



**TECHNICAL WHITE PAPER**

# Simply baked: Raising a fresh perspective on lecithin

The label-friendly trend is accelerating in bakery, as consumers seek out bakery products containing familiar ingredients, with short ingredient lists. As a result, bakery manufacturers are under pressure to reformulate by adopting plant-derived ingredients with strong functionality.

Lecithin has been an essential ingredient in manufacturers' toolkits for almost 100 years. Not surprising as this plant-derived, versatile, label-friendly emulsifier seems to do it all. Lecithin is composed of phospholipids, which hold the secret to its extensive functionality. Phospholipids first attract oil and then water. This amphipathic property allows lecithin to create strong oil-in-water and water-in-oil emulsions. But its technical benefits go far further still.

**“In the last few years, the lecithin market has faced numerous challenges both related to global supply chain issues, but also issues specific to lecithin, such as peanut contamination coming from India. We believe rapeseed would be a perfect alternative offering both to replace the missing flow of sunflower lecithin due to the war in Ukraine, as well as the missing flow from Russia. As it is widely grown within the EU, it is a perfect answer to NGM soy.”**

*Elena Revenko, Product Line Manager Lecithin*



## Raising to the challenge

When reformulating with lecithin, it is crucial to understand the impact on below key characteristics:

- Emulsifying properties by binding water and fat
- Batter stabilization
- Crumb softening and dough handling
- Shelf life improvement
- Process and dosing

Furthermore, understanding the cost in use requirements is also a key consideration.



### Lecithin tends to bring the following key characteristics:

1

Improves dough handling

2

Increases dough tolerance

3

Enhances volume, crumb structure and mouthfeel

4

Improves mixing and blending

5

Extends shelf life

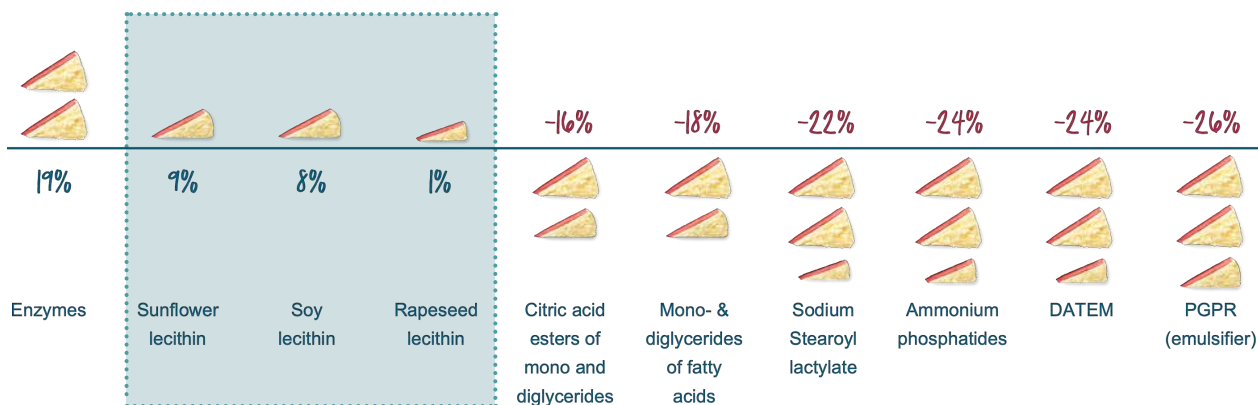
- 1. Improves dough handling:** De-oiled lecithin enhances the rheological properties of the dough, making it easier to handle and provides better machinability.
- 2. Increases dough tolerance:** De-oiled lecithin improves the tolerance of the dough, helping it to withstand changes in processing conditions and reducing the risk of defects.
- 3. Enhances volume, crumb structure and mouthfeel:** De-oiled lecithin improves the structure and texture of baked goods, producing higher volume and a more uniform crumb structure.
- 4. Improves mixing and blending:** De-oiled lecithin aids in the mixing and blending of ingredients, ensuring a more uniform distribution of the dough ingredients.
- 5. Extends shelf life:** De-oiled lecithin helps to stabilize the dough, preventing staling and extending the shelf life of baked goods.

## Leveraging our plant-based emulsifiers for label-friendly formulation

Despite its long history of use in bakery applications, the rise of the label-friendly trend has given new momentum to lecithin as an alternative to commonly used emulsifiers such as mono- and diacetyltartaric acid esters of mono- and diglycerides of fatty acids (DATEM), mono-diglycerides (MDG) and distilled monoglycerides (DMG). This label-friendly ingredient seems to have positive health perception and is more likely to be considered natural due to the reference of plant sources. In contrast, the acronyms & chemical sounding options (MDG and DATEM) tend to be viewed as bad for you.\*

### Lecithin NET Health Perception

NET = Good for You (T2B) minus Bad for You (B2B)



Base: N=943-988. Q: Please indicate how good or bad for you each of these ingredients is, in your opinion. Please select the number on the scale that best corresponds to your opinion.

\*Source: Cargill's EMEA 2022 *IngredientTracker*™





With this in mind, INFUSE by Cargill™ technical experts set out to run validation studies for both de-oiled lecithin and lecithin on carrier (LOC) in a variety of bakery applications: Berliner doughnuts, croissants and pound cakes. The aim of the “Simply baked” family was to test how our lecithin solutions would perform in terms of both functionality and cost, when compared to commonly used emulsifiers. For these trials we decided to use our rapeseed lecithin for its allergen friendly status. However, performance of different botanical sources such as rapeseed, sunflower and soy is very similar. Cargill has an extensive lecithin portfolio to meet your individual needs.

**“In the industry, emulsifiers such as DATEM and MDG have traditionally been used to improve freshness and crumb softness over shelf life, as well as for their cost in use. However, with the mainstreaming of the label-friendly trend, we wanted to assess whether we could replace those commonly used emulsifiers with different dosage levels of lecithin, and whether such reformulation could enhance performance, while being cost conscious.”**



*Martina Foschia, Senior Application Specialist Bakery*

## SPOTLIGHT: DE-OILED LECITHIN SOLUTION



### Label-friendly emulsifier

- Plant derived (from rapeseed, sunflower or soy), versatile, label-friendly emulsifier
- Rapeseed and sunflower lecithin do not require allergen or GMO declaration
- In Europe, our de-oiled lecithin is sourced from European crops with the highest levels of quality, food safety and reliable supply



### Multi-purpose functionality

- Improving shelf life – softer during longer time
- Enhancing volume & crumb structure
- Improving dough handling (better machinability but also dough tolerance which helps to withstand changes in processing conditions)
- Improving mouthfeel and moistness perception



## Pound Cake: De-oiled recipe

Ingredients %	Control	Rapeseed lecithin
Flour	22.65	22.65
Sugar	24.45	24.45
Liquid whole egg	24.50	24.50
<b>Cargill high oleic sunflower oil</b>	<b>17.47</b>	<b>17.47</b>
<b>C*Gel 20006, Wheat Starch</b>	<b>8.70</b>	<b>8.70</b>
Mono-and diglycerides of fatty acids	0.90	0
<b>Lecimulthin® RS, rapeseed lecithin*</b>	<b>0</b>	<b>0.90</b>
Baking powder	0.66	0.66
Skimmed milk powder	0.66	0.66

G/100g	
<b>Energy kcal (1066kJ)</b>	<b>252kcal</b>
Fats	3.6
<i>of which saturated</i>	3.2
Carbohydrates	48.0
<i>of which sugars</i>	25.6
Dietary fibers	0.64
Proteins	6.2
Salt	0.4



## Process

- Mixing in VEMA mixer using a paddle
- All-in-one mix method used
- Mix at speed 1 for 2 minutes
- Scrape down
- Mix at speed 3 for a further 2 minutes
- Measure the batter specific gravity
- Scale 270g of batter per mold tin
- Baking temperature: 170 °C, in a low deck oven
- Baking time: 40 minutes with rack underneath



### Easy replacement:

- 1:1 replacement in dosage



### Product improvement:

- Recipe with Lecimulthin® RS was perceived as the softest over shelf life



### On par to the control recipe on sensory:

- No after taste or off-notes
- No difference in volume or crumb softness

\* Botanical source, fat and recipe will influence the dosage and cost-in-use

## Why lecithin on carrier is tomorrow's bakery solution

Cargill has the unique advantage of offering both lecithin as single ingredient as well as lecithin on carrier (LOC), a capability that goes beyond being just a blend of ingredients. Cargill's LOC solution (based on rapeseed lecithin) provides improved handling such as flowability, ease of dosing and dispensing, while delivering softness over time. In short, we have the solution for you to create enhanced functionality, label-friendly bakery products.

Used in baking agents, lecithin on carrier (LOC) helps to strengthen the gluten structure, as well as improving the aerological properties, facilitating the rising, and increasing the volume of the dough. The benefit of LOC is that Cargill can adjust the product to the customers' need. Depending on the challenge, we can offer a different solution (e.g. label-friendly, high tolerance for process fluctuations, freeze/thaw stability, long shelf-life etc.).

So how does it work? Thanks to our technological process for a powdered LOC, we have been able to achieve a kind of encapsulation of any type of powder with a fat layer.

### Some of Cargill's analysis capabilities for powder

- **Particle size distribution & sieving:** This type of technology is suitable for the analyzing new raw materials.
- **Density & flowability:** This analysis technology can be used to determine bulk & tapped densities and angle of repose. These data can be used to characterize the flow behavior of powders.
- **Flowing properties of powders:** Cargill offers powder rheometer and ring shear cell capabilities. This is a universal powder tester enables of how powder flow relates to tableting, mixing, feeding, hopper discharge.
- **Interaction with moisture:** Moisture sorption isotherms can also be determined through Dynamic Vapor Sorption (DVS) techniques.

**“Our customers benefit from lecithin on carrier thanks to the efficiency of the carrier in terms of lecithin absorption, which helps to maximize functionality. This means that a lower dosage level is required when compared to other lecithin – making it cost efficient. This dust-free lecithin product is very easy to use and offers good flowability. Additionally, it can be easily stored without the need for specific storage equipment.”**

*Delphine Savereux, Product Manager Functional Systems*



## SPOTLIGHT: LECITHIN ON CARRIER SOLUTION (LOC)



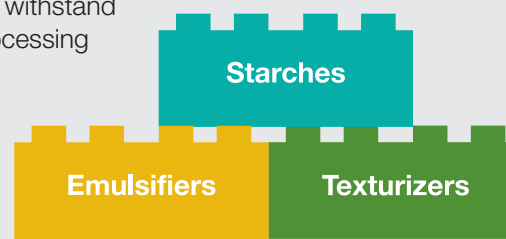
### Formulated using our building blocks approach

- Lecithin on carrier is a unique blend of lecithin and texturizers created using a spray-cooled technology
- The technological process improves dispersibility and handling properties of the ingredient
- Offering a staged release of ingredients and dissolution during food processing



### Capabilities to meet your needs

- We can tailor your solution; providing multiple ratios of fat and powder carrier, while optimizing your lecithin content
- Understand powder flow and how it relates to tableting, mixing, feeding, hopper discharge
- Improving dough handling (better machinability but also dough tolerance which helps to withstand changes in processing conditions)



## Berliner: Lecithin on carrier recipe

Ingredients %	Control	Lecithin on carrier
Water	Up to 100%	Up to 100%
Flour	53.32	53.56
Sugar	5.00	5.00
Eggs	5.00	5.00
<b>Cargill IY 34, vegetable fat</b>	<b>4.17</b>	<b>4.17</b>
Skimmed milk powder	3.33	3.33
Instant yeast	1.07	1.07
Mono- and diglycerides of fatty acids	0.67	0
Salt	0.67	0.67
<b>Emulthin® GFI 1533</b>	<b>0</b>	<b>0.60</b>
Mono- and diacetyltartaric acid esters of mono- and diglycerides of fatty acids (DATEM)	0.17	0

G/100g	
<b>Energy kcal (1678kJ)</b>	<b>401kcal</b>
Fats	21.2
<i>of which saturated</i>	7.9
Carbohydrates	44
<i>of which sugars</i>	8.17
Dietary fibers	1.6
Proteins	7.8
Salt	0.71



## Process

- Mixing in Spiral mixer: Low speed 4 minutes, 5 minutes at high speed
  - 1 min speed 1: all dry ingredients with water and eggs
  - After 1 minute add the fat and mix 3 minutes on speed 1
  - Knead into a well-developed smooth dough (5 minutes on speed 2)
- Round and rest for 15-20 minutes
- Flatten dough and divide/round with divider 30 x 50g
- Place rounded dough pieces on oiled tray to avoid them sticking to the tray
- Allow final proof at 32 °C / 85% RH for app. 45-50 minutes
- Fry at approx. 180 °C using Cargill IY 34, Vegetable fat
- Frying time 2 minutes on each side
- Cool down

## Labeling suggestion

### Emulthin® GFI 1533:

Rapeseed Lecithin

### Cargill IY 34:

Cocoa butter, vegetable oils  
(Sunflower, Rapeseed)



### Cost-efficient:

- A 30% lower dosage vs control recipe makes our solution cost-competitive



### Easy to use:

- Easy dosing and handling
- Enhanced dispersion and homogenous dough



### On par to the control recipe:

- Comparable results in terms of volume, dough performance\* and moistness over life\*\*
- Comparable results in terms of sensory\*\*\* appearance, color, bite and taste

\*Temperature, processing and frying evaluations carried out

\*\* Measured on day 1, day 3 and day 7

\*\*\* Internal evaluation on day 4

## Discover more solutions

Our team of experts can also support the reformulation of commonly used emulsifiers such as DATEM or MDG in whole meal bread without compromising key properties.

Our bakery team have proven that such replacement is possible with no compromise on dough handling, performance and quality of the end-product. Trials also highlighted that lecithin together with enzymes will have a synergistic effect providing an enhanced performance.

### Last but not least...

To answer current EU market challenges, Cargill plans to broaden its rapeseed offering by adding Leciprime® RS & Topcithin® fluid grades next to existing de-oiled lecithin brands Lecimulthin® RS & Emulpur® RS.

## MEET OUR CARGILL EXPERTS



### Martina Foschia

*Senior Application Specialist Bakery*

Martina joined Cargill R&D Centre (Vilvoorde, Belgium) in 2022 as Senior Bakery Application Specialist. Martina started her professional career at University of Udine, Italy, where she obtained a PhD degree in Food Science, focusing on the impact of dietary fibers in products containing cereals. Currently, Martina has been focusing on the development of egg replacement and clean label solutions.



### Elena Revenko

*Product Line Manager Lecithin*

Elena joined Cargill in 2006 and worked as a Key Account manager & Business development Manager in Ukraine & Russia. As of 2019 she manages the lecithin product line in Europe and focuses on serving our customers with the right lecithin solutions for their needs. Elena is located in Mechelen, Belgium.



### Delphine Saveroux

*Product Manager Functional Systems*

Delphine joined Cargill in 2015 and worked as product Specialist for our functional system products. Since 2019, she is part of INFUSE by Cargill™ solutions offering model where she makes sure we have all the needed building blocks in place to quickly deliver tailor-made solutions to customers. Delphine is located in Bauppte, France, where we manufacture our INFUSE blended ingredient solutions.



# IN FUSE

by Cargill™



Time to get INFUSED

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