

PARIVESH

Solid Waste Management in Slaughter House



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EDITORIAL

The importance of waste management in industries hardly needs any emphasis. Effective waste management not only reduces environmental problems but also increases productivity of industrial activity. Slaughter house generates substantial quantity of solid wastes. Waste management in regard to this category of units has special significance because their wastes tend to form an ideal breeding ground for pathogenic micro-organisms. Such wastes attract flies, dogs, birds and other vermin, thus causing public nuisance and also accompanied by the danger of spreading disease if disposed of without proper care. Burning or burying of wastes leads to the total loss of potential by products. Waste processing and disposal has to be economical and environmentally acceptable. It needs to be noted that almost all the wastes generated by a slaughter house can be processed to obtain various products which have commercial value.

The issue of Parivesh outlines different methods for processing, utilisation and disposal of slaughter house wastes. I am thankful to my colleagues Shri D.S. Kharat, Environmental Engineer, Shri Lokesh Kumar, Sr. Scientific Assistant, Shri P. Kumar, Sr. Environmental Engineer and Shri P.M. Ansari, Additional Director for their contribution in this publication

It is hoped that this publication would be useful to municipal agencies, agencies responsible for day-to-day operation of slaughter houses, regulatory agencies and others involved in this field.

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1. INTRODUCTION

There are 2702 registered slaughter houses in the country, which are mostly service oriented performing only slaughtering and dressing. Slaughter houses besides catering to the needs of consumers, serve as source of raw materials for a wide range of industries such as tanneries, bone mills, gelatine, glues, live stock animal feed processing units and pharmaceuticals. A large number of the slaughter houses are very old and operate with inadequate basic amenities such as lairage, proper flooring and water supply.

Live stock available for slaughtering comprises of animals namely, buffaloes, cattle, sheep, goats, pigs and poultry. As per the recent data published by the Ministry of Agriculture, live stock population is 84.2 million buffaloes, 204.5 million cattle, 50.8 million sheep, 115.3 million goats, 12.8 million pigs and 307.1 million poultry. In the year 1992-93, meat production was 1.5 million tonnes which increased to 2 million tonnes in 1997-98. State-wise meat production is given in Table 1. West Bengal, Bihar, Delhi and Maharashtra are the states which contribute over 60 per cent of meat production in the country.

Table 1: State-wise production of meat

State	1992-93	1997-98
1 Andhra Pradesh	96	106
2 Arunachal Pradesh	14	17
3 Assam	22	16
4 Bihar	260	400
5 Goa		
6 Gujarat		18
7 Haryana	7	8
8 Himachal Pradesh	4	4
9 Jammu & Kashmir	10	23
10 Karnataka	58	73
11 Kerala	99	111

State	1992-93	1997-98
12 Madhya Pradesh	17	22
13 Maharashtra	147	199
14 Manipur	10	18
15 Meghalaya	22	29
16 Mizoram	2	7
17 Nagaland	13	18
18 Orissa	29	37
19 Punjab	5	4
20 Rajasthan	58	75
21 Sikkim		
22 Tamil Nadu	60	71
23 Tripura	3	4
24 Uttar Pradesh	106	137
25 West Bengal	410	427
26 A&N Islands	0	1
27 Chandigarh	1	1
28 D. & N. Haveli		0
29 Daman Diu		0
30 Delhi	166	200
31 Lakshadweep		0
32 Pondicherry	3	3
Total	1591	1988

Quantity expressed as thousand tonnes

Source: Department of Animal Husbandry and Dairying, Ministry of Agriculture, Govt. of India

2. CLASSIFICATION OF SLAUGHTER HOUSES

Based on scale of operation, slaughter house have been classified into three categories namely, large, medium and small as given in Table 2.

Table 2: Classification of slaughter houses

Category	Slaughtering capacity (tonnes of live weight killed per day)
Large	Above 70
Medium	15 - 70
Small	Below 15

3. PROCESS AND OPERATIONS

Slaughtering: Large animals are slaughtered as per the Islamic rites by halal method. In majority of units

stunning facility is not available, and the animal is pushed on the floor for slaughtering and bleeding.

Goats and sheep are slaughtered either by halal or jhatka methods as per the needs of consumers. The animal is stunned with the help of electric stunner in mechanized slaughter houses, whereas in manual slaughter houses stunning is not practiced before slaughtering.

Dressing: The dressing operation consist of removal of horns, legs, head trimming, demasking, flaying of abdomen and chest and removal of hide or skin.

Evisceration: In this process, edible and non edible offal are segregated. While the edible offal are cleaned with water and sold, the non edible portions are disposed of as solid waste. In mechanised slaughter houses, dressing and evisceration is carried out in hung position with the help of equipments.

In case of pig slaughtering also the basic unit operations viz. slaughtering and bleeding, dressing, and evisceration are identical to large animals (bovines) and goat and sheep slaughtering. Only the additional operations are stunning, scalding and dehairing.

animal is stunned with an electronic instrument. Subsequently sticking is done and body is hoisted on rail to ensure complete bleeding.

Scalding: For dehairing, the carcass is dipped into hot water at 60 °C for 5 minutes to relax the muscles and make the dehairing operation easier.

Dehairing: Animal is transferred to a mechanical dehairing machine. The final dehairing is done manually or by using gas burner. Thereafter, the dehaired carcasses are washed. In manual slaughtering, stunning is not practised and dehairing is done manually.

4. SOLID WASTE GENERATION

Carcasses are the products of slaughter house. Other offals are by-products or wastes. Generally, the terms by-products and offal are used to denote every part which is not included in a dressed carcass. By-products can be divided into two groups namely, edible and inedible. Organs such as kidneys,



Stunning: The

Animals arriving at slaughter house

brain, liver, heart, gullet are examples of edible by-products. Hooves, horns, hair, bristles, gall bladder, ears, skin etc. are among the inedible by-products. By-products can form a part of edible meat or can be converted to produce items for various commercial usages. The components left unrecovered simply form solid wastes. It has been observed that waste generation is largely influenced by the facility for recovery of by-products. It also depends on customs of consumer community. As such, quantity of wastes varies from place to place.

Ruminal, stomach and intestinal contents essentially form solid waste. Besides this, stomach and large intestine are also disposed of as waste in most of the slaughter houses. Soft meat parts such as lungs and pancreas are collected in large slaughter houses for sale to poultry feed processing units, whereas these offals are disposed as waste in medium and small slaughter houses. Horns and hooves are generally collected for sale.



Dressing of carcass in progress

Based on the data collected during the survey, the solid waste quantity generated in the bovine, goat and sheep and pig slaughter houses is shown Table 3. Average solid waste generation from bovine slaughter houses is 275 kg/tonne of live weight killed (TLWK) which is equivalent to 27.5 per cent of the animal weight. In case of goat and sheep slaughter house, average waste generation amounts to be 170 kg per TLWK which is 17 per cent of animal weight. Solid waste generation from pig slaughtering is 2.3 kg/head equivalent to 4 per cent of animal weight.

It is observed that there is no organised system for disposal of solid wastes in most of the slaughter houses. The entire solid waste is collected and disposed of as land fill. In few slaughter house, dung and rumen digesta are collected separately for composting.

Table 3: Solid waste generation

Animal	Quantity of Solid Waste		
	Kg/Head	Kg/TLWK	% of Animal weight
Bovine	83	275	27.5
Goat/sheep	2.5	170	17
Pig	2.3	40	4

Slaughter house waste contains mostly biodegradable matter. Characteristics of solid wastes from goat and sheep slaughtering are given in Table 4

Table 4: Characteristics of slaughter house waste

Parameters	Value
Moisture, %	69.45
Total solids, %	30.55
Volatile solids, %	87.95
Fixed solids, %	12.05
Org. carbon, %	23.32
Total nitrogen, %	2.71
Phosphorous, mg/g	4.19
Potassium, mg/g	6.9

5. CLASSIFICATION OF SOLID WASTE

The solid waste of slaughter houses can be broadly classified into two categories i.e. vegetable matter and animal matter as given in Table 5. These waste streams should be segregated so that wastes can be properly treated.

Table 5: Classification of solid wastes

Category	Constituents of waste
Type-I waste	Vegetable matter such as rumen, stomach and intestine contents, dung, agriculture residues etc.
Type II waste	Animal matter such as inedible offals, tissues, meat trimmings, waste and condemned meat, bones etc.

6. SOLID WASTE MANAGEMENT

All most every by-product of slaughter house can be utilized. However, various circumstances do not always permit by-product recovery. The reasons may be inadequate quantity of materials, lack of markets, cost of processing etc. In such instances, they simply form part of waste lot for which different methods of processing and disposal have to be considered. For the slaughter house wastes composting, biomethanation and rendering systems are suggested. Selection of appropriate method, however, depends mainly on type of wastes and its quantity. Incineration is also an option for treatment of slaughter house waste.

6.1 Composting

Practically, all slaughter house waste i.e. type I and type II waste, can be used for compost making. The agriculture residue and dung from the lairage, ruminal and intestinal contents, blood, meat cuttings, floor sweepings, hair,

feathers, hide trimmings can be stabilized by composting.

For preparation of compost stack, it is suggested that alternate layers of type I waste and type II waste should be built up to a height of 4 to 5 feet as shown in Fig 1. The heap should preferably be laid direct on the ground. It is advisable to put a layer of about 6-inch of course material, such as maize or millet stalks, banana stumps, straw, grass, small twigs etc. underneath in order to achieve proper ventilation. In case type II waste contains large organs such as kidneys and lungs or other similar wastes, then they are not put in whole but need to be minced or chopped into 2 to 3 inch pieces. For better results it is advised to mix these pieces with earth and evenly spread out in the centre of the heap where the temperature is high. Higher temperature in compost keeps rats, dogs or other vermin away. The ruminal and intestinal contents provide sufficient moisture for a start of bacterial activities. As such no water is required initially.

To achieve optimum conditions for the bacteria, moisture and proper aeration must be maintained from start to finish. A gradual reduction in height will follow because of the shrinkage of decomposed matter. At least two turnings are required to obtain a uniform compost material. The first turning is normally advised after 2 to 3 weeks and the second turning after 3 to 4 weeks. The compost can be removed after 4 to 5 weeks. The total time required about 90 days. This is reasonable enough time for composting although it depends on many factors: size and type of material, size of heap, ambient temperature etc.

