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# **SEWAGE SLUDGE DISPOSAL: THE COMPOSTING OPTION**

*Thesis presented in fulfillment of  
the requirements for the  
Degree of Master of Technology  
in Biotechnology  
at Massey University*

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## ABSTRACT

The objective of the present studies was to explore the possibility of employing composting as a mean of sewage sludge stabilization. A series of composting experiments were performed using dewatered secondary activated sewage sludge from a domestic wastewater treatment plant in New Plymouth, New Zealand. These trials have been carried out treating the sludge in both open and closed composting systems on a laboratory scale. Two open system methods, one aerated windrow and one static pile, and three closed experiments using a compostumbler were performed. Throughout the whole study woodchips (in varying ratios) were used as a bulking agent.

An initial moisture content of nearly 60% in the sludge - woodchips mixture produced the highest degree of composting activity over a three week period.

Biological drying during the process was indicated by an increase in total solids up to values between 17% and 27%.

Partial stabilization of the organic fraction was indicated by a decrease in volatile solids of 28% - 50%. In two closed system trials a total carbon decrease of 26% - 42% was observed, serving as an additional indication that there had been a reduction in organic matter.

Total nitrogen losses were substantial in all experiments. Reductions were in the range of 14% - 58% with the highest

losses observed in the static pile experiment.

Phosphorus was found to be stable with only minor concentration changes observed.

Temperature development in the composting material followed the well known pattern, provided that the factors influencing the composting process were close to optimal. Temperatures approaching 70°C in the initial stage of the process were measured.

Bacteriological studies indicated, that the final composted product was not free from microbial hazard. In one closed system trial, however, no entero-streptococci were observed, indicating a complete inactivation of these indicator microorganisms.

Ongoing development of the composting systems used, including improvements of methodologies employed is necessary in conducting further investigations.

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## TABLE OF CONTENTS

|                                                               | PAGE  |
|---------------------------------------------------------------|-------|
| ABSTRACT                                                      | i     |
| ACKNOWLEDGEMENTS                                              | iii   |
| TABLE OF CONTENTS                                             | v     |
| LIST OF TABLES                                                | xiii  |
| LIST OF FIGURES AND PLATES                                    | xiv   |
| ABBREVIATIONS AND SYMBOLS USED IN THE TEXT                    | xvii  |
| <br>CHAPTER 1: INTRODUCTION                                   | <br>1 |
| <br>CHAPTER 2: SLUDGE TREATMENT AND DISPOSAL<br>- AN OVERVIEW | <br>3 |
| 2.1 GENERAL ASPECTS OF SLUDGES                                | 5     |
| 2.2 MUNICIPAL WASTEWATER SLUDGES                              | 9     |
| 2.2.1 SOURCES AND PRODUCTION                                  | 9     |
| 2.2.1.1 Primary Sludge                                        | 10    |
| 2.2.1.2 Secondary Sludge                                      | 11    |
| 2.2.1.3 Digested Sludge                                       | 13    |
| 2.3 SLUDGE TREATMENT                                          | 14    |
| 2.3.1 INTRODUCTION                                            | 14    |
| 2.3.2 SLUDGE CONDITIONING                                     | 18    |
| 2.3.2.1 General Considerations                                | 18    |
| 2.3.2.2 Chemical Conditioning                                 | 18    |
| 2.3.2.3 Physical Conditioning                                 | 19    |
| 2.3.2.4 Thermal Pretreatment<br>of Sludges                    | 20    |
| 2.3.3 MOISTURE REDUCTION AND<br>CONCENTRATION OF SOLIDS       | 20    |
| 2.3.3.1 Sludge Thickening                                     | 20    |

TABLE OF CONTENTS: continued

| CHAPTER 2: | CONTINUED                                       | PAGE |
|------------|-------------------------------------------------|------|
|            | Gravity Thickening                              | 21   |
|            | Flotation Thickening                            | 22   |
| 2.3.3.2    | Dewatering of Sludge                            | 22   |
| 2.3.4      | SEWAGE SLUDGE STABILIZATION<br>AND DISINFECTION | 23   |
| 2.3.4.1    | Chemical Sludge<br>Stabilization                | 24   |
|            | Chlorine Oxidation                              | 24   |
|            | Lime Stabilization                              | 24   |
| 2.3.4.2    | Physical Sludge<br>Stabilization                | 25   |
|            | Pasteurization                                  | 25   |
|            | Thermal Reduction                               | 25   |
|            | Heat Drying                                     | 26   |
|            | Air Drying                                      | 27   |
|            | Irradiation                                     | 27   |
| 2.3.4.3    | Biological Sludge<br>Stabilization              | 28   |
|            | Anaerobic Digestion                             | 28   |
|            | Aerobic Digestion                               | 30   |
|            | Composting                                      | 31   |
| 2.4        | COMPOSTING OF SEWAGE SLUDGE:<br>PREVIOUS WORK   | 33   |
| 2.4.1      | INTRODUCTION                                    | 33   |
| 2.4.2      | PRINCIPAL FACTORS                               | 37   |
| 2.4.2.1    | Process Fundamentals                            | 37   |
| 2.4.2.2    | Biochemical Aspects                             | 39   |
| 2.4.2.3    | Microbiology                                    | 40   |



**TABLE OF CONTENTS:** continued

| CHAPTER 2: CONTINUED                        | PAGE |
|---------------------------------------------|------|
| 2.4.2.4 Heat Generation and Temperature     | 44   |
| Basic Reaction Pattern                      | 44   |
| Heat Generation - Temperature Interactions  | 45   |
| 2.4.2.5 Aeration, Heat and Moisture Removal | 46   |
| 2.4.2.6 Pathogenic Organisms                | 49   |
| 2.4.3 COMPOSTING TECHNOLOGIES               | 53   |
| 2.4.3.1 General Aspects                     | 53   |
| 2.4.3.2 Conventional Windrow Process        | 55   |
| 2.4.3.2 Aerated Windrow Process             | 56   |
| 2.4.3.3 Aerated Static Pile Process         | 57   |
| Process Description                         | 57   |
| Process Control                             | 58   |
| 2.4.3.4 In-Vessel Systems                   | 60   |
| Vertical Flow Reactor                       | 60   |
| Horizontal and Inclined Flow Reactor        | 61   |
| 2.4.4 CONCLUDING REMARKS                    | 62   |
| CHAPTER 3: MATERIALS AND METHODS            | 64   |
| 3.1 EQUIPMENT AND MATERIALS                 | 64   |
| 3.1.1 SLUDGE: SOURCE AND CHARACTERISTICS    | 64   |
| 3.2.1 BULKING AGENT                         | 65   |

TABLE OF CONTENTS: continued

| CHAPTER 3: CONTINUED              | PAGE |
|-----------------------------------|------|
| 3.1.3 SITE CONDITIONS             | 65   |
| 3.1.4 AERATION EQUIPMENT          | 65   |
| 3.1.4.1 Piping Materials          | 65   |
| 3.1.4.2 Fan and Compressor        | 66   |
| 3.1.5 COMPOSTUMBLER               | 68   |
| 3.1.6 TEMPERATURE RECORDING       | 68   |
| 3.1.7 SAMPLING                    | 69   |
| 3.2 EXPERIMENTAL PROCEDURE        | 71   |
| 3.2.1 MIXING OF THE COMPONENTS    | 71   |
| 3.2.2 AERATED WINDROW TRIAL       | 71   |
| 3.2.2.1 Windrow Construction      | 71   |
| 3.2.2.2 Aeration Pattern          | 72   |
| 3.2.2.3 Sampling Procedure        | 73   |
| 3.2.3 AERATED STATIC PILE TRIAL   | 74   |
| 3.2.3.1 Pile Construction         | 74   |
| 3.2.3.2 Aeration Pattern          | 75   |
| 3.2.3.3 Sampling Procedure        | 76   |
| 3.2.4 DRUM TUMBLER TRIALS         | 79   |
| 3.2.4.1 First Trial               | 79   |
| 3.2.4.2 Second Trial              | 80   |
| 3.2.4.3 Third Trial               | 81   |
| 3.3 ANALYTICAL METHODS            | 82   |
| 3.3.1 CHEMICAL ANALYSIS           | 82   |
| 3.3.1.1 pH - Measurement          | 82   |
| 3.3.1.2 Total and Volatile Solids | 82   |

**TABLE OF CONTENTS:** continued

| CHAPTER 3: | CONTINUED                                       | PAGE |
|------------|-------------------------------------------------|------|
|            | Sludge                                          | 82   |
|            | Woodchips                                       | 82   |
| 3.3.1.3    | Total Nitrogen and Phosphorus                   | 83   |
|            | Sample Preparation                              | 83   |
|            | Digestion Mixture                               | 83   |
|            | Digestion                                       | 83   |
|            | Determination                                   | 84   |
| 3.3.1.4    | Total Carbon                                    | 85   |
|            | Sample Preparation                              | 85   |
|            | Determination                                   | 85   |
| 3.3.2      | MICROBIOLOGICAL ANALYSIS                        | 86   |
| 3.3.2.1    | Media                                           | 86   |
| 3.3.2.2    | Media Preparation                               | 87   |
| 3.3.2.3    | Sterilization of Media, Glassware and Equipment | 87   |
| 3.3.2.4    | Sample Preparation                              | 87   |
| 3.3.2.5    | Analysis for Indicator Microorganisms           | 88   |
| 3.4        | STATISTICAL ANALYSIS                            | 90   |
| CHAPTER 4: | RESULTS                                         | 92   |
| 4.1        | PRELIMINARY REMARKS                             | 92   |
| 4.2        | OPEN SYSTEMS                                    | 93   |
| 4.2.1      | INTRODUCTION                                    | 93   |
| 4.2.2      | AERATED WINDROW COMPOSTING                      | 94   |
| 4.2.2.1    | Analysis of Variables                           | 95   |

TABLE OF CONTENTS: continued

| CHAPTER 4: | CONTINUED                           | PAGE |
|------------|-------------------------------------|------|
|            | Temperature<br>Development          | 95   |
|            | Total Solids and<br>Volatile Solids | 99   |
|            | Total Nitrogen and<br>Phosphorus    | 102  |
| 4.2.3      | AERATED STATIC PILE COMPOSTING      | 104  |
| 4.2.3.1    | Analysis of Variables               | 105  |
|            | Temperature<br>Development          | 105  |
|            | Total Solids and<br>Volatile Solids | 108  |
|            | Total Nitrogen and<br>Phosphorus    | 108  |
| 4.3        | DRUM TUMBLER COMPOSTING             | 117  |
| 4.3.1      | INTRODUCTION                        | 117  |
| 4.3.2      | FIRST TRIAL                         | 118  |
| 4.3.2.1    | Analysis of Variables               | 119  |
|            | Temperature<br>Development          | 119  |
|            | Total Solids and<br>Volatile Solids | 120  |
|            | Total Nitrogen and<br>Phosphorus    | 120  |
|            | Microbiological<br>Counts           | 123  |
| 4.3.3      | SECOND TRIAL                        | 125  |
| 4.3.3.1    | Analysis of Variables               | 125  |
|            | Temperature<br>Development          | 127  |

TABLE OF CONTENTS: continued

| CHAPTER 4: | CONTINUED                           | PAGE |
|------------|-------------------------------------|------|
|            | Total Solids and<br>Volatile Solids | 128  |
|            | Total Nitrogen and<br>Phosphorus    | 128  |
|            | Total Carbon                        | 128  |
|            | Microbiological<br>Counts           | 130  |
| 4.3.4      | THIRD TRIAL                         | 132  |
| 4.3.4.1    | Analysis of Variables               | 132  |
|            | Temperature<br>Development          | 132  |
|            | Total Solids and<br>Volatile Solids | 134  |
|            | Total Nitrogen and<br>Phosphorus    | 134  |
|            | Total Carbon                        | 135  |
|            | Microbiological<br>Counts           | 135  |
| CHAPTER 5: | DISCUSSION                          | 140  |
| 5.1        | INTRODUCTORY REMARKS                | 140  |
| 5.2        | OPEN SYSTEMS                        | 141  |
| 5.2.1      | AERATED WINDROW COMPOSTING          | 141  |
| 5.2.1.1    | General Observations                | 141  |
| 5.2.1.2    | Process Performance                 | 142  |
|            | Moisture Content                    | 142  |
|            | Temperature                         | 143  |
|            | Decomposition<br>Activity           | 145  |
|            | Nutrients                           | 146  |

TABLE OF CONTENTS: continued

|            |                                 |      |
|------------|---------------------------------|------|
| CHAPTER 5: | CONTINUED                       | PAGE |
| 5.2.2      | AERATED STATIC PILE COMPOSTING  | 147  |
| 5.2.2.1    | General Observations            | 147  |
| 5.2.2.2    | Process Performance             | 149  |
|            | Moisture Content                | 149  |
|            | Temperature                     | 149  |
|            | Decomposition Activity          | 150  |
|            | Nutrients                       | 151  |
| 5.3        | DRUM TUMBLER COMPOSTING         | 153  |
| 5.3.1      | PROCESS PERFORMANCE             | 153  |
| 5.3.1.1    | Moisture Content                | 153  |
| 5.3.1.2    | Temperature                     | 155  |
| 5.3.1.3    | Decomposition Activity          | 155  |
| 5.3.1.4    | Nutrients                       | 157  |
| 5.3.1.5    | pH - Value                      | 158  |
| 5.3.1.6    | Bacteriology                    | 159  |
| 5.4        | PRACTICAL PROBLEMS              | 162  |
| CHAPTER 6: | CONCLUSIONS                     | 164  |
| CHAPTER 7: | RECOMMENDATIONS FOR FUTURE WORK | 166  |
| REFERENCES |                                 | 167  |
| APPENDIX:  | EXPERIMENTAL DATA               | 181  |

## LIST OF TABLES

| Table |                                                                                                                                         | PAGE |
|-------|-----------------------------------------------------------------------------------------------------------------------------------------|------|
| 4.1a  | Mean values of selected variables for the aerated windrow A.                                                                            | 96   |
| 4.1b  | Mean values of selected variables for the aerated windrow B.                                                                            | 97   |
| 4.2   | Calculated F-values for selected variables for the aerated windrow composting trial.                                                    | 103  |
| 4.3   | Calculated F-values for selected variables for the aerated static pile trial.                                                           | 110  |
| 4.4   | Mean values of selected variables for the first drum tumbler trial.                                                                     | 122  |
| 4.5   | Microbial counts in raw dewatered activated sewage sludge including one compost sample, determined during the first drum tumbler trial. | 124  |
| 4.6   | Mean values of selected variables for the second drum tumbler trial.                                                                    | 126  |
| 4.7   | Microbial counts in raw dewatered activated sewage sludge and compost samples, determined during the second drum tumbler trial.         | 131  |
| 4.8   | Mean values of selected variables for the third drum tumbler trial.                                                                     | 133  |
| 4.9   | Microbial counts in raw dewatered activated sewage sludge and compost samples, determined during the third drum tumbler trial.          | 137  |
| 4.10  | F-values calculated for selected variables for all drum tumbler trials.                                                                 | 139  |
| A.1   | Replicate contents of total solids and volatile solids originating from both windrows in the aerated windrow trial.                     | 182  |
| A.2   | Replicate contents of total nitrogen and phosphorus throughout the aerated windrow trial.                                               | 183  |
| A.3   | Duplicate contents of selected variables collected at different positions throughout the aerated static pile trial.                     | 184  |

| <u>LIST OF TABLES:</u> | continued                                                                          | PAGE |
|------------------------|------------------------------------------------------------------------------------|------|
| A.4                    | Replicate contents of selected variables throughout the first drum tumbler trial.  | 185  |
| A.5                    | Replicate contents of selected variables throughout the second drum tumbler trial. | 186  |
| A.6                    | Replicate contents of selected variables throughout the third drum tumbler trial.  | 187  |

### LIST OF FIGURES AND PLATES

| FIGURE |                                                                                                                                       | PAGE |
|--------|---------------------------------------------------------------------------------------------------------------------------------------|------|
| 2.1    | Diagram of wastewater treatment processes.                                                                                            | 4    |
| 2.2    | Unit processes and operations employed in treatment, utilization and disposal of sewage sludge.                                       | 8    |
| 2.3    | Schematic representation of different activated sludge systems.                                                                       | 12   |
| 2.4    | Schematic relationship of different alternative sludge treatment forms.                                                               | 15   |
| 2.5    | Schematic overview of the composting process.                                                                                         | 34   |
| 2.6    | Schematic diagram of temperature versus time course during the composting process.                                                    | 39   |
| 2.7    | Generalized scheme for the composting process showing inputs of feed substrate, compost product recycle, amendment and bulking agent. | 54   |
| 2.8    | Biological activity of composting systems and their limitations induced by different ventilation systems.                             | 59   |
| 3.1    | Schematic representation of the aeration piping layout in the aerated windrow trial.                                                  | 67   |
| 3.2    | Timer configuration for the 'on - off'-regime of the aeration and the temperature measurement.                                        | 68   |



| <u>LIST OF FIGURES AND PLATES:</u> | continued                                                                                                                                                       | PAGE |
|------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| 3.3                                | Compostumbler, used as mixing device and as equipment for the drum tumbler trials.                                                                              | 69   |
| 3.4                                | An example of a remote handling tong, a sampling device similar to the one actually used in the experiments.                                                    | 70   |
| 3.5                                | Positions of temperature measurement in the two windrows of the aerated windrow trial.                                                                          | 74   |
| 3.6                                | Aerated static pile trial.                                                                                                                                      | 76   |
| 4.1                                | Mean temperature changes during composting in the aerated windrow A and B at various positions.                                                                 | 98   |
| 4.2                                | Changes in total solids, volatile solids, total nitrogen and phosphorus during composting in windrow A.                                                         | 100  |
| 4.3                                | Changes in total solids, volatile solids, total nitrogen and phosphorus during composting in windrow B.                                                         | 101  |
| 4.4                                | Temperature changes during composting monitored by thermocouples 1-6 in the aerated static pile study in two dimensional and three dimensional representation.  | 106  |
| 4.5                                | Temperature changes during composting monitored by thermocouples 7-12 in the aerated static pile study in two dimensional and three dimensional representation. | 107  |
| 4.6                                | Changes in total solids, volatile solids, phosphorus and total nitrogen at position <u>1</u> during aerated static pile composting.                             | 111  |
| 4.7                                | Changes in total solids, volatile solids, phosphorus and total nitrogen at position <u>2</u> during aerated static pile composting.                             | 112  |
| 4.8                                | Changes in total solids, volatile solids, phosphorus and total nitrogen at position <u>3</u> during aerated static pile composting.                             | 113  |
| 4.9                                | Changes in total solids, volatile solids, phosphorus and total nitrogen at position <u>4</u> during aerated static pile composting.                             | 114  |

| <u>LIST OF FIGURES AND PLATES:</u> | continued                                                                                                                                                                                      | PAGE |
|------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| 4.10                               | Changes in total solids, volatile solids, phosphorus and total nitrogen at position <u>5</u> during aerated static pile composting.                                                            | 115  |
| 4.11                               | Changes in total solids, volatile solids, phosphorus and total nitrogen at position <u>6</u> during aerated static pile composting.                                                            | 116  |
| 4.12                               | Mean temperature changes during composting in the first drum tumbler trial.                                                                                                                    | 119  |
| 4.13                               | Changes in total solids, volatile solids, total nitrogen and phosphorus during composting in the first drum tumbler trial.                                                                     | 121  |
| 4.14                               | Mean temperature changes during composting in the second drum tumbler trial.                                                                                                                   | 127  |
| 4.15                               | Changes in total solids, volatile solids, total nitrogen and phosphorus during composting in the second drum tumbler trial.                                                                    | 129  |
| 4.16                               | Mean temperature changes during composting in the third drum tumbler trial.                                                                                                                    | 134  |
| 4.17                               | Changes in total solids, volatile solids, total nitrogen and phosphorus during composting in the third drum tumbler trial.                                                                     | 136  |
| Plate                              |                                                                                                                                                                                                |      |
| 3.1                                | Aeration during the aerated static pile trial was achieved using a manifold attached to four parallel distribution pipes (orifices were drilled every 0.1 m) which ran the length of the pile. | 77   |
| 3.2                                | Manifold for air distribution into four parallel perforated pipes.                                                                                                                             | 77   |
| 3.3                                | Compostumbler for tumbling and composting woodchips and secondary sludge.                                                                                                                      | 78   |
| 3.4                                | Experimental aerated static compost pile comprised of woodchips and secondary sewage sludge.                                                                                                   | 78   |

ABBREVIATIONS AND SYMBOLS USED IN THE TEXT

|                    |                                     |
|--------------------|-------------------------------------|
| B <sub>95%</sub> : | 95% confidence interval on the mean |
| BEA:               | Bile Esculin Azide                  |
| C:                 | Carbon                              |
| °C:                | Degree Celsius                      |
| CFU:               | Colony Forming Units                |
| C/N:               | Carbon to nitrogen ratio            |
| F:                 | F-ratio of mean sums of squares     |
| g:                 | Gram                                |
| h:                 | Hour                                |
| kg:                | Kilogram                            |
| l:                 | Liter                               |
| m:                 | Meter                               |
| ml:                | Milliliter                          |
| MPN:               | Most Probable Number                |
| N:                 | Nitrogen                            |
| P:                 | Phosphorus                          |
| PCA:               | Plate Count Agar                    |
| s:                 | Standard deviation                  |
| TS:                | Total solids                        |
| VS:                | Volatile solids                     |
| v/v:               | Volume/Volume                       |
| w/w:               | Weight/Weight                       |