check EU recommendation: https://ec.europa.eu/growth/smes/business-friendly-environment/sme-definition_en

We know applying to an open call takes time and dedication, and we are grateful you take up the challenge of applying to the AMULET 2nd Open Call. Please take into consideration the guidelines below to prepare the best possible application.

✓ **Deadline date**

Make sure you submit your proposal before the **deadline** on the 22nd of March, 2023, at 17:00 Brussels Time. If you submit the form correctly, the system will send you a confirmation of your submission. Get in touch with us immediately if this was not the case. Applicants are strongly recommended to start the submission process quite before the deadline in order to avoid last minute circumstances. Submitting applications after the deadline, no matter the reason, will result in rejection.

✓ **English Language**

Your proposal must be written in **English** in all mandatory parts in order to be eligible. Only parts written in English will be evaluated.

✓ **Multiple submissions**

Though applicants can submit multiple applications, one SME can receive the AMULET grant only once. If several consortia which have the same composition or the same members (1, 2 or 3) will be selected to pitch during a Jury Day, only the best proposal (decided by the 'Selection Committee') will be considered for funding.

✓ **Every question deserves your attention**

All mandatory sections of your proposal - generally marked with an asterisk - must be filled in. Make sure that the data provided is true and complete. This is crucial for us to properly assess your proposal. Conversely, any additional material that is not specifically requested in the online application form will not be considered for the evaluation.

✓ **Healthy finances and a clean sheet are a must**

We won't accept entities that are under liquidation or enterprises in difficulty according to the Commission Regulation No 651/2014, art. 2.18. Neither will we accept proposals from entities that are excluded from the possibility of obtaining EU funding under the provisions of both national and EU law or by a decision of both national or EU authority.

✓ **Absence of conflict of interest**

The existence of a potential conflict of interest among you and one or more of the AMULET Consortium partners will be taken into consideration. The AMULET Consortium partners, their affiliated entities, employees and permanent collaborators cannot take part in the AMULET programme. All cases of potential conflict of interest will be assessed case by case.

✓ **Have a European dimension:**

Your proposal should have a clear *European* dimension to fully exploit the potential of the European economy and society. The ultimate goal of AMULET is to significantly contribute to decarbonisation and resource-efficiency in the EU by boosting the role of SMEs, in which their innovations are expected to be facilitated & supported by clusters.

✓ **It is your proposal**

Your project should be based on your original work. If not, please make sure your right to use the IPR is 100% certain. Going forward, any foreseen developments must be free from third-party rights and if not, these third-party rights must be clearly stated.

✓ **Be exhaustive**



Have you answered all the sections of the form? It won't be possible to add any information after the deadline. However, you will be able to modify the form as much as you like even after the proposal is submitted, as long as it is done before the deadline.

6. How will we evaluate your proposal?

Our evaluation process is transparent, fair, and equal to all our participants. We expect a high number of applications, so if you want to stand out, *quality* is the way to go. What does it mean? In short, provide as many details as possible while being extremely clear and structured.

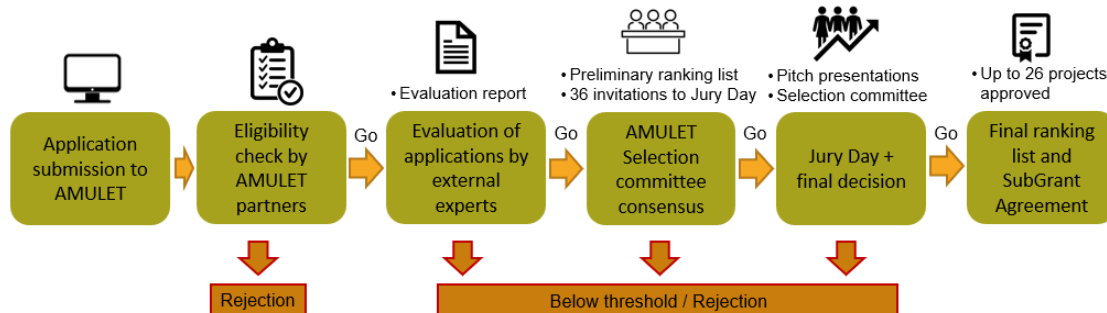


Figure 4 Overview of the applications' evaluation and selection of funded projects in AMULET

6.1 First Eligibility Check

The first evaluation step is about verifying some basic requirements based on the statements from your proposal. Your proposal will be admissible for the next phase if it:

- ✓ Is **complete, readable and in English** in all mandatory sections.
- ✓ Has been submitted via the online form <https://amulet-2oc-h2020.fundingbox.com/apply> within the **deadline** on 22nd of March 2023, 17:00 Brussels Time.
- ✓ Is addressing **exactly one** of the announced **Open Challenges within the 2nd Open Call** (Annex 2).
- ✓ Is submitted by a **micro-consortium of 2-3 SMEs**.
- ✓ Includes the properly filled declaration of honour. Read carefully the **Declaration of Honour** template included in the application form here: <https://amulet-2oc-h2020.fundingbox.com/apply>, as we will check the related submitted statements. You will not be able to change them after the deadline.

The proposals that do not comply with these criteria will be excluded. We will inform you about the results of this first eligibility check within two weeks after the deadline for submission of the application.

6.2 External Evaluation

Each eligible project will be evaluated by three **external and independent** evaluators specialised in the Lightweight Advanced Materials field.

These are the criteria they will consider to complete the evaluation:

(1). EXCELLENCE will evaluate:

- **Ambition.** You have to demonstrate to what extent the proposed project is beyond the **State of the Art** and describe the innovative approach behind it (e.g., ground-breaking objectives, novel concepts and approaches, new products, services or business and organisational models).
- **Innovation:** You should provide information about the level of innovation within your market and about the degree of **differentiation** that this project will bring.

- **The soundness of the approach** and credibility of the proposed methodology.

(2). **IMPACT** will analyse:

- **Market opportunity:** You have to demonstrate a clear idea of what you want to do and whether the new/improved product has market potential, e.g., because it solves a problem for a specific target customer.
- **Competition:** You have to provide information about the degree of competition for your particular product/service and if the idea is disruptive and breaks the market, i.e., the products/services to be brought to market can be clearly differentiated from the competition.
- **Commercial Strategy and Scalability:** You have to demonstrate the level of scalability of the new/improved product meaning that it is not addressed to solve a specific problem but able to be commercialised to solve a structural problem in a specific sector/process/etc.

(3). **IMPLEMENTATION** will consider:

- **Team:** You have to demonstrate your management and leadership qualities, your ability to take a concept from ideas to market, your capacity to carry through your ideas, and understand the dynamics of the market you are trying to tap into. The team should be balanced and cross-functional with a strong background and skill base.
- **Resources:** Demonstrate the quality and effectiveness of the resources assigned in order to get the objectives/deliverables proposed. One important aspect is that you make clear in the proposal that what you suggest can be developed using applicants' technical resources and solutions. The application form must include information how the grant will be distributed between micro-consortium partners. When preparing your budget split, please remember that.

Transversal criteria such as 'Environment and low carbon economy contribution' (real and measurable impact) 'Equal Opportunities, Gender balance & Diversity' or 'Social Impact' will be also considered by evaluators when scoring the applications.

The evaluators will score each criterion on a scale from 0 to 5:

0 = Not acceptable – The proposal fails to address the criterion, or it cannot be assessed due to missing or incomplete information.

1 = Poor – The criterion is inadequately addressed, or there are serious inherent weaknesses.

2 = Fair – The proposal broadly addresses the criterion, but there are significant weaknesses.

3 = Good – The proposal addresses the criterion well, but there are a certain number of shortcomings.

4 = Very good – There are a small number of shortcomings, but overall the proposal addresses the criterion very well.

5 = Excellent – The proposal successfully addresses all relevant aspects of the criterion with no or minor shortcomings.

Each evaluator will rank the application assigning a score from 0 to 5 for each criterion and produce an Individual Evaluation Report. No half-points are allowed (decimal points may arise during the calculation of the average of the individual assessments provided by the external evaluators but not as an individual evaluation grade). The threshold for the individual criteria score is 3.

At this stage, since the Amulet project promotes cross-border collaboration, 0.5 points will be added to each proposal with SMEs from at least 2 different eligible countries involved in the micro-consortium (after the evaluators' evaluation).

The final score will be calculated as an average of the individual assessments provided by the evaluators + 0.5 points added for cross-border micro-consortium. The maximum score possible is 15.5. The threshold for the final score is 10. Proposals in which the final score will be below 10 or in which one of the individual criteria scores will be below 3 will not be recommended for funding.

Ties will be solved using the following criteria, in the given order:

- ✓ Cross - border collaboration projects

- ✓ Impact score
- ✓ Excellence score
- ✓ Implementation score
- ✓ Gender Balance: proposals with a female in the CEO position (or equivalent position) will be prioritised to those without women or having women but not in management positions.

All applications obtaining a score above the threshold will move on to the next step.

Do note that the evaluation phase takes time as it implies a more personal, qualitative, and thus non-automated approach.

6.3 Consensus Meeting

The 'Consensus Meeting' will be organized with the participation of the 'Steering Committee' of AMULET plus three external evaluators (Selection Committee) and has a goal of selecting - by consensus (minimum $\frac{2}{3}$ majority vote) - **projects that will be invited to pitch at the Jury Day**. The decisions are based on the score obtained after evaluation from the external evaluation. In all cases, we will make sure that the proposal of finalists is fully in line with the goals of AMULET in terms of securing a broad coverage of project goals.

Bear in mind that even if it is normally the best-marked applications that are selected for funding, the 'Selection Committee' may have fair reasons for objecting to the selection of a specific candidate. These reasons can relate to:

- ✓ The alignment with AMULET goals and scope,
- ✓ The ability to achieve the strongest possible impact,
- ✓ Commercial competition,
- ✓ The existence of significant ethical concerns,
- ✓ The existence of a potential conflict of interest,
- ✓ Too many solution providers for the same challenge.

In case a top-ranked application is rejected, the 'Selection Committee' will consider selecting the next best-ranked proposal.

Finally, the exact number of applications approved will be decided based on the overall quality of the applications and the 'Ranking List of Fundable Projects' will be finalised.

6.4 Jury Day

If your proposal has been selected following the Consensus Meeting, well done!

You will be invited to online Jury Day during which you will have the opportunity to pitch your project in front of the AMULET 'Selection Committee'.

All the proposals included in the 'Ranking List of fundable projects' will be invited to participate in the Jury Day (planned for the 1st half of May 2023) and will be informed by email about the invitation at least 14 calendar days before the Jury Day event.

You will be requested to send a recorded presentation - as if you presented online (up to 10 minutes **video pitch** or **pitch as a pdf** with voice recorded) in advance at least 3 calendar days before the Jury Day. During the Jury Day, the recorded presentation will be displayed and at least two representatives of the applicants should explain their proposal in the 10 minutes of Q&A session in front of the 'Selection Committee'. Sending a pitch and attending the Jury Day are mandatory requirements for the finalists; not attending any of these requirements will automatically imply the exclusion of the proposal from the list.

The 'Selection Committee' will select up to 26 out of up to 36 applicants final beneficiaries taking into account the following 'Awarding criteria':

- ✓ High potential impact on the project goals,
- ✓ Vision and attitude of the team,
- ✓ Positive impact on the proponent's processes.

FINAL DECISION:

The 'Selection Committee' at this stage composed of the 'Steering Committee' of AMULET plus the External Advisory Board (7 external experts as representatives of the advanced materials and manufacturing technologies value chains and other relevant industries and academic entities) will decide by consensus (or a minimum of 2/3 majority vote) the 'Pre-Selected Beneficiaries', and 'Reserve List'. The exact number of applications approved will be decided based on the overall quality of the applications.

The 'Selection Committee' agrees on the potential future beneficiaries and informs them within 3 calendar days after the Jury Day. No waiting time here, you will know right away!

Your application has successfully passed the evaluation phase: bravo! And if not, be persistent: there will be other funding opportunities which may suit - even better - your proposal and the possibilities to benefit from other AMULET support activities.

6.5 What's next? Sub-Grant Agreement Preparation and Signature.

In case you are pre-selected to be the beneficiary of the AMULET programme, you need to sign the Sub-Grant Agreement (SGA) with the AMULET Consortium (for the details please check our Frequently Asked Questions Document).

Before signing the Sub-Grant Agreement, you must provide documents (within one/two weeks) regarding your formal status. The AMULET Consortium will proceed to a verification of these documents to make sure you are eligible. Failure of providing the requested documents within the given time frame may result in exclusion of your project from the 'Pre-selected Beneficiaries'. In such case, the excluded project will be replaced by a project from the 'Reserve list'.

Pre-selected SMEs should be able to provide some basic information in regards to their registration and financial data. Please check the Frequently Asked Questions section to see the details.

Be extremely vigilant with respect to:

1. **The nature of the documents** we request.

If the documents you provide us with do not prove your eligibility, you won't be allowed to move to the next phase of the process.

2. **The deadlines** that we will give you to hand us these documents.

If you do not deliver the requested documents on time, without a clear and reasonable justification, we will have to exclude you from the further formal assessment. Another applicant from the Reserve list will then replace you.

7. Our Support Programme and Payment Arrangements

Once your eligibility has been confirmed following the formal check and the Sub-Grant Agreement signed, you would be an official beneficiary of the AMULET programme. Hence, the adventure begins and it is now high time you understand how the funding is going to be distributed.

The AMULET support programme is divided into three stages and starts with a Feasibility study (Stage 1). The projects are evaluated after the first stage and a funnel system is applied. The best evaluated projects (up to 7) are promoted to the Demonstration Stage (Stage 2). The projects have to comply with set milestones to proceed to the last stage of the support Stage 3 - Follow up support for innovation.

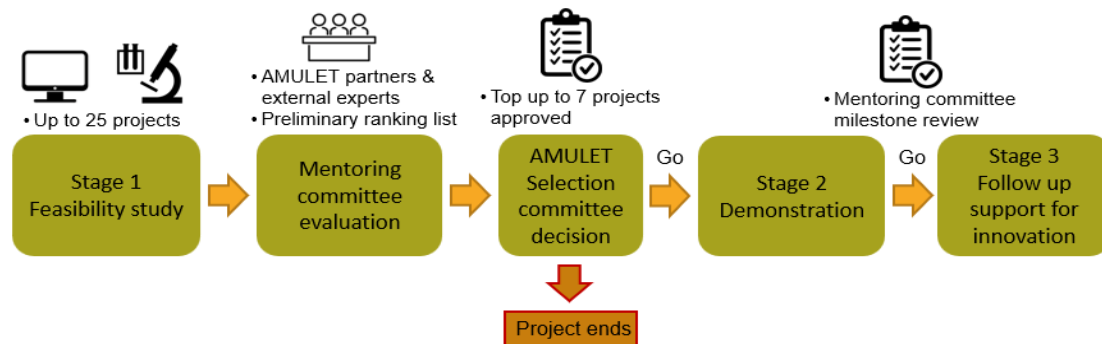


Figure 5 Overview of the AMULET support stages and projects' evaluation process (2nd Open Call)

If you manage to go through all stages, as a micro-consortium, you will receive a fixed lump sum of up to €120,000. **The maximum amount of financial support will never exceed €60,000 EU Funds per one SME.**

The lump sum is a simplified method of settling expenses in projects financed with Horizon 2020 funds. It means that you are not required to present accounting documents to prove the project-related costs incurred (e.g. invoices). However, you are obliged to demonstrate that the implementation of the project is in line with the milestones set for it. The milestones (deliverables, KPIs and ethical recommendations) will be defined and calendarised in the Individual Mentoring Plan set at the beginning of the programme and elaborated during Stage 1 (Feasibility study).

7.1 Supported activities

The AMULET's support programme for innovative SMEs in the lightweight field is structured in a funnel approach from Stage 1 to Stage 2. The indicative supported activities and ideas as well as the scope per stage are summarised as follows:

- **Stage 1: A Feasibility study**

Scope: The aim is to prepare a document that summarises the assessment of the practicality of the solution to the corresponding challenge. This could include, among others, any preliminary analysis to develop the solution, its description, market analysis and impact, organisational structure (e.g. requirements, resources needed), preparation of timeline and financial projections.

Indicative supported activities/ideas:

- ✓ Desk research for elaborating dedicated analysis
- ✓ Targeted interviews to get insights and relevant data
- ✓ Preliminary tests to support proof-of-concept
- ✓ Staff effort to elaborate required documentation

Output: The document in word format no longer than 10 pages that addresses all relevant aspects of the feasibility study and provides the plan for demonstration (Stage 2) and exploitation (Stage 3) as well as the detailed project-specific technical and business indicators

Requirements for qualification to the next stage can be found in Section 7.3 Payment Arrangements and 7.4 Progress Evaluation Process.

- **Stage 2: Demonstration**

Scope: The aim is to carry out the technical work needed to validate the solution to the challenge, following the plan designed during the Feasibility study stage. This could include the manufacturing of prototype parts and components that could then be tested in order to get experimental data that supports the verification of the solution. In the framework of AMULET, simulation and modelling could be used as well for the validation of results.

Indicative supported activities/ideas:

- ✓ Manufacturing of physical prototype parts and components

- ✓ Characterisation, simulation and modelling activities
- ✓ Prototype integration into the system
- ✓ Technical testing

Output: physical prototype(s) and results from the validation (report).

Requirements for qualification to the next stage can be found in Section 7.3 Payment Arrangements and 7.4 Progress Evaluation Process.

- **Stage 3: Follow-up support for innovation**

Scope: Once the prototypes are demonstrated to TRL7 in Stage 2, the aim of Stage 3 is to pave the way for successful exploitation at the market stage after completing the AMULET support programme. This includes a marketing strategy, IPR and dedicated studies in the targeted sectors (automotive, aerospace & aeronautics, energy and building) considering the commercial particularities of the three types of lightweight materials. Effort-intensive analysis, such as technology scouting and surveillance, can be also included in this stage since they could support the market entry of new solutions in a competitive way.

Indicative supported activities/ideas:

- ✓ Foresight studies and scenario planning
- ✓ Technology roadmapping for the targeted sector(s) and type of lightweight material(s)
- ✓ Tailored market studies including competitive analysis
- ✓ IPR strategy
- ✓ Technology scouting and surveillance.

AMULET acknowledges that these studies might fall outside the capabilities and expertise of SMEs, especially those willing to enter new market sectors and applications. Therefore, a list of potential experts from industry and academia, capable of delivering the required activities and ideas for Stage 3, will be made available to all participants for providing the required external expertise and the money from AMULET can be used to sub-contract those activities. The beneficiaries can hire experts independently. Please note that the support money given for this phase 3 should only be spent for activities directly in line with the further development of your solutions. For other applications, please refer to the AMULET support and training programme: a proof of joint activities (meeting minutes, study, market strategy results...) should be provided in the final document.

Output: dedicated study(ies) tailored exclusively to the solution for ensuring successful exploitation (report in word format as well as other supporting documents e.g. tables in excel file or presentations in PowerPoint format). *Requirements for qualification to finalise the Programme can be found in Section 7.3 Payment Arrangements and 7.4 Progress Evaluation Process.*

7.2 Eligible costs

The lump-sum grants provided in each of the stages of the support programme to selected SMEs can be used by the beneficiaries for several purposes related to the achievement of milestones. Although the lump-sum grants don't foresee the delivery of a detailed list of costs and expenses incurred by beneficiaries, AMULET partners will verify the achievement of the agreed milestones and KPIs according to the work plan proposed in the Individual Mentoring Plan and then in the Feasibility study (Stage 1) and check its coherence with the technical advancements (deliverables of Stage 2). The final technical evaluation will not include a financial assessment of costs but the beneficiaries shall keep all original documents of their expenses (e.g. timesheets, invoices, contracts) in case of an audit.

The following rules apply to eligible costs:

- ✓ Only costs incurred during the lifetime of the AMULET programme can be eligible. Expenditures incurred before the submission date of the proposal are not eligible as well as those incurred after the programme period.
- ✓ SME consortia applicants will provide an indicative budget allocation per each micro-consortium partner.

The eligible costs in AMULET comprises the following:

- ✓ Personnel costs: cost hours of the SME(s) staff dedicated to solutions development during the feasibility study, demonstration and follow-up support for innovation.
- ✓ Other direct costs: includes travelling, consumables, and equipment. For the latter, standard rules on depreciation apply as well as the part of equipment costs used for the project. Costs of other goods and services are also included, e.g., protection of results, costs related to intellectual property rights, and plan for the exploitation and dissemination of results.
- ✓ Indirect costs: costs that can't be attributed directly to the project, e.g., energy costs or general administration costs. A flat rate of 25% of the direct eligible costs shall be applied.
- ✓ Subcontracting: includes tasks/services subcontracted to academic and industry experts from the targeted sectors. Subcontracting costs in the framework of the AMULET support programme might come in the form of specialised and dedicated studies, testing, certification and other tasks carried out by a provider-subcontractor via a legal agreement. Subcontracting costs are only allowed in the second.

(Demonstration) and third, (Follow-up support for innovation) stages of the programme and should not exceed 30% of the total lump sum grant (i.e. up to €36,000.00 for both stages).

Specifically, for Stage 3 of the support programme (Follow-up support for innovation), €17,000 should be exclusively used to purchase innovation support services from external experts.

AMULET will make available to SME consortia a pool of external experts from industry and academia, which would offer their coaching services and technical advice under the budget lines of other direct costs or subcontracting. The choice of suitable external experts is not limited to the list provided by AMULET.

7.3 Payment Arrangements

In short, we will carefully assess your progress and the quality of your work during Interim Reviews but we will not review your accountancy. Bear in mind that the lump sum does not release you from the obligation to collect documentation to confirm the costs under fiscal regulation.

The payments for the 3 support stages, with a funnel system, applied from Stage 1 to Stage 2 (see section 7.4), will be arranged as follows:

- **Stage 1: Feasibility study:** a fixed lump sum of up to **€23,000 per Project - up to 26 projects in the 2nd Open Call**
- **Stage 2: Demonstration:** a fixed lump sum of up to **€80,000 per Project - up to 7 projects in the 2nd Open Call**
- **Stage 3: Follow-up support for innovation:** a fixed lump sum of up to **€17,000 per Project - up to 7 projects in the 2nd Open Call**

The payments will be transferred to the coordinator of the micro-consortium who will transfer the payments to the rest of the SME micro-consortium partners in tranches as stated in the Sub-Grant Agreement and the Individual Mentoring Plan. The coordinator of the micro-consortium is obliged to deliver the confirmation of the transfer of the grant to micro-consortium partners to the contractor after each Stage.

For the sake of simplicity and transparency, the Financial Support will be paid against specific Deliverables as stated in the table below:

| | | | |
|--|--|--|---|
| | STAGE 1: FEASIBILITY PLAN M1- M4 up to 26 consortia | STAGE 2: PROTOTYPING/ DEMONSTRATION M5-M13 up to 7 consortia | STAGE 3: FOLLOW UP SUPPORT FOR INNOVATION up to 7 consortia |
|--|--|--|---|

| | | | | | |
|------------------------|---|---|---|--|--|
| How much? | 40% - up to 9,200€ | 60%- up to 13,800€ | 40%- up to 32,000€ | 60%- up to 48,000€ | 100%- up to 17,000€ |
| Is payment due? | Month 1 | Month 4 | Month 7 | Month 13 | Month 15 |
| Requirements? | signature of the Sub-Grant Agreement | validation of the Deliverable(s) established for this stage (i.e. 'Proof of Concept [PoC]' and 'Business Plan'). | validation of the Deliverable established for the mid-term stage (i.e. 'Validation of Results' | successful conclusion and validation of the Deliverable stabilised for this stage (i.e. 'Prototype' | successful conclusion and validation of the Deliverable established for this stage (i.e. 'Exploitation Plan'). |

Table 2 Tranches of Payments against specific Deliverables

7.4 Progress Evaluation Process

From the up to 26 SME consortia participating and successfully finishing Stage 1, only up to 7 best ones, with the most innovative projects, will be promoted to Stage 2 and Stage 3 of the Programme.

Qualification from Stage 1 to Stage 2 and from Stage 2 to Stage 3 will be based on several criteria (as presented below in the 'Evaluation process'), reflecting the quality of agreed deliverables and performance indicators.

Evaluation process: The 'Mentoring Committee' (managed by a responsible AMULET partner under the theme and composed of the external technical and business mentors) will evaluate your project performance at the Milestone Review (established every time a payment is due), according to the following criteria:

- ✓ Deliverables quality - based on the Deliverables established in the 'Individual Mentoring Plan,
- ✓ Technical performance indicators - based on the KPIs established in the 'Individual Mentoring Plan,
- ✓ Business performance indicators - based on the KPIs established in the 'Individual Mentoring Plan,
- ✓ Deadline Compliance.

Each criterion will be scored from 0 to 10 and the weight of each one of these criteria, in the final score, will be as follows:

- ✓ Deliverable quality (30%),
- ✓ Technical performance indicators (30%),
- ✓ Business performance indicators (30%),
- ✓ Deadline Compliance (10%).

The maximum score possible is 10 points. According to the obtained final score:

- ✓ Beneficiaries over the threshold (7 points) will successfully receive the next payment and be candidates to continue in the programme.
- ✓ Beneficiaries under the threshold will be proposed, by the 'Mentoring Committee', as candidates to leave the programme. And, if this decision is finally ratified by the 'Selection Committee', they will have to leave the programme and won't receive the next payment.

The 'Selection Committee' will review and validate the 'Mentoring Committee' proposal, putting special attention to the 'under threshold' cases, if any, by taking into consideration all possible objective reasons

for underperformance (i.e. external factors which might have influenced the beneficiaries' performance). The 'Selection Committee' will take the final decision, and approve the payments.

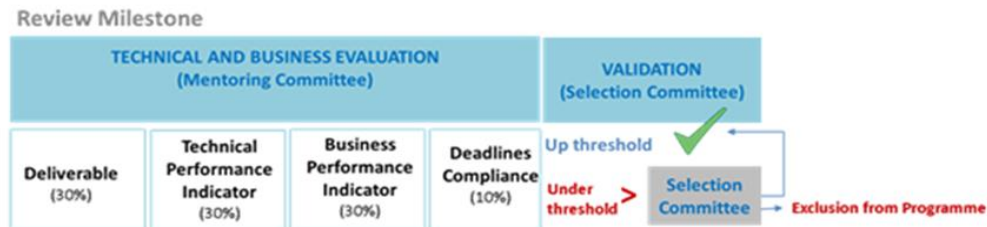


Figure 6 Overview of the evaluation criteria and process at the support stage of AMULET

At the end of each stage, the 'Selection Committee', in close cooperation with the 'Mentoring Committee', will decide which projects will pass to the next stage. The Criteria that the 'Selection Committee' will take into account are based on the performance of the projects evaluated in the Milestone Reviews, as described above.

Considering the progress from Stage 1 to Stage 2, the 'Selection Committee' will take into account, as well, the following criteria:

- ✓ Innovation potential at technical and business levels (projects with higher scalability and replicability to other sectors and therefore a greater impact will be promoted),
- ✓ Technological excellence and time to market opportunity (projects with higher technological excellence and shorter time to market will be promoted).

Pass from Stage 1 to Stage 2: the projects will be evaluated by the 'Mentoring Committee' (as described above) and the ranking list will be proposed to the 'Selection Committee' which will promote up to 7 SME consortia with the top scores to Stage 2.

Pass from Stage 2 to Stage 3: the projects successfully finishing Stage 2 (up threshold score) will be approved by the 'Selection Committee' to proceed to Stage 3.

A final event will be organised at the end of the project to present and promote the projects that have successfully completed the three stages of the AMULET support programme. The companies will be requested to travel and participate in this event.

8. Contact us

How can we help you?

If you still have any doubts regarding our Open Call process, feel free to get in touch with us:

- ✓ Ask your question in the Helpdesk space of AMULET Community at <https://spaces.fundingbox.com/spaces/i4ms-amulet>
- ✓ Send us an email to the following address: info.amulet@fundingbox.com

If you ever face any technical issues or problems, make sure you include the following information in your message:

- ✓ Your username, telephone number and your email address,
- ✓ The details of the specific problem (error messages that appeared, bug descriptions such as a dropdown list that isn't working, etc.),
- ✓ Screenshots of the problem.

Complaints

First of all, be aware that we won't be reviewing your complaint **if**:

- ✓ It is anonymous,

- ✓ The information is incomplete,
- ✓ It is not related to the results of the evaluation of the eligibility criteria. Indeed, most of the evaluation process is run by **independent experts** in the given field. The AMULET Consortium does not interfere with their assessment.

If, after receiving the results of one of the evaluation phases you consider that a mistake has been made, resulting in the rejection of your application, you have the right to send us a complaint. You can email us in English to info.amulet@fundingbox.com including the following information:

- ✓ Your contact details (including email address),
- ✓ The subject of the complaint,
- ✓ Information and evidence regarding the alleged mistake.

Important note:

You have **3 calendar days** to submit your complaint starting from the day after the communication was sent. On our side, we will review them within no more than **7 calendar days** from its reception. If we need more time to assess your complaint, we will inform you by email about the extension.

Please take into account that the evaluation is run by external experts and we do not interfere with their assessment, therefore we will not evaluate complaints related to the results of the evaluation other than related to the mistakes in the evaluation of the eligibility criteria.

9. Last but not least- Final provisions

Any matters not covered by this Guide will be governed by Belgian law and rules related to the Horizon 2020 programme and European Union grants regulations.

We are obliged to keep all the applicants' data confidential. However, to avoid any doubts, you are entirely responsible to indicate what information is confidential.

Your IPR will remain your property.

For the selected beneficiaries, the agreement will include the set of obligations towards the European Commission (for example: promoting the project and giving visibility to the EU funding, maintaining confidentiality, understanding potential controls by the EC/ECA and OLAF, providing non-confidential information/summary on the project that receives financial support).

The AMULET Consortium might cancel the call at any time, change its provisions or extend it. In this case we will inform all applicants about such change. Signature of the agreement (all partners in the micro-consortium will sign the Sub-Grant Agreement) is an initial condition to establish any obligations among applicants and any AMULET Consortium partners (with respect to the obligation of confidentiality of the application).

You didn't find what you were looking for? You may want to check our Frequently Asked Questions.

10. Extra hints before submitting your proposal

A proposal takes time and effort and we know it. Here a few crucial points you should read before hitting the "Submit" button in order to maximise your chances of success:

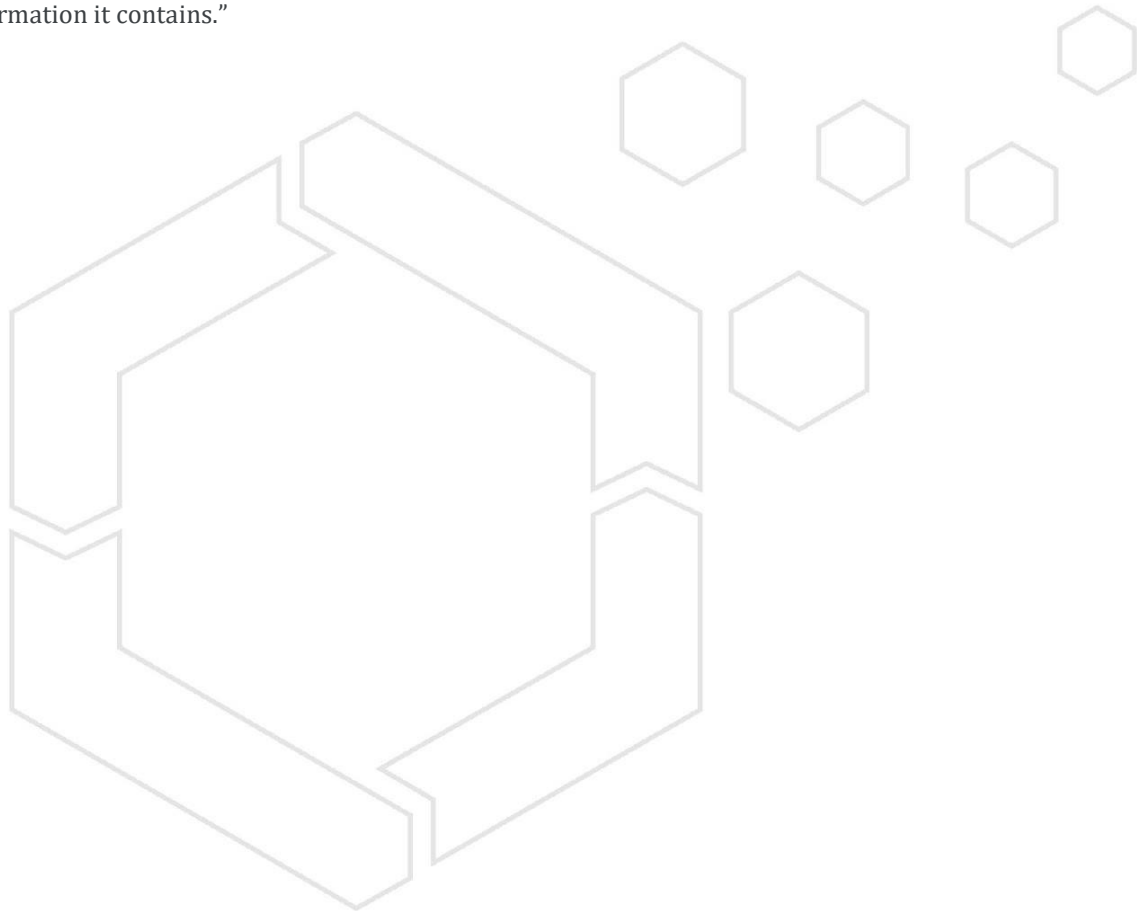
- ✓ Is your project in line with what AMULET is looking for? Not 100% sure? You can consult section **5.1** as well as the [website](#).
- ✓ Did you present your project in a way that will convince evaluators? Go back to section **6.2** if you have any doubts.
- ✓ Is your project fulfilling all the eligibility requirements described in the Guide for Applicants? Check again section **5.2**.

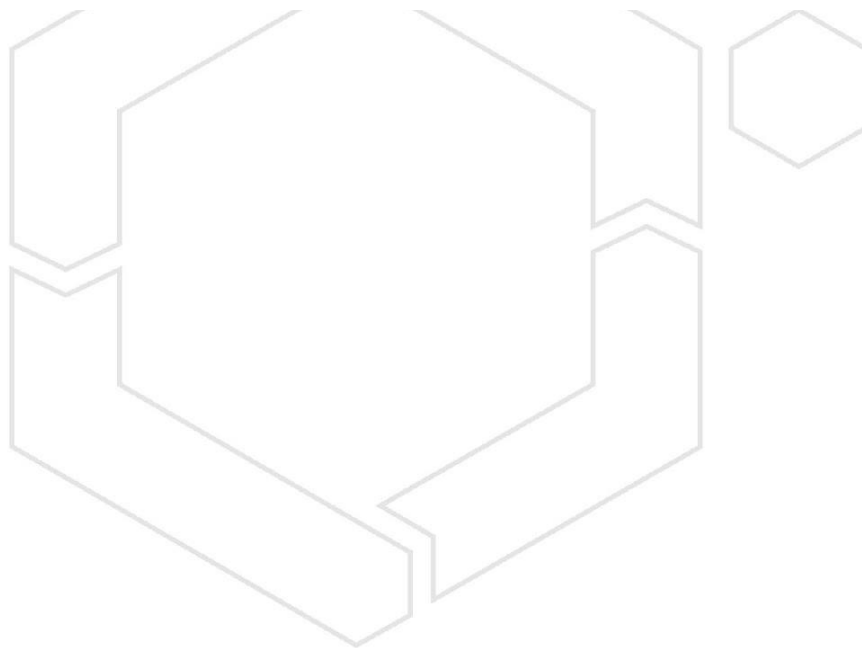


- ✓ Are you a SME in accordance with the SME definition of the European Union? In cases of partner or linked companies, consult the guide of the SME definition.
- ✓ Are you able to cope with our signature agreement process and payment arrangements for the selected proposals? You may want to go over section 6.5 Did you check our Sub-Grant Agreement (SGA) Template? Check it here.
- ✓ Do you need extra help? Get in touch!

And as a bonus: You can read our [R.E.C.I.P.E. for an outstanding European Funding Opportunity application](#) for additional advice. Good luck!

The content of this document represents the author's view only and is his/her sole responsibility. The European Commission and the Agency do not accept any responsibility for use that may be made of the information it contains."







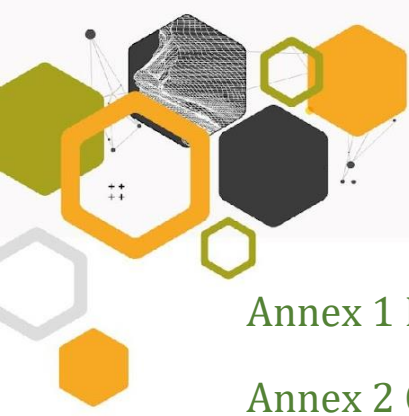
Annexes

AMULET 2nd Open Call

Submission of applications starts on the 10th of January, 2023, at 13:00 Brussels Time

Submission deadline: 22nd of March, 2023, at 17:00 Brussels Time





Annex 1 Information clause

Annex 2 Open Challenges description

Annex 3 Call Announcement



Information clause for personal data processing in the 2nd Open Call organized under AMULET Project

Grant Agreement No. 101005435

CONTROLLER`S IDENTITY AND CONTACT DETAILS

The data controllers are all entities in the [FundingBox capital group](#) as the Joint Controllers. All FundingBox entities have agreed on common data processing purposes. In all matters regarding personal data, you can contact us using the following email address: privacy@fundingbox.com.

The essence of the arrangement is available [here](#).

PURPOSES, LEGAL BASIS AND PROCESSING PERIOD

| The purpose and legitimate interest of processing | Legal basis for processing | Period |
|--|---|--|
| 1) To run an Open Call and collect data necessary to evaluate applications submitted in the Open Call. | Legitimate interest of FundingBox (based on Article 6, paragraph 1 (f) of GDPR) which is fulfilling the obligations and our other interests related to implementation of the Project. | 6 years from the end of the year in which the Project ended. |
| 2) To realize the Project goals described in the Grant Agreement (e.g. communication, reporting, collaborating with other project partners). | | |
| 3) To consider potential complaints. | | |
| 4) To gather feedback from applicants when the Open Call is over to improve processes. | | |
| If an applicant has been selected to become the beneficiary of the project: | | |
| 5) To collect the applicant's details and documentation necessary to verify its legal status. Data will be collected in separate form via FundingBox platform. | Processing is necessary for the performance of a contract (based on Article 6, paragraph 1 (b) of GDPR). | |

DATA RECEIVERS

The Joint Controllers will transfer personal data only to trusted recipients such as IT service providers, accountants, law firms, postal and courier companies (who process personal data on the controllers' behalf).

Due to the fact that we use the services of Google LLC, your data may be transferred to the USA. We have concluded an agreement with those entities – the so-called Standard Contractual Clauses. This means that in accordance with the decision of the European Commission No.



2021/914 EU of June 4, 2021, your personal data may be processed by this company in the USA. More information about the decision at: <https://fundingbox.com/trust/transfer-outside-eea/>.

To realize the Project, data can be transferred also to Project Partners (complete list of the project partners is available at the email address: privacy@fundingbox.com) and European Commission.

RIGHTS OF DATA SUBJECT

Due to the fact that we process your personal data, you have the right to:

- 1) request access to your personal data,
- 2) demand the rectification of your personal data,
- 3) request to remove or limit the processing of your personal data,
- 4) data portability,
- 5) complain with the supervisory authority (https://edpb.europa.eu/about-edpb/about-edpb/members_en).

You also have a right to object to processing of your personal data for all purposes indicated above (according to the Article 21 of GDPR).

INFORMATION ABOUT VOLUNTARY OR OBLIGATORY DATA PROVISION

Providing data is voluntary, although it is necessary to participate in the Open Call. Without providing your data, it is not possible to contact you and evaluate the application.



Annex 2 Open Challenges description

AMULET

LIST OF CHALLENGES FOR 2nd OPEN CALL

This document provides a list of the Open Challenges selected for the 2nd Open Call based on real current needs of the industry. The challenges are divided into 12 Thematic domains for the three materials:

- Polymer-based composites, Light Metal Alloys and Ceramic Matrix Composites

in four industrial sectors:

- Aerospace & Aeronautics, Automotive, Energy and Building.

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AEROSPACE & AERONAUTICS

Polymer-based composites

1_A&A_PBC_LightAIRCRAFT

Title: Wet lay-up/vacuum bag process optimization for lightweight aircraft structures

Challenge summary

Wet lay-up/vacuum bag process optimization for lightweight aircraft structures, comparing different carbon fiber fabrics and core materials regarding weight and mechanical properties.

Scope of the challenge

- Production optimization of carbon fiber reinforced epoxy parts for light-weight aircraft by wet lay-up/vacuum bag process to achieve maximal mechanical performance (tensile-, compressive-, flexural strength, modulus etc.)

Objectives of the challenge

- Objective 1: Producing test panels (monolithic and sandwich) for mechanical testing with wet lay-up technology, materials to be used:
 - 200 gsm carbon fiber woven fabric (aero grade)
 - 160 gsm carbon fiber woven fabric (aero grade)
 - 200 gsm carbon fiber biaxial non-woven fabric
 - 80 gsm UD carbon fiber fabric
 - 300 gsm UD carbon fiber fabric
 - Airex C-70 PVC foam (or equivalent) with 5 mm thickness
 - AHC-Hex-48 aramid paper honeycomb, 48 kg/m³ – 3,2 mm cell size, 8 mm thickness
 - MGS LR285 + MGS LH287 resin system
- Objective 2: Tests to be performed
 - ASTM D3039, ASTM D6641, ASTM D3518, ASTM D5379, ASTM D790, ASTM D7249
- Objective 3: Comparing fiber volume fraction, mechanical properties according to standards above.
- Objective 4: Based on results, define optimal process parameters and lay-up.

2_A&A_PBC_APoCoP

Title: Automatic placement of corrosion protection for hybrid light weight aeronautical assemblies

Summary

Structural assemblies using dissimilar materials require measure to limit galvanic corrosion between the different components. When combining CFRP materials with aluminum the current accepted protection scheme is using edge sealing of the CFRP part and using silicon fillet sealing of the aluminum parts. Today these measures are applied manually. The purpose of this challenge is to automate both the placement of the edge sealing of the CFRP part as well the placement of fillet seal between the edge of the Aluminum part and the CFRP.

Scope: Target parts: complex 3D shaped parts with reduced accessibility

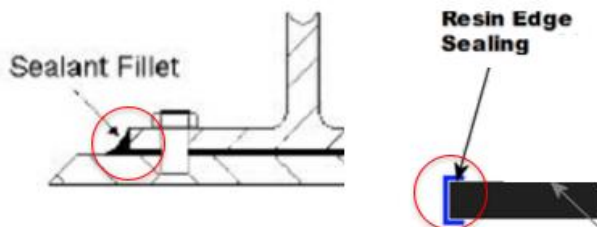


Technical issues:

- seal application is highly temperature humidity, batch and local geometry dependent and is requiring an adaptive approach
- Accessibility is poor so a compact solution is required

Targeted operations:

- Sealant fillet
- Resin edge sealing



Objectives:

- Define process parameters and process control means
- Develop automated head for application
- Automated for complex 3d shaped parts

3_A&A_PBC_SpreadTape

Title: Quality assurance and measurement system for spread fiber tapes

Summary:

Unidirectional continuous fiber-reinforced thermoplastic tapes (UD tapes) are playing an increasingly role as prepreg material in fiber reinforced plastics for many applications such as automotive, aerospace and consumer products. Essential quality criteria of UD tapes are among others highly aligned fiber orientation, homogeneous fiber area weight and constant thickness. There is a lack of knowledge and suitable systems for the quality assurance of this criteria based on inline measurement systems for dry spread fiber tapes. Aim of this project should be a selection and test of suitable commercially available optical measurement devices, development of a prototype in combination with a sophisticated evaluation software which can be tested on a tape production line.

Scope:

UD tape production lines are based on roll-to-roll processes pulling fiber rovings from creels, spreading them to a dry fiber tape and impregnating it with thermoplastic melt (Fig 1). Quality of the tape and thus, mechanical performance for lightweight applications, is mainly influenced by the spreading and impregnation process. Quality control is needed already after the spreading process to detect the tape thickness over the working width and thus, fiber area weight and most critical: gaps. Here optical measurement systems are favored but not yet suitable for the prevailing material and process conditions. Commercially available (optical) measurement devices should be researched and assessed on suitability. Based on a jointly selected preferred solution a prototype should be developed in combination with a sophisticated evaluation software. The system will be tested on a tape production line of challenge giver.

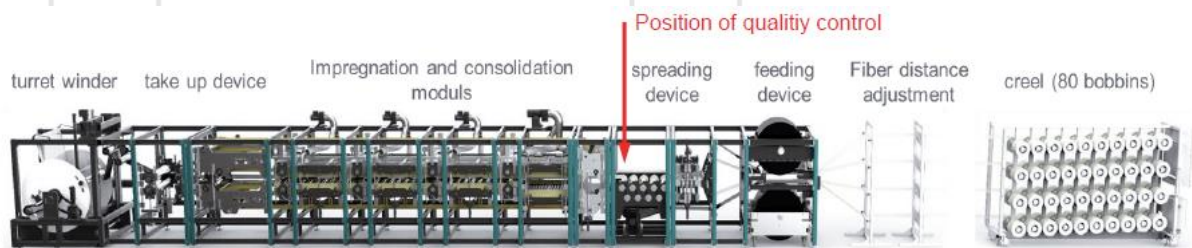


Fig. 1: Layout of the UD tape production line and position of the targeted measurement system

Objectives:

- Rating list of commercially available measurement devices considering the prevailing material and process parameters as well as measurement requirements
- Design proposal for measurement prototype with budget estimation (cooperation partner 1)
- Software implementation for signal processing and evaluation (cooperation partner 2)
- Stand-alone prototype for functional tests (in cooperation with challenge giver)
- Installed prototype on challenge giver’s tape production line in the development centre

4_A&A_PBC_CFRPwing

Title: 3D-printed micro-pins and nano-enhanced adhesives

Summary Composites have flown on commercial safety critical aircraft primary structures for more than 30 years, but only recently have conquered the fuselage, wingbox and wings, most notably on the Boeing 787 Dreamliner and the Airbus A350 XWB. These carbon fiber-reinforced plastic (CFRP) structures, however, still require assembly with thousands of mechanical fasteners, which are today the most convenient and least expensive way to meet current certification requirements with addition of significant weight penalties and high environmental footprint. Adhesive composite joints have been progressively replacing mechanical fasteners, mainly for secondary aircraft parts, and only in exceptional cases safety-critical aircraft primary structures. For aero-structure manufacturer, the general view prevails that the full cost and weight savings of composites cannot be achieved until bonded joints can be certified without fasteners. A breakthrough joining technology is needed where the currently used technique (adhesive bonding and bolting) are coupled in a structured manner to overcome the major drawbacks associated to each joining technique. Current advancement in 3D printing of micro-pins and nano-enhanced polymers are promising candidate to progressively replace current joining techniques.

The present challenge proposes a novel solution enabling composite joining for aerostructures but also secondary parts for automotive and for segmented wing blades within the energy sector, exploiting the combination of 3D-printed micro-pins and nano-enhanced adhesives which could finally meet in-service loadings requirements (aeronautics) and reduced time of assembly (aeronautic/automotive) leading to substantial cost and weight savings as well as extended fatigue life (energy). The proposed challenge focus on the optimization of shape micropin and development of nano-based filled adhesive to improve the damage resistance behavior of composite-to-composite joint for part assembly and repairing process.

Taking the most out of micropin interleave layer optimized by modelling technique and manufactured by 3D printing process and developing new nanofilled adhesive to improve surface interface and fracture performance also by “ad hoc” synthesized nanoparticles, enhancement of the final composite-to-composite joining and also composite-to-metal could be attained as also, recently, reported within the frame of a FP7 funded EU project, titled EXTREME. The ultimate goal of this challenge is to test feasibility and effectiveness of the proposed solution by comparing CtC and CtM engineered joints comparing them with traditional adhesive and riveted analogous items.

Scope

- Improve the joining behavior of composite-to-composite primary element;
- Enhance repairing technique by use of novel engineered interface solution;
- Demonstrate the reliability and effectiveness of through-thickness micro-reinforcements and nano-filled adhesive to strength composite joining;
- Exploit new morphologies and geometry of nanoparticles to achieve superior matrix damage performance and resilient performance;
- Micro-pin shape and density optimization for the required service loads and application

- Modelling the effect of different pin shape on the damage tolerance in the joining element;
- Implementation of computational technique to predict delamination phenomena in unidirectional and multidirectional composites under out-of-plane loading to model both interlaminar and intralaminar cracks.

| | | Current SoTA | Current Challenge Contribution |
|--------------------|--------------------------|--|--|
| Specific Challenge | Aerospace & Aeronautics | <i>Repair is still costly and time-consuming due to uncertainty in residual strength and quality.</i> | <i>Improve repairing methods and implementation monitoring system</i> |
| | Polymer-based composites | <i>Penetration volume rate is lower than 2% because manufacturing processes are not suitable for large-scale production.</i> | <i>Improve process technology for joining and fast production of assembled parts</i> |
| | Automotive | <i>Current adhesive systems in headlamps are mostly based on thermoset which very rigid and non-reversible. The substrate materials are difficult to be recycled or repaired. A thermoplastic adhesive could offer advantages w.r.t. re-use of components.</i> | <i>Enhanced joining technique for repairing with extended service life</i> |
| | Energy | <i>Main applications for renewable energy e.g. wind industry; FRP are effective as blade materials since they can bear high stress while being lightweight. Current commercial solutions mainly rely on discontinuous fibres; use of continuous fibres with enhanced performance is limited to lab scale (TRL4).</i> | <i>Exploitation of nanofiller effects to improve damage performance and fatigue life</i> |

Objectives:

- Simplifies the joining methodology eliminating holes and riveting or bolting
- Achieve a nanoparticles-based material to improve adhesion;
- Optimization of pin shape, location and associated 3D printing process for specific use case applications
- Development of nano-reinforced adhesives, resins and automatic fiber placement preforms manufacturing
- Demonstrating and validating the technology in five distinct case demonstrators, respectively, riveting, bonded, pinned, nano-modified bonded and hybrid (i.e. and pinned-nanomodified) elements.

27_A&A_PBC_InjectModel

Title: Development of flexible technology modules for injection molding

Summary

Development of flexible technology modules for injection molding machines and injection molding lines for processing fiber-filled thermoplastics (fiber composite plastics) into lightweight molded parts in automotive and aerospace applications.

Injection molding of thermoplastics is one of the main technologies for the production of molded parts. Special injection molding processes are suitable for applications as lightweight molded parts in vehicles and in aerospace, which use fiber reinforcements to increase the mechanical characteristic values of the molded parts and/or to reduce the mass of the molded parts by processing foamed thermoplastics. For large-area molded parts with low wall thicknesses and thus long flow paths of the melts in the mold cavity, equipment (devices / assemblies) to be specially developed are required for injection molding machines and injection molding systems.

Main components and functions of these components to be developed are:

- Hot runners for leakage-free absorption of the thermoplastic melt from the plasticizing and injection unit for largely loss-free onward transfer to the sprue bush of the mold-forming die.
- Sensors for recording the parameters of the melts as they flow through the hot runner (data acquisition for AI and Industry 4.0).
- "Housings" (holding devices) for the hot runners adapted to the machine or system, which thermally insulate them and absorb forces acting on the hot runners from the outside, e.g. the nozzle contact pressure of the plasticizing and injection unit.
- Opening and closing devices for the hot runner to prevent melt leakage.
- Flow-optimized design of the geometry of the melt channel in the hot runner to minimize damage to mold fillers, e.g. fibers.

Molded parts made from reinforced thermoplastics have lightweight potential compared with those made from metallic materials due to lower densities, while retaining virtually the same mechanical properties. This reduces the mass of the vehicles, which will lead to CO₂ savings in operation. Furthermore, molded parts made of thermoplastic are recyclable - at the end of their service life, the molded parts can be recycled mechanically and/or chemically.

Scope

For the production of thermoplastic lightweight molded parts by injection molding, injection molding machines and injection molding lines are required in addition to the mold-forming tools. Commercially available machines and systems are limited in terms of their flexibility for technology and application trials. Flexible technology modules to be developed, e.g. in the form of hot runner adapter plates, enable the melt to be conveyed to the mold sprue bush largely independently of the respective machine. Furthermore, it is possible to easily introduce additives, e.g. fibers, into the melt flow and to record process parameters with suitable sensors.



Objectives

Development of flexible technology modules for injection molding machines and injection molding lines for the production of thermoplastic large structural parts for lightweight applications, enabling:

- Processing of long fiber additives,
- Processing of high-temperature plastics, e.g. PEEK,
- Production of foamed lightweight molded parts with Class A surfaces.



28_A&A_PBC_AirIntake

Title: Cost-effective lightweight design and tool-less manufacturing for an Air Intake duct of ECS application

Summary

The component proposed for the technological study in this project, selected on the basis of the OEM's choice to identify a material and process that can lead to a considerable reduction in weight and in cost is the Air intake duct of the Environment Control System (ECS). Challenges when designing ECS ducting can stem from the complexity of component configuration, a powerful solution for overcoming these difficulties could be additive manufacturing.

Scope

Create a demonstrator with an alternative material and process of the Air intake duct of the Environment Control System (ECS), and test it statically. Air Intake Duct is made of autoclave-cured carbon fiber material and is already manufactured in one piece.

The scope is to identify a material and process that can bring significant weight and cost savings on this component and on all similar complex shaped parts. In particular, the challenge is to identify a process and a material able to introduce any change easily, without high costs.

For a real possession of the technologies (possibility of certifying the product) it is necessary to have a potential qualification of the candidate material and process.

- Processes that can be used to build parts with complex shapes as monolithic as possible.
- The search for lower cost materials to Qualify and search for Eligible ones to be used for a possible Product Certification.
- A structural testing campaign (at coupons level if needed) for the previous purpose and to support the process, up to the full-scale test of ECS Air intake duct.

The component proposed for the technological study in this project is the Air intake duct of the Environment Control System installed on an aircraft.

Objectives

Realize a demonstrator in alternative material and process of the Air intake duct of the Environment Control System (ECS) taken as a reference. The main objectives of this challenge are:

- Weight reduction 20-25%
- Cost reduction 20-35%.
- Set-up method to qualify material and process, to apply the same material and process on similar items.
- Organize a dedicated aeronautical supply chain.

29_A&A_PBC_GreenAircraft

Title: Novel interiors cabin design for greenest Aircraft

Summary

Development of a novel design of Cabin and Cargo aircraft interiors in accordance with the use of materials and processes conceived for an environmentally-friendly lightweight solution of the cabin items, 100% from recyclable sources, and more affordable technologies for materials treatments and processes with the aim to promote the use of recycled carbon fibers for semi-structural applications.

Scope

Production and testing validation of cabin&cargo interiors items by re-generating and returning back to process of hybrid CF/GF reinforced epoxy scraps coming from manufacturing process (figure 1), and uncured CF reinforced epoxy scraps in the form of preimpregnated patch, to achieve comparable mechanical performances (tensile-, compressive-, flexural strength, modulus etc.) with respect to state of the art as well as compliancy to flammability requirements.




Figure 1: hybrid CF/GF reinforced epoxy scraps from manufacturing process.

Objectives

Objective 1: Producing small panels (sandwich) for both mechanical and flammability testing with the materials to be used:

- Hybrid CF/GF reinforced epoxy prepreg scraps provided by challenge giver.
- CF reinforced epoxy scraps of prepregs provided by challenge giver.
- PET foam (or equivalent) $50 - 70 \text{ kg/m}^3$ with thicknesses: 7mm; 8mm; 10mm; 12mm; 19mm.
- Airex Tegracore foam (or equivalent), 50kg/m^3 , with thicknesses: 7mm; 8mm; 10mm; 12mm; 19mm.
- Divinycell F (or equivalent), 50kg/m^3 , with thicknesses: 7mm; 8mm; 10mm; 12mm; 19mm.

Objective 2: Tests to be performed: flame Vertical V-60 (CS-25.853), Smoke Density/Toxicity (CS-25.853-a), Heat Release Rate (OSU-method); mechanical ASTM D7249, ASTM C297, ASTM C365, ASTM D1781.



Objective 3: Performing LCA and LCC analysis.

Objective 4: Reduction of weight (at least -8%) and recurring costs (at least -5%) with respect to state of the art.

Objective 5: Production of large panels/full scale items for final experimental validation to be performed by challenge giver.



30_A&A_PBC_AVIC

Title: Automated visual inspection of composite parts

Challenge summary

CFRP parts are produced by manually or automatically drape layers according a defined pattern and assisted by laser projection. Especially in manual lay-up, this process is prone to errors like missed layer, wrong layer, wrinkles, edge effects or a protection foil not removed. This results in an expensive repair or even a scrapped part.

In case of CFRP the layers are black which makes it particularly challenging for a visual system based on a camera and image treatment. Both prepreg and dry fibers are considered as base material.


After curing and machining, the parts pass through NDT but also visual inspection for any external defects. Automating this process could then lower cost and be more accurate than the human eye.

Scope of the challenge

- Target parts: all CFRP/GFRP parts with manual lay-up operation



- Technical issues:
 - Define a set-up with the sensor, camera, lighting and image treatment to detect the errors during lay-up.
 - Define a set-up with the sensor, camera, lighting and image treatment to detect the errors after cure.
- Robotize and automation of this process.



Objectives of the challenge

- Objective 1: Select vision system + SW for lay-up errors.
- Objective 2: Define vision system + SW for visual defects.
- Objective 3: Elaborate a POC for an automated inspection.





Light Metal Alloys

6_A&A_LMA_MACOLI

Title: Clean and high-performance machining of composite and light metal alloy stacks

Description: The new CRFP, CMC and Ti/Mg alloys are bringing with also challenges how they can be more sustainably machined, in individual or stack applications. The solution has to meet higher performance, higher quality in combination with more health and environmental acceptable solutions – NO oil-based emulsion usage

Scope:

- Higher productivity
- Lower machining/manufacturing costs
- Substitution of oil-based emulsion
- Clean and dry machining process (especially in CRFP materials this improves the functionality of the produced parts)

Objectives:

- Find the solution for novel machining/processing of light weigh metals (Ti alloys, Mg alloys, Al alloys)
- Find the solution for novel machining/processing of CMC materials (C/C–SiC) and stuck structures with metals (i.e. Ti)
- Find the solution for novel machining/processing of CRFP materials and stuck structures with metals (i.e. Ti)

7_A&A_LMA_ILOSI

Title: Innovative Lightweight structures for Optronic cameras and systems for Space Instruments

Description: Satellite payloads are nowadays encompassing more and more optronic systems, e.g., remote sensing instruments, cameras to provide imagery, star trackers etc... With the current boom of the Newspace and the development of nanosatellites or Low Altitude Platforms, the weight requirement of such assemblies becomes the main driver.

This challenge consists in proposing innovative lightweight material solutions to improve the weight of the instruments, and address their compatibility with the space sector and requirements, to enable innovative materials and assemblies to be used in this field

Scope:

- In space satellites, instruments weight is varying a lot for cameras, from 300kg for standard satellite payload (ex. Sentinel 2 MSI Instrument) up to a few kgs for smaller instruments (e.g. compatible with nanosats)
- The mechanical structure must be as light as possible, mechanically robust, and compatible with the optronic components: detectors, electronics, lasers etc..., contributing to thermal regulation to enable proper functioning of electronic parts; specific parts of a camera can be explored in a first instance if deemed necessary (ex. typical detector mechanical interface etc...)
- Several materials are conventionally used (see Edeson et. al., Acta Astronautica 66 (2010) p.13); New materials or innovative material post process should be explored in view of enabling weight decrease and therefore performance increase of the whole system, especially for small satellites, nanosats and possibly drones

Objectives:

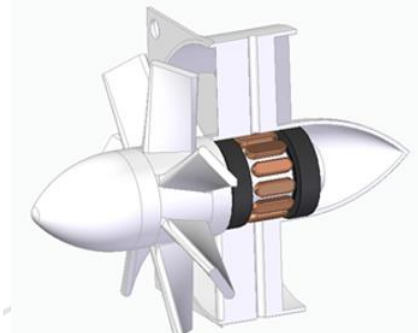
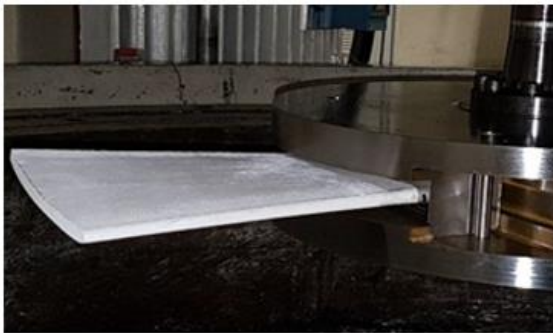
- Proposing lightweight innovative alternatives to currently used materials,
- Reducing the total camera weight by 10 to 50%
- Addressing -at least theoretically- their compatibility with space requirements as per ECSS-Q-ST-70C section 5
- Possibility to go towards a demonstrator if successful, in the frame of a cooperative project, depending on the outcomes

Ceramic Matrix Composites

8_A&A_CMC_CMCFan

Title: Lightweight CMC High-Temperature Fan for Aerospace Applications

Summary: Metal alloy fans are used in gas turbines, fire protection and for inflatable systems. There is experience with Ceramic Matrix Composites (CMCs) in aerospace applications such as atmospheric re-entry heat shields, mainly silicon carbide (SiC) matrix based. Lightweight oxide-based CMCs for fans offer up to a three-fold weight reduction compared to the best metal alloys at similar high temperatures. They can also enable innovative circular economy technologies like inflatable atmospheric decelerators (IADs) for reusable rockets, enabling CO₂ reductions in production and logistics for launch vehicles. The challenge is to demonstrate a working prototype (TRL 7) of a high temperature fan made of oxide-based CMC, based on experience with single fan blade demonstrations (TRL 4-5). The single blade was successfully manufactured and tested in a centrifuge test (Figure left). It exceeded the demanded 3000 rpm up to the point where the adhesive attachment of the blade to the test stand failed. The main goal is to improve the attachment in a real fan application (Figure right).



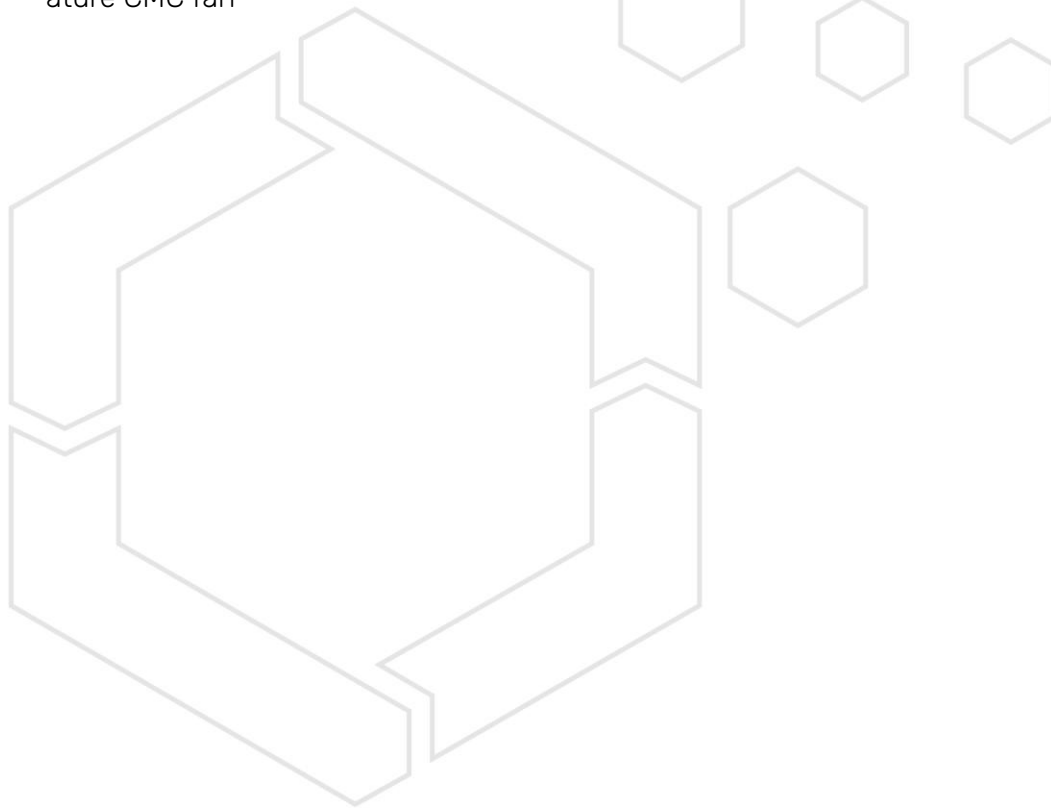
Scope: Single-blade demonstrations of all-oxide CMC fans have been conducted (TRL 4-5). The joining of a single blade and the rotor proved technically challenging. A feasible solution for joining multiple fan blades in a rotor needs to be developed and demonstrated. It is intended to demonstrate the all-oxide CMC fan in the context of use as an electric ducted fan (EDF) for inflatable atmospheric decelerators (IADs). IADs are at the cutting edge of atmospheric re-entry research conducted by NASA and ESA. The challenge giver is participating in the ESA Business Incubation Center to demonstrate innovative patent-pending IAD technology with the ultimate goal of making space transportation sustainable. With regard to the application, we intend to primarily use OCMC blades for the electric ducted fans of an IAD. There are other applications possible, such as micro gas turbines or combustion gas ventilators, but for an IAD, it enables a breakthrough in mass savings.

The state of the art in IAD technology uses heavy gas tanks for inflation (examples include IRDT or NASA HIAD). If we demonstrate the feasibility of using hot air during re-entry for inflation, this enables the use of extremely lightweight IADs for small rocket stages and return of cargo from space.

This would be a great step forward towards a sustainable, circular economy in space, leading to CO₂-reductions in the manufacturing and logistics of rockets. As SpaceX is currently the only company in the world partly reusing rockets, this project would be a great contribution towards building the first European reusable launch vehicles.

Objectives:

- Preliminary CMC fan design (feasibility study)
- Preliminary aerodynamic design (feasibility study)
- CMC fan blade Finite Element Method (FEM) analysis (Demonstration)
- Aerodynamic optimization using Computational Fluid Dynamics (CFD)
- Manufacturing and assembly of all-oxide CMC fan rotor (Demonstration)
- Demonstration run of 20 cm diameter, 12.000 rpm, 800 °C lightweight high temperature CMC fan

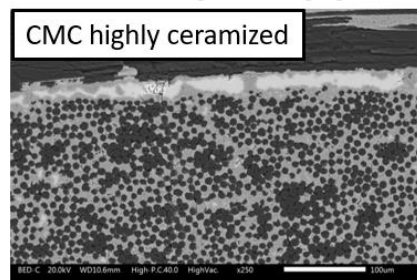
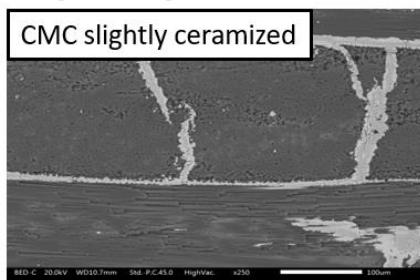


9_A&A_CMC_PrepegCMC

Title: Prepeg optimized for the Ceramic Matrix Composites production

Challenge summary: Ceramic Matrix Composites (CMC) are an enabling technology for the lightening of parts that have to operate at high temperatures. These materials are thus a key factor for the CO₂ reduction in several aerospace and automotive applications. Prepeg features strongly affect the CMC properties. Prepeg manufacturers are not involved in developing prepeg optimized for the CMC. This is due to the low volumes of the CMC market compared to the polymer composites market. The aim of the project is to establish a cooperation between CMC (1 SME) and prepeg producers (2 SME) in order to develop CMC for automotive and aerospace applications with improved properties.

Scope of the challenge: The aim of the project is to develop a CMC with improved thermo - mechanical properties and/or with an easier processability: The purpose is to understand how the fiber/matrix interaction in the polymer matrix composite affect the CMC properties. Different polymers interact differently with the carbon fibers and there is a non-trivial correlation between the polymeric preform properties and the CMC ones. This is a lack of knowledge that if solve can lead to the manufacturing of CMC with higher thermo mechanical properties. **The LSI (Liquid Silicon Infiltration) process must be considered as the reference CMC manufacturing process.**



The CMC ceramization grade is regulated by the polymeric pre-preg used for the preform manufacturing

Objectives of the challenge:

- To develop a not harmful and easy to use pre-preg, optimized for the CMC manufacturing
- To improve the use of high performing CMC in aerospace applications
- To improve the use of high performing CMC in automotive applications

**AUTOMOTIVE****Polymer-based composites****10_AUTO_PBC_FRA-TP**

Title: Fire resistance additives for continuous fiber thermoplastics

Description: Develop additives to give fire resistant properties to continuous fiber thermoplastics. There is a market to develop composite battery housings (top cover or base plate) of BEV (battery electric vehicles). The housings must have fire resistant properties for thermal runaway of batteries and/or protection of batteries from external fire. Describe clearly your challenge. Current solutions are in metal (steel or aluminum) or in some case in thermoset composites. Fire resistant TP composites could reduce the CO₂ footprint of the car and be easier to recycle than thermosets. Composite solutions could be lighter than metals.

Additives should be proposed to be mixed with thermoplastics (PP or PA6). It should not limit the impregnation of the reinforcing fibers (glass in priority) with a high fiber content of 60-70 wt%.

Scope:

- No available “ready to use” additives that have the potential to improve the fire resistance of continuous fiber thermoplastics (PP or PA6) without limiting the fiber content and without reducing drastically the mechanical properties of the composite (strength, modulus, resistance to impact, thermal and ageing behavior)
- Initial objective is to have a UL94V0 classification of the composite with a glass content of 60 wt% of continuous fibers for PP and/or for PA6
- Cost of the additive should be “acceptable” for the automotive industry

Objective:

- L94V0 classification of the TP composite
- Reduction of mechanical performance is less than 10% vs. composite without fire additive
- Cost premium is limited to max 10% vs composite without additive



12_AUTO_PBC_AdhesiveFilm

Title: Adhesive film to allow structural bonding of composite with metal part during ecoat process

Description: The standard process to manufacture a car is to weld steel part together to make a body in white that is protected for corrosion and painted. The integration of composite parts in a steel body in white is difficult and is today mainly done with adhesive bonding. In that case a liquid adhesive is dispensed on the composite which is then pressed on the metal structure. The adhesive cures in the oven that is used after the ecoat process. This process limits the geometry of the parts that can be assembled and the process is difficult to control.

The challenge proposed here is to develop an adhesive that could be solid when the composite is placed in contact with the metal body. Ideally the adhesive would be placed in the mold when the composite part is molded. The adhesive would then cure when the BIW is placed in an oven around 200°C for a duration of around 15 minutes to create a structural bond between the metal and the composite. Solutions for thermoset and/or thermoplastic composites are of interest.

Hybrid metal/composites structures have a high potential for weight savings

Scope:

- Create a structural bond between a steel part and a composite part (thermoset or thermoplastic) without liquid adhesive and use oven of ecoat process to cure the adhesive the bond between steel and composite. The adhesive should be dry and as a solid thin layer at the surface of the composite to make the assembly process easier for the automotive OEM
- Structural bonding with values of bond around 25 Mpa in simple shear test at new and reduction of less than 25% after wet ageing
- Cost of the additive should be "acceptable" for the automotive industry

Objective:

- Adhesive is delivered as a roll of material (solid)
- Adhesive cures at 200°C in 10 minutes
- Bond between composite and steel is structural (shear strength of 25 Mpa).
- Good resistance of the adhesive after thermal (range -30°C to 80°C) and/or wet ageing
- Cost of the adhesive is compatible with automotive targets

13_AUTO_PBC_RESeat

Title: Novel child seat components made of recycled thermoplastic fiber reinforced plastic

Description: Development of child seat components with high crash performance for automotive application. New technology combines particle foaming, injection moulding and local continuous fibre reinforcement. This particle-foam composite injection molding (PCIM) process offers a weight and CO₂ saving of up to 30 percent. Re-use of recycled thermoplastic tapes for injection molding of FRP molded component improves CO₂ footprint of the manufacturing process.

This is a challenge in terms of material and technology. It is declared to use recyclates (re-use of thermoplastics tapes) for the child seat production. The product fulfills the criteria of a hybrid composite and combining production technologies and joining various materials, which is important for lightweight composites. Main objective the development of thermoforming and injection molding in combination with particle forming is new, this is the challenge.

Scope:

- Weight and CO₂ saving of up to 30 percent
- Excellent crash performance for automotive application
- Energy-efficient production process (one instead of two manufacturing processes = CO₂ saving) by Particle-foam composite injection molding
- (Re-)Use of recycled thermoplastic tapes for injection molding of FRP molded component
- Partner for product design is a child seat manufacturer based in Poland

Objective:

- Main objective: the development of thermoforming and injection molding in combination with particle forming
- Development of a functional demonstrator based on a head rest of a child seat (The challenge focuses us on the head rest of the child seat. This is the main component of the child seat with high requirements to crash safety and it's a perfect technology demonstrator. For that reason, the predicted budget is suitable.)
- Development of re-use technology of thermoplastic tapes
- Material analysis and selection
- Topology optimization and numerical design of the structure
- Development of a thermoforming and injection molding tool as well as a particle foaming tool
- Implementation and optimization of the manufacturing process
- Crash tests of the technology demonstrator

37_AUTO_PBC_Material2design

Title: Material selection tool prior to design phase

Description: Current process solutions enable the production of multi-material composite parts at high lot sizes allowing to replace heavier metal parts in automotive applications. However, this is only possible if the part design is near to optimal. This optimal state is defined by having the minimum amount of the “right” material (for example continuous fiber composite material patches or metal inserts) at the “right” place which allows to comply the specifications while achieving the overall best part weight or cost. One main issue in current design approaches is that a first design must be selected before starting a part optimization. In the latter it is possible to define the lay-up of the composite patches or the exact shape of a metal insert. This first design creation is generally guided by the experience of the engineers and eventually leads only to non-optimal solution.

The goal of the challenge is to create a tool which, starting by a given design space and loadcases, identifies a zoning of the design space which roughly describes which material is to be put in which zone of the design space to achieve the optimal weight or cost. The tool should follow objective rules and have a short runtime. Based on the tools output a first design can be created which can thereafter be optimized in a second step.

Scope:

- To authors knowledge there is no tool on the market supporting the material selection for zones of a multi-material part using objective criteria.
- A link with existing simulation tools (or other supports) can be possible.
- The tool should be able to consider different loadcases on the same part.
- The evaluation time should be reasonable (max 1-2 days or less depending on the part complexity) as used prior to design start.

Objective:

- A tool supporting to select the best material for different zones in a design space prior to defining a proper part design.
- Main criteria: robustness and evaluation time.
- Optimization criteria: Part weight or cost.
- Definition of use cases can be provided as the testing.

38_AUTO_PBC_SUSMA

Title: Sustainable Material Usage in Automotive Industry by Developing New Easy-to-recycle Coating Technology

Description: Recycle and bio plastics are currently using in automotive industry however there are still big hurdles to expand the usage of this materials such as unpleasing odor and insufficient aesthetic properties (especially in the condition of applying foaming technologies). Interior hard trim PP parts have big potential for application of sustainable materials. Easy to recycle, de-bondable coating systems can be developed by using similar thermoplastics so that aforementioned problems can be eliminated. By achieving this, CO₂ emissions will be reduced owing to not using fossil derived sources and lightweighting technologies will be applied such as physical or chemical foaming.

Scope: Usage of recycled or bio plastics has vital importance for automotive industry.

- Enabling the such sustainable materials considering lightweighting and fully replacing with fossil derived plastics.
- To achieve this, developing new coating (including IMD and IML technologies) or additive technology (preventing odor and surface defects) or combining thereof.

Objectives:

- Elimination of surface defects in the condition of fluctuating material properties.
- Lightweighting the parts by using physical & chemical foaming without sacrificing mechanical & thermal properties.
- Developing new coating technology which is applicable for variety of thermoplastics so that preventing unwanted odor and covering surface irregularities could be possible.

Considering design for sustainability, it is expected that whole part needs to be fully recyclable as scrap on EoL. Therefore, new coating or additive need to be compatible with PP so that after end of life it can be recycled and used again without significantly reducing its properties.

39_AUTO_PBC_FEPREV

Title: Feasible Low-Medium Volume Part Production in Automotive Industry: Focus on customized EVs

Description: Rapid growth in the EV industry leads us to find more agile solutions & processes for manufacturing diversified plastic parts with lower volume compared to injection molding expected part volume. Injection molding is an excellent manufacturing method for high volume production, however it is not feasible for under thousands of parts. Therefore, this technology needs to be substituted by other growing Technologies such as additive manufacturing, in-situ polymerization techniques, or other, when it comes to lower production needs. For instance, reaction injection molding can be applicable and feasible for this situation since mold & equipment investment and the energy consumption is lower. On the other hand, suitable raw materials prices are challenging compared to thermoplastics in the market.

Scope:

- New technology & process adaptation to automotive parts considering feasibility & lightweighting & sustainability in order to make low & medium volume production possible especially for under the hood EV components which only needs up to 10000 annual productions.
- Customizable manufacturing to merge different production lines into one.
- Cost-efficient raw material development for selected manufacturing Technologies.

Objectives:

- Creating manufacturing Technologies that usage of thermoplastics can be possible to produce low-mid volume parts cost-effectively. These Technologies demand customized production aiming at the manufacturing of different variations of the same functional parts with identical equipment.
- Expanding the usage of in-situ polymerization techniques in automotive applications focusing on customized EVs such as AM, RIM, RTM, vacuum infusion by applying thermoplastics to these techniques.
- Developing new materials to be cost-effective and to replace thermosets with thermoplastics to rely on circularity. More specifically expanding usage of thermoplastics (PA, PMMA, PBT etc.) in in-situ processes combining them with carbon and glass fibers according to part specifications.

Light Metal Alloys

15_AUTO_LMA_DIJOALS

Title: Dissimilar joining of metallic components for serial applications.

Description: Dissimilar joining of:

- aluminum-steel
- Steel- composite
- Aluminum- composite for serial applications.

Dissimilar joining can be possible with only possible with screw and nut and some rivets technology in serial productions.

These have some limitations; therefore, we need alternative solutions:

- More aesthetic
- Faster
- Cheaper
- Lighter

Objectives:

- Increasing the lightweight material on vehicle
- Give design convenience to designer
- Faster, more reliable and lighter joining
- Less heat generating during joining (like arc welding)

Challenges:

- Dissimilar joining without extra fastener usage (no screw, no nut) or very small low cost elements. Constraint: the mechanical properties of the joining area must be bigger than the lowest properties of sheet metal in the mechanical structure.

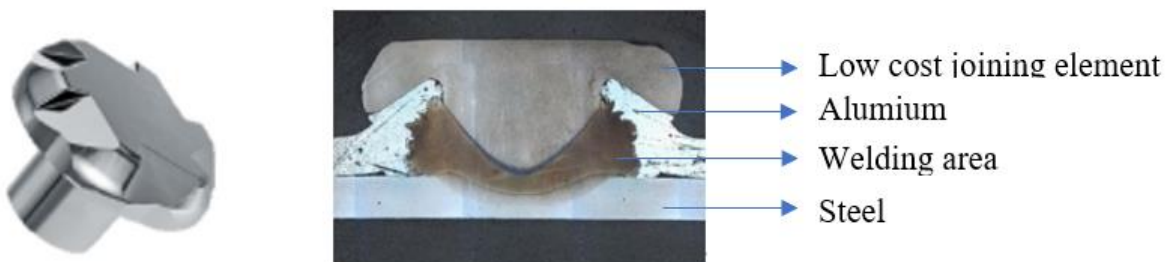


Figure 1: Example of low cost element

- Joining without pre-readiness (hole opening, nut welding etc.), for current solutions, we need to make extra operations for joining. Opening holes, welding nuts, tuckers etc. We are looking to eliminate opening holes, welding nuts, tuckers etc, and create easy assembly ways. Example: self-drilling screws

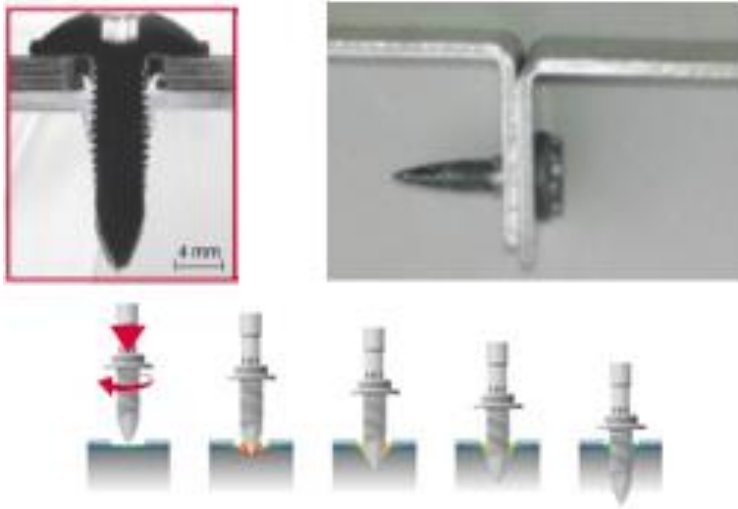


Figure 2: Self drilling screws

- We want to use hole expansion index properties to create a nut with sheet material itself. We want to create a norm about it



Figure 3: Hole expansion index

16_AUTO_LMA_E-carGEAR

Title: Light metal alloys for e-car gearbox

Summary: Light weight alloy (or as more challenging alternative fibre reinforced polymers) with noise reduction characteristics to be utilized to realize e-car gearbox and differential housings. Possible application extension (depending on production cost) also on industrial gearboxes. Start TRL4/5, end TRL7

Description:

New e-vehicle will require a big attention to weight, to improve the overall efficiency of the vehicle, penalized by the big mass of the battery pack. Innovative solution will be necessary either to reduce the weight of the vehicle transmission (gearbox and differential) or to reduce NVH (in particular, noise) due to the fact that to improve e-motors performances their max speed is already above 20K rpm. Innovative solutions can identify new material that can replace aluminum/cast iron die casting and that could be more efficient in terms of NVH and weight, i.e., composite material with sandwich structure. Obviously, cost could be another important driver.

Please note that the challenge doesn't consider battery pack production, as the reference on battery pack is only to remind that the e-vehicle with heavy BP, could need to improve their weight but on other components (like transmission or other components).

New materials and production technologies will be necessary to take up this challenge

Objectives:

- Objective n.1: alternative material/solution to aluminum housing of a gearbox, with a weight reduction at least of 30% and a cost increase not higher than 10%. As output of the Project a sample of gearbox/ generic housing, to show weight reduction at same mechanical overall performances.
- Objective n.2: improve NVH emission by at least 30-50% with a laboratory simulation at different frequencies.

40_AUTO_LMA_ALUweld

Title: Reducing aluminium oxidations on the surface for laser welding applications

Description: Aluminum is important to the automotive industry because of its lightweight, strength, flexibility, malleability, conductivity, reflectivity, and resistance to corrosion. Aluminum is light, with about one-third the density of steel.

Vehicles made from aluminum have better acceleration, better braking, and better handling. The rigidity of aluminum provides drivers with more immediate and precise control.

Scope of the challenge

One of main challenge of welding aluminum involves the formation of oxide film on the work surface. The melting point of aluminum oxide is approximately 3x the melting point of pure aluminum, which can result in particles of aluminum oxide contaminating the weld and leading to porosity issues. In most cases, oxide film must be removed either by mechanical or chemical means prior to welding. Aluminum oxide can affect laser welding: oxide films can change the reflectivity of the parts surface, which negatively impacts the amount of laser energy making it to the base metal. To avoid oxide films and hydrocarbon contamination, aluminum to be laser welded must be thoroughly cleaned. This is often achieved mechanically, using stainless steel wire brushes, grinding, filing, or scraping to remove any oxides. Alternatively, there are chemical cleaning methods utilizing immersions in caustic solutions and water that are effective at removing aluminum oxide.

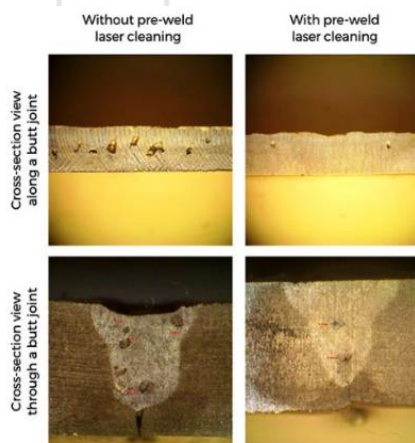


Figure: Welding result with cleaning the oxidation; Source: <https://www.laserax.com/blog/cleaning-aluminum-welding>

Objectives

Development of an alternative aluminium surface processing enabling following benefits in comparison to the conventional processes:

- Reduction of the cost for surface preparation by 20%,
- Deaccelerate the oxidation process on the surface by 30%,
- Reduction of porosities in the welding pool by 20%.

41_AUTO_LMA_ASAS

TITLE: Removing Zinc impurities in 6xxx billet casting

Description

Casting the 6xxx Al series after the 7xxx Al series:

- 7020 to 6063
- 7020 to 6082
- 7005 to 6063
- 7005 to 6082.

Nowadays, it is expensive to cast 7xxx series aluminum alloys especially for large industries. Since 7xxx series have lower demand compared to 6xxx series, current demands cannot meet big furnaces capacity. As a result, large extrusion companies cannot give respond to these demands. Zinc content in the furnace after casting 7xxx alloys has to be removed which reduces the quality of the 6xxx cast. Solving this issue would allow reducing the price and therefore increase the competitiveness of 7xxx series. Automotive OEMs who are eager to replace steel with 7xxx alloys would benefit from the reduced prices. There could be a great progress in replacing steel with aluminum for improving lightweight performance. Large companies' investment in these works will also pave the way for research and R&D studies for 7xxx series aluminum alloys.

At the manufacturing stage, billets are input of the extrusion process and they are produced by direct chill casting (DC). 7xxx series alloys have Zn as main alloying element. 6xxx series alloys have Si and Mg as main alloying element. When the 7xxx series are casted, the 6xxx series cannot be casted in the furnace because of the remaining Zn impurities. The furnace must be cleaned to remove impurities. That's why in the passing from 7xxx series casting to 6xxx series casting, 2 scapyard castings are made. Casting of the 6xxx series is a problem. In order to ensure its continuity, at least 2 castings are wasted. These wasted castings cannot be used as scraps.

They have some limitations; therefore, we need alternative solutions:

- More sustainable
- More efficient
- Cheaper
- Faster

Challenges:

On the one hand, 7xxx series are the most valuable alloys of the Challenge giver. According to EN 573-3 standard for alloys, the composition is shown in Table 1.

| Alloy/Element | Si | Mg | Zn | Al |
|---------------|------|---------|---------|--------|
| 7020 | 0,35 | 1,0-1,4 | 4,0-5,0 | Remain |
| 7005 | 0,35 | 1,0-1,8 | 4,0-5,0 | Remain |

Table 1. 7020&7005 Alloy Content (only major elements are shown)

On the other hand, 6xxx series are the most common alloys, which composition is shown in Table 2 according to the same standard.

| Alloy/Element | Si | Mg | Zn | Al |
|---------------|---------|----------|------|--------|
| 6063 | 0,2-0,6 | 0,45-0,9 | 0,10 | Remain |
| 6082 | 0,7-1,3 | 0,6-1,2 | 0,20 | Remain |

Table 2. 6063&6082 Alloy Content (only major elements are shown)

The problem is that after casting the 7xxx alloy, the Zn element does not leave the process while casting the 6xxx alloy. Zn needs to be removed from industrial casting furnace reverber type, which is achieved with 2 extra scraps waste castings. Constraint: element content of 6xxx series billets must be lower than the 0.1% zinc content after the 7xxx series billets.

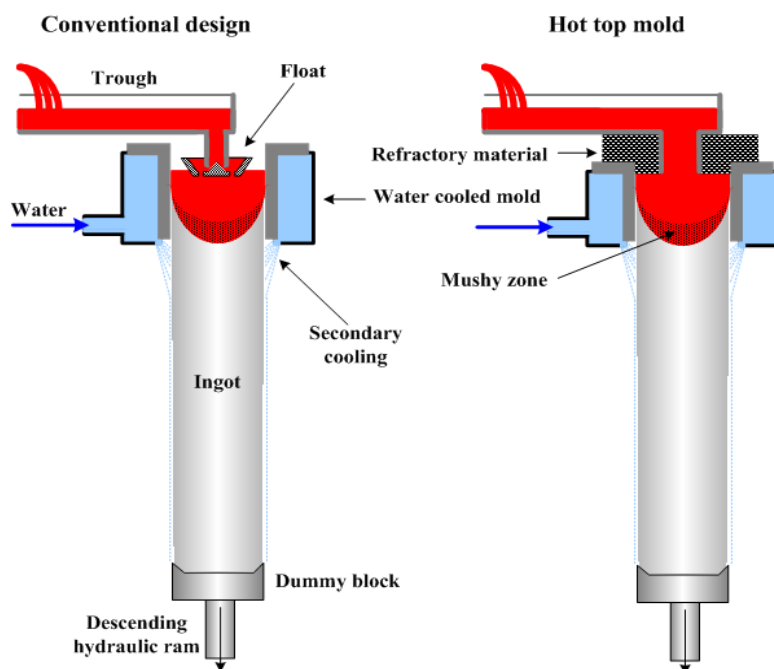
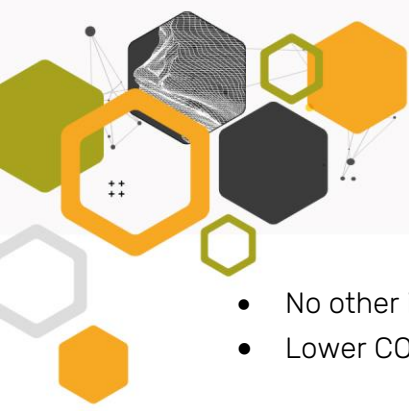


Figure 1. Vertical Direct Chill (DC) Casting

Objectives:

- Faster, more reliable and efficient casting,
- Less time passing during the casting,
- No Zinc content (at least lower than 0.1%),



- No other impurities,
- Lower CO₂ emissions.





Ceramic Matrix Composites

42_AUTO_CMC_ASIL

Title: ASIL factor calculation for Battery disconnection fuse

Description:

Battery disconnection fuse is a device for disconnecting direct electric circuits, which takes advantages of the method of disconnecting an electric circuit with pyro switches and melting fuses in parallel connection with pyro switches. The product has several patents (Pat. Nr. WO 2019/027373 A1, WO 2019/027373 A1) related to the principles of operation and actuation. The Battery disconnection fuse allows a rated current of 600A at a maximum voltage of 800V d.c. and overloaded up to 2700A for 10s. Triggering is external (ECU or BMS) and internal (REED contact, pat. Nr. WO 2019/027373 A1). The product is fully developed and internally and externally validated and customer homologated and has a superior performance/weight ratio. It is used in the serial electric super cars which is the fastest EV car on the world with speed world record (412km/h). The Battery disconnection fuse design is superior compared to the fusible link design and other solutions that exist on the market. Technical Breaking capacity factor (kA d.c.)/weight is much greater than that achieved by the fusible link and other similar pyro-switch solutions. By obtaining the ASIL product reliability factor, according to standard ISO26262, the potential market for sales in the automotive and other markets will increase greatly.

Objectives

1. Calculation and acquisition of FIT (failure in time) factors from suppliers for individual Battery disconnection fuse components.
2. Based on FIT factors perform calculation of ASIL factor for Battery disconnection fuse (according to standard ISO26262). Technical data of the Battery disconnection fuse will be provided by the challenge giver at the start of the project.
3. Minimum ASIL B is final requirement for automotive market.

Polymer-based composites

18_ENER_PBC_LightHtank

Title: Lightweight gaseous hydrogen storage tank for aeronautical application

Summary: Hydrogen application is one of the most promising solution to decarbonize the aeronautical industry. The storage of hydrogen in a lightweight tank is one of the biggest challenges. This project proposes to develop a new type of tank in order to make gaseous hydrogen storage a feasible solution for aviation. New composite materials could be investigated as well as new design for the tank.

For our airship application, 6000 T of CO₂eq can be saved per airship and per year if using hydrogen instead of kerosene, and we plan to manufacture and operate 100 airships for the first 10 years.

Scope:

Hydrogen will be the enabler to decarbonize aviation. However, it must be done without impacting the performances of the aircraft i.e. as light as possible.

Gaseous hydrogen storage is the most mature technology since it has widely been developed for automotive. But the aeronautical constraints in term of weight have not been considered.

Thus, there is a need to design gaseous hydrogen storage for aviation. The airship can therefore be a first application given the less constraining design, especially regarding the volume constraint: dozens of cubic meters. This leads to investigating big and light vessels with possibly lower pressure than the common 350 or 700 bars.

The outcomes of this project could be adapted not only to airships. Indeed, GH₂ tanks are first easier to be designed with as few constraints as possible. So, not considering the volume constraint (for airship application) will help to converge on different architectures. Then, it will be easier to take account the volume variable for other applications such as maritime or in energy.

Objectives:

- The main KPI for developing a hydrogen tank for aviation is its weight.
- An output of the project could be a parametric model coupled with an optimization algorithm that proposes different gaseous hydrogen tank designs (variables = inner pressure, materials, manufacturing process, dimension(s) of the tank, etc).
- Challenge giver can provide the specifications for such a storage as well as some preliminary results.
- The model shall take into consideration new materials & processes and their compatibility with hydrogen, and tank design (parametric model).

20_ENER_PBC_CFNWfabric

Title: Carbon fiber spayed non-woven fabric

Summary: The basic problem is to produce a non-woven carbon fiber non-woven material from recycling, mainly from pyrolysis. The problem is that the existing textile techniques should be adapted to the needs of producing carbon nonwovens of appropriate quality, enabling their further use - processing. According to our tests, the production of such nonwovens is possible by combining several techniques known from the textile industry, including: needling, binder spraying combined with calendering, sewing, e.g. with the Maliwat technique.

In case of great problems with achieving cohesion after needling, it is possible to add other fibers improving the cohesion of the non-woven fabric, including natural fibers.

Scope: Carbon nonwovens are currently produced mostly by needling, we want to produce them by blowing them without needling. Currently, we do not know the possibility of such production.

Should be also examined the market to see if there is a demand for such nonwovens.

Objectives:

- to create inflatable nonwovens,
- the pyrolysis process we have carried out allows the recovery of long fibers, up to 2 meters in length, which allows the creation of nonwovens from longer threads, which will significantly affect the strength of the non-woven fabric,
- creating a closed loop for carbon fiber,
- new product on the market,
- possibility of cooperation with biggest producers and recyclers of such.

The main goal is to obtain nonwovens made of pyrolytic carbon fibers suitable for the formation of:

- a) pre-impregnates
- b) nonwovens for infusion and RTM techniques
- c) stitched nonwovens for the production of open and closed profiles using cheap techniques
- d) manual lamination.

Referring to the current geopolitical situation, the techniques and materials from the submitted task will enable the production of cheap drones and other military flying means that strengthen defence.

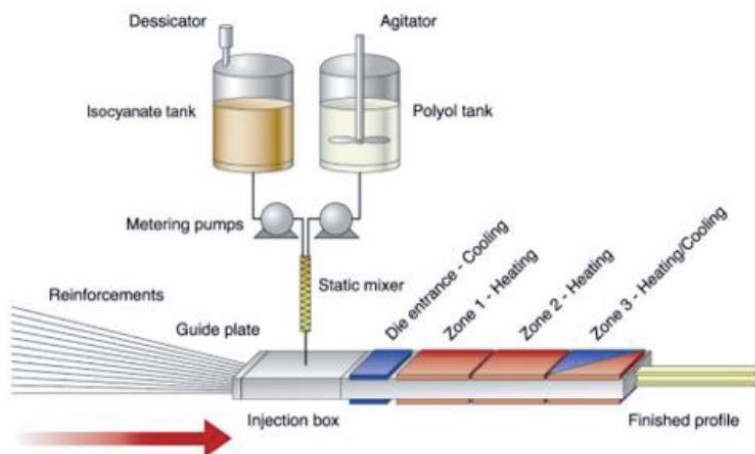


43_ENER_PBC_SimulOpt

Title: Simulation of curing processes for better defect image analysis in pultrusion

Summary: For an increase in economic efficiency and a simultaneous increase in the acceptance of FRP in various areas, a simulation option of the pultrusion process is required. In particular, the focus is on the curing process in the mold, which is still a "black box" today. Problems and challenges that lead to process abortions or component rejects are to be investigated by simulation before the actual production runs and process windows are to be limited. In this way, resources and energy are to be saved and reliable and, above all, economical lightweight construction is to be created for a wide range of applications. Current TRL: 4

Scope: The continuous pultrusion process (see figure) already impresses with its cost-effectiveness and ability to produce high mechanical load-bearing structures. Due to the complex and constantly parallel process steps, a high level of effort is required in process control and design. This know-how is currently distributed among very few people and is mostly based on years of experience. An adaptation of simple profile geometries to complex cross-sections is not easily possible and again requires a great deal of try and error. The same challenges arise with new material systems, which require a great deal of practical preliminary work and investigations or trial-and-error. This situation is to be changed with a preliminary or accompanying simulation, so that a lot of time and, above all, costs can be reduced. The focus should be on the simulation of profile hardening in the corresponding mold - combined with the question of occurring error patterns. In concrete terms, these are cracks and internal stresses.



Michael Connolly, John King, Trent Shidaker u. Aaron Duncan: Pultruding Polyurethane Composite Profiles: Practical Guidelines for Injection Box Design, Component Metering Equipment and Processing. 2005

Objectives:

Simulation model for the pultrusion process (simple geometry, one material system)

- Consideration of the curing behavior of the plastic in the mold,
- Display of internal stresses and cracks.

44_ENER_PBC_CompTape

Title: Reinforced polymeric materials for capacitor housings

Introduction: Challenge giver produces thermoplastic composite tapes, mostly with continuous glass fibre and polypropylene. Normally these tapes are wound on a liner, plastic or metal, to guarantee water and/or air tightness. During the winding process the thermoplastic material in the tapes is melted again.



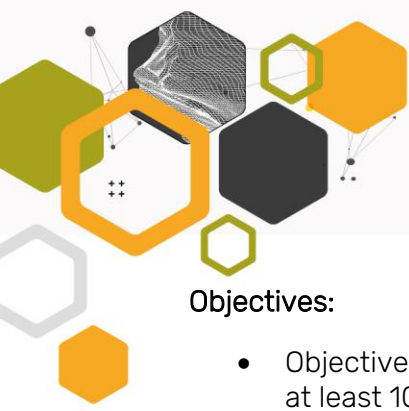
Figure: Thermoplastic composite pressure vessels. Thermoplastic composite tape wound on PP (left) and steel (right) liners

The challenge in the composite pressure vessel industry is to find a cheap liner solution. PET, well-known by its use in the blow moulding of soda bottles, offers a versatile and cheap opportunity to produce liners with. The aim is to find a technology partner that can develop and produce PET liners with a volume of 10-20 liters and more, where soda bottles are normally 1-2 liters. Blow moulding of PET for much larger volumes is not state of the art.

The final application is pressure vessels. The composite that is wound on the liner will handle the strength/stiffness requirements that result from the burst pressure requirement. So, the liner itself does not have a specific strength requirement apart from the connection(s) at the poles.

Scope: The (technical) scope of the project is:

- The liner will be used in the manufacture of composite pressure vessels.
- Blow moulding is the foreseen liner technology but other technologies are welcome.
- PET is the required liner material.
- The volume of the liner should be 10 liters and more.
- Roughly, the shape of the liner consists of the two hemispherical domes and a cylindrical part in between for an optimal strength.
- One or two openings at the poles of the domes with flange or screw connection.



Objectives:

- Objective 1: Demonstration of the blow moulding of a PET container with a volume of at least 10 liters.
- Objective 2: Design of a flange or screw connection that can withstand an internal (burst) pressure of 30 bar at least.
- Objective 3: Realisation of (a functional model or prototype) of a liner consisting of two hemispherical domes and a cylindrical part in between.



45_ENER_PBC_FuseCoat

Title: Low-temperature glaze – coating components for middle voltage MV fuses

Summary: Components of middle voltage fuses, used also for a safe interface of green electricity generators like wind turbines to the grid, include among others, ceramic tubes and ceramic support. According to customer requests, we can finish tubes by several specific design and various technologies: cutting, grooves grinding, centreless grinding and others. Tube surface can be glazed with white or brown colour.

Glaze is a glass coating on the surface of ceramic tubes. We can achieve the impermeability of the porous ceramic coating, smooth surface and shine, and we can increase the mechanical strength of the product by glazing. With colouring of the glaze, we hide the colour of the base and improve the look of the ceramics. The glaze is usually applied to the ceramic product in the form of a suspension. This is followed by drying and sintering, where the components of the glaze react, melt and form a glassy phase that fuses with the base. Under current production conditions, the glaze is sintered together with the product at temperatures around 1300°C. The thickness of the glaze application is 150 - 300 μm .

The development of new tube production technology presents the application of glaze – coating, great challenge. We would significantly reduce technological waste (sintering), from 25% to 5%, which cannot be avoided with existing technology. Technological waste, which is produced in its raw state, would be used as a secondary raw material in the process of preparing the material. In this way, the amount of raw material needed to produce the material would be reduced.



Figure 1: examples of current products with brown and white glazes.

Scope of the project is to develop a new glaze-coating that will be applied at much lower temperatures to the sintered ceramic fuses. The glaze should be electrically insulating. The current glaze material fulfils standard IEC 60672 – 3 group C120 with a sintering temperature of 1300°C and thermal expansion coefficient $30\text{-}600\text{ }^{\circ}\text{C}^{-1} \cdot 7 \times 10^{-6} \text{ K}^{-1}$.

Objectives:

Develop a glaze-coating (preferably polymer-based) that will retain all the functions of the glaze:

- Ensure impermeability of the ceramic tiles,
- Provide a smooth surface and shine (Figure 1),
- Increase mechanical strength of ceramic part (by 20%),



- Connects to the ceramic tube and will not cause deviation or cracks,
- Possibility of application without heat treatment or treatment at low temperature (preferably below 300°C),
- Retain the brown (RAL 8016/8017) and white (RAL 8011) colour, possibility of colour adjustments,
- Electrically insulating,
- Applied as a thin coating (not increasing the mass of the product importantly).



A decorative graphic in the top left corner consisting of several overlapping hexagons in shades of orange, yellow, and grey, some with internal patterns like a grid or a star.

Light Metal Alloys

21_ENER_LMA_EDLCcapacitor

Title: EDLC capacitors with anodized aluminum foil

Summary: The basis of this challenge is to create a product, an EDLC capacitor that has an anodized aluminum foil. However, we must not forget that the capacitor is made from several different components and not just an anodized aluminum foil, and all components work together simultaneously to get the best capacitance values. Among these components, we give a high importance to the cohesion between the anodized aluminum foil and electrolyte.

Challenge is to develop EDLC capacitors with anodized aluminum foil. In combination with a suitable electrolyte, it has a higher specific surface area, which in turn allows us to have higher capacitance values. By achieving higher capacitance values with less material we are bringing lightweighting to the field of capacitors as well by reducing the materials and implementing new modern material we are reducing CO₂ emissions as well will develop and implement new production technologies with aiming to reduce CO₂ emissions.

We have chosen the material for the heart of the capacitor - the capacitor roll as aluminum. The metal itself is very reactive and spontaneously forms a thin transparent oxide layer, upon contact with atmospheric conditions, which provides great stability. The oxide layer has the properties of a dielectric, and its surface is porous, which increases its active surface. Therefore, we want to use it as a dielectric, and with its properties significantly increase the capacitance of the capacitor at the same dimensions. It is possible to form an oxide layer to the correct thickness and porosity by various electrochemical processes. This allows us maximum capacity per unit volume. Therefore, in the field of technology, it will be necessary to develop the process of anodizing the aluminum foil to gain the required specific active surface needed.

The electrolyte in an electrolytic capacitor supports the operation of the capacitor. When impregnating the capacitor element - coil, with liquid electrolyte, we electrically connect the cathode and anode material. In the presence of a layer of aluminum oxide formed on the anode foil and acting as a dielectric, a capacitor with a high capacitance value is obtained. In this case, the electrolyte has a cathode function. The basic properties that the electrolyte must meet are electrical and ionic conductivity, chemical stability and compatibility with other capacitor components, superior impregnation characteristics, low viscosity and good surface tension.

Scope:

- In the field of capacitors, we want to increase the capacitance value of the EDLC capacitor by increasing the specific surface area by anodizing the aluminum foil, which is achieved in combination with a specific electrolyte.
- It will be necessary to determine the thickness of the anode layer, porosity and other properties of the material.
- In the field of technology, it will be necessary to specify the process of anodizing aluminum foil so that it will achieve the required dielectric (aluminum oxide) properties.

- Activities to be carried out will also include research and development of a suitable electrolyte, a fluid with a wide range of electrical properties from ESR (Equivalent Series Resistance), a range of capacities ranging from millifarads onwards, electrolyte leakage, life-enhancing additives, operation and maintenance of primary functions at high temperatures, vibrations, pressures and other severe environmental conditions (humidity,...)
- Missing knowledge is also on the material side when speaking of the electrolyte composition. The technology side mentioned before (anodization process) will be determined in next future steps. – When an ideal solution for the EDLC has been determined, the production technology comes. This means that after the goal has been reached, a production process is to be developed.
- Laboratory equipment is also missing to provide right and fully need to successfully finish the project.
- Missing knowledge and equipment can be provided by Institute – if we do not have the required analytical equipment for certain required analysis, or, if there is a question on which we cannot give the answer to, an external Institute or University can be found as a subcontractor.

Objectives:

- determine the appropriate thickness of the anode layer
- ensure a porosity standard
- development of new technological processes for the production of new capacitors
- achieve other material properties (basic electrolyte properties: electrical and ionic conductivity, chemical stability at temperatures up to 120 °C and compatibility with other capacitor components, does not cause corrosion in other elements, superior impregnation characteristics, low viscosity and good surface tension).

22_ENER_LMA_contactPADS

Title: Contact pads in low voltage switchgear products

Description: Improving the balance of conductivity in low voltage switchgear products by improving existing or providing alternative materials (metal or ceramics)

We want to improve the materials (currently used are AgSnO_2 and AgW) with which we achieve the mechanical properties required in low voltage switchgear, especially by improving the balance of transportability by changing the hardness, strength, resistance of contact surfaces to welding in electric arcs, weight and CO_2 friendliness.

Scope: When we are switching load, contact pads hit with each other and electric arc is created. This electric arc burns out contact pads and lifespan of the switch is shortened.

We want to develop materials that will be more resistant to contacts, while we want to meet the new market requirements for the implementation of new advanced materials and internal and external needs to reduce CO_2 footprint.

The standards IEC/EN 60947-4-1 and IEC 62955 specify:

- short-circuit tests (3000 A with pre-fuse): At short-circuit tests very high temperatures are generated which can melt or evaporate copper and the contact material/pads,
- switch on test at full load (high switching currents, high inrush current): electric arcs are created burning down the contact material,
- allowable heat on the contacts: Contact material such as AgW can have higher contact resistance causing non-conduction through the pole and overheating,
- switches' mechanical durability: 3 million cycles with no load.

Objectives:

- Improving the balance of conductivity mechanical properties (hardness, strength, resistance of contact surfaces to welding in electric arcs)
- Improving technology of production targeting CO_2 footprint reduction
- utilization with standard category AC-1 and category AC-3

Ceramic Matrix Composites

23_ENER_CMC_LightGRID

Title: Lightweight active grid for replacement of lead alloy grids

Description: Replacement of lead alloy grid with lightweight material with better conductivity and resistant in dilute sulfuric acid. Seeking for lightweight material for active grid with electrical conductivity and resistant in dilute sulfuric acid. Achieving adhesion with active material to collect electrons from chemical reactions in active mass in batteries electrodes.

Figures: top active grid, bottom battery components



Objectives:

- Higher energy density (weight reduction)
- Reduce the use of lead
- CO₂ emissions reduction

46_ENER_CMC_siliconeFIRESTOP

Title: Arc extinguishing material on the melting elements of fuse link

Description: We currently use a special silicone named FIRESTOP with the addition of aluminium trihydrate to limit the electrical arc inside the fuse link during fuse operation on DC voltage (up to 1500V d.c.). Electrical arc made chemical reaction which aluminium trihydrate “change” to water and aluminium oxide. Energy consumption from chemical reaction reduce the temperature of electric arc. Additional material which is added to silicone is SILAN which improved adhesion to the melting element.

Silicone is applied to the melting elements which is a part of fuse link. Using a silicone FIRESTOP reduce the length of fuse link for more than 30% and weight for more than 20% in comparison to other technical solutions.

The process of application of the silicone on the melting element in the production is relatively complicated and time consuming (application on the melting element, drying, curing, control).

The challenge is to find a suitable technical (replacement for FIRESTOP silicone or another additive to quartz sand (like boric acid)) and find technological equivalent to the existing process, which will be simpler and will reduce production costs.

Existing technical solution with FIRESTOP silicon is patented in EU (Pat. Nr.EP 14 835 723.9)

Objectives:

- Finding a technical and technological equivalent for the existing FIRESTOP silicone.
- Significantly reduce costs of material used and production process (for more than 50%).

Figure: Example of fuse link

Polymer-based composites

47_BUILD_PBC_LoCaBaFi

TITLE: Low Carbon dioxide emitting Basalt fibre production for composite material

Description Carbon fiber reinforced polymers (CFRP) have a negative environmental impact due to the fossil-based manufacturing process of the carbon fibers, and the inefficient waste recovery at the end-of-life phase. The concept of the LoCaBaFi includes several approaches that will achieve a substantial reduction of CO₂ emission of at least 30 % in the life cycle assessment of basalt fiber reinforced polymer (BFRP) and reinforced ceramics (BFRC).

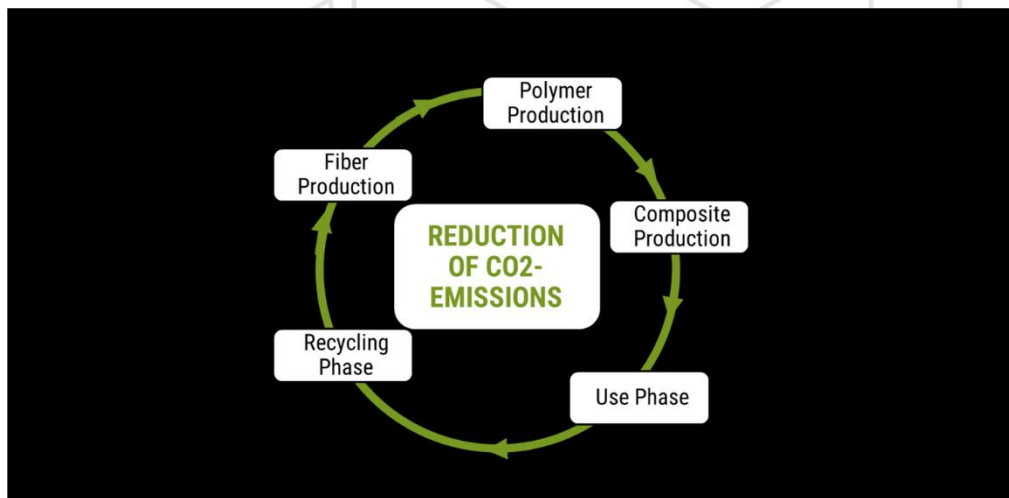


Figure: Potential for reduction of CO₂ emissions.

Iceland is a world leader in using renewable energies summing to over 99% of its total electricity consumption. Iceland has also plentiful of natural basalt resources from which basalt fibers (BF) can be produced using renewable energies. Nowadays, raw basalt rock is mainly mined in Russia, Ukraine and Georgia. The long transportation distance to Europe and the use of fossil-based energy to produce the fibers accounts for a negative environmental impact. Additionally, a risk of time-to-market shortage could become possible upon changes in political partnerships or due to political conflicts.

The matrix of the lightweight BFRP developed in this project will be made of a 100 % bio-based thermosetting polymer or CO₂ neutral Geopolymers for BFRC compared with concrete leading to a further reduction in CO₂ emission. Concerning environmental impact, BF is a natural material, eco-friendly, non-toxic and can be easily processed and recycled. Regarding mechanical properties, BF bridge the gap between glass and carbon fibers and offer the advantage of cost effectiveness, resistance to elevated temperatures and to chemical environments.

The outcome of the project of reducing the CO₂ emission has an enormous positive environmental impact and has a direct positive impact on the society. Additionally, it contributes to the goal of reaching a circular industrial value chain and a resilient Europe.

Scope of the challenge

The aim of the LoCaBaFi challenge is to develop a low CO₂ footprint FRP / FRC made of BFs of natural raw materials reinforcing a fully bio-based thermosetting polymer and or Geopolymer. This sustainable BFRP / BFRC paves the way to a substantial reduction in CO₂ emission of lightweight composites and to support the effort of the EU to combat global warming. The concept of the project is based upon the following approach combinations to achieve this exceptional contribution of CO₂ reduction:

I. Mining natural basalt in Iceland

Iceland is an important source of natural basalt and lava rock originating from the volcanic activity over the past thousands of years. Additionally, basalt and lava rock are continuously formed due to the frequent volcanic activity encountered in the region. These natural resources could then be used as an alternative to currently used sources coming from remote countries (e.g. Russia, Ukraine and Georgia), ensuring resilience, economic flexibility and a shorter time-to-market for European lightweight producers.

II. Fiber production using renewable energy

Iceland generates over 99 % of its electricity production using hydropower and geothermal power. Producing the BFs using renewable energy, instead of using the energy-intensive fossil-based manufacturing process, reduces dramatically the emission of CO₂ upon production of the fibers. As fiber production accounts for an intensive energy consumption process, this will be an immensely beneficial to circular economy of lightweight composites.

III. Melt-Spinning prototype machine

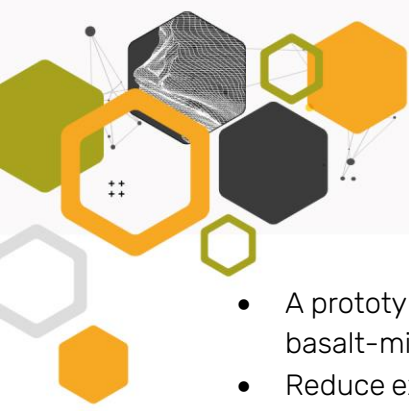
One of the project partners will build a prototype melt-spinning machine validated to TRL 5 with a 20-50 bushings capacity and will lend / give it to another project partner for fibre spinning. The machine will be the base for an industrial up-scaling prototype plant. This introduces two important benefits: (1) reduction of CO₂ emission by the low transportation distance between the mining site and the location at which the melt-spinning plant for fiber production will be established, (2) reduction of export control regulations and reduction of EU dependency on producers of BFs from countries outside the EEA.

IV. Prepreg / semi-finished products

Semi-finished products based on commercial bio-based polymers like tubes or rods for building - reinforcement of concrete - or aerospace & aeronautics.

Objectives

- A reduction of CO₂ emission of at least 30 % in the LCA of the new BFRP in comparison to commercially available CFRP and GFRP.
- Development of semi-finished products out of these new basalt fibres based on bio-based polymers.
- Development of a composite with over 50 vol.% of bio-based materials.
- Usage of 100 % renewable energy sources for manufacturing natural BFs.



- A prototype melt-spinning machine validated to TRL 5 will be established at the main basalt-mining site.
- Reduce export control regulations, secure time to market of lightweight solutions and reduce EU dependency on producers of BFs from Russia and other countries outside the European Economic Area (EEA).





Light Metal Alloys

24_BUILD_LMA_WAAMconnectors

TITLE: WAAM technology for structural steel connections with advanced design

DESCRIPTION

This challenge aims to improve the methods and practices used in the design and fabrication of steel connectors for new and existing structures exploiting the potential of novel 3D printed metal technology (such as WAAM) in terms of new geometries and improved structural performances.

Nowadays, steel connectors are a crucial point in both design and construction phases of steel frames, especially in seismic prone areas where high demand is requested for moment resisting frames thus requiring ad-hoc costly solutions (high strength bolts, stiffeners, full penetration weldings,...) . New layouts and geometries are currently realized using fused metal and cast iron with specific formwork that involve:

- waste of material
- poor flexibility (difficulty in adapting to changes in plan)
- high costs
- time consumption

The proposed solution is to use metal 3D printing technology for large parts such as Wire and Arc Additive Manufacturing (WAAM) to design and manufacture a new class of steel connectors for frame structures with high flexibility in the geometry and structural performances of the outcome.

The following technological results will be achieved during the project:

- Off-site manufacturing of novel steel joints for moment resisting frames
- Development of new designs methods for efficient steel connectors exploiting the potential of WAAM fabrication methods.

Objectives of the project:

- Reduction of manufacturing time
- Increased productivity
- Reduction of weight
- Increased geometrical flexibility towards a new class of efficient connectors
- Reduction of material waste
- Reduction of environmental impact

Ceramic Matrix Composites

25_BUILD_CMC_HEALmortar

Title: Self-healing mortar for ETICS facade systems

Summary If facade final coats are cracked rain water penetrates inside the facade system, which reduces thermal insulation properties of the ETICS system and can damage also the buildings load-bearing structure. The developments of new materials, like self-healing materials, are highly needed to repair cracks instantly to prolong facade service life.

External thermal insulation composite facade system (ETICS) is assembled from different materials and each has its own specific function.




Figure: left - 1 Primer, 2 Thermal insulation, 3 Anchor, 4 Base coat, 5 Reinforcement mesh, 6 Primer, 7 Top coat; right - crack examples

Basic function of Base coat is to bear stresses due to thermal expansions and possible impacts (e.g. hail, ball...). Usually base coat is made by cementitious mortars in thickness 3 to 5 mm and reinforced with glassfibre mesh. Quite common cracking of base coat occurs (up to 0.5 mm) together with decorative top coat before end of life, which is usually considered to be 25 years.

Concrete self-healing solutions are already on the market, but self-healing solutions for cement-based mortars are still not well defined. From literature the known self-healing solutions are: superabsorbent polymers (SAPs), shape memory polymers (SMP), bacteria-based self-healing, encapsulated healing agents (macro and microcapsules), engineered fibres, which provide crack closures for crack widths greater than 0.15 mm; while shape memory composites (SCMs) seal smaller cracks widths (< 0.15 mm).

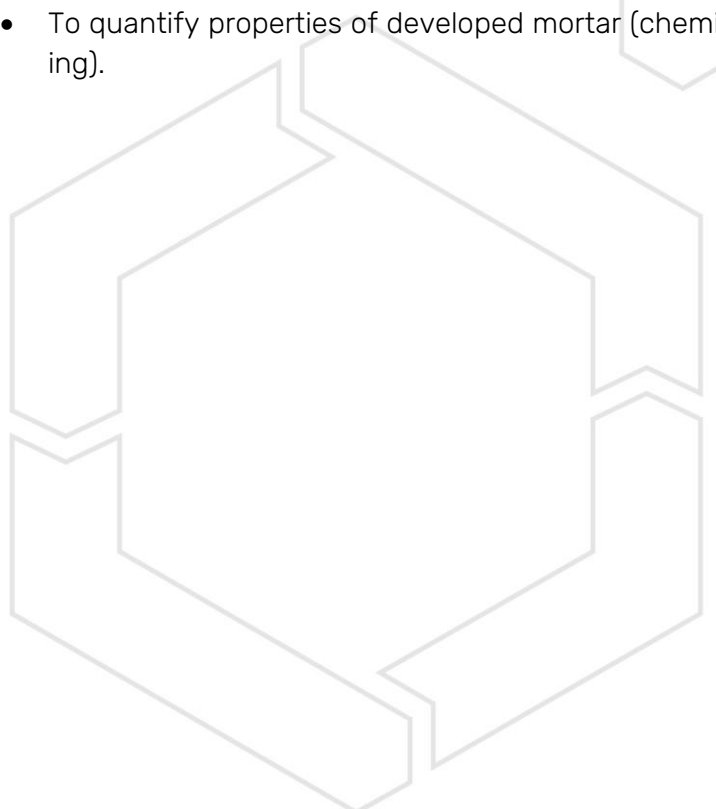
Scope of the project would be to develop self-healing mortar for base coat that in the case when cracking occurs cracks up to 0.2 to 0.3 mm would self-filled and prevent water to penetrate deeper into the facade system. We prefer the solutions with microencapsulated



agent, which is present in mortar and it is released when crack occurs. Solution with SCMs and expansive minerals as fly ash, silica fume, BFS, CSA, bentonite clay or any other material which make a strong bond between the crack faces... It would be desired using waste material from local productions, that we can contribute to circular economy and also, we would like to contribute to reducing pollution.

We are seeking self-healing solution for achieving crack-free mortars in normal conditions (without further heating or compressing). The know how should include the knowledge about the effect of self-healing additive on the properties of cement mortar especially durability improvements. Challenge-giver would provide basic formulation of the mortar.

Objectives:

- To develop formulation of mortar with self-healing properties.
 - To quantify properties of developed mortar (chemical, mechanical, applicable, healing).
- 

26_BUILD_CMC_MgOconstruction

Title: Magnesium-based by-products and slags for alternative construction materials

Summary: The challenge is focused on the potential application of two magnesium-based compounds. On the one hand, the reuse of Magnesium oxide by-products obtained during the industrial calcination process of magnesite. On the other hand, potential uses of refractory ceramic residues from steel industry.

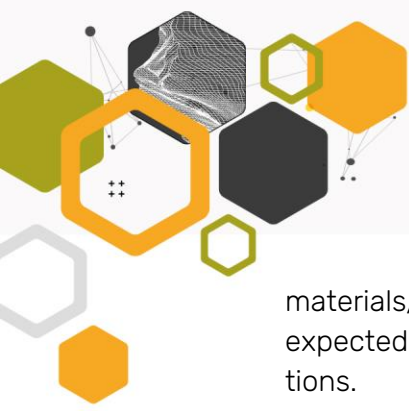
MgO by-product relevant information: collected as the cyclone dust from the kiln as a fine brown powder. It is mainly composed by MgO, and carbonates from the mineral ore because of the uncompleted calcination decomposition. The MgO content is between 60-65% (on ignited basis) and the CaO, SiO₂ and Fe₂O₃ around 7, 3 and 2,5 % respectively. This by-product is currently used as soil stabilization agent, and as a precursor for developing alternative cements, such as Magnesium Phosphate Cements (MPCs), among other applications. MPCs developed by using this by-product presents excellent properties as insulating material, as repairing material, and as matrix of natural fibers due to its neutral pH. However, the cost is very high in comparison to Portland Cement, mostly due to the cost of the phosphate source.

Refractory residues relevant information: refractory material obtained after service in the steel industry. These refractory residues contain different metals that can be cleaned by magnetic treatment. Subsequently, the material is properly conditioned reducing the particle size by crushing and milling. It is mainly composed by Mg, Si, Ca, Al and Fe. The main issue is the large amount of these type of wastes obtained by the steel industry. Besides, they are poured into landfills. Our company seeks for a valorization of this kind of wastes in order to reduce CO₂ emissions and to enhance the sustainability by promoting the circular economy.

Scope: The main purpose is based on the development of sustainable and valuable construction materials as an alternative to the conventional ones. To seek the CO₂ emission reduction, and the development of lightweight construction materials with relevant properties. Start TRL4, end TRL7.

Objectives:

- Use of both materials in the development of sustainable construction materials considering or including lightweight brick and mortar material solution (under the material classification considered into the UNE EN 998). This can be achieved by using them as secondary raw materials, and/or as an addition for improving some properties of conventional construction materials.
- Economically viable construction materials (brick and mortar) for the proposed alternative construction solutions. Realistic scenarios in order to be competitive in the market.
- Interesting technical targets are considering, regarding their properties, for these objective and developed products/materials in this project: densities around 500-525 kg/m³ and 1000-1250 kg/m³ (UNE EN 998), for the brick and mortar respectively, and thermal conductivities ((UNE EN 1745 for thermal properties) of no more than 0,4 W/mK for both products, are targeted for these sustainable construction



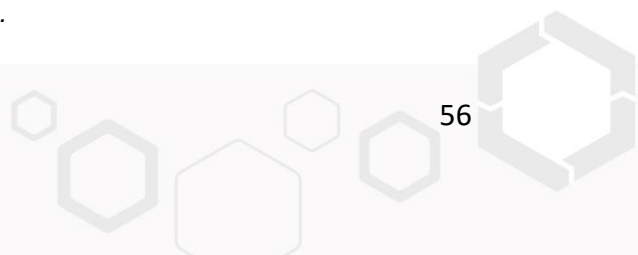
materials/products to be developed in this project, by keeping resistance and other expected and required properties for the conventional construction materials solutions.





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Annex 3 Call Announcement

Competitive Calls and H2020 Financial Support to Third Parties

AMULET- 2nd Open Call for Applicants- Call Announcement

| | |
|-------------------------------------|--|
| Call title: | <i>AMULET Second Open Call</i> |
| Full name of the EU funded project: | Advanced Materials and Manufacturing Technologies United for Lightweight |
| Project acronym: | AMULET |
| Grant agreement number: | 101005435 |
| Call publication date: | <i>10.01.2023 at 13:00 Brussels Time (CET)</i> |
| Call deadline: | <i>22.03.2023 at 17:00 Brussels time (CET)</i> |
| Expected duration of participation: | <i>15 months</i> <i>Stage 1: 4 months</i> <i>Stage 2: 9 months</i> <i>Stage 3: 2 months</i> |
| Total EU funding available: | €1,193,000.00 (2 nd AMULET Open Call) |
| Submission & evaluation process: | <p>Submission through the application form available at: https://amulet-2oc-h2020.fundingbox.com/</p> <p>In the 2nd Open Call AMULET will select up to 26 projects. The selection of the open call proposals will be carried out in a five-step process.</p> <ul style="list-style-type: none"> ● Step one will check the proposals against eligibility criteria. ● Step two will involve external evaluation to assess the proposal according to the criteria (3 independent experts per proposal). ● Step three will involve the AMULET Selection Committee (Steering Committee + 3 external experts) to choose the proposals that will be invited to Jury Day, based on the external evaluation results and the objectives of the AMULET project. ● Step four will involve the AMULET Selection Committee (Steering Committee + External Advisory Board) to select the finalists based on the Jury Day pitches and evaluation criteria. ● Step five will include the review of legal documents before the Sub-Grant Agreement signature. <p>For further information see the Guide for Applicants.</p> |
| Further information: | <p>Application form: https://amulet-2oc-h2020.fundingbox.com/apply</p> <p>OC helpdesk: https://spaces.fundingbox.com/spaces/i4ms-amulet</p> <p>OC helpdesk email: info.amulet@fundingbox.com</p> <p>OC website: https://amulet-2oc-h2020.fundingbox.com/</p> |

| | |
|-------------------|--|
| | Project website: https://amulet-h2020.eu/ |
| Task description: | <p>The funding instrument will include a lump-sum grant of up to €120,000 per project (whereas SMEs individually may not receive more than €60,000) for developing the solutions at demonstration scale and coaching sessions during and beyond their development. The total duration of support provided will not exceed 15 months per project and will be divided into 3 stages.</p> <ul style="list-style-type: none"> - up to 26 consortia (2-3 SMEs) to submit a feasibility study: €23,000 - up to 7 consortia (2-3 SMEs) to demonstrate their solutions: €80,000 - up to 7 consortia (2-3 SMEs) to follow a tailored educational program: €17,000 |

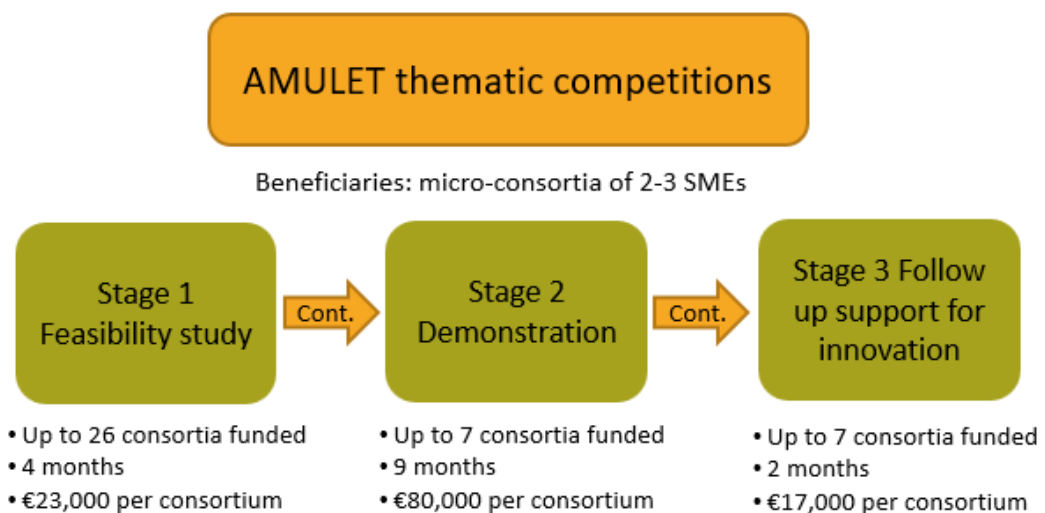
Additional Information

AMULET <https://amulet-h2020.eu/> is an EU funded innovation project. The proposed activities should address the development and implementation of demonstration activities around technology and system applicable to exactly one of the Open Challenges publicly announced with this Open Call coming from one of the three types of lightweight materials (polymer-based composites, ceramic matrix composites, and light metal alloys) for four industrial markets: automotive, aerospace & aeronautics, energy, and building. The proposals aiming **to reach Technology Readiness Level (TRL) 7, starting from TRL 4-5**, are preferred.

The projects must be proposed by a **micro-consortium of a minimum of 2 and a maximum of 3 independent legal entities**, including **exclusively SMEs**, registered prior to the launch of the Amulet 2nd Open Call, established in:

- ✓ The Member States of the European Union and its Overseas Countries and Territories (OCT),
- ✓ Associated Countries to H2020, or
- ✓ The United Kingdom.

Neither AMULET partners nor challenge givers **CANNOT** be involved in these consortia (or their affiliates or employees, permanent collaborators).





AMULET is funded by the European Union's Horizon 2020 Research and Innovation Programme
under the Grant Agreement n° 101005435



FREQUENTLY ASKED QUESTIONS


AMULET 2nd Open Call

Submission of applications starts on the 10th of January 2023, at 13:00 Brussels Time

Submission deadline: 22nd of March, 2023 at 17:00 Brussels Time

Version 02/01/2023





Thank you so much for your interest in the AMULET Open Call and welcome to our Frequently Asked Questions (FAQ). We hope these questions can help you solve your doubts about the application and submission process of the AMULET Open Call.

This FAQ will be updated based on the questions we receive and if you cannot find the answer to your question here, please submit your question(s) at AMULET Online Community or to our Helpdesk <https://spaces.fundingbox.com/spaces/i4ms-amulet>.

This document refers to the 2nd Open Calls under the AMULET project, which launches on Tuesday 10th of January, 2023 at 13:00 Brussels time and has a submission deadline of Wednesday 22nd of March, 2023 at 17:00 Brussels time.

Please refer to more information about the AMULET project and to the Guide for Applicants (GfA) for information about the call.

You can submit your application at the Open Call microsite.

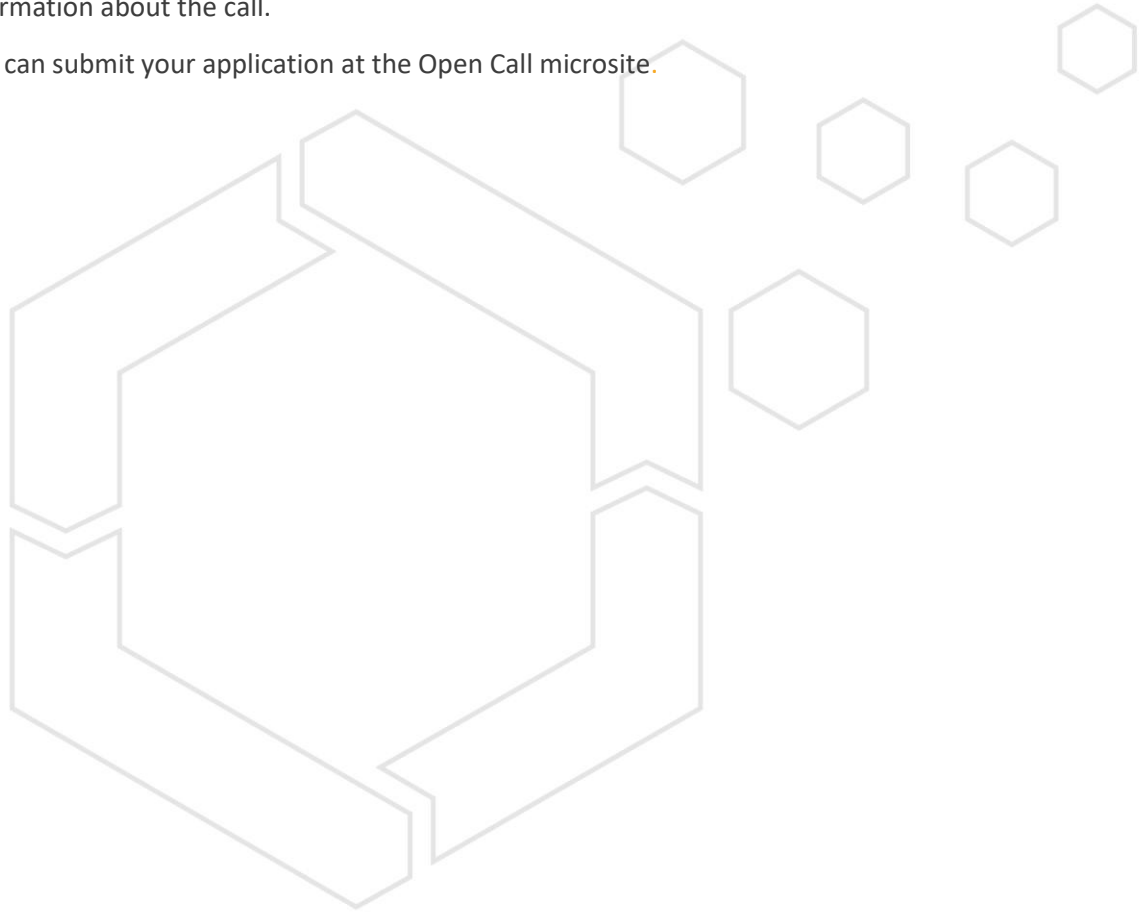
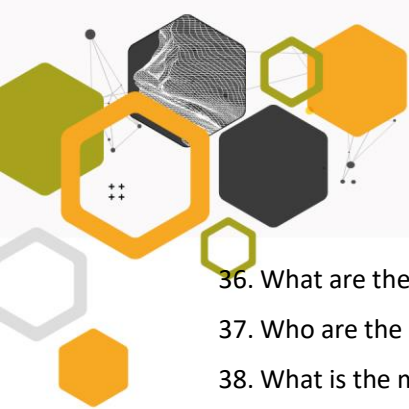


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1. What is AMULET?

AMULET is a HORIZON 2020 project that aims to consolidate novel value chains for multi-sectoral industrial applications enabled by advanced materials and their related manufacturing technologies as Key Enabling Technologies (KETs), ultimately contributing to decarbonisation and resource-efficiency.

AMULET is focused on the next lightweight materials:





- ✓ Polymer-based composites;
- ✓ Light metal alloys;
- ✓ Ceramic composites.

AMULET is focused on the next industrial sectors:

- ✓ Automotive;
- ✓ Aerospace & Aeronautics;
- ✓ Energy;
- ✓ Building.

AMULET will deliver financial support for third parties to select up to 50 Bottom-up projects in 2 Open Calls, from which up to 13 best projects will complete the full support programme, distributing 2.4 M€ among them. The AMULET Consortium consists of 13 partners, coordinated by POLYMERIS.

2. Which organisations are the partners of the AMULET Consortium?

| | | |
|---|--|--|
|  | <p>POLYMERIS (POLYMERIS)</p> | <p>https://www.polymeris.fr/en.html</p> |
|  | <p>Chemnitz University of Technology (TUC)</p> | <p>https://www.tu-chemnitz.de/</p> |
|  | <p>BYDGOSZCZ INDUSTRIAL CLUSTER (BIC)</p> | <p>https://klaster.bydgoszcz.pl/</p> |
|  | <p>THE ADVANCED MATERIALS CLUSTER OF CATALONIA (MAV)</p> | <p>https://www.clustermav.com/</p> |

| | | |
|---|--|---|
|  <p>FLANDERS MAKE DRIVING INNOVATION IN MANUFACTURING</p> | <p>FLANDERS MAKE (FLANDERS MAKE)</p> | <p>https://www.flandersmake.be/en</p> |
|  <p>NTNU Norwegian University of Science and Technology</p> | <p>NORGES TEKNISK-NATURVITENSKAPELIGE UNIVERSITET NTNU (NTNU)</p> | <p>https://www.ntnu.edu/</p> |
|  <p>Jožef Stefan Institute</p> | <p>JOŽEF STEFAN INSTITUTE (JSI)</p> | <p>https://www.ijs.si/ijsw/IJS</p> |
|  <p>IMST SCARL</p> | <p>I.M.A.S.T. - DISTRETTO SULL'INGEGNERIA DEI MATERIALI POLIMERICI E COMPOSITI E STRUTTURE SCARL (IMAST)</p> | <p>https://www.imast.biz/it/</p> |
|  <p>South West Hungarian ENGINEERING CLUSTER</p> | <p>PECS-BARANYAI KERESKEDELMI ES IPARKAMARA (CCIPB-SWHEC)</p> | <p>https://pbkik.hu/ www.ddgk.hu</p> |
|  <p>CLUST-ER MECH MECCATRONICA E MOTORISTICA</p> | <p>CLUST-ER MECCATRONICA E MOTORISTICA (CLUST-ER MECH)</p> | <p>https://mech.clust-er.it/en/</p> |
|  <p>AUTOKLASTR</p> | <p>MORAVSKOSLEZSKY AUTOMOBILOVY KLASTR OS (MSAK)</p> | <p>https://autoklastr.cz/cs/</p> |
|  <p>FundingBox</p> | <p>FUNDINGBOX ACCELERATOR SP ZOO (FBA)</p> | <p>https://fundingbox.com/</p> |
|  <p>BAX & COMPANY VALUE FROM SCIENCE AND TECHNOLOGY</p> | <p>BAX INNOVATION CONSULTING SL (BAX)</p> | <p>https://baxcompany.com/</p> |



3. Where can I find more information about the project?

Project website: <http://amulet-h2020.eu/>

Open Call website: <https://amulet-2oc-h2020.fundingbox.com/>

Community: <https://spaces.fundingbox.com/spaces/i4ms-amulet>

LinkedIn: <https://www.linkedin.com/company/amulet-h2020/>

OC helpdesk email: info.amulet@fundingbox.com

4. What do we offer?

Under the 2nd AMULET Open Call will select up to 26 SME consortia to be funded in the Stage 1 - Feasibility study, and then through a funnel system up to 7 SME consortia to be funded in the Stage 2 - Demonstration and Stage 3 - Follow-up support for innovation of the AMULET programme. The funding instrument will include a lump-sum grant of up to €120,000 per project whereas SMEs individually may not receive more than €60,000. The total duration of support provided will not exceed 15 months per project. Following a funnel system (from Stage 1 to Stage 2 of the Programme) up to 7 **SME** consortia will have a chance to complete the full programme.

5. Who can apply?

Consortia of **2 or 3 SMEs** with a demonstration project in the area of lightweight materials (polymer-based composites, light metal alloys and/or ceramic matrix composites) applicable to the next sectors: automotive, aerospace & aeronautics, energy and/or building.

The preferable initial TRL (Technology Readiness Level) should be **TRL4-5** (TRL4: technology validated in lab, TRL 5: Technology validated in relevant environment) and should target TRL7 at the of the support programme.

For more detailed information please check our Guide for Applicants.

6. Is my project eligible for funding?

We will check the eligibility of all proposals submitted in compliance with the deadline via our online application form <https://amulet-2oc-h2020.fundingbox.com/>. All the eligibility criteria are listed in Section 5 of the Guide for Applicants. The projects that do not comply with those criteria will be excluded and marked as ineligible. We will check the eligibility criteria based on the information provided in your application (it is not possible to submit additional data after the call deadline).

7. Is the applicant from the UK or Switzerland eligible for funding?

Yes, applicants registered in Switzerland and in the UK are eligible to apply and receive funding.

8. What is an SME?

Small and medium-sized enterprises (SMEs) are defined in the [EU recommendation 2003/361](#). The main factors determining whether an enterprise is an SME are: staff headcount, either turnover or balance sheet total.

| Company category | Staff headcount | Turnover | Or | Balanced sheet total |
|------------------|-----------------|----------|----|----------------------|
| Medium-sized | <250 | ≤ € 50 M | | ≤ € 43 M |
| Small | <50 | ≤ € 10 M | | ≤ € 10 M |
| Micro | <10 | ≤ € 2 M | | ≤ € 2 M |

Additional details can be found at https://ec.europa.eu/growth/smes/sme-definition_en

9. Do you accept consortia including large companies?

No, we do not accept it: a micro-consortium must be composed of minimum 2 and maximum 3 legal entities including exclusively SMEs.

10. Can I submit my application if my company is not yet established?

No, you can't. It's only for registered legal entities (registered **before** the Open Call starts: 10th of January, 2023).

11. Can I apply if I don't have a company?

No, you must have a legal entity set up to apply to the Open Call.

12. Can I apply together with other organisations?

Yes, you must. The projects must be proposed by a micro-consortium of at least 2 and at most 3 legal entities, including exclusively SMEs. All of them must be established in an EU Member State eligible for H2020 funding or in an Associated Country or in the UK.

13. Can 2 SMEs that are linked (for example: 1 SME having 51% of the shares of the other SME) form a micro-consortium for AMULET and both get funding?

2 SMEs applying as one micro-consortium have to be independent to each other (without capital or personal links).

14. Is a one-person company eligible to receive AMULET funding?

Yes. As long as it is an SME and forms a micro-consortium with at least one or at maximum two more SMEs, then it is eligible to apply. Please, remember that the one-person company, as well as other applicants, will have to prove that it has the resources necessary for the successful implementation of the project.

15. What are the challenges to be addressed?

The proposed activities should address one of the Open Challenges publicly announced on 23rd of December, 2022 (available in Annex 2 of the Guide for Applicants) coming from one of the three types of lightweight materials (polymer-based composites, ceramic matrix composites, and light metal alloys) for four industrial markets: automotive, aerospace & aeronautics, energy, and building. The proposals aiming to reach **Technology Readiness Level¹ (TRL) 7, starting from TRL 4-5**, are preferred.

16. Can I choose more than one challenge?

No, you can't. You must select exactly one challenge from the list provided by AMULET.

17. How do I submit my application to the Open Call?

Applications to the 2nd Open Call must be submitted through the AMULET Open Call microsite at <https://amulet-2oc-h2020.fundingbox.com/>. Applications submitted by any other means will not be considered for funding. Inside the online application form there are specific fields to provide relevant descriptions.

18. What sections should I fill in the application form?

The applications submitted to the 2nd Open Call will include the following sections:

- ✓ BASIC AND LEGAL INFORMATION
- ✓ PROJECT
- ✓ EXCELLENCE
- ✓ IMPACT
- ✓ IMPLEMENTATION
- ✓ ETHICS SELF ASSESSMENT
- ✓ STATISTICAL SECTION
- ✓ DECLARATION OF HONOUR
- ✓ PROCESSING OF PERSONAL DATA

All mandatory sections of your application- generally marked with an asterisk - must be filled in.

19. How long does it take to fill in the application?

In order to successfully fill in the application form you will probably need **1-2 days** of writing, but we imagine that your team is composed of members specialised in their area of expertise so you can divide the work. You'll be able to add contributors to your application so that each team member can tackle their application area and you will be done quicker. Take into account that specific character limits have been established in each section of the online application form, so we encourage you to keep your application focused on the requested information keeping in mind the challenges and sectors covered by this 2nd Open Call. We also recommend that you start the submission process quite before the deadline in order to avoid last minute circumstances.

¹ [link](#) to TRL as defined by Horizon2020

20. Should my micro-consortium partners submit a separate application for?

No, as a micro-consortium you should submit only one application on behalf of your partners, thus you need to gather all necessary information from micro-consortium partners. At the beginning of the application form, you will be asked to provide the name and contact details of the person who will be the contact point and coordinator in your micro-consortium.

21. Which requirements must the application fulfil?

There are a few important requirements you must take into account:

- ✓ The objectives of the proposal must fit within the scope of AMULET as it is described in the Guide for Applicants in the call;
- ✓ Applications must be submitted before the deadline;
- ✓ Applications must be submitted in English;
- ✓ Applicants shall not have any conflict of interest;
- ✓ All mandatory parts should be completed.

For more information on eligibility criteria, you can visit section 5 of the Guide for Applicants.

22. Can one team submit two project ideas?

Though applicants can submit multiple applications, one SME can be funded only once by AMULET. If several selected consortia have the same composition or the same members (1, 2 or 3), it is only the proposal with the highest number of points received during the whole evaluation process that will be funded.

23. Does an application get the extra score for the 'cross-border collaboration' if the micro-consortium is composed of 2 or 3 SMEs from at least 2 different countries?

Since the AMULET project promotes cross-border collaboration, 0,5 points will be added to each proposal with SMEs from at least 2 different eligible countries involved in the micro-consortium (in addition to the evaluators' evaluation).

24. Can I apply if my company is associated with the partners of AMULET?

Applicants cannot be affiliated (directly or indirectly, for example through board members or third parties) to any of the AMULET Consortium partners. They can't be the AMULET Consortium partner's employees nor board members nor permanent collaborators. All cases of potential conflict of interest will be assessed case by case.

25. Can I apply if I have received FSTP grants from other projects before?

Yes, it is possible to apply to other open calls. The only point that you should pay attention to if you are selected (funded) to multiple EU projects is the "no double funding" rule. "Double funding" means the situation where the same costs for the same activity are funded twice through the use of public funds. It is not allowed in any circumstances. That means that you have to be able to confirm that

funding received from the AMULET project will not cover the same costs/tasks which were already funded by other EU projects (if you have received any).

26. Are applicants required to include the budget plan in the application?

We will ask you in the application form to provide information on how the grant amount will be distributed among your micro-consortium partners (SMEs) in case the project will be funded. Details about the budget are not required at the application stage. The detailed budget planned for execution will be requested only from the SMEs selected for funding, at the beginning of the support programme as part of the Sub-Grant Agreement.

27. What happens if I do not submit my application within the deadline?

Applications must be submitted before the closing time and date published in the 2nd Open Call. The closing time recorded by the FundingBox Platform for this call is 22nd of March, 2023 at 17:00 Brussels Time. We do not accept applications after the deadline. We strongly encourage you not to wait until the last minute to submit your proposal. Failure of meeting the submission deadline for any reason, will result in the rejection of the proposal.

28. Will I be able to modify my proposal after submission?

You can modify the application as many times as you need before the deadline, but remember that you need to submit it before the 22nd of March, 2023 at 17:00 Brussels Time. You won't be able to modify your application after this deadline.

29. What is a TRL?

Technology Readiness Levels (TRLs) are indicators of the maturity level of particular technologies. This measurement system provides a common understanding of technology status and addresses the entire innovation chain. There are nine technology readiness levels; TRL1 being the lowest and TRL9 the highest. In our project we refer to Annex G of the General Annexes to the Work Programme 2016/17 for a full description of TRLs.

| | | |
|-------------|------|---|
| DEPLOYMENT | TRL9 | Actual system proven in operational environment |
| | TRL8 | System complete and qualified |
| | TRL7 | System prototype demonstration in operational environment |
| DEVELOPMENT | TRL6 | Technology demonstrated in relevant environment |
| | TRL5 | Technology validated in relevant environment |
| | TRL4 | Technology validated in lab |
| RESEARCH | TRL3 | Experimental proof of concept |
| | TRL2 | Technology concept formulated |
| | TRL1 | Basic principles observed |

30. What type of support is available for preparing the application?

The Guide for Applicants is the main reference document. It provides detailed information about the requirements of the application, evaluation and selection processes. A Helpdesk service for the Open Call is at hand at <https://spaces.fundingbox.com/spaces/i4ms-amulet> to clear up any doubts you may have relating to the application process (eligibility rules, application form information requests, etc.). If there is any doubt left, you can contact info.amulet@fundingbox.com.

Further information on the Open Challenges for the support of your proposal preparation will be available during the online matchmaking events. The events will explain AMULET support activities to SMEs and the opportunities and benefits it entails, answering questions that might arise from the audience:

- ✓ Explaining specific details on the process of the thematic competitions, the guidelines and criteria to compete;
- ✓ Presentation of the selected industrial challenges per theme;
- ✓ Promoting SMEs to network and start matchmaking, aiming at identifying relevant partners to work with on the development of solutions to thematic competitions.

Participation at matchmaking events is not mandatory but strongly recommended.

31. What are examples of an ideal project?

The examples below only give you the overall vision of the project organisation and do not apply to the challenges defined in the AMULET 2nd Open Call.

Automotive

The ideal project for AMULET is a micro-consortium applicant of 3 different SMEs with a use case for automotive that uses bio-materials for developing hybrid structural and semi-structural components that deliver a better lightweight performance than traditional materials such as steel or aluminium, while also being more circular. One SME contributes with their own-developed bio-based resins while the other two partners provide their design capabilities and joining expertise, respectively, using their own resources (models and components). The use case proposed addresses the sustainability challenges currently faced by the automotive industry (to deliver green content > 50%) while also increasing durability. The preferable initial TRL should be TRL 4-5 (Technology validated in lab).

Aerospace & Aeronautics

The ideal project for AMULET is a micro-consortium applicant of 2 different SMEs with a use case for aerospace that uses hybrid components based on oxide ceramic matrix composites (OCMC) for extreme conditions in terms of operating temperature and corrosion resistance. One of the SMEs brings a sound experience in OCMC manufacturing while the other one contributes with additives from their own catalogue that allows them to improve mechanical performance. The use case proposed is more cost-effective from the materials and manufacturing perspective than current solutions, addressing the typically high costs of ceramic matrix composites. It also has an innovation potential in other application areas e.g. automotive, energy. The preferable initial TRL should be TRL 4-5 (Technology validated in lab).

Building

The ideal project for AMULET is a micro-consortium applicant of 3 different SMEs that will jointly develop a new composite formulation based on hemp that could be used in green building. One of the SMEs contributes with specialised machinery for the bio-based components while another one will focus on improving the mechanical and hygrothermal performance using MgO-based by-products. The

third SME will focus on preparing small cabins for performing the necessary in-situ tests at open areas for validating the innovative formula. The use case proposed is more sustainable than the typical lime-based solutions and the improved lightweight/mechanical performance allows opening the market for external applications, currently limited to interior usage in buildings. The preferable initial TRL should be TRL 4-5 (Technology validated in lab).

Energy

The ideal project for AMULET is a micro-consortium applicant of 3 different SMEs that will collaborate together for improving lightweight performance and circularity of wind turbine blades. One of the SMEs contributes with an epoxy-based resin that can be recovered with a proprietary chemical process, which enables full recyclability. This SME will also contribute with manufacturing, including the use of own equipment. The second SME will investigate the use of recycled carbon fibres in the formulation while the third SME will focus on the mechanical testing. The third SME will also simulate and optimise the formulation with regards to energy production in different conditions using their own modelling capabilities. The use case proposed includes a small prototype that could be then used as reference in other applications, such as in the aerospace sector. The preferable initial TRL (Technology Readiness Level) should be TRL 4-5 (Technology validated in lab).

32. What happens after my application has been submitted?

Right after the submission deadline on 22nd of March, 2023 at 17:00 Brussels Time there will be an eligibility check to see if the applicants meet the eligibility criteria included in Guide for Applicants.

33. How to write a proposal that convinces evaluators?

Make sure you do not leave any information out of your proposal. Be specific and provide precise answers to the questions in the application form. If you want to stand out, quality is the way to go. The proposed project should provide a solution to the specific challenge, while having in mind the overall goal of the AMULET project; decarbonization, resource efficiency, technical excellence and business potential among others.

34. How will we evaluate your proposal?

The evaluation process has 4 steps + formal verification.

Step 1. Eligibility Check

The eligibility check will determine whether applicants meet the eligibility criteria listed in Section 5 of the Guide for Applicants.

Step 2. External evaluation

In this phase, each project will be evaluated by 3 external and independent evaluators specialised in the respective thematic domain.

Step 3. Consensus Meeting

The 'Steering Committee' plus 3 external evaluators, selected from the pool of experts that evaluated individually the proposals, will define by consensus (or minimum of 2/3 majority vote) a Ranking List of up to 36 fundable projects that will be invited to pitch at the Jury Day.

Step 4. Jury Day + Final decision

You will pitch your project online in front of the AMULET Selection Committee composed of Steering Committee + members of the External Advisory Board). The Selection Committee will select up to 26 final beneficiaries out of 36 applicants.

Formal verification: Sub-Grant Agreement Preparation and Signature

Before signing the Sub-Grant Agreement you should provide documents regarding your formal status. The AMULET Consortium will proceed to a verification of these documents to make sure you are eligible.

35. How will we check your SME status?

The following documents could be asked after the selection procedure:

- ✓ an extract of the current (up to date) official registration document or its equivalent. The enterprise's registration document is a written statement from the Government or other authority which confirms that the company legally exists and confirms its data, e.g. address of the registered office, legal representatives, owners;
- ✓ an official and signed declaration indicating your enterprise shareholders and the percentage of shares that they own in your organisation;
- ✓ the complete, closed and registered for official purpose, financial accounts (financial statements) of the last 3 years (for last 3 years or, if it is not applicable, for the period starting at the registration date). Please note that these accounts should include: the annual balance sheet; the annual turnover and the staff headcount. If your financial statement does not contain information about the staff headcount, the selected SMEs will be able to provide enterprise statistic reports/annual reports or any other supporting document which demonstrates the staff headcount (it can be an official and signed declaration indicating the number of employees expressed in Annual Working Units);
- ✓ VAT/tax ID Certificate;
- ✓ Bank account information.

In case of having partners or/and linked companies, we will request for additional documentation of partners and linked enterprises:

- ✓ financial statements of all partners and linked enterprises (to confirm the annual turnover, annual balance total sheet and employment);
- ✓ document showing the holding structure of partners/linked enterprises, e.g. official extract of shareholders (from the Chamber of Commerce or any other Official Register) or instead we can accept also an official and signed declaration indicating shareholders and the percentage of shares that they own in the organisation;
- ✓ statistical reports/annual report/financial statements indicating the number of declared employees of a partner/linked enterprise. If the number of employees is not clearly indicated in the above-mentioned documents, we can accept other supporting documents such as an official and signed declaration on the staff headcount expressed in Annual Working Units.

36. What are the criteria to assess the proposals?

External and independent evaluators will evaluate and score the Excellence, Impact and Implementation of the proposal. Each evaluator will rank the application assigning a score from 0 to 5 for each criterion and produce an Individual Evaluation Report. The final score will be calculated as an average of the individual assessments provided by the Evaluators. At this stage, since the AMULET project promotes cross-border collaboration, 0,5 points will be added to each proposal with SMEs from at least 2 different eligible countries involved in the consortium (in addition to the Evaluators' evaluation). A detailed description of each criterion and the scoring is included in Section 6 of the Guide for Applicants.

37. Who are the external evaluators?

External evaluators are external independent experts with proven experience in the Advanced Materials and Manufacturing Lightweight Field within the 12 thematic domains of AMULET. External experts come from industry and academia.

38. What is the minimum score to pass the External Evaluation phase?

The default threshold for individual criteria (Excellence, Impact and Implementation) is 3 (the average of the three external evaluators' scores). The default overall threshold, applying to the sum of the three individual scores, is 10 out of 15.5 maximum (15 from the three criteria and 0,5 for cross-border micro-consortium). The final score will be calculated as an average of the individual assessments provided by the Evaluators. Ties will be solved using the following criteria, in order: Cross-border collaboration projects, Impact score, Excellence score, Implementation score, Gender Balance. All proposals obtaining a score above the threshold (3 for individual criteria and 10 for final score) will move to the Consensus Meeting stage, where the Selection Committee, together with 3 external evaluators, will decide which projects will go to the next phase (Jury Day). Please find more information in Section 6 of the Guide for Applicants.

39. What is the composition of the Selection Committee?

The Selection Committee is made up of the core partners from the AMULET Steering Committee. It will be coordinated by FBA and the composition can be extended in the following cases:

- ✓ Consensus meeting: by inviting 3 External Evaluators, selected from the pool of experts that evaluated individually the proposals;
- ✓ Jury Day + Final Decision: by including the members of the 7 External Advisory Board;
- ✓ Review Milestones: by including the Ethic experts from the Ethics Committee, if needed.

40. What happens after the Consensus Meeting?

Up to 36 proposals selected during the Consensus Meeting will be invited to an online Jury Day where you will have the opportunity to pitch your project in front of the AMULET JURY and take part in the Q&A session.

41. What happens during the Jury Day?

If your project is among the finalists, you will be invited to Jury Day. During the Jury Day, you will have the opportunity to pitch your project with a 10-minute video in front of the AMULET JURY composed of the selected AMULET members and supported by the ethical expert(s). You will be requested to send a recorded presentation- as if you presented online (up to 10 minutes video pitch or pitch as a pdf with voice recorded), in advance at least 3 calendar days before the Jury Day. The Selection Committee will agree on the Q&A for each applicant team, in order to make the session more efficient.

42. Which licensing rights apply?

The IP rights remain with the owner (SME). Indeed, we apply the HORIZON 2020 rules in that sense. There are specific clauses about that in the Sub-Grant agreement which will be signed by beneficiaries.

43. Do selected consortia get any money in advance?

No. The first payment (up to 9,200€) will be made upon validation of signing the Sub-Grant Agreement.

44. What are the different evaluation phases and the expected schedule?

The table below presents the indicative dates of the 2nd Open Call in which each of the evaluation phases will end and the number of expected applicants that would go through to the next phase.

| Phase | Approximate Date | Number of applicants |
|---|------------------------------|----------------------|
| Applications | January 2023 - March 2023 | no limitations |
| Eligibility Check + External Evaluation | March – April 2023 | - |
| Consensus Meeting | April 2023 | up to 36 |
| Jury Day + Final Decision | May 2023 | up to 26 |
| SME check + SGA signature | May 2023 – July 2023 | up to 26 |
| Feasibility study | July 2023 – October 2023 | up to 26 |
| Demonstration | November 2023 – July 2024 | up to 7 |
| Follow up support | August 2024 – September 2024 | up to 7 |

45. What is a conflict of interest?

Conflict of interest may occur, if there are capital or personal connections between two or more entities (Applicant, AMULET Consortium partner or any person involved in the selection process), in particular, it should be understood as:

- ✓ any ownership relations - ownership of shares, financial links and economic connections - like joint venture, holding, joint participation, silent partner, e.g. Applicant's entity owns shares in the AMULET Consortium partner company or the AMULET Consortium partner company owns shares in the Applicant's company (it also refers to the Applicant's partners/linked enterprises). As economic connection we can understand exclusive licenses, sale agreements if they concern product or solution covered by your application etc;
- ✓ family and personal relationships, in particular: marriage, kinship, a relationship or affinity to the second degree in a straight line or lateral line, adoption, custody or guardianship or actual life and other close personal ties binding the Applicant and the AMULET Consortium partner or any person involved in the selection process – e.g. person representing the AMULET Consortium partner company has family/personal ties with anyone representing the applicant company;
- ✓ the existence of material, especially financial relationships (such as the receipt by a person involved in the selection process from Applicant any significant gifts, donations, future contracts or employment, etc);
- ✓ relationships based on employment, cooperation or existing civil contract between the AMULET Consortium partners and people involved in the Applicant's structure, including managerial or supervisory functions, position in managing or supervising bodies. E.g. Director of the AMULET Consortium partner is involved in the management bodies of an Applicant company; the applicant's employees involved in the Project are employed or contracted by the AMULET Consortium partner company etc;
- ✓ remaining in a legal or factual relationship that may give rise to justified doubts as to the impartiality of the people involved in the selection process (expert/evaluator/employee/member of the management bodies of any of the micro-consortium partners etc).

The reasons set forth above may result in a conflict of interest if they occur at the time of an action or have occurred in the past (during the last 2 years before the action starts). Time limits do not apply to family and personal relationships.

Remember that the concept of the conflict of interest should be understood widely, so if you have any doubts about the conflict of interest please consult it with our team info.amulet@fundingbox.com.

All cases of conflict of interest will be assessed on a case by case basis.

46. What are the payment conditions?

For the sake of simplicity and transparency, the Financial Support will be paid against specific Deliverables defined in the Individual Mentoring Plan and in the Sub-Grant Agreement . You can find detailed information and schedule of the payments in the Guide for Applicants.

47. What is 'lump sum'?

The lump sum is a simplified method of settling expenses in projects financed with HORIZON 2020 funds. It means that you are not required to present accounting documents to prove the investment-related costs incurred. However, you are obliged to demonstrate that the implementation of the project is in line with the milestones set for it.

48. Is any accountability required on the way the funds have been used, e. g. invoices and other financial documents? Are there any specific restrictions on how the funds are utilised?

The lump sum is a simplified method that means that you (the FSTP recipient) is not required to present accounting documents like invoices, timesheets, etc, to prove that the cost was actually incurred. However, AMULET will assess your progress and quality of your work during Interim Reviews, not your accountancy. In this sense, we will ask you to demonstrate the implementation of the project in line with the milestones set. In any case, the lump sum methodology does not release you from the obligation to collect documentation to confirm the costs under fiscal regulation (in case of an audit). Please bear in mind that by participating in the AMULET support programme, receiving the grant and signing the Sub-Grant Agreement you will also be responsible towards the competent tax authorities, and the EC audit bodies such as the European Court of Auditors (ECA) and the European Anti-Fraud Office (OLAF).

49. How will AMULET monitor the progress of the teams?

The 'Mentoring Committee' will evaluate your project performance at the Milestone Review (established every time a payment is due), according to the following criteria.

- ✓ **Deliverables quality.** Based on the Deliverables established in the 'Individual Mentoring Plan';
- ✓ **Business performance indicators.** Based on the KPIs defined in the 'Individual Mentoring Plan';
- ✓ **Technical performance indicators.** Based on the KPIs defined in the 'Individual Mentoring Plan';
- ✓ **Deadline Compliance.**

Have a look at Section 7 of the Guide of Applicants.

50. What does subcontracting involve?

Subcontracting is allowed for covering limited part of the action (core activities cannot be subcontracted). Subcontracting includes tasks/services subcontracted to academic and industry experts from the targeted sectors. Subcontracting costs in the framework of AMULET support programme might come in the form of specialised and dedicated studies, testing, certification and other tasks carried out by a provider-subcontractor via a legal agreement. Subcontracting costs may also be incurred for the development of special material compositions, the special material testing that follows, the procurement of very specialised material that is only available from an outside service provider, for example.

Subcontracting costs are only allowed in the second (Demonstration) and third (Follow-up support for innovation) stages of the programme and should not exceed 30% of the total lump sum grant (i.e. up to €36,000.00 for both stages).

51. What are the general payment terms?

- ✓ All payments will be made in Euros (€);
- ✓ Expenditures incurred before the Contract signature date or after the AMULET Support programme duration period are ineligible;
- ✓ Costs incurred for the implementation of the project must be used for the sole and close purpose of achieving the objectives of the project and its expected results;
- ✓ The payments will be transferred to the coordinator of the micro-consortium, who will transfer the payments to the rest of the micro-consortium in tranches as stated in the Sub-Grant Agreement and the Individual Mentoring Plan. The coordinator of the micro-consortium is obliged to deliver the bank transfer confirmation to the contractor after each Stage.

52. Where can I ask my question?

If you still have any doubts regarding our Open Call process, feel free to get in touch with us:

- ✓ Ask your question in the Helpdesk space of AMULET community <https://spaces.fundingbox.com/spaces/i4ms-amulet>;
- ✓ Send us an email to the following address: info.amulet@fundingbox.com.

53. How can I complain about the results of the evaluation?

If after receiving the results of any of the selection phases you consider that a mistake has been made, resulting in the rejection of your application, you have the right to send us a complaint. You can email us in English to info.amulet@fundingbox.com including the following information:

- ✓ Your contact details (including email address)
- ✓ The subject of the complaint
- ✓ Information and evidence regarding the alleged mistake

Important note regarding the timeline:

You have 3 calendar days to submit your complaint starting from the day after the communication was sent. On our side, we will review them within no more than 7 calendar days from reception. If we need more time to assess your complaint, we will inform you by email about the extension.

54. According to the EU recommendation we are within the Micro enterprise rank, can we apply to this Open Call?

Yes, Micro Enterprise is still eligible. You can apply!

55. Does the team member part in the app form include people from other companies in the consortium or it is only the Lead SME?

Yes, team member includes members from all the companies in the consortium.

56. How can I upload the 'Letter of intent' in the App Form?

There is no need to upload it, you just have to mention what it was and what it concerns.

57. How do we show the budget allocation for each participant in the application? Do we have to register RTO?

At the end of the IMPLEMENTATION section you can find the box to show the distribution of funds per SME. RTO are not eligible to get funding directly from AMULET, SME can subcontract them at 2nd and 3rd Stage up to €36.000.

58. These Open Challenges are created/asked by large companies or organisations? So, will there be the opportunity of interacting with them for future technology acquisition and/or pre-sale?

Within AMULET: during the solution's development, the challenge giver could give punctual advice to make sure it fits their needs.

59. Can a 2-SME consortium include SMEs from the same country?

Yes they can, however if there are at least 2 different countries you will receive 0.5 points more in evaluation.

60. Does the intellectual property generated during the project remain within the SMEs of the consortium?

IPR remains within the Micro-Consortium.

61. We have a solution to the challenge but we don't have a partner to the Consortium. Can we still apply?

Unfortunately, to be eligible you need to create a micro-consortium. Don't give up and look for a partner on [Eventtia Platform](#) by checking attendees and posting a message. Check it out, we will plan new events very soon!



62. Can I apply if I am a challenge giver?

The authors of challenges (challenge givers) CANNOT participate in the AMULET Open Calls.





Form preview

This is how the form will render.

BASIC AND LEGAL INFORMATION

Project Title *

Your project will be identified by this name (max. 50 characters).

Project Acronym *

Please enter the short acronym of the Project Title (max 100 charactes).

Project short description. Describe your project in 5 - 6 sentences, that we can publish. This will be used for project dissemination.(max. 250 characters) *

Contact Person *

Please enter your complete name (first name and last name).

Contact person email address *

Please enter only one email address in format: mail@mail.com. This will be the email adress to which we will send the communications related to the Open Call.

Contact person phone number *

Please enter the phone number including a country code , in a format +XX XXX XXX XXX.



Position(s) of the person(s) indicated above *

AMULET Contact. Have you contacted any AMULET partner before/ during the Open Call? If yes, which one?

LEGAL INFORMATION

Legal name of the company (coordinator of the micro-consortium) *

company = coordinator of the micro-consortium (max. 50 characters)

Country of registration Please be aware that if the country indicated is not one of the countries indicated in Section 5.2 of the Guide for Applicants, your proposal will be excluded for not being an eligible country. *

Street name and number *

Please enter the adress of the registration of the Entity.



Postal code



The city where the company is registered. *

Date of main registration of the company (according to the registration document) (DD/MM/YYYY) *

VAT number *

Please insert the link to the official registration document (https://... or http://...)

Conflict of Interest. Are you linked financially or personally with any of the AMULET Consortium partners? Have you identified any potential conflict of interest? *

 Yes No

Micro-consortium Composition

How many entities are involved in your micro-consortium? *

 2 3

How did you find your partner/s to the micro-consortium? *

Is your consortium cross border? *

 Yes No

Is your entity the micro-consortium coordinator/leader? *

 Yes No

Please list all your micro-consortium members.

First Legal Entity - coordinator of micro-consortium

First Legal Entity - coordinator of micro-consortium

Name of the legal entity. The name in the country where the company is incorporated *

Year of creation *

Type of organization: Please confirm the SME status of consortium member (the only eligible type of applicant that can receive funding is SME, please check the Guide for Applicants, Section 5.2 and Frequently Asked Questions for the definitions): *

I confirm that this consortium member is a small and mid-size enterprise (SME)

Company size: Number of people employed in the organisation. Please remember that by the official EC definition, for a company to qualify as SME, it must have less than 250 employees (see Section 5.2 of the Guide for Applicants) *

less than 5

5-10

11-49

50-99

100-250

more than 250

Website URL (https://... or http://...) *

Contact person email address *

Please enter only one email address in format: mail@mail.com. This will be the email address to which we will send the communications related to the Open Call.

Contact Person *

Please enter your complete name (first name and last name).

Contact person phone number *

Please enter the phone number including a country code , in a format +XX XXX XXX XXX.

Establishment/ Registration country *

Country where the organization is legally established

Please insert the link to the Company logo (https://... or http://...)

Other Legal Entity

Other Legal Entity

Name of the legal entity. The name in the country where the company is incorporated *

Year of creation *

Type of organization: Please confirm the SME status of consortium member (the only eligible type of applicant that can receive funding is SME, please check the Guide for Applicants, Section 5.2 and Frequently Asked Questions for the definitions): *

I confirm that this consortium member is a small and mid-size enterprise (SME)

Company size: Number of people employed in the organisation. Please remember that by the official EC definition, for a company to qualify as SME, it must have less than 250 employees (see Section 5.2 of the Guide for Applicants) *

less than 5

5-10

11-49

50-99

100-250

more than 250

Website URL (https://... or http://...) *

Contact person email address *

Please enter only one email address in format: mail@mail.com. This will be the email address to which we will send the communications related to the Open Call.

Contact Person *

Please enter your complete name (first name and last name).

Contact person phone number *

Please enter the phone number including a country code , in a format +XX XXX XXX XXX.

Establishment/ Registration country *

Country where the organization is legally established

Please insert the link to the Company logo (https://... or http://...)

Press the green (+) button above to add next legal entity

PROJECT

Project Title *

Your solution will be identified by this name (max. 50 characters).

Tagline *

Describe your solution in one sentence (max. 140 characters including spaces).

Brief Description *

Tell us more about your project and how you see not only its market implementation but also the potential of shared gains for the entire ecosystem impacted by your project (max. 1000 characters).



Website URL (https://... or http://...) *

Optional. You can upload here a link to a presentation of your business idea (Max. 10MB) (https://... or http://...)

Optional: If available, video explaining your business idea (max 2 min), if available.

http://...

City: where your team or most of your team members will be based *

Country. Take notice that only countries indicated in Guide for Applicants are eligible for application. *

Sectors: Please select sector and material relevant to your project. *

- Building Polymer-Based Composites.
- Building Ceramic Matrix Composites.
- Building Light Metal Alloys.
- Aerospace & Aeronautics Polymer-Based Composites.
- Aerospace & Aeronautics Ceramic Matrix Composites.
- Aerospace & Aeronautics Light Metal Alloys.
- Energy Polymer-Based Composites.
- Energy Ceramic Matrix Composites.
- Energy Light Metal Alloys.
- Automotive Polymer-Based Composites.
- Automotive Ceramic Matrix Composites.

- Automotive Light Metal Alloys.

Please select **ONLY ONE** of the open challenges (under a specific sector and material) that is addressed by your project.

SECTOR: AEROSPACE & AERONAUTICS

- Polymer-based composites

Challenges. Select the most relevant challenge to your project.

- 1_A&A_PBC_LightAIRCRAFT
- 2_A&A_PBC_APoCoP
- 3_A&A_PBC_SpreadTape
- 4_A&A_PBC_CFRPwing
- 27_A&A_PBC_InjectModel
- 28_A&A_PBC_AirIntake
- 29_A&A_PBC_GreenAircraft
- 30_A&A_PBC_AVIC

- Light Metal Alloys

Challenges. Select the most relevant challenge to your project.

- 6_A&A_LMA_MACOLI
- 7_A&A_LMA_ILOSI

- Ceramic Matrix Composites

Challenges. Select the most relevant challenge to your project.

- 8_A&A_CMC_CMCFan
- 9_A&A_CMC_PrepegCMC

SECTOR: AUTOMOTIVE

- Polymer-based composites

Challenges. Select the most relevant challenge to your project.

- 10_AUTO_PBC_FRA-TP
- 12_AUTO_PBC_AdhesiveFilm
- 13_AUTO_PBC_RESeat
- 37_AUTO_PBC_Material2design

38_AUTO_PBC_SUSMA

39_AUTO_PBC_FEPREV

• **Light Metal Alloys**

Challenges. Select the most relevant challenge to your project.

15_AUTO_LMA_DIJOALS

16_AUTO_LMA_E-carGEAR

40_AUTO_LMA_ALUweld

41_AUTO_LMA_ASAS

• **Ceramic Matrix Composites**

Challenges. Select the most relevant challenge to your project.

42_AUTO_CMC_ASIL

SECTOR: ENERGY

• **Polymer-based composites**

Challenges. Select the most relevant challenge to your project.

18_ENER_PBC_LightHtank

20_ENER_PBC_CFNWfabric

43_ENER_PBC_SimulOpt

44_ENER_PBC_CompTape

45_ENER_PBC_FuseCoat

• **Light Metal Alloys**

Challenges. Select the most relevant challenge to your project.

21_ENER_LMF_EDLCcapacitor

22_ENER_LMF_contactPADS

• **Ceramic Matrix Composites**

Challenges. Select the most relevant challenge to your project.

23_ENER_CMC_LightGRID

46_ENER_CMC_siliconeFIRESTOP

SECTOR: BUILDING

- Polymer-based composites

Challenges. Select the most relevant challenge to your project. *

47_BUILD_PBC_LoCaBaFi

- Light Metal Alloys

Challenges. Select the most relevant challenge to your project.

24_BUILD_LMA_WAAMPipelines

- Ceramic Matrix Composites

Challenges. Select the most relevant challenge to your project.

25_BUILD_CMC_HEALmortar

26_BUILD_CMC_MgOconstruction

Please specify in detail how you will address the challenge.

(max. 1000 characters including spaces)

Has the company previously received any Horizon 2020 funding?

Yes

No

If yes, which ones? Please provide a brief description.

(max. 1000 characters including spaces)

EXCELLENCE

Ambition *

Please, demonstrate to what extent the proposed project is beyond the State of the Art and describe the innovative approach behind it (e.g. ground-breaking objectives, novel concepts and approaches, new products, services or business and organisational models). (max. 2000 characters).



Innovation *

Please, provide information about the level of innovation within the market and about the degree of differentiation that your project will bring. (max. 2000 characters).



Soundness of the approach and credibility *

You should provide concrete and verifiable arguments, and/or evidences that demonstrate the soundness of your approach regard to the premises of the proposed ideas. (max. 2000 characters).



Status at technological level. Which of the best describes the innovative maturity of the technological solutions. *

- No Innovation
- Few technological blocks
- Highly innovative

Which of the following best describes the TRL of your solution at the moment of applying? TRL (Technology Readiness Levels) are indicators of the maturity level of particular technologies. There are 9 technology readiness levels; TRL 1 being the lowest and TRL 9 the highest. For more information, please check our FAQ. Please note that for Demonstration Instrument it is expected that the initial TRL is min. 4-5 *

- TRL 1 – Basic Principles Observed and Reported
- TRL 2 – Potential Application Validated
- TRL 3. Experimental proof of concept

- TRL 4. Component and/or breadboard validation in laboratory environment
- TRL 5. Component and/or breadboard validation in relevant environment
- TRL 6. System/subsystem model or prototype demonstration in a relevant environment
- TRL 7. System prototype demonstration in an operational environment.
- TRL8. Actual system completed and qualified through test and demonstration.
- TRL 9. Actual system proven through successful mission operations.

Micro-consortium composition at the geographical level. Which of the following best describes your micro-consortium composition? *

- we are located in the same region
- we are located in different regions but in the same country
- we are located in different countries

Cross-sectoral collaboration *

Demonstrate the cross-sectoral dimension of your proposal, with a special focus on consortium composition. (max. 1000 characters).

IMPACT

Market opportunity *

Present the market potential of your project. You have to demonstrate a clear idea of what you want to do and whether the new/improved product has market potential, e.g. because it solves a problem for a specific target customer. (max. 1500 characters).

Market opportunity. Please indicate the scale of a target market for your solution implemented during next few years: *

- regional
- country
- EU
- global

Scalability of the solution. Please indicate how the solution to specific challenge that will be developed and implemented within this project can be scaled: *

- this solution will be tailored and will solve only the specific problem of challenge-giver
- the solution can solve the problem of small group of end-users (market niche)
- the solution can be easily adapted by wide group of end-users

End-Users of developed solution to specific challenge. Please indicate which group of end-users you would like to target by the solution developed under the AMULET project: *

- Large enterprises (OEM, Tier 1,2 suppliers).
- SMEs
- Private customers
- None of the above

End-users engagement *

Are you going to engage end-users to your project? If yes, please describe how they will be involved, provide also the name(s) of end-users and the type of organization (e.g. large company, university, public body). If you have, please indicate the documents that prove it (e.g. letters of intent). (max. 1500 characters).

Competition *

You should provide information about the degree of competition for your particular product/service and if the idea is disruptive and breaks the market. (i.e. the products/services to be brought to market can be clearly differentiated from the competition). (max. 1500 characters).

Commercial Strategy and Scalability *

You have to demonstrate the level of scalability of the new/improved product/service, meaning that you should prove that your solution does not address only a specific problem, but can be commercialised to solve a structural problem in a specific sector/process/etc. (max. 1500 characters).

Demonstration in the operational environment *

Please explain how you are going to perform the demonstration and prove the potential for demonstration in the operational environment. (max. 1500 characters).



IMPLEMENTATION

Team *

Demonstrate your consortium management and leadership qualities, your ability to take a concept from ideas to market, your capacity to carry through their ideas and understand the dynamics of the market you are trying to tap into as well as their technical capabilities to reach the defined objectives. Your team should be a balanced and cross-functional team, with a strong background and skill base. (max. 1000 characters).



Please provide the webpage, CV or linkedin profile of core team member (please provide at least 4 team members profiles)

Please provide the webpage, CV or linkedin profile of core team member (please provide at least 4 team members profiles)

LinkedIn profile. It will be used by Reviewers as your CV.

http://...

Press the green (+) button to add next webpage or linkedin profile of each team member

Transversal criteria. Gender balance

Please provide the number of female team members that will be involved in the project execution *

Please provide the number of male team members that will be involved in the project execution *

Team skills. Please indicate the specific experience among your consortium team: *

- Entrep./Business development + Researcher + Engineer + Mgm/Finance + Mkt/Sales + IT Development.
- Entrep./Business development + Researcher + Engineer + Mgm/Finance + Mkt/Sales.
- Entrep./Business development + Researcher + Engineer + Mgm/Finance.
- Entrep./Business development + Researcher + Engineer.
- Researcher + Engineer

Human resources for developing security solution protection from cyber threats). Choose the most appropriate description of your human resources for developing security solutions: *

- We don't have the employees and will not hire them
- We will hire the employees and are confident in finding them in the market
- We want to hire employees but there is no skilled people in the market
- We have the resources but they need to get new skills
- We have the resources and they are skilled

Dedication to the project. Choose the most appropriate description of your team dedication to the project: *

- 1 founder dedicated part-time
- 1 founder dedicated full-time
- 2 founders dedicated part-time
- 1 founder full-time and 1 part-time
- 2 founders, or more, dedicated full-time

Proved experience in the specified market. Please indicate the years of experience in the target market by the most experienced member of the team (e.g. if one has 2 years, and another has 4 years, then mark "3 to 5 years" - and not "More than 5 years"): *

- Less than 1 year
- 1 to 3 years
- 3 to 5 years
- More than 5 years

Resources *

You should demonstrate the quality and effectiveness of the resources assigned in order to get the objectives/deliverables proposed.(max. 1500 characters).



Risk management *

You should present the risk assessment and propose measures to overcome them, especially you should provide information about the legal constraints related to the project execution. (max. 1500 characters).



Transversal criteria. Please mark all the transversal aspects that your project is contributing to: *

- my project has a positive impact on the environment and contribute to the low carbon economy
- my project has a positive impact on promoting the equal opportunities
- my project has a positive social impact
- my project does not contribute to any of the areas mentioned above

If yes, describe how your project will affect the protection of the environment. (e.g. improving the quality of the natural environment by: limiting the harmful effects of production and consumption for the state of the environment, protection of natural resources, etc.), equal opportunities & gender balance and describe the social impact of your project (max. 2000 characters).



Project plan *

Please describe the plan and structure of your project. The maximum characters is 4000.

KPI. Please indicate below the KPIs that you are going to achieve in your project. Please provide at least 2 and up to 4 KPIs.

KPI. Please indicate below the KPIs that you are going to achieve in your project. Please provide at least 2 and up to 4 KPIs.

KPI name and short description *

Please provide the name of KPI and short description.

KPI value *

Please provide the value of KPI and how you are going to measure it

Press the green (+) button to add next KPIs

Distribution of grant amount in a 1st Stage: Please indicate how the grant amount will be distributed among your consortium (SMEs) in a funded project in the 1st Stage. You will receive up to €23.000 for your project in a 1st Stage (Feasibility Study) (max. 1000 characters). *

Distribution of grant amount: Please indicate how the grant amount will be distributed among your consortium (SMEs) in a funded project? You will receive up to €120.000 for your project (maximum €60.000 per SME). (max. 1000 characters). *

ETHICS SELF ASSESSMENT

Are there any issues on ethics data protection, and privacy of relevance? *

- Yes
- No

Will the solution be used only for civil applications? *

- Yes
- No

STATISTICAL SECTION

Proposal Originality. Is there a baseline or is this a new initiative?

- Completely new approach - Disruptive
- Improvement of existing approach – Incremental

Proposal maturity. At what stage of readiness is the initiative? Select the highest degree of readiness from the list.

- Basic principles of product/service understood
- Technology concept for product/service defined
- Experimentation has demonstrated approach
- Product/service validated in laboratory environment
- Product/service demonstrated with complete infrastructure required for deployment
- Product/service demonstrated in testing environment
- None of those

Position in the value-chain. How do you see your position in the ecosystem? Select all relevant from list.

- Developer or Enabler
- Application developer
- Application manager
- Service provider
- Market facilitator
- Technology partner for others
- Training Provider
- None of those

Innovation Idea. Where do the needs and/or requirements come from? Select all relevant from list.

- Competitor
- Client
- Stakeholder Community
- Internal User
- Beta Client
- Literature / Technology Roadmap
- Market Research
- Applicant's Perception of Gap
- Other

Years of management expertise. Indicate the combined number of years (or fractions) of management experience considering all your team members.

Years of technology experience. Indicate the combined number of years (or fractions) of technical experience in the target domain of your proposal considering all your team members.

Market type: Type of customer that will use the product or service. Select all relevant answers

- Consumer
- Business
- Government
- Indifferent
- Other

Potential User Benefits. Select the most important benefits of your product / service. Select all relevant from list.

- Reduce cost to users
- Increased quality
- Reduces User's current time commitment
- Increase ease of Use of technology
- Increase accessibility of technology

Potential Economic Benefits. Select the most important benefits of your product / service. Select all relevant from list.

- Creates jobs
- Stimulates economic growth
- Increases knowledge based economy
- Reduces vendor lock-in
- Increases European innovation-based assets

Potential Societal and Environmental Benefits. Select the most important benefits of your product / service. Select all relevant from list.

- Creates jobs
- Reduce digital divide
- Increase quality of life
- Increase citizen participation

- Reduce energy consumption
- Reduce emissions
- Reduce traffic
- Increase environmental awareness

Does the proposer hold intellectual property rights in the proposal domain?

- No
- Patent pending
- Patents
- Copy rights
- Utility models
- Trade marks
- Design
- Licenses

Geographical Scope. Select target geographic areas for the proposed product or service.

- AMER (Americas)
- EMEA (Europe, Middle East, Africa)
- APAC (Asia Pacific)
- Local
- Regional
- National
- Global

How did you hear about AMULET?

- Social media
- E-mail campaigns
- Newsletter
- Internet search
- Regular media
- Partners' network
- By word of mouth

Other

DECLARATION OF HONOUR

I have read and understood the information about the project, as provided in the Guide for Applicants (GfA) *

- Yes
 No

I have been given the opportunity to ask questions about the project and my participation via helpdesk <https://spaces.fundingbox.com/spaces/i4ms-amulet> *

- Yes
 No

I voluntarily agree to participate in the AMULET project *

- Yes
 No

I understand I can withdraw at any time without giving reasons and that I will not be penalised for withdrawing nor will I be questioned on why I have withdrawn *

- Yes
 No

I acknowledge that the evaluators and the European Commission and its bodies and agencies may have access to the data collected under the open call *

- Yes
 No

The data provided in the application form are true and up-to-date *

- Yes
 No

The entity I represent meets the eligibility conditions described in the GfA, in particular is an SME *

- Yes
 No

There is no conflict of interest between the company I represent and any of the consortium partners *

Yes

No

Moreover, the entity I represent, or persons with power of representation, decision-making or control over the aforementioned legal entity:

• is /are not bankrupt or being wound up, is not having its affairs administered by the courts, has not entered into an arrangement with creditors, has not suspended business activities, is not the subject of proceedings concerning those matters, or is not in any analogous situation arising from a similar procedure provided for in national legislation or regulations *

True

False

• has/have not been convicted of an offence concerning their professional conduct by a judgment which has the force of res judicata *

True

False

• has/have not been guilty of grave professional misconduct proven by any means which the contracting authority can justify, including by decisions of the European Investment Bank and international organisations *

True

False

• is/are in compliance with their obligations relating to the payment of social security contributions or the payment of taxes in accordance with the legal provisions of the country in which it is established or with those of the country of the contracting authority or those of the country where the contract is to be performed *

True

False

• has/have not been the subject of a judgment which has the force of res judicata for fraud, corruption, involvement in a criminal organisation or any other illegal activity, where such illegal activity is detrimental to the Union's financial interests *

True

False

• is/are not subject to an administrative penalty for being guilty of misrepresenting the information required by the contracting authority as a condition of participation in a grant award procedure or another procurement procedure, or failing to supply this information, or has/have not been declared to be in serious breach of their obligations under contracts or grants covered by the Union's budget. *

True

False

I did not make false declarations in supplying the information required, as a condition of participation in the Open Call or do not fail to supply this information *

True

False

I voluntarily agree to be registered at AMULET Community at <https://spaces.fundingbox.com/spaces/i4ms-amulet> and I understand that I can delete my profile from the above-mentioned Community by informing the AMULET Team via helpdesk of this space *

True

False

The ELCA online platform will be used to support AMULET activities, including the open calls. Thereby I confirm I will register at the ELCA platform by 22nd of March, 2023 at 17:00 Brussels Time. The registration is quite simple. Please request access <https://elca.innogetcloud.com/login> and you'll receive then a confirmation email with a quick start guide. *

Yes

No

PROCESSING OF PERSONAL DATA

I confirm that I read and understood the information clause concerning processing of the personal data provided above. *

Yes

I confirm that I have legal basis for processing personal data of the team members listed in the application form. *

Yes

I will pass the information clause provided above to all team members mentioned in the application form. *

Yes