

STUDY OF THE SYSTEM OF MANAGEMENT OF WASTES IN A RAILWAY COMPLEX

THESIS SUBMITTED BY

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DEDICATION

The inspiration for undertaking this study has come from the life and writings of Mahatma Gandhi, to whom I reverentially dedicate this humble effort.

"..... and he that will not apply new remedies must expect new evils; for time is the greatest innovator; and if time of course alter things to the worse, and wisdom and counsel shall not alter them to the better, what shall be the end?....."

Francis Bacon
In Of INNOVATIONS, The Essays

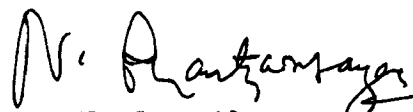
CERTIFICATE

This to certify that the thesis entitled
STUDY OF THE SYSTEM OF MANAGEMENT OF WASTES IN A
RAILWAY COMPLEX, presented by Mr Y.P. Anand, is
worthy of consideration for the award of the degree
of DOCTOR OF PHILOSOPHY and is a record of the ori-
ginal bona fide research work carried out by him
under our guidance and supervision and that the
results contained in it have not been submitted in
part or in full to any other university or insti-
tute for award of any degree.



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ABSTRACT

Major railway complexes in India are self-contained areas used intensively and extensively by both the users and the employees. The main categories of waste generated in these areas are human waste, municipal solid waste (MSW) and drainage water, and the minor wastes are animal and plant wastes. The situation is typical of most of the Indian towns which do not have a modern sewerage system and sewage treatment plant, and present a picture of increasing insanitation, the most acute problem being how to manage the human waste.

Indian Railways control municipal functions within their areas themselves. They are also expected to have a much better standard of sanitation than the towns which they serve. While they too are subject to the constraints applicable to the municipalities, still they can commit relatively much larger resources, including management and professional skills. Railways have the advantages of having even otherwise large-sized civil engineering and medical organisations under them, well defined area limits and a direct control over their users as well as employees. Therefore, railway complexes could become models of satisfactory waste management in the Indian conditions.

The aim of this study was to give a critical and detailed appraisal of the existing system of waste management in major railway complexes, to identify deficiencies and problem areas and, with guidance from the available literature and other information, and having regard to the local

conditions and constraints, to formulate the requirements of satisfactory waste management, and appropriate alternatives and remedial measures for achieving it.

Since the types of wastes and their characteristics are similar in most of the major railway complexes, Moradabad railway complex was selected for a representative case study for this thesis. The complex was surveyed and detailed field data was collected on generation of various categories of waste and current waste management practices. For the study, the complex was divided into 9 zones and the collected data was compiled into a number of tables and plans. For better appreciation, railway's own extant standards and instructions were also compiled into various annexures.

During the data collection stage itself, it became obvious that the sanitation methods appropriate for such situations - the most important factor here being absence of a sewerage system - whether for human waste, MSW or drainage waste-water should be much more decentralised and much less costly than the 'standard' methods practised in the developed countries and in some of the metropolitan areas of the developing countries. Literature was collected dealing both with the standard methods and the methods more appropriate to the developing countries with their largely unsewered urban areas and with their well-known constraints, more tropical climates and poorer populations. The literature study was organised proceeding from the general to the specific for each category of waste. Special efforts were made to obtain

literature on the onsite treatment and disposal of human waste, which is the core of the waste management problem in such situations.

The survey data has been appraised critically, both zonewise and waste categorywise. For each category, a critique of the existing waste management system has been presented. In the case of human waste, it also became necessary to study in depth the septic tank system, which is used in developed countries for the rural or suburban areas, where a sewerage system is not justified but enough open land exists for subsurface absorption of the septic tank effluent. Unfortunately, this system has become popular in a truncated form, that is without any subsurface effluent absorption, in the unsewered urban areas in India. The thesis also covers briefly and makes use of the 'state of the art' information on waste characteristics, the unit processes of the conventional sewage treatment, onsite anaerobic digestion, methods of composting of municipal solid waste—with and without human waste, and management of open drains.

Finally, from the data appraisal, and the literature study, requirements of a satisfactory system of management of each waste, and appropriate alternatives and remedial measures for each deficiency in the existing system, have been worked out. The resource constraints and the need to avoid any serious dislocation while improving the present system, have been kept in view. For human waste, since an eight-year programme has been evolved for implementing

the final solutions and, in view of none of the existing waste disposal systems being acceptable, interim strategies which can be adopted within two years, have also been worked out.

Rough cost estimates and implementation programmes have been worked out for each category of waste. The issues concerning organisation, administration and equipment, have also been dealt with and measures have been suggested for making the system more productive, economical and professional, keeping in view the conditions particular to such areas in India, where wholesale mechanisation is neither feasible nor justified.

The study is comprehensive and complete and is ready for implementation.

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