

## Director's Digest



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AREA CODE 312-827-0139

September, 1973

No. 111

### Thermodynamics in the Batch Cooker

The Australian Meat Research Committee recently sponsored an investigation of the physical chemical aspects of batch dry rendering because little basic knowledge of this process is available. Using a batch cooker their heat transfer studies provide data that should aid in evaluating and designing new rendering processes and equipment.

A conventional batch cooker processing principally bone and offal of sheep and cattle was fitted with temperature probes, pressure gauges, steam flow indicators and recorders. Processing time for 8-9,000 lb. of raw material was about 2-2½ hours. Heat transfer coefficients of about 170 Btu/ft<sup>2</sup>hr°F. were recorded initially which, however, decreased rapidly during the first half of the rendering cycle to about 60 Btu/ft<sup>2</sup>hr°F. and remained near the lower level for the remainder of the cycle.

The authors suggested that a phase change in cooker contents might be responsible for this dramatic reduction in heat transfer. As water is progressively vaporized the amount of fat liberated from the solid raw materials increases and free flowing fat droplets are dispersed in a continuous water phase which is in direct contact with the heating surface. Eventually, as more water is evaporated, the fat droplets are packed closer and closer together until the phase inversion process begins with the gradual coalescence of fat droplets. Soon fat becomes the predominant and continuous liquid component in which the water droplets are now the dispersed phase. Heat transfer then depends primarily upon a continuous fat phase in contact with the heating surface which secondarily transfers its heat content for vaporization of the water droplets. This hypothesis was supported by measurement of electrical conductivity which paralleled the reduction in heat transfer.

Because of difficulty in identifying the phase composition in a plant cooker, further confirmatory studies were carried out in a small laboratory cooker charged with mixtures of tallow and water only. Overall heat transfer coefficients correlated well with electrical conductivity and phase composition of the emulsions. In the range of up to 58% fat the heat transfer rate, conductivity and boiling point remained substantially constant. As the fat content rose to 87% with continued evaporation of water the rate of heat transfer decreased. Conductivity also decreased gradually to the 80% fat level and then fell rapidly to almost zero at 87% fat. Internal temperature of the cooker remained quite constant at the boiling point of water until fat concentration reached 84% and then it began to rise, eventually approaching the temperature of the heating surface. These data provide strong support for the hypothesis that the heat transfer rate in rendering cookers is dependent upon the composition of the emulsion which inverts during evaporation from the initial oil-in-water to a water-in-oil emulsion. Details of these investigations were reported by L. S. Herbert and T. C. Norgate, "Heat and Mass Transfer in a Batch Dry Rendering Cooker", Journal of Food Science, 36, 294 (1971) and L. S. Herbert and H. Mamers, "Batch Dry Rendering: An Investigation of Heat Transfer to Boiling Water/Tallow Emulsions", Journal of Food Science, 38, 856 (1973).

These results indicate that the oil-in-water emulsion should be maintained as long as possible for optimum heat transfer efficiency and corresponding economy of the rendering process, perhaps aided by the addition of specific emulsifying agents. The reduced rate of heat transfer also suggests that it would be advantageous to increase the area of the heat transfer surface during the latter part of the rendering cycle.

## Baby Foods Are Out; Pet Foods Are In

*A security analyst tuned to the sociological trends should have sold Gerber Products short and bought Ralston Purina.\**

WHEN PEOPLE TALK about the population explosion, they're usually talking about people. Babies. Not at Ralston Purina, however. Nor at Liggett & Myers or Quaker Oats. Nor at Carnation or General Foods. These companies share 65% of the pet-food market; the population explosion they're talking about is in cats and dogs.

In a nation of 210 million people the dog-and-cat population now totals 90 million—and is growing three times as fast as the people population. The human population growth rate in the U.S. has fallen to below 1% a year; for dogs and cats, it's around 3% a year. There are currently an estimated 58 million domesticated cats and dogs in the U.S.—one for every four people—which explains why those five companies are jubilant about this particular population explosion.

It pleases them, too, that the people who own pets are just as dotting as people who have babies, perhaps even more so. Pet owners are becoming increasingly fussy about what their pets are eating. Grocery store shelves now are bulging with hundreds of varieties of pet foods. What's more, evidence shows those dotting pet owners don't seem to care how high the prices are. Result: Between the pet population explosion and rising pet-food prices, the market is growing at around 10% a year—to a projected total this year of \$1.75 billion. Profits? About \$75 million.

Small wonder, then, that many supermarkets have been cutting back on space for baby foods, and even some breakfast cereals, and increasing the amount of space allotted for pet foods. Small wonder that Gerber Products and other companies catering to the baby market have suffered slower sales and squeezed profit margins. According to a recent study by the A.C. Nielsen Co., supermarkets are now providing 160 linear feet per store to pet foods, vs. only 117 linear feet as recently as 1970.

As in any rapid-growth business, the pet-food explosion has attracted fresh competition. Kellogg was unable to establish itself and withdrew in the Sixties. Campbell Soup, a more recent entry, has been more successful, however. Campbell looked at some of the numbers: the fact that Americans will spend \$125 a year to feed a small dog, as much as \$250 to feed a large one. This is probably more than they spend on soup, and,

more importantly, the soup market isn't growing by 10% a year. So Campbell barged into the dog segment of the market with premium canned dog foods under the Recipe label.

Or in the words of one competitor: "Campbell blasted its way into the market, spreading money around in promotion as though it were going out of style. I'd say it spent between \$25 million and \$30 million on deals, coupons, advertising and the like."

So far Campbell's dog food has sales of over \$30 million a year. Although it has yet to make a profit on its huge investment, Campbell has damaged some market shares in canned dog food, which accounts for 42% of total dog-food sales. Only L&M's Alpo, among the major canned dog foods, has increased market share since the Campbell onslaught.

Price controls, in the face of soaring beef and grain prices, have also taken some nicks out of profits during the past year or so. Some producers tried to hold down costs by reformulating their products to include more fillers like soymeal and chicken parts, only to have those prices take off too. So in spite of a big growth in dollar sales in 1973, pet-food profit margins will be lower than they were in 1972—though a round of two price increases this year should improve profits considerably for 1974. Still, the 1973 net profit margins will run about 4.5%, vs. 2.5% for the average food company.

### Tougher Competition

The big winner is Ralston Purina, which is far and away the biggest pet-feeder in the land. Since 1968 it has lifted its market share from 15% to 25%, for around \$475 million in pet food sales this year. Ralston has shown a knack for bringing out new products that catch pet owners' imaginations (if not the pets' themselves). Its two most resounding winners of recent years: Chuck Wagon, a dry dog food, and Tender Vittles, a moist cat food. But even sharp marketer Ralston had a loser in a canned dog food a couple of years back.

Ralston Purina pumps big dollars into product research, and even bigger dollars into advertising. Last year it spent some \$30 million on advertising, nearly half the industry total

\*Since mid-1971 Gerber, which caters to human babies, has dropped from more than 50 to around 16; Ralston, which is big in pet foods, has risen from the mid-20s to 45 in the past five years.



of \$70 million. But the payoff was big too. Pet foods account for about 20% of the company's revenues, but well over 30% of net profits.

Ralston Purina is counting on pet foods to continue bringing it growth. Not only because of the increasing cat-and-dog population; not only because of the higher profit margin in pet foods; but also because the companies that share nearly 35% of the market are finding it more and more difficult to compete with the Big Five. Borden's Calo and Armour's Dash have been steadily losing ground. Even among the leaders, not everyone has held market share. Says William Stiritz, who heads Ralston Purina's grocery products division: "The cost of staying in the market is soaring every year. Why, we will have spent about \$185 million alone in new plant in just four years. Those who have trouble coming up with new products will stagnate and have to drop out."

Will the cat-and-dog population continue to explode at the present rate of 3%? The industry believes it will because there apparently is a direct correlation between the fact that people are having fewer babies and their affection for pets. A business executive who lives in Greenwich Village and walks her dog in Washington Square has made a hobby of asking other dog owners she meets whether they would like to mate their dogs. She says: "I haven't failed to make a match yet." ■