

General Introduction

Chapter 1 Background

- The History Of Sewage Transport Systems And Odours.....5
- The Cost Of Ignoring Odour And Corrosion.....7
- Current Industry Knowledge.....8
- STS Definition8
- How STS Operators Should Use This Guide8

Chapter 2 Odour And Odour Chemistry

- What Are The Common Odorous Compounds In Sewage?9
- Odour Versus Hydrogen Sulfide.....10
- Safety And Sewer Gas.....10
- Gas Concentrations And Conversion Of Units11
- The Generation Of Hydrogen Sulfide In STS's.12
- How Much Hydrogen Sulfide Will Be Released From Sewage As A Gas?13
- Estimating Worst Case Gas Levels.....14
 - 1. General Method For Odorants In Sewage At 25°C.14
 - 2. Method For Hydrogen Sulfide At Different Temperatures.....15
- Estimation Of Sulfide Generation In Pipelines16
- Trade Wastes17
 - 1. Trade Waste Quality17
 - 2. Trade Waste Flow Management.....18
- Hydrogen Sulfide And Corrosion.....19

Chapter 3 Measuring Odorous Compounds Odour And Gas Flows

- Liquid Phase Measurements Including Safety Aspects20
 - Safety Aspects20
 - Sampling.....21
 - On Site Liquid Phase Oxidation Reduction Potential (ORP) Measurements21
 - On Site Liquid Phase Soluble Sulfide Measurements21
 - Laboratory Based, Liquid Phase Soluble Sulfide Measurements22
 - Continuous Liquid Phase Measurements22
- Gas Phase Measurements Including Safety Aspects24
 - Safety Aspects.....24
 - Laboratory Based Measurement Of Odour And Odour Related Compounds.....24
 - On Site Gas Phase Measurements24
- Gas Flow Rate Testing And Estimation Of Downwind Odour Levels26
- Smoke / Leak Testing27
- Site Sampling And Testing Kit Checklist For Operators28

Chapter 4 Sewage Transport System Components And Odour Issues

• STS Components.....	29
◦ Household Boundary Traps	29
◦ Gravity Reticulation Collection Mains	30
◦ Pump Stations And Wet Wells	30
◦ Rising Mains	31
◦ Manholes	31
◦ Hydraulic Drops	32
◦ Sewage Treatment Plant Inlet Works.....	32
◦ Vents	32
◦ Ventilation Fans	33
• Principles Of Ventilation	34
◦ Septicity And Venting	34
◦ Ventilation Air Flow Rates	34
• Gravity Mains And Reticulation Pipework Venting.	34
• Pump Station Venting.....	35
• Part Full Branch And Trunk Sewer Venting.	36
• Air Valves Versus Vent Stacks.....	36
• Pressure Sewers.....	37
• Vacuum Sewers	37

Chapter 5 Targets For Achieving Low Odour

• Targets For Sewage Quality Including Trade Wastes.	38
• Targets For Vents And Ambient Air	40
◦ EPA Odour Legislation And Standards	40

Chapter 6 Control Of Sulfide Levels In Sewage

• General Principles.....	41
• Treatments That Prevent Sulfide Formation	41
◦ Air And Oxygen.....	41
◦ Chlorine	43
◦ Nitrates	43
◦ Nitrites.....	45
◦ Anthraquinone	45
◦ Bacterial Mixtures	45
◦ Nutrient or Bacterial Stimulant Mixtures.....	45
◦ Alkalis	46
◦ Other Biocides	46
• Treatments To Prevent Sulfides Leaving The Liquid Phase.....	46
◦ Caustic Soda (Sodium Hydroxide) Solution	46
◦ Lime	47
◦ Magnesium Hydroxide (MHL)	47
• Treatments To Remove Existing Sulfides.....	47
◦ Air And Oxygen.....	47
◦ Hydrogen Peroxide	48
◦ Chlorine	48
◦ Nitrates	48
◦ Nitrites.....	48
◦ Ferric Chloride And Ferric Sulfate.....	49
◦ Ferrous Chloride, Ferrous Sulfate and Pickle Liquors (Ferrous Salts).....	49
◦ Others	50
• Removing Other Odorous Compounds From Sewage.....	50
• Chemical Dosing: Dosing Point and Control Type	50
• Comparison Of Liquid Dosing Options For Sulfide Control.....	52

Chapter 7 Treating Odorous Gases

- General Treatment System Principles.....55
- The Four Main Systems Commonly Used.....60
 - 1. Activated Carbon Adsorbers.....60
 - 2. Biofilters.....63
 - 3. Wet Chemical Scrubbers.....68
 - 4. Biotrickling Filters71
- Summary Of Typical Design And Operational Characteristics73
- Other Gas Treatment Systems.....77
- Cost Comparisons.....78
- Basic Operational Checks For Gas Treatment Systems79

Chapter 8 Solving Odour Problems - A Practical Procedure

- Self Management Of Odour Control.....81
- Define The Problem - Steps 1 to 6.....81
 - Step 1. Gather System Information.....81
 - Step 2. Determine If The Problem Is Real82
 - Step 3. Identify Possible STS Site(s) Responsible82
 - Step 4. Carry Out Quantitative On Site Tests83
 - Step 5. Predict Downwind Concentrations Of Odorant For Existing And Required Situations83
 - Step 6. Produce A Problem Definition Statement83
- Determine And Implement The Best Solution - Steps 7 to 9.....84
 - Step 7. Decide If There Are Any Appropriate Non-Treatment Related Solutions.....84
 - Step 8. Consider Sewage And/Or Gas Treatment Options, And Choose Best System(s)...85
 - Step 9. Install And Confirm Performance.....86

Chapter 9 Closing Words

Appendices

- Appendix 1. Case Study – Steps In Solving An Odour Problem In An STS88
- Appendix 2. Table Of Molecular Weights.....92
- Appendix 3. Sewage Odours Information Sheet.....93
- Appendix 4. Odour Complaints Record Sheet.....94

- References 95