

## **INTRODUCTION**

### **1.1 GENERAL BACKGROUND OF THE RESEARCH**

Nowadays, there is great political and social pressure to reduce the pollution arising from industrial activities. Almost all developed and underdeveloped countries are trying to adapt to this reality by modifying their processes so that their residues can be recycled. Consequently, most large companies no longer consider residues as waste, but as a raw material for other processes.

The brewing industry generates relatively large amounts of by-products and wastes; spent grain, spent hops and yeast being the most common. However, as most of these are agricultural products, they can be readily recycled and reused. Thus, compared to other industries, the brewing industry tends to be more environmentally friendly (Ishiwaki et al., 2000).

Spent grain is the most abundant brewing by-product, corresponding to around 85% of total by-products generated (Reinold, 1997). According to Townsley (1979), spent grain accounts, on average, for 31% of the original malt weight, representing approximately 20kg per 100l of beer produced (Reinold, 1997). Brewers' spent grain (BSG) is available at low or no cost throughout the year, and is produced in large quantities not only by large, but also small breweries.

For example Brazil, the world's fourth largest beer producer, 8.5 billion litres/year, exceeded only by the United States of America (23 billion), China (18 billion) and Germany (10.5 billion) (Berto, 2003), in 2002 generated around 1.7 million tonnes of spent grain.

Although BSG is the main by-product of the brewing process, it has received little attention as a marketable commodity, and its disposal is often an environmental problem. Some possible applications for this agro-industrial by-product are described below.

### **1.1 FOOD INGREDIENT**

### **1.1.1 Animal nutrition**

Until now, the main application of BSG has been as an animal feed (mainly for cattle), due to its high content of protein and fibre. As an animal feed, BSG can be employed either as a wet residue, shortly after separation from the wort at lautering, or as a dried material (Ozturk et al., 2002; Townsley, 1979). According to Huige (1994) BSG is an excellent feed ingredient for ruminants since it can be combined with inexpensive nitrogen sources, such as urea, to provide all the essential amino acids. In addition to its high nutritional value, BSG is reported to promote increased milk production without affecting animal fertility (Belibasakis and Tsirgogianni, 1996; Reinold, 1997; Sawadogo et al., 1989). When BSG was incorporated into the diet of cows, milk yield, milk total solid content and milk fat yield were increased. On the other hand, blood plasma concentrations of glucose, total protein, albumin, urea, triglycerides, cholesterol, phospholipids, sodium, potassium, calcium, phosphorus and magnesium were not affected (Belibasakis and Tsirgogianni, 1996).

Currently, the primary market for BSG is dairy cattle feed, but as the BSG provides protein, fibre and energy, its consumption has also been investigated for a range of animals, including poultry, pigs and fish (Table 3). Kaur and Saxena (2004) evaluated BSG as a replacement for rice bran in a fish diet, and observed that fish fed with a diet containing rice bran and 30% spent grain had a superior body weight gain when compared with fish fed with rice bran only. According to these authors, the better growth performance was due to the increased content of proteins and essential amino acids provided by the spent grain.

### **1.1.2. Human nutrition**

Due to its relatively low cost and high nutritive value, BSG has been evaluated for the manufacture of flakes, whole wheat bread, biscuits and aperitif snacks. However, BSG is too granular for direct addition in food and must first be converted to flour (Hassona, 1993; Miranda et al., 1994a,b; Ozturk et al., 2002).

## **1.2 PROBLEM STATEMENT**

The spent grain from the breweries is often times discarded and wasted without any use for it. But it has been discovered that the spent grain can be used for several useful purposes including using it for making animal feed.

The design and construction of a mechanical dryer for spent grain will solve this problem in a way.

### **1.3 OBJECTIVE OF THE STUDY**

The aim of this project is to:

Design and construct a mechanical dryer for spent grain.

Evaluate the performance of the dryer.

### **1.4 SCOPE OF THE STUDY**

This project will be centred on the design and construction of a mechanical dryer for drying spent grain.

## **DESIGN AND FABRICATION OF A MECHANICAL DRYER FOR DRYING OF SPENT GRAIN**

The complete project material is available and ready for download. All what you need to do is to order for the complete material. The price for the material is NGN 3,000.00.

Make payment via bank transfer to Bank: Guaranteed Trust Bank, Account name: Emi-Aware technology, Account Number: 0424875728

Bank: Zenith Bank, Account name: Emi-Aware technology, Account Number: 1222004869

or visit the website and pay online. For more info: Visit <https://researchcub.info/payment-instruct.html>

After payment send your depositor's name, amount paid, project topic, email address or your phone number (in which instructions will sent to you to download the material) to +234 70 6329 8784 via text message/ whatsapp or Email address: [info@allprojectmaterials.com](mailto:info@allprojectmaterials.com).

Once payment is confirmed, the material will be sent to you immediately.

It takes 5min to 30min to confirm and send the material to you.

For more project topics and materials visit: <https://researchcub.info/> or For enquiries: [info@allprojectmaterials.com](mailto:info@allprojectmaterials.com) or call/whatsapp: +234 70 6329 8784

Regards!!!