

# BIOMICROGEL<sup>®</sup> REAGENTS FOR PALM OIL EXTRACTION

It will help you to extract more vegetable oils and reduce losses without major capital investments or additional equipment

- ✓ Increases CPO production volume more than 5%
- ✓ Reduces oil losses in heavy phase and solid more than 30%
- ✓ Increases oil extraction in empty fruit bunches more than 10%



# BIOMICROGEL<sup>®</sup> REAGENTS FOR PALM OIL EXTRACTION: PROBLEMS TO BE SOLVED

The process of producing palm oil has not changed for the last 50 years.  
We have just improved it so you can earn more and:

- 🌿 Increase OER (CPO extraction)
- 🌿 Reduce oil losses
- 🌿 Make oil processing faster and easier
- 🌿 Save money on expensive equipment
- 🌿 Reduce water consumption
- 🌿 Not affect the quality of the oil or its characteristics





# BIOMICROGEL<sup>®</sup> FOR PALM OIL EXTRACTION: HOW IT WORKS

Biomicrogel<sup>®</sup> is a new technology for production of biopolymers from agricultural waste

These biopolymers substitute standard synthetic polymers, making oil extraction more efficient, cost-effective and sustainable

Watch Biomicrogel<sup>®</sup> effect in our YouTube video



Food Grade  
**CELLULOSE**



Food Grade  
**BEEF PECTIN**



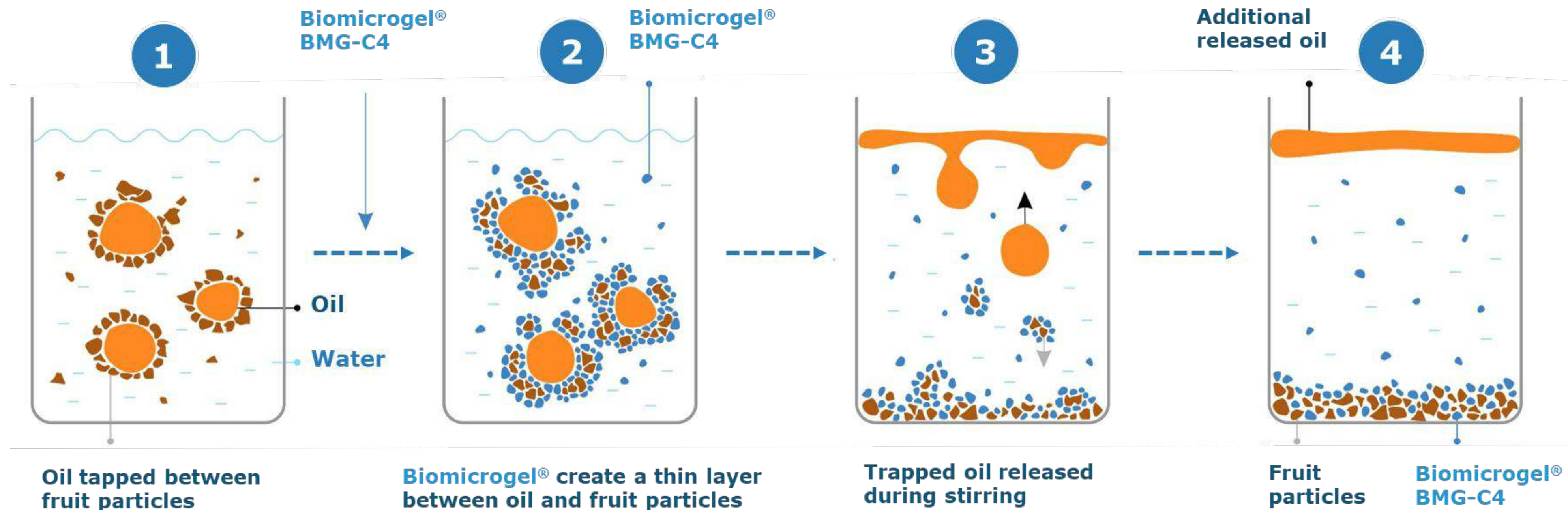
Food Grade  
**APPLE PECTIN**





# BIOMICROGEL® FOR PALM OIL EXTRACTION: HOW IT WORKS

Biomicrogel® helps to release oil trapped between fruits residue, boosting oil extraction











- Biomicrogel® added to DCO forms a biopolymer nanolayer on the surface of suspended solids in the sludge, speeds up oil extraction in the clarifier
- Negatively charged biopolymer molecules are attached to positively charged solid particles' surface and repel droplets of oil



# BIOMICROGEL® FOR PALM OIL EXTRACTION: ADVANTAGES

Biomicrogel® presents significant advantages for factories to increase productivity without CAPEX investments and translates in attractive Economic Value Added effect

-  Increases OER extraction by 0.5-1.3 p.p. for CPO, and 15 p.p. for SPO
-  Reduces extraction time and water consumption up to 50%
-  Reduces oil losses in Underflow, Heavy Phase, Cake and Mill effluent (POME)
-  Reduces moisture content in SPO (from 17% to 0.9%)
-  Works with temperatures up to 100°C and does not affect the quality of the oil
-  No changes needed in Mills operating procedures, low implementation and running costs
-  BMG can be dissolved in hot or cold water
-  Works with Empty Bunch Liquor and Palm Kernel Oil





# BIOMICROGEL® FOR PALM OIL EXTRACTION: PRODUCTS

Biomicrogels Group offers several solutions in Upstream and Downstream of palm oil extraction process



## BMG-C4

Increases vegetable oil extraction and reduces oil losses



## BMG-SPO

Extracts 25% more quality SPO twice as fast without additional equipment



## BMG Dosing Station

Easy to integrate and operate with low running costs

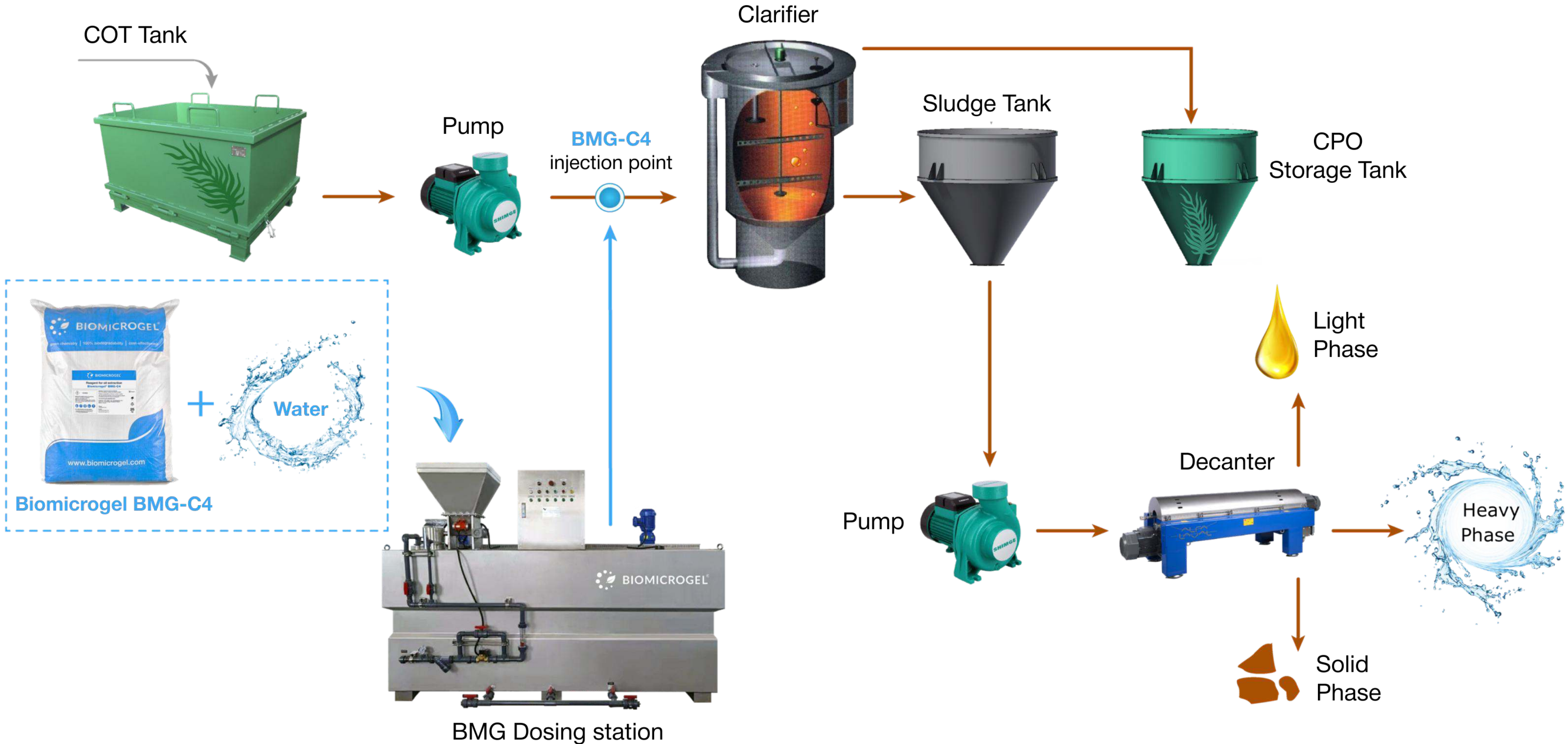


## BMG HERO

Recovers 80% of oil in POME



# BIOMICROGEL® FOR PALM OIL EXTRACTION: INTEGRATION IN PALM OIL MILL PROCESS



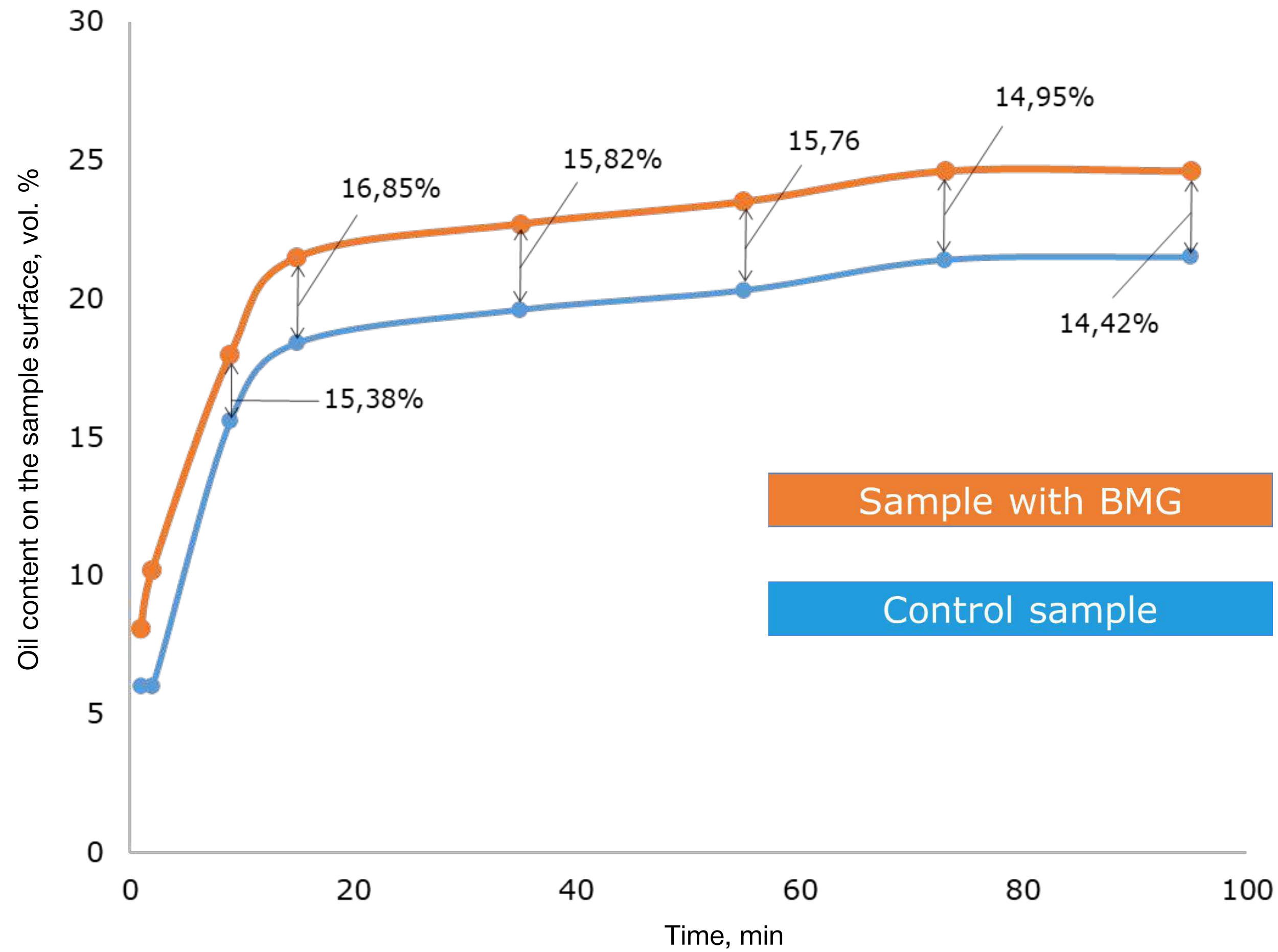
Mills operating procedures remain the same.

BMG solution integrates without major costs and changes to the extraction process





# BIOMICROGEL® FOR PALM OIL EXTRACTION: LAB TESTS RESULTS



Oil level vs time curve, 3% BMG solution, Dosing 1 g/l

We carried out multiple tests at Indonesian and Malaysian factories and each of them showed increase in oil extraction by up to **10-80%** after one hour





# BIOMICROGEL® FOR PALM OIL EXTRACTION: LAB TESTS RESULTS – SLUDGE PALM OIL

## Task

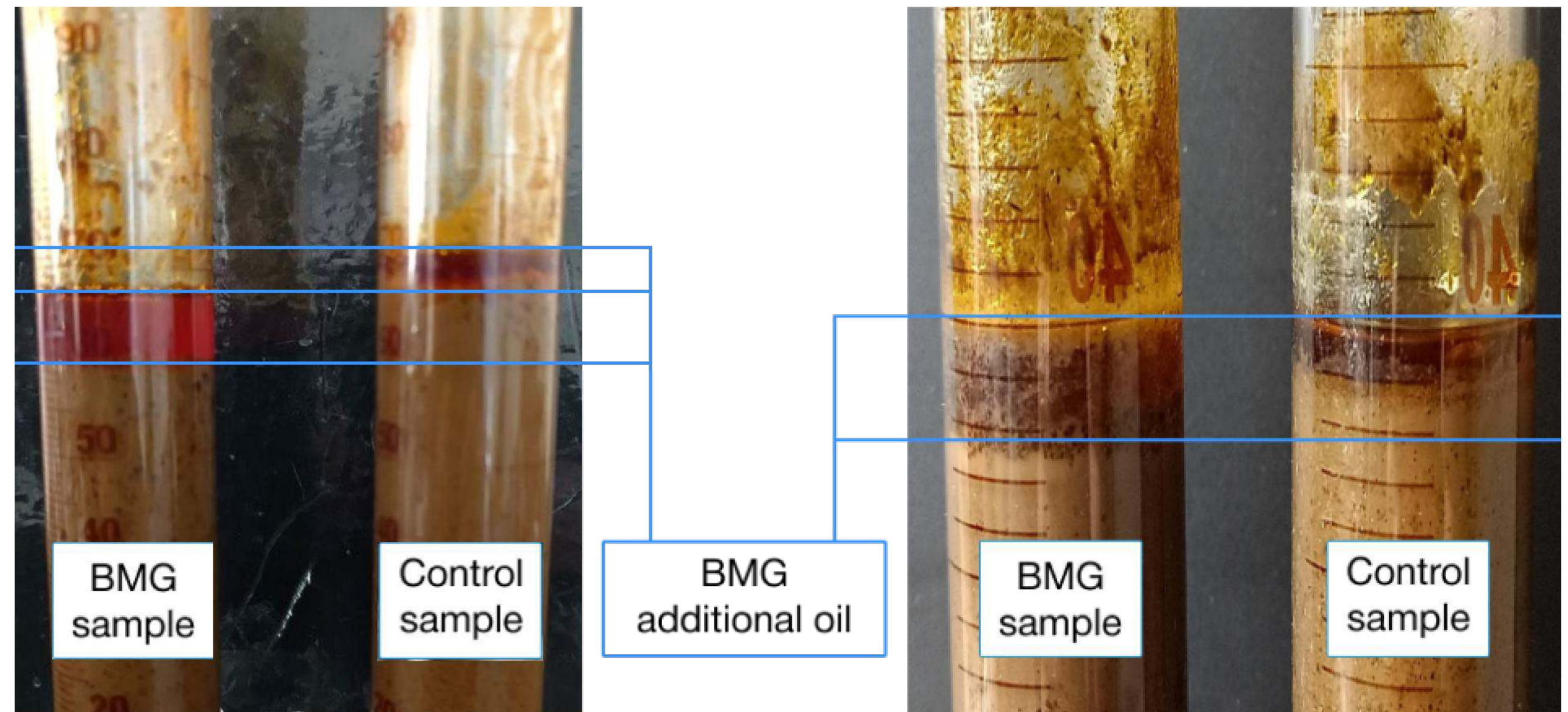
Demonstrate BMG effect in lab tests

## Lab test method

- COT and Underflow samples taken
- Biomicrogel® BMG-C4 used in BMG tube
- Control tube and BMG tube placed in the water bath, heated to 90°C

## Results

- Increased oil layer in COT sample by 100% after 75 minutes of settling
- 10 mm of oil in Underflow sample vs 5 mm in Control sample after 60 minutes of settling



COT sample

Underflow sample





# BIOMICROGEL® FOR PALM OIL EXTRACTION: LAB TESTS RESULTS – SLUDGE PALM OIL

## Task

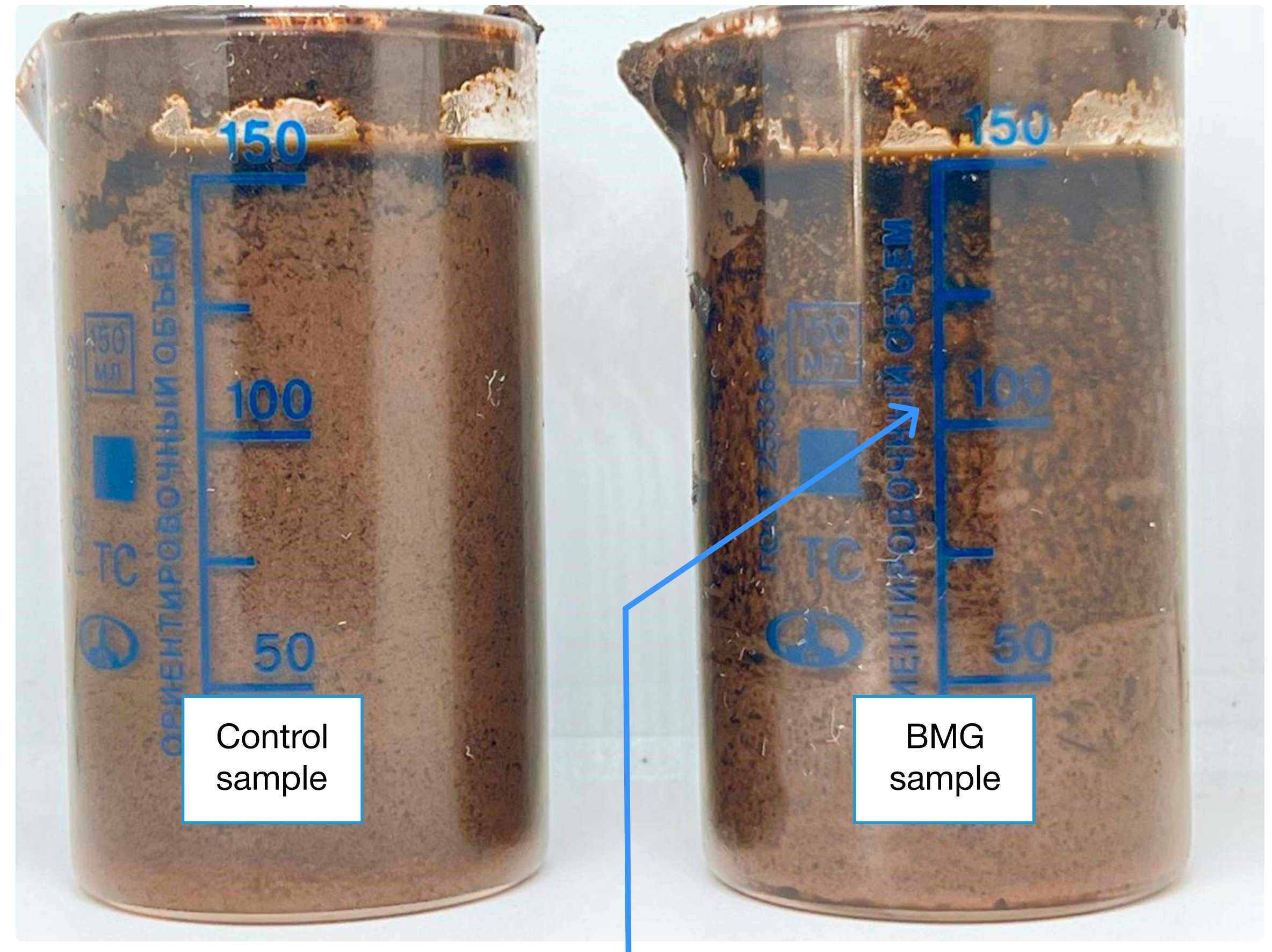
Demonstrate BMG application for Sludge Palm Oil

## Lab test method

- Sludge palm oil samples taken
- Biomicrogel® BMG-C4 used in BMG tube
- Control tube and BMG tube placed in the water bath, heated to 90°C

## Results

After one hour BMG extracts 28-40% more oil, and oil in sludge looks better separated from solid



Visible oil separation after 1 hour





# BIOMICROGEL® FOR PALM OIL EXTRACTION: HERO EQUIPMENT RESULTS

- HERO – High Efficiency Recovery Oil equipment for extracting oil from POME
- 6 contracts signed including Felda and Felkra Groups
- HERO can recover 80% of oil in POME after 1 hour retention time
- Recovered oil in the latest case in Malaysia had FFA 10.09% and moisture 0.44%





# BIOMICROGEL® FOR PALM OIL EXTRACTION: PRODUCT EXAMPLE



## Physical properties of BMG-C4

|                 |                                   |
|-----------------|-----------------------------------|
| Aggregate state | Powder                            |
| Color           | Varies from beige to yellow-brown |
| Bulk density    | 0.55 - 0.60 g/m <sup>3</sup>      |
| pH value*       | 1.4 - 6.5                         |

*\*The concentration of the aqueous solution should not exceed 3%*

## Package

BMG-C4 is supplied in 25 kg sealed bag





# BIOMICROGEL® BMG-C4

## TECHNICAL INFORMATION

### Application

BMG-C4 is designed to increase the extraction of various vegetable oils during their production at the stages of settling and centrifugation. A water solution of BMG-C4 has the property to separate oil from solid particles. BMG-C4 is used as a 3% working solution

### Recommended dosage

The optimal dosage of the BMG-C4 is from 0.7 to 1.0 g of BMG-C4 dry powder per 1 litre of non-oil sludge in DCO flow. BMG-C4 dosage is calculated based on the combined volume of water, non-oil-solid and emulsion, or volume of sludge minus oil volume

It is recommended to add in the form of a 3% water working solution. The volume of working solution BMG-C4 is from 10 to 33 ml per 1 litre of non-oil sludge in DCO flow

### Preparation of the working solution

The working solution of BMG-C4 is prepared in a tank equipped with an overhead stirrer at a stirring speed of 100 rpm by dissolving an appropriate amount of dry BMG-C4 powder in tap or hot water that. The dissolution time varies from 10 to 30 minutes

To prepare a working solution with 3 % concentration – take 30 kg of BMG-C4 dry powder, pour it into a mixing tank and add 970 litre of tap water. The recommended stirring time is 20-30 minutes, or until BMG-C4 is completely dissolved

### Safety data

Sodium carboxymethyl cellulose, (CAS-No.) 9004-32-4, (EC-No.) 618-378-6  
BMG safety confirmed by independent expertise in test centers in Malaysia and Indonesia



# BIOMICROGEL® FOR PALM OIL EXTRACTION: PRODUCT EXAMPLE



## Physical properties of BMG-SPO

|                         |                                   |
|-------------------------|-----------------------------------|
| Aggregate state         | Powder                            |
| Color                   | Varies from beige to yellow-brown |
| Bulk density            | 0.6 - 0.7 g/m <sup>3</sup>        |
| pH of 1% water solution | 5.5 - 6.5                         |

## Package

BMG-SPO is supplied in 20 kg bag





# BIOMICROGEL® BMG-SPO

## TECHNICAL INFORMATION

### Application

BMG-SPO is used as a working solution with a concentration of no more than 1%.

Stirring speed — 900 rpm (until a funnel forms).

Mixing time — 60 minutes (or until completely dissolved)

The working solution is dosed into sludge before the settling stage. Working solution and 25% of water are simultaneously added to sludge. BMG-SPO can be dissolved in the added water, or prepared separately in a smaller volume

### Recommended dosage

Recommended consumption of BMG-SPO:

- For dry product — 1 kg/m<sup>3</sup> sludge;
- For working solution — 100 l/m<sup>3</sup> sludge.

To clarify the optimal dosages of BMG-SPO, it is recommended to conduct laboratory tests and/or industrial trials

### Storage

BMG-SPO is recommended to be stored in closed, ventilated warehouses under conditions that prevent exposure to precipitation and dust, protected from direct sunlight, at temperatures from +5 to +35 °C

Guaranteed shelf life in original packaging, subject to transportation and storage rules, is 36 months from the date of manufacture, after opening the package — 7 days, subject to storage conditions. The shelf life of the working solution — 3 days

### Safety data

Sodium carboxymethyl cellulose, (CAS-No.) 9004-32-4, (EC-No.) 618-378-6  
BMG safety confirmed by independent expertise in test centers in Malaysia and Indonesia





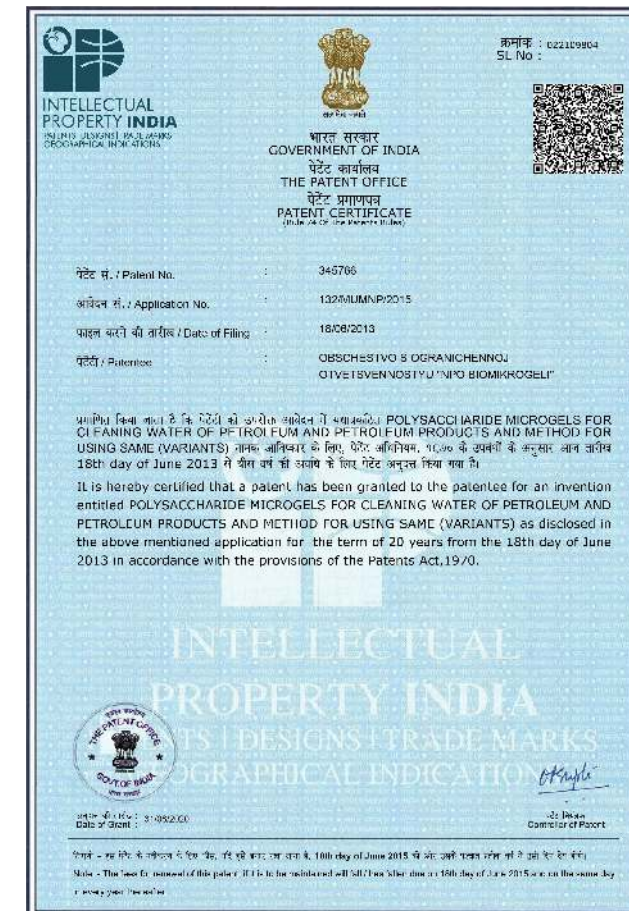


# BIOMICROGELS GROUP: ABOUT THE COMPANY

We have been producing industrial reagents for more than 12 years  
Registered more than 100 patents globally

## Our products are applied for:

-  Home care and cosmetics products
-  Mineral processing
-  Industrial wastewater treatment
-  Vegetable oils extraction



## Recognized as a game changer by the Palm Oil leading experts:

**BUSINESS** **BERNAMA.com**

**BIOMICROGELS GROUP INTRODUCES PRODUCTS TO OPTIMISE PALM OIL PRODUCTION IN MALAYSIA**



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Read on **X**



Innovation, Science and Economic Development Canada  
Brevet canadien / Canadian Patent

2,876,623

20190924  
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Canada

United States of America  
The Director  
of the United States Patent and Trademark Office has received an application for a patent for a new and useful invention. The title and description of the invention are enclosed. The requirements of law have been complied with, and it has been determined that a patent on the invention shall be granted under the law.

Therefore, the United States

**Patent**

grants to the person(s) having title to this patent the right to exclude others from making, using, offering for sale, or selling the invention throughout the United States of America, and if the invention is a process, of the right to exclude others from using, offering for sale or selling throughout the United States of America, products made by that process, for the term set forth in 35 U.S.C. 351(a)(1) or (a)(2), subject to the payment of maintenance fees as provided by 35 U.S.C. 418. See the Maintenance Fee Notice on the inside of the cover.

Andrew Iannone  
DIRECTOR OF THE UNITED STATES PATENT AND TRADEMARK OFFICE





# BIOMICROGELS GROUP: ABOUT THE COMPANY

## Product development for customer needs

- 🌿 Own research and development center
- 🌿 4 modern laboratories
- 🌿 Doctor and candidates of chemical sciences on staff

## Modern manufacturing

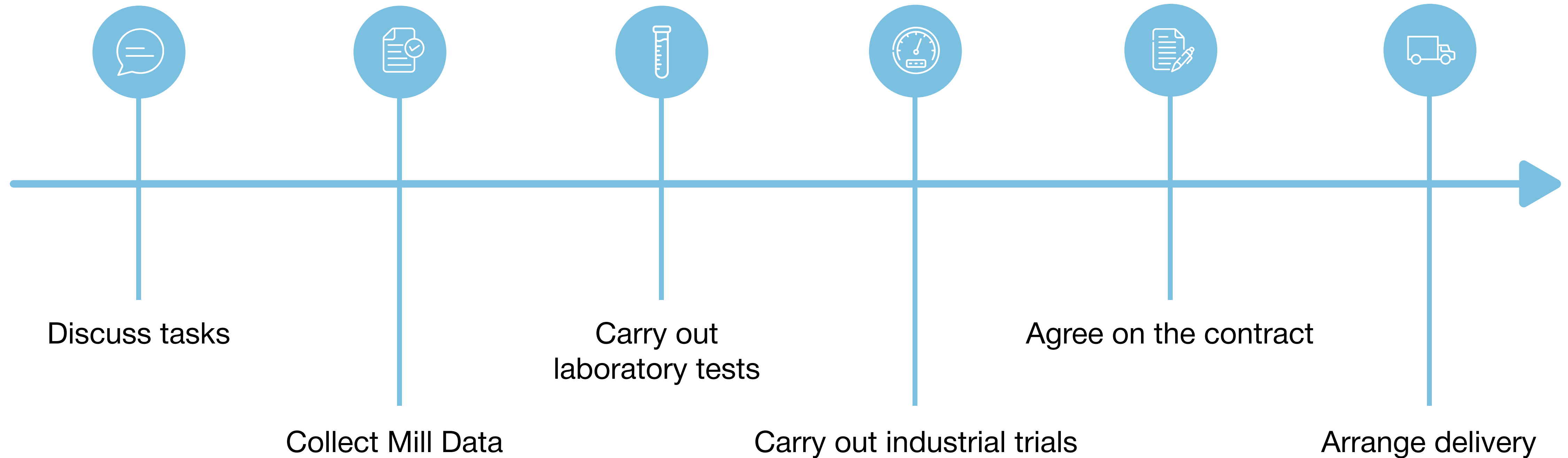
- 🌿 3000 m<sup>2</sup> production area
- 🌿 10 tons of finished products per shift
- 🌿 600 m<sup>2</sup> warehouse area





# BIOMICROGELS GROUP: BMG IMPLEMENTATION FLOW-CHART

We collect samples, conduct laboratory and industrial tests, and accompany you at all stages  
Before delivery, we will prove that Biomicrogel<sup>®</sup> products are guaranteed to solve your tasks





# BIOMICROGELS GROUP: AWARDS



Winner in the «Green Development» category in the BRICS Innovation competition 2023



The Best Tech Company at G20, Italy 2021



«Seal of quality» of the European program on implementation of innovations Horizon 2020



Included in the ranking of the 100 most promising companies in the world



Winner of the international innovation development program Poland Prize



«Best Technology» at the international environmental award EWA AWARDS 2020






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