A-THERMAL

RETORT TECHNOLOGIES (PTY) LTD

Thermal treatment of hazardous mercury waste

WASTEKHORO

31 May to 1 June 2016

COASTLANDS CONVENTION CENTRE, UMHLANGA

"PROMOTING INNOVATION AND UPSCALING ENTERPRISE DEVELOPMENT"

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Department:
Environmental Affairs
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Presented at 2016 Waste Khoro

South African Department of Environmental Affairs

31 May to 1 June 2016

Presentation overview

- Brief introduction to A-Thermal Retort Technologies (Pty) Ltd
- Waste hierarchy in relation to mercury treatment
- Literature review and best available technologies
- Practical application of thermal treatment
- Conclusions

Brief introduction to A-Thermal

A-Thermal specialises in the thermal treatment of hazardous and toxic wastes

- Operating since 1996 by using *thermal desorption* (pyrolysis)
- Considered Best Available Technology (BAT) by US EPA and EU IPPC Directive for hazardous waste destruction
- Specialist projects: Treated PCB contaminated soil and **recovered mercury from mercury contaminated waste** (400 tons)
- Currently service Chemical and Pharmaceutical sectors
- Plant located in Olifantsfontein, Gauteng, South Africa

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Brief introduction to A-Thermal

- Operating permits:
  - Waste Management Licence (WML) (Department of Environmental Affairs)
    - Includes hazardous waste containing mercury
  - Air Emission Licence (AEL) (Ekurhuleni Municipality)
- Certifications:
  - ISO 9001 (Quality system)
  - ISO 14 001 (Environmental management system)
  - OHAS 18 001 (Occupational health and safety system)
  - CAIA (Chemical and Allied Industries Association) – Responsible Care

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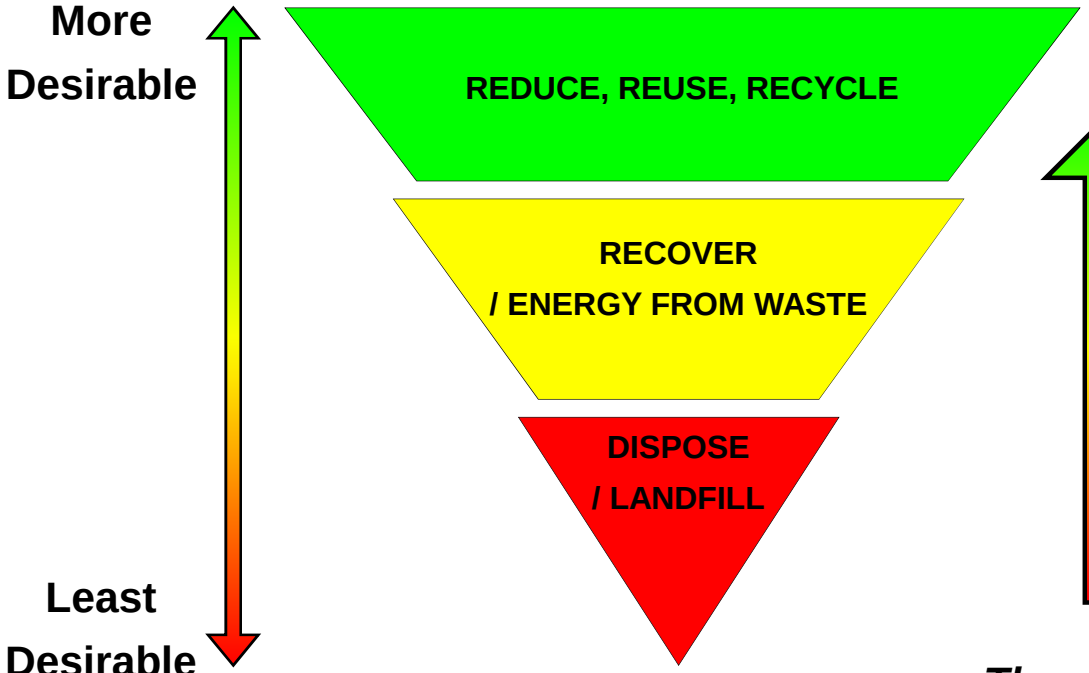
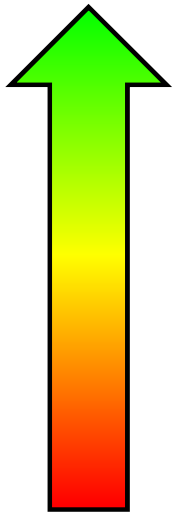
SN3

Waste hierarchy

What do we do with hazardous waste?



How do we apply this to hazardous waste with mercury?



Treated and potential for recovery of materials

Waste with hazardous components

Thermal treatment *allows movement of waste material back up the hierarchy by removing hazardous components present in waste.*

N1

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Slide 5

SN3 Important to stay on Last Tier and Highlight Differences between Landfill and Treatment - Look at WCMR and Landfill Norms and Standards
Sherwin Naicker; 2016-05-30

N1 THe concern you will raise here with the NGOs is you are now adding HG into circulation again instead of reducing it... therefore we must mention the stabilisation of it.

THe argument then becomes why do we not landifll and stabilise from the start...
The reply being this is best practice'; it is waste stream anand the HG cannot swtay in this form becuase of MeHG. the only way to effectively destroy Me HG is thermally
Nicolas; 2016-05-30

Literature review and BATs

- Current global practice

United Nations Environmental Program (UNEP), Practical Sourcebook on Mercury Waste Storage and Disposal, 2015	Chapter 4 (Thermal treatment)
United Nations Environmental Program (UNEP) Chemicals, Global Mercury Assessment, 2002	General information on mercury
European Commission, Integrated Pollution Prevention and Control: Reference Document on Best Available Techniques for the Waste Treatments Industries, 2006	Section 2.3.3.9 (Thermal desorption); Section 4.3.3.3 (Treatment of mercury waste)
European Commission, Integrated Pollution Prevention and Control: Reference Document on Best Available Techniques for the Waste Incineration, 2006	Section 2.5.6.2 (Mercury emission reduction)
Mercury Recovery Services for United States Department of Energy, Recovery and removal of mercury from mixed wastes, 1995	Focussed on thermal treatment

Hazardous mercury waste composition

- Why is it classified as hazardous?
  - Mercury present
  - Heavy m
  - Organic

Above limits for safe handling and above limits allowed by landfill. Have e chemically changed more stable form. capsulation possible ut still hazardous

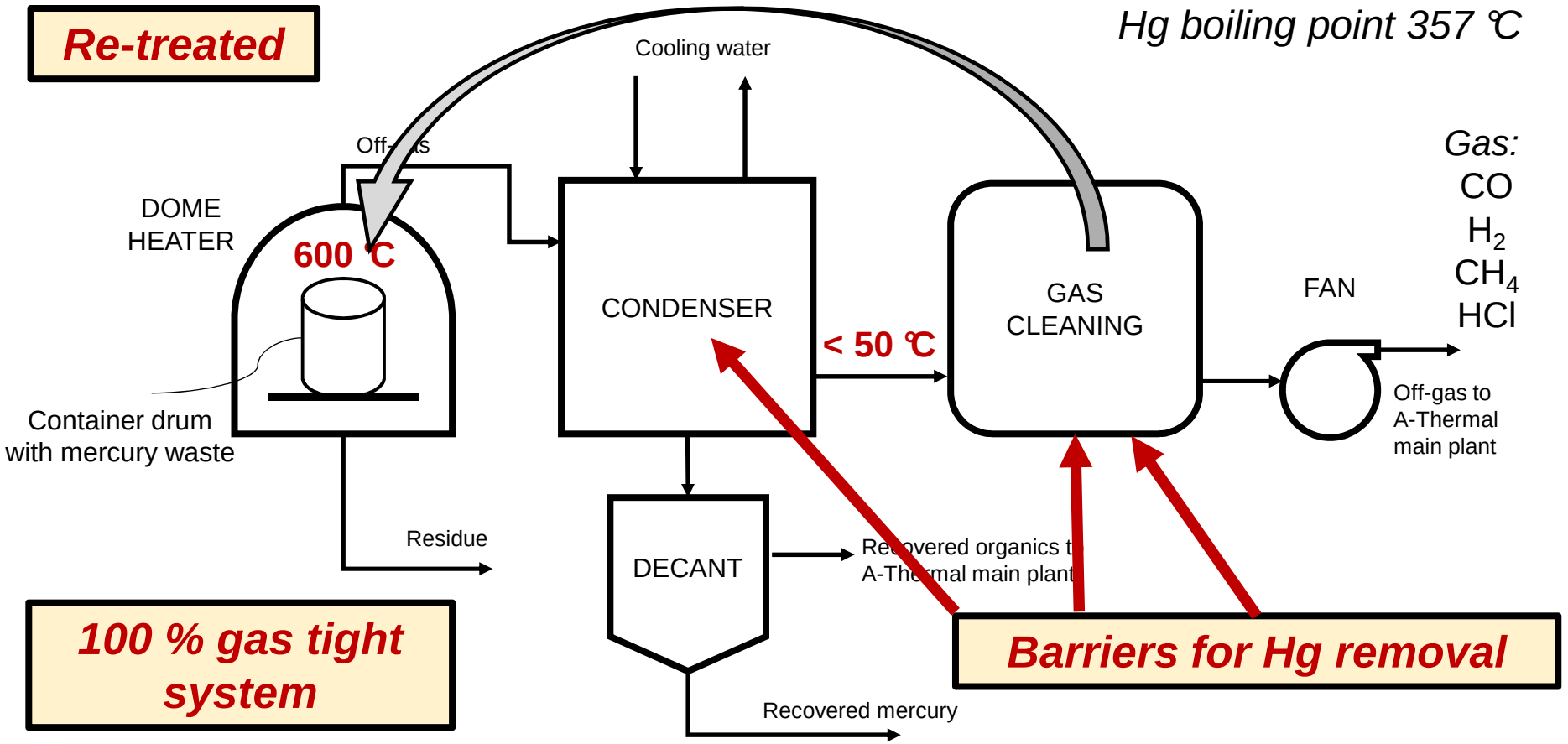
Present together, in various concentrations as one hazardous mixture or "toxic cocktail"

Metals	Ag,
Heavy metals	As,
Inorganics	Cl,
Organics (selection)	Chl com atic
Mercury types	Elemental Hg^0, ionic mercury (Hg^{2+}), methylmercury, mercuric chlorides (Hg_2Cl, $HgCl_2$) and similar compounds

N4

Practical application of thermal treatment

- As per EU BAT: thermal desorption, condense mercury, clean gas



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Slide 8

N4 Must limit this slide, it should not be up from scrutiny from the ignorant people

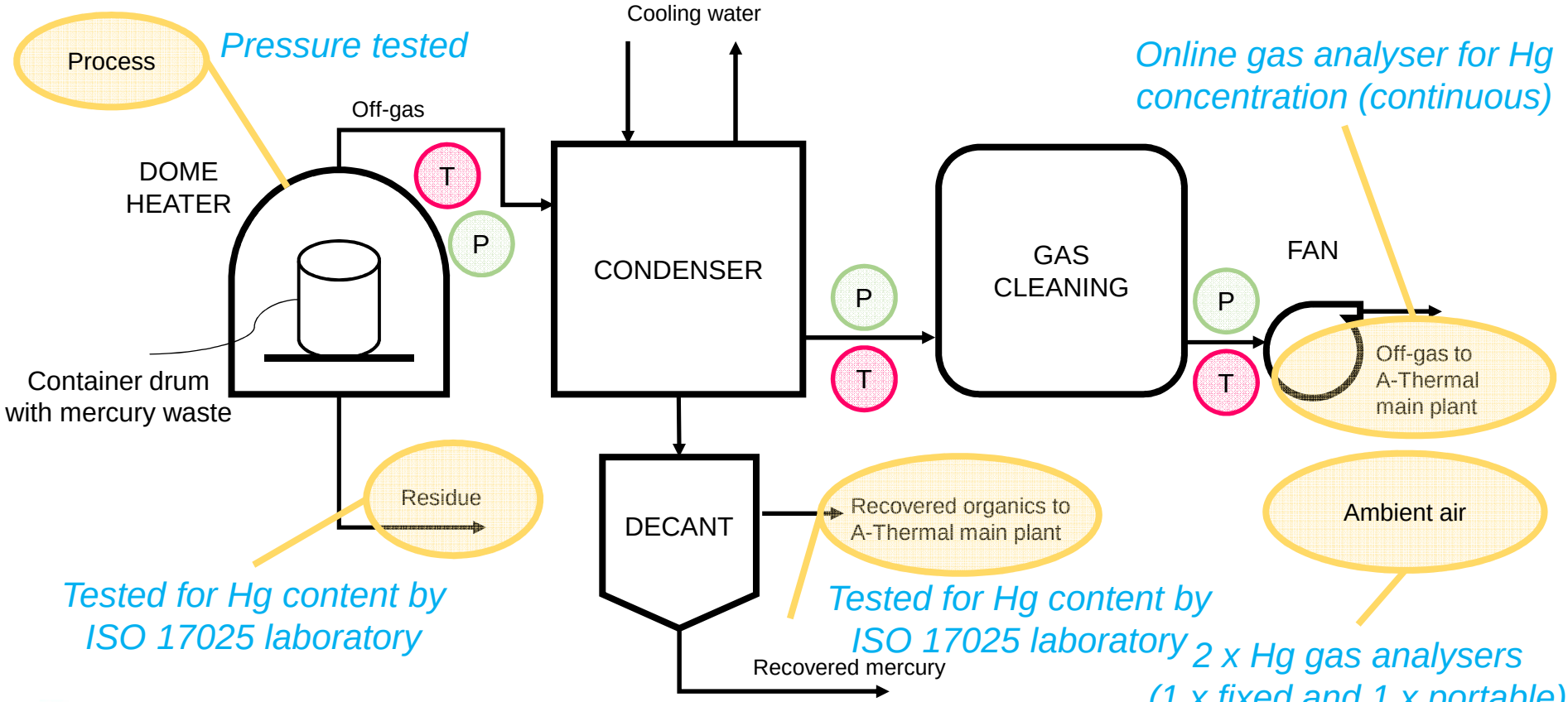
Nicolas; 2016-05-30

SN4

N5

Practical application of thermal treatment

- "Tests on completion" – how is the process monitored to ensure safe operation, and what about by-products?



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Slide 9

SN4 Highlight our technology in a table? Worried we may be giving our technology away
Sherwin Naicker; 2016-05-30

N5 Again must limit (black box)
Nicolas; 2016-05-30

Practical application of thermal treatment

- A-Thermal provides a treatment service for hazardous mercury waste
- The recovered mercury is returned to the customer at 99.9 % purity, or which stabilised further for long term storage as mercuric sulphide HgS
- This ensures that mercury is stable with all hazardous components (organics, chorine etc.) removed and destroyed separated
- No new mercury “production” from process
- Ensures improved environmental management because now mercury from waste has been quantified and can be controlled

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Conclusions

- A-Thermal Retort Technologies (Pty) Ltdhas been treating hazardous waste using thermal methods for 20 years
- For hazardous waste containing mercury, thermal treatment can be used for elemental mercury recovery and subsequent stabilisation
- A-Thermal offers a treatment service to customers in order to take waste and move it back up the waste hierarchy by recovering components present in the waste and stabilisation further if needed

Thank you

For further details:/ information / plant visits:

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Mercury as a global pollutant

"Mercury is a chemical of global concern owing to its long-range atmospheric transport, its persistence in the environment once anthropogenically introduced, its ability to bioaccumulate in ecosystems and its significant negative effects on human health and the environment"

"Stressing the importance of financial, technical, technological, and capacity-building support, particularly for developing countries … in order to strengthen national capabilities for the management of mercury"

Preamble of the Minamata Convention on Mercury, United Nations, 10 October 2013 [1]

Mercury: introduction

- What is mercury?
  - A chemical element (symbol Hg), which is a metal, and liquid at room temperature
  - Occurs naturally in the earth as mercuric sulphide (HgS), known as cinnabar
  - Used in many applications from thermometers to light bulbs, especially in electronics and industrial chemistry

- Why is mercury dangerous?
  - Mercury is classified as a toxic (very hazardous)
  - Mercury absorbed through the skin and mercury vapours can be inhaled
  - Mercury can cause chronic (long term exposure) and acute (short term) poisoning
  - Mercury accumulates in organs over time
  - Once it has been released, mercury persists in the environment, cycling between air, land and water, and biomagnifies up the food chain [2]

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Mercury waste: introduction

- What is mercury waste? 3 Types, as defined [2]:
  - Wastes consisting of mercury or mercury compounds
    - Mercury recovered from wastes
  - Wastes containing mercury or mercury compounds
    - Thermometers, fluorescent lamps, other wastes of mercury-added products (e.g. batteries)
  - Wastes contaminated with mercury or mercury compounds
    - Residues generated from mining processes, industrial processes, or waste treatment processes, including wastewater

- Mercury waste sources are well understood [2] and range from mining activities and the chemical industry to contaminated sites

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Mercury waste: treatment options

- What are the technology options available for treating Mercury waste?

(1) Thermal methods

- Thermal desorption: with condensation of Hg
- Incineration: with wet scrubbing and adsorption to catch Hg

(2) Alternative methods

- Removal and recovery: Acid/chemical leaching, carbon adsorption, ion-exchange
- Immobilization: Hg is immobilized in a matrix (e.g. cement) for long term storage
- Developing technologies: direct chemical oxidation, acid digestion

- How do we know these options are technically proven? EPA and EU
- What is the best option for a specific type of waste?

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6. Licenses and accreditations

- A-Thermal has the current licenses in place for operation
  - WML
  - AEL
- A-Thermal is accredited with certification:
  - ISO 9001
  - ISO 14 001
  - OSHAS 18 001
- A-Thermal is signed to CAIA and Responsible Care (product Stewardship)

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5. Complete project management

- Beyond the treatment plant
  - HR training and biological monitoring
  - Decontamination room
  - Transportation of material
  - Testing and monitoring of gas
  - Preventative maintenance of plant
  - Environmental management

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Reference plants / treatment companies

Bethlehem Apparatus Co., Inc., Pennsylvania, USA
http://www.bethlehemapparatus.com/

Mercury Waste Solutions, Wisconsin, USA
http://www.mwsi.com/

Econ Industries, Starnberg, Germany
http://www.econindustries.com/

BMT, Farmsum, The Netherlands
http://bmt-mercury.com/

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References

[1] United Nations, Minamata Convention on Mercury, 2013

[2] United Nations Environmental Program (UNEP), Practical Sourcebook on Mercury Waste Storage and Disposal, 2015

[3] United Nations Environmental Program (UNEP) Chemicals, Global Mercury Assessment, 2002

[3] European Commission, Integrated Pollution Prevention and Control: Reference Document on Best Available Techniques for the Waste Treatments Industries, 2006

[4] Mercury Recovery Services for United States Department of Energy, Recovery and removal of mercury from mixed wastes, 1995

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