



The Livestock Waste Control Scheme : Guidelines for Wet Muck-out and Hybrid Systems

INTRODUCTION

Following the implementation of the Livestock Waste Control Scheme in 1988 and the revised Livestock Waste Control Scheme in 1994, livestock farmers in Livestock Waste Control and Restriction Areas must comply with control requirements in the management and disposal of livestock waste. A wet muck out system or a hybrid system is a possible option for treating wastewater generated from livestock keeping operations. The effectiveness of the wet muck out system or the hybrid system is a very important element in the on-farm management of livestock waste.

These guidelines are prepared with a view to providing livestock farmers and waste treatment system designers with general information on the provision of wet muck out or hybrid systems for the treatment of livestock waste. In general, a hybrid system is the same as wet muck out system, in terms of treatment processes, but a dry muck out operation (see “Guidelines for Dry Muck-Out of Livestock Waste”) is carried out prior to washing or hosing down waste residues to dung channels. A hybrid system is different from a normal dry muck-out operation in that the wastewater generated cannot be disposed of by a septic tank and soakaway system and has to be treated by a wastewater treatment plant. Adopting a hybrid system will lead to a reduction in the scale of the treatment plant that needs to be installed, because there will be less water used, less waste to be treated, and less sludge to be dried. However, the scale of the plant will depend critically upon the degree of dry muck out achieved, and the amount of water used. All wastewater treatment systems for treating livestock waste should be designed to eventually achieve the minimum standard of not exceeding 50mg/L of Biochemical Oxygen Demand and 50mg/L of Suspended Solids. Farmers should seek competent professional advice on the design and operation of these systems.

It should be noted that it is an offence under the Waste Disposal Ordinance (WDO) to discharge substandard effluent at any time. An offence under the WDO may constitute a violation of other legislation (including the Water Pollution Control Ordinance, the Public Health and Municipal Services Ordinance and the Waterworks Ordinance).

The adoption of wet muck out and installation of a wastewater treatment system in a farm is not always suitable. This depends on the following factors:

- (a) Size of farm operation (and the amount of wastewater generated).
- (b) Availability of an ample and reliable electricity supply.
- (c) Availability of land area.
- (d) Availability of competent personnel to operate and maintain the system.
- (e) Loading capacity of the soil to support the heavy water tanks and various waste treatment units.

Before adopting wet muck out or a wastewater treatment system, a responsible farm operator must carefully evaluate the above factors, in particular the loading capacity of the soil. If in any doubt, expert advice from competent bodies and/or consultants should be sought.

THE WET MUCK OUT/HYBRID SYSTEM

A wet muck out or hybrid system normally includes the following: a reception tank, screens, an aeration tank, a sludge drying unit and associated pumps and dung channels. Figure 1 below is a schematic diagram showing the general arrangement of the components of a system to treat livestock farming wastewater, especially that generated from wet muck out practices.

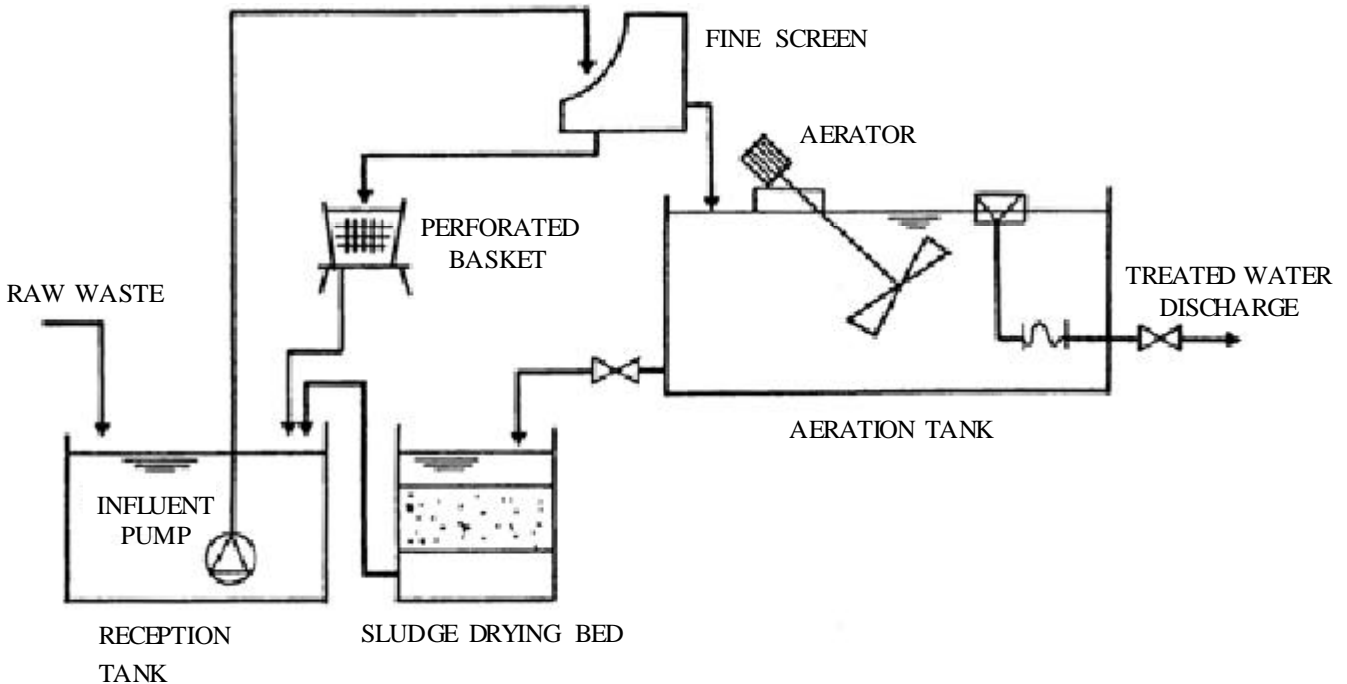


Figure 1 The General Arrangement of the Components of a Wet Muck Out/Hybrid System

The major components of a wet muck out/hybrid system are described below.

i) *Dung Channel*

The purpose of the dung channel is to collect and convey wastewater to the inlet of the reception tank.

A well designed dung channel should be:

- (a) of sufficient width to facilitate periodic maintenance,
- (b) of sufficient gradient to enable self cleansing,
- (c) constructed to prevent rainwater ingress and overflow, and
- (d) fitted with screening gear to enable the removal of gross solids.

Settled/screened solids and fallen leaves in the dung channels should be removed each time after washing livestock structures, and be properly disposed of by arranging for it to be collected for reuse, treatment or disposal in accordance with the Code of Practice for Livestock Waste Management.

ii) *Reception Tank*

The purpose of a reception tank is to collect wastewater from the dung channels and store it prior to treatment.

A well-designed reception tank should be sufficiently large to prevent overflow and to enable the trapped solids and grits to be easily removed. It should be covered to prevent ingress of rainwater. It should be large enough to store the maximum daily volume of wastewater likely to be generated in the farm. In general, there should be at least 0.06m³ of reception tank volume per porker if a full wet muck out system is used. If a hybrid system is used the tank volume required will be less but the exact size will depend upon the effectiveness of the dry muck out operation.

A reception tank must also be equipped with a pump to convey the wastewater to the aeration tank for treatment.

iii) Screen

The purpose of the screen is to remove suspended solids and coarse matter in the wastewater before it enters the aeration tank.

The screen openings should be sufficiently small to retain the solids but large enough to allow the wastewater to pass through. The screen(s) must be arranged in such a way that the screenings can be easily removed on a regular basis.

The collected screenings must be properly contained and disposed of.

iv) Aeration Tank

The main purpose of an aeration tank is to facilitate the biological treatment of wastewater by pumping or inducing air into it.

An aeration tank should be leak-proof, and sufficiently large to enable aeration to take place without overflowing. In general, there should be at least 0.285m³ of aeration tank volume per porker if a full wet muck out system is used. Less tank volume will be required for a hybrid system, depending on the effectiveness of the dry muck out operation.

There are many types of aeration systems using different types of aerators, with different design and operating requirements for the aeration tank. Aeration system suppliers should be able to recommend the most appropriate system for each individual farm and provide technical advice on the operation and maintenance aspects. A typical aeration tank comprises an aerator, a wastewater inlet, a treated water outlet and a sludge outlet. In general, wastewater should be continuously aerated so as to maintain a dissolved oxygen level of 1-2mg/L for 18 to 20 hours. This should be followed by at least an hour of settling in order to achieve the required quality for discharge. The settled sludge should be drained off to a drying unit after each aeration cycle. It must be stressed that excessive aeration could also result in very poor treated water quality. Farmers are therefore strongly advised to adhere strictly to the suppliers' operating recommendations and seek their assistance whenever necessary.

v) Sludge Drying Unit

The purpose of a sludge drying unit is to remove the water from the aeration tank's settled sludge so that it may be more easily handled and disposed of.

Sludge from the aeration tank is approximately 98% water. There are many types of sludge drying techniques such as heated evaporation, natural drainage and evaporation, and mechanical dewatering. Suppliers should be able to recommend the most appropriate system for each individual farm and provide technical advice on the operation and maintenance aspects.

One of the simplest and more economical means of achieving sludge drying is natural drainage and evaporation. This requires a drying bed of sand with an underdrainage system. In general, there should be at least 0.15m² of drying bed area per porker if a full wet muck out system is used. Less drying bed area will be required for a hybrid system, the exact size depending on the effectiveness of the dry muck out operation. The drained water should be returned to the reception tank and the dried sludge properly contained and disposed of in accordance with the Code of Practice for Livestock Waste Management.

GENERAL PRECAUTIONS

For effective performance of a Wet Muck Out or a Hybrid system, the following general principles should be adhered to:

- (a) Check and clean up the dung channels, screens and reception tank regularly.
- (b) Prevent overflowing throughout the system. This may be achieved through proper design (eg. units should be of sufficient capacity and capability), construction and maintenance (eg. regular desludging). Allowing overflow to occur will result in prosecution.
- (c) Always adhere to the supplier's recommended operating and maintenance procedures.

OTHER INFORMATION

There are altogether three sets of similar guidelines in Chinese and English available free of charge from the Environmental Protection Department:

- (a) Guidelines for Dry Muck Out of Livestock Waste;
- (b) Guidelines for Wet Muck Out and Hybrid Systems; and
- (c) Guidelines for Soakaway System.