



Investment Potential:

2019 GC3 Technology Showcase Finalists

GC3 GREEN CHEMISTRY &
COMMERCE COUNCIL



***Creating an innovation ecosystem for
green chemistry technologies***



Members of the GC3 Startup Network Include:



4th Annual GC3 Technology Showcase & Pitch Competition



**Investment Potential Panel
GC3 Innovators Roundtable
May 8, 2019**



Application
Process



Internal &
External
Review



Semi-Finalist
Selection



Pitch
Competition

3



Winners



Panelists

Al Iannuzzi, Estée Lauder Companies, Inc.

Chris Killian, Eastman Chemical Company

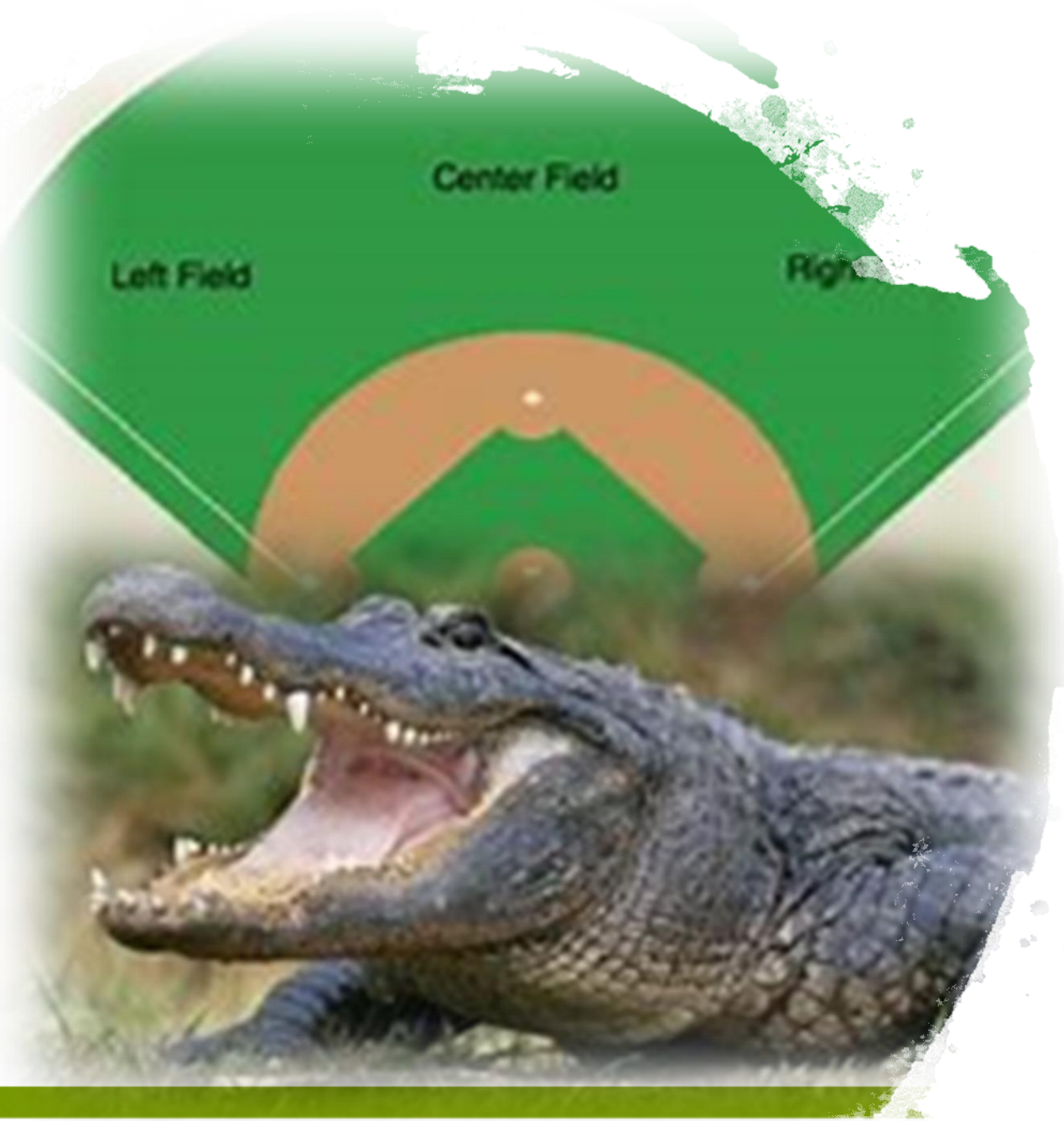
Martin Mulvihill, Safer Made

Brian Stubbert, Dow



2019 GC3 Startup Pitch Competition





Alligator Alley





Synthetic Biology Enabled Manufacturing

www.visolisbio.com

Paul Petersen

Vice President

ppetersen@visolisbio.com

(508) 769-5159



VISOLIS
CARBON NEGATIVE MATERIALS

GC3 Technology Showcase
May 8, 2019

Team

Talented team with key scientific advisors to commercialize bio-based manufacturing

Our Team



Dr. Deepak Dugar, Founder and CEO



Erik Rutten, VP, Business Development



Paul Petersen, VP, Sales



Dr. Lin Louie, Director of Catalysis



Dr. Brian Lee, VP, Biotechnology



Scientific Advisors



Dr. Larry Evans



Prof. Jay Keasling



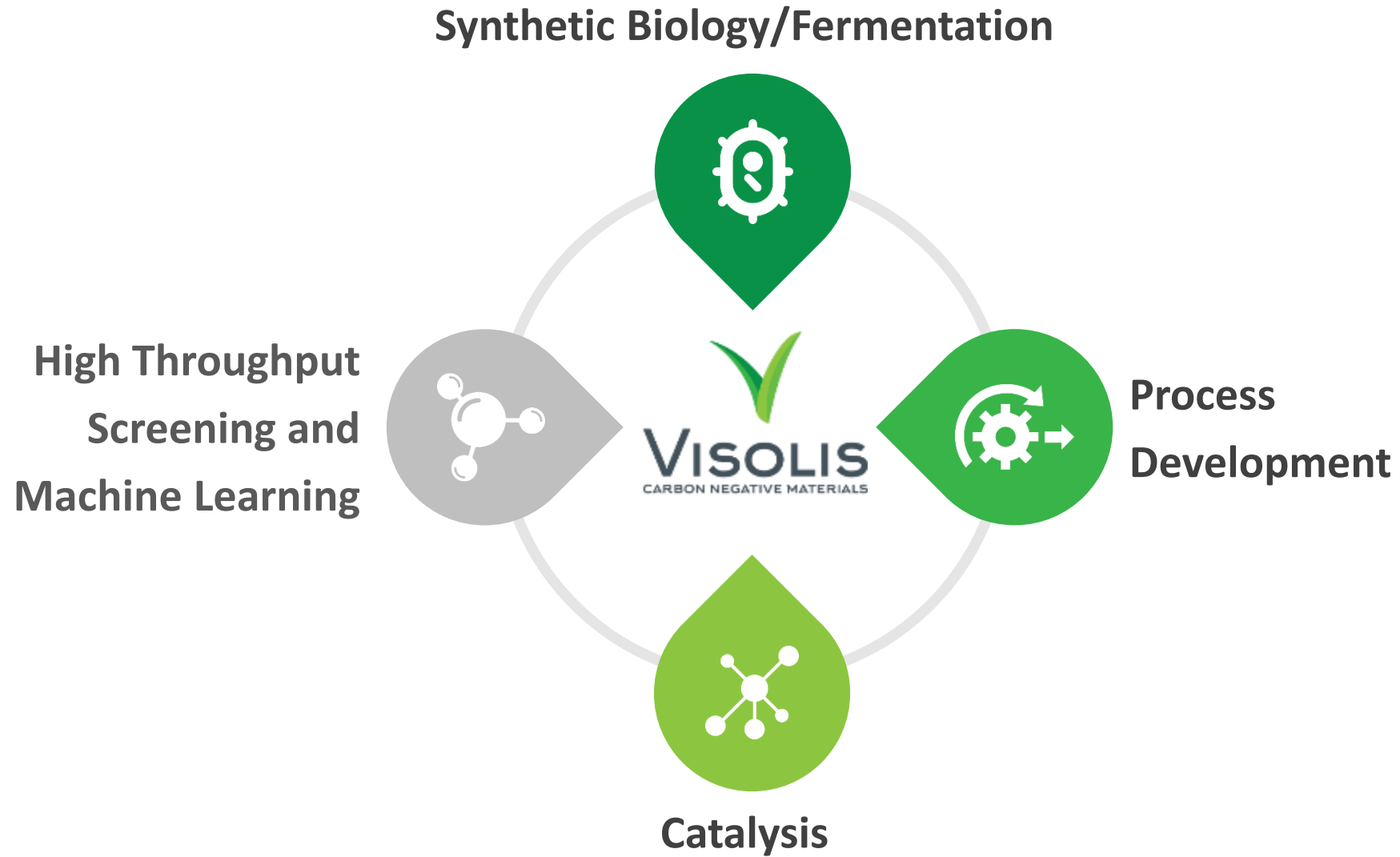
Prof. F. Dean Toste



Company Highlights

- 15 full time scientists and engineers in Berkeley, CA and Geleen, Netherlands
- Additional 10+ FTE contractors
- Acquired fermentation assets in Canada with replacement value of USD 170 million

Technology



Platform Applications

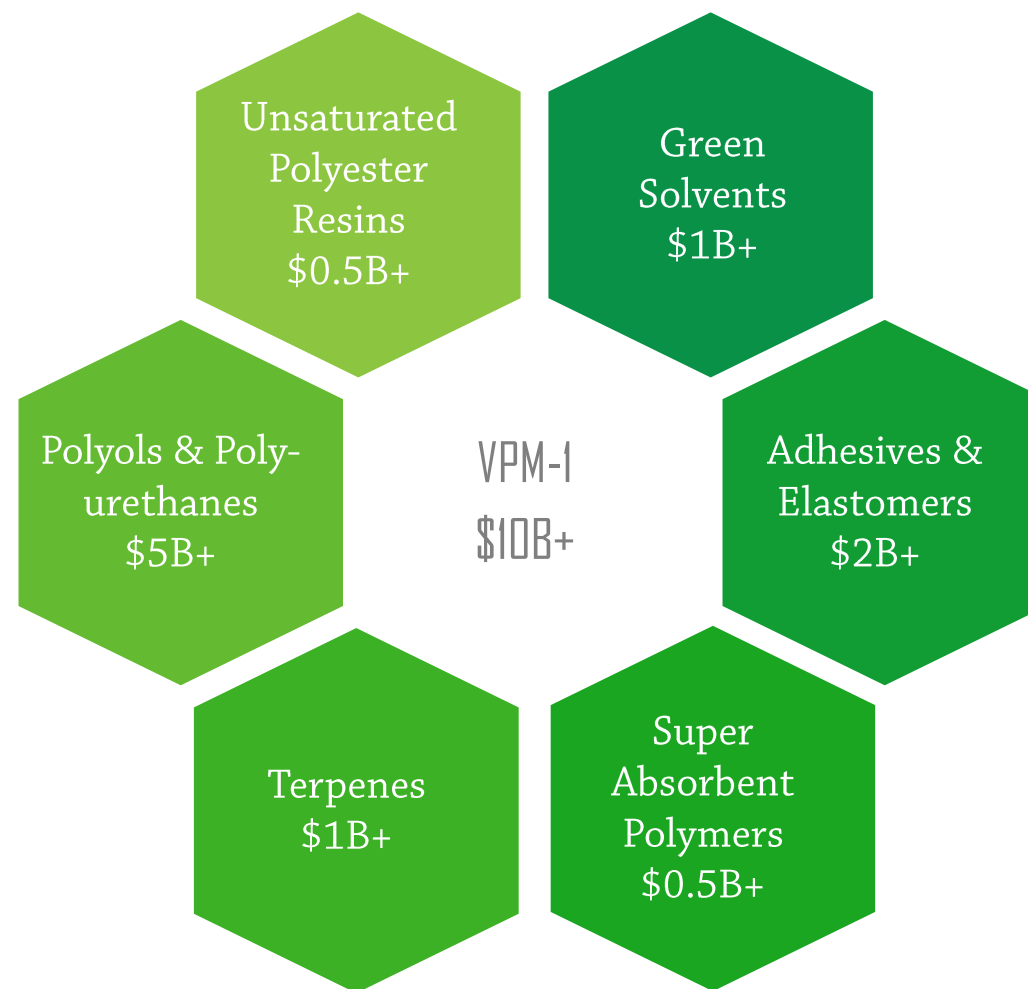
Our first platform molecule (VPM-1) can reach broader opportunities exceeding \$10 billion in market size

Our Base Platform

- » Poly-functional molecule
- » Cost-competitive
- » 100% bio-based
- » Offers drop-in replacements and new chemical offerings

Raw Materials

- » Sugars
- » Biomass (corn, waste, glycerol)
- » Syngas from fossil sources or renewable electricity (future)

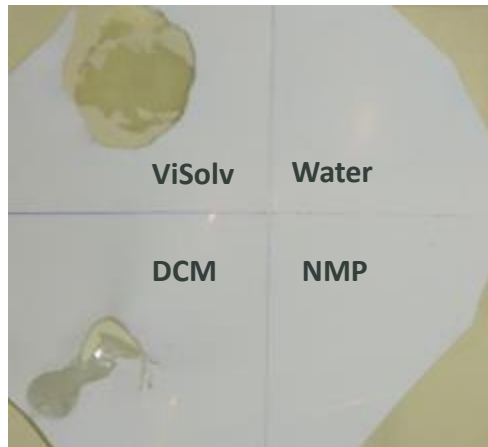


Application Examples from VPM-1

New Green Solvent and Drop-In Building Block Molecule

New Green Solvent with Performance Advantages

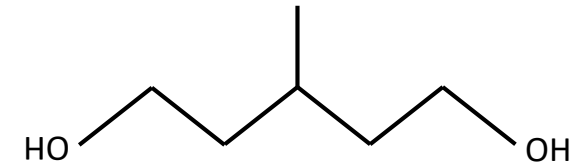
- » **Aggressive Solvent:** Similar to Dichloromethane (DCM) and N-Methyl Pyrrolidone (NMP) in Hansen solubility space
- » Can **dissolve high performance polymers** like PES, PAN, PVC, Polycarbonate
- » New application potential in **polymer recycling and processing**



- 50 ul of ViSolv, NMP, DCM and water were spotted on a PES membrane for 10 sec.

- ViSolv rapidly dissolves the membrane relative to other solvents.

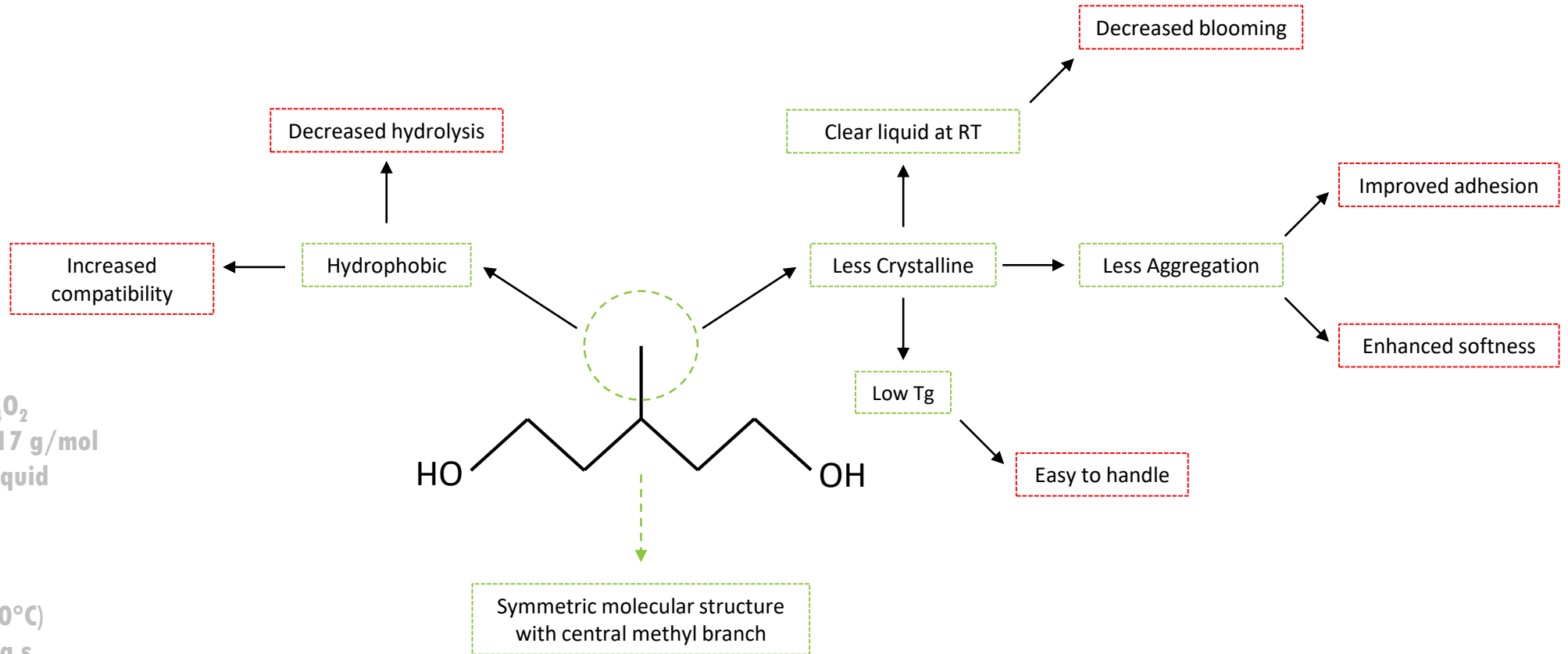
Bio-Based Diol Offering Drop-In Replacement



- » **MPD (3-Methyl-1,5-pentanediol)** is low viscosity liquid C6 diol
- » Used in production of **specialty inks, coatings and performance adhesives**
- » **Limited market supply** due to expensive production via traditional petro-chemical routes
- » Visolis technology enables **less costly, new bio-based route**

MeVol™ - MPD (3-Methyl-1,5-pentanediol)

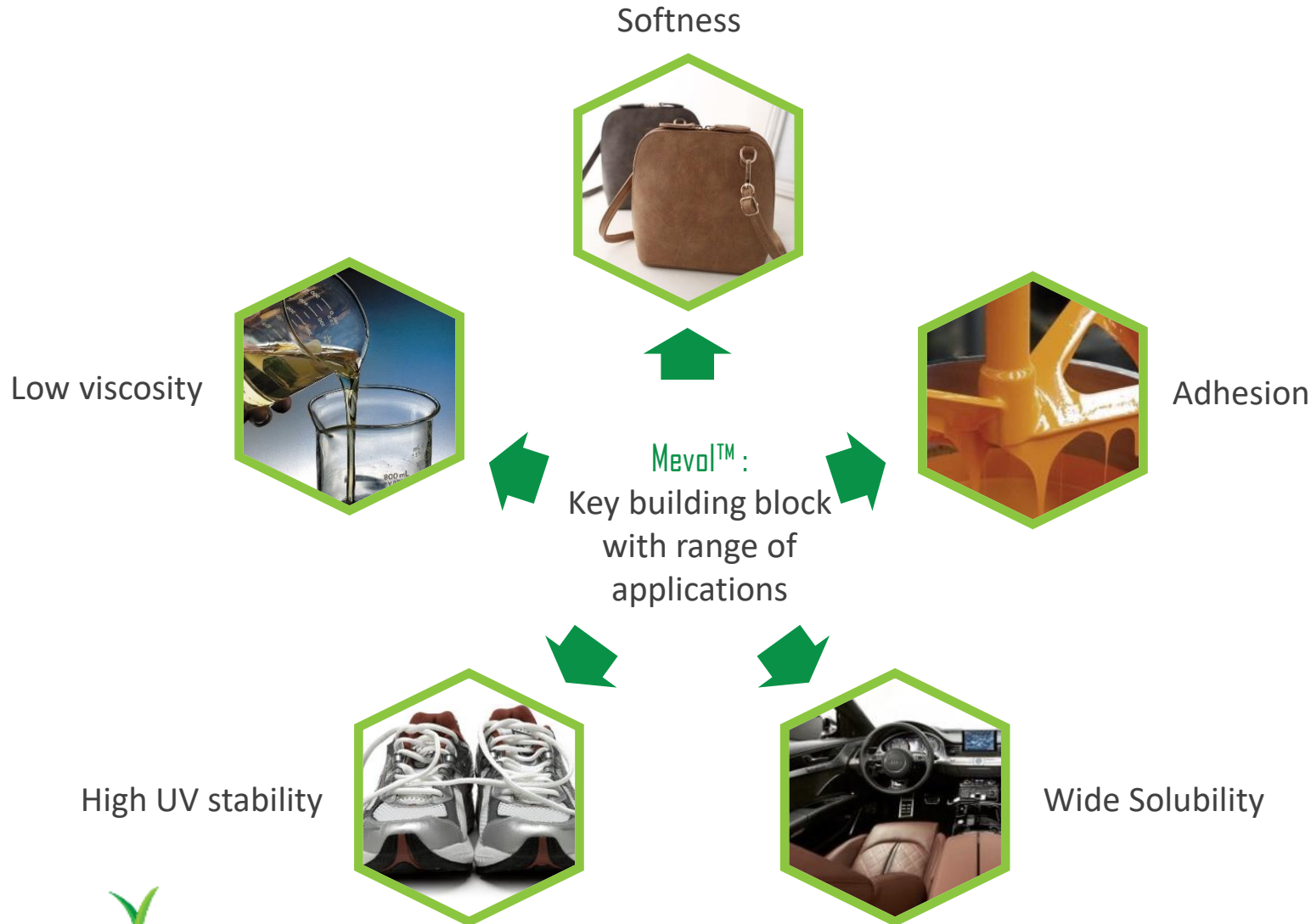
Bio-based diol with unique molecular structure; leading to advantages in a wide range of applications



Chemical Formula: $C_6H_{14}O_2$
Molecular Weight: 118.17 g/mol
Appearance: Colorless liquid
Boiling Point: 250°C
Melting Point: < -50°C
Flash Point: 143°C
Specific Gravity: 0.97 (20°C)
Viscosity (20°C): 173mPa s
Solubility in H₂O: Infinite

Specialty Polymer Precursor

MeVol™: Key diol monomer for high performance polyurethanes, polyesters and polycarbonate polyols

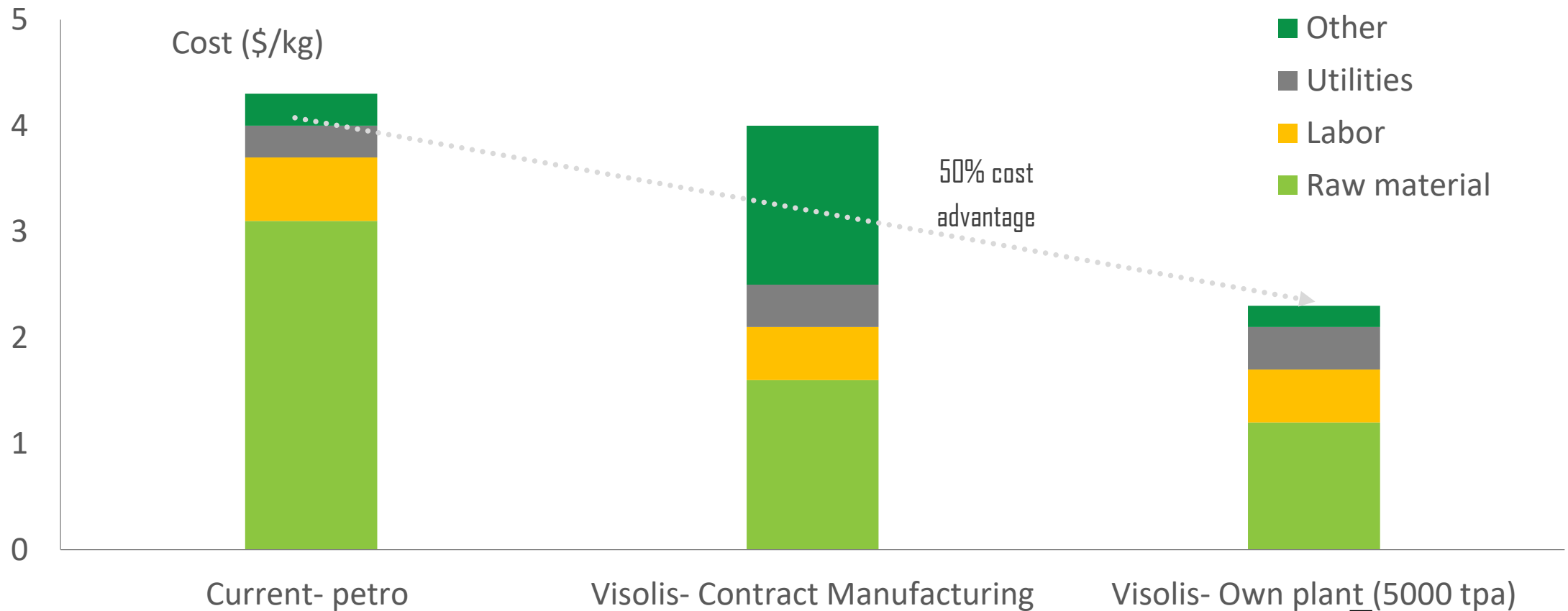


Market Overview

- » Mevol is used in making specialty inks, coatings and high performance adhesives today
- » It is very expensive to make via traditional petrochemical routes
- » Visolis technology enables reduction in cost of manufacturing

Significant Competitive Advantage Due to Low Cost Position

Compared to existing sole supplier

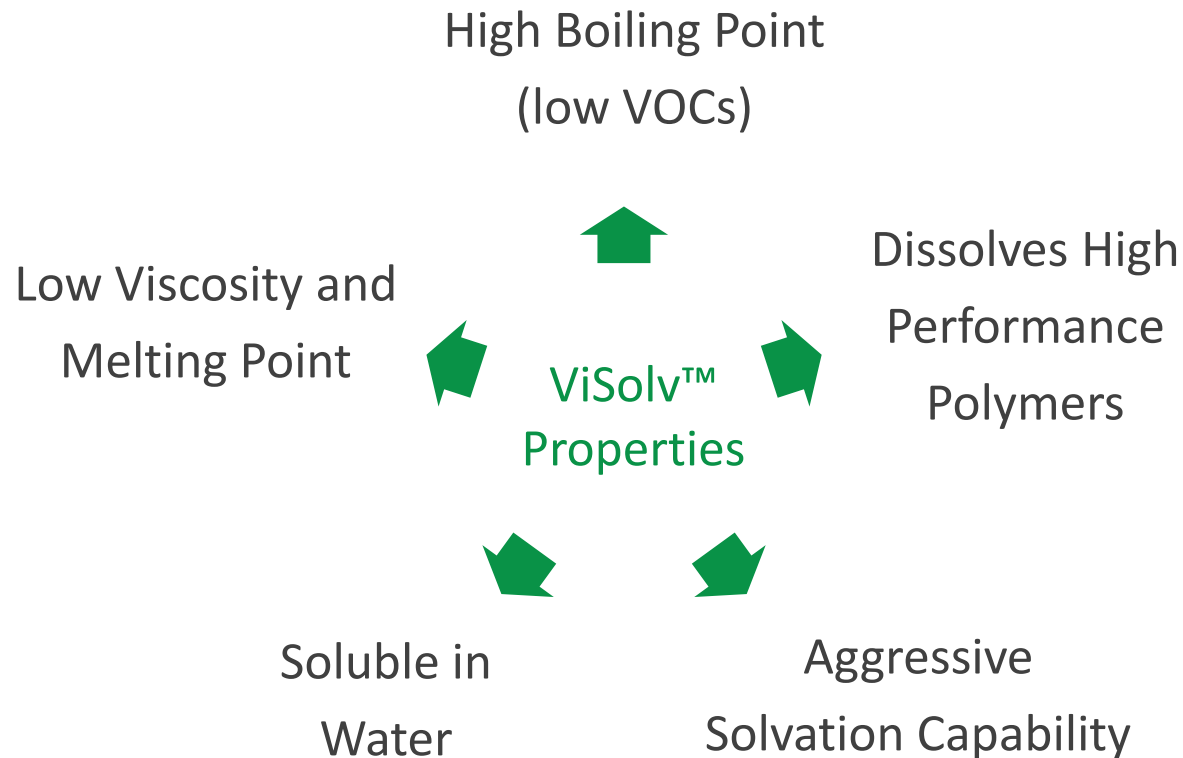


- Low yields due to six step process
- Expensive raw materials

- High yield due to two step process
- Cheaper raw materials

High Performing Solvent - ViSolv™

New bio-based high performing solvent made from renewable feedstocks



Product Summary

- » High boiling point (above 230°C)
- » Low melting point (below -20°C)
- » Low viscosity (3cps viscosity) liquid at room temperature

Market Overview

- » Competitively priced to similar solvents currently used in the industry
- » Potentially better health hazard profile relative to toxic high-performance solvents

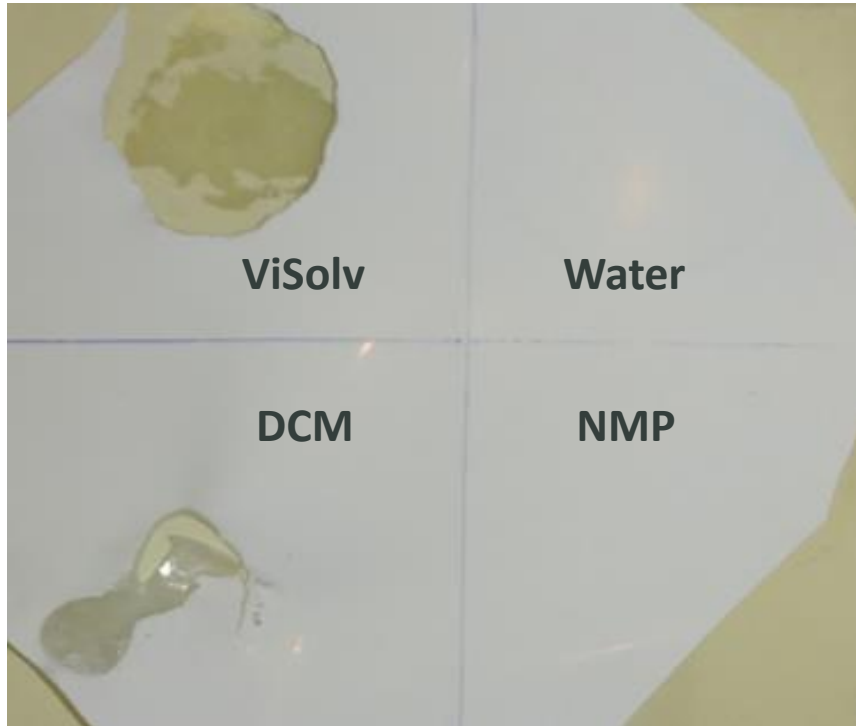
ViSolv™

Similar to NMP (N-methyl pyrrolidone) and DCM (dichloromethane) in Hansen Solubility Space

Solvent	δD	δP	δH	Distance
ViSolv	17.4	9.8	7.4	0
DCM	17.0	7.3	7.1	2.6
NMP	18.0	12.3	7.2	2.8
Cyclohexanone	17.8	8.4	5.1	2.8
1,4-Dioxane	17.1	6.8	7.8	3.1
MEK	16.0	9.0	5.1	3.7
Acetone	15.5	10.4	7.0	3.9
1,3-Dioxolane	18.1	6.6	9.3	3.9
Dibasic Esters	16.2	6.5	8.4	4.2
THF	16.8	5.7	8.0	4.3
Butyl Benzoate	18.3	5.6	5.5	4.9
Methyl Acetate	15.5	7.2	7.6	4.6
DMF	17.4	13.7	11.3	5.5
Ethyl Acetate	15.8	5.3	7.2	5.5

Ability to dissolve high performance polymers like PES, PAN, and PEI

Solvent Spotting on PES Membrane



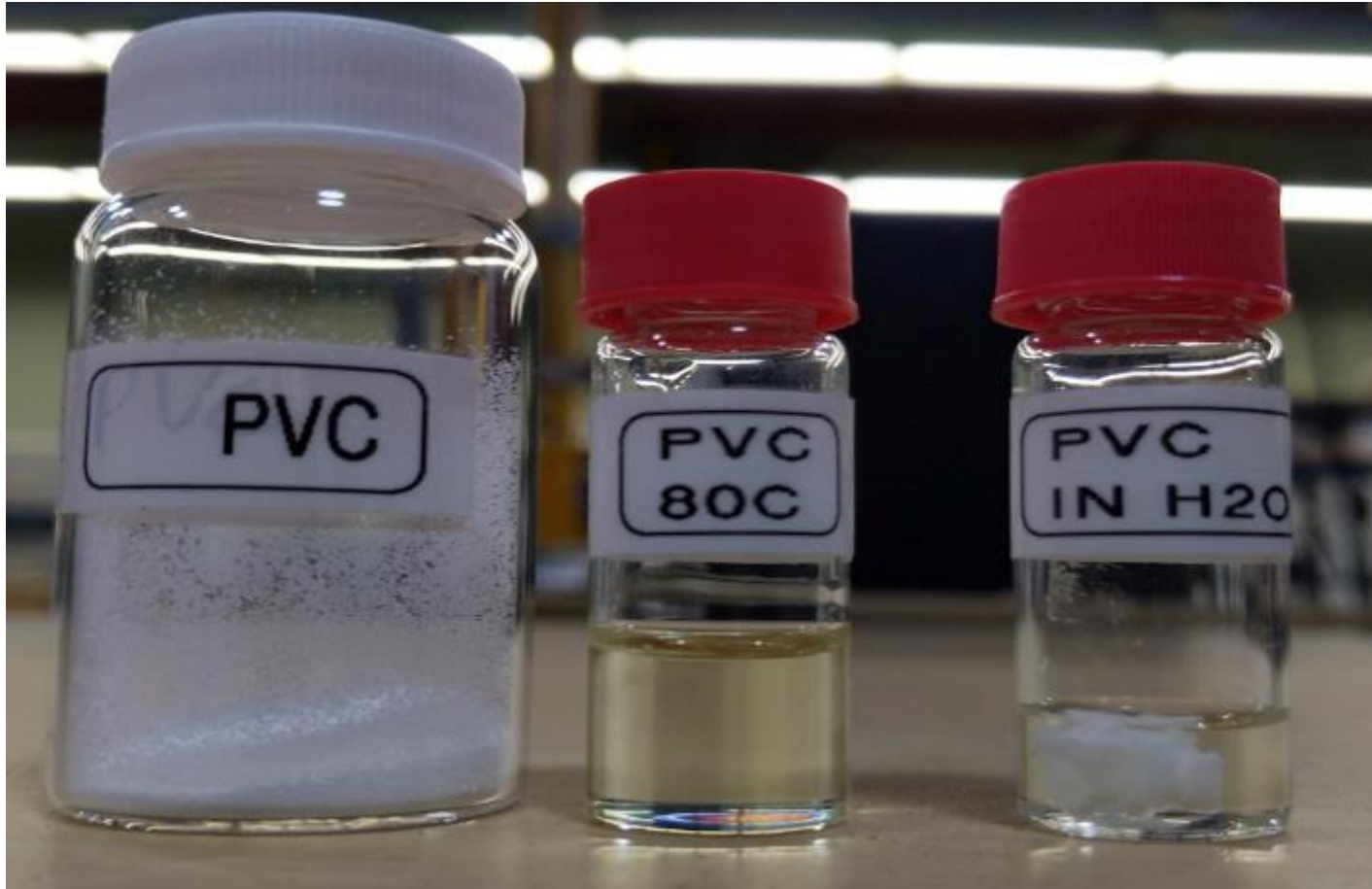
Polymer	Dissolved (Y/N)	Polymer	Dissolved (Y/N)
PEI, 80°C	Y	PEI, 150°C	Y
PVA, 80°C	Y	PVA, 150°C	Y
PVB, 80°C	Y	PVB, 150°C	Y
PS, 80°C	Y	PAI, 150°C	Y
PMMA, 80°C	Y	Nylon, 150°C	Y
PVC, 80°C	Y	PS, 150°C	Y
PLA, 80°C	Y	PMMA, 150°C	Y
PC, 80°C	Y	PVC, 150°C	Y
PAN, 80°C	Y	PEEK, 150°C	N
PPS, 80°C	N	PVDF, 80°C	N

PEI: Polyether imide
 PVA: Polyvinyl acetate
 PVB: Polyvinyl butyral
 PS: Polystyrene
 PMMA: Polymethyl methacrylate
 PVC: Polyvinyl chloride
 PLA: Polylactic acid
 PC: Polycarbonate
 PAN: Polyacrylonitrile
 PAI: Polyamide imide
 PPS: Polyphenylene sulfide
 PEEK: Polyether etherketone
 PVDF: Polyvinylidene fluoride
 PES: Polyether sulfone

- 50 ul of ViSolv, NMP, DCM and water were spotted on a PES membrane for 10 sec.
- ViSolv rapidly dissolves the membrane relative to other solvents.

ViSolv™

Recycling of high performance polymers using anti-solvents

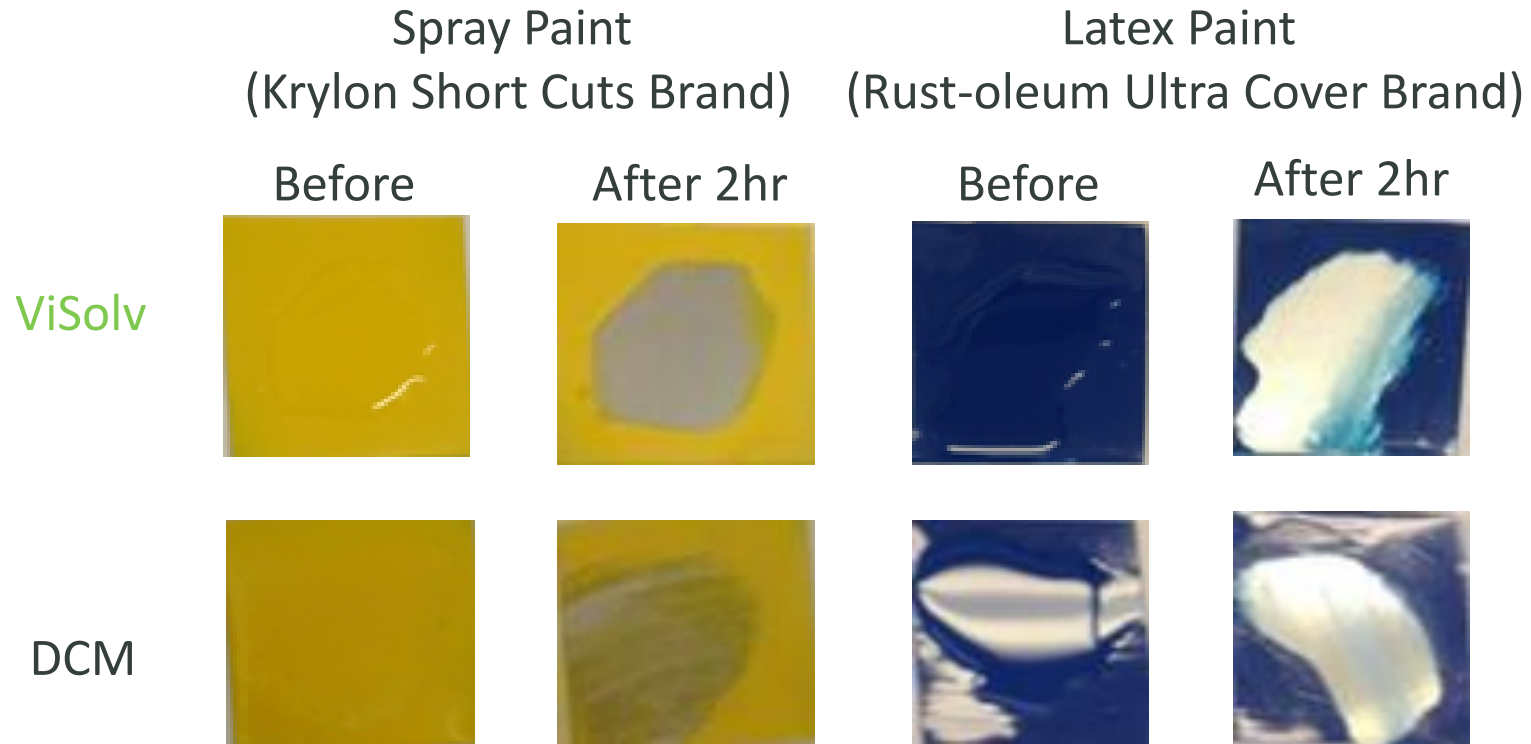


From L to R:

- 1) PVC standard
- 2) 10% PVC dissolved in ViSolv™ at 80°C
- 3) PVC precipitation on mixing solution 2 with H₂O as anti solvent.

ViSolv™

Increased Ability to Remove Paints compared to Dichloromethane (DCM)



- Metal flashings were painted with craft spray paint and latex brush-on paint and cured for 24 hours.
- Solvent was applied, let to sit for two hours, and wiped off

BioCat Polymers Consortium

EU Funded project to bring bio-chemicals to market

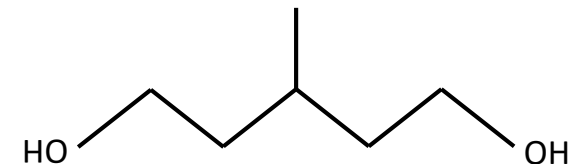
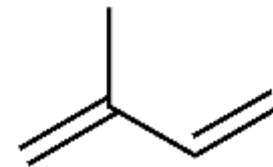


Summary

- » BioCatPolymers is a 3-year European project funded by the European Union's Horizon 2020 research and innovation program
- » The objective is to demonstrate a cost-effective, sustainable and efficient cascade technological route for the conversion of low-value, low-quality residual biomass to bio-polymers with equal or better performance than their fossil-based counterparts
- » Specifically focused on two monomers:
 - » Isoprene
 - » 3-MPD

BioCat Polymers Workshop takes place on May 15, 2019 in Delft, Netherlands!! Free to attend!!

CENTRE FOR RESEARCH & TECHNOLOGY-HELLAS	CERTH CENTRE FOR RESEARCH & TECHNOLOGY HELLAS
SEKAB E-Technology AB	SEKAB
VISOLIS BV	VISOLIS
BIOPROCESS PILOT FACILITY BV	BPF
PROCESS DESIGN CENTER BV	PDC
QUANTIS SARL	Quantis
COVESTRO DEUTSCHLAND AG	covestro



Scale-Up: Concept to Commercial Production in Just 2 years

Stage A (R&D)

Stage B (Scale up)

Stage C (Commercial)

500ml
Lab Scale



✓ Yield

5L Scale



✓ Titer
✓ Productivity

2016-17
Pilot/demo scale
0.3-9 kL, 100ton/yr



✓ Process validation
✓ Launch Application 1
(fine chemical)

2018-2019
Small commercial volumes
50-200kL, 500-2000 ton/yr



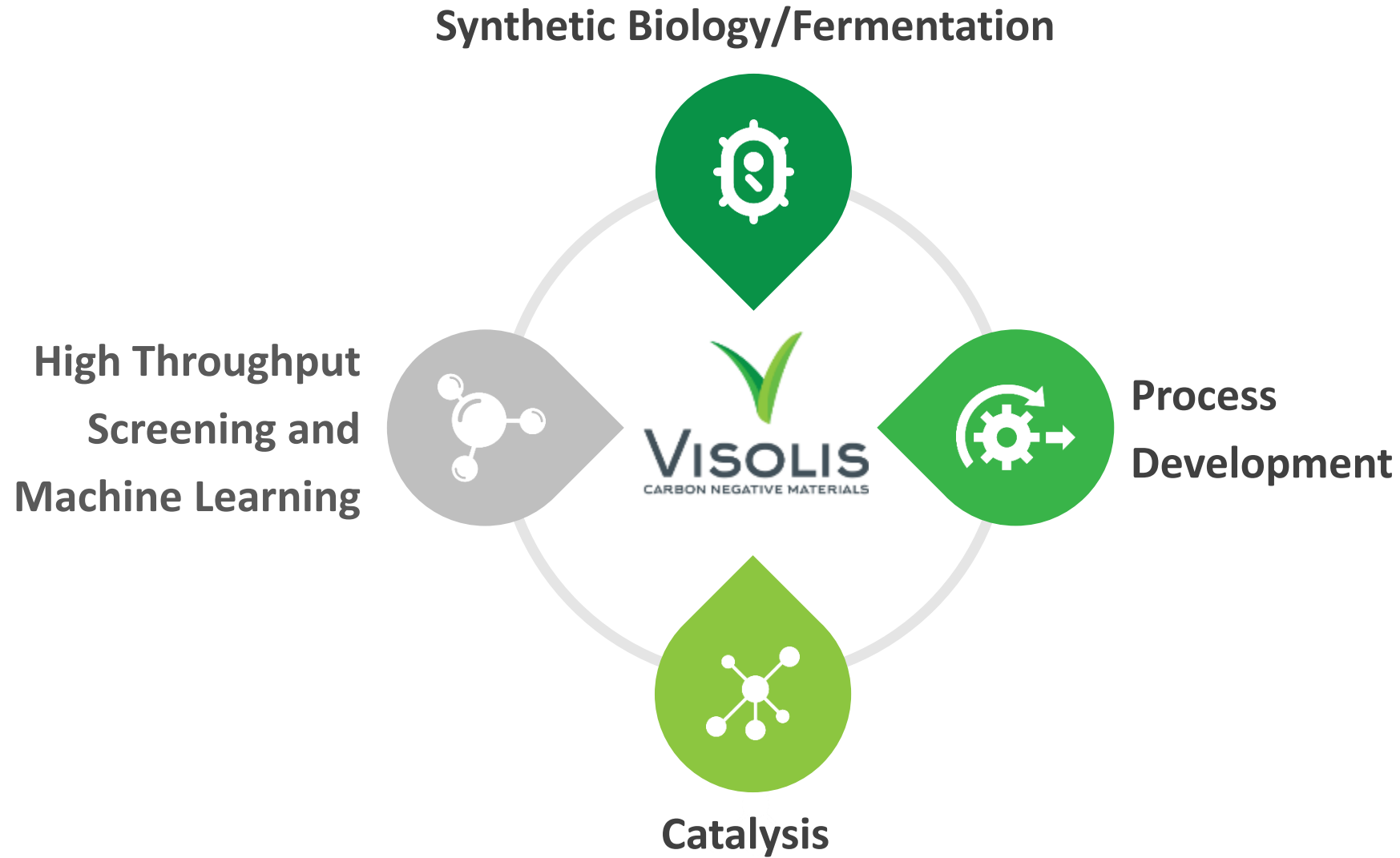
✓ JV partnership
• Launch Application 2
(specialty chemical)

2020 onwards
World-scale production
3M Liter, 30,000 ton/yr



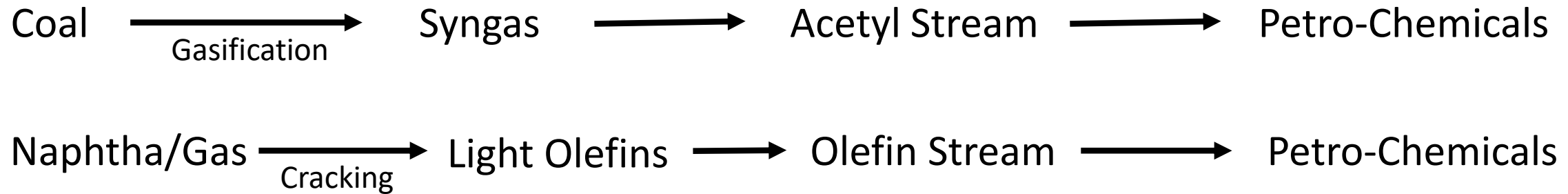
- Visolis JV to own and operate world scale bio-chemicals plant in Sarnia
- Launch Application 3
(bulk and other usage)

Technology

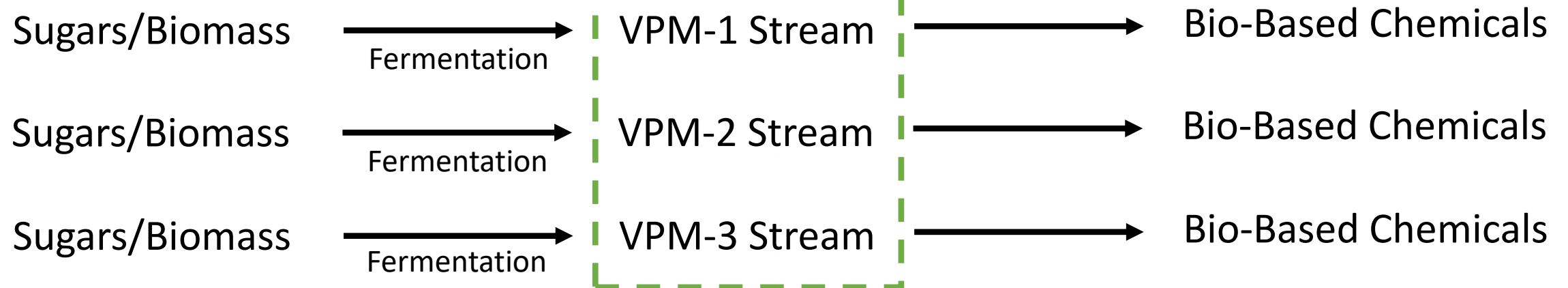


The Future?

Conventional Chemical Manufacturing



Potential Chemical Manufacturing



Grants, Awards & Investments

\$15 Million in total funding till date and more in pipeline

Grants



Awards



Contact Info:
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Synthetic Biology Enabled Manufacturing

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Vice President

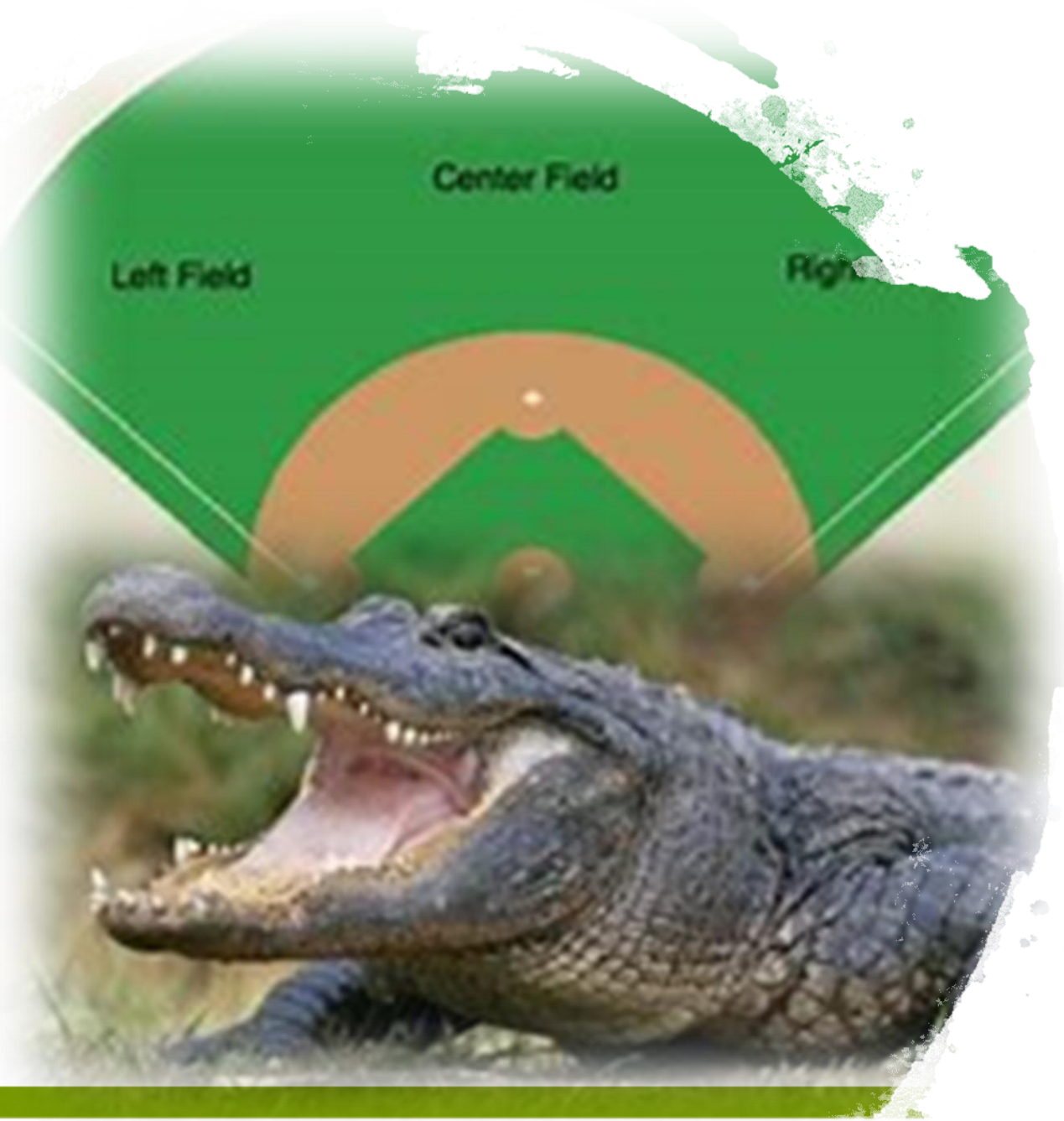
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CARBON NEGATIVE MATERIALS

GC3 Technology Showcase
May 8, 2019



Alligator Alley





Sustainable textile dyeing with synthetic biology

We are the only dyeing technology that exclusively uses renewable resources

Green Chemistry & Commerce Council, 8 May 2019

Dr David Nugent Chief Commercial Officer



NATURAL PIGMENTS



Coccinellids



Murex snail



Indigofera

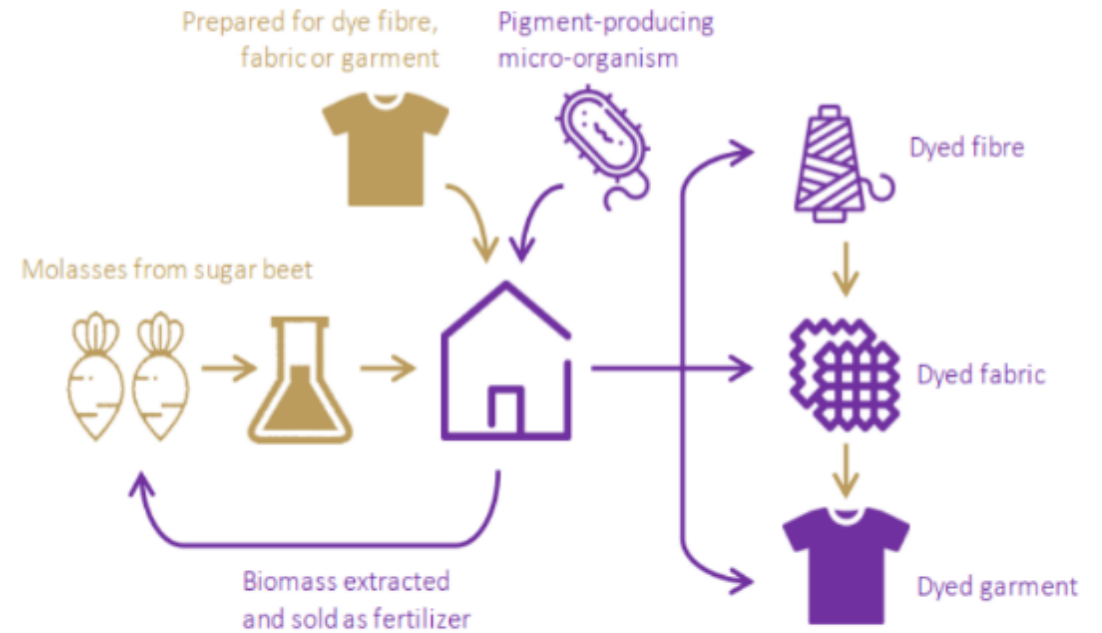


GREENPEACE

OUR SOLUTION



- Microorganisms engineered to produce, transfer and fix pigments onto substrate
- Zero hydrocarbons. Less water. Less energy.
- No hazardous chemicals
- Industrial fermentation. Existing dye machines
- Natural and synthetic fibres
- Excellent performance



VALUE PROPOSITION



→ We meet all primary customer requirements in a market searching for sustainable solutions

Primary customer need	Colorifix USPs
Sustainable Dyeing solutions that minimally impact the natural environment	Low-value agricultural by-products converted into pigments and dyed textiles. Zero hydrocarbons. Less water. Less energy. No hazardous chemicals.
Scalable Processes that can be scaled to >500kg per dyeing batch	Pigments will be grown using industrial fermenters and transferred using existing dye machines
Affordable Minimal or zero cost premium over conventional synthetic pigments	Minimal cost premium over synthetic pigments
Wide range of fabrics Applicable to widest range of synthetic and natural fibres	Uniquely capable of dyeing both natural and synthetic fibres
High performance Replicate or improve upon the durability of synthetic pigments	Meets or even exceeds the wash fastness of synthetic pigments
Wide colour palette Replicate or exceed the colour range of synthetic pigments	Nature is our palette. Almost any pigment found in Nature can be replicated using the Colorifix process

Hi David,

Disperse dyes are again going to increase in price due to the further Chinese chemical plant explosion and again we face shortages in supply.

We are keen to support in any way we can, to develop a working relationship going forward as an industrial partner and to promote your technology.

It is clear there is an urgent need for the whole dyestuff market to change. Dyestuff production is currently not sustainable on an economic basis and more importantly definitely not on an environmental level.

Thanks



Dyehouse Technical Manager

Email received 24 April 2019







WIRED

INSIDE
JEFF BEZOS'
LUNAR
MISSION

STELLA
MCCARTNEY
AND THE
SUSTAINABLE
BUSINESS
REVOLUTION

FASHION

GOES
TECH

THE
FUTURE
OF
RETAIL

RADICAL
INTEGRITY
HYPER
PERSONALISED
DATA DRIVEN
POP-UPS
ROBOT STYLISTS!

2019
TRENDS
BRIEFING

INSIGHTS
FROM GOOGLE
AMAZON
FACEBOOK &
MICROSOFT



COLORIFIX, UK

Problem: Dyeing textiles is typically incredibly water-intensive, with chemical runoff often seeping into water supplies.

Solution: Colorifix's dye uses synthetic biology to engineer bacteria with dye-giving properties; the company claims this uses ten times less water than conventional dyeing.



FROM INNOVATION TO IMPACT

Daring innovation lives here. Through our Accelerator and Scaling Programmes, Fashion for Good helps to grow ideas that are shaping the future of the fashion industry. These innovations challenge us to rethink every step of how a product is made. Materials made from food waste. Business models designed for renting and reselling. Technologies that "close the loop" so that old clothes can be turned into new ones. Because doing good is not simply doing less bad; it is about creating technologies and systems that actively benefit us all.





TV

The Future of Fashion: Colorifix

2018 | 4 mins

Synopsis

What started with an investigation into the water quality in Asia ended in the creation of a pollution-free dye. After residents in Nepal and Bangladesh found copious amounts of harmful chemicals in the water left by the textile industry, the engineers at Colorifix pioneered a way to reproduce the colours of the natural world using microorganisms that bind with fabric. Guided by nature, Colorifix offers a greener future for fashion.



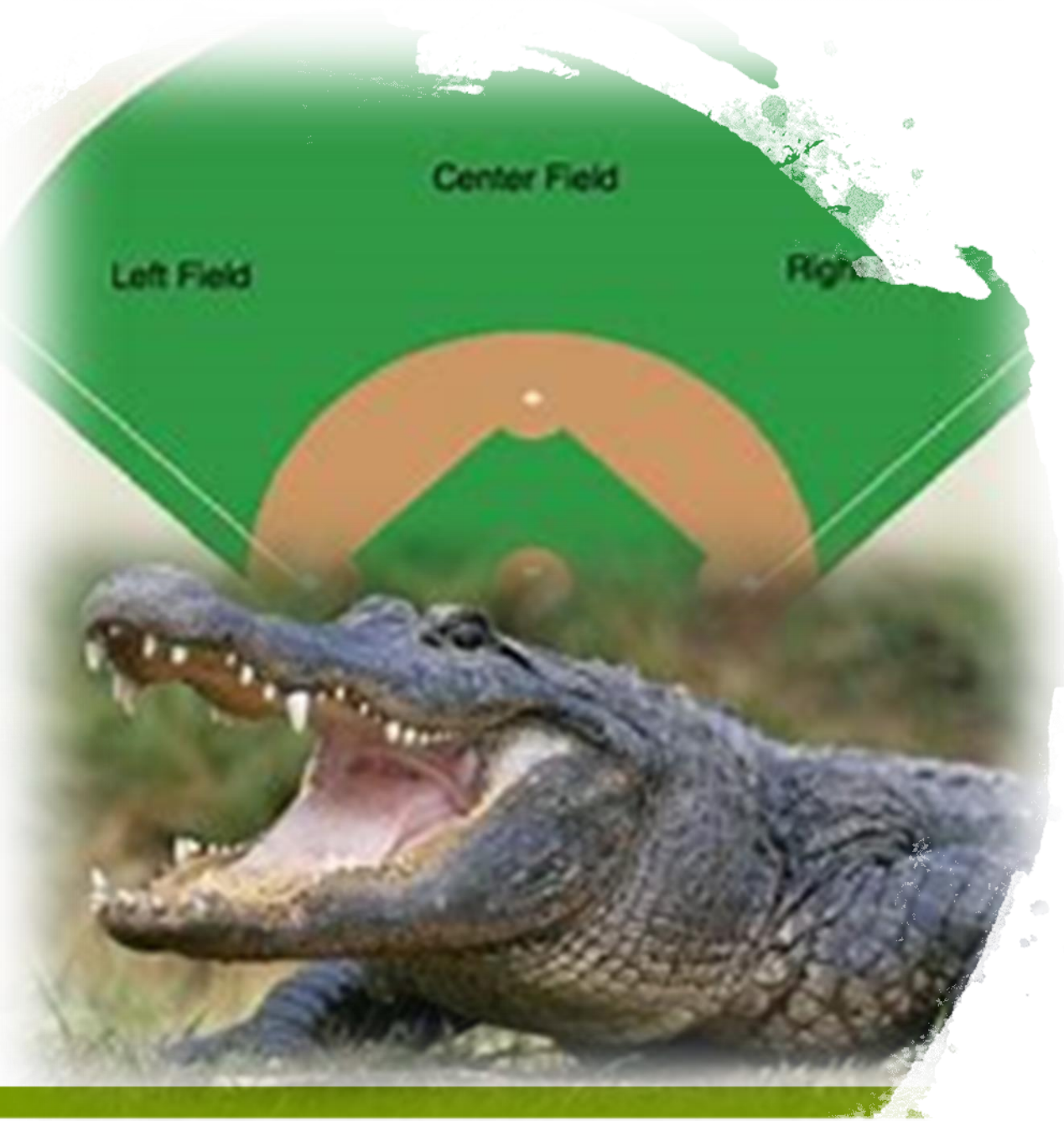
Sustainable textile dyeing with synthetic biology

We are the only dyeing technology that exclusively uses renewable resources

Green Chemistry & Commerce Council, 8 May 2019

Dr David Nugent Chief Commercial Officer





Alligator Alley





Creating Big Things from Small Fibers

Presented by Dr. Kevin White

Chief Operating Officer and Principal Scientist



The Recap

- Bio-inspired approach for adhesion
- Scalable and versatile manufacturing platform
- Re-founded in 2015 with NSF SBIR Phase II grant



The Struggles

- Translating lab-scale success
- “Dancing with elephants”

The background of the slide features a stack of white adhesive tape rolls. One roll is leaning against the stack on the left side, while the rest of the stack is positioned towards the center and right. The lighting is soft, highlighting the texture of the tape.

The Progress

- Scale-up in 2018 – how to qualify?
- Process “lock” in November
- Customer “re-discovery”

Shop

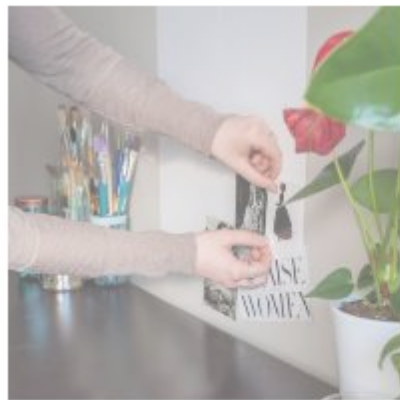
ALL

PINLESS PICS

PINLESS PLUS

PINLESS POST

PINLESS PRO



Pinless Post Mounting and Display Board (White Background)

from \$10.00



Pinless Pics Premium Gloss Inkjet Photo Paper

from \$7.50

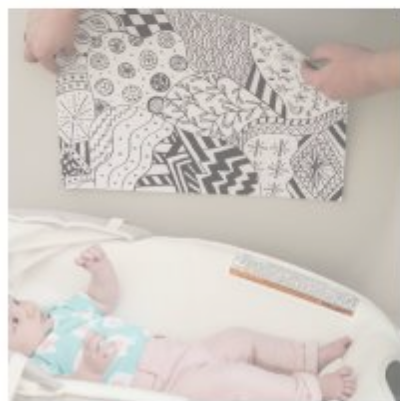


Pinless Pics Matte Inkjet Photo Paper

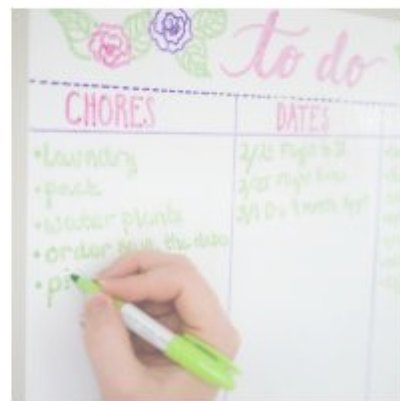
from \$10.00

The Launch

Pinless™ Brand Products



Pinless 80# Gloss Cover Digital Paper



Pinless Plus White Dry Erase Board



Trial Pack

\$25.00

John

<Joh. May 7, 2019, 6:32 PM (15 hours ago)



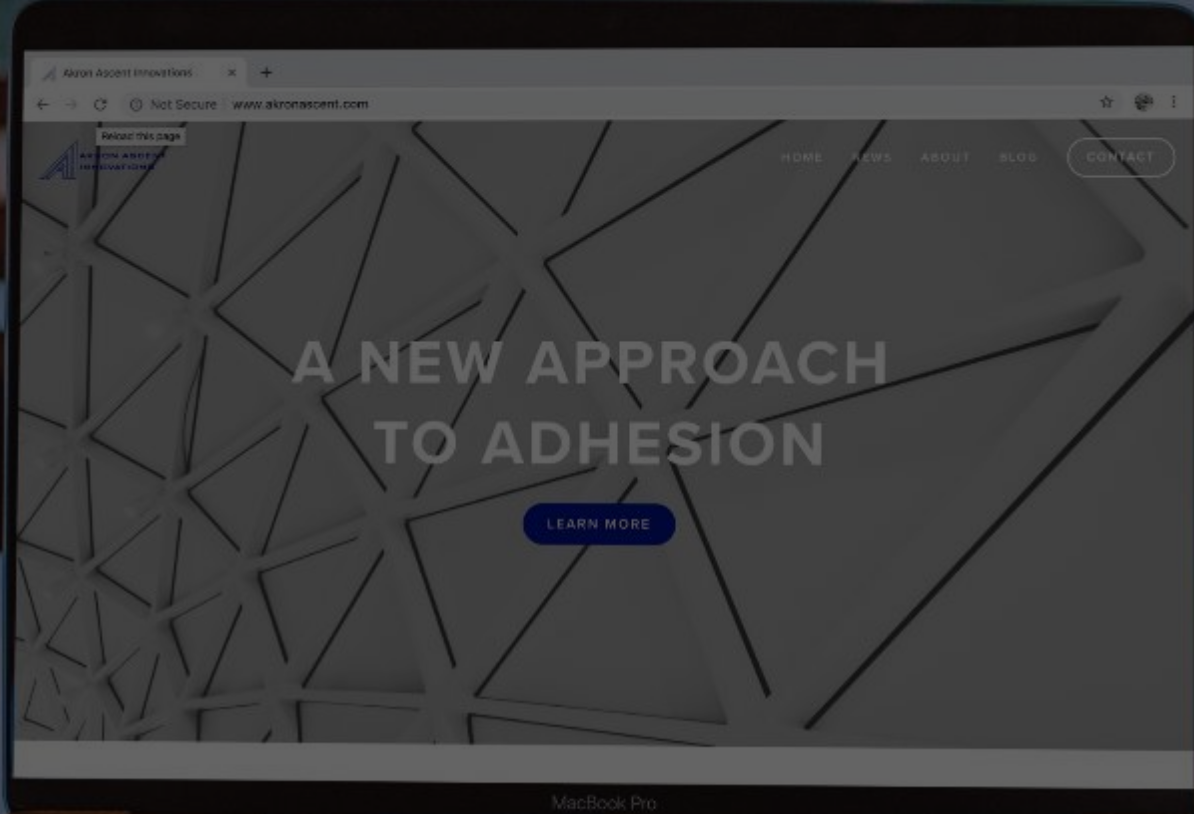
to me, Barry ▼

I had my first couple meetings today. One customer said, “I have people who will go ‘ape s*%t’ when they see this!” I took this as a positive sign. When I am back on Friday perhaps we could connect on the phone to discuss?



The Future

- Expanding pipeline for existing product
- Partnerships to guide development
- Advanced solutions to drive value add



Let's keep in touch

AkronAscent.com • ShearGrip.com • ThePinless.com

kevin@AkronAscent.com



Creating Big Things from Small Fibers

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Alligator Alley

