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**PHILIPPINE AGRICULTURAL ENGINEERING STANDARD PAES 531:2012**  
**Slaughterhouse Equipment – Poultry Defeathering Machine – Specifications**

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### **Foreword**

The formulation of this national standard was initiated by the Agricultural Machinery Testing and Evaluation Center (AMTEC) under the project entitled “Development of Technical Standards for Poultry Dressing/Slaughtering Plant” which was funded by the Department of Agriculture – National Meat Inspection Service (DA-NMIS)

This standard has been technically prepared in accordance with PAES 010-2 – Rules for the Structure and Drafting of International Standards.

The word “shall” is used to indicate mandatory requirements to conform to the standard.

The word “should” is used to indicate that among several possibilities one is recommended as particularly suitable without mentioning or excluding others.

In preparation of this standard, the following documents/publications were considered:

PAES 020:2005 General – Metrication Guidelines

PAES 508:2007 Slaughterhouse Equipment – Dehairing Machine – Specifications

Sams, Alan R. *Poultry meat processing*. Department of Poultry Science, Texas A&M University. CRC Press. 2001

Mead, G.C. 2004. *Poultry meat processing and quality*. Woodhead Publishing in Food Science and Technology. Woodhead Publishing Limited. Cambridge England

Small Poultry Abattoir Operation, [www.humdeyn.co.za/Abattoir.pdf](http://www.humdeyn.co.za/Abattoir.pdf). <Accessed May 02, 2012>

Poultry Slaughterhouse

[http://www.zhauns.com/pdf/CHICKEN\\_POULTRY\\_SLAUGHTER\\_HOUSE.pdf](http://www.zhauns.com/pdf/CHICKEN_POULTRY_SLAUGHTER_HOUSE.pdf) <Accessed May 02, 2012>

Guidelines on Chicken Slaughtering and Chicken Meat Handling in Small Scale Chicken Slaughterhouses. Directorate of Veterinary Public Health Directorate General of Livestock Services Ministry of Agriculture. 2006

Vertegaal, Jacobus Gerardus and Boxmeer, N. Poultry Plucking Machine. United State Patent. 1968

Conaway, Everett T. Poultry De-Feathering Apparatus and Method. United State Patent. 2003

## **1 Scope**

This standard specifies the requirements for manufacture, installation and performance of defeathering machine with rubberized fingers for poultry animals such as chicken, geese, turkeys, ducks, ostriches, and others.

## **2 References**

The following normative documents contain provisions, which, through the references in this text, constitute provisions of this National Standard:

- AWS D1.1:2000** Structural Welding Code – Steel
- ASTM D2240 – 05(2010)** Standard Test Method for Rubber Property – Durometer Hardness
- PAES 102:2000** Agricultural Machinery – Operator’s Manual – Content and Presentation
- PAES 103:2000** Agricultural Machinery – Method of Sampling
- PAES 529:2012** Slaughterhouse Equipment – Poultry Scalding - Specifications
- PAES 532:2012** Slaughterhouse Equipment – Poultry Defeathering Machine – Methods of Test

## **3 Definitions**

For the purpose of this standard, the following definitions shall apply:

### **3.1**

#### **carcass**

body of dressed/slaughtered poultry animal after defeathering, evisceration, and removal of head and feet

#### **3.1.1**

##### **warm carcass**

newly dressed/slaughtered poultry animal

**3.2****defeathering****plucking**

process of removing the feathers from the skin of poultry animal after scalding as part of preparing its meat for food

**3.3****defeathering capacity**

maximum weight of poultry animals the machine is capable of defeathering per unit time, expressed in kilograms per hour

**3.4****defeathering efficacy**

measures the quality of the carcass after defeathering, expressed in percentage base in class

**3.5****defeathering efficiency**

ratio of amount of feathers removed and the total amount of poultry feathers, expressed in percent

**3.6****defeathering machine**

mechanical assembly equipped with rotating device with attached rubberized fingers that removes the feathers from the poultry animal after scalding

**3.7****evisceration**

process of removing the internal organs on the abdominal and thoracic cavities

**3.8****feather**

one of the light, flat growths forming the plumage of poultry animals, consisting of numerous slender fibers, forming a vane on either side of partly hollow shaft

**3.9****poultry**

birds that are usually domesticated for their eggs, meat and feathers (e.g. chicken, geese, turkeys, ducks, and ostriches)

**3.10****rubber fingers**

defeathering mechanism made of rubber materials and are being used to pluck feathers from the poultry animal's skin during defeathering operation

**3.11****scalding**

slaughterhouse equipment that contains hot water with specific temperature that is being used to loosen and facilitate removal of poultry animal's feathers from its skin and for partial sanitation purposes

### 3.12 scalding

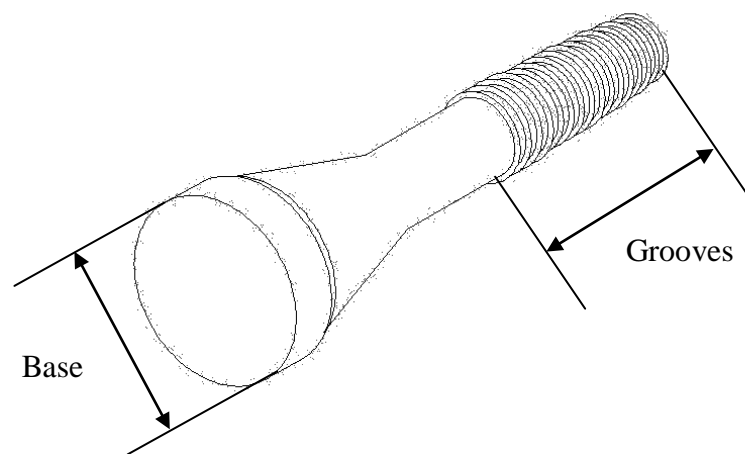
process of subjecting poultry animal to steam or hot water to loosen feathers from its skin prior to defeathering

## 4 Classification

Classification of the defeathering machine shall be according to the following:

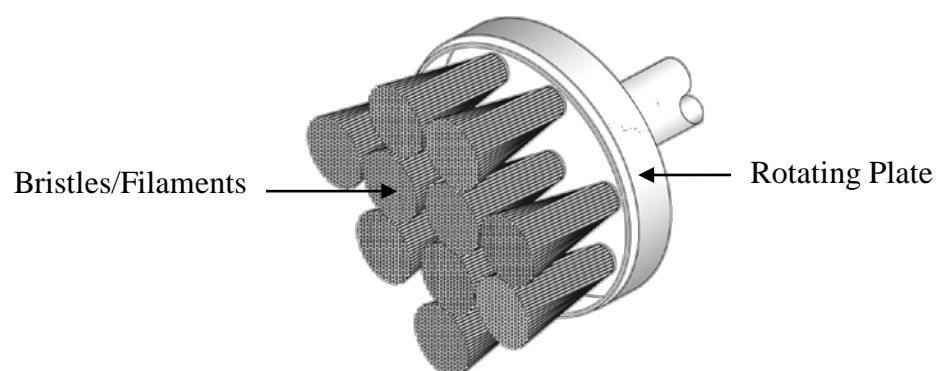
### 4.1 Defeathering Mechanism

#### 4.1.1 Rubber fingers



**Figure 1. Rubber finger**

#### 4.1.2 Bristles or filaments

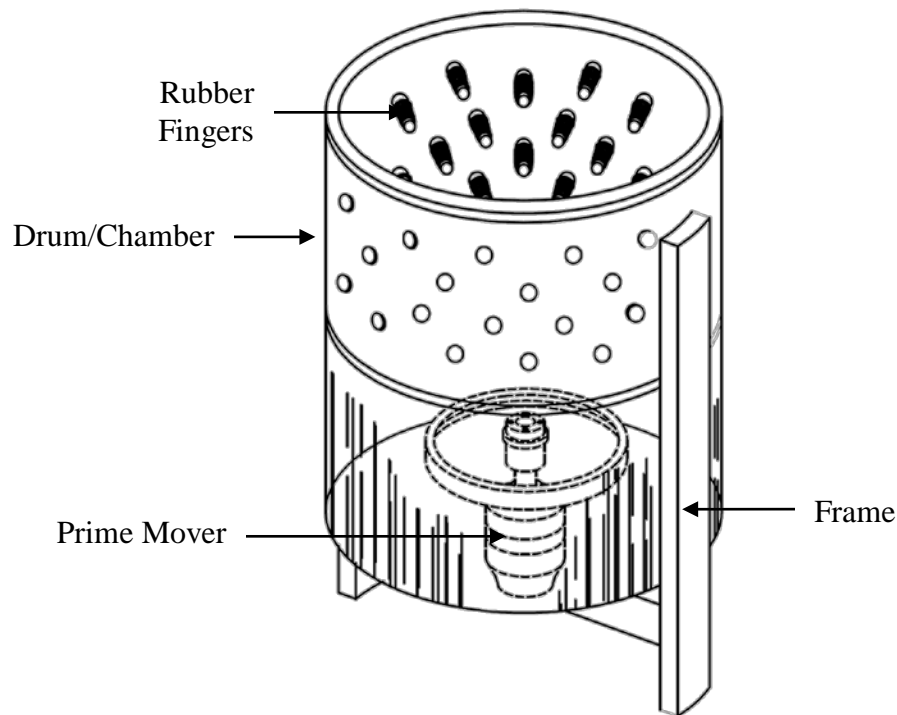


**Figure 2. Bristles or filaments**

## 4.2 Defeathering Machine Orientation

### 4.2.1 Vertical type

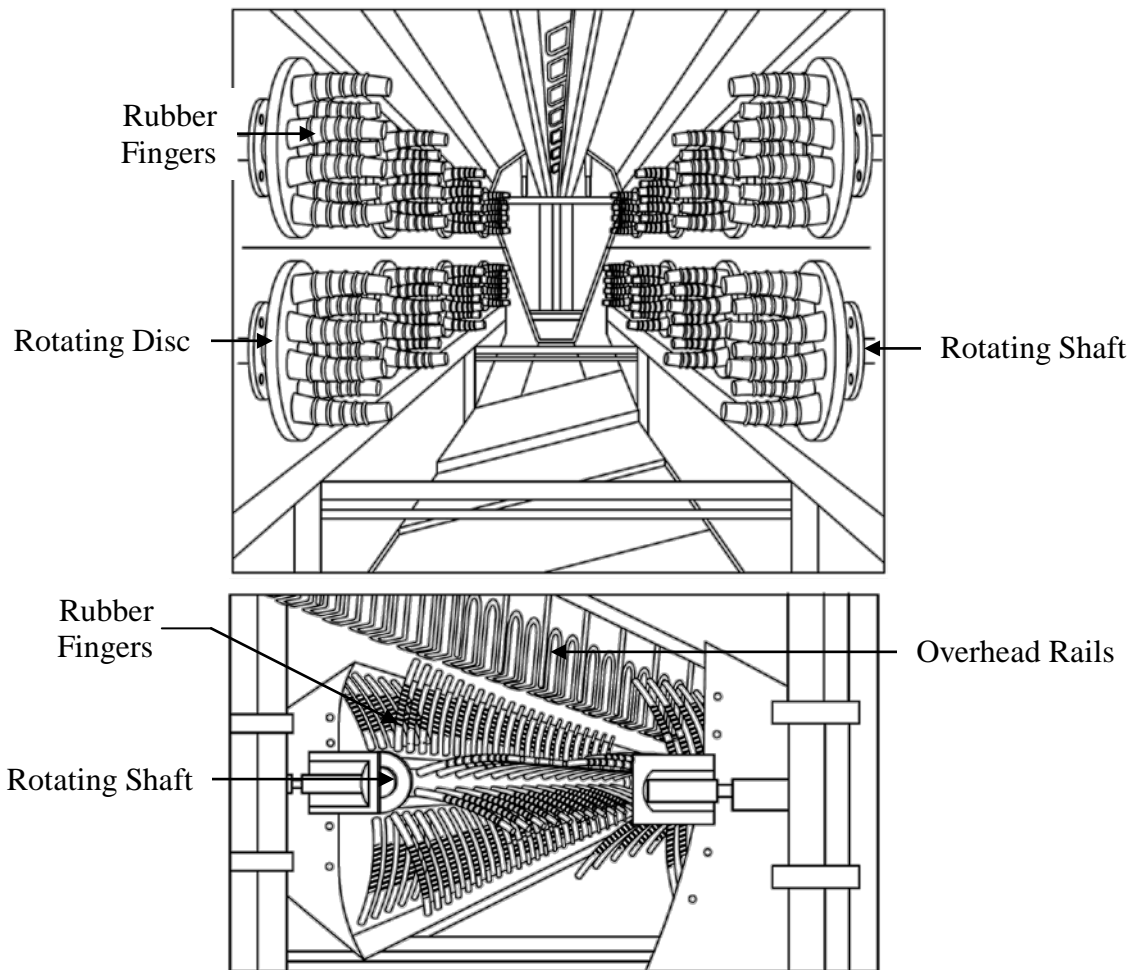
Type of defeathering machine in which the defeathering drum/chamber is rotating with the aid of a vertically installed shaft. This type of defeathering machine is intended for small-scale poultry dressing/slaughtering plant where batch type loading of poultry animals to the machine is necessary.



**Figure 3. Vertical defeathering machine (commercial model that can defeather at most 4 poultry animals per minute)**

### 4.2.2 Horizontal type

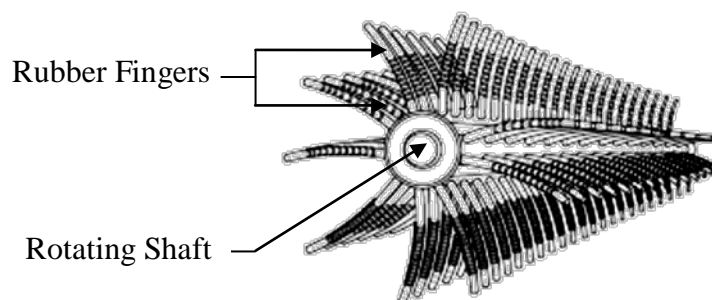
Type of defeathering machine wherein the defeathering mechanism rotates with horizontally installed shaft. This type of defeathering machine is intended for large-scale poultry dressing/slaughtering plant where poultry animals are automatically and continuously loaded.



**Figure 4. Horizontal defeathering machine (commercial model that can defeather at least 10 poultry animals per minute)**

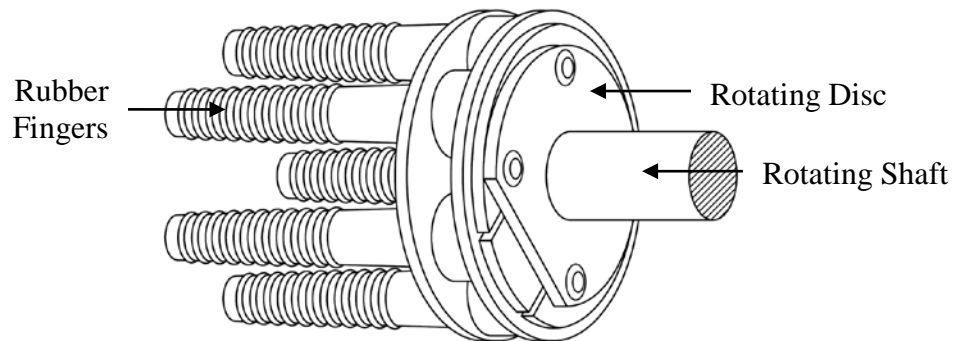
### **4.3 Defeathering Rubber Fingers Mounting**

#### **4.3.1 Perpendicular to the shaft**

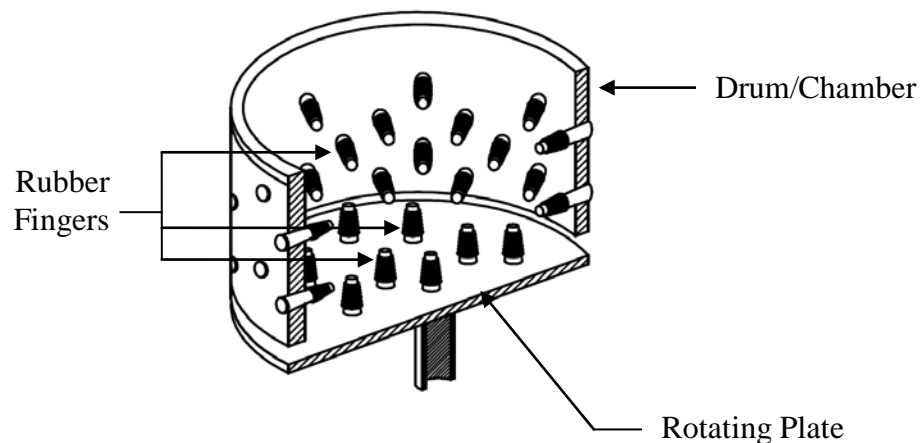


**Figure 5. Defeathering mechanism mounted perpendicular to the shaft**

#### 4.3.2 Parallel to the shaft



**Figure 6. Defeathering mechanism installed in a plate**



**Figure 7. Defeathering mechanism installed in the defeathering drum/chamber**

### 5 Principle of Operation

- 5.1 Defeathering shall be done immediately after proper scalding of the poultry animals in accordance with PAES 527.
- 5.2 Defeathering machine shall be turned on for the plucking process. For horizontal defeathering machine, the distance between the rubber finger assemblies shall be adjusted (if provided) depending on the size of poultry animal to be defeathered.
- 5.3 For vertical defeathering machine, the poultry animals shall manually be loaded to the defeathering mechanism. For horizontal defeathering machine, poultry animals shall be moved in overhead railings to the defeathering mechanism. Water shall be sprayed to facilitate cleaning of the poultry animals and the machine.

- 5.4 For vertical defeathering machine, the carcasses shall be removed manually from the machine for evisceration. For horizontal defeathering machine, carcasses shall proceed for evisceration.

## 6 Manufacturing Requirements

- 6.1 The defeathering machine shall generally consist of drum/chamber, defeathering mechanism, prime mover and water supply system.
- 6.2 The defeathering drum/chamber shall be made of non-corrosive materials (e.g. stainless steel 304 or higher) with a minimum wall thickness of 3 mm (0.118 in.).
- 6.4 Rubber fingers for defeathering machine shall be made of food grade rubber (nitrile rubber, etc.). It shall be flexible to remove the feathers of the poultry animals without creating any damage to the skin.
- 6.5 Hardness of rubber fingers shall be 50-60 shore for short size (90 mm to 95 mm or 3.54 in. to 3.74 in.) and 55-70 shore for long size (96 mm to 140 mm or 3.8 in to 5.5 in.). This hardness shall be based on durometer scale A of ASTM D2240.
- 6.6 For electric powered defeathering machine, the size of the power cord shall correspond to the maximum power rating supplied. Motor can be installed at the top, bottom, and side of the drum and shall be properly enclosed.
- 6.7 The defeathering machine shall be constructed such that it can easily be assembled and disassembled for cleaning and maintenance of moving parts.
- 6.8 Vertical defeathering machine shall be able to support the maximum weight specified by the manufacturers.
- 6.9 Water shall be applied at the rate of 0.25 – 0.5 liters per poultry animal.
- 6.10 The distance between rubber fingers should be 6 mm to 9 mm (0.236 in. to 0.354 in.) from center to center.

## 7 Installation Requirements

- 7.1 Defeathering machine shall be securely fastened to the floor to maintain stability during operation.
- 7.2 Rubber fingers shall be securely mounted to rotating disc or shaft.
- 7.3 Rubber fingers of uniform size, length, and hardness shall be used.

## 8 Performance Requirements

- 8.1 Defeathering efficacy and efficiency shall be at least 90% and 98% respectively.



- 8.2 Rotational speed of the plate for vertical defeathering machine shall be 6.8 m/s to 7.3 m/s and for horizontal defeathering machine 340 to 350 rpm disc velocity.
- 8.3 The defeathering machine shall be able to remove the feathers of at most 20 poultry animals per 5 minutes (small-scale and vertical type machine) and at least 20 poultry animals per 2 minutes (large-scale and horizontal type machine).
- 8.4 Defeathering machine shall be able to attain the specified capacity of the manufacturer.

## **9 Safety, Workmanship and Finish**

### **9.1 Safety**

- 9.1.1 All moving components shall be dynamically balance and running with at most 92 dB noise levels.

NOTE: Allowable noise level for Six (6) hours of continuous exposure based on Occupational Safety and Health Hazards, Ministry of Labor, Philippines. 1983

- 9.1.2 Cover or guards for pulley and/or belt mechanism and prime mover shall be provided.
- 9.1.3 All sharp edges shall be deburred.

### **9.2 Workmanship**

- 9.2.1 Parts of the defeathering machine shall be free from any manufacturing defects.
- 9.2.2 All welded parts shall be leak-free, smoothly polished and shall pass visual inspection criteria (AWS D1.1). Welded joints shall not be less than 4 mm (1/8 inch) side fillet welded. Undercut shall not exceed 2 mm (1/16 inch) for any length of weld.

### **9.3 Finish**

- 9.3.1 Surface of the defeathering machine shall not be painted.
- 9.3.2 The defeathering machine drum shall be smooth and shall be free from sharp edges or surfaces.

## **10 Maintenance**

- 10.1 An operator's manual which conforms to PAES 102, shall be provided.
- 10.2 Greasing of mechanical parts shall be done regularly. Food grade grease and oil shall be used.

- 10.3 Defeathering machine shall be cleaned after each used.
- 10.4 Broken rubber fingers shall be replaced immediately.
- 10.5 A set of manufacturer's standard tools required for maintenance shall be provided.

## **11 Warranty of Construction and Durability**

- 11.1 The defeathering machine's construction shall be rigid and durable without any major breakdown on its components within six (6) months after installation and acceptance by the consumer.
- 11.2 Warranty shall be provided for parts and services within six (6) months after installation and acceptance by the consumer.

## **12 Testing and Sampling**

The defeathering machine to be tested shall be randomly selected from a lot in accordance with PAES 103. It shall be tested in accordance with PAES 532.

## **13 Marking and Labelling**

- 13.1 Each defeathering machine shall be marked in English with the following information using a plate, stencil or by directly punching it at the most conspicuous part:
  - 13.1.1 Name, address and contact number of fabricator
  - 13.1.2 Country of manufacture (if made in other country)/ "Made in the Philippines" (if manufactured locally)
  - 13.1.3 Brand name or Registered trademark of the fabricator (optional)
  - 13.1.4 Model and/or Serial Number
  - 13.1.5 Maximum weight capacity
- 13.2 Other additional markings shall be provided and shall include the name and address of the importer, if imported (optional).
- 13.3 Safety precaution markings shall be provided. Marking shall be stated in English and Filipino and shall be printed in red color with a white background.
- 13.4 The markings shall be securely fastened and shall be all weather resistant. Under normal cleaning procedures, it shall not fade, discolor, crack or blister and shall remain legible.