PILOT INTEGRATED WASTEMANAGEMENT SCHEME
for SMALL AND MEDIUM SCALE SLAUGHTERHOUSES

project physical address:
ANIMAL PRODUCTS DEVELOPMENT CENTER
A. Fernando St., Marulas, Valenzuela City, Philippines 1441
phone nos.: (63-2) 2935489, 2938402, 2938401 / phone/fax no: (63-2) 2916834
e-mails: apdc@manila-online.net / apmpapdc@manila-online.net

Department of Agriculture
BUREAU OF ANIMAL INDUSTRY
ANIMAL PRODUCTS DEVELOPMENT CENTER
**Treated wastewater as fertilizer**

- Treated wastewater is discharged through a tube after the indicator pond to a vegetable garden composed of radish, eggplant, okra, squash, and string beans.

---

**DEWATS Efficiency test results after five (5) months of operation**

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Indicator pond</th>
<th>Standards (inland waters class C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Suspended Solids, mg/L</td>
<td>26.00</td>
<td>70</td>
</tr>
<tr>
<td>BOD₅, mg/L</td>
<td>35.00</td>
<td>50</td>
</tr>
<tr>
<td>COD, mg/L</td>
<td>128.00</td>
<td>100</td>
</tr>
<tr>
<td>pH</td>
<td>7.00</td>
<td>6.5 - 9.0</td>
</tr>
</tbody>
</table>
DEWATS module: Indicator Ponds

⇒ Advanced treatment and further reduction of organic load through aerobic degradation
⇒ Pathogen removal

Resource Recovery

Biogas as energy resource

⇒ As previously mentioned biogas generated from the digester is used as energy resource for heating purposes at the offal room replacing liquefied petroleum gas (LPG).

INTRODUCTION

The operation of a slaughterhouse encompasses the appropriate handling of food animals from the time they are brought to the stockyard, until they are dispatched in the form of carcasses and other secondary by-products. This involves different stages wherein substantial volume of solid and liquid wastes is generated, the degree of which varies according to existing slaughter practices. The more unhygienic or the least developed the facilities are the more serious is the pollution problem.

These wastes ranging from inedible animal by-products, to dead animals and effluent pose disposal problems. These are highly organic in nature and therefore are subject to deterioration and contaminated with microorganisms, and without proper management/treatment would result to different forms of pollution.

Adverse effects would be contaminated food, water source and supply, coupled with spread of zoonoses and related foodborne diseases, leading to deterioration of the environment, pollution, and health hazards.

The industry is needed to feed and support the ever-growing population. But the question is can it be maintained in a sustainable and environmentally sound manner, keeping in mind ecological balance and environmental preservation.
SOURCES AND COMMON DISPOSAL PRACTICES
OF WASTES FROM THE SLAUGHTER OPERATION FLOW
FOR CATTLE AND PIG LINES

Clean-up water & Urine

Manure

LAIRAGING

Wastewater

BLOOD BATH

BLEEDING

Blood

Scalding vat water containing blood, hairs bristles, dirt dissolved fat

SCALDING

Hides

Hairs, bristles

FLAYING

EVISCERATION

Gall bladder

MEAT INSPECTION

Condemned meat

CLEANING OFFALS

Ruminal, stomach and intestinal contents

WASHING AND TRIMMING OF CARCASSES

Skull and feet, bones, horns, hooves meat trimmings

RECEIVING BODY OF WATER

WASTEWATER TREATMENT PLANT

DISPOSAL

CONTRACT BUYERS

DRAWNAGE CANAL

DEWATS module: Planted Gravel Filter

⇒ Aerobic–facultative-anaerobic degradation of dissolved and fine suspended solids; pathogen removal
⇒ Used for pre-treated wastewater where suspended solids and colloidal suspended solid have been removed
⇒ Advanced treatment and further reduction of organic load through increased oxygen supply from roots of plants and from the air
⇒ Space req. 5 sqm/1 cum wastewater disposed
⇒ Three sizes of round gravel were utilized, size ranges between 10-15 cm in the inlet and outlet portions, 0.5-1.0 cm in the mid portion and 1.0-2.5 cm to cover the top of the bed

Gravel filter

Planted gravel filter
DEWATS Module: Anaerobic Filter

Anaerobic degradation of suspended and dissolved solids through intensified contact with beneficial bacteria on the fixed bed media as treatment process

- These microorganisms trap and consume BOD and ammonia from wastewater
- Space req. 1 sqm/1 cum wastewater disposed
- Up 90% BOD/COD reduction

PILOT INTEGRATED WASTE MANAGEMENT SCHEME AT THE APDC-BAI

The Animal Products Development Center (APDC) of the Bureau of Animal Industry (BAI) has the mandate to serve the meat sector in the Philippines through training, development and extension of appropriate technologies, leading to improved methods of handling, processing and utilization of animal products and by-products. APDC also hosted the Asia Pacific Meat Project (APMP). This project was supported by Common Fund for Commodities (CFC), Food and Agriculture Organization of the United Nations (FAO), Center for International Migration and Development of German Technical Cooperation (GTZ-CIM) and the Governments of Bangladesh, Myanmar, Samoa and the Philippines.

Under the APMP, APDC was developed into the Main Center of the project, and pilot training centers were established in Bangladesh, Myanmar and Samoa. At APDC, slaughter and processing facilities were upgraded to meet international standards on hygiene and workflow and intensive staff training on modern technologies took place. In addition to these improvements in the slaughter and processing areas, the old waste treatment facilities were also identified as outdated and dilapidated and additional outside funds were sourced to start with the rehabilitation efforts.

Up to now a pilot integrated waste management scheme including waste separation and collection stations resulting in minimization and transformation of liquid and solid wastes was developed and introduced with support from the Livestock, Environment and Development Initiative (LEAD) based in the Animal Production and Health Division (AGA) of the Food and Agriculture Organization of the United Nations (FAO). Data collected before and after introduction of these waste minimization techniques clearly show that an improved collection of solid wastes results in lower pollution load for wastewater generated. After introduction of the new pilot waste management scheme, effluent characteristics changed, with a significant reduction in total effluent volume by 25% and Biological Oxygen Demand (BOD) load by 35%.

Still the existing system at APDC is seen incomplete. To further reduce the BOD load of the remaining wastewater to not only reach national standards but also make APDC a showcase, it is absolutely necessary to introduce a final treatment system. Cooperation with the Bremen Overseas Research and Development Association (BORDA) with Basic Needs Services Philippines Inc. (BNS) was agreed for the design and implementation of the appropriate waste treatment facility, applying Decentralized Wastewater Treatment System (DEWATS) technology.

In line with its Water and Sanitation Program in the Philippines, GTZ provided assistance on the construction of parts of the waste treatment facility, specifically for the biogas digester. The APDC waste management approach in combination with DEWATS designed wastewater treatment facilities can easily serve as a showcase on a national and regional level. Future close cooperation on dissemination of the developed technology between FAO, BORDA, BNS, GTZ, CIM and APDC is being envisaged.
INTEGRATED WASTE MANAGEMENT SCHEME FOR SMALL AND MEDIUM SCALE SLAUGHTERHOUSES

WASTES GENERATED

- Rehabilitation of waterline system
- Upgrading of the wastewater canal system at holding pens and slaughterhouses
- Rehabilitation / Upgrading of physical structures
- Construction of solid wastes collection points (SWCP) provided with catch baskets and stainless steel baskets
- Construction of dewatering plots

WASTE Minimization Techniques

- Source Reduction
- Recycling
- Good Housekeeping
- Waste Segregation
- Staff Education

Improvement of working procedures

Training of slaughterhouse personnel on waste minimization techniques followed by strict implementation with monitoring systems

Reduction of wastewater

- Correction of stunning/sticking techniques
- Optimum collection ¾ complete bleeding ¾ provision of collection containers in bleeding area
- Breast bone cutting
- Evisceration

Conserve water use with installation of water meter (to measure and regulate consumption) and water saving devices, i.e. reducers, gate valves

Check water lines, faucets and hoses for leaks

Periodic washing of hands, knives, aprons should be done at the handwashing sinks and not with use of water hoses

Dry cleaning with use of rubber squeegees and broomsticks followed by drain-up

Water should not be used as a broom

Wastewater Treatment Plant (DEWATS)

DEWATS Module: Biogas Digester

⇒ Air-tight plastered fixed dome plant
⇒ Used as separate settling/digestion unit for wastewater with high organic load
⇒ Source of renewable energy
⇒ Up to 90% BOD reduction.

Design preview of Chinese fixed dome digester as encircled

Biogas digester with inlet and expansion chamber

DEWATS Module: Anaerobic Baffled Reactor

⇒ Anaerobic degradation of suspended and dissolved solids through intensified contact with activated sludge in each compartment
⇒ The series of chambers will protect the next treatment from any hydraulic and organic shock loads
⇒ Space req. 1 sqm/1 cum wastewater disposed
⇒ Up to 75% BOD/COD reduction

Design preview of baffle reactor as encircled
Bile as cleansing agent

⇒ Bile from gall bladders of cattle or pigs when diluted with water is used as emulsifying agent for grease and fat removal.

  savings on use of detergent for cleaning, removal of grease/fat and dirt from slaughterhouse tools and small equipment

Handicrafts from bones, hooves and horns

⇒ Bones, hooves and horns may be used as materials for handicraft-making.

creation of secondary industry and employment generation

Brushes from hairs and bristles

⇒ Cattle tail hairs may be used for paint brushes, while pig bristles for cleaning brushes.

creation of secondary industry and employment generation

WASTE MINIMIZATION TECHNIQUES

=keeping wastes off the floors and out of the drains=

SOURCE REDUCTION

Dry cleaning before wet clean-up

⇒ gathering and sweeping of solid wastes with the use of simple tools and contraptions, i.e., shovels, rubber squeegees and broom, before introducing water.

  eliminates need for off-site recycling or treatment and disposal

Water conservation

⇒ provision of water meter as well as gate valves, pipe reducers to measure and regulate water consumption.

⇒ repair of leaking faucets and waterlines.

  leaking faucet = 1 li water/min wasted
  running water = 40 li water/min wasted

  - savings resulting from decreased water consumption
  - reduction in treatment costs of wastewater

Waste segregation

⇒ complete bleeding and use of catch containers for blood spillages.

  materials with potential for by-products utilization are not only recovered but also prevented from contaminating low-strength wastes
⇒ emptying of stomach/ intestinal contents directly into sacks or receptacles.
⇒ provision of solid waste catch baskets at waste collection points.
- more efficient solid wastes collection
- brings about savings on operational costs and reduces capital and maintenance costs for wastewater treatment and disposal

Staff education

⇒ training of all levels of personnel within the slaughterhouse on wastes generation, impact to facility and to environment and methods of waste minimization.
⇒ reorientation of slaughterhouse personnel on good slaughter practices to improve methods of stunning, sticking/bleeding, flaying and evisceration.

training makes management and employees aware on how to reduce or control wastes generation

⇒ tying of the esophagus with plastic straw.
⇒ tying of the rectum with plastic straw.

prevents contamination of the carcass with intestinal/stomach contents and possible spillage on the floor conserving water use

RECYCLING

Composting

Valuable sources of nitrogen are manure, rumen contents and condemned materials (soft animal tissues) and to a certain extent also hairs and hooves. These combined with dried leaves or other carbon sources are composted for fertilizers or soil conditioner.

⇒ tying of the esophagus with plastic straw.
⇒ tying of the rectum with plastic straw. prevents contamination of the carcass with intestinal/stomach contents and possible spillage on the floor conserving water use

⇒ Piling of compost heap with alternate layering of dried leaves and solid wastes
⇒ Turning of compost heap
⇒ Application of composted materials
⇒ Solid wastes collected from the whole slaughter operation may be dried which could be used as soil conditioner but of inferior quality than compost. Natural sundrying is employed for drying with the aid of drying beds.

⇒ possible sale of soil conditioner obtained means less solid wastes for disposal while creating additional revenue