

# 3D Printing Fused Granulate Fabrication (FGF) Engineering Challenge

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## ENTRY PACK



# The Opportunity

Growth Garage is the **Open Innovation Hub** of the **Mitsubishi Chemical Group**. Our mission is to support and develop new ideas and projects using our advanced manufacturing technologies and **Specialty Materials**, to help tackle some of today's biggest engineering challenges.

## The Mitsubishi Chemical Group Growth Garage Online Open Innovation Hub

The Mitsubishi Chemical Group Growth Garage Open Innovation Hub is an online platform where we host open innovation programs in collaboration with industry partners and experts. In these open innovation programs we invite innovators and entrepreneurs at startups, scaleups and innovative companies to submit their ideas and projects.

We host **3 programs** on our hub:

1. **Engineering Challenges**
2. **Pitch Sessions**
3. **Continuous Intake of Innovative Ideas**

In these programs, we offer the opportunity for engineers, innovators, and entrepreneurs from startups, scaleups and innovative companies to join our community and submit their ideas and projects through the online platform based on predefined topics.

### What benefits do the winners and finalists receive?

Depending on the **Open innovation program**, winners and finalists receive different set of support and benefits.

In general, successful participants receive exposure and access to Mitsubishi Chemical Group's network of industry experts, Mitsubishi Chemical Group's CVC team and business partners to advance their ideas and projects.

### What are the basic differences between the Open Innovation programs?

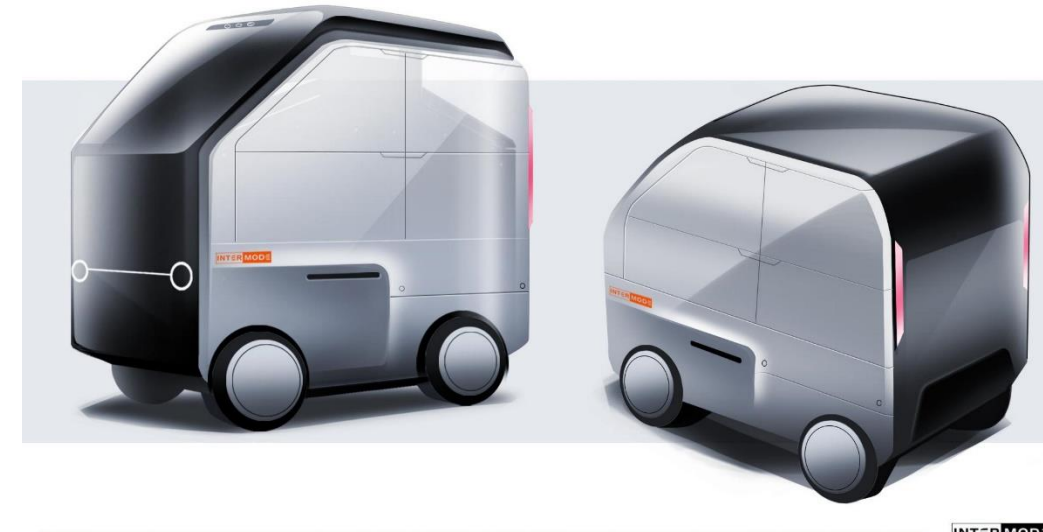
**Program 1. Engineering Challenge:** The open window for participation to an Engineering Challenge program is 4-5 months per year. The challenge is open to any startup, scaleup, innovative company, research team, or project across the globe that fulfills the selection criteria and is interested to create a joint proofpoint based on the expertise and the Specialty Materials portfolio of MCG. By participating, you become part of the community and get the opportunity to create exposure for your business, project and ideas. The typical duration of the follow-up with the winners is 6 to 9 months.

**Program 2. Pitch Session:** The Pitch Sessions are organized a couple of times per year. It is important that you submit prior to the deadline (indicated per topic) and are available to pitch online during the Pitch event. Outcome: You are seeking exposure for your business by pitching to an audience of industry experts, senior business leaders and the CVC team.

**Program 3. Continuous Intake of Innovative ideas:** This program is open throughout the year. You will receive written feedback from the expert jury team based on the predefined selection criteria. Outcome: You are seeking feedback on your business, product, project or idea by a team of industry experts, senior business leaders and the CVC team.

### What unique benefits did the previous winners gain from entering our open innovation programs?

*"Mitsubishi Chemical Group's expertise in design, simulation, advanced materials sampling, and guidance on business model has been instrumental in improving our delivery vehicle."* Arnold Kadiu, CEO, Intermode and Winner of the Circular Economy Challenge 2022.



### What material and manufacturing expertise can Mitsubishi Chemical Group offer?

Mitsubishi Chemical Group offers a wide variety of Specialty Materials, ranging from soft to structural, high-performance properties (strength, stiffness, dimensional stability, etc.). In addition, various materials have a low carbon footprint, since they are bio-based or contain recycle content.

Additionally, Mitsubishi Chemical Group has a wide range of advanced manufacturing technologies and can support the creation of prototypes, semi-finished parts and finished parts for series production.

### Why is the circular economy essential to Mitsubishi Chemical Group?

Mitsubishi Chemical Group offers a wide selection of bio-based, bio-compostable, materials with recycled content and materials that can be recycled at the end-of-life.

The implementation of sustainability and circular economy in our initiatives is in line with our KAITEKI principles. KAITEKI is our philosophy and management framework for delivering sustainable well-being of people, society and our planet Earth.

# The Entry Pack

This comprehensive guide is split into three sections, ensuring you get the most out of taking part in the Challenge:

## The Challenge

Find out all the information you need to know about the challenge, as well as:

- What materials, technologies, products or services are in scope?
- Who should apply?
- When does your entry need to be submitted?
- What are the benefits of being an early-bird entrant?



## Entry Checklist

This handy guide will ensure that you include all the information required for a successful entry that grabs the judges' attention. The Challenge is all about the idea and the problem it solves, so don't worry if you haven't fully developed your business model or plan yet. But remember all early-bird entrants and winners will receive help to create these elements.

All entries need to include the following:

- A concise description of your idea and the problems it solves;
- A demonstration of its feasibility and scalability, and how it addresses sustainability
- An outline of your business model and plan;
- Supporting evidence or proof points to substantiate your idea;
- Images, designs or other visual evidence to back up your entry.



## Backdrop

The final part of the guide provides valuable context and background information that will help you develop a successful entry, including:

- The rules of engagement
- Previous winners' stories
- A guide to the judges and their backgrounds
- An introduction to the Mitsubishi Chemical Group



# The Challenge

This section will provide you more information on specifics of the 3D Printing FGF Engineering Challenge

# Challenge Brief

Mitsubishi Chemical Group (MCG) Growth Garage and their partners are inviting startups, scaleups and innovative companies that want to [explore the possibilities of 3D Printing FGF](#) or [want to combine 3D Printing FGF with composites using hybrid manufacturing technologies](#) for their product or application to submit to the 3D Printing FGF Engineering Challenge.

## WHAT IS 3D Printing FGF?

Fused Granulate Fabrication (FGF) is an additive manufacturing technique that uses granulates (pellets), typically plastics or composites, as the primary feedstock for printing. FGF offers the advantage of flexible material selection, making it a cost-effective and versatile option.

## MITSUBISHI CHEMICAL GROUP IS LOOKING FOR

- 1 Applications/products that benefit from using FGF or hybrid technologies, such as combining FGF with carbon fiber or uni-directional (UD) tape or other composite materials.
- 2 Companies and organizations who are playing a role in enabling and promoting circularity in the field of FGF
- 3 Companies that can use our wide variety of FGF materials, ranging from soft to high-performance properties (strength, stiffness, dimensional stability, etc.), that have a low carbon footprint (as they are either recycled or bio-based)

Mitsubishi Chemical Group's 3D Printing material portfolio comprises a wide variety of materials, [ranging from soft to structural, high temperature performance](#) properties, recycled and bio-based grades with a low carbon footprint. Additionally, the materials can be further customized according to the specific requirements. Mitsubishi Chemical Group offers

- Over 65 different standard off the shelf pellet grades
- Off the shelf pellet grades such as recycled PETg carbon with a customizable filler content.
- Custom made pellets according to required properties such as flame retardancy, UV-stability, transparency, specific mechanical properties and more.

The print geometry, size and other specifications can be adapted based on the requirements.



A 5m long 3D printed bridge with FGF, using recycled PETG granulates from Mitsubishi Chemical Group. Source: [Autodesk](#)

# Who should enter?

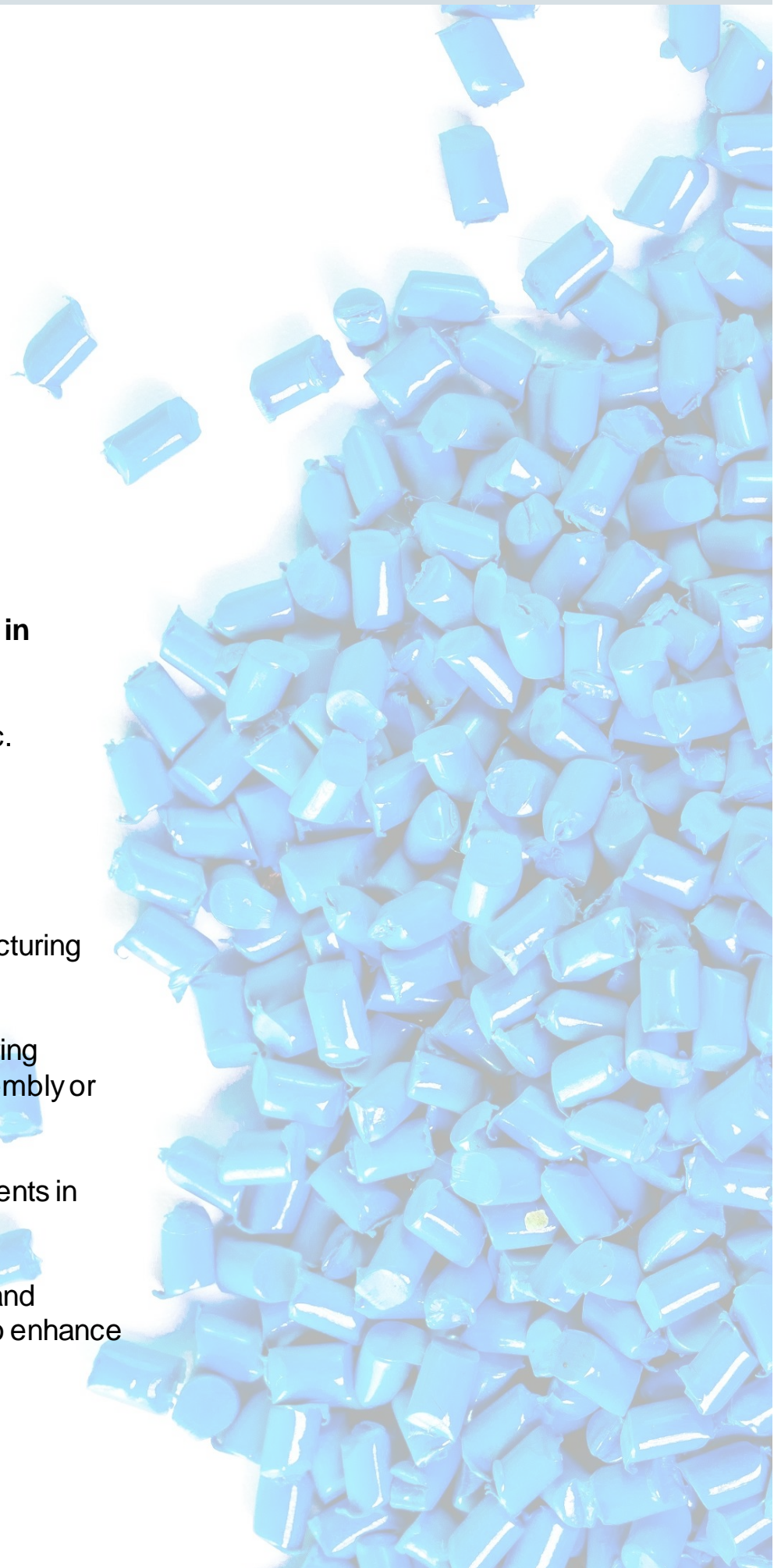
We are inviting innovative startup, scaleups and companies that are:

- ✓ Inexperienced with 3D Printing and wish to explore the possibilities with 3D Printing FGF for prototyping or small series production.
- ✓ Experienced with 3D Printing (FFF) and are interested in testing, implementing and switching to FGF.
- ✓ Experienced with 3D Printing FGF and want to use it in combination with hybrid technologies such as continuous carbon-fiber based composites.

We are looking to receive entries for parts, products or applications (but not limited to) that have applications in market segments such as:

- **Mobility:** This encompasses automotive parts, jigs and fixtures, autonomous delivery vehicles, rail, UAV, eVTOL etc.
- **Assistive technology:** Prosthetics, bionics (artificial limbs), wheelchairs..
- **Maritime:** This includes ships, boats, yachts, their components and more
- **Robotics:** It includes innovations in both industrial and consumer robotics, which can range from advanced manufacturing robots to home automation systems.
- **Jigs and fixtures for production:** This category involves tools and equipment designed to facilitate the manufacturing process. Jigs and fixtures are critical components that aid in holding, guiding, or positioning workpieces during assembly or machining processes
- **Furniture:** Innovations in furniture design, materials, and functionality fall under this category. It includes advancements in the aesthetics, ergonomics, and sustainability of furniture items for both residential and commercial spaces
- **Sports and leisure:** This category focuses on technology and product developments related to sports, recreation, and entertainment. It can involve advancements in sporting equipment, sports apparel, and leisure products designed to enhance the overall experience of individuals engaged in various recreational activities.

Note: The applications listed above are indicative and we also encourage submissions in other segments and areas that can implement 3D Printing FGF or hybrid technologies.



# What does the Challenge Winner receive?

The Challenge Winner Support is a comprehensive package designed to empower the overall winner of our challenge with valuable resources and assistance worth \$25,000. We are committed to nurturing and advancing the promising idea or project of the winning participant, and this support includes a wide array of benefits:

## 1. Support in Material/Technology Selection

We understand the critical role that materials and technologies play in the success of any project. Our support will encompass guidance in choosing the right materials and technologies that align with your project's goals and requirements.

## 2. Assessment and Evaluation of Value Proposition and Business Model

Our experts will closely assess and evaluate your project's value proposition and business model. This in-depth analysis will provide you with valuable insights and recommendations for enhancing your project's market viability and potential for success.

## 3. Access to a Wide Selection of (Customizable) Materials for 3D Printing:

You will have access to a diverse range of materials for 3D printing, which you can customize to suit the specific needs of your project. This flexibility ensures that you can experiment and fine-tune your designs effectively.

## 4. Support in Design for Manufacturing:

The transition from design to manufacturing is a crucial phase. We will provide guidance and support to optimize your designs for efficient and cost-effective manufacturing processes, ensuring that your project can be brought to market more efficiently.

## 5. Global Exposure in Various Media:

As the Challenge Winner, your project will gain substantial global exposure through various media channels. This exposure will help create brand awareness, attract potential collaborators, and generate interest.

## 6. Access to Our Wide Partner Network:

Our extensive partner network is a valuable resource for forging strategic collaborations. You will be connected to relevant partners who can further support your project's growth.

## 7. Exposure to Senior Management in Mitsubishi Chemical Group and the Corporate Venture Group:

You will have the unique opportunity to engage with senior executives within Mitsubishi Chemical Group and the Corporate Venture Group. Their insights and experience can provide invaluable mentorship and guidance.

## 8. Exposure to Potential Customers:

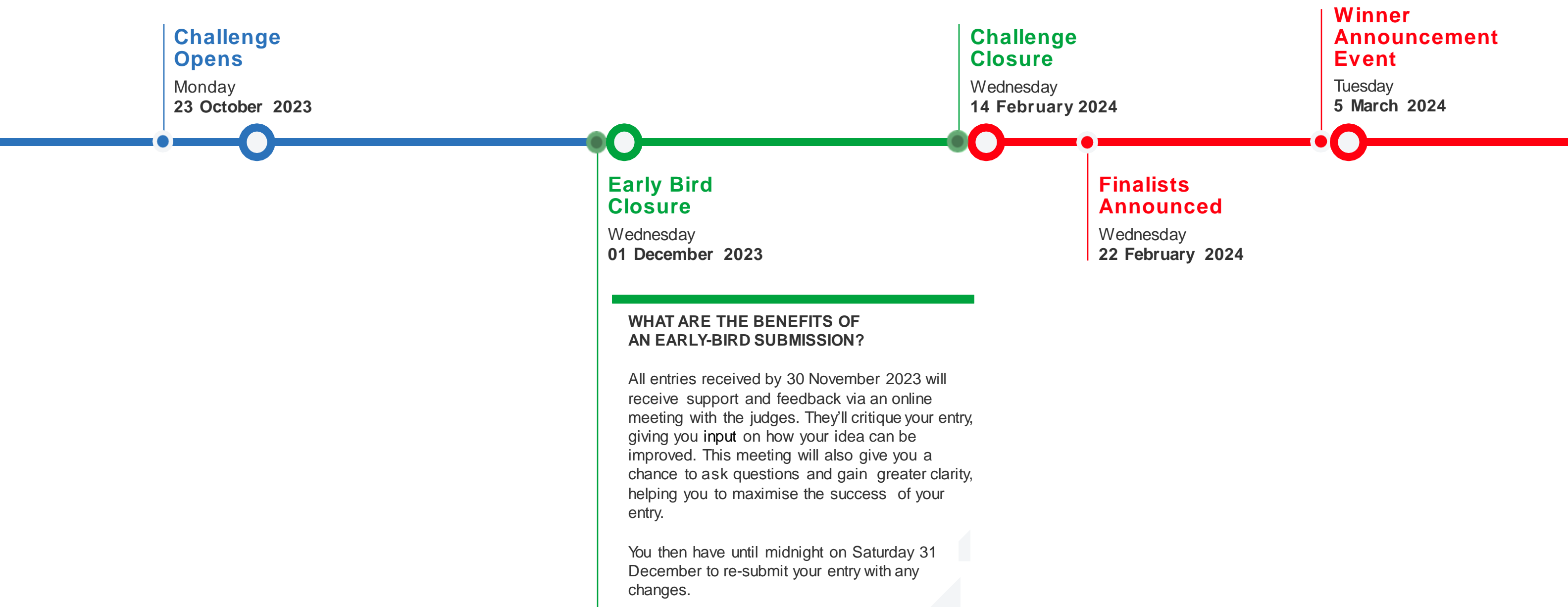
We will facilitate introductions to potential customers who have an interest in your project, helping you to establish meaningful business relationships and expand your market reach.

## 9. Access to Experts in Our Community and Jury:

Our community of experts and the jury members possess a wealth of knowledge and experience. You will have access to their expertise, allowing you to seek advice and solutions to the challenges you encounter during the development and scaling of your project.

In summary, the Challenge Winner Support is a comprehensive package that goes beyond financial rewards. It is a commitment to nurture and propel your project to new heights, providing you with the resources, mentorship, and connections needed to make your innovation a resounding success. We look forward to partnering with you on this exciting journey.

# What are the key Challenge dates?



Ready to join the Challenge?

Your journey begins here. Share your engineering idea with us via the Growth Garage platform ([growthgarage.mcgc.com](https://growthgarage.mcgc.com)). Together, we can turn your idea into innovation, and innovation into a better tomorrow. Let's build the future together!



# Entry Checklist

This section provides more information on the specifics of your Challenge entry, judging criteria and how you can make a successful submission

# What should be included in your entry?

The following points need to be addressed in your submission:

1. Provide an overview of your project and explain the specific issue or obstacle that your product, component, or application resolves or confronts.
2. How do you differentiate your product, part or application from your competition? Include the Value Proposition of your solution.
3. Describe the Technical Readiness Level (TRL) of your submission and indicate your project's level according to this scale. (Read more about TRL on the next page).
4. Describe the Manufacturing Readiness Level (MRL) of your submission and provide an indication of your project's level according to this scale. (Discover more details about MRL on the next page).
5. What material and manufacturing technology are you using for the prototypes or the small series production?
6. How would 3D Printing FGF benefit your product, part or application? Describe how you would improve your current product, part or application using 3D Printing FGF in combination with CNC machining (hybrid manufacturing) or 3D Printing FGF with a combination of carbon-fiber, UD tape and other hybrid composite technologies.
7. What resources or expertise would you require to achieve success with 3D Printing FGF?
8. How do you bring sustainability into your project?
9. Describe your core team members' functions and responsibilities.
10. This challenge is for original ideas only. Please confirm that you own or have rights to the intellectual property of your submission?
11. Support your submission with images, renders and technical drawings (max 10). Provide one clear image of your submission and one of the team for use on social media by Mitsubishi Chemical Group.

Here are some tips to help you develop a successful entry:

## What's your idea? What problem is it trying to solve?

Here you need to explain your idea via a concise elevator pitch.

Here are six approaches used by some of the biggest names in Silicon Valley that will help you to describe your idea concisely. <https://medium.com/@gtabidze/describe-your-idea-framework-2bfca3dc6ec9>

complete

## What does your entry need to demonstrate?

Your entry needs to demonstrate four key elements. First, we will look at your idea's feasibility from technical and commercial standpoints. We'll then examine its scalability from the perspective of your manufacturing methodology and the attributes of your team. And finally, we'll consider its impact on the circular economy.

complete

## Feasibility - Technical

- Do you have a product or part design?
- Which material(s) and production technology do you have in mind?
- Have you already produced a prototype and tested it?

complete

## Feasibility - Commercial

- Has the part or product already been in commercial production, or is it in a testing phase?
- Have you already tested it with customers?
- What is your business model?
- What do you need to make your business a success?

complete

## Scalability - Manufacturing & Team

- Do you plan to manufacture yourselves, via a partner, or with Mitsubishi Chemical Group?
- Which technology do you plan to use for manufacturing higher production volumes?
- Do you have the right team and competencies in place to start a pilot and create a joint proof point if you are announced as the winner?

complete

## Sustainability & Circularity

- Why is your solution better for the environment?
  - Lower carbon footprint
  - Less waste
  - Lower weight or friction, or other in-use benefits
  - Recyclable at its end-of-life

complete

# Judging Criteria

In the 3D Printing Fused Granulate Fabrication (FGF) Engineering Challenge, submissions are equally evaluated based on three key criteria:

- ❑ **Feasibility (Technical and Commercial)**
- ❑ **Scalability (Manufacturing and Team)**
- ❑ **Sustainability**

The judging criteria for our Challenges is divided into three parts as indicated in the table below. In the judging process, all criteria have the same weightage and are hence **equally important**.

Criteria	Sub-Criteria	Contents
1. Feasibility	Technical	<ul style="list-style-type: none"> <li>• TRL: Technical Readiness Level</li> </ul>
	Commercial	<ul style="list-style-type: none"> <li>• Business Model</li> <li>• Differentiated Value Proposition</li> <li>• Customer Testing</li> </ul>
2. Scalability	Manufacturing	<ul style="list-style-type: none"> <li>• MRL (Manufacturing Readiness Level)</li> <li>• Capacity scalability</li> </ul>
	Team	<ul style="list-style-type: none"> <li>• Competencies and Motivation</li> <li>• Partners</li> </ul>
3. Sustainability		<ul style="list-style-type: none"> <li>• Circularity</li> <li>• Carbon footprint reduction</li> <li>• Quantified environmental impact (Product Carbon Footprint, Life-Cycle Assessment, etc.)</li> </ul>

## THE CRITERION FOR EVALUATING YOUR ENTRY

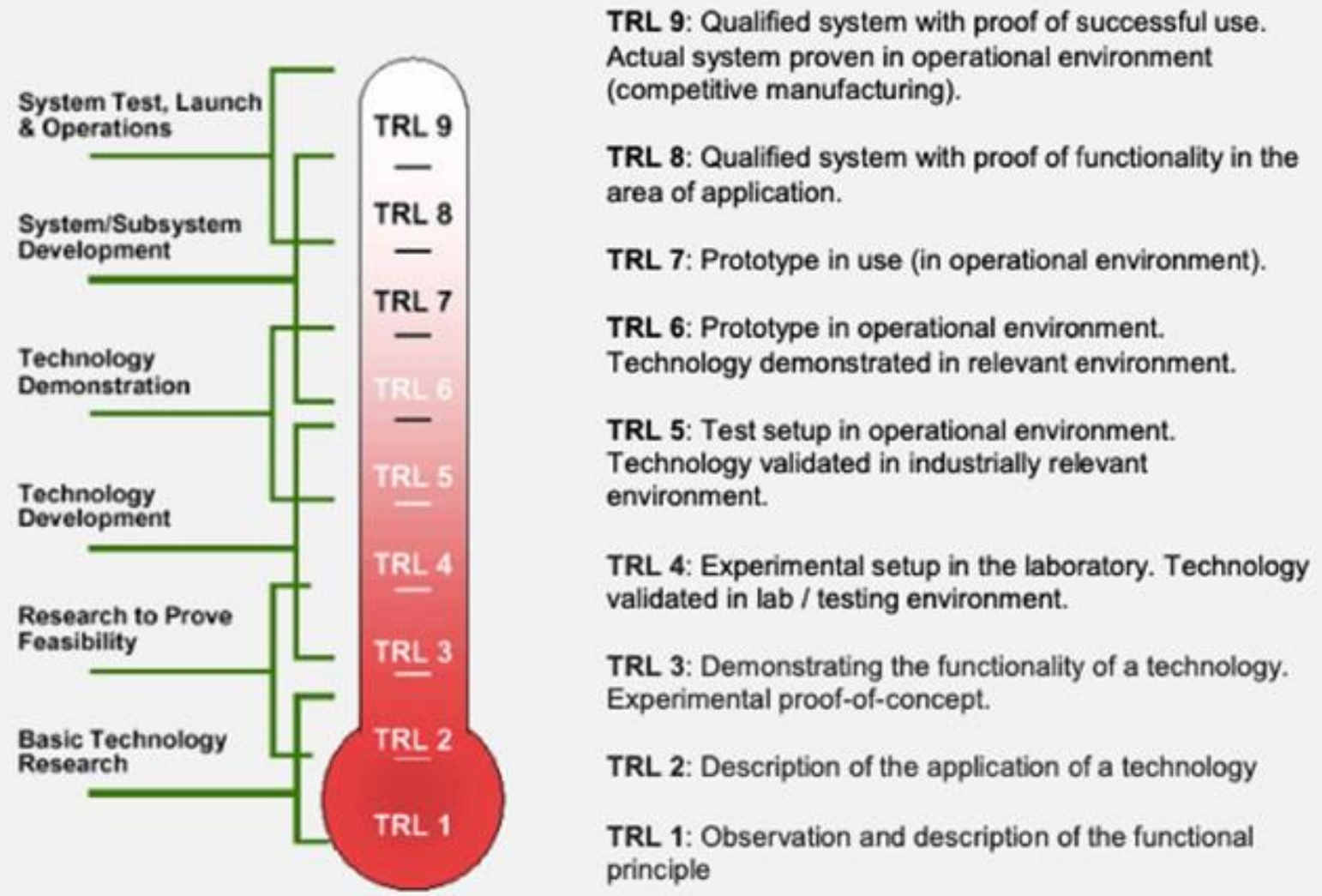
Startups and scaleups typically test their first functional prototypes, known as beta versions, with a selective set of customers to gather valuable feedback in the early stages of their development. This approach reduces time-to-market and avoids wasting resources (time and money). A great way to assess both technical and commercial feasibility early in development is to create an **MVP (Minimum Viable Product)**, that's about 60-80% complete and test it with a small audience for early feedback. This initial step is followed by multiple iterative loops. Usually, the final product, based on customer feedback, differs from what you envisioned at the start of your journey. We recommend reading 'The Lean Startup' by Eric Ries (<https://leanstartup.co/team/eric-ries/>) to gain more insights into this approach.

## FEASIBILITY

While we applaud imaginative thinking, your idea also needs to be a realistic proposal that makes the most innovative use of our materials and technologies. Innovation is more than big ideas – it involves sustainable implementation.

### Technical Feasibility (TRL)

**Technical feasibility** is evaluated by a team of technical experts who assess the technical readiness, often referred to as **TRL** (Technical Readiness Level). Teams that can demonstrate customer testing or have entered in commercial sales (of beta-versions or beyond) are favored, as it indicates a higher readiness level. Although the TRL scale was initially developed by NASA, it has been adopted by numerous other organizations, including the European Union, for easy application across various industry sectors. The US Department of Defense (DOD), the Department of Energy (DOE), the Air Force, the oil and gas industry and the European Space Agency (ESA), all use the TRL scale. NASA introduced the TRL to enable more effective assessment and communication of technology maturity and it can also serve you to assess your product as well, even if your product is not intended for aerospace. Our judges assess the submission's technical readiness based on the TRL scale.



Source: [https://de.wikipedia.org/wiki/Technology\\_Readiness\\_Level](https://de.wikipedia.org/wiki/Technology_Readiness_Level) , [https://en.wikipedia.org/wiki/Technology\\_readiness\\_Level](https://en.wikipedia.org/wiki/Technology_readiness_Level)

**Intellectual property (IP)**

It is advantageous to own the intellectual property behind your solution. At a minimum, you need to demonstrate that you've checked that you are not infringing anybody else's patent. Neither your work nor its use should infringe the intellectual property rights of another person. Please do not share information that is regarded as 'confidential'. Neither the Specialty Materials division of Mitsubishi Chemical Group nor its partners will claim any intellectual property rights over the content you submit, and your submission does not constitute an invention assignment.

**Commercial Feasibility**

This is largely dependent on your business model. While uniqueness, differentiation potential, and the value proposition play significant roles, we adopt a holistic approach, considering the entire business model. We welcome transactional, service-based, and circular business models (or elements thereof) in our Engineering Challenges.

However, we also recommend you use the following guides to develop your entry:

**Differentiate your idea from other solutions**

To check how differentiated your idea is and to reflect that in your brand positioning, we advise you to read the book 'Find your Zag' by Marty Neumeier. It's easily digestible and includes practical guidance. <https://www.martyneumeier.com/>

**Communicate your business model**

To ensure that you have covered all elements in building your business model, we advise looking at the Business Model Canvas by Alex Osterwalder <https://www.alexosterwalder.com/>

**Develop a minimum viable product that allows us to test the viability of your idea**

A great way to check commercial feasibility (in an early stage of development) is to create a minimum viable product (MVP). This allows you to test your idea with a small audience and get early feedback. Multiple iteration loops typically follow this first step.

This approach will also allow you to pivot your idea, should you need to. For example, the winner of the second Growth Garage Challenge envisioned a robot for use on the Moon or Mars, but ended up developing a machine to measure temperature and humidity within grain silos.

Typically, the final product (based on customer feedback) is not what was envisioned at the start of the journey. We recommend reading Eric Ries' book 'The Lean Startup' for more insights into this approach.

<https://leanstartup.co/team/eric-ries/>

Other key considerations are:

- How radical is your solution? Does it offer incremental change? Is it a redesign of an existing idea, or is it totally new to the world?
- Industry type: are you operating in an existing recognized sector? Or is it totally new?
- Global reach: is this a solution that could be used in any part of the world?

## SCALABILITY

### Manufacturing scalability

The manufacturing scalability refers to the ability of a production process to adapt, expand, or adjust in order to handle increasing demands or changes in production volume without significant loss of efficiency or increase in costs. In other words, a manufacturing process is considered scalable if it can smoothly accommodate larger production volumes without requiring substantial changes or disruptions to its operations. Manufacturing scalability is evaluated according to the **MRL** (Manufacturing Readiness Level) principles

MRL	Definition	Description
1	Basic manufacturing implications identified	Basic research expands scientific principles that may have manufacturing implications. The focus is on a high-level assessment of manufacturing opportunities. The research is unfettered.
2	Manufacturing concepts identified	Invention begins. Manufacturing science and/or concept described in application context. Identification of material and process approaches are limited to paper studies and analysis. Initial manufacturing feasibility and issues are emerging.
3	Manufacturing proof of concept developed	Conduct analytical or laboratory experiments to validate paper studies. Experimental hardware or processes have been created, but are not yet integrated or representative. Materials and/or processes have been characterized for manufacturability and availability but further evaluation and demonstration is required.
4	Capability to produce the technology in a laboratory environment.	Required investments, such as manufacturing technology development identified. Processes to ensure manufacturability, producibility and quality are in place and are sufficient to produce technology demonstrators. Manufacturing risks identified for prototype build. Manufacturing cost drivers identified. Producibility assessments of design concepts have been completed. Key design performance parameters identified. Special needs identified for tooling, facilities, material handling and skills.
5	Capability to produce prototype components in a production relevant environment.	Manufacturing strategy refined and integrated with Risk Management Plan. Identification of enabling/critical technologies and components is complete. Prototype materials, tooling and test equipment, as well as personnel skills, have been demonstrated on components in a production relevant environment, but many manufacturing processes and procedures are still in development. Manufacturing technology development efforts initiated or ongoing. Producibility assessments of key technologies and components ongoing. Cost model based upon detailed end-to-end value stream map.

MRL	Definition	Description
6	Capability to produce a prototype system or subsystem in a production relevant environment.	Initial manufacturing approach developed. Majority of manufacturing processes have been defined and characterized, but there are still significant engineering/design changes. Preliminary design of critical components completed. Producibility assessments of key technologies complete. Prototype materials, tooling and test equipment, as well as personnel skills have been demonstrated on subsystems/ systems in a production relevant environment. Detailed cost analysis include design trades. Cost targets allocated. Producibility considerations shape system development plans. Long lead and key supply chain elements identified. Industrial Capabilities Assessment for Milestone B completed.
7	Capability to produce systems, subsystems or components in a production representative environment.	Detailed design is underway. Material specifications are approved. Materials available to meet planned pilot line build schedule. Manufacturing processes and procedures demonstrated in a production representative environment. Detailed producibility trade studies and risk assessments underway. Cost models updated with detailed designs, rolled up to system level and tracked against targets. Unit cost reduction efforts underway. Supply chain and supplier Quality Assurance assessed. Long lead procurement plans in place. Production tooling and test equipment design and development initiated.
8	Pilot line capability demonstrated. Ready to begin low rate production.	Detailed system design essentially complete and sufficiently stable to enter low rate production. All materials are available to meet planned low rate production schedule. Manufacturing and quality processes and procedures proven in a pilot line environment, under control and ready for low rate production. Known producibility risks pose no significant risk for low rate production. Engineering cost model driven by detailed design and validated. Supply chain established and stable. Industrial Capabilities Assessment for Milestone C completed.
9	Low rate production demonstrated. Capability in place to begin Full Rate Production.	Major system design features are stable and proven in test and evaluation. Materials are available to meet planned rate production schedules. Manufacturing processes and procedures are established and controlled to three-sigma or some other appropriate quality level to meet design key characteristic tolerances in a low rate production environment. Production risk monitoring ongoing. Low Rate Initial Production cost goals met, learning curve validated. Actual cost model developed for Full Rate Production environment, with impact of Continuous improvement.
10	Full rate production demonstrated and lean production practices in place.	This is the highest level of production readiness. Engineering/design changes are few and generally limited to quality and cost improvements. System, components or items are in rate production and meet all engineering, performance, quality and reliability requirements. All materials, manufacturing processes and procedures, inspection and test equipment are in production and controlled to six-sigma or some other appropriate quality level. Full rate production unit cost meets goal, and funding is sufficient for production at required rates. Lean practices well established and continuous process improvements ongoing.

## SCALABILITY

### **Team**

In addition to the manufacturing technology, we are highly interested in the team behind your submission. Do you have the right team, the appropriate competence, and partners onboard to execute within a specific timeframe? This aspect typically becomes more crucial as your company matures, transitioning from a single entrepreneur to a startup, to a scale-up, and beyond. Not having all the necessary competences in place yet is not a disqualifying criterion, as you will gain access to our ecosystem and partners that will provide support, including funding. The key factor is having the passion and drive to see the endeavor through to completion.

Not having all the competencies in place yet will not rule you out, as you will get access to our ecosystem and partners to support you (including funding). However, it is crucial to demonstrate how your passion and drive will take your idea all the way. You can assess where your business and idea are at by using the Manufacturing Readiness Scale (MRS) opposite.

## SUSTAINABILITY

This is an important criterion in the assessment of your submission. This encompasses various aspects, such as solutions benefiting societal well-being (e.g., assistive technologies like wheelchairs and prosthetics), waste reduction by using lesser material for production, printing with bio-based and recycled material grade, financial sustainability by reducing-costs by switching to 3DP FGF, reduced waste by having more flexibility in prototyping phase, and promoting a circular economy. Can you quantify the impact of your technology, service, or product?

For instance: Switching the manufacturing method of a car monocoque (chassis) to 3DP FGF with x% recycled grade printing pellets helped us achieve x% reduction in manufacturing cycle time and x% savings in CO2 emissions in its lifecycle. Check out the example of how CEAD and Mitsubishi Chemical Group collaborated on a project with TU Eindhoven for producing an electric vehicle using 3D printed FGF: <https://ceadgroup.com/portfolio-items/fully-3d-printed-monocoque-for-co2-neutral-car-zem/>

We firmly believe in a giving-back philosophy rather than a taking approach. Solutions incorporating these aspects are typically ranked as more future proof, with a higher likelihood of long-term success in the market. Quantifying the reduction in carbon footprint and CO2 emissions savings compared to the incumbent market solution can be a compelling selling point. Our experts specializing in Life Cycle Assessments (LCA) are integral members of our jury expert panel and are integral to our ecosystem.



# Backdrop

Here you'll discover some valuable background information to the Challenge and some hints to help you succeed.

## THE RULES OF ENGAGEMENT

### What You Need To Know Before Submitting

1. Owning the intellectual property of your solution is an advantage or as a minimum having done the check that you are not infringing anybody's patent. Your work nor its use should infringe the intellectual property rights of any person. Neither the Advanced Materials division of Mitsubishi Chemical Group nor its partners will claim any Intellectual property rights over the content that you submit, and your submission does not constitute invention assignment. By submitting your entry, you acknowledge that neither the work nor its use infringes the intellectual property rights (whether a patent, utility model, functional design right, aesthetic design right, trademark, copyright, or any other intellectual property right) of any other person.
2. If you are selected as a finalist, you may need to supply additional video and/or documents for 'proof of concept' and the ability to engage in a pilot project. Failure to provide files may disqualify you from the challenge.  
If you are selected as the Challenge winner than you commit to executing a joint pilot/project throughout 2024 to check the technical and commercial feasibility. You also commit to documentation (video, interviews, etc.) of the journey during the pilot and execution for joint marketing purpose (feedback and inspire the community).
4. You give permission to Wevolver & Mitsubishi Chemical Group to share the images and text provided here on social media. ([Wevolver](#) is an online community for engineers, innovators and entrepreneurs who are our partners in the Challenge marketing campaigns)
5. You consent for your submission and contact details to be shared with Mitsubishi Chemical Group. (This is required to enable the jury to review your application, and for Mitsubishi Chemical Group to be in contact with you).
6. Contestants are not entitled to any compensation or reimbursement for any costs.
7. Contestants agree to be bound by the decisions of the jury.
8. You read and agreed with the rules of engagement.



## WHAT CAN I LEARN FROM PREVIOUS WINNERS?

There have been three previous Growth Garage Challenges, so we asked the winners for some tips on producing a successful entry.

### What benefits did you get from being an early-bird entrant?

"I applied early in the entry process, which was extremely helpful as we got feedback that allowed us to tweak and hone the final entry. We were able to ask questions about how the manufacturing process would work as well as technical questions, which also helped solidify the application and provide a really watertight case." *Michael Deloyer, Delson Aeronautics and previous Challenge winner.*

**What was the most challenging part of putting together your entry?** "It was a real team effort. However, it was far easier than some applications we've had to do. One of the challenges was the question around material requirements where I needed to lean on a team member who had some expertise in that area. I pulled all the pieces we had together and made it more discursive, and then we went through a couple of iterations to finalize it". *Lorenzo Conti, Founder and Managing Director, Crover and previous Challenge winner*

"When you are deep inside a topic and project, it is really challenging to boil all the information down to a few sentences. The Challenge criteria got us thinking about the fundamentals of our project. Sustainability was something that we hadn't thought about specifically. As it was one of the major criteria of the Challenge, it really got us thinking about how we could minimise our product's environmental impact". *Aidan Mitchell, Lunar Rover Arm team, Student Winners*

### How have they benefited from winning the competition?

"Mitsubishi Chemical Group bring a lot of expertise to the project that we simply don't have." *Lorenzo Conti, Founder and Managing Director, Crover and previous Challenge winner*

"Winning the Challenge and having Mitsubishi Chemical Group as our manufacturing partner has been key. The whole experience has been a brilliant stepping-stone and enabled Delson to go from burgeoning start-up to exit in record time." *Michael Deloyer, Delson Aeronautics and previous Challenge winner.*

"Mitsubishi Chemical Group is helping us scale up the product's production cost-effectively for the different stages of growth." *Lorenzo Conti, Founder and Managing Director, Crover and previous Challenge winner.*

*"Winning the Challenge and having Mitsubishi Chemical Group as our manufacturing partner has been key. The whole experience has been a brilliant stepping-stone and enabled Delson to go from burgeoning start-up to exit in record time."*

**Michael Deloyer**, Delson Aeronautics and previous Challenge winner.



# Frequently asked Questions (FAQs)

Do you have additional questions regarding the 3D Printing FGF Engineering Challenge?  
This section will answer the most frequently asked questions about our open innovation programs

## 1. What are the basic differences between the Open Innovation programs?

**Program 1. Engineering Challenge:** The open window for participation to an Engineering Challenge program is 4-5 months per year. The challenge is open to any startup, scaleup, innovative company, research team, or project across the globe that fulfills the selection criteria and is interested to create a joint proofpoint based on the expertise and the Specialty Materials portfolio of MCG. By participating, you become part of the community and get the opportunity to create exposure for your business, project and ideas. The typical duration of the follow-up with the winners is 6 to 9 months.

**Program 2. Pitch Session:** The Pitch Sessions are organized a couple of times per year. It is important that you submit prior to the deadline (indicated per topic) and are available to pitch online during the Pitch event. Outcome: You are seeking exposure for your business by pitching to an audience of industry experts, senior business leaders and the CVC team.

**Program 3. Continuous intake of Innovation ideas:** This program is open throughout the year. You will receive written feedback from the expert jury team based on the predefined selection criteria. Outcome: You are seeking feedback on your business, product, project or idea by a team of industry experts, senior business leaders and the CVC team.

## 2. Who can participate in the Engineering Challenge?

The Challenge is open to any startup, scaleup, innovative company, research team, or project across the globe that fulfills the selection criteria and is interested to create a joint proofpoint based on the expertise and the Specialty Materials portfolio of MCG. By participating, you become part of the community and get the opportunity to create exposure for your business, project and ideas.

## 3. What are the benefits of being an early-bird entrant?

As an early bird entrant, you will have the opportunity to pitch your idea, technology, service or product directly to our expert jury and get feedback to improve your submission, before you submit your entry for the second time.

## 4. I just started my company, Can I participate?

Yes of course!

When selecting the finalist and winner, we do check if you (and your team) have the right expertise and are able to execute together with our supporting team. We can support you with a wide range of expertise: design, material selection, prototyping, production, funding, business intelligence, digital marketing, industry expertise, create MVP's, reflect on business models, etc.

## 5. I am a student. Can I submit my idea?

Although this Open Innovation programs are typically more focused on experienced innovators and entrepreneurs at startups, scaleups and innovative companies, we do encourage entries from students, particularly those in postgraduate studies looking to develop their ideas. If your idea aligns with the judging criteria, your application is as valid as any other.

## 6. Will I retain the ownership of my Intellectual Property (IP)?

Yes, you remain owner of the intellectual property. Owning the intellectual property of your solution is an advantage or as a minimum having done the check that you are not infringing anybody's patent. Your work nor its use should infringe the intellectual property rights of any person. MCG Advanced Materials nor its partners will claim any Intellectual property rights over the content that you submit, and your submission does not constitute invention assignment. Mind not to submit any confidential information.

## 7. What are the (joint) marketing opportunities?

Winners and finalists receive a marketing package based on the program in which they participated. Are you not a winner or a finalist, but still interested to generate exposure in our community? Please get in touch with us at [growthgarage@mcgc.com](mailto:growthgarage@mcgc.com) since we are always interested to inspire our community with your great ideas, project and business.

## I would like to ask an additional question.

Let us know what's on your mind, we will connect with you ASAP. Just keep in mind that if you don't receive an answer in the next minute, it's only because of the time zone difference. In the mean time send your question to [growthgarage@mcgc.com](mailto:growthgarage@mcgc.com).

# The Jury

The jury comprises a team of engineers, materials and sustainability experts, and business development leaders. Together they bring several decades of experience to bear on the judging.



**Dr Lisa Weigand**  
Advisor Circular Economy, Mitsubishi Chemical Europe

Lisa believes that the chemical industry plays a major role in making chemicals and plastics more sustainable – and thus reducing the environmental impact of those products. She is passionate about sustainability, innovation and the transformation to the Circular Economy, and supports MCE group companies' implementation of those concepts in their day to day business. She holds a PhD in Chemistry from Imperial College London.



**Dr Peter Walde**  
Founder & CEO at MAPEGY

Peter is a speaker, researcher and entrepreneur. He's the founder of MAPGEY, a leading market research service in the technology sector, which provides an up-to-date and comprehensive picture of the technology landscape and the latest trends, research, forecasts and news. Before setting up MAPEGY, he headed the internal business unit for Volkswagen's data-driven competitive, technology and trend intelligence. He has a PhD in Computer Science from Leipzig University.



**Jules Harings**  
Associate Professor & Group Leader Macromolecular Physics & Technology at AMiBM/Maastricht University

Jules was awarded his PhD in Polymer Technology by the Eindhoven University of Technology in the Netherlands. He spent four years as an industrial research scientist and project leader in fibre physics and new product development for a leading materials business before returning to academia in 2012. He took up his current role in 2019.



**Tim Vorage**  
Founder and Manager of the Growth Garage at Mitsubishi Chemical Advanced Materials

Tim has a passion for open innovation and business development based on the Circular Economy, which resulted in him founding the Growth Garage accelerator for Mitsubishi Chemical Advanced Materials in 2019. He holds a master's degree in Chemical Engineering and PdEng in Process and Development from the University of Eindhoven.



**Mark Geljon**  
Customer Experience leader, change-maker, and social entrepreneur

Mark is the founding partner at GriDD, which designs fantastic customer experiences and effective organisations. He works as a change-maker and strategic sparring partner at large corporations to create transformational business strategies. He's also an entrepreneur who loves building ideas to make them work, create value and build platforms that matter. He has an MSc in systems engineering, policy analysis and management from the Technische Universiteit Delft.



**Randy White**  
Carbon Fiber and Composites Division Leader, Americas, Mitsubishi Chemical

Randy is the former President and CEO of Piper Plastics, a leading supplier of plastic fabrication and machined plastics in the US. He joined Mitsubishi Chemical Group in 2019.



**Simon McEvoy**  
UK Head of Strategy & UX at Omobono

Simon is a commercially minded marketing leader with a background in brand, campaigns, user experience (UX), content marketing and digital. He has worked with large multinationals including Xbox and Samsung, and with smaller organisations and NGOs such as the National Trust and Samaritans. Simon has worked at Omobono, a creative agency for enterprise business brands, since 2017. He has a degree in philosophy from the University of York.



**Henning Bloech**  
Global Director Sustainable Solutions, Mitsubishi Chemical Advanced Materials

Henning is an accomplished sustainability expert, business leader and strategic marketing professional with global experience across various industries. He drives sustainability strategy, including Circular Economy infrastructure and sustainable business models, for Mitsubishi Chemical Group through products and investments, and supports Mitsubishi Chemical Group's vision of KAITEKI in terms of how we operate our business and how its products impact the world around us.



**Bram Geenen**  
CEO and co-founder of Wevolver

Wevolver is a platform and community founded by Bram in 2014. It enables the engineering community and industry to connect around deeply informative content that helps them to understand the latest in cutting edge technology – including robotics, autonomous vehicles, aerospace and cleantech. He has a degree in 3D design from HKU University of the Arts, Utrecht.



**Andy Rudd**  
Global New Business Development Manager, Mitsubishi Chemical Methacrylates

Andy has over 20 years of commercial management experience within SME and multinational organisations in the global chemical industry, with a proven track record of sales and marketing management and business development. He's developed existing products and led the development of new products, innovations and markets.



**Fumiko Uraki**  
Director, Corporate Ventures, Mitsubishi Chemical Group

Fumiko Uraki leads the Corporate Venture activity of Mitsubishi Chemical Group, covering broad industry fields in materials, healthcare, and sustainability. She joined Mitsubishi Chemical Holdings R&D Strategy Group in 2016, taking the lead role in setting up the venture group and its subsidiary company Diamond Edge Ventures, in Silicon Valley to accelerate startup engagement and investment. Globally the team have made nine investments to date and created startup engagement with over 200 companies, aiming to contribute to society's sustainable well-being by leveraging the Mitsubishi Chemical Group's expertise. Previously, she worked in various roles at BASF.



**Stefan Schnippering**  
PhD, Venture Associate, Diamond Edge Ventures

Stefan is an Organic Chemist by training and received his PhD from the University of Cologne, Germany. He joined Mitsubishi Chemical in 2019 to explore growth opportunities in Europe with a strategic focus on clean technologies and Circular Economy. Prior to joining Mitsubishi Chemical, Stefan worked in various sales and marketing roles primarily in the lithium industry. He joined the Diamond Edge Ventures team in 2021 to further expand strategic investment footprint in the EMEA region leveraging his experience in the European chemical industry. In his leisure time Stefan manages a local sports club or you can find him in a campground with his family.



**Jonas Grau Thomsen**  
Founder and CEO of Nordic Bionics

For over a decade, Jonas specialised in wearable technologies as he lives with a disability that is slowly rendering him unable to walk. During this time, he earned a bachelor's degree in Innovation and Entrepreneurship from the University College of Lillebaelt in Denmark. While doing his research, he realised how much potential this technology has to change the world for the better. Wearable technology will make a massive difference in the way we live and work in the future. This was the foundation for Nordic Bionics, which aims to disrupt the assistive device market using new technologies such as carbon fibre and other composite materials.



**David Leach**  
Director, Business Development, ATC Manufacturing

David is passionate about the benefits of composite materials. He has spent most of his career in thermoplastic composites for aerospace and high-performance applications. His experience includes materials and process research, applications development, operations, new product introduction and business development. Prior to ATC Manufacturing, his professional experience included roles at Henkel and Cytec (now Solvay). He has authored over 40 technical papers and three book chapters. David is a Fellow of the UK Institute of Materials and the US Society for the Advancement of Materials and Process Engineering (SAMPE).



# What do we do

“To meet the challenges of tomorrow we have to nurture the visionaries of today.”

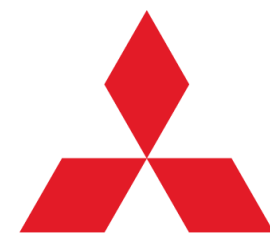
We foster open innovation and collaboration with innovators and entrepreneurs to uncover new growth opportunities, accelerate the implementation of the circular economy (CE), and positively impact the well-being of people, society, and planet Earth.

Mitsubishi Chemical Group (MCG) is a specialty materials provider with an unwavering commitment to lead with innovative solutions to achieve KAITEKI, the well-being of people and the planet. We bring deep expertise and material science leadership in core market segments such as mobility, health & life sciences, and electronics, enabling industry transformation, technology breakthroughs, and longer, more fruitful lives for us all.

Mitsubishi Chemical Group is committed to the realization of KAITEKI, “a sustainable condition which is comfortable for people, society and the Earth”. To realize this vision, the Mitsubishi Chemical Group engages in corporate activities that provide products, technologies and services based on the comprehensive capabilities of the group in performance products, industrial materials and health care, with chemistry as the basis of our activities. We jointly express and promote our commitment under the corporate brand THE KAITEKI COMPANY.

## **This Challenge is hosted by:**

Mitsubishi Chemical Group (MCG)  
Growth Garage in cooperation and partners



MITSUBISHI  
CHEMICAL  
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Science.  
Value.  
Life.

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