

Biomicrogels[®]

Oil extraction boost



BIOMICROGEL[®]

Green chemistry | 100% biodegradable | cost-effective

About Company & Technology

Biomicrogel® are abbreviated BMG

Biomicrogels Group – founded 2012, international innovation company, created an absolutely new technology for production of biopolymers from cheap and widely available agricultural wastes.

These biopolymers substitute standard synthetic polymers in home care and cosmetics products, industrial wastewater treatment, vegetable oils extraction as well as oil spill response sectors, making them more efficient, cost-effective and sustainable.

BIOMICROGELS® ARE NANO-SCALE PLANT-BASED BIOPOLYMERS THAT:

- Boost oil extraction, increase productivity
- Enhance OER
- Reduce oil losses in wastes
- Patented in more than **60 countries**

KEY ADVANTAGES



Plant-based and 100% biodegradable



Cost-efficient



Easy to use



Food Grade
CELLULOSE



Food Grade
APPLE PECTIN







Food Grade
BEET PECTIN

BMG – About the Company

Biomicrogel® are abbreviated BMG

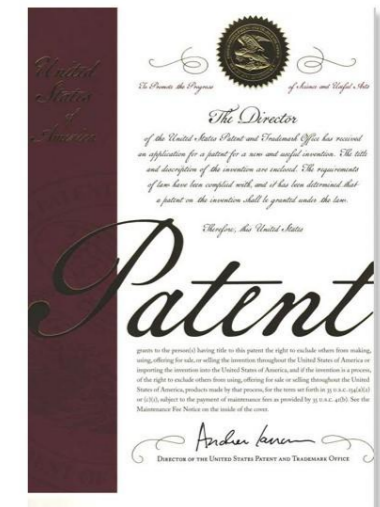
We have been producing industrial reagents for more than 12 years
Registered more than 100 patents globally

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:



BIOMICROGEL Applications

Biomicrogel® are abbreviated BMG



Biomicrogel® for Palm Oil

Biomicrogel® are abbreviated BMG

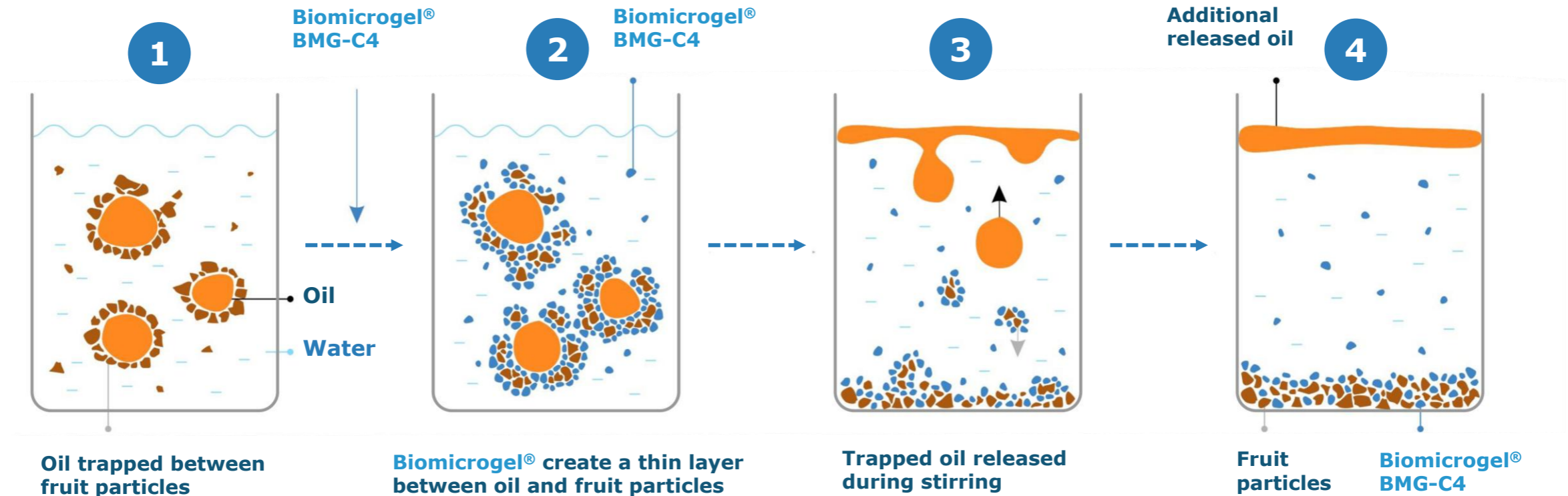
- Increases CPO extraction
- Reduces extraction time in Clarifier
- Works with temperatures up to 100°C
- Reduces water consumption in COT tank up to 50%
- Reduces oil content in Heavy Phase, Cake, POME
- Reduces emulsion in the process and moisture in SPO (from 17% to 0.9%)
- No changes in Mills operating procedures
- Low implementation and running costs
- BMG effectively works with Empty Bunch Liquor and Palm Kernel Oil in lab tests



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

Biomicrogel® for Palm Oil – How It Works

Biomicrogel® are abbreviated BMG



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

BMG particles help to release oil trapped between fruits residue

Lab Test Confirmation – DCO/COT Sample

DOCUMENTATION OF LAB TEST RESULTS WITH EACH OBSERVATION TIME:



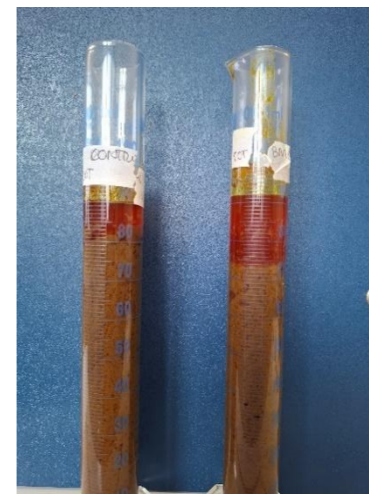
15 Minutes



30 Minutes



45 Minutes



60 Minutes



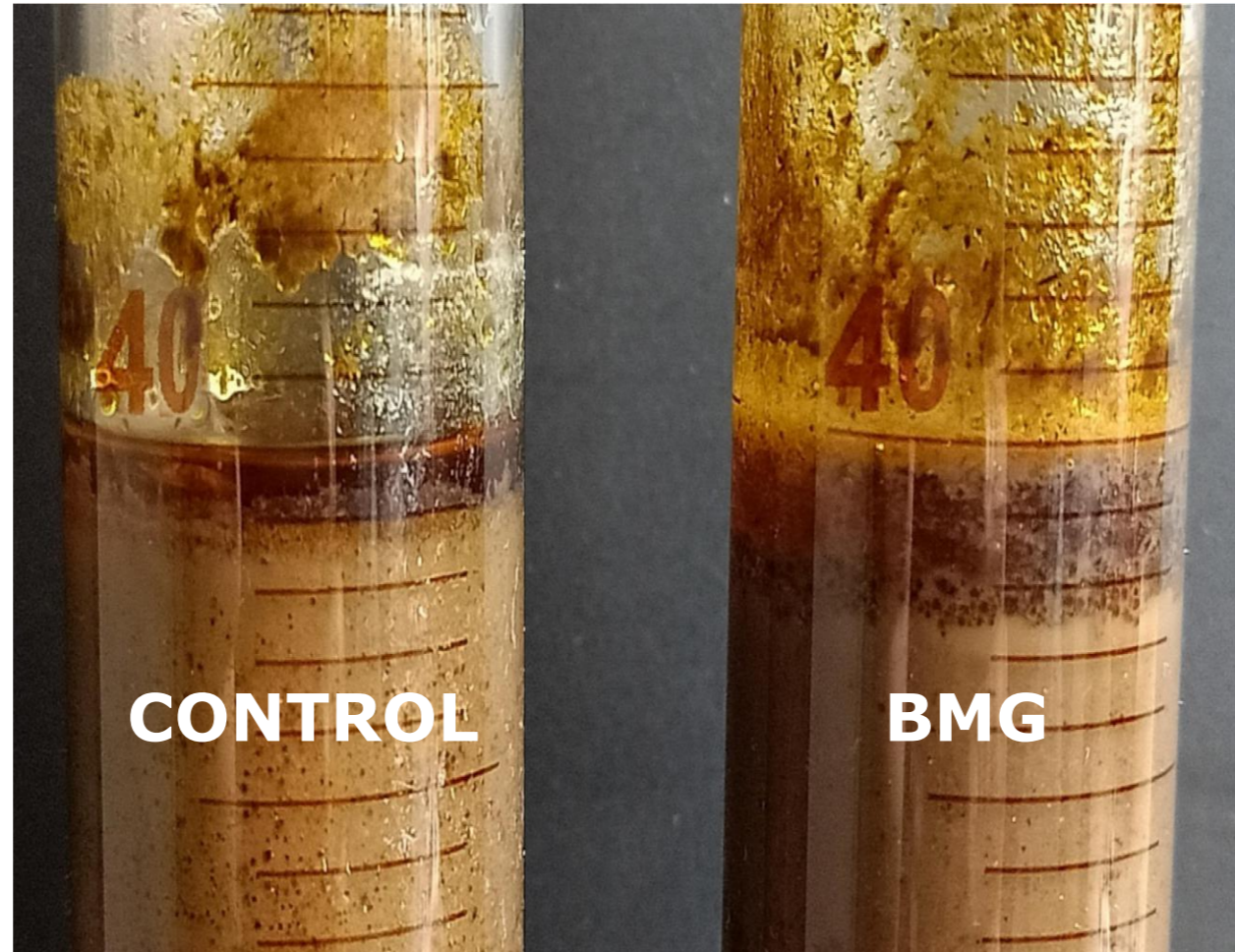
75 Minutes

Lab Tests Confirmation – Underflow sample

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BMG effect demonstrated in a lab test with Underflow sludge samples placed in a bath tub

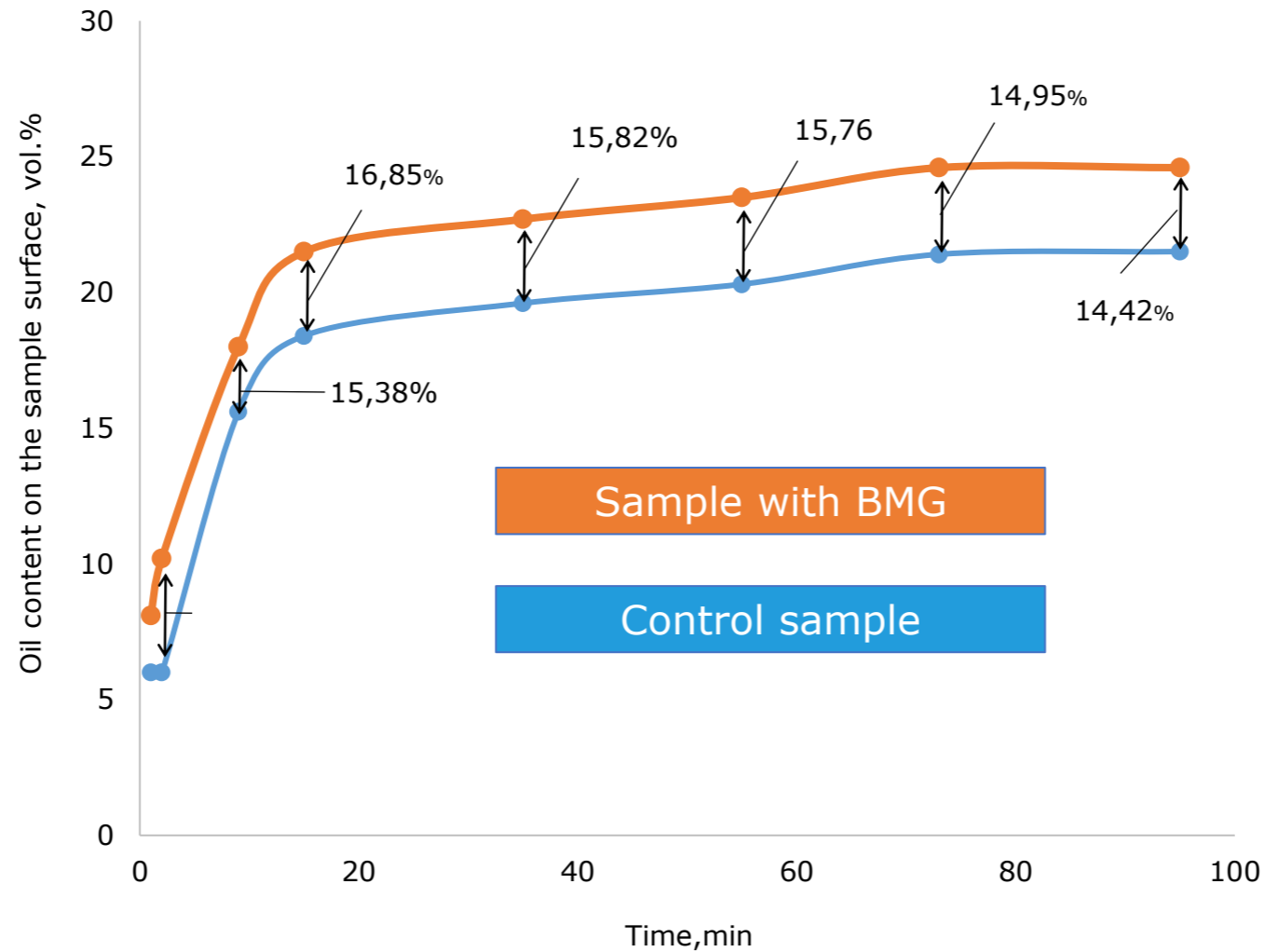
- From left to right: control and BMG injected tubes
- BMG dosing 1.0 g/l into Underflow, after 1 hour in 80 °C bath tub (BMG can work with temperatures range 75-100C)



- BMG solution evenly distributed in the tube column – simulating Clarifier
- Estimated 12-30% of additional oil per hour in lab environment

BMG extracts additional 20-30% oil in 1 hour in lab tests

Tests Results: Oil Volume % vs Time (lab tests, COT sample)

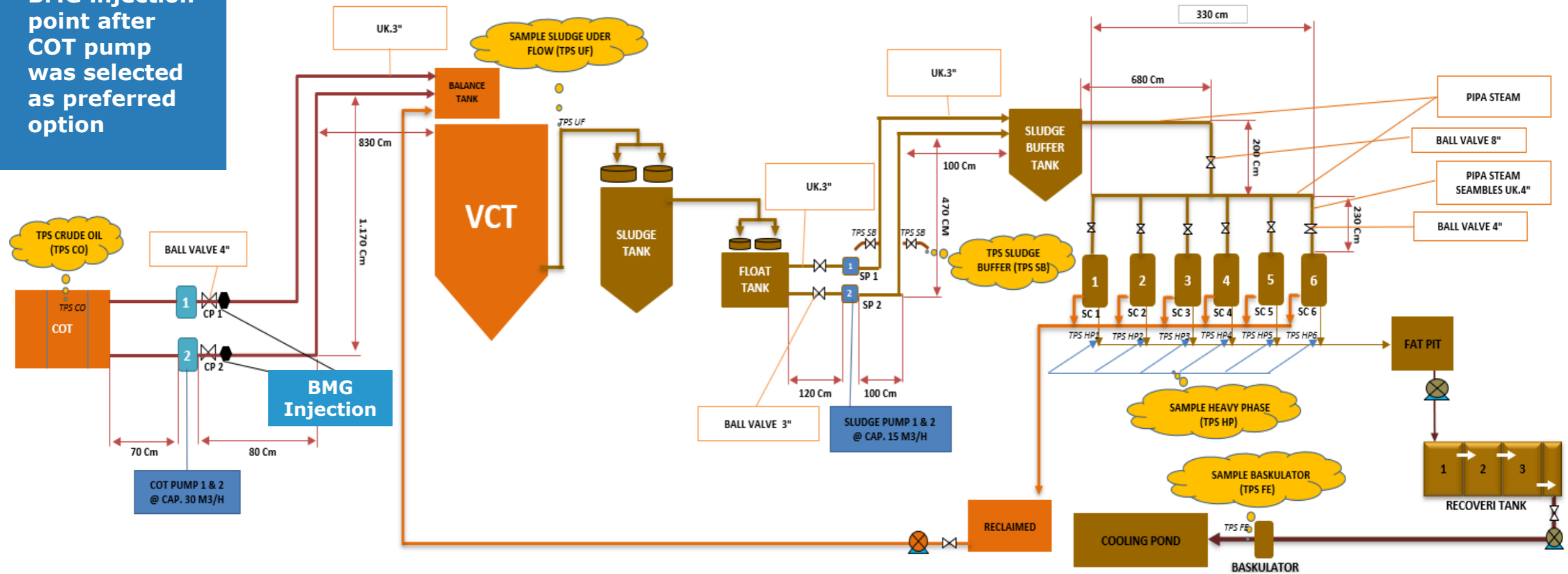


Oil level vs time curve, 3% BMG solution, Dosing 1 g/l of sludge – oil content (we exclude oil because BMG does not affect oil)

BMG INTEGRATION IN PALM OIL MILL

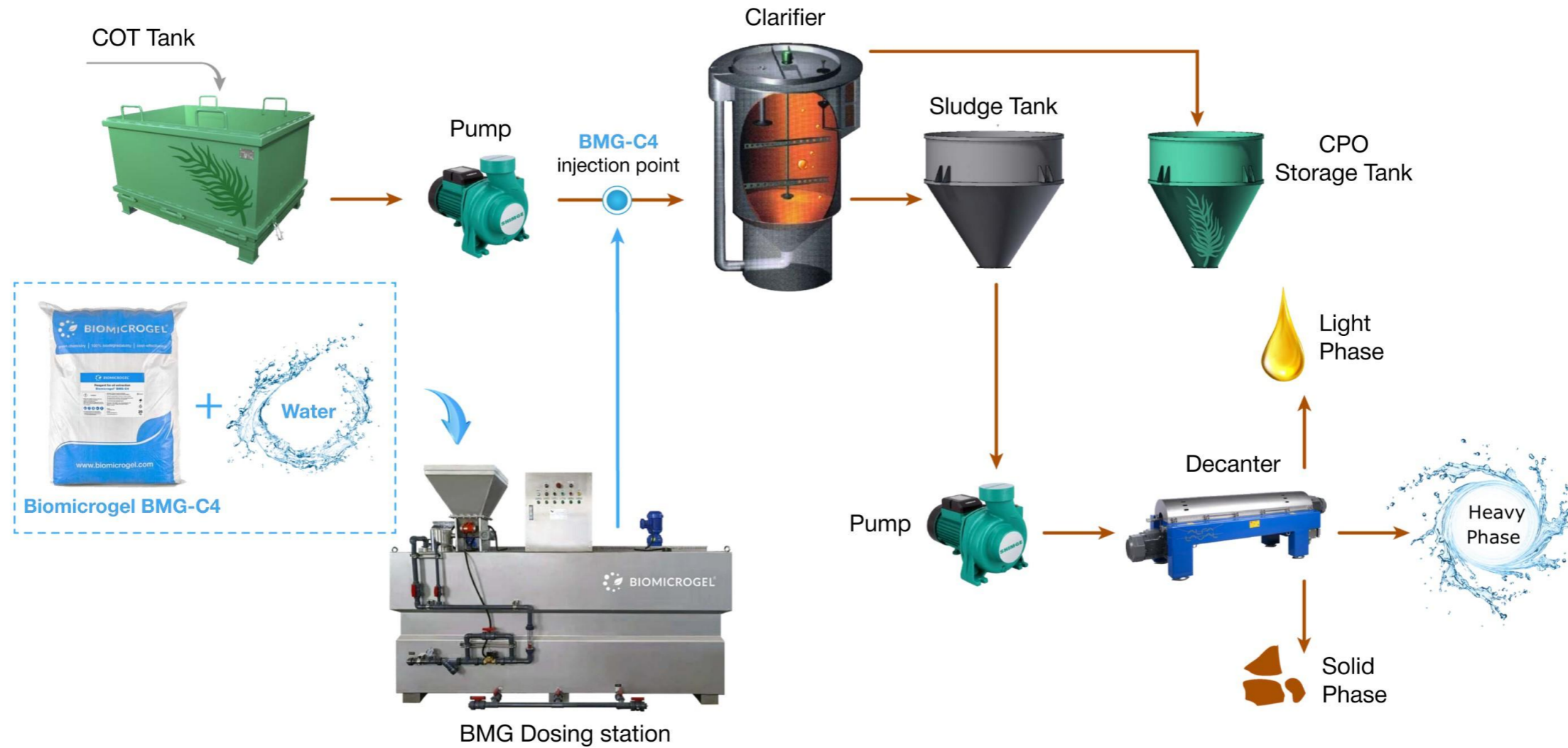
After several factory trials BMG injection point after COT pump was selected as preferred option

DIAGRAM FLOW SLUDGE ST. CLARIFICATION



INTEGRATION IN PALM OIL MILL PROCESS

Biomicrogel® are abbreviated BMG



BMG Dosing station integration in mill

Biomicrogel® are abbreviated BMG

BMG Dosing Station – designed specifically for BMG dosing at Palm Oil Mills

BMG can be dissolved in 10-20 minutes in cold or hot water



BMG Dosing station integration in BGA's mill

Biomicrogel® are abbreviated BMG

BMG Dosing Station is easy to operate and semi-automation



Key Findings

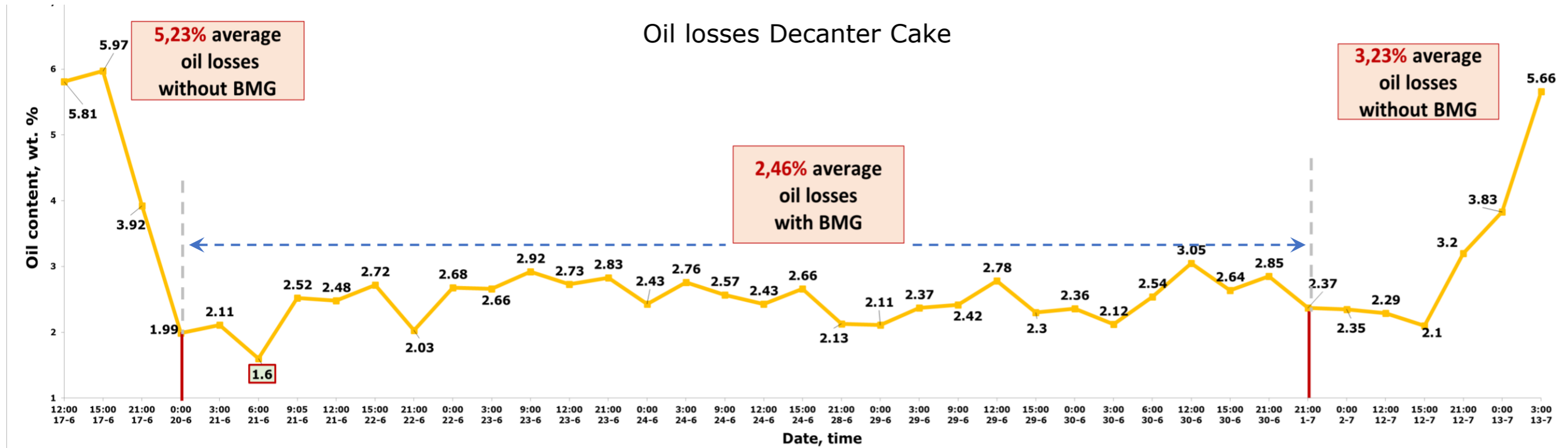
Biomicrogel® are abbreviated BMG

- **OER**
 - BMG increased OER **0.5 - 1.3 p.p.** at standard BMG dosage vs control days
- **Oil in Clarifier**
 - Accelerated CPO extraction starts after BMG fills the whole system (from 10 to 23 hrs)
 - Additional oil observed on the surface of CST and measured hourly, extra oil is skimmed
- **Oil losses reduced**
 - Oil content reduced in Underflow **20-30%**, in Cake **20-26%** and in Heavy phase **19-36%** vs control days

BMG increases daily productivity and reduces oil losses in Heavy phase and Decanter Cake

Oil Losses: Decanter Cake

Biomicrogel® are abbreviated BMG



* Foss express test done on Foss equipment where samples analysis is done in 2 minutes vs 6-10 hours in extraction tests

With BMG oil losses in Decanter Cake reduced 50 to 25% in the Foss express tests

BMG effect on OER – Kalimantan trials

OER data Control vs BMG Dosing period

| Date | OER by FM |
|------------------------|--------------|
| | % |
| Control period average | 25,28 |
| BMG period average | 26,32 |
| BMG Effect, % | 4,13 |
| BMG Effect, pp | 1,04 |

With BMG the Kalimantan mill achieved annual target of 25%, showed absolute record OER for the mill and the Group, and new target OER 25.25% is set for 2024

BMG effect on Oil losses – Kalimantan trials

| Dates | Inderflow CST-A | Inderflow CST-B | Heavy Phase HSS 1 | Heavy Phase HSS 2 |
|-----------------------|-----------------|-----------------|-------------------|-------------------|
| | Oil, % | Oil, % | Oil, % | Oil, % |
| Control period | 4.9 | 4.4 | 0.61 | 0.64 |
| BMG Dosing | 4.3 | 3.9 | 0.53 | 0.56 |
| BMG Effect | -12% | -10% | -12% | -13% |

With BMG the Kalimantan mill achieved annual target of 25%, showed absolute record OER for the mill and the Group, and new target OER 25.25% is set for 2024

BMG Economic Value Added Model for CPO

| EVA model for Customer Indonesia, CPO at Rp. 14,500,000/tn | | | |
|--|----------------|------------------|------------------|
| OER increase, % | 3 | 4 | 5 |
| Current Average OER, % | 23.5% | 23.5% | 23.5% |
| OER target, % | 24.2% | 24.4% | 24.7% |
| BMG, kg/day | 210.00 | 210.00 | 210.00 |
| Average FFB, tn/day | 600 | 600 | 600 |
| Average CPO, tn/day | 141.0 | 141.0 | 141.0 |
| CPO with BMG, tn/day | 145.2 | 146.6 | 148.1 |
| Additional CPO, tn/day | 4.2 | 5.6 | 7.1 |
| CPO price, Rp/tn FFB (000) | 14,500 | 14,500 | 14,500 |
| Additional CPO income (sales value) | 61,335 | 81,780 | 102,225 |
| BMG cost, Rp/kg (000) | 135 | 135 | 135 |
| BMG Cost, Rp/day (000) | 28,382 | 28,382 | 28,382 |
| BMG cost per 1 tn FFB, Rp (000) | 47.30 | 47.30 | 47.30 |
| BMG cost per 1 tn CPO, Rp (000) | 6,710 | 5,032 | 4,026 |
| Net Profit, Rp/day (000) | 32,953 | 53,399 | 73,844 |
| Additional CPO income (sales value) , Rp/month (000) | 1,594,710 | 2,044,500 | 2,555,625 |
| BMG Cost, Rp/month (000) | 737,919 | 737,919 | 737,919 |
| Net Profit, Rp/month (000) | 856,791 | 1,306,581 | 1,817,706 |
| Economic Value Added | 125% | 188% | 260% |
| EVA= (Additional Oil cost - BMG cost)/ BMG cost | | | |
| BMG cost per 1 tn FFB, Rp (000) | | | 47.30 |
| Kurs | 15.9 | Rp/\$ | (000) |

Key figures:

- **BMG dosing = 350 gr per 1 tn FFB**
- **3% solution**
- **1gr per 1 liter of Sludge – Oil content**
- **Oil losses reduction is not taken into effect**
- **Price may be vary, depends on volume of order and area**

Environmental Impact

Biomicrogel® are abbreviated BMG

| WATER | CO ₂ | HUMAN HEALTH | SEAS AND SOILS | RESOURCE SECURITY |
|--|--|---|---|---|
| <p>The water crisis ranked in the top 3 of global risks for the third consecutive year by World Economic Forum</p> | <p>In 2020 CO₂ emissions hit new record despite Covid-19 lockdowns</p> | <p>The number of allergic people is growing at a large pace</p> | <p>Oil contamination, e.g. Gulf of Mexico or Norilsk disasters, is a hazard for local and regional flora and fauna</p> | <p>Securing the global supply of resources is one of the key challenges of the XXI century due to population growth</p> |
| OUR TECHNOLOGY | | | | |
| <p>Biomicrogel® solutions are directly aimed at the treatment and cleaning of water, unlocking fresh water resource</p> | <p>Saving of up to 23 mn tonnes of CO₂ per year through the recovery of oil from water at various applications, as well as through the use of agricultural waste as feedstock for the production of biomicrogels®</p> | <p>Biomicrogel®-based home and personal care products are safe for people with sensitive skin and allergies.</p> | <p>Biomicrogels Group has developed solutions specifically addressing the challenges of reducing oil contamination and dealing with it's consequences</p> | <p>Biomicrogels® solutions not only help treat water from oils, but provide the means to recover the product for re-use</p> |
| SOLUTIONS | | | | |
| <ul style="list-style-type: none"> • Industrial wastewater treatment • Produced and mining water treatment • Oil spill response | <ul style="list-style-type: none"> • Biomicrogel® production • Vegetable oils extraction • Industrial wastewater treatment | <ul style="list-style-type: none"> • Home care and cosmetics • Ingredients for home care and cosmetics production | <ul style="list-style-type: none"> • Oil spill response at sea and on land | <ul style="list-style-type: none"> • Oil spill response • Produced water treatment • Production of biomicrogels from renewable raw materials |

BMG SAFETY DATA

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BMG IS 100% NATURAL 
PRODUCT PRODUCED FROM CELLULOSE

Data Safety Sheet:

- Sodium carboxymethyl cellulose, (CAS-No.) 9004-32-4, (EC-No.) 618-378-6
- Food grade, Non-toxic, not classified, not dangerous for environment according to EC No.1272/2008
- Used as thickener and stabilizer for reagents in food, cosmetics, pharmaceutical industries
- **BMG safety was confirmed** by independent expertise in one of the leading test centers in Malaysia



R&D AND PRODUCTION FACILITIES



BIOMICROGELS GROUP: ABOUT THE COMPANY

We have been producing industrial reagents for more than 10 years.
Registered more than 100 patents in Russia and the world.

Expert sales and technical support department

- 🌿 The engineer will select the optimal modification and dosage. You will get maximum efficiency with minimal reagent consumption.
- 🌿 A sales specialist will negotiate the best price and special conditions for purchases.
- 🌿 The manager will accompany you from sending samples for testing to exchanging documents and post-sales support.



BIOMICROGELS GROUP: ABOUT THE COMPANY

Modern manufacturing

- 🌿 3000 m² production area;
- 🌿 10 tons of finished products per shift;
- 🌿 600 m² warehouse area.



Product development for customer needs

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



BIOMICROGELS GROUP: AWARDS



Winner in the «green development» category in the BRICS innovation competition 2023.



Top 10 best technology solutions in G20 countries for 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.



THANK YOU

If you have any interested, please do not hesitate to contact us below :

Whatsapp : +62 812 6060 1439

Email : alpin.Istanto@biomicrogel.com