

Scale-up of Mouldable Adhesive Formulations

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**Formative
Formulation 2**

The logo for the RSC Interest Group, featuring a stylized 'C' made of blue and yellow segments.

RSC INTEREST GROUP
FORMULATION SCIENCE
& TECHNOLOGY

Online Conference 12th March 2021

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Agenda

About Me

Mouldable Adhesive Glues – Sugru's Background information

From Formulation Development to Scale-up of Room Temperature Vulcanizing Silicones (RTV)

What changes from Lab Scale to Scale up?

Summary

Next Projects

About Me...



2013

Masters in Chemical Engineering
IPL – ISEL – Lisbon, Portugal



2013

Production Technician



2014

Laboratory Technician and
Research Assistant



2019 - Present

Senior Product Development
Scientist and Health and Safety
Officer



2016

New Product Development
Scientist

About Me...

Sugru by tesa

About Me...



- Manage technical projects and coordinate the work with other scientists and departments, in order to define and fulfil existing and potential market need;
- Making improvements or modifications to current processes and suggest new production processes or stages within the process;
- As HSO I am responsible for working closely with the Health and Safety Consultant and for coordinating all Health and Safety related actions derived from internal audits (risk assessments, COSHH, air quality, etc);



2019 - Present

Senior Product Development Scientist and Health and Safety Officer

- Convert bulk amounts into small packs for retailers and customers while ensuring high quality product

12/03/2021

12/03/2021

Sugru by tesa

2013 Production Technician



Sugru by tesa

- Direct involvement in laboratory research, development of formulations, processes, and root-cause analysis;
- Implementation of a new mixing technology, including advice on design of new equipment, FAT at supplier in USA, and implementation on site;
- Mentoring, supervising and training technical staff when working on specific projects as required; Manager of graduate chemistry placement student;

12/03/2021

Sugru by tesa

2014 Laboratory Technician and Research Assistant



- Responsible for quality assurance of Sugru Product;
- Implement and maintain Standard Operating Procedures for laboratory equipment;
- Help the research team organizing and testing experimental work;

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NEBOSH
National
General
Certificate

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New Product Development
Scientist



Mouldable Adhesive Glues

Sugru's Background information



What is Sugru?



You can Sugruit!

Sugru by tesa

Sugru ●





This is Sugru Mouldable Glue

1-part RTV, highly filled silicone adhesive composite

The world's first multi-purpose mouldable glue that sets strong by turning into a durable, flexible silicone rubber.

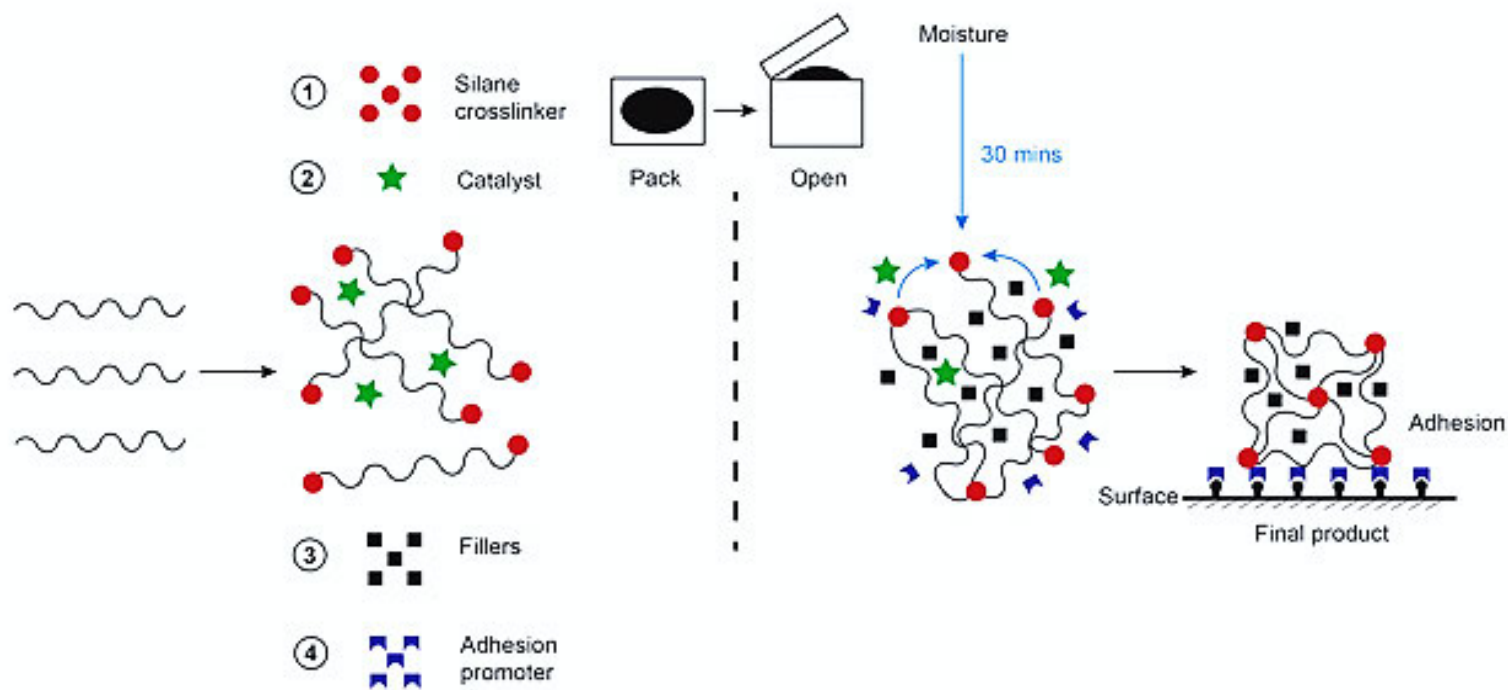
Why is our all-purpose mouldable glue so cool?

Where liquid glues just don't work, tapes are temporary, and epoxies are rigid and hazardous – Sugru Mouldable Glue steps in. With its unique combination of properties and clean ease of use, Sugru delivers results regular glues can't.



	Silicone sealants	Silicone putty	Epoxy putty
RTV-1	✓	✓	✗
hand mouldable	✗	✓	✓
flexible	✓	✓	✗
good adhesion	✓	✓	✓
thermal stability	✓	✓	✓

The Chemistry of Sugru



From Formulation Development to Scale-up of RTV



From Formulation Development to Scale-up of RTV



R&D Idea Conception

Refine the ideas

Initial research and literature review

Consultation with raw ingredient suppliers

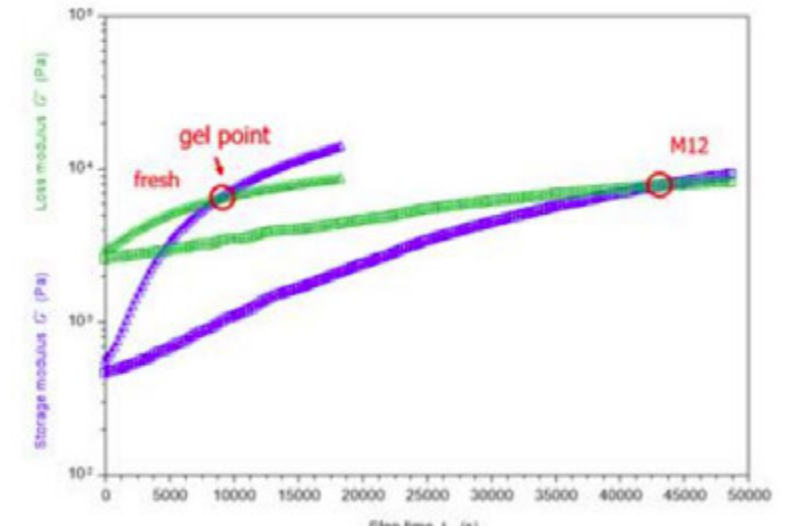
Review of learnings from past formulations projects

From Formulation Development to Scale-up of RTV



Basic Chemistry platform development

- Initial screening of raw ingredients
- Input from past formulations
- Trial and Error
- Test method development for cure profiles (Rheology, cure depth)



From Formulation Development to Scale-up of RTV



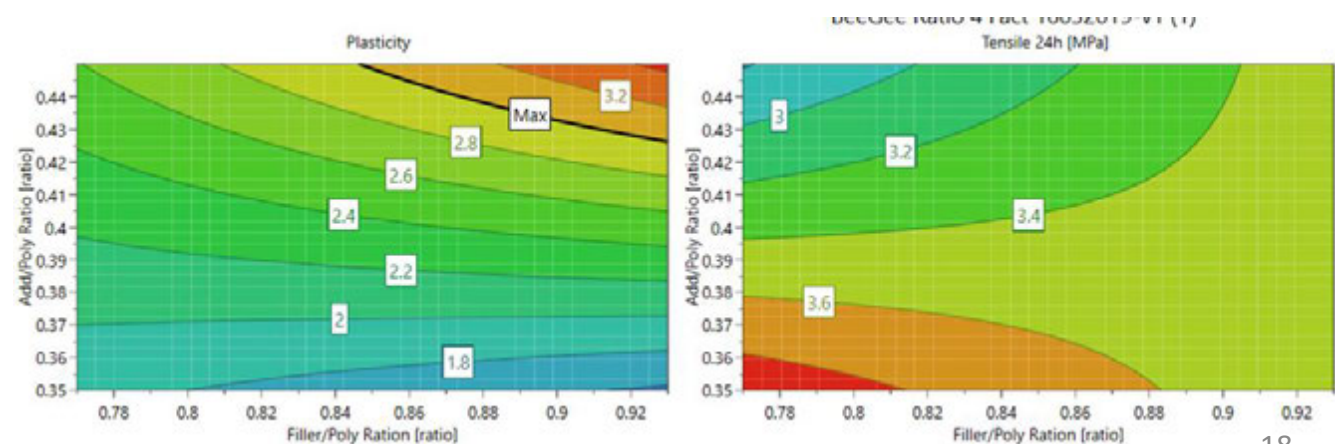
Lab Scale

Optimizing reaction steps through process changes;

Mixing of all ingredients and finding the best combinations;

DOE to identify number of experiments required to do.

Ideal formulation selected;



From Formulation Development to Scale-up of RTV



Product Specification

Specification of different properties locked (mouldability, tensile strength, adhesion strength etc);

Good repeatability achieved for all colour profiles;

Good stability based on highly accelerated life testing;

Pass UX trials;

Plasticity

Quantitative method for mouldability

Higher plasticity -> harder to knead

Lower plasticity -> softer to knead

Tensile strength

Numerical value on the cured properties of the product

Shelf-life of the silicone elastomers monitored

Adhesion strength

Adhesive failure - Failure between sample and Sugru

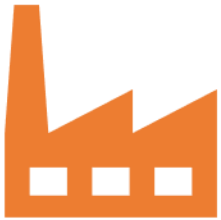
Cohesive failure - Failure within the Sugru

Hardness

Resistance to indentation

Shore A hardness increases with the curing time.

From Formulation Development to Scale-up of RTV



Manufacturing Scale-up

Full process optimization;

Close collaboration with quality control department and mixer operators



What changes from Lab Scale to Scale up?

Times

- Blend times
- Reaction rates
- Addition rates of reactive chemicals

Temperature Gradients

- Heating up/Cooling down
- Hot spots

Order of Addition of reactive ingredients

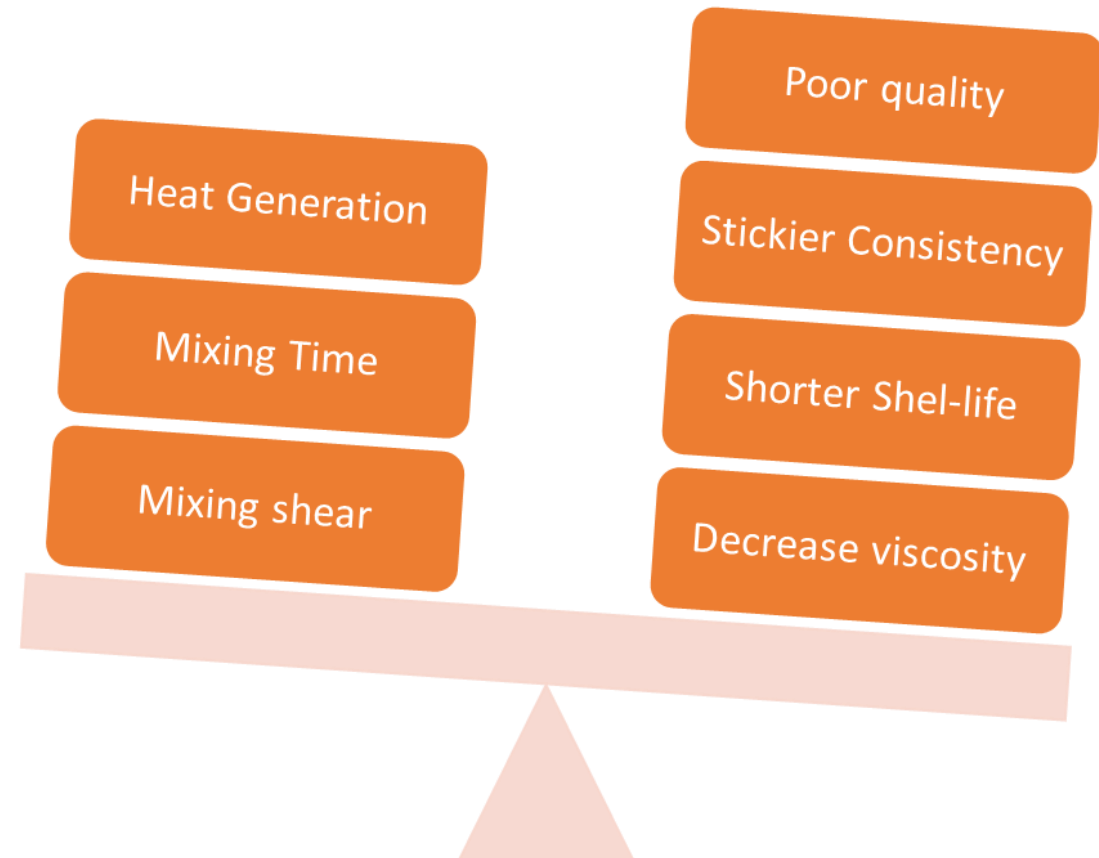
Mixing Speeds

Purity of Reactive chemicals

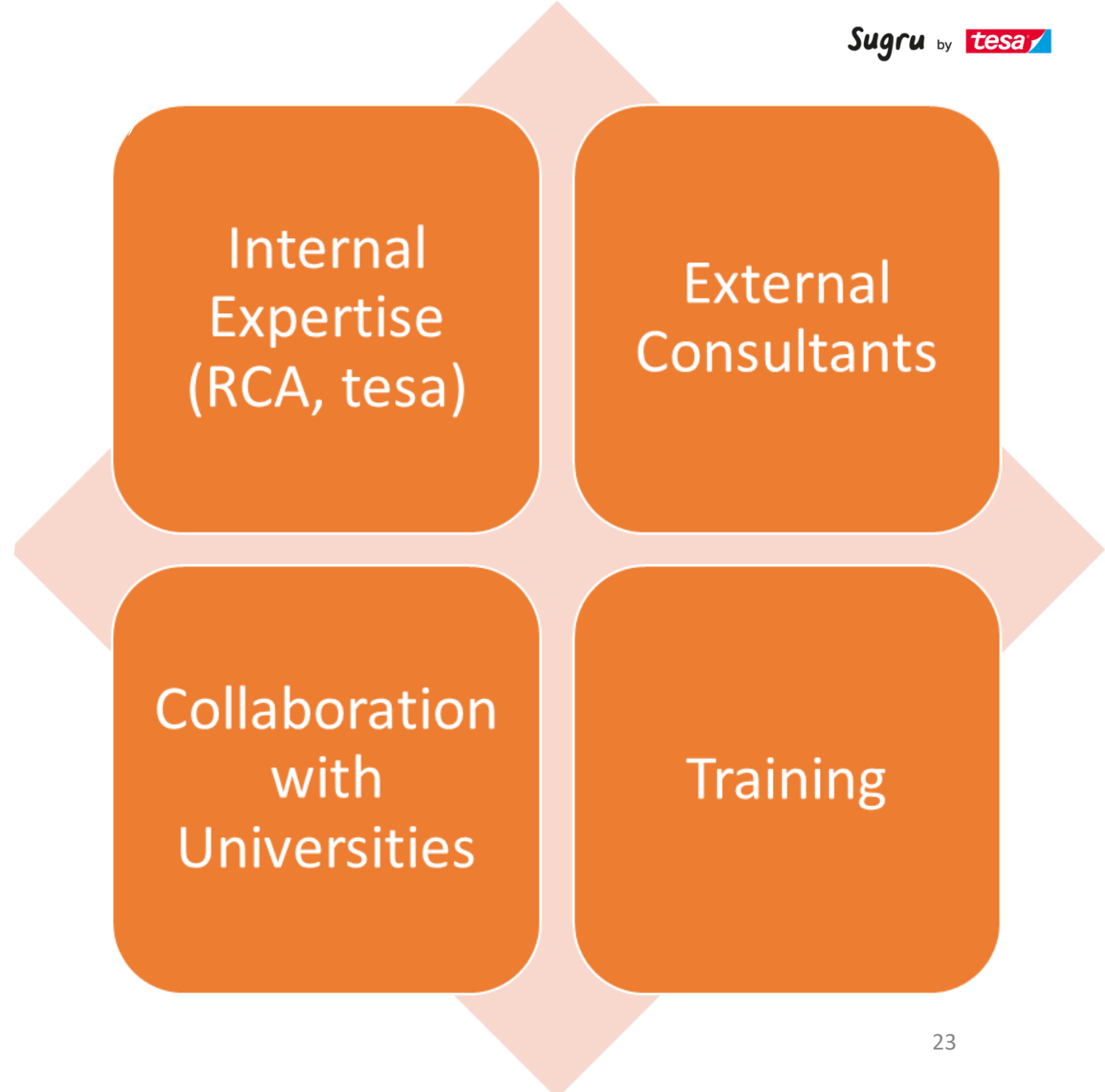
Process Changes

UX Affect

Scale-up: Trade-offs



How do we overcome challenges?



Summary

My Journey

from university
to Health
and Safety to
Senior
Product
Development
Scientist

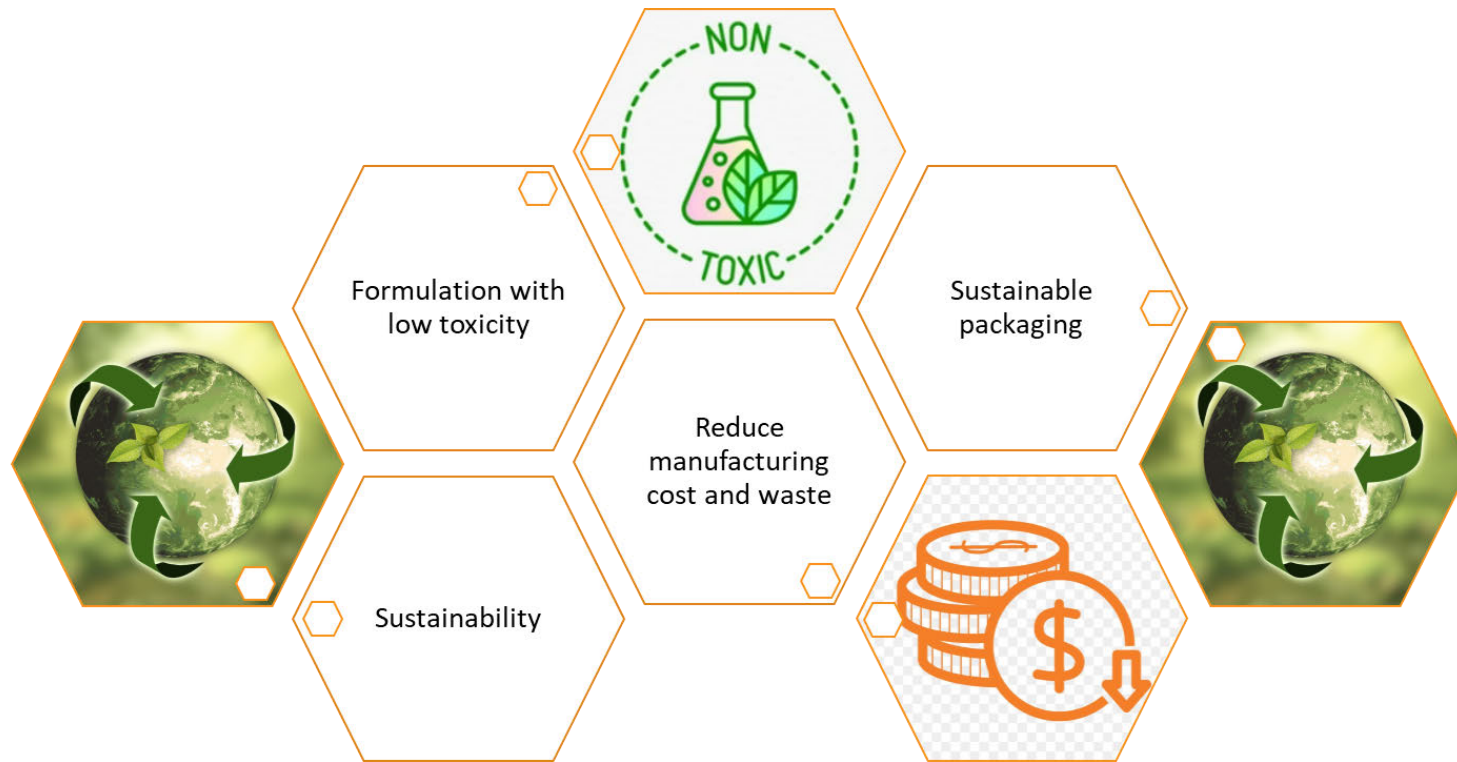
What Sugru is

Mouldable
glue that is
safe to use
by everyone
and helps to
reduce the
waste and
the throw
away culture

Formulation to Scale-up

Steps to
formulate
Challenges and
trade offs in
scale-up
How we tackle
the
challenges

Next Projects



Thank you for Listening!

Priti Mukesh Ariscrisna

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Scientist & Health and Safety Officer

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email: priti@sugru.com



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The logo for the RSC Interest Group Formulation Science & Technology. It features a stylized circular icon with blue, yellow, and red segments on the left, followed by the text 'RSC INTEREST GROUP FORMULATION SCIENCE & TECHNOLOGY' in a blue, sans-serif font.

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FORMULATION SCIENCE
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