LOWE Environmental Impact

Mortuary Wastewater Management

A Collaborative Approach to Implementing Tikanga

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Overview

- Mortuaries at funeral homes and hospitals generate wastewater including body fluids from embalming processes
- To protect public health, mortuary wastewater passes through the sewer and WWTP where it is treated and discharged
- Tikanga considers all parts of deceased people to be tapu and requires intact burials (return to Papatuanuku)
- Wairoa District Council, local iwi, and funeral home have been collaborating since 2017 to address tikanga concerns
- Mortuary wastewater characterisation and land discharge design options have made some progress during the last few years

Embalming Process

Chemicals

Embalming chemicals are pre-mixed

- Different types of chemicals are used
- Different volumes are mixed together

Embalming

Body is laid on embalming table

- Stainless steel table with raised edges
- Tap water constantly washes the table
- Drain removes contaminated water

Process

Embalming chemicals are injected which pushes blood and fluids out

Discharge

Table wash water flushes fluids away

Sorry, this part is a bit gruesome but unavoidable!

What is Mortuary Wastewater?

Mainly wash water that contains:

- Embalming preservatives
- Detergents
- Disinfectants
- Blood
- Body fluids
- Pharmaceuticals
- Cosmetics and perfumes

Embalming Chemicals

Typically 3 L total concentrate is used

Aldehydes
Formaldehyde, paraformaldehyde, acetaldehyde, glutaraldehyde

Glycols
Ethylene glycol, propylene glycol

Alcohols
Methanol, ethanol, isopropanol

Disinfectants and Solvents
Phenol, dichlorobenzene, acetone

Surfactants/Detergents

Māori Concerns About Mortuary Wastewater

- Embalming replaces body fluids, so part of each person is lost
- Embalming disrupts a person's mauri
- No part of a deceased person should contact human wastes
- The person's mauri and mana are polluted and disrespected by contacting wastewater
- Discharging treated wastewater containing mortuary wastewater exacerbates harm to the receiving environment's mauri
- Waterways and land receiving mortuary waste are tapu and rahui would be imposed on mahinga kai and ceremonial activities

Wairoa's Mortuary Wastewater Management Review Process

2017

Iwi raised concerns during WDC's consultation to inform Wairoa WWTP discharge consent renewal application

2018

WDC volunteered consent conditions to consider options for separate treatment and discharge. Consent was granted on 1 October 2021.

2022

WDC amended Trade Waste and Wastewater Bylaws to prohibit mortuary wastes discharging into sewers

2023

WDC, iwi, and undertaker investigated practicalities of separation, tikanga, volume, composition, and land discharge design options

Investigation Programme

Practicalities

- Separating from sanitary plumbing
- Storage
- Transportation
- Discharge to land (and treatment)

Characterisation

- Volume
- Chemical composition
- Toxicity
- Treatment requirements

Land Discharge System

Design Parameters

- Volume
- Composition
- Treatment loads
- Hazard management
- Consenting processes

Tikanga

- Burial with or near the person
- Respectful and include whanau
- Natural discharge system
- Plants and soil absorb everything

Outcomes So Far

Practicalities

- Can rearrange sanitary plumbing for separation
- Can store at mortuary (maybe 2-3 people)
- Can transport using dedicated waste tanker
- Can discharge to land for treatment

Characterisation

Design Parameters

Tikanga

Outcomes So Far

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- Can rearrange sanitary plumbing for separation
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Characterisation

- Volume is about 100 L for each person
- High total organic carbon and modest solvent concentrations
- High BOD and nitrogen concentrations
- Slightly toxic and not very infectious

Design Parameters

Tikanga

Outcomes So Far

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Initial results:

- TSS 800 g/m^3
- pH 7.0
- TN 700 g/m^3
- TP 23 g/m^3
- BOD_5 5,800 g/m^3
- TOC 3,400 g/m^3
- *E. coli* <1,000 cfu/100 ml
- Isopropanol 1,100 g/m^3
- Propylene glycol 115 g/m^3
- Phenol 3.2 g/m^3
- Formaldehyde 67 g/m^3

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Design Parameters

- Volume is manageable
- Mixture of body fluids and solvents in water
- High BOD and nitrogen treatment loads
- Modest toxicity and biohazards
- Consenting processes are novel

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Tikanga

- Burial with casket may be possible
- Respectful and can include whanau
- Discharge structure at cemetery
- Discharge structure uses plants and soil

Achievements

Collaboration

- Council, iwi, and funeral home are successfully collaborating
- Iwi and funeral home staff have fully engaged
- Enthusiasm to install new system for Wairoa
- Opportunities to adopt system design nation-wide

Incorporation of Tikanga

- Respectful of tapu and mauri values
- Design can be installed at marae urupa
- Removes mortuary wastewater from sewage and river
- Relies on land and natural processes (Papatuanuku)

Next Steps

- **Analyse** — Analyse more mortuary wastewater samples
- **Design** — Design land treatment system to match loads
- **Consent** — Obtain discharge resource consent
- **Install** — Install and commission the system
- **Monitor** — Gather information about its operation
- **Adjust** — Adjust the design and operation as needed
- **Replicate** — Replicate elsewhere – locally and nationally

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