# Panel Discussion and Symposium: Nonfood Uses of Coconut Oil: Where are We Headed?[1]

N.O.V. SONNTAG, Panel Chairman; H. FINEBERG, H. MOLTENI, H. ZABEL and E. S. PATTISON, Panelists.

**Abstract**

Coconut oil prices will exert much influence on synthetic fatty acid commercialization; if domestic oil prices maintain at 12–13¢/lb, demand for coco acids and derivatives could triple during the next three years; however, at an oil price of 22–24¢/lb, about 90% of domestic research and development on lauric acid products would be dropped. Synthetic fatty acids could hold the market if they can be commercialized near present prices. Proportionally higher food uses will be evident for coconut oil for the next several years. Increased demand for short chain ($C_5$–$C_9$) acids in high temperature synthetic lubricants, estimated to grow from the present 25 million lb/year to 50 million lb/year by 1973, will exert an increased demand.

DR. SONNTAG: The Northern California Section and the National Program and Planning Committee of the American Oil Chemists' Society welcome you to a panel discussion on "Nonfood Uses of Coconut Oil: Where Are We Heading?" A distinguished group of expert panelists will discuss the inedible uses of coconut oil, its methyl esters and fatty acids, the advantages and disadvantages of coconut oil as applied to this purpose, and will attempt to trace past developments which have led the industry to its present position. The panel will also review the present situation with respect to inedible uses of lauric acids, some research and development trends, the price and supply situation, the broad economic background and the trends in edible uses, particularly as they affect the overall nonfood uses.

The subject "Nonfood Uses of Coconut Oil" is somewhat ambiguous and misleading. Although we will be talking about cosmetics, soap, lube oil additives, detergent foam boosters and a host of other nonedible coconut oil-derived products, we will also have to mention some industrial derivatives that eventually wind up back in food, as perhaps FDA-approved food emulsifiers or other food additives. These lauric esters, as most of them are, will not be confused with the "as-is" food uses of coconut oil in baking, confectionary, imitation milk and other recognizable food uses of coconut oil. Our panelists will discuss the future prospects for coconut oil, the possible, or perhaps probable influence of synthetic lauric acid, synthetic $C_6$, $C_7$, $C_8$, $C_9$ and $C_{10}$ acids, and $C_{12}$ and $C_{14}$, the major components of coconut fatty acids.

Where it is applicable, the panelists will make no disclosure about the new research programs within their companies laboratories, nor will they attempt to unfold the marketing strategy they are currently using to solve the many problems besetting the lauric acid industry. When selecting this group, the AOCS felt that an educated guess by an experienced veteran is likely to be quite accurate, better than one from an amateur or no guess at all. Our panelists represent 103 years of collective fatty acid experience. Let me introduce each of them to you. Henry Molteni, Manager of the Industrial Division of Drew Chemical Company. Mr. Molteni represents a company that is both a producer of lauric acid and a lauric acid derivatives producer. Similarly, he speaks from the viewpoint of a consumer of coconut oil for both edible and inedible end uses.

Herbert Fineberg, Director of Project Analysis of the Ashland Chemical Company. At one time Dr. Fineberg was Vice President of Research and Development for Glyco Chemicals, Inc. His position with us is unique since he represents the dual point of view of the fatty acid industry tempered with that of the petroleum industry. Ashland Oil acquired the chemical portion of the Archer Daniels Midland Company about two years ago and they also acquired Dr. Fineberg. This distinguished fatty acid veteran assures us some knowledgeable market and long range planning background.

The next panelist is Herman Zabel, Executive Vice President of Roger Williams Technical and Economic Services, Inc. of Princeton, N.J. Roger Williams has been a noteworthy survey, market development and long-range planning organization for the petroleum, detergent, plastics, chemical and fatty acid industries for many years. Perhaps some remember the comprehensive survey on dibasic acids for the chemical and plastics industries of 15 years ago. More recently, Roger Williams undertook studies for the Food and Agricultural Organization of the United Nations on the subject "United States and Canadian Nonfood Uses of Coconut Oil." This alone qualifies Mr. Zabel for a place on our panel. And, I might add, this survey was required prerequisite reading for all our panel members. I should have known better. Every one of them had digested it cover to cover long before I suggested that they read it prior to joining this panel. But a greater value in having Mr. Zabel with us is that Roger Williams has covered related areas to the lauric fatty acid industry. Their most recent effort is a most comprehensive 260 page survey "Surface Active Agents," which is a market study of vital interest in our deliberations on coconut oil and lauric acid. The remaining panelist doesn't need an introduction, at least to anyone who has ever produced or bought a pound of fatty acid. He is E. Scott Pattison, Manager of the Fatty Acid Producers' Council and head of The Soap and Detergent Association. Mr. Pattison is the man who best knows what fatty acid we are producing and how much of it we make. He supplies each of us with the industry totals, but much as we might like to have them he doesn't supply us with our competitors' production volumes. Mr. Pattison is a relatively late addition to our panel and I think you can readily understand why we were so anxious to have him with us. He is also editor of "Fatty Acids and Their Industrial Applications," recently published for the FAPC. And that leaves myself, Norman Sonntag, Director of Research for Glyco Chemicals, Inc., producer and consumer of lauric acid. It is with humility that I sit in the presence of this distinguished group of experts. I really know very little about this subject myself, and I am here principally to learn.

Before introducing Scott Pattison to present the current situation with respect to the U.S. consumption of coconut oil, the production of lauric acids and the general use pattern for coconut oil, I would like to make several points: There are six different types of vegetable oils with lauric acid contents of greater than 45% from which a lauric acid can be made. Only two warranting serious discussion are available in any significant quantity, coconut oil and palm kernel oil. A third type, babassu oil, from Brazil, is available sporadically and only on a limited basis. Total world production of all lauric oils

[1] Conducted at the AOCS Meeting, San Francisco, April 1969.

TABLE I
Soap vs. Synthetic Detergents[a]
(million pounds)

| | '48 | '58 | '68 (Est.) |
|---|---|---|---|
| Soap | 2,517 | 1,138 | 970 |
| Detergents | 401 | 2,951 | 4,700 |
| | 2,918 | 4,089 | 5,670 |

[a] SDA Reports.

TABLE III
Coconut Oil Uses[a]
(million pounds)

| | '58 | '68 | Growth rate |
|---|---|---|---|
| Food | 250 | 375 | (50%) |
| Nonfood | 375 | 450 | (20%) |
| | 625 | 825 | |

[a] USDA (Approx.).

in 1968 was approximately 5.2 billion lb, which is about 6% of the total world production of all fats and oils. Coconut oil comprises about 4.3 billion lb, palm kernel oil 780 million lb and babassu oil 150 million lb. Annual imports of all lauric oils into the U.S. totals nearly 1 billion lb broken down into 860 million lb of coconut oil, 120 million lb of palm kernel and 20 million lb of babassu oil. Not all of the lauric acid produced from natural raw material comes from coconut oil; a small but significant amount, probably as much as 8–10%, could be derived from palm kernel oil. In any breakdown of coconut oil use, we must remember that by-products from the edible coconut oil usage, such as coconut oil soapstocks derived from the refining of oil, could wind up as nonfood lauric acid end uses. Finally, all of the coconut oil imported into the U.S. is Philippine Islands product because of the preferential tariff treatment afforded by the Laurel-Langley Trade Agreement made in 1954. We are now in a position to look at the data for coconut oil consumption, lauric acid production and the general use patterns which Scott Pattison will present to us.

Mr. Pattison, will you take over and review this situation in general?

MR. PATTISON: I want to make clear that just because the FAPC has members in the fatty acid business and also in the soap business does not mean that I possess any inside information. As a matter of fact, the only information I do have is what these companies want me to spread throughout the industry. So most of the information that will be presented is a result of government statistics or educated guesses from published material. It is not based on any confidential whispers from member companies. I would like to start with what happened over the last 20 years in this particular respect. You will notice in Table I that 20 years ago the country was producing about 2.5 billion lb. of soap. About 500 million lb. of this was based on natural coconut oil. Today we produce almost 6 billion lb. of chemical cleaning products or almost 30 lb per capita of soaps and detergents taken together. But only a billion lb. of this is soap. So you can see that soap has lost its importance as the dominant consumption factor for coconut oil.

Fats and oils for soap (if it were a new market) would still represent a substantial market to think about. Table II, dealing specifically with soap shows just where we stand today. Here again is a 20 year spread showing the fats and oils that go into soap. The estimates are for 1967, the year that the last government figures are available. The coconut oil use for soap was down to 150 million lb. Of course, there is probably a greater use in the detergent industry as a whole; this is the surfactant production of coconut oil which is now of equal or greater importance than the soap use. But if you put the two together, both the present surfactant use and the present soap use, I am quite sure it wouldn't total as much as the 500 million lb indicated 20 years ago. Now, Dr. Sonntag mentioned food versus nonfood uses. I think that it is worthwhile to take a quick look at the growth pattern of these two fields. Again from USDA figures (Table III), you will notice that nonfood uses are still the larger of the two. However, the growth rate is such that, given another 10 years, the food uses will have passed the nonfood uses. Dr. Sonntag stated that there is some overlapping here because some nonfood uses generate products which eventually get into food and some refining for food uses generate soapstocks that get into nonfood. These are the government figures which reflect approximately the situation as it stands today. The food use is another story, a story of which I have no particular knowledge. So let's take the nonfood use and see what happens to that. (Table IV). These are estimated figures. These figures don't appear in the USDA as such because they have a lot of diverse categories, and therefore we have to estimate them. You may wonder why the 250 is in the middle. Based on some published information which has been circulated in the industry, 1964 is apparently the year in which natural fatty alcohol had a peak in this country. However there is a feeling that since that time, with the emergence of the synthetic fatty alcohols, a decline has started. Many people predicted that the decline would be more rapid that it has been. In the fatty acid area, things are a little different, and I will explain this shortly. Now, if you take the detergent alcohols and go one step farther, you can examine the Census Bureau statistics and the Tariff Commission figures on surfactants and then try to figure out where these things fit in. This is very difficult to do. For example, statistics do not distinguish between natural and synthetic alcohol sulfates. Nor is there a clear dividing line between what is coconut and what is tallow alcohol. Table V gives some idea of where we stand in the detergent field and I have deliberately confused the issue with the horizontal line near the bottom. To start, if you take the principal surfactants used in the detergent industry, obviously the big one is ABS, or LAS, a biodegradable material which is used 100% in the United States. The larger all-inclusive figure (596) represents material which is sold for export or sold for nondetergent uses. As we proceed down Figure 5 we note natural alcohol sulfates, natural alcohol ethoxylates and a total for alkanolamides that includes figures based on tallow or based on material other than coconut. Then we come down to the key figure. How much synthetic alcohol has been entering into the derivatives which in turn are impinging on these natural surfactant products? The best estimate that can be made is 200 million lb. A Shell publication at one time made an estimate of 175 million lb which they said was in the detergent range and equivalent to about 240 million lb of coconut oil. The capacity of these synthetic alcohol plants has been estimated at 350 million lb. I think this has been published

TABLE II
Fats and Oils for Soap[a]
(million pounds)

| | '47 | '67 |
|---|---|---|
| Tallow | 1,526 | 642 |
| Coco | 511 | 150 |
| Other | 326 | 20 |
| | 2,363 | 812 |

[a] U.S. Dept. Commerce; U.S. Dept. Agriculture.

TABLE IV
Coconut Oil Nonfood Uses[a]
(million pounds)

| | '58 | '64 | '68 |
|---|---|---|---|
| In soap | 160 | | 150 |
| In det. alcohols and deriv. | 170 | (250) | 225 |
| In fatty acids and deriv. | 40 | | 65 |
| Other | 5 | | 10 |
| | 375 | | 450 |

[a] Estimated from "others" USDA.

TABLE V
Principal Detergent Surfactants
1967 Estimates (USTC)

| | Million lb. |
|---|---|
| Alkyl benzene sulfonate | (LAS 480) 596 |
| $C_{10}$–$C_{18}$ synthetic alcohol derivatives | 200 (1968) |
| Natural alcohol sulfates | 150 |
| Natural alcohol ethoxylates | 65 |
| Natural acid alkanolamides | 80 (Coco 48) |
| Nonyl phenol ethoxylates | 20 |

before. We are talking about plants of Continental Oil, Ethyl Corporation and Shell. There really is probably, in addition to that 350 million lb capacity, a capacity of secondary alcohol being used and its ethoxylate sold as a surfactant by Union Carbide. This would indicate that there is a substantial expansion of capacity and of production in the fatty alcohol field. Now, I am not primarily talking about fatty acids. And this brings up the question: To what extent is this likely to be projected in the future? For Table VI I have taken some material from my collaborator, Mr. Zabel. This is his chart. Note that it is in terms of metric tons rather than in terms of millions of lb. This was his prediction three years ago of what was going to happen to detergents or surfactants based on natural coconut oil from 1965 to 1975. And it looks a little bit sad from the point of view of overall coconut oil consumption. There are a number of reasons why the fatty acids are much more resistant to the competition of synthetic materials.

To conclude my statistics, Table VII indicates the situation on the trend of coconut fatty acid production. When the Figure was prepared, the 1968 figure was estimated at 66.7, and actually turned out to be 70.1. So that the rate of growth is greater than I have shown. Furthermore, the oil figure which is indicated as not available, turns out to be 64.3. Now, you might say, "How can you . . . in some years have more oil than you have acids, and in some years have more acids than you have oil?" I don't really know, except that this question of soap stocks keeps moving in and out of the picture. Also, I suspect that oil or soapstocks may be held back one year and used to make fatty acids the next year. That is probably part of the explanation.

Dr. Sonntag: Thank you Mr. Pattison. I suppose the first thing to do is say, "Don't believe what you just saw." Now we are probably going to poke holes in these figures for the rest of the afternoon until the tabulated data resemble Swiss cheese. The first thing that we ought to pinpoint is the changing pattern of the food and industrial uses, and I wouldn't want it to go by without making further comments. I have before me a report that was written over a year ago. It is just as true today as it was then, and I think it summarizes this particular development in coconut oil better than any other words that I could use. A commodity analyst for a leading New York investment firm wrote in an article last year that coconut oil achieved a new status. "Even though everyone knows that coconuts are edible, the oil derived from extracting coconut or copra has traditionally been an industrial oil. It is an industrial oil in the United States even today. Therefore, it was always thought even as little as 10 years ago that the industrial uses of coconut oil far exceeded those of the food type. In 1965

TABLE VI
Predicted Use of Coconut Oil in Detergents[a]
(thousands of metric tons)

| | '65 | '70 | '75 |
|---|---|---|---|
| Heavy duty detergent | | | |
| Surfactant | 91 | 45 | 11 |
| Boosters and stabilizers | .... | .... | .... |
| Liquid light duty detergent | | | |
| Surfactant | 18 | 9 | 5 |
| Boosters and stabilizers | 9 | 11 | 14 |
| TOTAL | 118 | 65 | 30 |

[a] FAO (UN).

TABLE VII
Coconut Fatty Acid Production[a]
(million pounds)

| | Acids[a] | Oil[b] |
|---|---|---|
| 1963 | 42.2 | 51 |
| 1964 | 44.2 | 54 |
| 1965 | 41.6 | 54 |
| 1966 | 47.1 | 60 |
| 1967 | 57.5 | 55 |
| 1968 (Est.) | 66.7 actual 70.1 | (64.3) |

this use was a 2 to 1 ratio, twice as much coconut oil used for inedible purposes as for edible. In 1967, however, the trend took a definite turn to a different pattern." The edible use of coconut oil first equaled and then exceeded the use for coconut oil and inedible products. During that year, for three months, just as much coconut oil was used for edible products as was used for the production of all of the inedible products: fatty acids, fatty acids derivatives. Now why has this change occurred? Well, one of the major reasons is that the new dairy product, filled milk, has arrived on the scene. The product is milk from which most of the fat has been eliminated and replaced with coconut fat. The oil is usually entirely a coconut oil; it has not been fractionated in any degree. The result is a milk product that many say has far better keeping qualities than pure milk. It certainly costs less. It is lower in saturated fats. This is a problem, of course, which we normally associate with arteriosclerosis. The taste is said by some to be enhanced. The overall quality is equally as good as whole fresh milk. In addition, it might even equal it in taste. Considerable research has been going on in the country in the last three years for this type of product by most of the dairy and food organizations. At first filled milk was accepted on the West coast where coconut oil is, of course, more available by import than any other place in the United States. But today it has spread to the Midwest and to the East coast. Here is a development that probably a few of us might have missed. Coconut oil is likely to be going more for edible products and is likely to be continuing that way today and in the immediate future. The demand is quite likely to be increasing in the future. In addition to imitation milk, a host of other edible products, such as coffee whiteners, topping, confectioners products, are even more likely to increase the demand for the edible uses of coconut oil, as opposed to its industrial uses. So I think we should pinpoint this development and keep a good close look at it for the next two or three years. From the figures that Mr. Pattison presented we did not see the coco methyl esters. Mr. Molteni, I think you had an important point on that.

Mr. Molteni: Yes, I did. If you look at Mr. Pattison's figures indicating the coconut oil and fatty acid or lauric acid production—and I'm going to take 1966 because I think we have a comparison there with the Tariff Commission report—you have a breakout of all of the coconut derived surfactants, whether they be the alcohol type or the fatty acid type. If you list those and then statistically determine the fatty component that constitutes the whole, there is an amount of coco and lauric fatty acid which is far in excess of the production figures that are listed by the member companies of FAPC. Now, I feel that part of this problem, the reason why there is a gap, is that methyl esters do not appear on fatty acid production reports. Possibly they should if we want to have these figures balance off in the future. For instance, the alkanolamides in this particular area of coconut surfactants constitute a majority of those special surfactants being used in the area of cosmetic and liquid detergents. The alkanolamides, as most of you know today, are manufactured for the most part via the methyl ester route in order to produce the quality of product that this industry requires. So, it is my feeling, Mr. Pattison, that maybe something should be done to bring those figures a little more closely in balance by having included in our future figures the actual methyl ester usage in the alkanolamide, amine oxide, and other types of applications.

Mr. Pattison: Well, inasmuch, as our members pay dues on a production basis, I would certainly like to include methyl esters.

Dr. Fineberg: What do you think is going to be the status of those natural coco alcohol plants in about five to ten years? Has synthetic alcohol actually pushed any significant natural alcohol production out of the market?

Mr. Pattison: A couple of years ago Chemical Week predicted the rapid discontinuance of the operation of a natural coconut oil splitter, but I understand it is still being operated because they have developed a lot of new markets in the plastics field. On the other hand, I think there are at least two companies who five years ago produced for captive use and to some extent for commercial use who have shut down their plants.

Dr. Sonntag: I think that is probably as good a statement as we can make under the circumstances. What do you think the raw material advantages and disadvantages are likely to be for coconut oil? Would you summarize your present feeling on this?

Mr. Zabel: Well, there is nothing really new about this chemical raw material, but I think it is worth a summary. It has many of the disadvantages of any raw material, but the specific properties that are available from it have won coconut oil the major place that it has in the market place. For the U.S. the disadvantages include availability only from a long distance and nondomestic source, i.e., primarily the Philippine Islands. Incidentally, the Philippines are the largest producer in the whole world. Another factor that should be remembered, is that the coconut palm per se does not have a major seasonal variation in coconut production. In one way that looks very good. However, that means that coconuts have to be harvested all year long, and rather than in the same manner as our seasonal crops (one harvest, one planting per crop) you have to do it all the time. That, I think, adds a bit to the cost of production. Another problem is the quota system we have in the U.S. Since we didn't have a seasonal pattern, we legislated one in. Coconut oil, too, is one of the products whose price varies almost from minute to minute, creating many problems for the user. Unfortunately, as we have found out in our consulting work, the users, and in many cases they are our clients, like to have a single number that they can stick in their balance sheets. It is rather difficult with coconut oil when it varies all over the lot. And, along this line, it might be noted that as a raw material, coconut oil is an extremely expensive item. It has been sold, in the last couple of years, within the general area of 10–22¢/lb. That is quite a wide variation. A competitive source, purified petroleum fraction, probably sells for no more than 1½–2¢/lb. That price can vary depending on the degree of refining needed. Coconut oil supplies are also at the mercy of the vagaries of the weather. It is impossible to count on its fixed supplies as a raw material. For example, the total exports of coconut oil and copra in the world in 1967 was 16% below those for 1966. This is primarily due to the insufficient rainfall and to the typhoons in many of the producing areas. And, since Dr. Sonntag did mention palm kernel oil, it might be worthwhile to note that these problems on rainfall existed in most of the producing areas for palm kernel oil as well. Therefore, we didn't have much help from that additional source. Now, there is one other thing I would like to note here to emphasize this extra cost for coconut oil as a raw material. There are two, perhaps three, processing steps that are required to produce fatty alcohol from the petroleum source. There is only one processing step required to convert coconut oil to the acid or the alcohol, but to compete on an even price basis, the petroleum producer has about 8–10¢/lb more to cover all of his processing than does the coconut oil producer. He can handle an extra processing step very readily if his plant is of any considerable size. Another factor is the belief that a synthetic product is not chemically identical to the natural product. And, this has been utilized as an argument that the synthetic product will never be a success. Unfortunately for coconut oil producers, most of the users have found that, in many respects, the synthetic products are completely substitutable for most uses for the natural product.

Dr. Sonntag: I would like to add a few things by way of summary to that, if I may. Perhaps we ought to do a little more detailed looking at the price fluctuations, which to me seem to be one of the major disadvantages of coconut oil. You know, the most delightful time in the life of a fatty acid producer is when he is in red hot pursuit of a dollar of profit with a reasonable chance of overtaking it. But, there are those in the fatty acid industry who, running this desperate race, will probably let the whole Philippine archipelago slip beneath the surface of the Pacific Ocean for a few 0.1¢/lb of raw material cost. While this may be construed in a rough way as progress, if there was a raw material of equivalent quality available for about the same price, I don't doubt that we would be willing to use it within the industry. The price fluctuations of coconut oil are probably the biggest reason the industry will accept synthetic product when and if it arrives. Two years ago we talked about this subject in Los Angeles. At that time coconut oil was priced near 22½¢/lb. Within several days after our deliberations at that Synthetic Fatty Acids Seminar, the price dropped, more than 7¢/lb. It plummeted to a price of 14¢ within a matter of months. How in the world can the natural fatty acid derivative producer cope with a problem like that, an 8¢ price drop within months? If it goes the other way, of course, he is in serious trouble. So the question is, should the lauric acid derivative industry align itself with synthetic fatty acid?

I submit that the lauric acid industry is wondering right now which step to take and in which direction to go. Certainly, the most basic thing that a derivative producer will need is the assurance that he will have his raw material tomorrow, and at about the same price that he gets it today. To me, stable price and availability is the most significant reason for looking forward with some degree of anticipation to a synthetic product, provided we don't have to pay 75¢/lb for development quantities.

I would like to explore for just a moment with you what I feel is a price-use relationship for coconut oil. The beauty about taking guesses like this is that you need not worry about anyone proving you are wrong, but, on the other hand, you can't prove you are right, either. It would seem to me that if coconut oil remained in the 12–13¢/lb range, we could expect a 200–300% increase in the number of fatty acid products and the number of derivatives made from it over the period of two or three years. I speak from our own experience. You may or may not agree with me in what specific degree; you probably will agree in principle. If the price of coconut oil goes to 15 or 16¢/lb, the small textile soap use will be the first to be in serious difficulty. In my opinion, 50% of the derivatives of fatty acids that are based on this raw material will now begin to lose their luster. When the price goes to 16–18¢/lb, it seems to me that 85% of the derivatives that the industry is spending research and development time and money on, would be off the "continue research" list. In the 20–21¢/lb range it appears that the toilet bar soap use might be hurt. You might bear in mind that this is the most profitable area for the sale of lauric acid derivatives: high quality, beauty, toilet bar soap. In that respect it is more profitable today than even the most highly priced synthetic detergents. At the 22–24¢/lb price for coconut oil, everyone will be running around, just as they were two years ago, looking desperately for substitutes. Of course, they will have started searching earlier in the price rise than this. The petroleum journals will be filled with articles on synthetic fatty acids. About 90%, at least

(Continued on page 672A)

## • *Nonfood Uses of Coconut Oil . . .*

(Continued from page 638A)

of all the lauric fatty acid derivative research and development will be dropped. So one of the things I think we can look for and hope for, at least, when and if we see a synthetic lauric acid that is reasonably priced within a penny of the natural acid from coconut when it is normally available, is a steady supply and a freedom from this up-and-down, now-you're-in now-you're-out type of situation that research directors lose their hair over. This seems to me to be one of the most important disadvantages that coconut oil has today.

I think, perhaps, we ought to now give a little attention and turn our collective thoughts to the general market and general use pattern for the nonedible coconut oil derivatives. Let us first turn our attention to the 150 million lb that Scott Pattison said was consumed for soap. Mr. Molteni, will you take over on that subject a little bit?

MR. MOLTENI: Yes, I think I could. Here again of course we have a discrepancy. Mr. Pattison gives 150 million lbs and the Tariff Commission gives 106 million for 1966 as far as coconut soap is concerned. Well, Drew is not in the soap business, so I am not too much concerned about that discrepancy.

In the area of soap, of course, I am sure that the synthetics are going to find and make inroads. It is the major market of the nonfood use of coconut oil and as Dr. Sonntag pointed out, the soap manufacturer surely would appreciate good, stable, uniform cost acid for the right product. I am sure there is a lot of work required to get an exact duplicate of a coco fatty acid. We don't know yet what branching might do as far as a soap bar is concerned. I am sure there is a lot of work going on in this area. I think the biggest job, as far as the synthetics are concerned, is going to be when they start shooting for the food area. We all know what it means to launch a new synthetic into the food area. We can point back, of course, to the success that glycerine has had in this area which would give them a lot of hope. I am sure that some day they are going to make it. But it is not going to be an easy road to follow.

Now, the thing that bothers me, however, about this whole soap industry is more insidious. When you study statistics you find that the per capita use of soap whether it be synthetically or naturally derived, is falling.

DR. SONNTAG: Do you think probably that the small textile industry use in the area of soap will be stabilized, or will be apt to see any decrease in this consumption?

MR. MOLTENI: My feeling is that there is very, very little coconut oil soap being used in the textile area. I think this was phased out a long time ago in favor of synthetics. There is some tallow, but we are realizing very, very little sale of any coconut type of soap product into the textile industry. And I think this is general.

DR. SONNTAG: Soap being what it is, certainly a homogeneous product in the sense that probably one kind of fatty acid may suffice for a great deal of soap volume, it might be an attractive product area for a synthetic fatty acid producer to look at as a homogeneous large volume market. But what about the detergent alcohol user? I think you had this use for 150 or 170 million lb. How much was it? Mr. Zabel, would you want to comment about the future?

MR. ZABEL: Well, first this is a case where I think I would have to disagree with that number. I think that it would be closer to 200 million lb. I find that Mr. Pattison has a different number, too. So we are still mixed up on that figure. But 170 to 200 is not a bad number.

DR. SONNTAR: All right, let's split the difference and call it 180–190 million.

MR. ZABEL: That is one thing I would like to do, but the clients do not want it. The detergent alcohols today are made up of many different products and, obviously, sources. These might be listed as the coconut derived fatty alcohols, branched chain fatty alcohols, the tallow derived fatty alcohols and the synthetic fatty alcohols. Breaking this down even further, the synthetic fatty alcohols could be made up of the products of the Ziegler type route, products of the oxo route, secondary alcohols, products of the hydrogenation of the methyl esters of synthetic fatty acids and coproducts of synthetic fatty acids syntheses. All of these are produced in the United States with the exception of the two types from the synthetic fatty acids. Obviously since we don't produce any synthetic fatty acids, with the exception of certain lower members in the U.S., we can't make alcohols from synthetic fatty acids. But, all of the routes that I have mentioned are commercial routes either in Russia or the U.S. or in both. I would like to go a bit further into the breakdown of the synthetic fatty alcohols; however, I have certain contractual obligations that prevent my doing so. Consequently I will have to stick to this broad number at this time. That is, I think 200 million based on work we have done is a bit better than the smaller number. Since that number was put together about 1966 I think it would be even higher today.

Many different thoughts have been expressed about the relationship between the coconut fatty alcohols and the synthetic fatty alcohols. My basic opinion on this over the past few years certainly has not changed. The opinion was that synthetic alcohols over the long pull can and probably will almost completely elbow the coconut alcohols from the market place. Note that I didn't put any time limit on that thing. That is very important. Otherwise I would have to start rephrasing that a bit. There are two general areas where this movement is perhaps slower than anywhere else. And although these have been referred to very briefly, I would like to mention them. These two areas are where coconut oil derivatives are used in making cosmetics and in making lube oil additives. In both cases, there is a major formulation problem. And once the formulation is put together, and it is considered satisfactory, they will fight like the devil before they change anything. It is primarily because of the dollars and cents of testing in both cases.

DR. SONNTAG: Fine, thanks. Well that brings us to the fatty acid derivative general picture for which I think we had some 65 or 70 million lb listed. Let me make a couple of remarks about it. Perhaps I should start by saying that it is closer to 80 than it is to 70. I don't think I can prove it, but it is a good guess. Perhaps the best way to examine the fatty acid derivative volume and breakdown is to look at recent data from the Tariff Commission (Table 8). We will go through these data and just pinpoint what they are and where they are used. These figures are fairly reliable as of 1966. A year ago when I talked along similar lines I made the statement that the third item on the list, lauroyl chloride, had peaked out. Well it had in 1964, and here in 1966 it is back in healthy shape and going up again. So one

TABLE VIII

Recent Production of Lauric-Type Derivaties in Thousands of Pounds[a]

| Derivative | 1965 | 1966 |
|---|---|---|
| Dodecylamine | 1,934 | 1,605 |
| Dilauryl-3,3'-thiodipropionate | 1,180 | 1,537 |
| Lauroyl chloride | 9,526 | 10,756 |
| Coconut oil acids diethanolamine condensates (amine-acid 2:1) | 17,194 | 13,194 |
| Coconut oil acids diethanolamine condensates (amine-acid 1:1) | 21,526 | 17,826 |
| Lauric acid diethanolamine condensates (amine-acid 2:1) | 20,654 | 17,069 |
| Lauric acid diethanolamine condensates (amine-acid 1:1) | | |
| Coconut oil ethanolamine condensates (amine-acid 2:1) | 2,312 | 1,025 |
| Lauric acid isopropanolamine condensates | 662 | 866 |
| Diethylene glycol monolaurate | 519 | 548 |
| Polyethylene glycol dilaurate | 1,067 | 989 |
| Polyethylene glycol monolaurate | 4,762 | 5,260 |
| *n*-Dodecyl alcohol, ethoxylated | 15–20,000? | 15–20,000? |
| *n*-Dodecyl sulfate, ammonium salt | 1,961 | ........ |
| *n*-Dodecyl sulfate, Na salt | 15,889 | 14,862 |
| *n*-Dodecyl sulfate, triethanolamine salt | 9,712 | 8,493 |
| All other *n*-dodecyl sulfate salts | 14,337 | 16,023 |
| Coconut oil acids, K, Na salts | ......... | 106,568 |
| Coconut oil acids, sulfated, Na salt | 2,758 | 2,100 |

[a] Source: United States Tariff Commission.

can never tell what is going to happen. But let's start at the beginning. The first item is dodecylamine. These figures are in thousands of pounds so we have about 1.65 million lb of dodecylamine made. It is used for various purposes, a great deal of it in the mining industry, specialty chemical manufacture and some quaternary compounds. There are several producers; Armour Industrial Chemical is one. Several other nitrogen fatty acid producers also make that product. It is quite small in overall volume but it is figuring perhaps for a modest increase over the next three or four years. The second item is a recognized lubricant additive. It has a good growth volume. From 1.1 to 1.5 million lb within a period of one year would be a very healthy growth by all standards of market development. The acid used to make it generally is the straight lauric cut. They do not need a 90% lauric acid to make that. On the other hand, for dodecylamine practically every grade of lauric acid imaginable has been used to make the product required for various purposes. Also, lauroyl chloride is generally made from a 90% lauric acid. Two uses that are obvious for this material, but are not obvious from the Tariff Commission's list, are further manufacture of such products as sodium lauroyl sarcosinate which Colgate-Palmolive used as "Gardol" in their toothpaste and which you will find in chewing gum and a number of other related areas, and for the manufacture also of lauroyl peroxide which does not appear on the list but is definitely an end product from lauroyl chloride. The increase there is substantial-9.526 million up to 10.756 million in one year, despite the fact that during 1963, 1964 and 1965 this appeared to peak out and then subside in overall volume.

The next four or five collective groups on the list, the coconut oil and acid diethanolamine condensates of both the 1:1 and 2:1 mole ratios, are all used in the detergent industry. These are the detergent foam boosters, a very large, substantial and collective market for lauric acid. Mr. Pattison and Mr. Molteni pointed out that we use both the acid and the methyl ester in their manufacture. Those shown are probably derived from both. Collectively this has been broken down into the several distinct types shown. Each has its own end use and each has its own composition of lauric acid required to be used as a raw material. Primarily, the acid (or methyl ester) most required for these is a 60–70% lauric acid with the balance myristic obtained by a fractional distillation of the hydrogenated coconut acid (or ester). It is anticipated that this market will grow, but not nearly as vigorously as we anticipated as little as three or four years ago. As a matter of fact, market researchers who look at these detergent additives are not as optimistic now as they were two years ago. Again, a 5% increase perhaps might be anticipated for those products collectively.

The products beginning with diethylene glycol monolaurate, the glycol dilaurate, and the polyethylene glycol monolaurates in general are all the same type of ester variously used in the food industry and in any other industry needing an emulsifier. They are used in baked products and food. They also find use as a specialty detergent for various number of end uses. A somewhat more optimistic viewpoint is held by most market development people on these products, but again we have probably seen a great growth already and can anticipate only a rather steady but nonspectacular growth during the next four or five years for products like these.

After the ester emulsifiers we see *n*-dodecyl alcohol ethoxylates. Now this is extremely difficult to make any predictions on, because it is already a mixture of the natural and synthetic products. And it is anyone's guess as to how much of each is produced. I don't have a guess to make, but probably many of you in the audience know this better than we do. The product *n*-dodecylsulfate ammonium salt is not given a volume here. Apparently it will not be made in substantial quantities from now on. The *n*-dodecylsulfate sodium salt is strictly a detergent. You will notice that it has a 14–15 million lb/yr volume. That will be around for a long while and probably has reached a peak as the Figures well illustrate. But it is not expected, by most surveyors and market people, to drop substantially in the next two or three years. Following that is the *n*-dodecylsulfate triethanolamine salt. For all these products derived from alcohol, it is extremely difficult for anyone to make an accurate judgement concerning how much is natural and how much is synthetic at the present time. Estimates range up to 40–60% synthetic, depending on whom you are talking to. The coconut potassium and sodium salts at 106 million lb are the soap uses that we were referring to under another category. It is interesting to speculate where we are heading in this area. That obviously is not going to be a market in which we see a great 10% increase every year. Probably a ½–2% decrease might be anticipated for these lauric derivatives. Now these are the things that there are already in production. The Tariff Commission only put down the figures that are reported to them. But if coconut oil was properly priced there are a number of other products that are right on the verge of commercial reality based on lauric acid or some of its derivatives. Among the nitrogen derivatives, of course, we can't ignore lauric amine oxide; actually it is the lauryl dimethyl amine oxide that is used in the detergent bars, light duty detergents and shampoo products. There are coconut isothionates that are very, very keenly watching the price of coconut oil as a future possibility for development. In my own opinion, if it is over 14¢/lb neither of these two will get too far. There are some oxazolines and imidazolines; nitrogen derivatives that are in the laboratories of some producers throughout the country. Perhaps these can tolerate a 16–18¢ coconut oil. Lauramide has been made by a number of producers. It seems never to have gotten off the ground. So has dimethyl lauramide. As a matter of fact, I noted a patent on its preparation held by C. P. Hall & Co. using the methyl ester. The hydrazide of lauric acid has some unusual properties. It might tolerate a slightly higher priced coconut oil.

Among the esters of lauric acid are a number of possibilities that are always to be considered. We have heard an awful lot about sucrose laurates (sugar detergents). We have heard about the tallow esters more often than the laurates, but the laurates are there too. They are definitely price restricted. The laurate esters of mannitol, and of sorbitol are currently being produced in small quantities for various specialty detergent uses. Vinyl laurate is a product that has a considerable amount of utility as an oil-soluble monomer for copolymerizations. It depends on lauric acid from a coconut oil probably priced in the range of 13¢/lb. There are some ethoxylated coco glycerides that could get off the ground if they were assured of a satisfactory price for coconut oil. So could the sulfated coconut monoglycerides but none of them will probably move at a 16–17¢ coconut oil. One of the largest developments for the lauric family is a product now estimated to be in 5 to 10 million lb production volume. This is a lauryl methacrylate polymer, a viscosity index improver for lubricating oil. There is a desperate need for lauryl alcohol correctly priced to satisfy that need. And production is, perhaps, 5–10 million lb already. That volume could quadruplicate with a satisfactorily priced raw material, but it is likely that a synthetic alcohol has already captured a substantial part of this potential. So where we are heading depends on what the price continues to be. And I can think of no more incentive for a synthetic fatty acid than to be plentifully abundant at a competitive price. The possibilities are all in the laboratory. Only the raw material needs to be assured.

I would like to propose a different point of view. I would like to turn now to Herb Fineberg to give us some more details on the synthetic fatty acids we have been hinting about and talking about briefly. We are not

(Continued on page 676A)

## • *Nonfood Uses of Coconut Oil . . .*

(Continued from page 674A)

about to skip the details on synthetic lauric acid, and here is Dr. Fineberg to talk about a few.

DR. FINEBERG: Dr. Sonntag has been reminding me all afternoon about how I felt originally with ADM having a pretty big fatty acid production facility in Peoria, Illinois when the first petroleum people came around talking about the possibility of synthetic acids. Our position has finally come around to a compromise somewhere between resignation on our part and an appreciation of the true evaluation of the original grandiose plans held by petroleum people. The volumes of the synthetic acids and the oils used industrially which might be replaced with acids would come to several hundred million lb (using the market figures shown in the tables). These volumes themselves should make it attractive to the synthetic producer on the surface. The coconut type of acid which we will talk about, primarily $C_{12}$ and $C_{14}$ chain length (the lauric oils having somewhere around 45% $C_{12}$ and $C_{15}$ to 20% $C_{14}$ acids in them), are low titer saturated acids which are those that give these lauric oils their uses both in the food area as soft fats and in detergency. They seem to have a unique natural combination for optimum detergency.

Why pay the price for coco acids? Some of the reasons were just mentioned, plus those you have heard from other members of the panel. Why do coco lauric oils have to be that high in cost? I am not really sure. If an agronomist really went after this what could he do with the price or the cost of coconut oil? And the supply?

We are going to talk just a little bit about the more promising synthetic routes which I will list as the Ziegler type, oxo type and paraffin oxidation type. What I am going to do is speculate about potential costs at the present state of the technology. The costs are always compared with each other or some yardstick which I will mention so that we will always know that these are not absolute points of view. They are relative to what present knowledge we have about the alternate routes to the synthetic acids. We are going to make some educated guesses. I don't have slides, unfortunately, so if you want me to repeat something, I will be glad to do so later.

The Ziegler route makes beautiful products; they are straight chained with even numbered carbon atoms. I think we've all had a look at some of them in the development quantities, they are very good. There is very little, if any, branching in them and a very good counterpart towards natural coco acids. Looking at potential costs and taking a 100 million lb plant as a basis for comparison on all of these routes, the way it looks to me is that the raw material cost is somewhere around 5¾¢/lb. The conversion costs, which include the capital costs, labor and utilities are somewhere around 5¢ to convert these raw materials to acids. So we have somewhere in the neighborhood of 10¾¢ for raw materials and conversion which take into account yields, selling and administrative, research, plant overhead costs, labor and utilities. Then when one inserts a minimum profit figure here, you've got somewhere around 13¾¢ cost F.O.B. bulk at the producer's plant. The big cost elements and, remember again, these are not absolute numbers (the big factors are raw materials) are in this case the aluminum powder and the ethylene (the ethylene was priced at 3¢/lb which I think is a fair transfer price down the road). You might be able to get a little less on the Gulf coast today but for the life of the investment I think you would be talking of about 3¢. The oxygen is relatively cheap and there isn't very much of it used in the product, again talking in the $C_{12}$ and $C_{14}$ chain length range. These costs can be shaved. Let's take these capital charges and say "Oh boy, we've got a plant here that's doing nothing and we can cut these investments in half." Well, we might get the costs down from the 13¾ to 11¼¢/lb. If we speculate that this thing might fall flat on its face in that market place and maybe we only get 50 million lb of sales when we banked on the plant with a production of 100 million lb, that cost might turn out to be 20¢/lb instead of 13¾. The chances are awfully good that this might happen.

The next process route that we should look at is the oxo. There are several ways to look at it. One is to simply start out with the $C_{11}$ olefin, say, the alpha olefin, carbon monoxide and hydrogen. The modified oxo yields the aldehyde. The aldehyde is later oxidized on through to acid without going to the alcohol first, so you know what the relative costs are. In this case, in my opinion, the conversion costs would be somewhere around 5½¢. The raw material costs—I have chosen a yield figure of 80% here whereas it was about 95% or better for the Ziegler—are up to 10.5¢ and the conversion costs are 5½¢, which again includes the selling and administrative charge. We are up to 16¢ and maybe as low as 14¢ depending on what price we charge olefin in. In one case, it is the 10¢ level and in the other case, 8¢. We insert some profit in there, which all people who spend capital expect to get, usually a minimum of 2¢, and we've got a minimum selling price of 16–18¢ F.O.B. bulk plant compared with the Ziegler price I just mentioned. Now, let's consider the other oxo possibility. Take these same olefins but with carbon monoxide and water, which according to the literature is quite feasible. We are still in the same economic ball park putting it all on the same basis. The same conversion costs of about 5½¢ and a 15½–17³⁄₁₀¢ selling price, FOB bulk with the minimum profit figure in it. Not too different. However, at 50% capacity utilization costs could be 19½–21³⁄₁₀¢.

Straight chain waxes in the 24 carbon range are valued at 4¢/lb in the estimate. Raw material costs (at 60% yield) and 7³⁄₅¢, conversion costs 5¹⁄₁₀¢, profit at 1¢, minimum selling price, FOB, bulk is 13¾¢/lb, on a relative basis.

Most of us are familiar with these type of acids which have been obtainable from the Iron Curtain countries.

Thus, it is seen that the probable plant conversion costs, without profit and selling costs, are 3½¢ for Ziegler, 4¢ for oxo, 3⅗¢ for paraffin oxidation, all very close. The differences in costs come mostly from raw materials or yields or both. It is believed that these numbers do give a reliable relative cost picture.

The third process is paraffin oxidation. Here's what I think is apt to happen, as long as you understand that my predictions are out of date the minute I give them (a typical market researcher's point of view, by the way). I think the coco range acids in this country, and I would say pretty much every country I know about including the Iron Curtain countries, are going to have to depend on the acids coming out of a larger operation in which the major products are not these coco acids at all. The costs in the coco range just don't seem to endanger naturals. I believe this is the way synthetic acids are going to get going in this country before any other way shows up. I will give you some examples of the routes that might be applicable. First, is the technique that is being worked on of oxidizing the straight chain paraffins to alcohol, not only in this country but overseas. Russia is a leader in this particular type of oxidation. Primary products are alcohols but major by-products are the straight chain acids. In the petroleum industry naphtha is sold both for oxidative cracking and also for oxidation to acids, primarily. Longer and longer chain lengths are being used in these naphtha feeds to oxidation plants, both in this country and overseas. This is apt to get up in the range of at least the short chain acids as by-products or coproducts. The other possibility is that the Ziegler alcohol plants (if they get too big a leak in their system) are going to end up with by-product acids some day. I do believe that the coco range acids are going to have to come out of some such source to become available in the next five or ten years.

DR. SONNTAG: Very ample details, thank you. I think Mr. Zabel has a few things to add to what you have just said, probably more in the market and economic area.

(Continued on page 678A)

## • *Nonfood Uses of Coconut Oil . . .*

(Continued from page 676A)

MR. ZABEL: Well the comments that I have certainly can't be as detailed as those that Dr. Fineberg mentioned, but there are certain points that I would like to mention. There is one recent change in the markets for fatty acids that could possibly speed up the productions of synthetics in the U.S. It is the apparent change in the short chain fatty acid market to the tune of an estimated need of an additional 25 million lb a year five years from now. This growing market is for synthetic lubricants, that is, the synthetic fatty acid used in the production of the synthetic lubricants. This market has existed for some time and the fatty acids that are utilized in its production have been somewhere in the $C_5$ to $C_9$ grouping. These would include, from the western sources, first the lower ends of the fatty acids from the natural fatty oils, in this case, I believe primarily, coconut oil. Second would be the heptanoic (enanthic) acid that is recovered from the Nylon 11 plant at Marseilles, France. This plant is being expanded by roughly 20%. I was informed recently by one party that this was going up by 100%. I do not believe this increase is going to be enough to satisfy this demand in any event. The third is the pelargonic acid that is recovered from coproduction with azelaic acid by the ozone oxidation of oleic acid. The fourth source has been in the lower ends of synthetic fatty acids from Russia. These have, as I understand it, come primarily to Germany where they have been refined and then eventually exported to the U.S. and also to England.

There is also a fifth possible source here but it can't be tapped for the U.S. Red China is selling and presumably producing synthetic fatty acids. At least they have certainly been advertising synthetic fatty acids in British publications for sale. The analyses that have been performed on the samples that were received in England indicate the probable availability of a suitable $C_5$ to $C_9$ source for lubricant use. But to repeat, this product can't be used in the U.S. because of the source. It was rather interesting concerning this particular ad since to my knowledge there never has been any indication that the Red Chinese were producing synthetic fatty acids other than this one. Back to the sources that have actually been utilized. Of the four sources that have been noted for this general area the Russian source was utilized to meet the demands over and above the other three sources, these being the low ends of the natural fats, the heptanoic and the pelargonic acids. And as I indicated recently, shipments from Russia ceased. Exact reasons have never been stated to my knowledge and I have no basic ideas as to why it should have been done. But it has. This is the basic reason for this sudden need. Well, why then is all of this comment important? First, it must be realized that synthetic fatty acids—I think Dr. Fineberg indicated this too by all of the large scale routes—are produced as a mixture usually ranging somewhere between $C_5$ and $C_{20}$ in the chain length. Prices are such that all of the products must be sold if there is to be a profitable operation. For discussion purposes these fatty acids are usually lumped into three groups. The lower ends, that is $C_5$ to $C_9$—the ones we have been discussing. The so called lauric group, say roughly $C_{10}$ to $C_{15}$ and the higher group centering around $C_{18}$, that is the tallow fatty acids, primarily stearic acid. The lauric group probably can be sold at the highest price of these three groups. The higher group ($C_{18}$) can probably be moved but at an extremely low price. It has to compete against tallow. The comments made about the $C_5$ to $C_9$ fatty acids indicates some recent change in this possibility. Exactly what this change is going to be, I will leave that to the sellers and the buyers. Nevertheless, because of this change, there is a better possibility of a greater sale of synthetic fatty acids than existed even a few months ago.

Generally speaking, there are three hydrocarbon raw materials for fatty acid synthesis. One process involves oxidation of a liquid normal paraffin fraction. In another a paraffin wax is oxidized in the presence of a potassium permanganate catalyst. The third involves the varying ways of treating the so called Ziegler intermediates made by reacting the ethylene with aluminum triethyl. This latter route appears to be the one nearest commercialization in the U.S. but it is the route that will be aided the least by this particular change by the lower fatty acids.

DR. SONNTAG: Thanks, and very well done. The fact that we now have some Chinese fatty acids would not come as a surprise. We have had Chinese gasoline, so I suppose fatty acids would be the next logical development. But I guess it is progress and we must face it. But, to change the point of view for a moment, Mr. Molteni, I think you had a question that you were getting polished up a little while ago. Why don't you ask it now?

MR. MOLTENI: I don't know whether it is a question or simply a statement. What I am thinking about—being in the business that we are—is basic in the coconut oil fatty acids and derivatives: what impact will the advent of synthetic fatty acids have on people like ourselves who may be considered to be large producers and consumers of coconut fatty acids? We are also, of course, lauric sellers. But we are consumers from the standpoint that we fractionate a great amount of material which we captively reesterify and put back into the trade as derivative type of items. Now we eventually will be competing, I imagine, with the petrochemical type of synthetic fatty acid. We think to ourselves, well, what do we do when this occurs? It may be unprofitable for us to stay in the lauric acid business when the synthetic product reaches a certain price level. Do we continue to stay in the coconut oil business if only from the food standpoint, will we be pushed out of the derivative area in favor of the lower cost synthetic? This is something we are considering and naturally, we are trying to plan ahead. We do have quite a bit of capital investment, for instance, in the high vacuum stills and fractionation equipment of many different types. We can't allow them to just sit there. It might come down to a point where we may have to make a deal ourselves with the petrochemical people and I think that some of the other people here might also be considering this same type of approach. We can't fight this forever; we have to accept

(Continued on page 680A)

## • *Nonfood Uses of Ccconut Oil . . .*

(Continued from page 678A)

the new technology that is coming along and the pricing system that we feel will be with us within the next few years. We are trying to plan ahead a little bit ourselves to see which will be the best road for us to take and I imagine all of you are doing the same sort of thinking. I might throw that back at you fellows.

DR. SONNTAG: Fine, I think you have asked the question and answered it very well. Mr. Pattison, what do you think from the point of view of the industry? What part of this concerns you as an overall industry spokesman?

MR. PATTISON: Well, I would like to answer this by analogy. Back in 1947, when I first got mixed up in this business by getting my hands in glycerine—I guess that's a good thing to get your hands in—that was when World War II price control first came off. Natural glycerine prices at that time rose to 50¢/lb. Now this happened; every formulation chemist in the country started looking around for substitutes, sorbitol, propylene glycol, pentaerythritol. All of these substitutes were products whose use required reformulation. And markets were being lost by glycerine, and being lost for good. For once someone reformulated it wasn't too easy to drift back. But just about that time Shell synthetic glycerine entered the picture under these conditions and that turned out to be a benefit rather than a disaster for the natural glycerine business. It brought the price down to a level which enabled the formulator to continue to use glycerine. So that, rather than forcing the consumer to play around with exotic substitutes, the expanded synthetic production saved glycerine as a valuable commercial commodity because the buyer could shift from natural to synthetic glycerine interchangeably and the optional supply sources protected him. I think that as the synthetic fatty materials, particularly the alcohols, are improved and the branch chains are knocked off the corners, an easy interchangeability will result. And this interchangeability will then act as a buffer. And with the availability of the synthetic alcohols requiring little or no reformulation there is less likelihood that the finished product formulator is going over to some completely different surfactant system that doesn't involve either of these materials.

DR. SONNTAG: Good point! Mr. Zabel you were grasping the microphone as though you were going to say something very weighty.

MR. ZABEL: No, no. Unfortunately, or maybe it is fortunately, I am not that weighty. All I can say is that I agree 100% with the point that Mr. Pattison made for a change. I like to argue with him but in this case, I can't.

DR. SONNTAG: Well, I think what Mr. Pattison is hinting at is that it really is not going to be the threat that many people think it will be. I don't think it is a threat either. One thing that we might say here is that things are never quite as bad as they may seem. Some good is bound to come out of everything. So we have to look for the good part and I think we will find that there is much to be said that is optimistic about the situation of synthetic fatty acid coming into the lauric acid area. This isn't the first time, I don't think, that we've had a crisis in this industry. We had one when synthetic glycerine came, Mr. Pattison mentioned. We had a second one, about 10 years ago when people were beginning to think that perhaps natural oleic acid would be eliminated because tall oil fatty acids were here. Well, this latter intrusion is now stabilized within the fatty acid industry. There are markets for tall oil fatty acids and there are markets for natural oleic derived from tallow or other sources. As a matter of fact, the advent of tall oil fatty acids has stimulated the fatty acid producers who make derivatives and provided them with additional raw materials out of which to make even more profitable products than there were before. So that turned out to be a blessing in disguise. And I have the opinion that when we finally do see synthetic lauric acid, it is going to be a blessing, not a threat. Of course, if you own a coconut plantation, I don't know what you might do with it, unless you are in the edible business. But those fatty acid producers that make derivatives can probably change a few valves in the plant instead of using a naturally derived product. They may not wind up with as much glycerine anymore but that's another problem. By changing a few things here and there certainly a synthetic can be turned into a very profitable series of derivatives in the long run. So I don't think that it is half the threat that the industry saw back when glycerine or tall oil fatty acids came in. And in the long run this thing is going to be the best blessing we have seen in a long time.

Now, what's holding up synthetic fatty acids? Why haven't we seen them? Well, everyone is holding his breath wondering where the product is, whether the Ethyl Corporation is ever going to produce it and make it available in the market. Obviously, our industry can't accept a 60, 70 or 80¢/lb development price and get very far. Sometimes raw materials start out that way and have a habit of lowering in price as time goes on. If anyone has any synthetic fatty acids and would like to sell them, we would certainly like to see some. And I think most of the other companies that are in our industry would have a similar point of view on it. I do see a few people sitting in our audience who might have a great deal to do in the future and have a good deal to say about the question, "will there be an American synthetic fatty acid in the 10, 12 or 14 carbon range?" I think perhaps some of you may have your hand on the throttle. You may indeed make the decisions as to how soon it gets here, where it will go, how it is made and for what it is marketed. I think perhaps the petrochemical company people who are here have this situation in their province more than we do within the fatty acid industry who are less able to predict or possibly influence such a development.

Well, gentlemen, we have come to the end of the time allotted. I want to thank the audience for their patience. Thank you very much for your kind attention. To the members of the panel who spoke for their organizations and for the organizations who permitted these people to speak for them, our special thanks. Thank you, again, for attending. I hereby declare the session adjourned.

## *43rd Fall Meeting Technical Sessions*

1. **J. V. Landis, R. W. Bates and D. L. Henry**
2. **T. R. Moorer, V. L. Langinas, E. D. Clary and H. D. Fisher**
3. **E. D. King, F. H. Passalaqua, E. E. Petty, J. R. Crafton and R. B. Wettstrom**
4. **T. L. Mounts, P. J. Thomas, E. Selke and E. D. Bitner**
5. **R. B. Wettstrom, E. E. Petty, E. Marshack, W. S. Gilpin Jr., and W. G. Mertens**
6. **S. F. Herb and G. Rouser**
7. **A. Rutkowski and G. D. Brueske**
8. **J. R. Zak, A. Rodeghier and D. R. Erickson**
9. **J. Fawbush and G. R. Miller**
10. **W. May, S. S. Chang and T. Murase**
11. **A. J. Schlaeger**
12. **B. Link and O. S. Privett**
13. **H. Singh**
14. **W. Hoerr, J. C. Lamping, A. V. Graci and S. C. Miksta**
15. **G. R. Evans, W. G. Mertens, M. D. Saari, C. K. Cross and P. A. Larson**
16. **D. W. Schmadeke, P. A. Larson, B. W. Minshew and S. Smith**
17. **R. A. Marmor and R. W. Bates**
18. **K. Dougherty and J. Fulmer**
19. **G. J. Nelson, G. Rouser and R. M. Burton**
20. **U. Varansi**