**The Appendix is an integral part of**
**Certificate of Accreditation No. 507/2019 of 07/10/2019**

**Accredited entity according to ČSN EN ISO/IEC 17025:2018:**

**MND a.s.**
Testing Laboratory
Velkomoravská 900/405, 696 18 Lužice

*The Laboratory provides expert opinions and interprets test results.*
*The Laboratory is qualified to carry out independent sampling.*

**Tests:**

| Ordinal number [1] | Test procedure/method name | Test procedure/method identification [2] | Tested object |
|---|---|---|---|
| 1.* | Determination of pH by potentiometry | SOP 02/01 (ČSN ISO 10523, ČSN ISO 10390, ČSN 46 5735, cl. 5.9, ČSN EN 15933, ČSN 65 6071 | Water, extracts, liquids |
| 2.* | Determination of electrical conductivity and specific resistance by electrometric method | SOP 03/01 (ČSN EN 27888, JPP ÚKZÚZ AP I, procedure 30060.1) | Water, extracts, liquids |
| 3. | Determination of suspended solids and annealed suspended solids by gravimetry and calculation of loss on ignition of suspended solids | SOP 04/01 (ČSN EN 872, ČSN 75 7350) | Water, extracts |
| 4. | Determination of $COD_{Cr}$ using dichromate by titration | SOP 05/01 (ČSN ISO 6060) | Water, extracts |
| 5. | Determination of $BOD_5$ by incubation method by electrochemical method | SOP 06/01 (ČSN EN 1899–1, ČSN EN 1899–2) | Water, extracts |
| 6. | Determination of phosphorus and phosphate by spectrophotometry and calculation of phosphorus pentaoxide | SOP 07/01, part A (ČSN EN ISO 6878) | Water, extracts, |
| 7. | Determination of ammonium by titrimetric method after distillation and calculation of ammonia nitrogen and free ammonia | SOP 08/01, part A (ČSN ISO 5664) | Water, extracts |
| 8. | Determination of ammonium by spectrophotometry and calculation of ammonia nitrogen and free ammonia | SOP 08/01, part B (ČSN ISO 7150–1) | Water, extracts |

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| Ordinal number [1] | Test procedure/method name | Test procedure/method identification [2] | Tested object |
|---|---|---|---|
| 9. | Determination of sulphate by gravimetry and calculation of total sulphur | SOP 09/01, part A (TNV 75 7476) | Water, extracts |
| 10. | Determination of nitrate by spectrophotometry and calculation of nitrate nitrogen and inorganic nitrogen | SOP 10/01, part A (ČSN ISO 7890-3) | Water, extracts |
| 11. | Determination of nitrite by spectrophotometry and calculation of nitrite nitrogen | SOP 11/01 (ČSN EN 26777) | Water, extracts |
| 12. | Determination of calcium by EDTA titrimetric method | SOP 12/01, part A (ČSN ISO 6058) | Water, extracts |
| 13. | Determination of hardness by EDTA titrimetric method and calculation of magnesium | SOP 12/01, part B (ČSN ISO 6059) | Water, extracts |
| 14. | Determination of ANC by titration and calculation of $HCO_3^-$, $CO_3^{2-}$, $OH^-$ and aggressive $CO_2$ | SOP 14/01, part A (ČSN EN ISO 9963-1, ČSN EN 13577, ČSN 75 7373, ČSN EN 206+A1, ČSN 65 6071:1986) | Water, extracts, aqueous extracts of petroleum |
| 15. | Determination of dissolved oxygen electrochemically | SOP 15/01, part A (ČSN EN ISO 5814) | Water |
| 16. | Determination of metals by flame AAS method [a)] and stoichiometric calculations of the content of compounds from the measured values | SOP 16/01, part A (ČSN ISO 8288, ČSN EN ISO 5961, ČSN 75 7400, ČSN EN 1233, ČSN ISO 7980, TNV 75 7408, ČSN 75 7385, ČSN ISO 9964-1, ČSN ISO 9964-2, ČSN EN ISO 12020) | Water, extracts |
| 17. | Determination of metals by flame AAS method [a)] and stoichiometric calculations of the content of compounds from the measured values | SOP 16/01, part B (ČSN 46 5735, cl. 5.13, JPP ÚKZÚZ AP II, procedure 30400.1, 30410.1, 30420.1, 30430.1) | Solid materials |

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| Ordinal number [1] | Test procedure/method name | Test procedure/method identification [2] | Tested object |
|---|---|---|---|
| 18. | Determination of the composition of natural gas by gas chromatography with FID and TCD and calculation of physical parameters[b)] | SOP 17/01 (ČSN EN ISO 6974 – 3, ČSN EN ISO 6976, ČSN EN ISO 6975, ČSN EN ISO 15403-1) | Natural gas and other heating gases |
| 19. | Determination of density of liquids – by oscillating U-tube method and calculation of API index and ethanol | SOP 18/01 (ČSN EN ISO 12185, Manual Density meter DMA 48, MP SR Bulletin, 2/2004, Part 4) | Liquids, water |
| 20. | Determination of saponification number in animal and vegetable fats and oils by titration and calculation of FAME | SOP 19/01 (ČSN EN ISO 3657, ČSN 65 6508, ČSN EN 14214+A1) | Animal and vegetable fats and oils, petroleum, petroleum products |
| 21. | Determination of distillation characteristics at atmospheric pressure and calculation of cetane index | SOP 20/01 (ČSN EN ISO 3405, ČSN EN ISO 4264) | Liquids |
| 22. | Determination of dissolved substances (RL, TDS) and RAS by gravimetry and calculation of loss on ignition | SOP 21/01 (ČSN 75 7346, ČSN 75 7347, ČSN EN 15216) | Water, extracts |
| 23. | Determination of chlorides by argentometry and calculation of total mineralization, ion balance and NaCl | SOP 22/02, part A (ČSN ISO 9297, ČSN 75 7358, ČSN 65 6030, Vláčil, F. et al.: Instrumental methods of chemical analysis, 1972) | Water, extracts, aqueous extracts of petroleum |
| 24. | Determination of chlorides by argentometry and calculation of NaCl | SOP 22/02, part B (ČSN ISO 9297, JPP ÚKZÚZ AP I, procedure 30010.1) | Solid materials |
| 25. | Determination of water content by KF method by volumetry | SOP 23/02 (ČSN ISO 760) | Liquids |

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| Ordinal number [1] | Test procedure/method name | Test procedure/method identification [2] | Tested object |
|---|---|---|---|
| 26. | Determination of dry matter and water content by gravimetry | SOP 27/02 (ČSN ISO 11465, ČSN EN 12880, ČSN EN 15934, ČSN 46 5735, cl. 5.5) | Solid materials |
| 27. | Determination of flash point – Pensky-Martens closed cup | SOP 25/02 (ČSN EN ISO 2719) | Liquids |
| 28. | Determination of dynamic viscosity by falling-ball viscometer and calculation of kinematic viscosity and viscosity index | SOP 29/03 (ČSN EN ISO 3104, ČSN ISO 2909, DIN 51 757, manual – ball viscometer MINIVIS II) | Liquids, water |
| 29. | Determination of non-metals by WD XRF method and calculation of tetrachloroethylene[c)] | SOP 30/03 (ČSN EN ISO 14596, Operation Manual Spectroscan MAKC-GV 2002) | Liquids |
| 30. | Determination of acid value by potentiometry | SOP 31/03 (ČSN EN 12634) | Liquids |
| 31. | Determination of NEL and EL by IR method | SOP 26/02, part A (ČSN 75 7505:1998, ČSN 75 7506) | Water, extracts |
| 32. | Determination of NEL and EL by IR method | SOP 26/02, part B (TNV 75 8052, TNI ISO/TR 11046) | Solid materials |
| 33. | Analysis of LPG by gas chromatography with FID and calculation of physical parameters [d)] | SOP 32/04 (ČSN EN 27941, ČSN EN ISO 8973, ČSN EN 589+A1) | Liquid petroleum gases |
| 34. | Determination of anionic surfactants (MBAS, PAL-A) by spectrophotometry | SOP 28/03 (ČSN EN 903) | Water, extracts |
| 35. | Determination of mercury by AAS method using AMA 254 analyzer | SOP 52/14 (ČSN 75 7440, ČSN 46 5735, cl. 5.15, JPP ÚKZÚZ AP II, procedure 30460.1) | Water, extracts, solid materials |

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| Ordinal number [1] | Test procedure/method name | Test procedure/method identification [2] | Tested object |
|---|---|---|---|
| 36. | Titrimetric determination of $COD_{Mn}$ using permangate | SOP 34/05 (ČSN EN ISO 8467) | Water expect waste water, extracts |
| 37. | Determination of univalent phenols by spectrophotometry | SOP 35/05, part A (ČSN ISO 6439) | Water, extracts |
| 38. | Determination of total and toxic cyanides by spectrophotometry | SOP 37/06, part A (ČSN 75 7415, ČSN ISO 6703-2) | Water, extracts |
| 39. | Determination of polycyclic aromatic hydrocarbons by HPLC method with DAD and FLD and calculation of the sum of PAH [e)] | SOP 38/06, part A (ČSN 75 7554, ČSN EN ISO 17993, Macherey-Nagel Application Method No. 302170 and 301250, EPA Methods 8310, EPA Methods 610) | Water, extracts |
| 40. | Determination of polycyclic aromatic hydrocarbons by HPLC method with DAD and calculation of the sum of PAH [e)] | SOP 38/06, part B (ČSN EN 16181, Macherey-Nagel Application Method No. 301310, EPA Methods 8310) | Solid materials |
| 41. | Determination of adsorbable organically bound chlorine AOX (Cl) by coulometry | SOP 39/07, part A (ČSN EN ISO 9562) | Liquids, water, extracts |
| 42. | Determination of adsorbable organically bound chlorine AOX (Cl) by coulometry | SOP 39/07, part B (ČSN EN 16166) | Solid materials |
| 43. | Determination of organically bound chlorine, EOX (Cl), total chlorine by coulometry | SOP 39/07, part C (ASTM D 4929-17, GOST P 52247-2004) | Liquids |
| 44. | Determination of organically bound chlorine EOX (Cl) by coulometry | SOP 39/07, part D (DIN 38 414-17) | Solid materials |
| 45. | Determination of inorganic chlorine and chlorides by coulometry and calculation of NaCl | SOP 39/07, part E (ČSN 65 6030) | Liquids, water, extracts |

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| Ordinal number [1] | Test procedure/method name | Test procedure/method identification [2] | Tested object |
|---|---|---|---|
| 46. | Determination of metals by AAS method with graphite furnace [f] and stoichiometric calculations of the content of compounds from the measured values | SOP 40/08, part A (ČSN EN ISO 15586) | Water, extracts |
| 47. | Determination of metals by AAS method with graphite furnace [f] and stoichiometric calculations of the content of compounds from the measured values | SOP 40/08, part B (ČSN 46 5735, cl. 5.12, JPP ÚKZÚZ AP II, procedure 30400.1, 30410.1, 30430.1) | Solid materials |
| 48. * | Determination of free and total chlorine by spectrophotometry using Hach Lange set and calculation of bound chlorine | SOP 41/08, part B (ČSN EN ISO 7393-2, Hach Lange manual) | Water except waste water |
| 49. | Determination of the content of mechanical impurities by gravimetry | SOP 42/08 (ČSN 65 6080, ČSN EN 12662, ČSN 65 6219, ČSN 65 6220) | Liquids |
| 50. | Determination of water content by distillation method | SOP 43/08 (ČSN EN ISO 9029, GOST 2477-65) | Petroleum and petroleum products |
| 51. | Determination of hydrocarbons $C_{10} - C_{40}$ by gas chromatography with FID | SOP 44/08, part A (ČSN EN ISO 9377-2) | Water, extracts |
| 52. | Determination of hydrocarbons $C_{10} - C_{40}$ by gas chromatography with FID | SOP 44/08, part B (ČSN EN 14039, ČSN EN ISO 16703) | Solid materials |
| 53. | Determination of volatile organic compounds by GCMS method in connection with SPME method and calculation of the sum of TOL [g] | SOP 45/10 (ČSN EN ISO 15680, ČSN EN ISO 10301, Supelco Application sheet 796-0685) | Water, liquids |
| 54. | Determination of nitrate by direct photometry in UV range, calculation of nitrate nitrogen and inorganic nitrogen | SOP 46/10, part A (Horáková, M., Lischke, P., Grünwald, A.: Chemical and Physical Methods for Water Analysis, 1986) | Water except waste water |

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| Ordinal number [1] | Test procedure/method name | Test procedure/method identification [2] | Tested object |
|---|---|---|---|
| 55. | Determination of TOC and DOC by Hach Lange cuvette tests | SOP 47/11 (Hach Lange manual, ČSN EN 1484) | Water, extracts |
| 56. | Determination of anions by capillary ITP method [h)] | SOP 48/12 (STN 75 7430, Application sheet no. 1 to the IONOSEP analyzer) | Water, extracts |
| 57. | Determination of humic substances by spectrophotometry | SOP 49/13 (ČSN EN 75 7536) | Water, extracts |
| 58. | Determination of fats and oils by gravimetry | SOP 50/13 (ČSN 75 7509) | Water, extracts |
| 59. | Determination of fluorides by electrochemical method (ISE) | SOP 51/13 (ČSN ISO 10359-1) | Water, extracts |
| 60. | Determination of total nitrogen by spectrophotometry and calculation of organic nitrogen | SOP 53/15 (ČSN EN ISO 11905-1, Berghof Products Application sheet) | Water, extracts |
| 61. | Determination of $COD_{Cr}$ Hach Lange cuvette set | SOP 54/16 (Hach Lange manual, ČSN ISO 15705) | Water, extracts |
| 62. | Determination of hexavalent chromium by Hach Lange cuvette set | SOP 55/16 (Hach Lange manual) | Water, extracts |
| 63. * | Determination of water dew point and hydrocarbons and calculation of water content and dew point at 4 MPa | SOP 56/17 (ČSN EN ISO 6327, ČSN EN ISO 11541, ČSN EN ISO 18453) | Natural gas, heating gases, compressed gases |
| 64. * | Determination of temperature | SOP 57/17 (ČSN 75 7342) | Water, extracts, liquids, air, soil |
| 65. | Determination of BNC by titration and calculation of the forms of $CO_2$ | SOP 58/18 (ČSN 75 7372, ČSN 75 7373) | Water, extracts |
| 66. | Determination of the loss on ignition (LOI, combustibles) and annealing residue (ash) by gravimetry | SOP 59/19 (ČSN EN 15935, ČSN EN 15169, JPP ÚKZÚZ AP III, procedure 1.1, ČSN 46 5735, cl. 5.6) | Solid materials |

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| Ordinal number [1] | Test procedure/method name | Test procedure/method identification [2] | Tested object |
|---|---|---|---|
| 67. | Determination of non-metals by ED XRF and calculation of tetrachloroethylene | SOP 60/19<br>(ČSN EN ISO 8754,<br>ČSN EN ISO 20847,<br>ČSN EN ISO 13032,<br>ElvaX Pro spectrometer application) | liquids |

[1] Asterisk at the ordinal number identifies the tests, which the Laboratory is qualified to carry out outside the permanent laboratory premises.

[2] If the document identifying the test procedure is dated, only these specific procedures are used. If the document identifying the test procedure is not dated, the latest edition of the specified procedure is used (including any changes).

Explanations:

| | |
|---|---|
| solid materials | soils, sludge, waste, sediments, technological materials |
| water | drinking, surface, ground, mineral, bathing, layer, waste, process |
| extracts | extracts of soils, sludge, waste and sediments (aqueous extract of waste prepared according to ČSN EN 12457-4, extract from other matrix according to the client's requirement) |
| liquids | petroleum, petroleum products, oils, organic solvents, their mixtures including aqueous, spirits |
| heating gases | biogas, landfill and soil gas |

List of determined parameters:

a) Ag, Al, Ba, Ca, Cd, Co, Cr, Cu, Fe, K, Li, Mg, Mn, Mo, Na, Ni, Pb, Rb, Sr, V, Zn and calculation of hardness

b) methane, ethane, propane, 2-methylpropane, 2-methylbutane, butane, pentane, hexanes, oxygen, nitrogen, carbon dioxides, helium, hydrogen, 2,2-dimethylpropane, gross calorific value, net calorific value, Wobbe index, molecular weight, compressibility factor, density, relative density, methane number MN, motor octane number MON

c) sulphur, chlorine

d) ethane, propane, 2-methylpropane, 2-methylbutane, n-butane, n-pentane, propene, 1,2-butadiene, 1,3-butadiene, cis-2-butene, trans-2-butene, 1-butene, 2-methylpropene, octane number, density at 15° C, absolute vapour pressure at 37.8°C, absolute vapour pressure at 40°C, absolute vapour pressure at 50°C, absolute vapour pressure at 70°C, gauge pressure of vapours at -10°C, tlak par manometrický při -5°C, gauge pressure of vapours at 0°C, gauge pressure of vapours at 10°C, gauge pressure of vapours at 20°C, gauge pressure of vapours at 40°C

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e) acenaphthylene (water and extract only), acenaphthene, anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(ghi)perylene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, phenanthrene, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, naphthalene, pyrene

f) Ag, As, Be, Cd, Co, Cr, Cu, Fe, Mn, Mo, Ni, Pb, Sb, Se, Sn, V

g) benzene, toluene, o-xylene, m-xylene, p-xylene, ethylbenzene, chloromethane, chloroform, tetrachloromethane, bromodichloromethane, dibromochloromethane, tribromomethane, 1,1,-dichloroethene, trans-1,2-dichloroethene, cis-1,2-dichloroethene,1,2-trichloroethylene, tetrachloroethylene, 1,1-dichloroethane,1,1,1-trichloroethane, 1,1,2-trichloroethane, sum of chlorinated hydrocarbons, sum of trihalomethanes, sum of BTEX, methanol, ethanol, isopropanol

h) sulphates

Abbreviations used:

| | |
|---|---|
| AAS | Atomic Absorption Spectrometry |
| AMA | Advanced Mercury Analyser |
| AOX (Cl) | Adsorbable organically bound chlorine |
| AP | Soil analysis |
| API | American Petroleum Institute |
| BNC | Base Neutralizing capacity |
| BOD | Biochemical Oxygen Demand |
| BTEX | benzene, toluene, xylenes |
| DAD | Diode Array Detector |
| Density | Density |
| DOC | Dissolved Organic Carbon |
| ED XRF | Energy Dispersive X-Ray Fluorescence Spectrometry |
| EDTA | Ethylenediaminetetraacetic Acid |
| EL | Extractives |
| EOX (Cl) | Extractable organically bound chlorine |
| FAME | Fatty Acid Methyl Esters |
| FID | Flame Ionisation Detector |
| FLD | Fluorescence Detector |
| GC/MS | Gas Chromatography/Mass Spectrometry |
| HPLC | High Performance Liquid Chromatography |
| $COD_{Cr}$ | Chemical Oxygen Demand with dichromate |
| $COD_{Mn}$ | Chemical Oxygen Demand with permanganate |
| IR | Infrared Spectrometry |

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|---|---|
| ISE | Ion Selective Electrode |
| ITP | Isotachophoresis |
| KF | Karl Fischer |
| ANC | Acid Neutralizing Capacity |
| LOI | Loss on Ignition |
| LPG | Liquefied Petroleum Gases |
| MBAS | Methylene Blue Active Substance |
| MN | Methane Number |
| MON | Motor Octane Number |
| MP SR | Ministry of Agriculture of the Slovak Republic |
| NEL | Nonpolar Extractives |
| PAL-A | Anionic Surfactants |
| PAH | Polyaromatic Hydrocarbons |
| DIS | Dissolved Inorganic Salts |
| SOP | Standard Operating Procedure based on normative documents |
| SPME | Solid Phase Microextraction |
| TCD | Thermal Conductivity Detector |
| TDS | Total Dissolved Solids |
| TOC | Total Organic Carbon |
| VOC | Volatile Organic Compounds |
| UV | Ultra Violet |
| WD XRF | Wave Dispersion X-Ray Fluorescence Spectrometry |
| ASTM | US Standard |
| DIN | German standard |
| EPA | Environmental Protection Agency |
| GOST | Russian standard |
| JPP ÚKZÚZ | Uniform working procedures of the Central Institute for Supervising and Testing in Agriculture (Soil analysis I Brno 2016, Soil analysis II Brno 2019, Soil analysis III Brno 2011) |
| MoE | Ministry of Environment |
| Supelco | 796-0685 - Analysis of alcohol-containing water samples |
| STN | Slovak Technical Standard |
| TNI | Technical Standardization Information |
| TNV | Branch Technical Standard of Water Management |

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**Sampling:**

| Ordinal number | Sampling procedure name | Sampling procedure identification [1] | Sampled object |
|---|---|---|---|
| 1. | Sampling of sludge and sediments | SOP 01/01, part A 1 (ČSN ISO 5667-12, ČSN EN ISO 5667-13) | Sludge and sediments |
| 2. | Sampling of gases | SOP 01/01, part B (ČSN 38 5520, ČSN 01 5113, ČSN EN ISO 10715) | Gases from air and utility facilities |
| 3. | Drinking water sampling | SOP 01/01, part C (ČSN ISO 5667-5, ČSN EN ISO 19458) | Drinking water |
| 4. | Dynamic and static sampling of ground water | SOP 01/01, part D (ČSN ISO 5667-11, ČSN EN ISO 19458) | Ground water |
| 5. | Sampling of surface water | SOP 01/01, part E (ČSN ISO 5667-4, ČSN EN ISO 5667-6, ČSN EN ISO 19458) | Surface water |
| 6. | Manual sampling of waste and process water | SOP 01/01, part F (ČSN ISO 5667-7, ČSN ISO 5667-10 except cl. 4.2.2, ČSN EN ISO 5667-13, ČSN 75 7315, Regulation 431/2001 Coll.) | Waste and process water |
| 7. | Waste sampling | SOP 01/01, part A 2 (ČSN EN ISO 5667-13, ČSN EN 14899, MoE Bulletin No. 4/2008) | Waste |
| 8. | Soil sampling | SOP 01/01, part A 3 (ČSN EN ISO 5667-13, ČSN 01 5111, ČSN ISO 11464) | Soils |

[1] If the document identifying the sampling procedure is dated, only these specific procedures are used. If the document identifying the sampling procedure is not dated, the latest edition of the specified procedure is used (including any changes).