On-site Wastewater Management Training Course

Failing Systems

Auditing and Troubleshooting

Introduction

- No amount of desktop assessment can substitute for an inspection of an existing onsite wastewater system
- Wide variation in designs and configurations makes standardised assessment a challenge
- Inspectors need a sound knowledge of past and present technologies and working knowledge of basic physical and biochemical processes
- Some of this can only be gained through field experience. Don't be afraid to have a look into a tank!

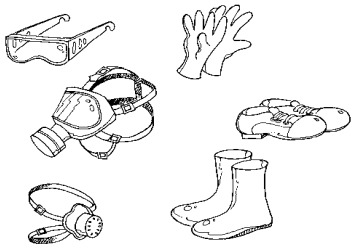
A look inside a septic tank!

Occupational Work Health and Safety

- WH&S Hazards around on-site systems:
  - Manual Handling
  - Infectious Material
  - Confined Spaces
  - Hazardous and Dangerous Substances
  - Electrical Injuries
  - Fatigue, Sunburn and Heat Stress

Work Health and Safety

- Use of Personal Protective Equipment (PPE) is just one strategy for managing WH&S risks



Inspection Equipment

- Inspection log sheets or digital log / notepad
- Basic tools such as screwdrivers, multi-grips, shifters, hammer etc.
- Crowbar, torch and at least one bucket
- Sludge measuring device (e.g. Sludge Judge)
- Measuring tape and camera
- Sample bottles for water quality sampling

Inspection Equipment

Inspection Equipment

Inspection Equipment

- Dye (e.g. Fluorescein) for checking flow paths
- Nessler's reagent (detects ammonia rich water)
- Imhoff cone or equivalent (activated sludge plants)
- Dissolved Oxygen (DO) or nutrient (N or P) test kits
- Free residual chlorine test kit and pH strips

Inspection Equipment

What is the purpose of inspection?

- There are two main questions to ask during a performance audit or assessment
  - Is the system operating as it was designed to operate?
  - Is the system adequately managing risks to public health and the environment?
- The answer to these questions will sometimes be no for one and yes for the other

System Inputs

- What is the peak and average hydraulic load coming into the system?
  - Can use tables from *AS/NZ 1547:2012* to estimate wastewater generation rates
  - If more scrutiny is necessary have a look at previous water bills
  - Wastewater typically makes up approximately 60-80% of the total water usage

System Inputs

- What sort of pollutant loads are entering the system?
  - Are there any activities going on that could cause influent to be different to typical domestic wastewater?
  - What sort of pressure is being put on the system by cleaning chemicals, detergents, disinfectants and antibiotics?

System Inputs

- Premises that use, produce or generate food (dairy, brewery etc.) products can input high organic loads
- Beware unusual home activities and businesses e.g. hairdressing, catering
- Age and health of residents might impact on system performance e.g. use of chlorine bleach, high levels of drugs and antibiotics

System Sizing

- Sized for hydraulic load
- Sized for sludge accumulation
- Sized for organic load (BOD)
- Sized for nutrient load (if required)
- General land capability assessment

System Performance Indicators

- Adequate removal of Suspended Solids
- Adequate removal of BOD
- Pathogens
- Removal of nutrients?
  - Nitrogen
  - Phosphorus

System Condition

- Structural integrity of all components?

System Condition

System Condition

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System Condition

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Sludge and Scum Accumulation

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Sludge and Scum Accumulation

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Effective Treatment Processes

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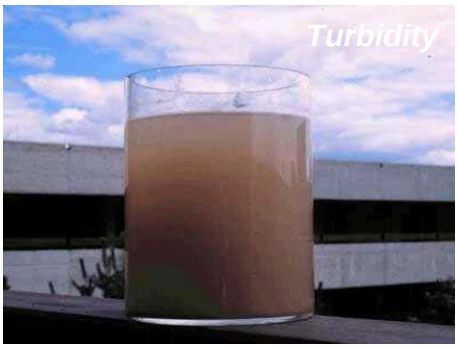
Effective Treatment Processes



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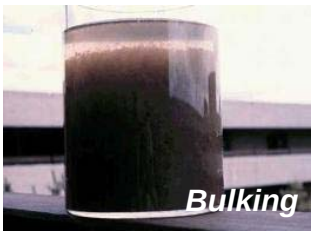
Effective Treatment Processes



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Mechanical / Moving Parts

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System Overflow / Leakage

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System Overflow / Leakage

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Land Application System

- Effluent discharge (surface or groundwater)
- Suitable land application method?
- Suitable sizing?
- Suitable location?
- Point of application in relation to water table?
- Buffers, separation distances, attenuation
  - Nutrients
  - Pathogens

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Land Application System

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Fluorescein Dye Testing

Rhodamine Dye Testing

Audit Scenario

- Existing two (2) bedroom house (3 occupants) on town water supply
- Proposed construction of two (2) bedroom secondary dwelling (granny flat)
- 10ha rural residential lot on riverine corridor
- Existing development serviced by 2.5kL septic tank and gravity dosed (20m) absorption trench (0.6m w)
- Site soils = 400mm sandy loam over >300mm (weak) sandy clay loam over light/medium clay

Thoughts??

- Why might we think this system is failing
  - Existing Load = 3EP x 150L/p/day = 450L/day
  - 2.5kL septic tank = >5 day HRT less accumulated sludge
  - Inlet and outlet tee's fitted?
  - Appropriate DLR for soil = 6-10mm/day (weak SCL) or LC?
  - Trench length = Q/DLRxW = 450/6 x 0.6 = 125m
  - Access to LAA?

Questions to Ask

- Is primary treatment (septic tank) appropriate?
  - Lower effluent quality
  - Requires adequate soil depth and permeability (time) to achieve treatment standard
  - GW contamination / primary contact risk
- Is absorption trench land application appropriate?
  - Large area (LAA) requirement
  - Access / accidental damage risk

Impact of changes??

- What impact will the proposed (granny flat) construction have?
  - Number of bedrooms increases from 2 to 4
  - Load = 6EP x 150L/p/day = 900L/day (>100%)
  - HRT reduction to septic tank
  - Continuing trench overload/failure
  - Effluent surfacing risk

Solutions

- What is appropriate strategy to rectify/upgrade?
  - Primary or secondary treatment system?
  - Separate or combined treatment system for dwelling units?
  - Design hydraulic load?
  - Subsoil (absorption), Shallow (SSI, LPED) or Surface land application?
  - Any other mitigation or control measures to consider?

Recommendation

- Proposed OSSM servicing approach
  - Recommend 'secondary' treatment system for combined load (both dwellings) ~ 900L/day
  - Recommend pressure-compensating SSI
  - Soil Loading Rate based on soil horizon within 0.6m of POA
  - Appropriate DIR = 3.5mm/day (SCL)
  - Topsoil importation may be necessary
  - Required LAA = 260m^2

Conclusions

- Don't be afraid to learn from plumbers, installers, designers and regulators with on-site experience
- Look at as many different systems as you can
- Be systematic and recognise the links between various processes
- Always keep an open mind about the possible cause of a problem