

Standard Operating Procedure

Title:	Dealing with Mercury Standard Operating Procedure		
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1 Introduction and Purpose

This procedure shall be used to ensure personnel safety whilst working on plant and process equipment that have the potential to contain mercury contaminated fluids or release mercury vapour into the working atmosphere. This procedure identifies testing requirements and methods, PPE requirements and the containment and disposal of mercury contaminated waste. This procedure is to be used each time it is required to break into systems that have had potentially mercury contaminated fluid through them, and when sampling these and other associated fluids.

Regular testing of Todd Energy wellsite and production station gas and hydrocarbon streams shows a low level of mercury that is below exposure standard threshold limits. The risk level under normal operating conditions is considered low. Activities that generate heat on process equipment such as hot washing or hot work on vessels/process equipment increase the potential of generating higher levels of mercury vapour, these activities are predominately associated with shutdowns or maintenance activities and present an increased level of risk.

2 Definitions and Abbreviations

- a) Site Health Hazards Management Registers contain Mercury (Hg) readings recorded for plant and work areas. This data can be found via link below or by contacting the HSE function.
- b) <https://toddenerynz.sharepoint.com/:f/r/sites/hse/hazardriskmgt/Health%20Hazards%20Management%20Registers?csf=1&web=1&e=yR0Z5f>
- c) Mercury Handling PTW Checklist No 25
- d) Job Hazard Analysis (JHA)
- e) Health Risk Assessment. (HRA)

3 Todd Energy Exposure Limit

- a) Mercury vapour 0.020 mg/m³ or 20.0 ug/m³ in air: Long-term exposure limit 8-hr Time Weighted Average TWA (Based on Workplace Exposure Standards and Biological Exposure Indices which prescribes a NZ limit of 0.025 mg/m³ or 25.0 ug/m³)
- b) 5-100 ppb wt mercury in liquids requires further testing to determine species of mercury.
- c) 1000 ppb in liquid: Based on NZ Provisional Tolerable Weekly Intake (PTWI), converted to oil and gas operational environment.

4 Procedure

4.1 Pre-work

- a) Review the site mercury hazard register or project HSE plan/project hazard register and determine if the system and site that you intend to work on have previously identified recorded mercury levels. Review the previous mercury exposure levels to ensure the correct PPE is available (section 4.3.1).
- b) If it is likely the task will result in recovering mercury contaminated liquids/sludge/solids waste e.g., waste with recorded levels above the exposure limits of 5 ppb wt mercury in liquids or 0.020mg/m³ or 20.0 ug/m³ (TWA) in the air in or around the equipment, then an identified location to temporarily store contaminated waste away from working areas needs to be identified.
- c) Ensure all personnel have fulfilled required mercury awareness training criteria as outlined in appendix A if the task is likely to record levels above the exposure limits.
- d) Prepare a permit and the appropriate paperwork allowing at least 24 hours for it to be reviewed. Ensure mercury hazards are identified on the permit.

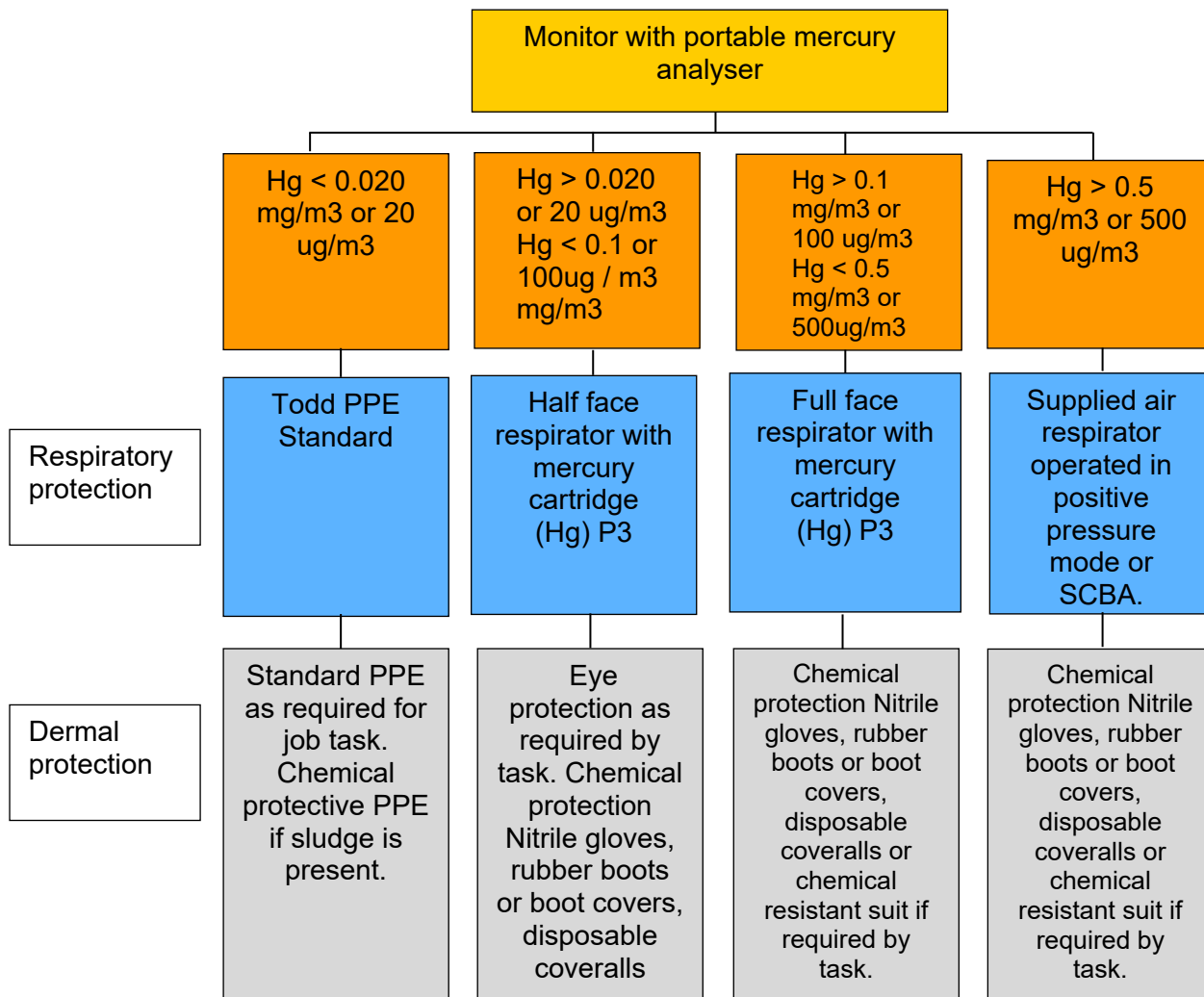
4.2 Testing and PPE Requirements

PPE requirements for breaking into the system and performing the testing, vary depending on whether the site and equipment being worked on has previously been tested positive for signs of mercury or not, and whether testing through the job requires a change in PPE.

- a) There are three types of mercury detectors used across the Todd Energy sites: , Jerome, ION Science and Nippon .
- b) As the mercury meters are not Intrinsically Safe, they cannot be used in a hazardous area that is not gas free, They can only be used in conjunction with a normal hydrocarbon gas detector to ensure the area to be mercury tested is free of hydrocarbon gas before the Analysers / Indicators are used under the control of a HW2 work permit.
- c) Any person using the mercury detection equipment must hold the appropriate competency in the Todd Energy CMS.
- d) The test is for the protection of people and should be undertaken in the expected “breathing zone” 30cm away from potential contaminated areas such as openings/contaminated surfaces.
- e) As a minimum a half face respirator with a A2B2E2K2 Hg P3 Drager or M3 filter fitted, shall be worn when first breaking into process equipment to take the initial mercury vapour recording.
- f) The mercury analysers / indicators are to be used in accordance with their operating instructions located with the device.
- g) All readings to be recorded on the mercury vapour measurement form in Checklist#25, and the Site Health Hazards Register is to be updated.
- h) When entering a vessel that is potentially mercury contaminated, respirator protection (Half or Full-Face Mask with a A2B2E2K2 Hg P3 Drager or M3 filter fitted), is to be used for the first entry and testing of the vessel, even if initial readings at the manway are below the exposure limit of 0.020mg/m³ or 20.0 ug/m³.

Testing should be repeated at intervals as specified in the permit based on the conditions that you are working in. Monitoring frequency during hot work or vessel cleaning should occur every 20-30 minutes. Tests should also be repeated if the weather changes (wind level drops, temperature or sunshine increases).

4.3 PPE requirements















4.3.1.

Where there may be contact with liquids that have over 5 ppb of mercury or 0.020 mg/m3 or 20.0 ug.m3 vapour, e.g., breaking of containment on process fluid system, the following PPE is required in addition to the Todd Energy standard PPE requirements (Fire-retardant overalls, helmet and eye protection). Respirator protection must be worn when taking the initial mercury reading when breaking into process equipment.

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As a minimum a half face respirator with a A2B2E2K2 Hg P3 Drager or M3 filter fitted, shall be worn when first breaking into process equipment to take the initial mercury vapour recording.

<p><0.020 mg/m³ or 20 ug/m³</p>	<p>Todd Standard PPE as required for job task. Chemical protective PPE if sludge is present. e.g. For confined space entry.</p>	<p>PPE is to be assessed when dealing with sludge regardless of readings. e.g. Face shield or goggles, chemical protective gloves, apron (if splash potential exists)</p>		
<p>0.020 to 0.1 mg/m³ or 20 – 100 µg/m³</p>	 Black Armour Nitrile Glove or equivalent	 Nitrile or Rubber boots or Microchem 3000 Boot Covers	 Microgard 2000 Ts Plus or equivalent	 Half face respirator with (Hg) P3 filter
<p>0.1 to 0.5 mg/m³ or 100-500 µg/m³</p>	 Black Armour Nitrile Glove or equivalent	 Nitrile or Rubber boots or Microchem 3000 Boot Covers	 Microgard 2000 Ts Plus or equivalent	 Drager X-Plore 5500 Full Face Mask and ABEK Hg-P3 filter or equivalent
<p>Over 0.5 mg/m³ or 500 µg/m³</p>	 Ansell ChemTek Viton/Butyl Style No. 38-612 or equivalent	 Bata PU Gumboots or equivalent rubber hydrocarbon resistant	 Microguard Microchem 3000 or chemical resistant suit	 Breathing Apparatus

Disposable PPE may need be tested to determine if it has been contaminated, if so, they will be disposed of as mercury contaminated in the site Hazardous Waste Bin. Gumboots that have had direct contact with sludge and or liquids are to be cleaned, liquids from this are to be captured and disposed of in the site process drain system, or follow 4.3, item e for the disposal of the liquids.



Note: Where the mercury vapour in or around the equipment/system is recorded at or over **0.5 mg/m³ or 500 ug/m³**, the work is to be stopped and the activity will be reassessed.

This activity will now become a Notifiable Activity to Worksafe as it becomes necessary to wear Breathing Apparatus (BA) and upgraded PPE shown above.

Additional Notes:

- a) When wearing the above PPE, the normal Flame-retardant overalls are to be worn closest to the body and to be tucked into the boots, and the Microgard or equivalent coveralls are to be worn over top of the boots. The coveralls are also to fully cover the wrist cuffs of the fire-retardant overalls and where possible should sit on top of the cuff of the gloves.
- b) If Mercury levels are above 1.0 mg/m³ or 1000ug/m³ stop work, tape off area and contact Operations and HSE for further advice.
- c) Once initial readings have been established and correct PPE selected, work may proceed. As any liquid or sludge is found, or more flanges opened, new tests should be taken after the area is re-checked as hydrocarbon gas free.
- d) When working on a system that has less than the 5ppb contamination level and there has been a significant splash (200+ml) then remove the standard PPE and shower, and have the PPE laundered as normal.

4.4 Contaminated Waste Disposal

Where waste has recorded levels of mercury in fluids over 1ppb or 0.020 mg/m³ or 20.0 ug/m³ mercury in or around the equipment then:

- a) All waste from this site/activity shall be treated as Mercury contaminated and shall be contained and stored in the appropriate containers (sealed drums, containers, skips or tanks) until the waste is sampled and tested and then the appropriate disposal method will be actioned according to the level of contamination.
- b) The waste streams will mainly be split into various categories as follows:
 - (i) Water which will be disposed of via the Produced water system at either MMPS or KPS into the site-based water injection well.
 - (ii) Trucked off site and disposed of via an approved contractor and disposal method for other sites.

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- (iii) Process Solids, i.e., sludge and silt which is to be stored in containers or skips, labelled and stored in the designated area for disposal of via an approved contractor and disposal method.
 - (iv) Contaminated soil/grade and other waste is to be stored in containers or skips, labelled and stored in the designated area for disposal of via an approved contractor and disposal method.
 - (v) Other waste such as well treatment fluids will be considered and disposed of on a case-by-case basis which will be planned as a part of the activity plans and procedures.
- c) All the above contaminated waste is to be collected and carefully transferred to the appropriate labelled container while wearing the appropriate PPE.
Note: The job number is to be identified on each of the containers to enable the tracking of the waste with the sample results.
- d) A representative sample is to be taken of each waste stream; the samples are to be appropriately labelled for sending away for analysis and reporting.
Note: The PPE does not need to be sampled.
- e) All liquids must be contained, sucked up by the vacuum truck and disposed of in an approved manner – this includes water to clean boots. Operations will advise where to unload.
- f) On completion of work, wipe down all tools and equipment and PPE that has come close to contact (dispose of the rags/cloths in the labelled disposable sealable drums(s) for contaminated PPE), and then test by passing mercury tester over them. If reading is above 0.020mg/m³ or 20.0 ug/m³ re-clean until levels are below 0.020mg/m³ or 20.0 ug/m³.
- g) Any equipment that is to be sent off site needs to have the Mercury Equipment Card Appendix E attached and filled in. EXTREME care is to be taken to ensure NO contaminated equipment, clothing or cleaning gear is removed from site unless in the sealable, labelled drum(s).
- h) Remove filter mask, replace seals and dispose of filter. A set of filters can be safely worn for one full day (i.e., up to 24hrs).
- i) Where the specific systems or sites are given specific clearance in the Mercury Hazard Register then there is no additional waste disposal or cleaning requirements other than normal housekeeping standard procedures.

All the above collected waste will be disposed of via the appropriate disposal method as detailed in the Todd Energy Waste Management Procedure, with all the appropriate documentation.

Appendix 1: Equipment Card

THIS LABEL SHOULD REMAIN WITH THE EQUIPMENT UNTIL IT HAS BEEN REINSTALLED IN THE TODD ENERGY INSTALLATION			
MERCURY CONTAMINATED (OR POTENTIALLY CONTAMINATED) EQUIPMENT CARD			
Location of origin :		Work Order No.:	
Func loc / equipment/ type :			
This equipment has been in direct or indirect contact with the gas / condensate product flow and is to be checked for the presence of mercury			
Circumstances during the mercury vapour measurements :			
Wind strength:		Temperature (°C):	
<input type="checkbox"/> None <input type="checkbox"/> Moderate <input type="checkbox"/> Hard		<input type="checkbox"/> < 5 <input type="checkbox"/> 5-15 <input type="checkbox"/> >15	
		Presence of sunshine:	
		<input type="checkbox"/> Night <input type="checkbox"/> Overcast <input type="checkbox"/> Cloudy <input type="checkbox"/> Bright Sunshine	
Date :		By :	
		Department :	
Check for	Measured values in breathing zone (at 0.30 m):		mg/m ³
Mercury vapour	Equipment is: <input type="checkbox"/> Not mercury-contaminated <input type="checkbox"/> Suspect * <input type="checkbox"/> Contaminated with mercury**		
Registration		From: TODD ENERGY	Department / Company
		To:	Date:
Transfer		From:	Department / Company
		To:	Date:

* Equipment suspected of being contaminated with mercury. Equipment that has been in direct contact or that via supporting processes has been in contact with the gas/ condensate production flow.

** Contaminated with mercury. Equipment where at a distance of 0.30 m (or greater) a mercury vapour level greater than 0.020 mg/m³ has been measured.

Revision History

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