



UNIVERSITY OF GHANA
(All rights reserved)

BSC. ENGINEERING
FIRST SEMESTER EXAMINATIONS: 2017/2018
DEPARTMENT OF FOOD PROCESS ENGINEERING
FPEN 405: ENGINEERING AND DESIGN OF FOOD PROCESSES III-PLANT PRODUCTS (3 CREDITS)

INSTRUCTIONS: ANSWER FIVE QUESTIONS

TIME ALLOWED: THREE (3) HOURS

1. The transformation of vegetables and fruits into shelf-stable safe products of high quality is essential in food processing. From the equipment shown in Figures 1 and 2 below;
 - a. Identify and describe the design features which make it more efficient and a preferred choice than other extractors.
 - b. List three food products which can be processed using this equipment.
 - c. Differentiate between hot break and cold break processes delineating the significance of the operations in determining final product quality..

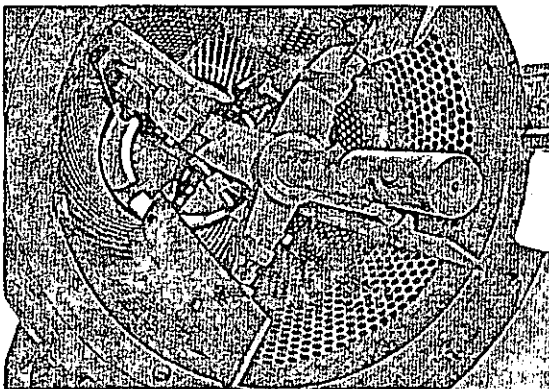


Figure 1 (Interior view)

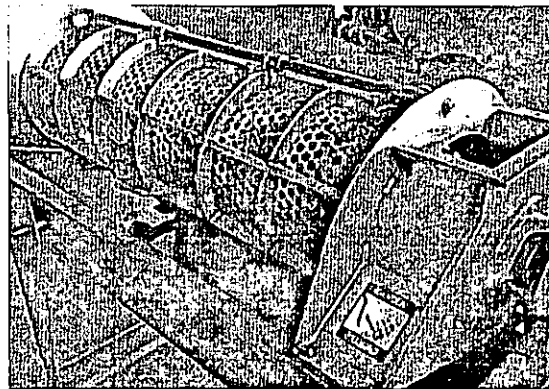


Figure 2 (exterior view)

2. A tomato paste processing plant has employed you as a Food Process Engineer to assist in upgrading their small-scale manual processing facility into a large-scale, automated facility. Describe the upgrading process you propose including the equipment and unit operations.
3. Palm kernel oil processing in Ghana involves a number of operations.
 - a. Draw a labeled flow diagram showing the operations and the flow of material streams.

- b. Identify and describe operations which in your view provide opportunities for Engineers to provide new design systems for process and product efficiency. Give reasons for your identification.
 - c. Select two (2) of the operations identified in (3b) and show what you will do as an Engineer to improve operational efficiency and safety.
- 4.
- a. The use of size reduction equipment for commercial processing of vegetables and condiments is prevalent in Ghanaian food system. The pictures below (Figures 3 and 4) show how the action zone of a size reduction equipment looks like after use in the Ghanaian markets. What are the design flaws? Provide suggestions for improvement?

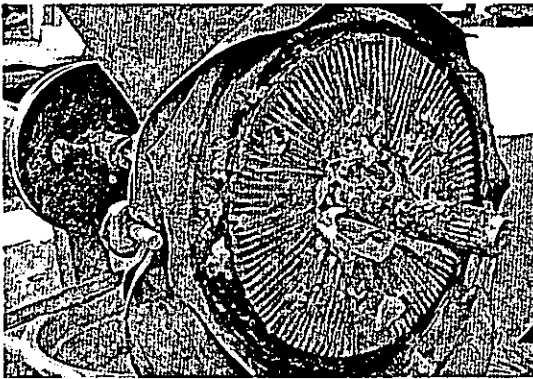


Figure 3

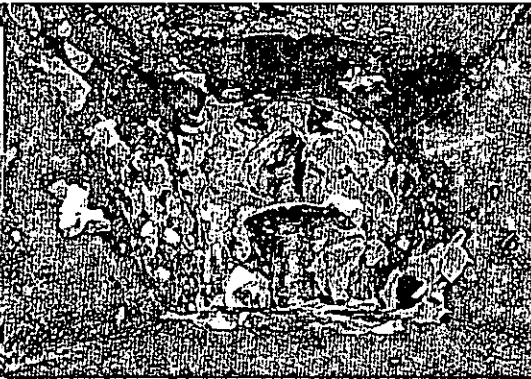


Figure 4

- b. Gari and fermented cassava dough “agbelima” are an important root crop products in Ghana. From field experience what will you present as design challenges for the processing of these foods?
5. The production of malted cereal beverage takes different forms in Ghana. Select a specific example and show the unit operations applied for their production. Provide a critical analysis of the engineering design option needed to modernize the production of malted cereal drinks in Ghana.
- 6.
- a. Give the functions and advantages of the application of extrusion technology as applied to plant food materials.
 - b. The screw design configurations for single- and twin-screw extruders affect their performance. Justify this statement with specific examples.
- 7.
- a. Cocoa fermentation and drying have influence on the outcome of industrial processing into cocoa powder and chocolate. Describe these processes and indicate the role they play in ensuring good quality cocoa. If you are to propose design changes to improve performance, what will be your proposals?
 - b. The melangeur and the conching machines are important equipment in chocolate manufacture. Discuss their use, functions and contributions to the development of chocolate quality.