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BEST AVAILABLE TECHNIQUES (BAT) AND BEST ENVIRONMENTAL PRACTICES (BEP): THE CASE OF ARTICLE 8 OF THE MINAMATA CONVENTION ON MERCURY

Okonkwo OJ

Department of Environmental, Water & Earth Sciences,
Faculty of Science,
Tshwane University of Technology

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MINAMATA CONVENTION ON MERCURY

- To protect human health and the environment from anthropogenic emissions and releases of mercury and mercury compounds

- Concerns are on controlling and, where feasible, reducing emissions of mercury and mercury compounds to the atmosphere from the point sources falling within the source categories listed in Annex D to the Convention -ARTICLE 8

- The control and reduction of levels of mercury should be carried out with some flexibility to accommodate national development plan

- It also contains measures on the environmentally sound interim storage of mercury and mercury wastes, as well as contaminated sites

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WHAT IS MERCURY?

LIVE SCIENCE. www.LiveScience.com

Periodic Table of the Elements

Group 1 1A | 2 2A | 3 3B | 4 4B | 5 5B | 6 6B | 7 7B | 8 | 9 8B | 10 | 11 1B | 12 2B | 13 3A | 14 4A | 15 5A | 16 6A | 17 7A | 18 8A

Period 1: 1 H Hydrogen 1.0078 | 2 He Helium 4.0026

Period 2: 3 Li Lithium 6.938 | 4 Be Beryllium 9.0122 | 5 B Boron 10.806 | 6 C Carbon 12.009 | 7 N Nitrogen 14.006 | 8 O Oxygen 15.999 | 9 F Fluorine 18.998 | 10 Ne Neon 20.180

Period 3: 11 Na Sodium 22.990 | 12 Mg Magnesium 24.305 | 13 Al Aluminum 26.982 | 14 Si Silicon 28.084 | 15 P Phosphorus 30.974 | 16 S Sulfur 32.059 | 17 Cl Chlorine 35.446 | 18 Ar Argon 39.948

Period 4: 19 K Potassium 39.098 | 20 Ca Calcium 40.078 | 21 Sc Scandium 44.956 | 22 Ti Titanium 47.867 | 23 V Vanadium 50.942 | 24 Cr Chromium 51.996 | 25 Mn Manganese 54.938 | 26 Fe Iron 55.845 | 27 Co Cobalt 58.933 | 28 Ni Nickel 58.693 | 29 Cu Copper 63.546 | 30 Zn Zinc 65.38 | 31 Ga Gallium 69.723 | 32 Ge Germanium 72.63 | 33 As Arsenic 74.922 | 34 Se Selenium 78.96 | 35 Br Bromine 79.904 | 36 Kr Krypton 83.798

Period 5: 37 Rb Rubidium 85.468 | 38 Sr Strontium 87.62 | 39 Y Yttrium 88.906 | 40 Zr Zirconium 91.224 | 41 Nb Niobium 92.906 | 42 Mo Molybdenum 95.96 | 43 Tc Technetium 98.9062 | 44 Ru Ruthenium 101.07 | 45 Rh Rhodium 102.91 | 46 Pd Palladium 106.42 | 47 Ag Silver 107.87 | 48 Cd Cadmium 112.41 | 49 In Indium 114.82 | 50 Sn Tin 118.71 | 51 Sb Antimony 121.76 | 52 Te Tellurium 127.60 | 53 I Iodine 126.90 | 54 Xe Xenon 131.29

Period 6: 55 Cs Cesium 132.91 | 56 Ba Barium 137.33 | 72 Hf Hafnium 178.49 | 73 Ta Tantalum 180.95 | 74 W Tungsten 183.84 | 75 Re Rhenium 186.21 | 76 Os Osmium 190.23 | 77 Ir Iridium 192.22 | 78 Pt Platinum 195.08 | 79 Au Gold 196.97 | 80 Hg [illegible] 200.59 | 81 Tl Thallium 204.38 | 82 Pb Lead 207.2 | 83 Bi Bismuth 208.98 | 84 Po Polonium (209) | 85 At Astatine (210) | 86 Rn Radon (222)

Period 7: 87 Fr Francium (223) | 88 Ra Radium (226) | 104 Rf Rutherfordium (261) | 105 Db Dubnium (262) | 106 Sg Seaborgium (266) | 107 Bh Bohrium (264) | 108 Hs Hassium (269) | 109 Mt Meitnerium (268) | 110 Ds Damstadtium (268) | 111 Rg Roentgenium (268) | 112 Cn Copernicium (268) | 113 Uut Ununtrium (268) | 114 Fl Flerovium (268) | 115 Uup Ununpentium (268) | 116 Lv Livermorium (268) | 117 Uus Ununseptium (268) | 118 Uuo Ununoctium (268)

Lanthanides: 57 La Lanthanum 138.91 | 58 Ce Cerium 140.12 | 59 Pr Praseodymium 140.91 | 60 Nd Neodymium 144.24 | 61 Pm Promethium (145) | 62 Sm Samarium 150.36 | 63 Eu Europium 151.96 | 64 Gd Gadolinium 157.25 | 65 Tb Terbium 158.93 | 66 Dy Dysprosium 162.50 | 67 Ho Holmium 164.93 | 68 Er Erbium 167.26 | 69 Tm Thulium 168.93 | 70 Yb Ytterbium 173.04 | 71 Lu Lutetium 174.97

Actinides: 89 Ac Actinium (227) | 90 Th Thorium 232.04 | 91 Pa Protactinium 231.04 | 92 U Uranium 238.03 | 93 Np Neptunium (237) | 94 Pu Plutonium (244) | 95 Am Americium (243) | 96 Cm Curium (247) | 97 Bk Berkelium (247) | 98 Cf Californium (251) | 99 Es Einsteinium (252) | 100 Fm Fermium (257) | 101 Md Mendelevium (258) | 102 No Nobelium (259) | 103 Lr Lawrencium (262)

11 — Atomic number
Na — Element symbol
Sodium — Element name
22.990 — Atomic weight

- Alkalai metals
- Alkaline earth metals
- Lanthanides
- Actinides
- Transition metals
- Unknown properties
- Post-transition metals
- Metalloids
- Other nonmetals
- Halogens
- Noble gases

SOURCES: National Institute of Standards and Technology, International Union of Pure and Applied Chemistry

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WHY ARE WE CONCERNED ABOUT MERCURY EMISSIONS

- Mercury is toxic to the central and peripheral nervous systems at high concentrations;
- It can adversely affect the digestive system, lungs and kidney;
- It has long range atmospheric transport;
- It is bio-accumulative in the ecosystem;
- It is persistent

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SOURCES OF MERCURY COVERED BY THE CONVENTION (ANNEX D)

- Coal-fired power plants;
- Coal-fired industrial boilers;
- Smelting and roasting processes used in the production of non-ferrous metals;
- Cement clinker production facilities;
- **Waste incineration**

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BEST AVAILABLE TECHNIQUES (BAT)

- **'Best available techniques**' means those techniques that are the most effective to **prevent** and, where that is not practicable, to **reduce** emissions and releases of mercury to air, water and land and the impact of such emissions and releases on the environment as a whole, taking into account economic and technical considerations ;
- "'**Best**' means **most effective** in achieving a high general level of protection of the environment as a whole;
- "'**Available**' techniques means, those techniques developed on a scale that **allows implementation** in a relevant industrial sector under economically and technically viable conditions, taking into consideration the **costs and benefits**;
- "'**Techniques'** means technologies used, operational practices and the ways in which installations are designed, built, maintained, operated and decommissioned;

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STEPS IN SELECTING BEST AVAILABLE TECHNIQUES (BAT)

- Establish information about the source, or source category. This may include, but not limited to, information on the processes, **input materials, feed-stocks** or **fuels**, and on the actual or expected **activity levels**, including **throughput**. Other relevant information could include the **expected life of the facility**, which is likely to be of particular relevance when an existing facility is being considered, and any requirements or plans for controlling other pollutants;
- Identify the full range of options of **emission control techniques** and combinations thereof which are relevant for the source under consideration;
- Identify technically viable control options, giving consideration to **techniques applicable to the type of plant within the sector**, and also to any physical limitations which may influence the choice of certain techniques;
- Select the control technique options which are the **most effective** for the control and, where feasible, reduction of emissions of mercury, taking into account the performance levels;
- Determine which of these options can be implemented under **economically and technically** viable conditions, taking into consideration **costs and benefits**

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EMISSION CONTROL TECHNIQUES USED IN WASTE INCINERATION

- Dust (particulate matter) removal technique;
- Wet scrubbing techniques;
- Activated carbon injection;
- Boiler bromine injection;
- Static bed filters

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TREATMENT TECHNIQUES FOR SOLID RESIDUES FROM INCINERATION

- Bottom and boiler ash treatment techniques;
- Treatment of solid flue gas residues;
- Residue reuse;
- Stabilization and solidification;
- Final disposal of residues

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BEST AVAILABLE TECHNIQUES FOR WASTE INCINERATION

- Pre-treatment of waste before incineration;
- Rotary kilns & grate -municipal solid waste techniques;
- Rotary kilns -hazardous waste incineration techniques;
- Fluidized bed -sewage sludge incineration techniques;
- Grates -medical waste incineration;

- Upgrading and improvement of existing treatment techniques -flue gas treatment techniques

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BEST ENVIRONMENTAL PRACTICES (BEP)

- ‘Best environmental practices’ means the application of the most appropriate combination of **environmental control measures** and strategies;

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RANGE OF MEASURES TO BE CONSIDERED WHEN APPLYING BEST ENVIRONMENTAL PRACTICES (BEP)

- **Good maintenance of facilities** and measurement equipment are important to the effective operation of control and monitoring techniques;
- **Well-trained operators**, who are aware of the need to pay attention to the processes, are indispensable to ensuring good performance;
- **Careful planning and commitment** from all levels within the organization operating the facility will also help to maintain performance, as w ell as administrative controls and other plant management practices;
- **Waste management practices** –waste minimization, separation and recycling, waste inspection and characterization before incineration, removal of non-combustibles, proper handling and storage, minimizing storage times, waste loading, incinerator operating and management practices-site selection and design of incinerator

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RANGE OF MEASURES TO BE CONSIDERED WHEN APPLYING BEST ENVIRONMENTAL PRACTICES (BEP)

- A **regulatory infrastructure** with sufficient capacity to permit incinerators, control and monitor mercury emissions regularly;
- The provision of **information and education to the public**, users and decision makers about the environmental consequences of choice of particular activities and choice of products, and ultimate disposal;
- The **development and application of codes of good environmental practice** which covers all aspect of the activity in the product's life;
- The **application of labels** informing consumers of environmental risks, enabling them to make informed decisions about choice;
- **Integrating waste collection and disposal systems** into residential, commercial, and industrial processes to ensure that all waste is managed in an environmentally sound manne;
- Avoiding the use of **hazardous substances** or products that contain hazardous substances and the generation of hazardous waste;
- The application of **economic instruments**, systems of licensing ;

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BEST ENVIRONMENTAL PRACTICES (BEP)

- Waste management practices;
- Monitoring;
- Direct methods;
- Indirect methods;

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Thank you all!