

CENTRAL ANALYTICAL LABORATORY

Lot 2135 Batu 23½ Jalan Johor Bahru-Kota Tinggi
81900 Kota Tinggi, Johor.

Tel: 07-8821145 / Email: jpcal@johorplantations.com

SERVICE TEST: EFFLUENT

| Materials/ Products Tested | Ref No. | Type of Test/ Properties Measured/ Range of Measurement | Standard Test Methods/ Equipment/Techniques |
|--|-------------------|--|--|
| Environmental Monitoring Palm Oil Mill and Rubber Factory Effluent | 1a | Biochemical Oxygen | DOE Method, 4 th Edition 2019, REF |
| | 1b | Demand (BOD ₃) | DOE Method, 4 th Edition 2019, ALT |
| | 2 | Chemical Oxygen Demand (COD) | DOE Method, 4 th Edition 2019, ALT |
| | 3 | Ammoniacal Nitrogen (AN) | In-house Method TP-EFF-03 Based on DOE Method, 4 th Edition 2019, REF |
| | 4 | Total Kjeldahl Nitrogen (TKN) | DOE Method, 4 th Edition 2019, ALT |
| | 5 | Suspended Solids (SS) | DOE Method, 4 th Edition 2019, REF |
| | 6 | Total Solids | APHA 2540 B, 19 th Edition 1995 |
| | 7 | pH | APHA Method 4500-H ⁺ B 22 nd Edition 2012 |
| | 8 | Oil & Grease (O & G) | DOE Method, 4 th Edition 2019, REF |
| | 9 | *Volatile Acids | APHA Method 5560 C 22 nd Edition 2012 – Organic And Volatile Acids |
| | 10 | *Alkalinity | APHA 2320 B 22 nd Edition 2012 – Titration Method |
| | 11 | *Volatile Suspended Solids | APHA 2540 E 22 nd Edition 2012 - Fixed and Volatile Solids Ignited at 550°C |
| 12 | *Dissolved Oxygen | APHA 4500-O G 22 nd Edition 2012 – Membrane Electrode Method | |

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SERVICE TEST: WATER

| Materials/ Products Tested | Ref No. | Type of Test/ Properties Measured/ Range of Measurement | Standard Test Methods/ Equipment/Techniques |
|---|------------|---|---|
| Environmental Monitoring Sewage Water Water Processed Water Surface Water | 13 | *Total Coliform | APHA Method 9221 B 23 rd Edition 2017 |
| | 14 | *E-Coli | APHA Method 9221 F 23 rd Edition 2017 |
| | 15 | pH at 25°C | APHA Method 4500-H+B 23 rd Edition 2017 |
| | 16 | Biochemical Oxygen Demand (BOD ₅) | In-house Method, TP-WAT-03, Based on APHA Method 5210 B 23 rd Edition 2017 |
| | 17 | Dissolved Oxygen | APHA Method 4500-O H 23 rd Edition 2017 |
| | 18 | Chemical Oxygen Demand | In-house Method, TP-WAT-05, Based on APHA Method 5220 B 23 rd Edition 2017 |
| | 19 | Ammoniacal Nitrogen | APHA Method 4500-NH ₃ C 23 rd Edition 2017 |
| | 20 | Nitrate Nitrogen | APHA Method 4500-NO ₃ ⁻ B 23 rd Edition 2017 |
| | 21 | Chloride | APHA Method 4500-Cl B 23 rd Edition 2017 |
| | 22 | Phosphorous | APHA Method 4500-P C 23 rd Edition 2017 |
| | 23 | Total Solids | APHA Method 2540 B 23 rd Edition 2017 |
| | 24 | Total Suspended Solids | APHA Method 2540 D 23 rd Edition 2017 |
| | 25 | Total Dissolved Solids | In-house Method, TP-WAT-12, Based on APHA Method 2540 C 23 rd Edition 2017 |
| | 26 | Conductivity | APHA Method 2510 B 23 rd Edition 2017 |
| 27 | Hardness | APHA 2340 B 23 rd Edition 2017 | |

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SERVICE TEST: WATER

| Materials/ Products Tested | Ref No. | Type of Test/ Properties Measured/ Range of Measurement | Standard Test Methods/ Equipment/Techniques |
|-------------------------------|------------|---|--|
| Environmental Monitoring | 28 | Potassium | APHA 3030E, 3120 B 23 rd Edition 2017/ICP |
| Sewage Water | 29 | Magnesium | |
| <u>Water</u> | 30 | Calcium | |
| Processed Water | 31 | Zinc | |
| Surface Water | 32 | Manganese | |
| | 33 | Iron | |
| | 34 | Copper | |
| | 35 | Aluminium | |
| | 36 | Sodium | |
| | 37 | Cadmium | |
| | 38 | Plumbum | |
| | 39 | Chromium | |
| | 40 | Selenium | |
| | 41 | Silver | |
| | 42 | *Sulphate | |
| | 43 | Turbidity | In-house Method, TP-WAT-16, Water & Environmental Analysis According to US EPA Regulations, 1995 |

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SERVICE TEST: PALM OIL PRODUCTS

| Materials/ Products Tested | Ref No. | Type of Test/ Properties Measured/ Range of Measurement | Standard Test Methods/ Equipment/Techniques |
|---|------------|---|---|
| Foods Palm Oil & Palm Oil Products | 45 | Moisture & Volatile Matter | MPOB Test Method p2.1:2004 |
| | 46 | Insoluble Impurities | MPOB Test Method p2.2:2004 |
| | 47 | Acidity | MPOB Test Method p2.5:2004 |
| | 48 | Iodine Value | MPOB Test Method p3.2:2004 |
| | 49 | Peroxide Value | PORIM Test Method p2.3:2004 |
| | 50 | DOBI | MPOB Test Method p2.9:2004 |
| | 51 | *Copper | MPOB Test Method p2.10:2004 |
| | 52 | *Ferum | MPOB Test Method p2.10:2004 |
| | 53 | *Phosphorous | MPOB Test Method p2.10:2004 |
| | 54 | *Discriminant Function | MPOB Test Method p2.14:2004 |
| | 55 | *Specific Extinction | MPOB Test Method p2.14:2004 |
| | 56 | *Carotene | MPOB Test Method p2.6:2004 |
| | 57 | *Physical Analysis | Palm Oil Factory Process Handbook, Laboratory And Milling Control |
| | 133 | *Total Chloride | Operational Manual (Horizontal Furnace) For Coulometer Model MCD- 210 |

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SERVICE TEST: FOLIAR

| Materials/ Products Tested | Ref No. | Type of Test/ Properties Measured/ Range of Measurement | Standard Test Methods/ Equipment/Techniques |
|--|------------|---|---|
| <u>Agriculture Products and Materials</u> Foliar, Leaf and Rachis | 58 | Nitrogen | In-house Method, TP-FOL-06, Based on LECO TruMac CN Nitrogen in Soil and Plant Tissue Application Notes 203-821-394:2010 |
| | 59a 59b | Phosphorus | In-house Method, TP-FOL-02, Based on MS 677:Pt.I, II & IV:1980 Method A: UV Method B: ICPOES |
| | 60a 60b | Potassium | In-house Method, TP-FOL-03, Based on MS 677:Pt.I, II & IV:1980 Method A: AAS Method B: ICPOES |
| | 61a 61b | Magnesium | In-house Method, TP-FOL-03, Based on MS 677: Pt.I, II & VII:1980 Method A: AAS Method B: ICPOES |
| | 62a 62b | Calcium | In-house Method, TP-FOL-03, Based on MS 677:Pt.I, II & IV:1980 Method A: AAS Method B: ICPOES |
| | 63a 63b | Boron | In-house Method, TP-FOL-05, Based on MS 677:Pt.I & II:1980 and Method 9.3 Official Journal of the E.U, 2003 Method A: UV Method B: ICPOES |
| | 64a 64b | Zinc | In-house Method, TP-FOL-04, Based on MS 677:Pt.I & II:1980 Method A: AAS Method B: ICPOES |
| | 65a 65b | Ferum | |
| | 66a 66b | Copper | |
| | 67a 67b | Manganese | |
| | 68 | *Ash | In-House Method |
| | 134 | *Chloride | In-House Method |

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SERVICE TEST: COMPOST

| Materials/ Products Tested | Ref No. | Type of Test/ Properties Measured/ Range of Measurement | Standard Test Methods/ Equipment/Techniques | |
|--|------------|---|---|----------|
| Agriculture Products and Materials Compost | 69 | Total Nitrogen | In-house Method, TP-FOL-06, Based on LECO TruMac CN Nitrogen in Soil and Plant Tissue Application Notes 203-821-394:2010 | |
| | 70a 70b | Total Phosphorus (as P ₂ O ₅) | In-house Method, TP-FOL-02, Based on MS 677:Pt.I, II & IV:1980 Method A: UV Method B: ICPOES | |
| | 71a 71b | Total Potassium (as K ₂ O) | In-house Method, TP-FOL-03, Based on MS 677:Pt.I, II & IV:1980 Method A: AAS Method B: ICPOES | |
| | 72a 72b | Total Magnesium (as MgO) | In-house Method, TP-FOL-03, Based on MS 677: Pt.I, II & VII:1980 Method A: AAS Method B: ICPOES | |
| | 73a 73b | Total Calcium (as CaO) | In-house Method, TP-FOL-03, Based on MS 677:Pt.I, II & IV:1980 Method A: AAS Method B: ICPOES | |
| | 74a 74b | *Total Boron (as B ₂ O ₃) | In-house Method, TP-FOL-05, Based on MS 677:Pt.I & II:1980 and Method 9.3 Official Journal of the E.U, 2003 Method A: UV Method B: ICPOES | |
| | 75a 75b | Total Carbon | a. | b. |
| | 76a 76b | Organic Carbon | In-house Method, TP-FER-08, Based on LECO TruMac CN Nitrogen in Soil and Plant Tissue Application Notes 203-821-394:2010 | *Furnace |
| | 77a 77b | Organic Matter | | |
| | 78a 78b | CN ratio | | |
| | 79 | Moisture | In-House Method, TP-FER-02, Based on MS 417:Part2:1994 | |
| | 135 | *pH | APHA Method 4500-H ⁺ B 23 rd Edition 2107 | |

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SERVICE TEST: FERTILIZER

| Materials/ Products Tested | Ref No. | Type of Test/ Properties Measured/ Range of Measurement | Standard Test Methods/ Equipment/Techniques |
|--|------------|--|---|
| <u>Agriculture Products and Materials</u> Fertilizers | 80a 80b | Moisture | MS 417:Part2:1994 Method A: Desiccators Method B: Oven |
| | 81 | Total Nitrogen | In-house Method, TP-FER-03, Based on MS 417:Part3:2020 (Second Revision) |
| | 82a 82b | Total Phosphorus as P ₂ O ₅ | In-house Method, TP-FER-04, Based on MS 417:Part4:2020 (Second Revision) Method A: UV Method B: ICPOES |
| | 83a 83b | Total Potassium as K ₂ O | In-house Method, TP-FER-05, Based on MS 417:Part5:2020 (Second Revision) Method A: AAS Method B: ICPOES |
| | 84a 84b | Total Magnesium as MgO | In-house Method, TP-FER-06, Based on MS 417:Part6:2020 (Second Revision) Method A: AAS Method B: ICPOES |
| | 85a 85b | Total Calcium as CaO | In-house Method, TP-FER-07, Based on MS 417:Part6:2020 (Second Revision) Method A: AAS Method B: ICPOES |
| | 86a 86b | Total Boron as B ₂ O ₃ | In-house Method, TP-FER-09, Based on MS 417:Part7:2020 (Third Revision) Method A: UV Method B: ICPOES |
| | 86c | *Water Soluble Boron as B ₂ O ₃ | In-house Method, TP-FER-09, Based on MS 417:Part7:2020 (Third Revision) / Titration |
| | 87 | Citric Acid Soluble Phosphorus as P ₂ O ₅ | In-house Method, TP-FER-16, Based on MS 417:Part4:2020 (Second Revision) / UV |
| | 88a 88b | Water Soluble Magnesium as MgO | In-house Method, TP-FER-17, Based on MS 417:Part6:2020 (Second Revision) Method A: AAS Method B: ICPOES |

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| Materials/ Products Tested | Ref No. | Type of Test/ Properties Measured/ Range of Measurement | Standard Test Methods/ Equipment/Techniques | |
|--|------------|---|--|--|
| <u>Agriculture Products and Materials</u> Fertilizers | 89a 89b | *Water Soluble Phosphorus as P ₂ O ₅ | In-house Method, TP-FER-04, Based on MS 417:Part4:2020 (Second Revision) Method A: UV Method B: ICPOES | |
| | 90 | *Sulphur | In-house Method, TP-FER-03, Based on MS 417:Part3:2020 (Second Revision) | |
| | 91 | *pH | APHA Method 4500-H+B 23 rd Edition 2017 | |
| | 92a 92b | *Ferum | In-house Method, Based on MS 417:Part5:2020 (Second Revision) Method A: AAS Method B: ICPOES | |
| | 93a 93b | *Manganese | | |
| | 94a 94b | *Copper | | |
| | 95b 95b | *Zinc | | |
| | 96a 96b | *Total Carbon | | |
| | 97a 97b | *Organic Matter | | |
| | 98a 98a | *Organic Carbon | | |
| | 99a 99b | *C/N Ratio | | |
| | 125 | *Particle Size | MS 417:Part2:1994 | |
| | 126 | *Hardness | In-House Method | |
| | 127 | *Ammoniacal Nitrogen | In-house Method, TP-FER-12, Based on MS 417:Part3:1994 (First Revision) | |
| | 128 | *Urea Nitrogen | In-house Method, TP-FER-13, Based on MS 417:Part3:1994 (First Revision) | |
| | 129 | *Nitrate Nitrogen | In-house Method, TP-FER-14, Based on MS 417:Part3:1994 (First Revision) | |

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| Materials/ Products Tested | Ref No. | Type of Test/ Properties Measured/ Range of Measurement | Standard Test Methods/ Equipment/Techniques |
|--|------------|---|--|
| <u>Agriculture Products and Materials</u> Fertilizers | 130 | *Sodium, Na | APHA 3030E, 3120B 23 rd Edition 2017 |
| | 131 | *Conductivity | MS 2457:2012 |
| | 132 | *Chloride | APHA 4500-Cl-B, 23 rd Edition 2017 |

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SERVICE TEST: SOIL

| Materials/ Products Tested | Ref No. | Type of Test/ Properties Measured/ Range of Measurement | Standard Test Methods/ Equipment/Techniques |
|--|-------------------|---|---|
| Agriculture Products and Materials Soils | 100 | pH | MS 2457:2012 |
| | 101 | Conductivity | MS 2458:2012 |
| | 102 | Total Nitrogen | MS ISO 13878:2014 |
| | 103 | Organic Carbon | In-House Method, TP-SOIL-05, Based on MS 10694:2016 and Soil Sampling, Preparation, and Analysis 1996 pg. 225 |
| | 104 | *Total Carbon | MS 10694:2016 |
| | 105 | *Organic Matter | |
| | 106a 106b | Available Phosphorus | In-House Method, TP-SOIL-06, Based on Buku Panduan Analisis Tanah & Tumb, Jab Sains Tanah UPM 1988 pg. 23, Method A: UV Method B: ICPOES |
| | 107 | Total Phosphorus | MS 678:Part VII:1980 Method: UV |
| | 108 | Exchangeable Cation Potassium | MS 678:Part IV:1980 Method: ICPOES |
| | 109 | Exchangeable Cation Magnesium | |
| | 110 | Exchangeable Cation Calcium | |
| | 111 | *Exchangeable Cation Sodium | |
| | 112 | Cation Exchangeable Capacity | MS 678:Part V:1980 |
| | 113 | *Exchangeable Al | Soil Analysis Handbook of Reference Methods. |
| | 114 | *Exchangeable H | |
| 115 | *Acid Extractable | | |

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| Materials/ Products Tested | Ref No. | Type of Test/ Properties Measured/ Range of Measurement | Standard Test Methods/ Equipment/Techniques |
|--|------------|---|---|
| <u>Agriculture Products and Materials</u> Soils | 136 | *Ferum | SOP Penentuan Free Iron Oxide (Fe ₂ O ₃). Kaedah Calorimetric-Bacaan Atomic Absorption Spectrometer, <i>Version 1.0, 2013</i> . Makmal Tanah, Jabatan Pertanian. |
| | 137 | *Loss of Ignition (LOI) | In House Method |
| | 138 | *Mechanical Analysis | SOP for Mechanical Analysis. Method DOA |

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| Materials/ Products Tested | Ref No. | Type of Test/ Properties Measured/ Range of Measurement | Standard Test Methods/ Equipment/Techniques |
|-------------------------------|------------|---|--|
| <u>Rubber</u> | 116 | Dry Rubber Content | MS 466:1987 |
| Field Latex | 117 | *TSC | MS 466:1987 |
| | 118 | *Ammonia | In-house Method |
| | 119 | *VFA | |
| | 120 | *KOH | |
| | 121 | *Coagulant | |
| | 122 | *Magnesium | |
| | 123 | *Zinc | |
| | 124 | *Specific Gravity | |

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