

Sustainable Advanced Recycling of End-of-life Single Use Plastic Waste

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 **TechCamp**

The Plastic Predicament: Introduction to Advanced Recycling

- **Global plastic waste crisis:**
 - 220 million tonnes generated annually (2024)
 - Only 15% collected for recycling
- **Limitations of traditional recycling:**
 - Can't handle mixed or contaminated plastics
 - Degrades material quality over time

- **Advanced recycling: A game-changing solution**
 - Breaks down plastics into chemical building blocks
 - Produces virgin-quality materials
 - Handles mixed and contaminated plastics
- **Key benefits:**
 1. Circular economy enabler
 2. Reduces dependence on fossil fuels
 3. Tackles previously unrecyclable waste

Chemical Recycling Unveiled: Spotlight on Pyrolysis

- Definition: Thermal decomposition of plastics in absence of oxygen

- Process overview:

1. Plastic waste heated to 300-900°C
2. Long polymer chains break into shorter hydrocarbons
3. Resulting vapors condensed into liquid oil

- Key advantages of pyrolysis:

- Handles mixed plastic waste

- Produces valuable hydrocarbons
- Minimal pre-sorting required

- Pyrolysis products:

1. Pyrolysis oil (main product): Used as feedstock for new plastics or fuels
2. Syngas: Can be used for energy in the process
3. Char: Potential use in construction materials

- APChemi's innovation:

- 99.7% purification efficiency
- Handles PET, PVC
- Reduces emissions by 20-75% compared to conventional methods

From Waste to Resource: Plastics Suitable for Chemical Recycling

- Ideal Feed:

1. Polyethylene (PE)
 - High-density PE (HDPE): Milk jugs, shampoo bottles
 - Low-density PE (LDPE): Plastic bags, squeeze bottles
2. Polypropylene (PP): Food containers, bottle caps
3. Polystyrene (PS): Disposable cutlery, packaging foam

- Challenging but possible:
 1. Polyethylene terephthalate (PET): Beverage bottles, polyester fabrics
 - Requires specific conditions due to oxygen content
 2. Polyvinyl chloride (PVC): Pipes, window frames
 - Needs careful chlorine management

From Waste to Resource: Plastics Suitable for Chemical Recycling

- Multi-layer and contaminated plastics:

- Often unsuitable for mechanical recycling
- Chemical recycling offers a solution

- Benefits of chemical recycling for these plastics:

1. Breaks down polymers to original monomers
2. Removes contaminants and additives
3. Enables true plastic-to-plastic recycling

Global Plastic Challenge: Obstacles and Opportunities

Obstacles:

1. Increasing waste generation:
 - Projected 460 million tonnes by 2030
2. Low recycling rates:
 - Only 15% collected for recycling
3. Environmental impact:
 - 8 million tonnes entering oceans annually
 - Microplastics in 90% of bottled water

Opportunities:

1. Economic potential:
 - \$1 trillion market for circular economy innovations
 - 10x more jobs in recycling vs. landfilling/incineration
2. Technological advancements:
 - Chemical recycling handling previously unrecyclable waste
 - Potential to recycle 17 million tonnes annually by 2034
3. Policy drivers:
 - Plastic Tax
 - EPR, Recycling Targets

Global Plastic Challenge: Obstacles and Opportunities

Challenges to address:

1. Infrastructure development
2. Public awareness and behavior change
3. Creating stable markets for recycled materials

Call to action:

- Collaborate across sectors
- Invest in innovative technologies
- Support policies promoting circular economy

Funding the Future: TechCamp Grant Opportunity Overview

TechCamp Small Grants Program:

- Aim: Support development of practical, tech-based solutions for waste management
- Eligibility: Open to all TechCamp Pune participants

Key Details:

1. Funding amount: \$3,000 - \$5,000 per project
2. Project duration: 6-9 months

3. Application deadline: October 13, 11:59 PM local time

Focus Areas:

- Innovative waste management
- Technology-driven approaches
- Addressing challenges explored at TechCamp

What's Not Funded:

- Core administrative costs
- Existing initiatives
- Partisan political activities
- Construction projects

Funding the Future: TechCamp Grant Opportunity Overview

Evaluation Criteria:

1. Innovation in using TechCamp-learned tools/concepts
2. Potential for impact and sustainability
3. Collaborative approach
4. Feasibility within budget and timeframe

Timeline:

- Late November: Grant fund disbursement begins
- Post-award: Detailed information on grant administration and reporting

Crafting a Winning Proposal: Key Elements for Success

1. Clear Project Title and Executive Summary

- Concise overview of project idea, goals, and relevance to TechCamp

2. Well-Defined Need and Objectives

- Specific challenge addressed
- Target audience and expected positive change

- SMART objectives (Specific, Measurable, Attainable, Relevant, Time-bound)

3. Detailed Activities and Timeline

- Specific project activities
- Realistic timeline with key milestones
- Roles of partner organizations (if applicable)

4. Measurable Impact and Outcomes

- Expected results at project end
- Clear metrics for success

Crafting a Winning Proposal: Key Elements for Success

5. Sustainability Plan

- Strategy for project continuation post-funding
- Potential for scaling or replication

6. Comprehensive Budget

- Detailed budget using provided template
- Clear budget narrative explaining each item

7. Strong Team and Partnerships

- Relevant expertise of team members
- Collaborative partnerships (preference for TechCamp attendees)

8. Innovation and Technology Integration

- Clear use of tools/concepts from TechCamp
- Innovative approach to waste management challenges

Crafting a Winning Proposal: Key Elements for Success

9. Alignment with TechCamp Goals

- Address themes explored at TechCamp Pune
- Demonstrate potential for broader impact

10. Clear, Concise Writing

- Well-organized proposal
- Free of jargon and easily understood

Power in Partnership: Strategies for Collaborative Projects

Why Collaborate?

- Leverage diverse expertise
- Share resources and costs
- Increase project impact and reach

Crafting a Winning Proposal: Key Elements for Success

Key Strategies:

1. Identify Complementary Partners

- Consider skills, resources, and networks
- Look for synergies among TechCamp participants

2. Define Clear Roles and Responsibilities

- Outline each partner's contributions

- Establish a decision-making process

3. Set Shared Goals and Expectations

- Align on project objectives
- Agree on timelines and deliverables

4. Communicate Effectively

- Regular check-ins and updates
- Use collaborative tools (e.g., project management software)

Crafting a Winning Proposal: Key Elements for Success

Key Strategies:

5. Plan for Challenges

- Discuss potential obstacles upfront
- Develop contingency plans

6. Formalize the Partnership

- Create a Memorandum of Understanding (MoU)
- Outline terms of collaboration

7. Leverage Each Partner's Strengths

- Assign tasks based on expertise
- Encourage knowledge sharing

8. Build Trust and Maintain Relationships

- Foster open and honest communication
- Celebrate shared successes

Remember: Strong partnerships can significantly enhance your grant application and project outcomes!

Collaborative Circular Economy: Enabling Advanced Recycling

The Current Linear Model vs. The Circular Vision

- Linear: Extract -> Produce -> Use -> Dispose
- Circular Goal: Reduce -> Reuse -> Recycle -> Recover
- Challenge: No single entity can close the loop alone

- Opportunity: Create a new cross-value chain collaboration for advanced recycling

Key Stakeholders in the Advanced Recycling Ecosystem

1. Waste Management Companies
2. Chemical Recycling Technology Providers (e.g., APChemi)
3. Petrochemical Companies
4. Plastic Manufacturers
5. Consumer Goods Brands
6. Retailers
7. Government and Regulators
8. Research Institutions
9. Consumers
10. Investors and Financial Institutions

Proposed Collaboration Model: The Advanced Recycling Alliance (ARA)

1. Centralized Platform:

- Digital marketplace for recycled materials
- Shared data on waste streams and recycling capacities
- Collaborative R&D projects

2. Integrated Supply Chain:

- Waste collection -> Sorting -> Chemical Recycling -> Remanufacturing

3. Joint Investment Fund:

- Pool resources for scaling up advanced recycling infrastructure
- Shared risk and rewards

4. Policy Advocacy Group:

- Unified voice for supportive regulations
- Engagement with policymakers on circular economy initiatives

5. Consumer Education Initiative:

- Coordinated campaigns on proper waste disposal and recycling
- Promotion of products made from chemically recycled plastics

Benefits of the Advanced Recycling Alliance (ARA)

- Waste Management Companies: Stable demand for collected plastics
- Chemical Recyclers: Consistent feedstock and offtake agreements
- Petrochemical Companies: Access to high-quality recycled feedstock
- Plastic Manufacturers: Reliable supply of recycled materials
- Consumer Goods Brands: Meet recycled content targets

- Retailers: Offer more sustainable products
- Government: Achieve waste reduction and recycling targets
- Consumers: Access to more sustainable products and clear recycling guidelines
- Investors: New opportunities in the circular economy

Overcoming Collaboration Challenges

1. Data Sharing and Privacy:

- Blockchain-based platform for secure, transparent transactions
- Anonymized aggregate data for market insights

2. Fair Value Distribution:

- Smart contracts for automated, equitable revenue sharing
- Performance-based incentives across the value chain

3. Quality Control:

- Standardized testing protocols for recycled materials
- Real-time quality monitoring and feedback loops

4. Regulatory Compliance:

- Collaborative compliance management system
- Joint representation in regulatory discussions

5. Technology Integration:

- Open API for seamless integration of various tech platforms
- Regular technology sharing workshops

Next Steps: Launching the Advanced Recycling Alliance

1. Form a steering committee with representatives from each stakeholder group
2. Develop a detailed blueprint for the ARA structure and operations
3. Pilot the collaboration model in a specific region or with a subset of partners
4. Evaluate and refine the model based on pilot results
5. Scale up the ARA nationally and then globally

Call to Action

- Identify your role in the advanced recycling value chain
- Commit to joining the Advanced Recycling Alliance
- Share your expertise and resources to build this collaborative ecosystem
- Be a pioneer in creating a truly circular economy for plastics

Together, we can transform plastic waste into a valuable resource and

create a sustainable future for generations to come.

Knowledge Check: Advanced Recycling and Grant Application Quiz

Test your understanding:

1. Which plastic is most suitable for chemical recycling?

- a) PVC
- b) Polyethylene (PE)
- c) PET
- d) Bioplastics

2. What temperature range is typically used in pyrolysis?

- a) 100-200°C
- b) 300-900°C
- c) 1000-1500°C
- d) 2000-2500°C

3. What is the funding range for TechCamp small grants?

- a) \$1,000 - \$2,000
- b) \$3,000 - \$5,000
- c) \$10,000 - \$20,000
- d) \$50,000 - \$100,000

4. Which is NOT a key element of a successful grant proposal?

- a) Clear objectives
- b) Detailed budget
- c) Sustainability plan
- d) Company profit projections

5. What's the best approach for collaborative projects?

- a) One partner does all the work
- b) Keep plans secret from other partners
- c) Define clear roles and responsibilities

d) Avoid communicating about challenges

Answers:



Reflection: How did you do? Any areas you need to review?

Charting Your Course: Next Steps and Resources

1. Immediate Actions:

- Review TechCamp materials and notes
- Brainstorm project ideas
- Identify potential collaboration partners
- Start drafting your proposal

2. Key Dates:

- October 13: Grant application deadline
- Late November: Grant fund disbursement begins

3. Application Process:

- Use the provided Qualtrics online application portal
- Complete all sections, including budget template
- Submit before the deadline

www.apchemi.com/techcamp



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