



# Developing Sustainable Technologies

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**Enterprise Technology**

**CRODA**



# Agenda

- The Croda organisation
- Technology in Croda



## Ideal business model

What would the ideal sustainable manufacturing business look like?

- based on nature's raw materials, harvested in a sustainable manner
- raw materials would be converted by carbon neutral processes
- finished products would have unique performance characteristics which were IP protected and for which the customers were prepared to pay a premium
- finished products would be fully biodegradable after use

Croda is as close as any to this model.....

# Our History...it makes us who we are

## Company history



**1925**  
Founded in Yorkshire, England to manufacture lanolin from woolgrease

Croda was founded at Rawcliffe Bridge in Yorkshire by Mr Crowe and Mr Dave to make lanolin, the refined form of wool grease. Crowe's nephew, A P (Philip) Wood was appointed manager. In October the first order – three barrels of lanolin – left the factory by horse and cart for Rawcliffe station.

Trading was difficult but a fortunate smile and report from Physical show the effect.

Edgar Lower was 14 year old, the first use of a natural ingredient in cosmetics.

**1964**  
Listed as a public company

Headquarters transferred to Cowick Hall, a beautiful but neglected mansion, which was formerly the country seat of Viscount Downe.

Following the death of Sir Edward Crowe, Fred Wood became Chairman as well as Managing Director.

Croda GmbH was established near Dosseldorf, Germany.

Croda Inc purchases site at Mill Hall, PA, to expand manufacturing facilities in US.

Croda South Africa and Croda Zimbabwe were formed.

Croda France and Croda Brazil were formed. Croda was truly international.

Croda celebrated its 50th anniversary. Profits had risen from £12000 pa in 1950 to £12 million, with worldwide sales of £128 million.

Croda bought Richardson Ink Co of Chicago, also J.C. Bottomley & Emerson, which makes dyestuffs and pigments.

Croda bought LSH Holdings, two factories at Hull and Barking which modified vegetable oils for use in paints and inks. This was followed by A B Reming, a collection of companies making printing inks and synthetic resins.

New malic acid plant opens at Widnes.

Croda celebrated its 50th anniversary. Profits had risen from £12000 pa in 1950 to £12 million, with worldwide sales of £128 million.

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**1990s**  
Acquired Crodarom, Sederma & Westbrook. Significant investment & Concentration on Personal Care & Health Care business



**1928**  
Eric Cannon joined the company as secretary. 25 years later Cannon's son, Mike, took over from Wood's son, Fred as head of Croda in the US.



**1930**  
Trading was difficult but a fortunate smile and report from Physical show the effect.

**1939**  
The outbreak of war led to collaboration with the government to produce a...

**1940**  
Headquarters moved to a former vicarage.

**1945**  
Aware of the potential of the US market, Fred Wood went to New York to set up an office – the first of Croda Inc.

**1949**  
George Crowe died and was succeeded as Chairman by his brother, Sir Edward.

**1950**  
Croda's first major merger with C M Keyworth of Leek, a supplier of fatty acid esters, spearheaded a period of steady organic growth.

**1954**  
Croda Inc USA purchased the lanolin business of Hummel Chemical Company, transferring production to a newly constructed plant at Newark, NJ.

**1957**  
Croda became a public company. Croda Nippon was formed in Japan as a joint venture with Sansho Oil and Fat Trading.

**1964**  
Croda decided to expand by acquisition, with its first target the United Premier Oil Company, a long established oil seed crushing/refining company. Its subsidiary, the Universal Oil Company, manufactured fatty acids – the basic material of the oleochemical industries.

**1967**  
Croda bought LSH Holdings, two factories at Hull and Barking which modified vegetable oils for use in paints and inks. This was followed by A B Reming, a collection of companies making printing inks and synthetic resins.

**1970**  
New malic acid plant opens at Widnes.

**1972**  
Croda celebrated its 50th anniversary. Profits had risen from £12000 pa in 1950 to £12 million, with worldwide sales of £128 million.

**1975**  
Croda bought Richardson Ink Co of Chicago, also J.C. Bottomley & Emerson, which makes dyestuffs and pigments.

**1978**  
Croda bought LSH Holdings, two factories at Hull and Barking which modified vegetable oils for use in paints and inks. This was followed by A B Reming, a collection of companies making printing inks and synthetic resins.

**1950**  
Established operations in the USA

**1970s**  
Established operations in Latin America & Asia

**2006**  
Latest acquisition – Uniqema

**CRODA**



## What are we?

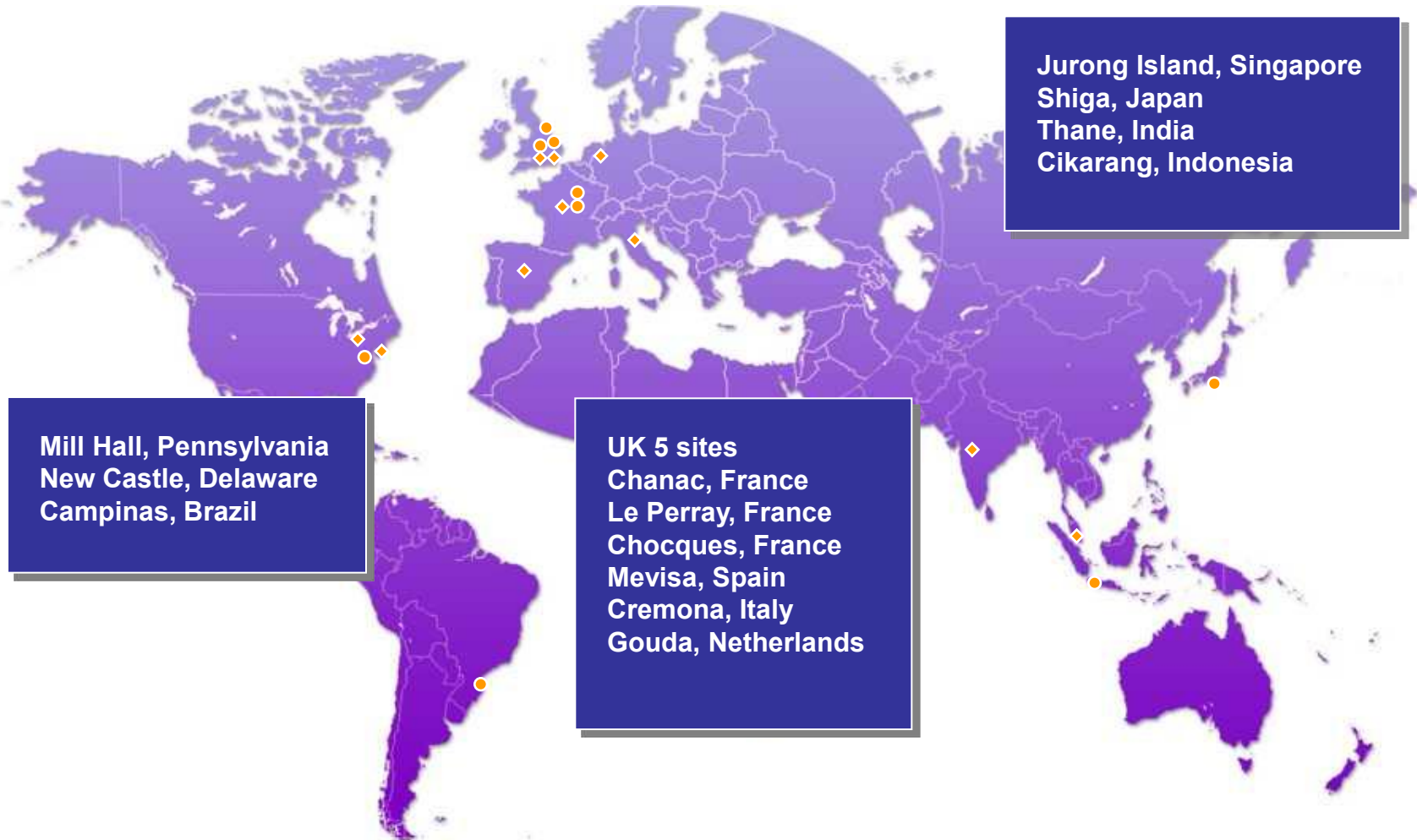
- A leading producer of speciality ingredients for high growth markets
- Majority of feedstocks are naturally derived (69%)
- Sell effects and not chemicals
- Driven by innovation and exploitation of technology

# Croda - The numbers

	2011	2010	2009	2008	2007	2006	2005
Turnover (£m)	1,068	1,001	916	911	886	519	306
Pbt (£m)	242	192	106	96	67	54	51
Returns (%)	23%	19%	12%	11%	8%	10%	17%
EPS (p)	122	95	53	48	37	29	26
Dividend (p)	55	35	22	20	16	14	13
Employees	3241	3174	3461	3624	3812	4000	1600

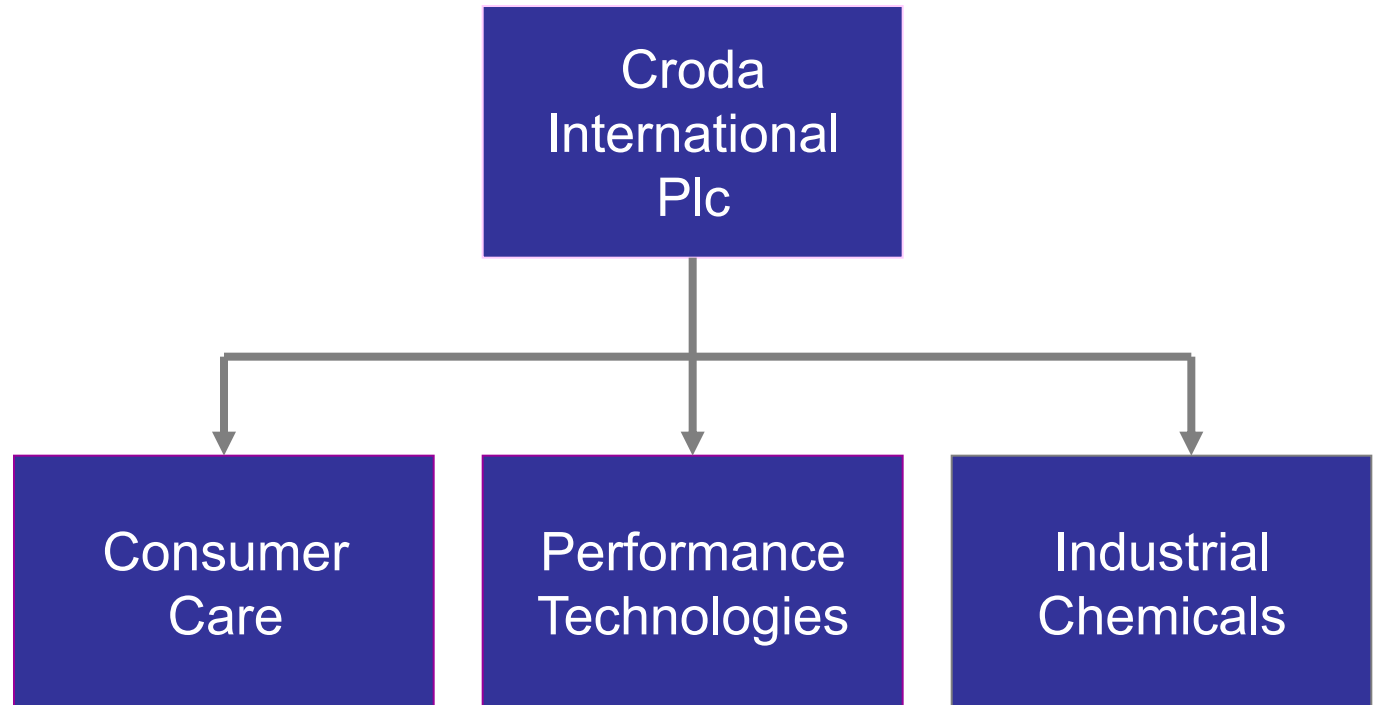


# Croda's Manufacturing Sites





Three divisions, different markets, one unified focus...



**... to grow through constant innovation**

Enterprise Technology  
The Science of Innovation





# Markets Served

## Consumer Care

- Personal Care
- Health Care
- Crop Care

## Performance Technologies

- Home Care
- Lubricants
- Geo Tech
- Coatings & Polymers
- Polymer Additives

## Industrial Chemicals

- Process Additives



# What are the key drivers in our core markets?

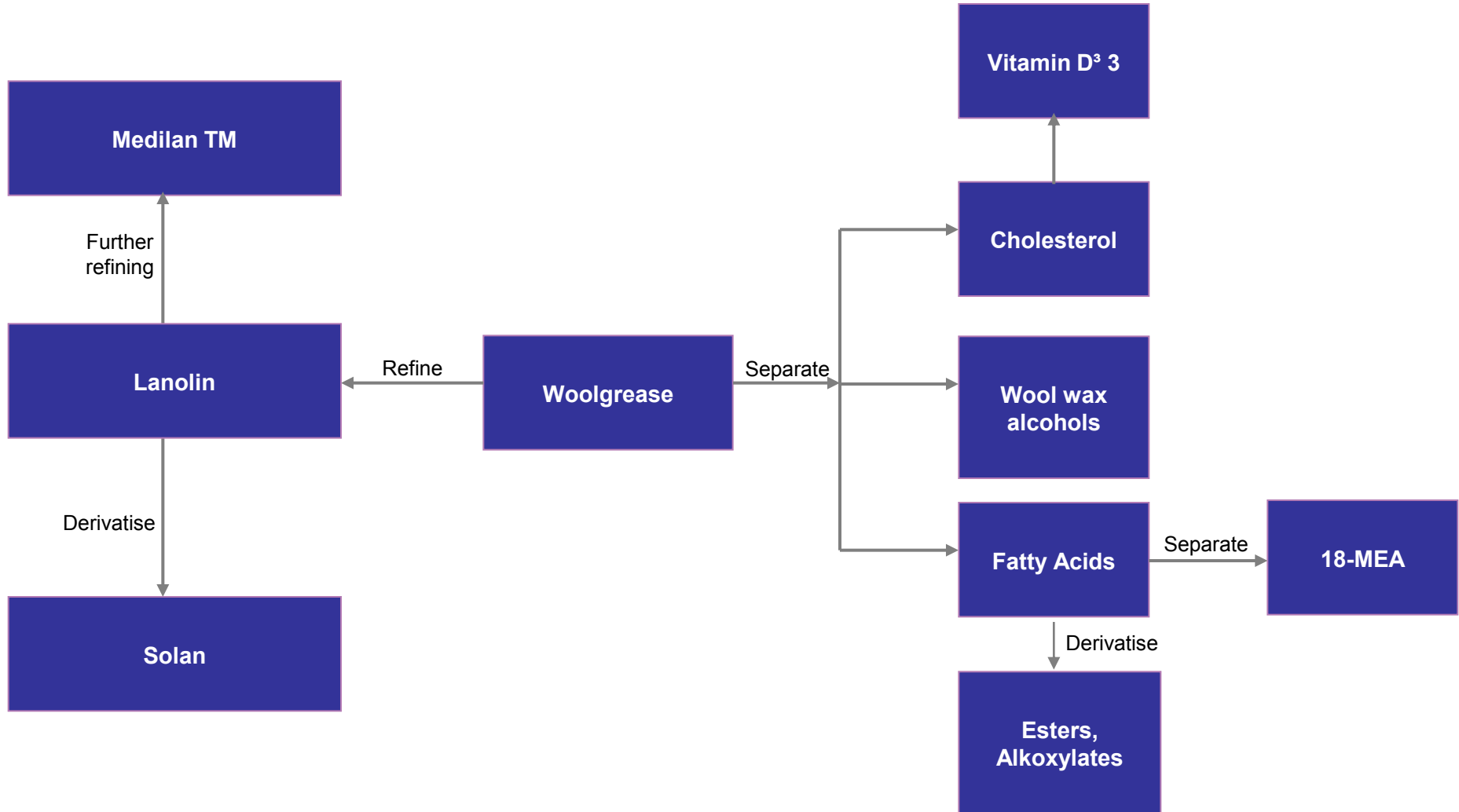
- Performance
- “Green”
  - Natural
  - Renewable
  - Sustainability
  - Low environmental impact
  - Biodegradable



## Technology in Croda

- What is Croda all about?
- From a technology perspective:
  - “Adding value to naturally derived raw materials by purification, separation and derivatisation”

# Woolgrease





# Woolgrease

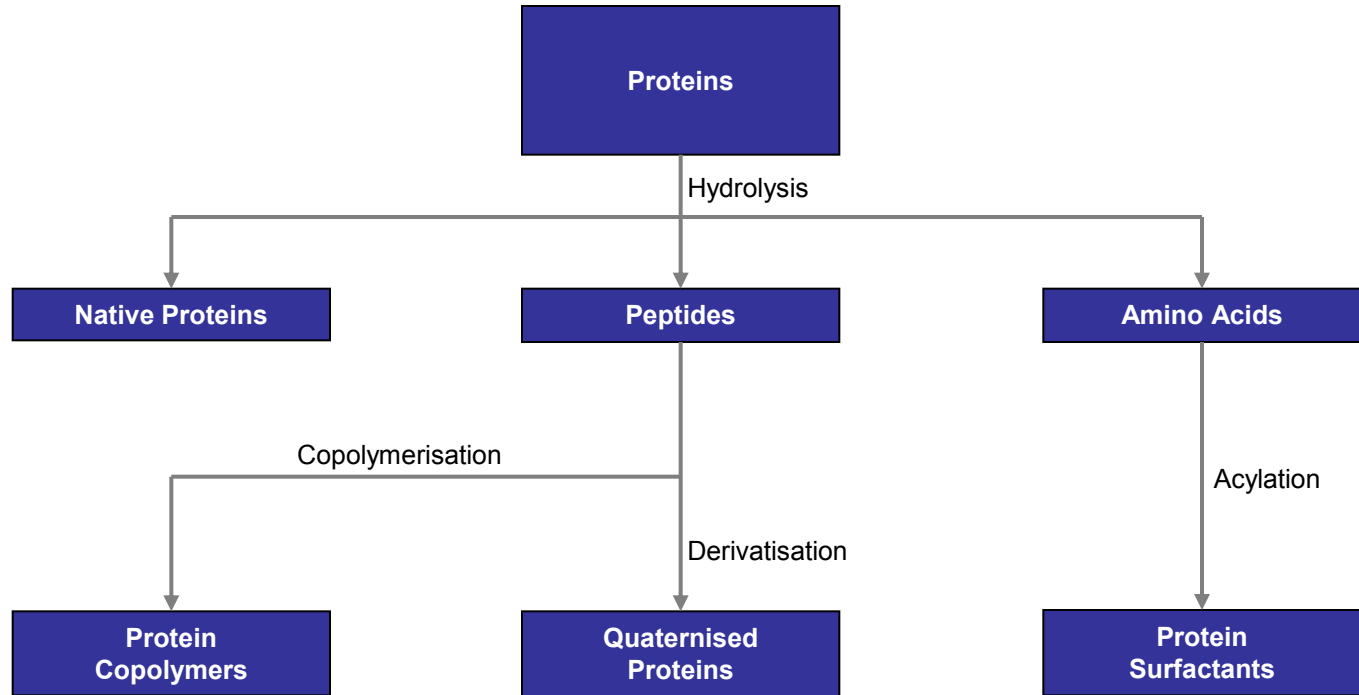
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# Proteins



Protein sources include Wheat, Soy, Milk, Cashmere, Potato, Silk, Cotton,



# Proteins

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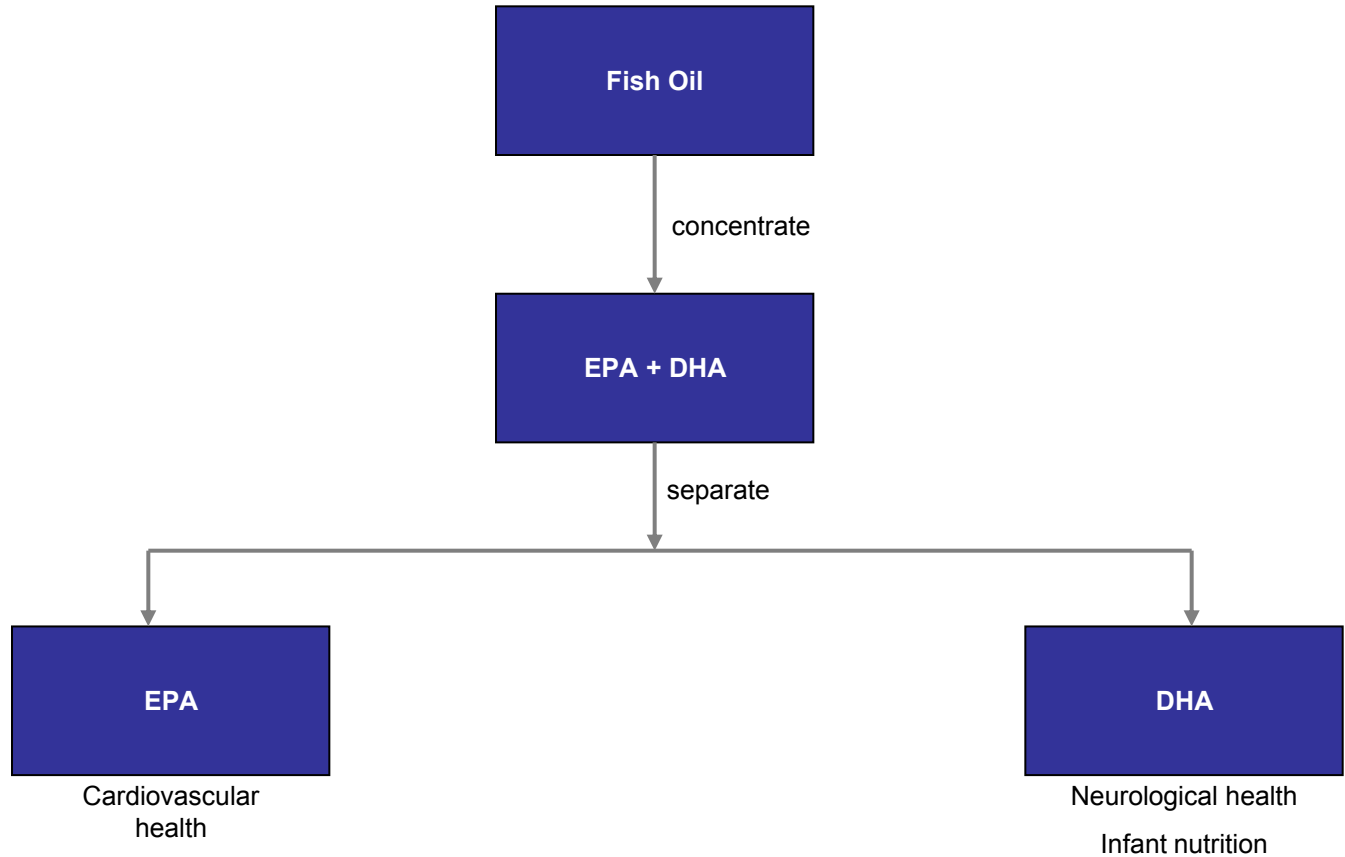


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# Fish Oil



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The Science of Innovation



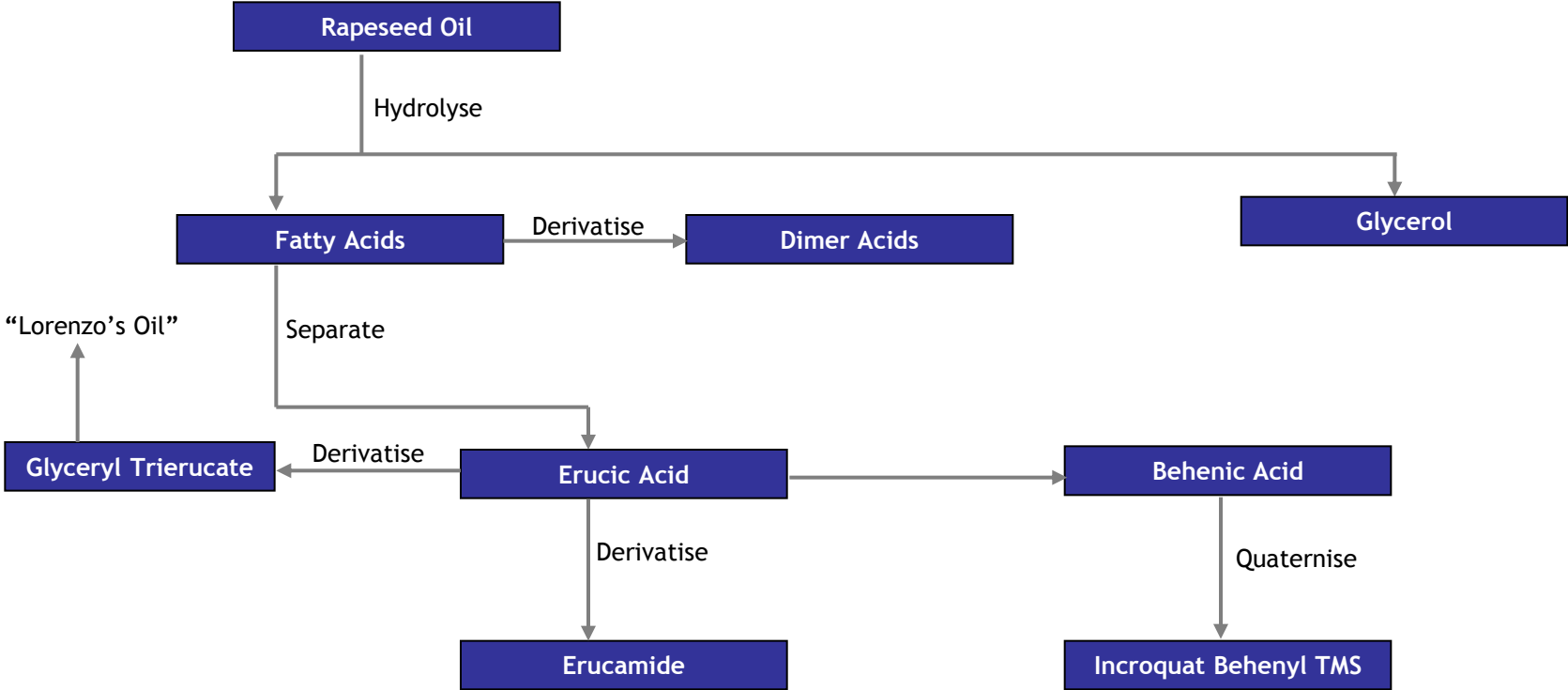
# Fish Oil

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The Science of Innovation



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# Rapeseed Oil





## Adrenoleukodystrophy (ALD)

- Late 1980s approached by Augusto Odone for a source of high purity erucic acid
- Requested to treat his son Lorenzo, who suffered from Adrenoleukodystrophy disease (ALD)
- Croda developed a biologically active derivative



# Amazonian Oils



Cupuaçu



Castanha  
do Brazil



Maracujá



Pequi



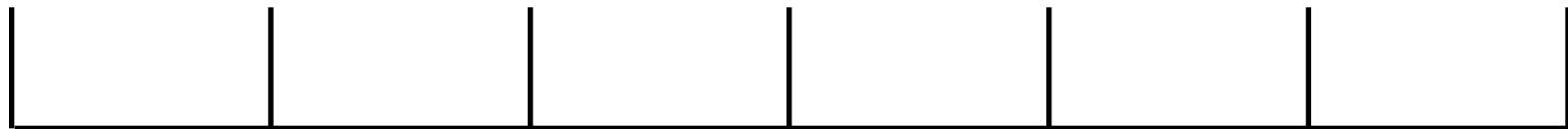
Andiroba



Babassu

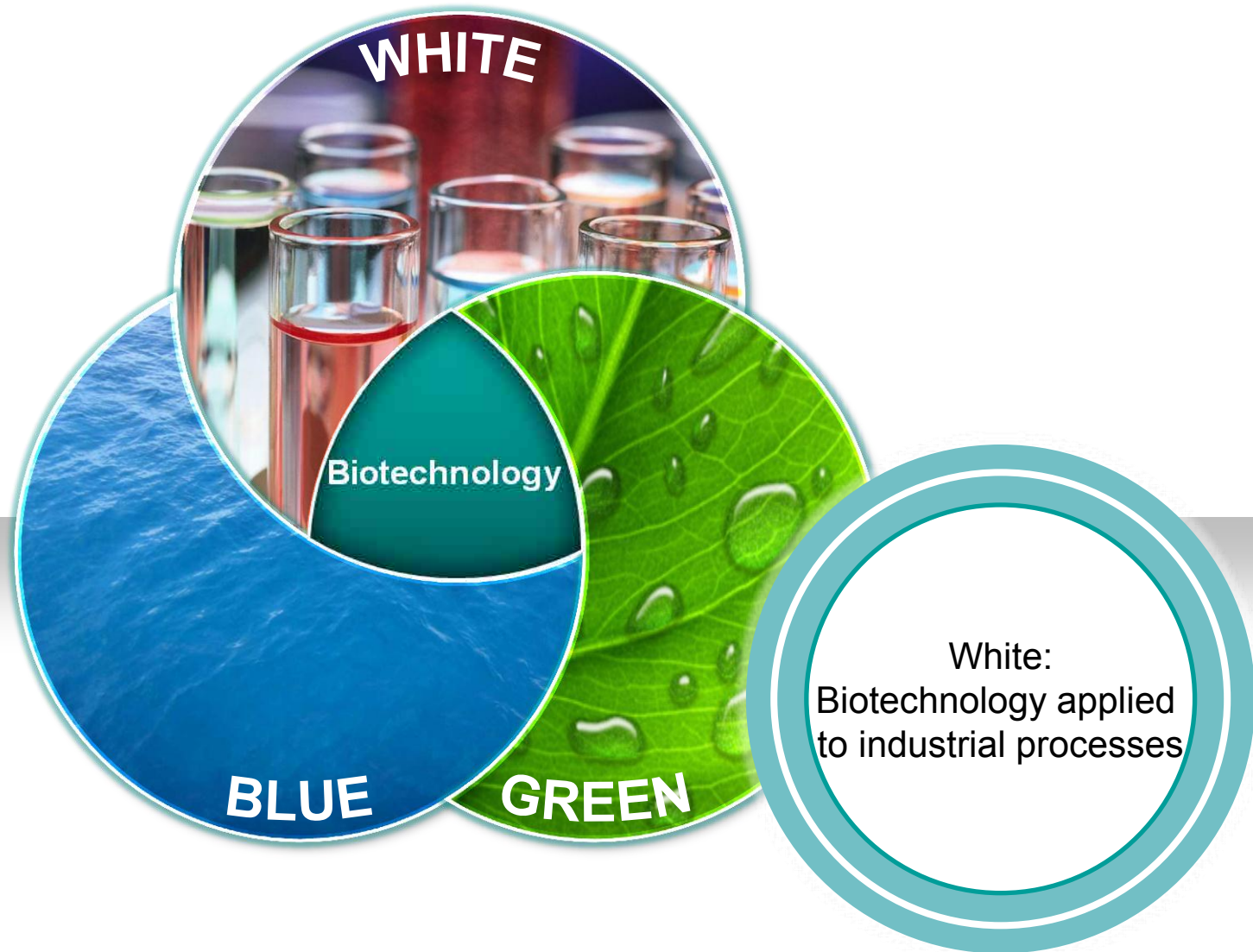


Murumuru



**Crodamazon Oils  
and  
Hydramazon Derivatives  
for  
Cosmetic Applications**

# Bio-innovation at Croda

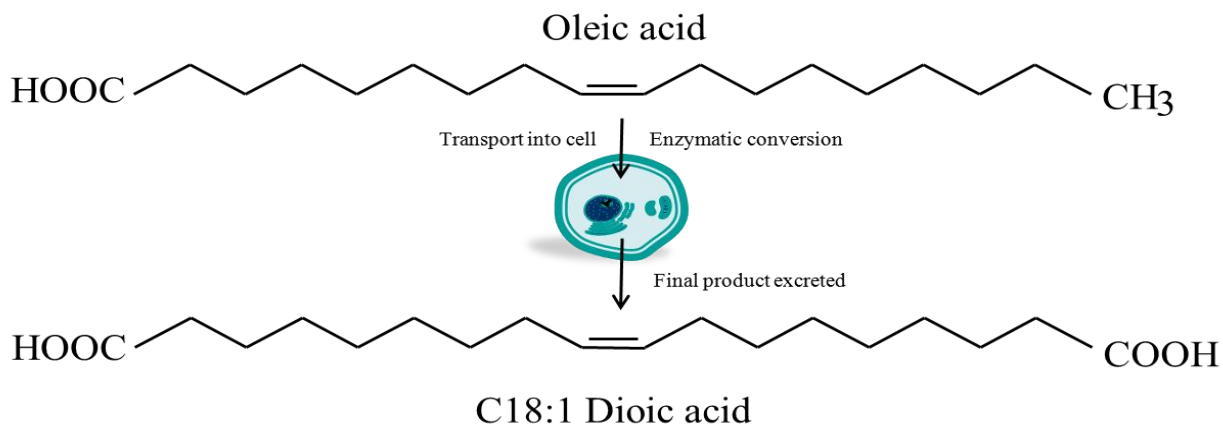






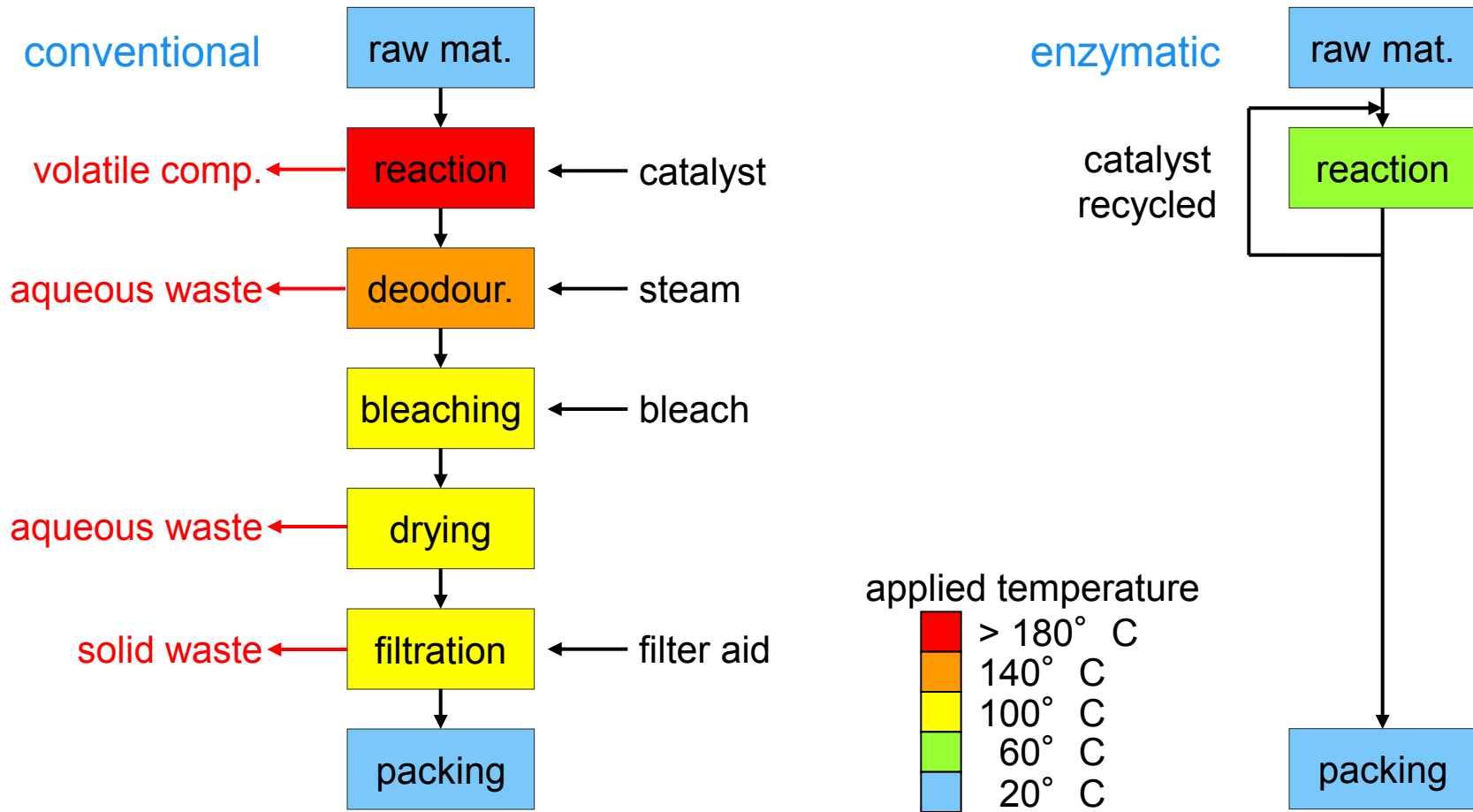
# White Biotechnology

- ODA White
  - A skin lightening active marketed by Sederma.
  - Based on oleic acid (C18:1) conversion to  $\omega$ -dioic acid.
  - An otherwise very difficult chemical conversion.
  - Conversion carried out by yeast biotransformation.





# White biotechnology - biocatalysis





## Why is Biocatalysis of interest?

- Remove need for chemical / metal catalysts
- Lower operating temperatures
  - Less energy consumption - lower CF
  - Less discolouration
  - Reduction / elimination of post-processing
- Higher specificity (fewer side reactions)
  - Higher yield
  - Reduction / elimination of post-processing

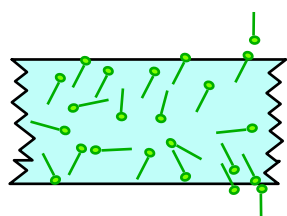
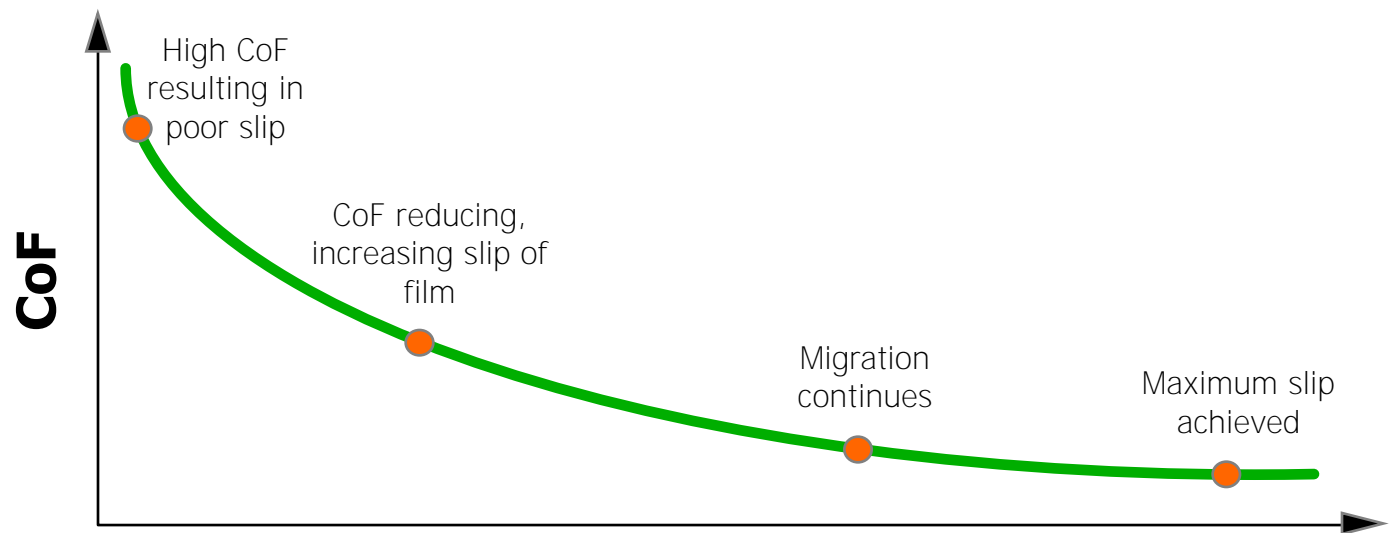


# Amides - polymer applications

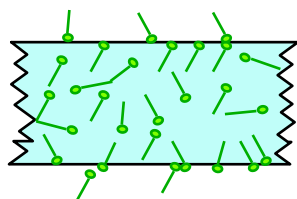
- Polymer surfaces often exhibit high friction
- High friction can result in difficulties with:
  - Winding of film rolls
  - Bag production
  - Packaging operations
  - Mold release
- Amides offer slip



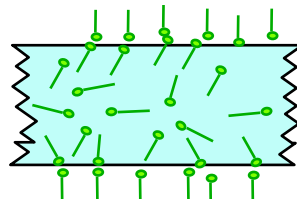
# How amides offer slip



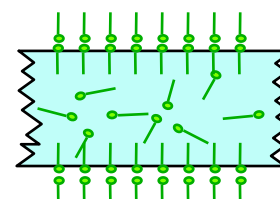
Amide molecules homogeneously distributed through amorphous polymer



Single layer of amide molecules starts to form at film surface



Single layer of amide molecules nearing completion at film surface

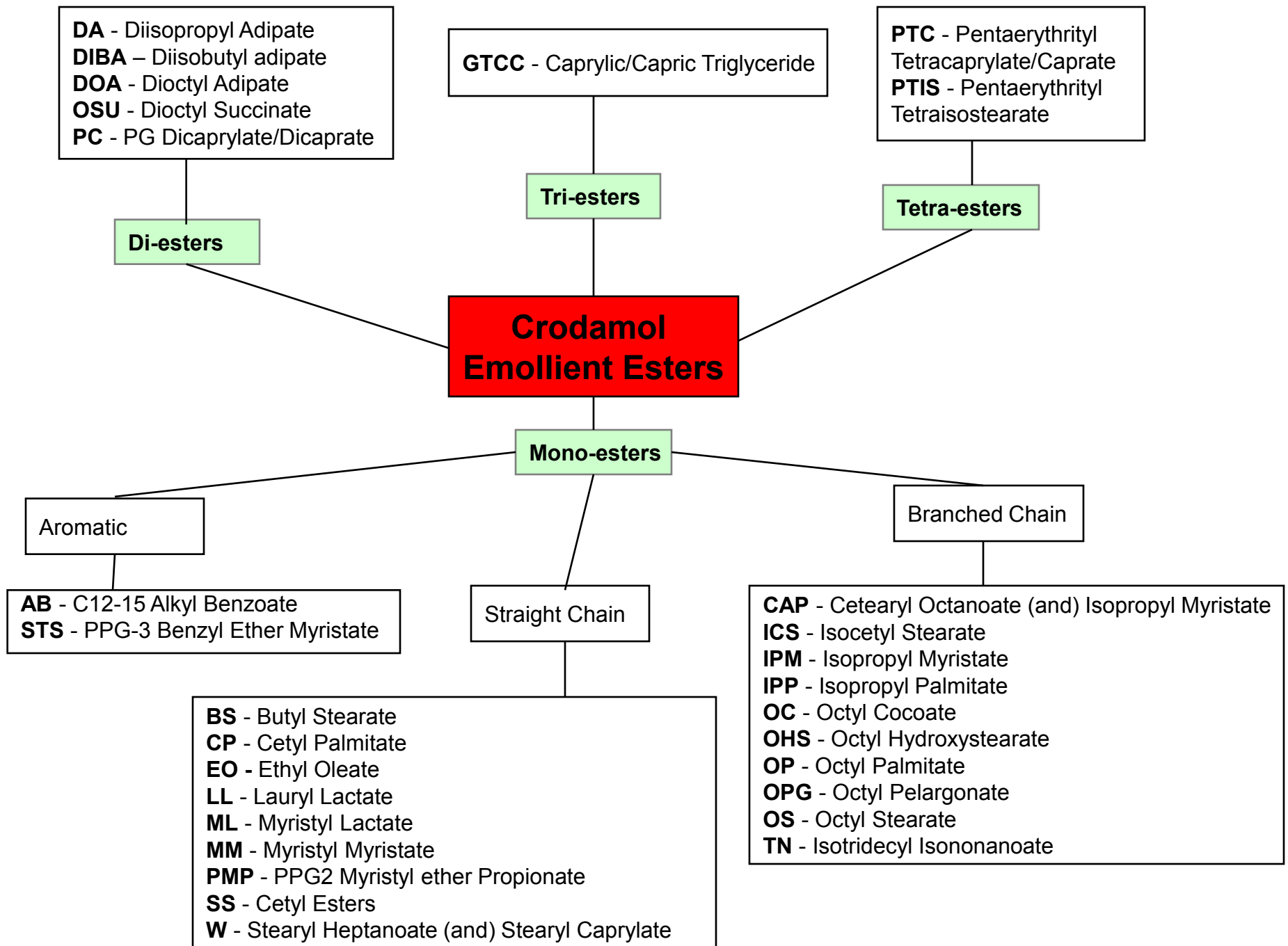


Multilayer of amide molecules complete



## Bioesters

- Customers use esters as emollients
- An emollient is a product that impart softness and/or smoothness to the skin
  - Moisturisation (plumping of the corneocytes)
  - Lubrication (decrease of the rough feel)





## Ester properties

- Molecular weight
- Melting point
- Spreadability
- Skin penetration
- Moisturisation
- Barrier repair
- Smoothing
- Dispersability
- Solubility



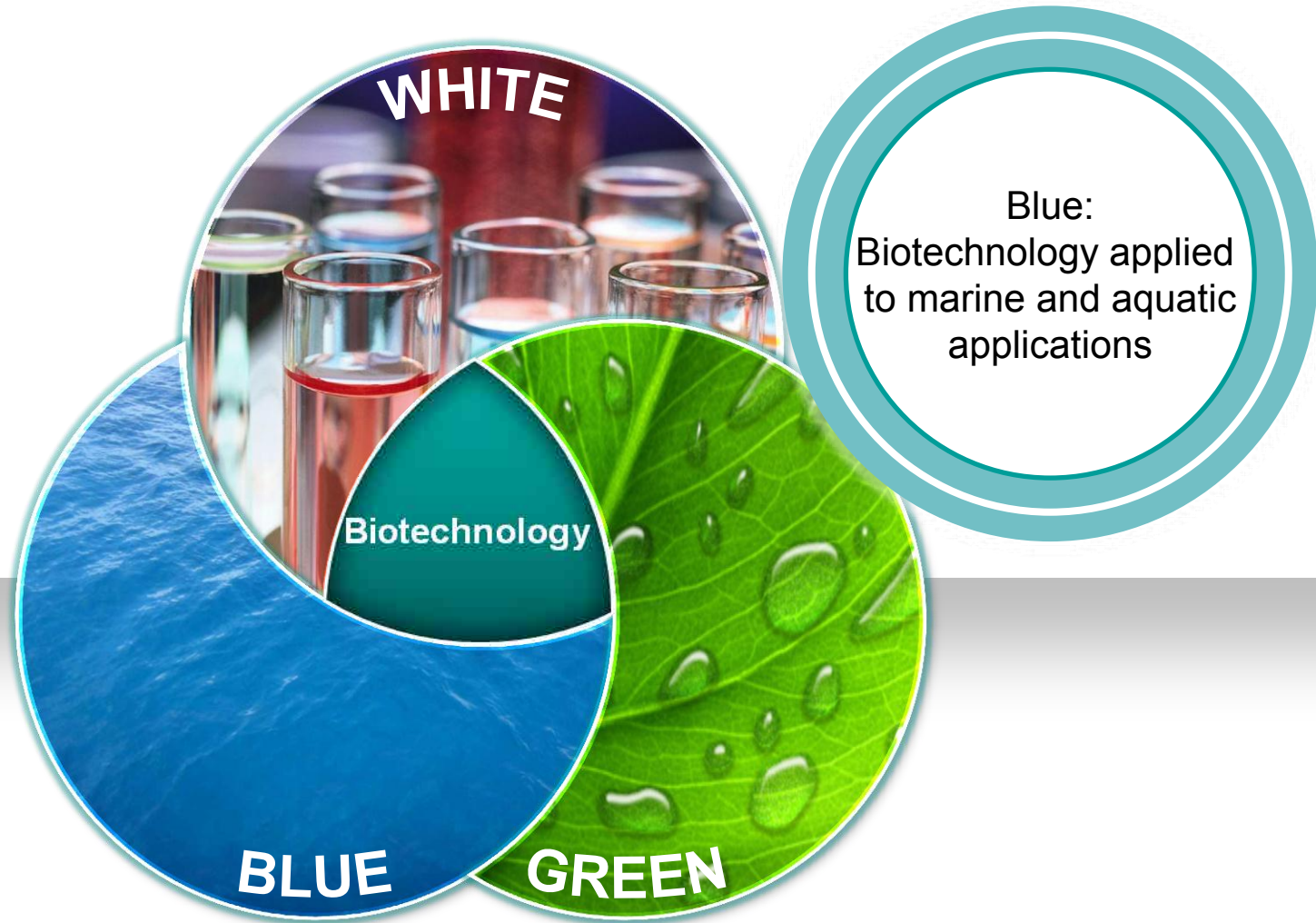


## Typical Esterification conditions

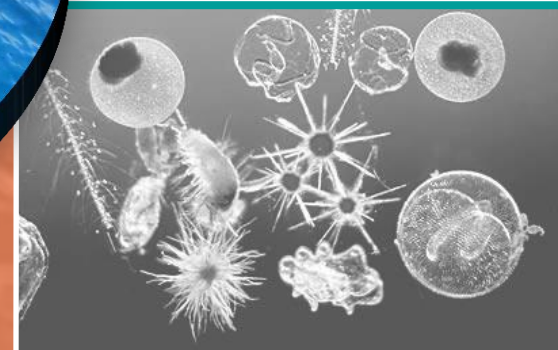
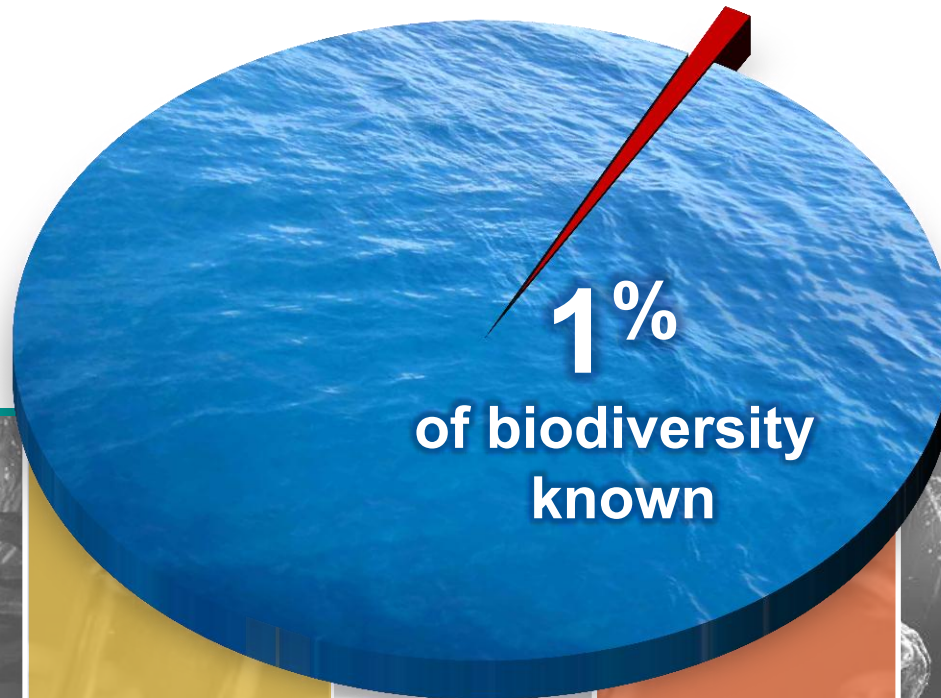


- Equilibrium forced to rhs by removal of water
- Carried out in hot oil reactors
- Batch sizes - 5, 10 & 20 MT
- High reaction temps (>230 C)
- Variety of metal catalysts
- Vacuum & Nitrogen

# Bio-innovation at Croda



# Blue Biotechnology



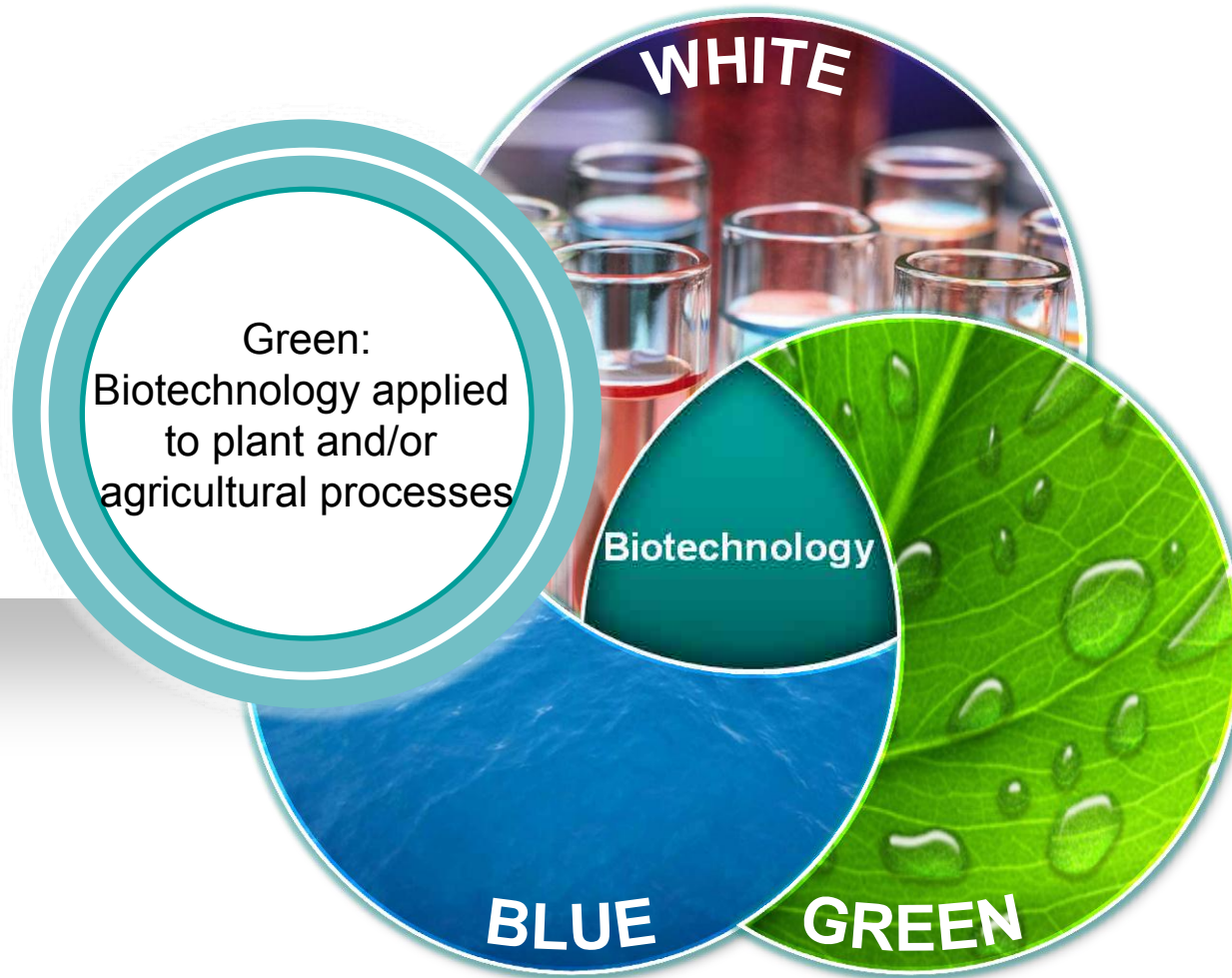


## Blue Biotechnology

- Venuceane
- Extract of a deep sea microbe
- Enzyme with multi anti-oxidant activity
- Anti-ageing effects for skin care.



# Bio-innovation at Croda





# Green Biotechnology

A woman's face is shown in profile, looking down with her eyes closed. She is wearing a green, textured mask that covers her forehead and neck. The background is a vibrant, abstract composition of blue and green watercolor-like splashes and circular patterns, suggesting a biological or scientific theme.

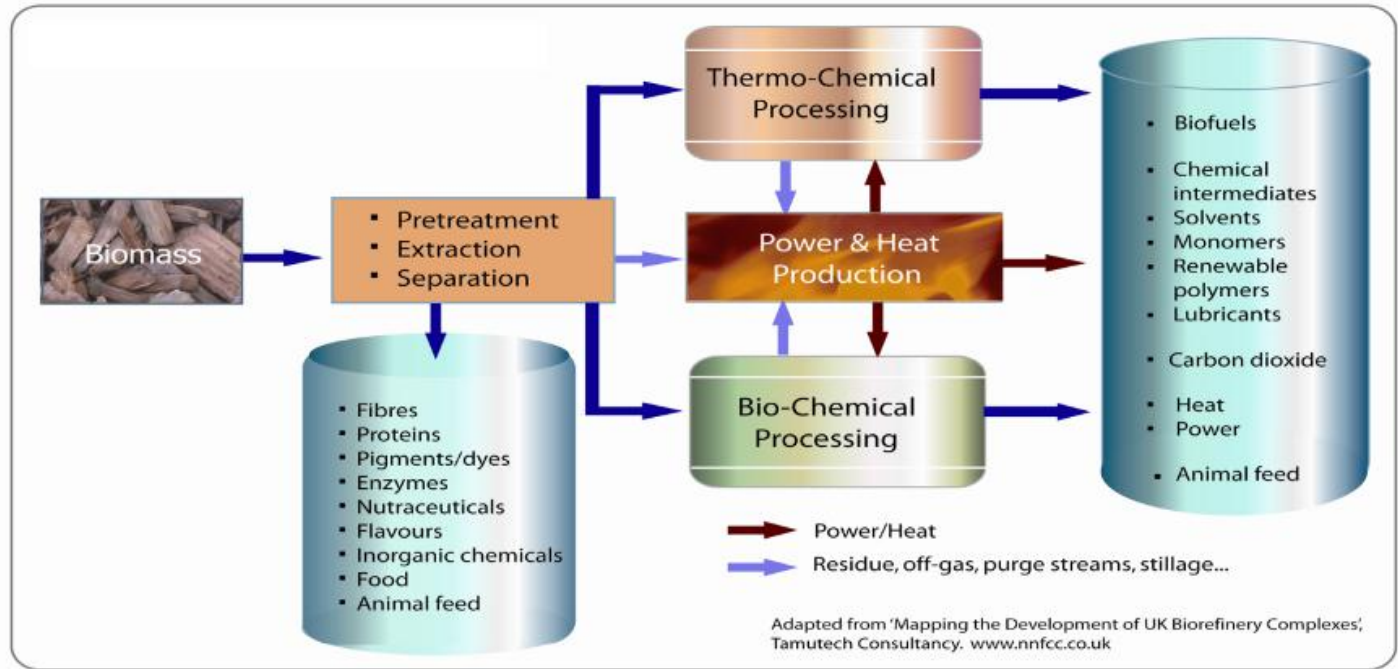
**RESISTEM™**  
Patent pending

Beautifully  
immunized  
against time



# Biorefinery Interests at Croda

- The use of biomass to generate speciality ingredients.
- Supporting the Integrated Biorefinery Technology Initiative (IBTI)





## New feedstocks

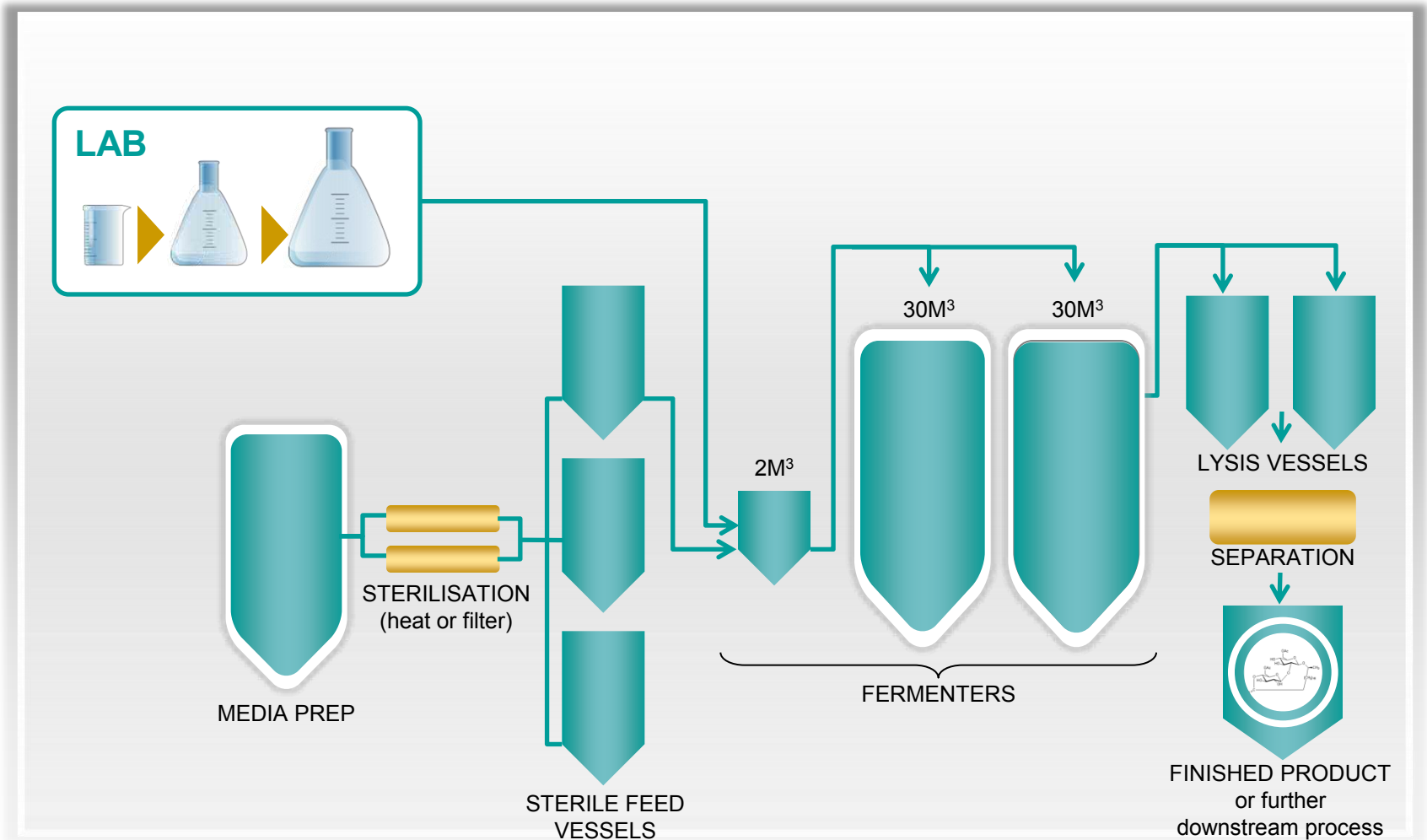
- Algae
- DDGS
- Cereal crops
- Lignocellulose
- Rape seed meal
- Fruit & Vegetable waste



# New Bio-Manufacturing Unit



# Bio-plant Capability Overview





## Ideal business model

What would the ideal sustainable manufacturing business look like?

- based on nature's raw materials, harvested in a sustainable manner
- raw materials would be converted by carbon neutral processes
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- finished products would be fully biodegradable after use

Croda is as close as any to this model.....



# Developing Sustainable Technologies

Thank you

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