Linear Accelerators Termed Best High Energy Source for Food Use

CAMBRIDGE, ENGLAND.—A British atomic energy scientist has advised the food industry to bank on linear accelerators, not fission products, as sources of ionizing radiation in the next 10 years. William Wild, deputy chief scientific officer at Harwell, Britain's atomic center expressed this view during a symposium on Preservation of Food with Ionizing Radiations, held here Feb. 10.

Wild listed four types of electronic generators now commercially available: the Van de Graaff generator, cascade resonant transformer, capacitron, and the linear accelerator. The linear accelerator now being built by a British firm produces a pulsating current of about 500 pulses per second. It is a four million electron volt machine. Although present models have a power of only 500 watts, it is expected that the power will be stepped up to between four and 10 kilowatts within the next 10 years.

The energy range to be considered for food sterilization is from 10 million electron volts downwards. Above this figure there is the danger of producing lasting radioactivity. The cost of food sterilization, according to Wild, would approximate five cents per pound. Using a 500-watt instrument at four million electron volts, the running cost (including amortization) would approximate £5,000 ($14,100) per year. Wild predicted that technological improvements in the next three to four years would cut sterilization costs to as low as one halfpenny per pound.

The Harwell scientist called attention to fission products as potentially enormous gamma sources. It has been predicted that, should the entire British electric power load be assumed by nuclear reactors, 17 tons of fission products would be available per year. Wild asked the food industry representatives what price per curie they are willing to pay for food sterilization by fission products. Intensive research is under way at Harwell, aimed at better handling techniques and more complete utilization of available energy, but Wild believed it would be 10 years before widespread use of the fission products by the food industry is commercially feasible.

Irradiation Effects. Cytoplasmic damage is one of the indirect effects of irradiation, pointed out Miss M. D. Davis, Cambridge University. Named as factors affecting sensitivity of organisms were: method of culture, age of culture, pre- and postirradiation heating, oxygen and water content, protective compounds, pH, and freezing.

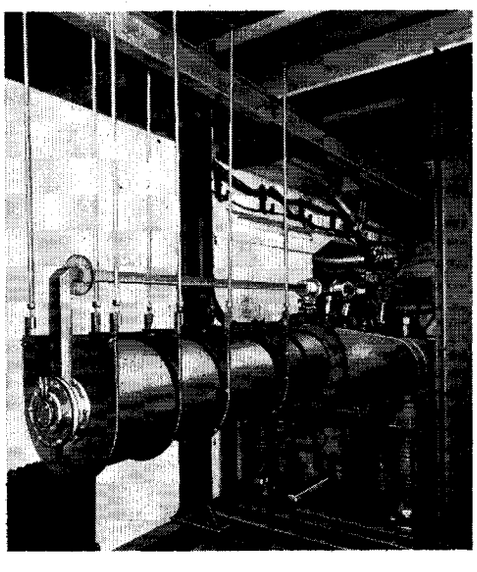
Meats can be sterilized at a dose between two and three million roentgen equivalent physical, said R. S. Hannan, Low Temperature Research Station, Cambridge. In the case of meats, the situation is complicated, due to the fact that the surface sections exist in aerobic conditions while the interior portions of the meat exist in anaerobic state. Browning and development of a "goaty" flavor frequently follow irradiation of meat. The addition of ascorbic acid has been suggested as a protective treatment by previous investigators and the Cambridge workers have recently completed tests along this line. Ascorbic acid in concentrations of between 0.1% and 0.5% gave a definite improvement to irradiated meat flavor. As the ascorbic acid content was increased, however, the protective compound itself developed an undesirable flavor as a result of irradiation.

Turning to the question of irradiation of fats, Hannan pointed out that bleaching and some flavor change inevitably takes place. He warned that antioxidants are usually destroyed, with a resulting deterioration of storage properties. Vegetables usually showed no marked changes, but bleaching and some change in texture (equivalent to partial cooking) were frequently noted.

Hannan advised caution when considering acceptability of irradiated foods for human consumption. He called attention to two hazards—the production of radioactive compounds in the food and chemical changes causing the destruction of minor constituents such as vitamins, or the formation of undesired compounds, such as carcinogens.

The Cambridge symposium was sponsored jointly by the Food and Microbiology Groups of the Society of Chemical Industry.

Linear accelerator manufactured by Metropolitan Vickers Electrical Co. Ltd. capable of delivering 8 million electron volts



Microbiological Assay Saves Time, Animals in Protein Evaluation

NEW YORK.—An assay based on the measurement of microbiologically available lysine resulting from the enzymatic hydrolysis of whey powder which offers great savings over conventional assay methods for milk protein. This was reported at the recent meeting-in-miniature of the New York Section of the AMERICAN CHEMICAL SOCIETY.

The flavor and nutritive value in dried whey and other dried milk products is often adversely affected by the so-called Maillard reaction, a form of oxidation involving sugars and amino acids or proteins. Previous methods of assay of these products have usually required animal feeding tests, costly in time and animals.

The enzymatic assay method reported by Robert M. DeBaun and William M. Conners of the National Dairy Research Laboratories is based on the measurement of the lysine liberated from the whey powder following digestion with a crystalline form of the enzyme trypsin. Digestion with a series of digestive enzymes, trypsin, chymotrypsin, carboxypeptidase, did not give a good correlation with the animal feeding tests.

DeBaun reported that the enzymatic digestion technique yields results which are in good agreement with animal feeding tests and that although the technique is reported for whey powder it is also applicable to other dried milk products. The researchers at National Dairy plan

to use the assay technique to evaluate various processing and storing practices for dried milk products.

Composting. Composting is moving out of the backyard garden, and may eventually be recognized as a method for disposing of industrial and municipal waste. The general principal of composting as a chain reacting refermentation technique were discussed by Mark Luckens of Emmet Technical Associates.

The biological conditions within a compost heap are anything but simple, according to Luckens, for the final compost material represents the results of a number of different microorganisms living together and in succession. Of fundamental importance is the interdependence of these microorganisms if the waste material is to be successfully converted to a compost product.

As he explained the reactions within the compost pile, the initial conditions, if aeration and moisture are suitable, favor the growth of fungi and aerobic bacteria.

The metabolism of these organisms gives off heat, killing the initial bacteria but providing optimum conditions for the thermophilic bacteria, which thrive at higher temperatures.

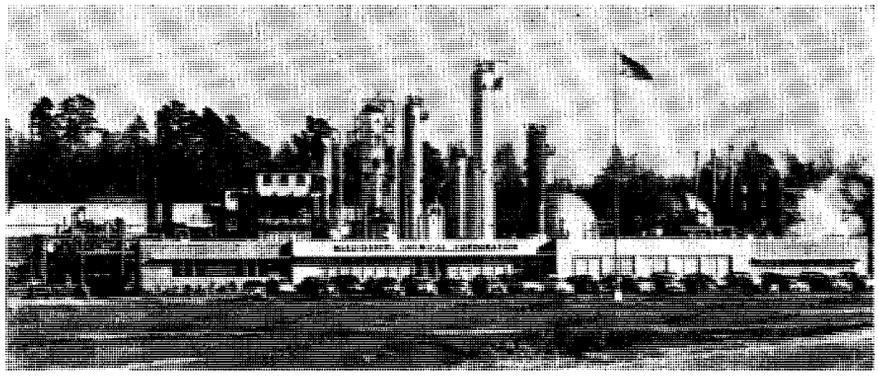
During this phase the temperature of the mass may reach 70° to 75° C. This high temperature is maintained until the food supply of the organisms is exhausted and then they die off.

The advantages of this method over older, garden compost heaps, according to Luckens, is that the aerobic bacteria are favored. The compost pile is aerated and a sufficient supply of oxygen is supplied so that waste is converted to humus in from five to seven days. Older composting techniques were dependent upon the action of anaerobic bacteria, which grow in the absence of air. Under the old composting techniques, it often took from nine to 12 months to dispose of wastes by composting.

Luckens pointed out that nitrogenous matter must often be added to municipal material to achieve satisfactory composting media.

The ratio of carbon to nitrogen in the initial pile is important for the microorganisms within the compost pile and also contributes to the final value of the compost humus.

This ratio of carbon to nitrogen seems to be of fundamental importance for if it is too low the microorganisms will not thrive and if too high, the resulting humus will convert the soil to which it added into a fermenter and rob it of the nitrogen needed for plant growth.



Mississippi Chemical continues anhydrous ammonia expansion at Yazoo City, Miss. New 60 ton gas reforming section with compressor and MEA purification units were to be on stream before March 1. Claude process modifications will increase production another 20 tons per day by September. A goal of 290 tons is scheduled for 1955—present output is 120 tons

Industry

Pacific Borax Sets Up Plant Food Division

Pacific Coast Borax Co. has announced the establishment of a new plant food division to be headed by James A. Naftel. The company said its new division has been organized because of the increasing use of its various products, fertilizer borate, colemanite, and Polybor, in mixed fertilizers and for direct application to correct and prevent boron deficiencies in the soil.

Dr. Naftel has been the company's southern agronomist. He will continue directing the new division from his headquarters in Auburn, Ala.

Research

Useful Citrus Leaf and Soil Tests

The use of plant and soil criteria to diagnose nutritional disorders in citrus orchards is becoming more and more practical. A paper reviewing progress in the field, Development and Use of Diagnostic Techniques for Determining the Nutritional Status of Citrus Trees, has recently been reported by H. D. Chapman and D. G. Aldrich of the University of California Citrus Experiment Station at Riverside.

A long term aim of the Station's Department of Soils and Plant Nutrition, the project has been the object of a great deal of greenhouse and field work. The symptoms and effects of mineral deficiencies, excesses and imbalances in citrus are drawing continuing investigation. Inorganic leaf composition and soil analysis are also getting close scrutiny. Enough data have now been collected to allow generally a ready solution to nutritional disorders, based upon visual or laboratory analysis of leaf samples.

This and related diagnostic methods growing out of the program are making blind use of fertilizers a thing of the past. The kinds and amounts of minerals needed in a given orchard can be determined through leaf and soil analysis and an efficient fertilization program set up.

The work has led to trial establishment of a leaf analysis laboratory by a California marketing organization. Members may submit leaves for analysis and will then be advised on fertilizer usage.

The Citrus Experiment Station has set up by request a school, to be run periodically, which will bring commercial laboratories up to date on the latest techniques in soil and leaf analysis.

Many gaps remain in the fund of knowledge in this field, say the authors of the paper, but the accrued information now available is proving itself increasingly useful to many individuals and groups in the citrus industry.

Coined Names Announced for Two Fungicidal Chemicals

The Interdepartmental Committee on Pest Control has announced two coined names for new pesticide chemicals. Dichlone has been selected as a coined name for the fungicidal chemical 2,3-dichloro 1,4-naphthaquinone.

Glyodin has been approved as the coined name for 2-heptadyl glyoxalidine acetate.

Approval of a coined name by the committee means that the name is available for free use in designating a chemical.

Dichlone has been sold under the trade name Phygon. The name dichlone will be used to indicate the percentage of the pure chemical present. Glyodin is sold as a fruit fungicide under the trade name Crag.