

Sustainable and robust enzymatic degumming process that increases yields and profitability

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**Welcome to
the world's
leading
biotech
powerhouse**



Novozymes at a glance



Global & diversified presence

~700 products
sold in 140 countries



Unrivalled R&D focused

~14% of sales
invested in R&D,



Innovation in line with
market Requirements

~6,500 patents



Market leader

~48%* of total market,
serving +40 different end
markets



Innovation in line with
market Requirements

Best-in-class concept
across **30+** industries



Strong Regional Presence
in India

800+ employees in India
Production Facility

* Industrial enzymes

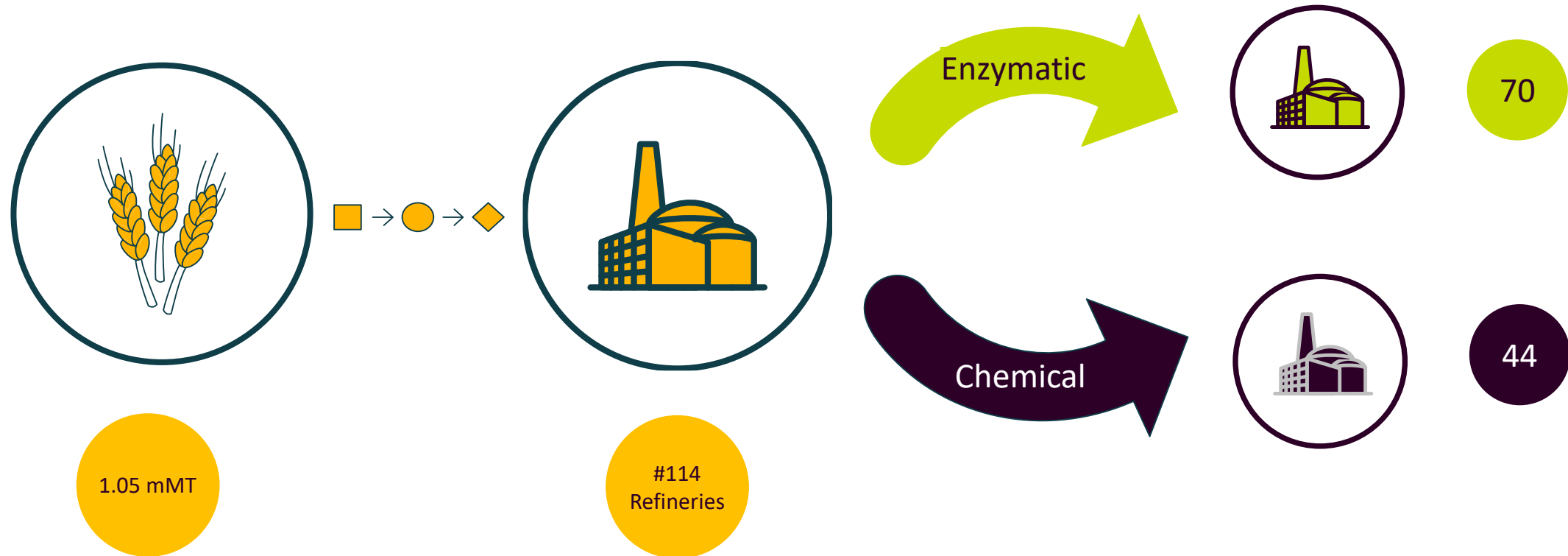
Expect more from Novozymes solutions across the oils and fats value chain

**Driving business impact.
Together.**



Quick glance on Indian Rice Bran oil market

Enzymatic degumming dominates Indian rice bran oil refining



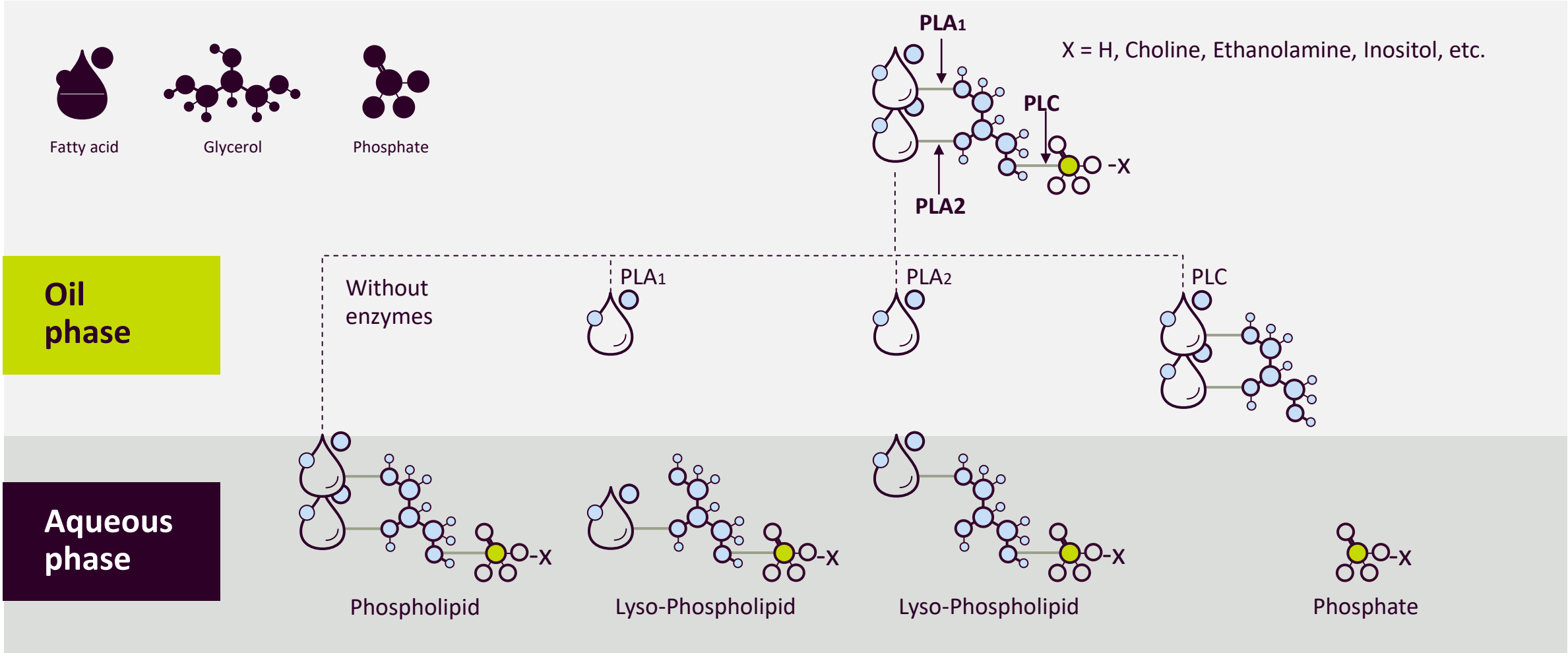
- Most plants operate at around 50-60% of their annual capacity as rice bran is seasonal crop
- Because of tight economy and availability of feedstock, margins of producers have been under pressure
- Given above factors even 1% extra oil yield increase matters a lot!

Most plants in India use
Enzymatic degumming because
they want to gain as much oil
yield as possible...



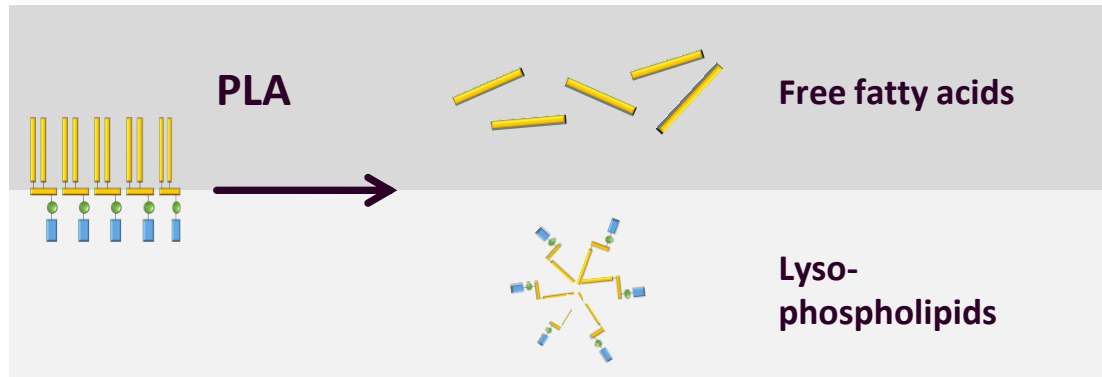
...up to
1.5%
extra oil
yield...

Understanding the Phospholipases reaction mechanism



Phospholipases increase oil yield in two ways

Expect more yield and valuable by-products while producing physically refined RBO with Lecitase® Ultra



More value for by-products

Conversion of phospholipids to free fatty acids (~0.36% FFA from 1% phospholipids)



Reduced chemical usage

Mild, natural & environmentally friendly process with less chemicals



Higher oil yield

Reduced oil loss in gums due to:

- Reduced gum volume
- Lyso-phospholipids bind less oil than unconverted phospholipids

Up to 0.5% yield increase per % gums in degumming section



Consistent degummed oil quality

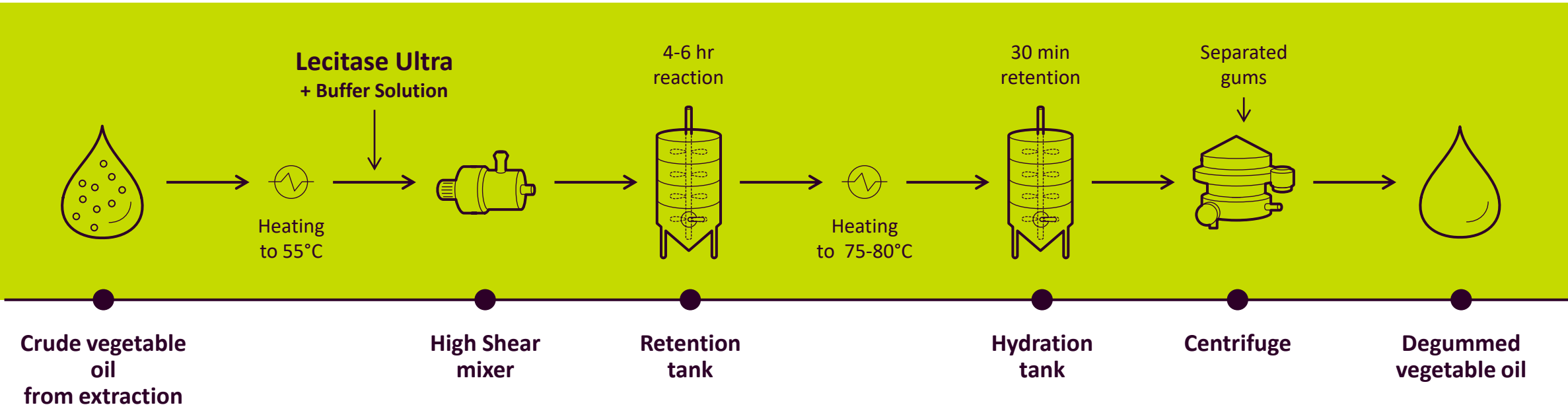
Consistently lower P Content ensures smooth processing in subsequent refining steps



Suitable for physically refining of other oils

Process is easily adaptable to other oils like mustard oil, soybean oil, sunflower oil, etc.

Enzymatic Degumming process for RBO with Lecitase Ultra



 **Operating conditions:**



55°C



1.5% water



4-6 hr reaction time



50-60 ppm enzyme

When a 100 TPD plant in South India moved from Chemical to Enzymatic Degumming using Lecitase Ultra

Index	Chemical Degumming	Enzymatic Degumming
Input Crude Oil	100 TPD	100 TPD
Gums	1.50%	1.50%
Degumming loss	3%	1.75%
Extra Oil / Ton	-	0.80%
Extra FAD / Ton	-	0.45%
Extra Gums / Ton	1.25%	-
Operatic Costs / Ton	₹ 318	₹ 301
Additional equipment	-	HSM, Dosing pump
Net savings/ MT of oil = ₹ 400		

Considering: oil price = 80000 ₹/MT, Dried gums = 50000 ₹/MT, FAD = 70000 ₹/MT

Beyond extra yield enzymatic degumming offers several additional benefits

Basis :
1 MT oil with 1.5 %
Phospholipids



Additional Benefits of Enzymatic Process



Consistently Lower P content



Reduces gums volume & oil carry over



Lyso-gums can be dried and used for feed application



Higher oil yield when crude oil has high P content

Losses illustration is without factoring the losses because of other impurities like HIS, Moisture etc

With enzymatic degumming you potentially achieve >1 crore additional profits per year...



...an extra up to

₹400

per ton of oil.



That's

₹40,000

every day,



every year.

₹10,000,000

every year.

Based on a plant with 100 TPD of oil processed and oil price at ₹80 per kg, 250 days



Commercial Proven



Training



Technical Support



Partnering with Engineering Companies

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