

**ENVIRONMENTAL & PRODUCTIVITY TECHNOLOGY INNOVATION
FOR THE
FOOD MANUFACTURING INDUSTRY**

**NEEDS STATEMENT TITLE: EGG SHELLS (BY-PRODUCTS/DISPOSAL)
ET-1-A-(5)**

DATE: MAY 17, 1996

TECHNOLOGY REQUIRED

The food processing industry is in need of research to find alternative methods for processing and using egg shells and hatchery waste in an environmental friendly way. There is a need to find a low cost solution.

BACKGROUND

Disposal of egg shells/hatchery waste are normally not profit centers but cost centers. Therefore, the least cost of disposal is most desirable. Some of the least cost opportunities are not options today because of government regulations in some areas of the U.S. Some of the options left should be looked at very critically and the most cost effective method(s) of recycling be considered.

PROBLEM AND IMPACT OF SOLUTION

The problem is to process egg shell and hatchery waste into value added products that may be utilized in many different ways. Stabilization of the egg shell and hatchery waste will improve environmental impacts over some current utilization practices used today.

STATE OF THE ART

Hatchery by-products from broiler hatcheries weights approximately 23 kg/1000 eggs set at 55-60% moisture. Egg shell moisture from breakers is approximately 30%. Total Kjeldahl Nitrogen (TKN) will vary from 1.5 to 4% depending on how the material is processed. If the liquids are removed from broiler hatchery waste, the TKN will be approximately 1.6% at a moisture of 25%. Calcium content varies from 20-35% for the various egg shell waste. The phosphorus content is approximately 0.50%. Several amino acids are available such as methionine, cystine, lysine, isoleucine, etc. It is assumed

waste from turkey hatcheries is within this range. The following processes have been used over time to dispose of egg shell/hatchery waste and/or processed into a by-product:

- Land filling--used on a limited base in some states today, for the most part a past disposal option.
- Land application--used in many states to dispose of the egg/hatchery waste. Odor can be a problem particularly in the warmer months. The shells contain approximately 20–35% calcium which can act as a soil buffer. Availability is an area needing study which will assist in determining application rates.
- Rendering into a shell/hatchery meal--very corrosive process with a high process equipment maintenance cost. Research has shown the meal can be successfully recycled as part of poultry diets. However, there may be a reluctance on part of some nutritionist to use the product in feed formulation.
- Dehydration--used in some areas of the U.S. to make a shell/hatchery meal. Without proper air scrubbing devices this process will produce odors. The equipment maintenance cost may be lower than in the rendering process. Favorable results were found in research trials using the dehydrated meal as part of rations fed to poultry.
- Extrusion--used in some areas to make shell/hatchery meal. In the extrusion process some carrier like soybean meal is used to reduce the moisture content of the egg shell/hatchery waste and to produce friction in the process. Friction will assist in producing elevated temperatures in the extruder. The resulting heat will destroy pathogens and viruses that may be in the egg shell/hatchery waste and cook the material under pressure. This product has also been successfully fed to poultry as part of a diet.
- Spin separation--in some states heavily populated with poultry, egg shell/hatchery waste are collected, spun and 50% of the liquid is removed and used as a protein source in pet foods. However, the egg shell remains to be utilized in some other way.
- Composting--an egg shell/hatchery compost can be made. The spin separated egg shell/hatchery waste has been successfully composted and utilized in making potting soil mixes and used in organic farming where certain plants require high levels of calcium. The compost can also be used in other organic fertilizer blends.

TECHNOLOGY SPECIFICATIONS AND CONSTRAINTS

Select a technology that is cost effective to produce an egg shell/hatchery waste value added by-product. The technology selected should assist in making the value added product a profit center and not a cost center.

LITERATURE REVIEWED

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The Needs Statements have been prepared by university and industry experts under the direction of the National Food Processors Association's technical staff according to the outline and format prescribed by the systems implementer, R. J. Philips & Associates, Inc.

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