PROCEEDINGS
WORKSHOP ON POULTRY PROCESSING PLANT WATER UTILIZATION AND WASTE CONTROL

Edited by
Roy E. Carawan
Department of Food Science
North Carolina State University
Held in Greensboro, North Carolina
September 16, 1971

Sponsored by: Agricultural Extension Service
Department of Food Science
Department of Economics
North Carolina State University
and the
Water Resources Research Institute
of
The University of North Carolina

The publication of this report was supported in part by the Agricultural Extension Service and the Department of Food Science, NCSU, and by funds provided by the United States Department of the Interior, Office of Water Resources Research, as authorized under the Water Resources Research Act of 1964.

Agreement Number 14-31-0001-3533
FY 1972
PROGRAM
POULTRY PROCESSING PLANT WATER UTILIZATION AND WASTE CONTROL
Ramada Inn
Greensboro, North Carolina
September 16, 1971

Thursday Afternoon
Chairman
Dr. Fred R. Tarver, Jr.
Department of Food Science

1:00 p.m.  WELCOME ........................................... Dr. James E. Legates, Dean
           School of Agriculture and Life Sciences

WORKSHOP OBJECTIVES .................................. Professor David H. Howells, Director
           N. C. Water Resources Research Institute

ECONOMIC ASPECTS ........................................ Dr. James A. Seagraves
           Department of Economics

THE GOLD KIST STUDY:
Background and Procedures ......................... Mr. Roy E. Carawan
           Department of Food Science

Process and Equipment Changes ..................... Mr. John A. Macon
           Department of Economics

Biological Evaluation .................................. Dr. Marvin L. Speck
           Department of Food Science

Overall Results ........................................ Mr. Roy E. Carawan
           Department of Food Science

Discussion

3:15 p.m.  BREAK

3:30 p.m.  INDUSTRY PROBLEMS AND CONCERNS - WATER AND WASTE MANAGEMENT:

Background ............................................... Mr. Byron Hawkins
           Gold Kist Poultry

U.S.D.A. Rules and Regulations .................... Dr. George Harner
           Regional Supervisor for Inspection
           Consumer Protection Programs
           U. S. Department of Agriculture

Now and the Future
Cities - Rules and Regulations -
Now and Future ........................ Mr. Leslie Matthews, Director
Industrial Waste Treatment Program
Durham, North Carolina

State and Federal - Rules and
Regulations - Now and the Future  .... Mr. William C. Mills
Regional Engineer
Industrial Waste Section
Water Quality Division
North Carolina Office of
Water and Air Resources

SUMMARY ................................................................. Mr. Byron Hawkins
Gold Kist Poultry

DISCUSSION

Thursday Evening

Chairman
Professor Gene McJunkin
Associate Director
N. C. Water Resources Research Institute

5:30 p.m.  DINNER

INDUSTRY PROBLEMS AND CONCERNS ........ Dr. Robert E. Cook, Head
Department of Poultry Science

6:30 p.m.  WORKSHOP SESSION (See attached list of workshop questions)

8:00 p.m.  REPORTS AND DISCUSSION

9:00 p.m.  ADJOURNMENT
TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>INTRODUCTION</td>
<td>1</td>
</tr>
<tr>
<td>WELCOME</td>
<td>3</td>
</tr>
<tr>
<td>WORKSHOP OBJECTIVES</td>
<td>5</td>
</tr>
<tr>
<td>ECONOMIC ASPECTS</td>
<td>7</td>
</tr>
<tr>
<td>THE GOLD KIST STUDY</td>
<td>19</td>
</tr>
<tr>
<td>Background and Procedures</td>
<td>21</td>
</tr>
<tr>
<td>Process and Equipment Changes</td>
<td>27</td>
</tr>
<tr>
<td>Biological Evaluation</td>
<td>37</td>
</tr>
<tr>
<td>Overall Results</td>
<td>41</td>
</tr>
<tr>
<td>INDUSTRY PROBLEMS AND CONCERNS - WATER AND WASTE MANAGEMENT</td>
<td>53</td>
</tr>
<tr>
<td>Background</td>
<td>55</td>
</tr>
<tr>
<td>USDA Rules and Regulations - Now and the Future</td>
<td>59</td>
</tr>
<tr>
<td>Cities - Rules and Regulations - Now and the Future</td>
<td>63</td>
</tr>
<tr>
<td>State and Federal - Rules and Regulations - Now and the Future</td>
<td>67</td>
</tr>
<tr>
<td>SUMMARY</td>
<td>71</td>
</tr>
<tr>
<td>INDUSTRY PROBLEMS AND CONCERNS</td>
<td>73</td>
</tr>
<tr>
<td>WORKSHOP SESSIONS</td>
<td>77</td>
</tr>
<tr>
<td>Discussion Group I</td>
<td>79</td>
</tr>
<tr>
<td>Discussion Group II</td>
<td>83</td>
</tr>
<tr>
<td>Discussion Group III</td>
<td>85</td>
</tr>
<tr>
<td>LIST OF PARTICIPANTS</td>
<td>89</td>
</tr>
</tbody>
</table>
INTRODUCTION

There is a growing awareness of the need to act now to insure adequate environmental protection. Research emphasis in industrial problems is shifting from destructive measures such as waste treatment toward in-plant water and waste management. New knowledge and competence are required for effective implementation of water and waste management in poultry processing.

This workshop will focus on the impact of in-plant process and equipment changes on water use and waste abatement in poultry processing. Objectives of the workshop are to: (1) share results of a research, development and demonstration project conducted in the Gold Kist plant at Durham, North Carolina; (2) interpret the usefulness of these results for improving the operation of your plant; and (3) discuss implications of the results for implementation of water conservation and waste abatement programs by poultry processing firms and enforcement of health and environmental programs by regulatory agencies.

A detailed study of opportunities for water and waste reduction was made throughout the plant. There has been a 30 percent reduction in water use (580,000 gallons versus 838,000 gallons) and a 65 percent reduction in waste discharged to the city system (1400 pounds versus 4000 pounds of BOD). Blood from the killing room has been effectively eliminated from plant effluent, and feathers in the plant effluent have been controlled. Biological quality of the final product has been maintained.

The Water Quality Office, Environmental Protection Agency, and Gold Kist supported the study on a 70-30 cost-sharing basis. North Carolina State University provided technical and research requirements including a biological evaluation of all phases. Effectiveness of the project has been greatly enhanced by the full cooperation of the Poultry Inspection Group at all levels.

This workshop was planned to give industry and regulatory leaders advance information concerning the demonstration project entitled, "Water and Waste Management in Poultry Processing." The meeting was sponsored by the Agricultural Extension Service, Department of Food Science and the North Carolina Water Resources Research Institute at North Carolina State University. A detailed report of the research will be published in the near future.
It is almost redundant for me to emphasize the need for water; and yet, we often must overemphasize in order to develop a proper perspective for those who haven't begun to think seriously about this need. Stop and think about how important our water supply is. We realize that it might be painful, but we can go without food as living organisms for a longer period of time than we can go without water. As you fly about in an airplane or travel in various countries, particularly in very arid regions, it is most interesting to note how the population follows the water supply. The bits of greenery stand out where the wells and streams have burgeoned forth. We're so vitally in need of water; and yet, we in North Carolina take it so much for granted. We have an abundance of water and at this time a fresh, clean water supply that we can preserve. As our population increases and our industrial demands for water increase, and you are considering these demands today, the amount of water per capita will continue to rise. Within reasonable bounds we have a fixed supply of water available. It is evaporated into the sky and then returned to us, moving from the continental divide toward the coast. We must learn to use this water resource in a most efficient and effective way. In the area of industrial uses, we are now just beginning to sense the need for proper usage.

This morning we had the good fortune of visiting a poultry plant similar to the one you will be discussing in your report today. This gave me a first-hand look at some of the problems involved in your study. We must have water to provide a quality product for our consumer; and yet, the cost of providing that water can become critical. I think it is most timely that you have come together to consider the results of this unique study. It isn't a laboratory study, but you have used the laboratory as a monitor. You have an operational working model which has been examined and permitted certain changes. This will make the findings that you shall be discussing most relevant to actual plant operations. The research to be reported could be one step toward finding the correct solution for your water utilization and waste disposal needs.
Professor Howells has kindly asked that I participate on the Water Resources Research Institute Board. By participating with you today, I shall gain an introduction to the program which his Institute is cooperatively sponsoring with other units of the University. This is a wonderful example of how we can and must work together to solve such broad-based problems in the days ahead. A multi-disciplinary approach involving segments of our industry and economy, provides the only meaningful way to approach problems of such a broad scope.

It is a special privilege for me to be able to be with you, and I wish you every success in your deliberations and discussions this afternoon. However, I do hope that you will not agree completely on all points that are presented. I remember a visit from Professor Hayes of the University of Minnesota to our campus some years ago. He pointed out that "progress is made by people who care enough to disagree." So if you will have sufficient concern about the problem at hand to disagree, once in a while, I'm sure solutions will be more rapidly forthcoming.
WORKSHOP OBJECTIVES

Professor David H. Howells, Director
North Carolina Water Resources Research Institute
of the University of North Carolina

The workshop objectives are clearly stated in the flyer sheets so really all I have to do is to repeat them. But this gives me a chance to make a couple of brief points that I much wanted to make. I think all of us here agree without any restatement that the water resource we're dealing with is relatively fixed in quantity. In spite of the very optimistic reports of the Bureau of Census during the past few weeks concerning the sharp drop in reproduction in this country, we have a lot of people in the pipeline, and I'm sure the population is going to continue to grow for quite a few years to come. Accompanying this, of course, will be a steady increase in industrial production.

It stands, therefore, that with these continuing pressures cities and industries in North Carolina are going to be faced with a future of increasingly stringent controls on the wastes that they're permitted to discharge into the air, the water and onto the land. This will be costly if we persist in our preoccupation with waste treatment—costly, indeed. Our goal, however, is not to build waste treatment facilities and I think we sometimes lose track of this. It is to preserve and upgrade water quality through the most economic combination of actions starting with in-plant reductions and other changes in water use in the industrial process.

In the near future many of our communities in North Carolina are going to be faced with providing at least some degree of advanced waste treatment, particularly in the upper Piedmont crescent. All will have to upgrade the efficiency of existing waste treatment facilities. As our communities and industries move into these higher ranges of treatment efficiency at higher unit costs, it becomes very important that our communities and industries imaginatively search for the least cost alternatives. This, I think, is of crucial significance.

What I'm saying is that all steps less costly than treatment must be taken before we invest in additional treatment facilities. This is not to say that steps toward necessary treatment should be postponed, but that they should be accompanied with an intensive review of the
preliminary steps which can sharply reduce the costs to reach our common objective which, of course, is clean water. Now this can avoid or decrease the need for new capital investment and operating costs for both waste treatment and water supply. It can increase the overall efficiency of waste reduction—and I use that term in lieu of treatment—and possibly defer the need for more advanced waste treatment. Also, it can save money for industry and the citizens at large.

The successful demonstration of the potential benefits from in-plant changes in the poultry processing industry is the purpose of this workshop today. The objectives, as you noted in the flyer, are: (1) to share the results of a research, development and demonstration project in the Gold Kist plant in Durham; (2) to interpret the usefulness of these results for improving the operations of your plant; and (3) to discuss the implications of the results for implementation of water conservation and waste abatement programs by poultry processing firms. This success story can be repeated in many other locations to the benefit of all of North Carolina and the states represented here today. It's worth noting, I believe, cooperative institutional participants in this project; i.e., the Environmental Protection Agency, the Southern Cotton Producers, and the state land grant university, all with the blessings of the State Department of Water and Air Resources. It shows what can be accomplished when private industry, the environmental agencies, and the university get together and put their collective shoulders to the wheel. I hope we have a very successful program today.

**Question:** I might ask, Professor Howells, it's nice to have alternatives, as you have expressed in your comments, and I'm sure that certain alternatives are more effective than others, which of those approaches do you feel is most effective?

**Answer:** My principal reference here, of course, using the Gold Kist project as an example, is the increased efficiency in the use of water, thereby reducing the volume of water purchased and the amount of waste which must be treated and controlled. These in-plant changes are made as alternatives to treatment to the extent they reduce the wastes discharged to a treatment plant.
This is a broad title—Economic Aspects—that leaves me lots of leeway. I could talk about whether printing money is a good way to increase our gross national product or I could talk about the President's wage-price freeze. However, I think I am supposed to talk about the relationship of this Gold Kist waste reduction project to the economy and to other research. Dean Legates and Professor Howells have done a good job of relating it to environmental concerns. We know that some of these environmental concerns are emotional and ephemeral, and it's possible to go off the deep end. Dean Legates made reference to the phosphate announcement. The government has had to make a reversal on its original stand against phosphates in detergents. I think there is a strong case to be made for better cost-benefit analyses of regulations or more study of all the pros and cons before the regulations are enforced.

Compared to regulations, the demonstration grant that we're considering this afternoon is a low-keyed, calm approach to environmental questions. The federal government pays 70 percent of the cost of the demonstration with the company putting up 30 percent. The way this project got started is that the university and the company got together. The university agreed to do the planning and scientific aspects, and Byron Hawkins with Gold Kist over in Durham agreed to manage the project and make some in-plant changes. We tried to analyze changes in the plant and make sure that they would be profitable before we made them. Byron Hawkins could veto any far out or unprofitable proposals.

I want to talk about another approach to pollution problems which is also related to the success of this demonstration grant. I refer to the industrial waste surcharges that Durham and some other cities are now using. Cities faced with higher costs of waste treatment are considering surcharges based on the strength of the wastes that they receive. In the past, they have simply charged for sewage or industrial wastes on the basis of the number of gallons or the volume of the waste. Lately, those that have had the worst problems have resorted to surcharges against industries that discharge large amounts of
treatable wastes. They charge on the basis of the pounds of BOD or suspended solids that are in the waste.

Maybe it would be good to think just a little about why poultry processing wastes might have been high or why some people might think they are high. "High" is only a relative thing. What grounds do we have for accusing the poultry processing industry of having "high" wastes? It's relative to something that we think should be lower. But one reason that these wastes might actually be relatively high compared with what it's profitable to do could be that these costs are insignificant in the total cost picture of the processing plant; water is a very small portion of cost. Yet, water is one place where industry has a high interrelationship with society so there is a lot of concern for the amount of water used and the quality of the water that comes back.

Another reason poultry processing plants might have seemingly "high" wastes is that some cities have not been giving us any signals as to what it costs the city to treat the wastes. In other words, if we're not being charged on a basis of what is in the wastes, why should this be of concern to us? So this ties in with my main topic, the relationship of the surcharges to these wastes.

Table 1 shows the cities in North Carolina that have surcharges now. Charlotte was the first city to adopt surcharges back in 1956. They charge around $60 per thousand pounds of BOD in their wastes. This surcharge is just for the pounds of BOD over 250 parts per million which is defined as the normal level covered by the regular sewer service bill. For the City of Durham there is a charge of $80 a thousand pounds over 250. In 1962, Greensboro started charging at $22 for BOD and $24 for suspended solids which is roughly equivalent to $36 per thousand pounds of BOD charged to the poultry industry. They only charge for the amount over 300 ppm. Monroe has a charge of $21 for the BOD over 250. Winston-Salem has a charge of $9 for both BOD and suspended solids for that part of each over 300 ppm. Added together this amounts to roughly $14 per thousand pounds. So these five cities in North Carolina have a relatively wide range of charges for the treatment of additional wastes: 1.4¢ per pound, 2.1, 3.4, 6 and 8¢ a pound of BOD. Also, they are charging in the normal water and sewage
Table 1
Surcharge Rates as of January 1971

<table>
<thead>
<tr>
<th>City</th>
<th>Date Surcharge Went Into Effect</th>
<th>Surcharges in Dollars/1000 pounds</th>
<th>Waste Strength in ppm over which there is a Surcharge</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>BOD</td>
<td>SS</td>
</tr>
<tr>
<td>Charlotte</td>
<td>1956</td>
<td>60</td>
<td>--</td>
</tr>
<tr>
<td>Durham</td>
<td>July 1970</td>
<td>80</td>
<td>--</td>
</tr>
<tr>
<td>Greensboro</td>
<td>1962</td>
<td>22</td>
<td>24</td>
</tr>
<tr>
<td>Monroe</td>
<td>January 1970</td>
<td>21</td>
<td>--</td>
</tr>
<tr>
<td>Winston-Salem</td>
<td>1970</td>
<td>9</td>
<td>9</td>
</tr>
</tbody>
</table>

bill for the part of the wastes under 250 or 300 parts per million.
Now you can also see from this table that three of these cities have just adopted their surcharges in the last year, and you can observe that Greensboro and Charlotte were two of the cities that adopted them early. They are also two of the cities that had the highest waste treatment problems, the highest level of waste treatment demanded by society, and the highest cost of waste treatment. It's very logical that those cities adopted the surcharges first. The current emphasis on higher waste treatment is one reason why these other three cities have adopted surcharges. Another reason is that the federal government has announced that it's not willing to cooperate with the cities in construction grants if they don't charge industries that discharge large amounts of treatable wastes according to loading or waste strength in addition to charging on the basis of volume. Are there any questions now about the magnitude of these surcharges or how they are levied?

Question: You've been talking about doing it on the basis of total strength here and then talk about volume. Do you do both?

Answer: Yes. There is a volume charge made through the regular water and sewer bill. This entitles the firm to discharge up to 250 pounds of waste per million pounds of water in the case of Charlotte. If the waste strength of a firm is averaging 1250 ppm, then the city would
consider this firm as being 1000 pounds above normal for every 1,000,000 pounds of water purchased. The surcharge would be $60 per 1000 pounds.

Let's discuss now the logic of surcharges. I think that you businessmen understand the incentives of charges very well so I'll try not to belabor these points.

Private and Social Effects of Surcharges

Surcharges make their contribution to social efficiency by making industry aware of the cost of waste treatment in the most dramatic way possible—through the pocketbook. Figure 1 will help illustrate the expected response of an industrial firm to a surcharge. Before the surcharge, wastes in pounds of BOD per year are indicated by $Q_0 Q_3$. The curve represents the cost per unit of removing BOD in the plant rather than sending it to the city. At first the costs are negative or indicate that profits can actually be increased by recovering some by-products rather than let them get in the city sewer. In other words, if the firm were just a little more conscientious about wastes and looking for small profits, it would reduce its wastes from $Q_0 Q_3$ to $Q_0 Q_2$. The profit it would gain is represented by the small shaded area $A$ below the axis. With a surcharge of $S$ it would pay this firm to further reduce its water-carried wastes to $Q_0 Q_1$. Beyond the point $R$ it is less expensive for the firm to buy waste treatment from the city than make further in-plant reductions in wastes. The amount the city would save by not having to treat the wastes $Q_1 Q_3$ would be represented by the area $R Q_1 Q_3 S$. That part of the waste reduction that can properly be attributed to the surcharge is only $Q_1 Q_2$.

Now Figure 2 is the same as Figure 1 but stresses the net returns to society associated with the in-plant removal of wastes $Q_1 Q_2$ and $Q_2 Q_3$. The movement from $Q_3$ to $Q_2$ would be optimal with a surcharge and can be described as the result of an information program or "awareness campaign." The city saves area $B$ and the firm area $A$. The further movement from $Q_2$ to $Q_1$ when the firm removes these wastes in response to the surcharge is accompanied by added costs to the firm represented by area $D$. But the savings to the city are areas $C + D$. Therefore, the net social gain from the surcharge—or from taking care of these wastes in the least
Figure 1. Expected effect of a surcharge on a typical firm

Curve shows added unit costs of waste removed by a particular industrial firm.

$q_3$ = optimal discharge of waste to city by typical firm that was not waste conscious. This is a non-optimal position and the shaded area represents dollar losses to this industry that could be avoided by optimal recovery of by-products.

$q_0q_1$ = optimal discharge of waste to city with surcharge.

$q_0q_2$ = optimal discharge of waste to city without surcharge.

$q_0q_3$ = cost to city of waste treatment that could be avoided by imposing surcharge.
Figure 2. Social returns to information programs about industrial wastes and to surcharges

Curve shows added unit costs of waste removed by a particular industrial firm

Surcharge

Surcharge = average cost to city of removing a pound of BOD

Present total wastes

In-plant removal of wastes  Wastes discharged to city

A = returns to information program which this firm can capture for itself simply by removing waste Q_2Q_3.

B = returns to society from an information program assuming this industry moves to its optimal position, Q_2.

C = returns to society from surcharge if this firm moves to new optimal position Q_1 where it is removing Q_1Q_3 pounds of BOD each time period.

D = added cost of in-plant waste reduction by firm per time period.

C + D = savings to city from not having to treat wastes Q_1Q_2.

B + C + D = savings to city from information campaign and surcharge.

A + B + C = net savings to society from information campaign and surcharge.
costly place—is area C. The gains to society from both the information program and the surcharge are the sum of area A, B and C.

A more conventional way to view this same cost curve for in-plant waste removal is as a demand curve for waste treatment by the city. In Figure 3 the curve from Figure 2 has been turned over so that $Q_0$ is on the left and $Q_0Q_1$ represents waste treatment purchased from the city in pounds of BOD per year. The marginal charge for added pounds of waste treated by the city is $Q_1R$, and this is also the marginal cost of further in-plant waste removal. But the whole area $RQ_1Q_0T$ is not paid to the city. Surcharges as they are normally levied are just on wastes above some defined normal strength, NW. Multiplying this defined normal (pounds per million pounds) times the quantity of water (converted to millions of pounds) indicates the quantity of waste treatment purchased through the normal water and sewer charge. The amount of surcharge paid to the city is indicated by the area $E$. The area marked "Free" wastes are only free in the sense that no surcharge is paid on them and that this area depends on the volume of water bought, not on the pounds of wastes. The volume of water bought could increase or decrease in response to such a surcharge.

Figure 4 is included to illustrate the demand and supply for water. The supply or cost curve of municipal water to the firm is a stair-stepped function with a long flat section indicated by $S$. The demand curve before surcharges is $D_1$ and the optimum quantity of water for this firm to buy was $W_1$. Immediately after conventional surcharges are imposed, water takes on an added dimension of utility indicated by the cross-hatched area; that is, the demand curve shifts upward to $D_2$ because additional water purchased provides what we called "free" wastes. With $D_2$, the optimum quantity of water purchased per year would be $W_2$. Surcharges would also tend to reduce the utility of water in plants as dry processes and more by-product recovery are adopted. Ultimately, the demand curve for water might fall to $D_3$ and the quantity demanded to $W_3$. Interestingly enough, a reduced use of water make some of the in-plant waste control devices such as screens and settling chambers more efficient. One of the challenges with respect to a study of the effects of surcharges is to quantify these interactions between the demands for water and sewer services.
Figure 3. Demand and supply curves for municipal treatment of wastes by a typical firm showing surcharges paid

Shaded area, E, shows surcharge actually paid.

NW is the defined level of normal wastes in parts per million.

(NW)W represents the allowable level of waste (pounds of BOD) covered by the normal billing for water and sewer.

W₁ is the amount of water purchased from the city before the surcharge.

Water demanded could increase to W₂ when surcharge is instituted so as to reduce or eliminate E, but the demand for water could also decrease to W₃ as dry methods of waste removal are substituted for wet methods.
Figure 4. Demand and supply curves for water by a typical firm

$D_1$ = demand for (utility of) water before surcharge on industrial waste.

$D_2$ = demand curve for water immediately after surcharge. The utility of added units of water has increased because of defined "normal" in surcharge.

$(NW)W_2$ = pounds of BOD that will not have to pay surcharge.

$D_3$ = demand for (utility of) water after surcharge and after firm has made in-plant changes to reduce water-carried wastes.

$S$ = normal rate schedule for water with declining marginal steps.
We made a study of five poultry plants in the United States that have been paying surcharges for more than five years each. We obtained twenty-seven observations from these five firms. We used regression analysis to estimate the effect of changing both the price of water and the surcharge. As was indicated by curve D in Figure 4, we found that higher surcharges were associated with less demand for water. Higher prices for water also had the effect of reducing the pounds of water-carried wastes per 1000 birds. These effects are summarized as elasticities in Table 2.

Table 2

Elasticities from Ethridge's regression analysis of five poultry processing firms that have been paying surcharges during recent years (twenty-seven observations)

<table>
<thead>
<tr>
<th>A one percent increase in the price listed in this column</th>
<th>Was associated with the following percentage reductions in</th>
<th>Water use</th>
<th>Water-carried BOD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal water and sewer charge</td>
<td>.63</td>
<td>.75</td>
<td></td>
</tr>
<tr>
<td>Surcharge on BOD and SS</td>
<td>.44</td>
<td>.51</td>
<td></td>
</tr>
</tbody>
</table>

A one percent increase in the price of water was associated with a .63 percent decrease in use. A one percent increase in the surcharge was associated with a .51 percent decrease in water-carried wastes. I do not have a high level of confidence in results obtained from only twenty-seven observations, but the coefficients involved were significantly different from zero at the five percent level. The response to the surcharge by poultry processing firms probably has been underestimated by these procedures.

You will notice that at least four of the five North Carolina cities that have surcharges also have poultry processing plants. Monroe has two poultry processing plants—the Central Soya Turkey plant and the Holly Farms plant. I asked Bill Hunnicutt from Monroe about the reductions in wastes in the processing plants there. As far as I can interpret the data, there's been at least a 35 percent reduction in wastes in a one-year period in the Holly Farms plant. Mr. Zimmerman explained that there has been a reduction in their processing of
broilers and a large increase in cutting-up operations. Data on seasonal output of turkeys would be needed to interpret the data on wastes from Central Soya's plant.

I don't want to steal the thunder of the next speaker to talk about the Durham study. However, the waste reduction that we have seen in the last two years in the Gold Kist plant is dramatic. Water-carried wastes are down from 0.045 pounds to 0.025 pounds per bird. That's pounds of BOD. There has been a more dramatic reduction in water, and John Macon will make it clear that we have not yet finished all the possible ways of reducing wastes. Water reduction is one of the secrets of reducing the cost of wastes separation. Screens, settling tanks and pretreatment are more efficient if you have less water.
THE GOLD KIST STUDY
Background and Procedures

Mr. Roy E. Carawan
Department of Food Science
North Carolina State University

The background of this study is very unique. I would like to give a couple of comments on the background and explain how the project developed.

All of our previous speakers have mentioned the increasing emphasis on environment, and their comments reassure me that it is an important fact; and that indeed, we do and should have this increasing environmental emphasis. I'm sure that if we had this meeting five years ago no one would have mentioned the environment. This emphasis has prompted new regulations and more vigorous enforcement of all regulations. We have new state regulations regarding waste discharges. We have the Corps permit program and the Environmental Protection Agency. You heard Dr. Seagraves mention that all cities who receive federal funds to build a facility--and I believe that just about all cities do receive these funds--will have to start charging equitable costs for waste treatment. Also, we're faced with the rising costs of production. I don't think this is any secret to the people in the poultry processing industry.

We began this study with the realization that the cost of water and wastes could be very significant in poultry processing. Although they're small, they're still significant. When only approximately 7.3¢ per pound exists for live hauling, processing, selling, delivery and profit and you take a cost of 0.1 to 1¢ per bird, it becomes very significant. Byron Hawkins can tell you when the costs go up at the same time they put a surcharge on you, it becomes a lot more significant. The management of water and wastes in the poultry processing industry has long been disregarded because it could be disregarded. It was too small to profitably manage. We began developing the project with the premise or the belief that management in poultry processing would act providing they had the necessary knowledge. We didn't believe that plants knew how much water they were using. We also didn't believe they knew how much wastes were being discharged or where they were coming from. What is normal operation for a poultry plant? Well, there are some figures in the literature; and since we began this study, I think we found out
they aren't too reasonable. They were developed fifteen or twenty years ago, and the poultry industry has expanded very rapidly in the last ten to twenty years, the plants have been modernized and have become larger. We now have some tremendous size poultry processing plants today.

I prefaced this with the fact that management would act providing they had the necessary knowledge. I have to agree that possibly a surcharge gives them a little incentive to do this. I'm not recommending them, but it does give an incentive. We began developing this study as a research project at the university with the feeling that something needed to be done in the poultry processing industry. There was enough water used and waste generated that we thought we could make an impact. Dr. Bill Crosswhite really helped begin the project. We began early with a small project from the Water Resources Research Institute of The University of North Carolina, and from there we proceeded to go to the Environmental Protection Agency. At that time we were offered the opportunity to do a demonstration grant with the poultry processing plant, and this is when we approached the Gold Kist organization and Mr. Byron Hawkins to act with us on this demonstration grant. The way a demonstration grant works is the federal government is willing to put dollars into an area where there is no knowledge, where you need modifications and where you need changes. This is what we felt was true in the poultry processing industry. We needed to tie together things that were there; we needed to tie together the new processing steps that were available.

Will someone turn on the projector? I work with the Agricultural Extension Service at North Carolina State University, and that's our famous Bell Tower. I'm in the Department of Food Science. That's our new building on the campus. If you're ever there, come and visit us. Our project was entitled, "Water and Waste Management in Poultry Processing." This is a pretty broad and pretty all-encompassing title. I hope by the time we get through that you'll better understand our project.

The trend of poultry production has been a great increase over the past two decades. The total production in the United States in 1970 was approximately 3,000,000,000 birds. The North Carolina State
University (NCSU) role, which is very unusual in a research project of this type, was involved with Gold Kist in what we call a subcontract. First, NCSU was responsible to train the operating personnel in the plant which were provided by the Gold Kist organization to manage the project, take samples, do the lab testing, and to be there and do the actual work. Also, we were responsible for supervising the sampling procedures that went on in the plant. The third thing was coordinating the development of the specialized equipment; to help decide what types of equipment would go in and where and help develop it; provide technical assistance in the in-plant changes, and this was largely through the efforts of Mr. John Macon who you will hear from in a few minutes; and to make a system evaluation in benefit-cost analysis. If we put in some changes, just what would they cost another poultry plant to institute and what could they expect to gain from these changes? We also need to develop some management guides. These can tell you how to develop the equipment and how to motivate the people to use less water and generate less waste.

One of the special features of this project was the joint development of the project. We had the Department of Economics with Dr. Crosswhite and Mr. John Macon, and we had the Food Science Department with myself. Dr. Speck and Dr. Tarver gave unlimited assistance, and this led to the interdisciplinary research team. Also, as I mentioned before, we had a full-time in-plant project staff which consisted of Mr. Lawrence Carter through most of the project, and he was the one that helped sample and keep records of the daily projects. Mr. Hawkins supervised him, and also through our efforts we helped supervise him and tell him which samples to pick up and where. But he was the one who was in the plant and had to do the work. Then, the applied systems analysis which was done by a graduate student in the Biological and Agricultural Engineering Department. The supporting biological work was done by Dr. Speck which he will report on later. Our reason for the biological work is that as we were making these water reductions and eliminating wastes, we had to assure ourselves and the USDA that the wholesomeness of the birds was not affected. We appreciate the cooperation of USDA in our project. They helped us in deciphering regulations, analyzed our work, and helped keep us on an even keel. Also, we appreciate all the cooperative work relations. I think Professor Howells pointed out very
clearly the cooperation we have received. There were the employees of
the Environmental Protection Agency; the state water resource people,
the Water Resources Research Institute and all the university staff.
We've had people from all over working with us on this project.

The demonstration project, although conceived by the university
and EPA, was asked for and granted to the Gold Kist organization. The
actual tests are being run at their Durham plant. The Durham facility
was managed by Mr. Byron Hawkins and Mr. Lawrence Carter was the
in-plant project director. Poultry are processed in the plant on two
lines with a combined capacity of 12,000 birds per hour. The cooperation
experienced within the university was continued with the Gold
Kist organization.

Now, getting to the specific objectives of the project: (1) to
install and/or modify the processing equipment itself. What could we
do in modifying the equipment that was in the plant to enable it to use
less water, to generate less wastes? (2) to evaluate the impact of these
changes. How much water reduction would a change make? How much waste
would one of our changes eliminate? (3) to determine the economic impli-
cations of these changes. Could a poultry plant justify the expenses
of the process modification? In other words, would we save enough
water and would we eliminate enough wastes to justify spending the
money to make the changes? Not all of our changes panned out. We
didn't expect them to, and this is why we had the demonstration grant.
If we had the answers before we started, we wouldn't have had to do the
work. (4) to formulate the management guides which I discussed
previously.

Now our basic plan of work was first to obtain bench mark infor-
mation. By bench mark information, we mean just how much water was
used in the plant. Where are the wastes coming from in the plant? This
was just to give us an overall feel for what was going on. The second
thing was to approach the technical developments in the plant itself.
These were the process modifications or changes. The last thing would
be the economic analysis and report writing, and we're not quite through
with the project yet; hopefully, within the next six months, we'll be
complete. Then, we will prepare the reports and management guidelines.
We decided to attack the whole plant as an operating unit and eliminate
the wastes before they got out of the plant. Slide A represents the plant. If you'll follow the potable water from the left and the birds from the truck going to receiving, the killing station, scalding, defeathering, the whole bird wash, evisceration, the final bird wash, chilling and then into grading, weighing and packing, you can spot the uses of water and areas of by-products recovery. You have feathers from defeathering; you have your blood; you also have offal that with the feathers normally goes to a poultry rendering plant, and they are both conveyed in the plant by water. This is one of our problems. When these go into the water, you get all the soluble substances in the offal leaking out; you get feathers, bits and pieces and everything else that has been going to the waste treatment system. One of the problems you have is how to eliminate the water in getting these out of the plant. It's very easy to throw it away in the water, but what are the problems you run into?

The way we approached the bench mark data and the biological work was to go to different points in the plant as shown in Slide A. But we took each unit operation in the plant and looked at it in its entirety. For example, we took the scalder exit; the chill entry and the pre-chiller, the whole bird wash, and at each point we took water flow and waste water samples to determine where the wastes are generated. Then we added these up for the total waste stream of the plant. Also, we did the same thing for the biological work.

Now if you wonder what this means in North Carolina, last year, if my figures are correct, we produced somewhat over 300 million birds. Using average water use figures, this amounts to over 3,60 billion gallons of water that was used in North Carolina last year from the processing of poultry. From two to ten million pounds of BOD₅ were discharged from the plants. You will notice I used a wide range there. It all depends on whose figures you're using for what plant. We do not have figures on most of the plants so I'm averaging these myself. But I'd say somewhere in the two to ten range, and this shows you the magnitude of the problem. It's quite a lack of information in this area and this is one of the problems and one of the reasons that we started the project.
Notable Water

Slide A. Flow Chart of Poultry Processing Plant with Sampling Points
Process and Equipment Changes

*Discussion with Slides by
Mr. John A. Macon
Department of Economics
North Carolina State University

It's a pleasure to be here. Usually, at the university we wouldn't think of doing a study without going through a laboratory model, a pilot plant and then scale-up to a full operating unit. When we proposed this research study to Washington, Washington wasn't interested at all. They said, "No, if we're going to get the job done, we want it now." That is, they wanted action. That's also what we wanted. So they turned us down in the very beginning and sent us back home. It was at that point, really, that the project got started as a research and demonstration grant. In revising the project we did exactly what we would have done at the university with one exception. Instead of buying a test tube or a flask, we bought the whole thing and put it in the plant no matter what it was. If it didn't work, we had paid out more money than we should have. But with all the effort that was made, the prime purpose being--and we hope that this will be true--to make changes that could be installed nationwide upon completion of our project with at least a two-year or better gain in time over traditional type research.

If you will look at it from that standpoint, we are thinking primarily of using our plant as a "laboratory in action." We made mistakes; we purchased materials that went to waste; but in making our mistakes, we were able to say these mistakes led to success. I think they should have changed the title of my subject to "The Problems of Getting These Changes Made" because there were some problems. First of all, I realize that it's hard enough to measure the quantity of goods going out of a plant, but water was squirting out of so many places in this plant I believe it would have been impossible to have measured all of the water going out. At that time it was close to a million gallons a day, and you don't put that in your pocket or bucket either.

* The slides could not be reproduced.
Question: Where were these gallons squirting out?

Answer: Well, if they weren't squirting out, they were going some place. They were running through the meter.

So that led us to believe that we'd better start some implementation on it which we did. Of course, we went right directly to our Parshall flume, which is nothing more than a measuring device. That and the V-notch weir were used with constant recorders. I realize that many of you are not familiar with these items, but maybe we can show a few slides as we go along. The thing that I carry around with me from now on is not only my watch, but my stopwatch. With a bucket and a stopwatch you can find out how much water is squirted out in those places.

Starting here with a Parshall flume, which is just one view, it is a restriction where you can measure the volume of water by merely taking a measurement of the depth of water flowing through the restricted area of a metal container which is just like a pipeline. Following that with a sampler—and I realize that it is very difficult to get good pictures of these units—but this was a composite sampler that takes samples continuously for twenty-four hours. This sample of the effluent gave us some representation of what was in the volume of water that was passing through the plant. Housed above this Parshall flume is a Thompson recorder that recorded the total flow of the water. Measuring to get the original volumes was one of the first things done throughout the plant. We put in water meters in just about every logical place to measure the daily volume of water. We knew then what was happening in each individual process. Meters were a very important part of our testing program.

The next thing was to find out if we could get the same results twice. Let me say that you can take samples all day long only to find out that if a worker comes in the next day and opens up the valves different than he did the day before, you're right back where you started. You don't know how much of what is passing through where. So the first thing we learned was to control, and this is my second topic. In this slide you can see the flow regulation and volume control. Before we could ever get a uniform pattern on waste use in this
plant, we had to settle it down and get at least some uniformity of operation; because literally, it was so irregular that I couldn't keep up with it. So one of the things we had to do was try to find out if we could get some regulation.

I have here three items that are common to everybody. On your right is a water pressure gauge. I know you've seen them on every home well system in the country, and you've seen them in many other places, too. Slightly to your left is a gate valve that is as common as the day is long. You can regulate the amount of water by shutting the valve down to a point where the gauge shows a certain amount of pressure. This pressure is uniform here giving us a certain flow. When using the pressure gauge and gate valve, you are relying on the operator to make that change or to check that flow every day. In this case we added a feature. We wanted to shut the water off and come back the next day and have the same flow as the day before. So we bought the third valve and put it in series with the ones that are supplying the spray nozzles. This assures a constant flow each time the gate valve is opened.

In this slide is a view of the quick shut-off valve which I recommend wholeheartedly because of the saving in time in opening and closing it.

Now we want to start with some of the processing departments. I'm going to try to follow the sequence of events that Roy has shown you on the flow diagram prior to this. In this slide you see the chickens that have been brought in, hung on the shackles, killed and are now passing along the blood collection chamber which we call the blood-collecting system. One of the first things we started to work on was one of the most difficult of all and that was to control the high BOD, concentrated blood that was being scattered all over everywhere. They have automatic killing machines in this plant, and it turned out that hand-killing is still giving us one of the lowest counts
of poor quality birds. So in spite of how well you have your automatic killers going I hope you success, and I hope that some of you can show me how it still beats the hand killing. At this point technique is something that needs to be challenged, and a good killing machine provided. For the workers doing hand killing we provided splash shields at the other end of this trough that are not visible in this picture; to keep all the blood possible contained and to keep it off the workers. The environment had been improved in such a way that at the time we had to remove the shields for experimental purposes the workers threatened not to hand kill chickens that day. So you can see it was not only for the benefit of water reduction and waste control, but it was an environmental and human resource advancement.

Along with the shields we have a stainless steel, sheet metal trough container. You will notice how clean and white these birds are. This is because right after the birds are killed—and if you've ever been around the home operation, you know that they flop all over the place—they pass over a series of electrical shocking bars and are stilled by the shocking machine early after being killed. You will notice that the body and the feathers are kept clean, the blood is well contained in our trough; therefore, we are collecting not only the worst pollutants of our plant but it is now a good by-product. Mr. Hawkins says he likes the way he gets the money back. So from that point we'll go now on into the next series of slides which is the defeathering department.

**Question:** The walls shown to the right—were they the original walls?

**Answer:** Yes, sir, it's true and you will see a picture later showing what the wall looked like. There has been a drastic change in the amount of loss of materials at this point.

In this slide I'm pointing a finger toward the recirculation lines to the scalder. The scalder is a chamber used to heat up the birds and wet them so that the feathers can be flailed from the birds. In this case instead of using regular fresh water, we installed the recirculation pumping system to go back to the scalder. This was a reuse of water and put the water from the chillers into the scalding machine.
Reuse of chiller water eliminated the use of fresh water for scalder make up. Now remember, our primary objectives were to do two things: To reduce wastes but at the same time minimize our water usage, and this was one case in which we are minimizing the water.

The largest volume users of water in this plant are the little hand nozzles at each eviscerating station along the evisceration line. See this picture of small timed spray nozzles that are used by the workers to both cool and rinse their hands from bird to bird. In this slide you are seeing a picture of one of the later versions of our first nozzle. When we first went there, they were using shower heads just like the ones found in home showers. Instead of washing their hands, the volume would be equal to the amount for washing a whole human being with a shower head. The shower type nozzles used three and a half gallons per minute. Our last nozzles like the ones in this slide use about 0.4 gpm.

Water flow rates vary slightly from place to place and station to station. With this drastic reduction in the amount of water these operators today do just as good a job as when they were using three and a half gallons of water per minute per nozzle.

There’s another view of the same type of nozzle. A worker was not at that point, but most important is the pressure gauge showing regulation of the flow out of these nozzles. Here’s what was happening to Durham prior to this study. The pressure going into the plant might be the same but due to the variable use of the water throughout the plant, the pressure would bounce up and down like a rubber ball and would range anywhere from about thirty-five to forty pounds up to eighty pounds or more. When the pressure ran up high, these nozzles would fog you just like you were going through a shower of rain. Before we could even use the nozzles, pressure was regulated to them. I'm going to stop at this point to point out some more of the different spray nozzles that we have.

Here is a body control valve which we will pass around. I'd like for you to see it. First of all, some people told me the workers wouldn't use it. It is sold by a regular manufacturing company, and here is an incident in which you don't see any water being sprayed, and it is being used. I do not recommend it on all the stations
throughout the whole plant. I am telling you that there are certain types of valves and spray nozzles that will further reduce your water. So please do not overlook them. Before I go any further, shown here is a tickler nozzle. This nozzle has not been approved by the USDA. We are examining this nozzle by experimentation, thanks to Dr. Harner and his staff. This tickler type hose nozzle is like one you would have at a service station that quits running when you drop it down. In this slide the lady was kind enough to hold this to one side to show how the water was flowing off the end of the tools and on her hands as she was using this nozzle. She wasn't washing her hands in this particular case but demonstrating this nozzle to show that the water was flowing to one side. We have found the total count and all on this very low, and we are going to pass the information to the USDA for their evaluation hoping that some day this nozzle may become useful to you. It does cut the water off completely. I'm sorry I didn't bring the other slides to show you, but it is absolutely a completely shut-off flow nozzle. It will not run until you push this little bar to one side. You will find them sold by your local supplier.

Coming back to the particular kind of control we had, here it is, the gate valve. Another thing we wanted to do along the eviscerating line was to further reduce the amount of water. We found that the pan on each side has to be flushed with water to keep the sides clean while the workers are working. As I mentioned earlier, the pressure regulator was installed before we could use the hand nozzles and shown in this slide is where we changed the valves from a single valve feeding the whole system to pressure regulated valve with the automatic control valve. This is shown at the base beneath the unit. The whole line is now on thirty-five pounds of pressure throughout the system. The spray nozzles are all adjusted exactly to fit the needs of the individual worker. When the pressure bounces up and down, this valve will regulate it to the preset value for you. We are getting much more uniform results, and the workers are not getting wet. It is a control device as we would think of it.

I wish I could have shown more in these slides than I have, but the control of water along the sides of these pans is through the valving underneath. If I could show the regulating valve, it would be a timed
When the water is on, it flows full force to properly flush the surface of the eviscerating pan, and then the electric timer cuts that water off immediately. It stays off a predetermined length of time, and then it's turned on again. We have found that this sequence gives a very clean surface along the pan while reducing the amount of water used. Before, in trying to control the water they had reduced the flow by merely cutting back on the amount of water flowing down the pan. Here, we felt like it needed the full force of the water to clean the total surface of the pan; and yet, we did not need it every moment of the time. That's one of the reasons for the automatic valve as well as the pressure regulator put in there to show you that while you have thirty-five pounds on the spray heads, you have the full eighty pounds here to flush the sides of that pan down and keep it clean.

The next thing I found was enough fittings in this plant to outfit several homes around Durham. We have completely rearranged some of the equipment. Not one of these outlets shown in this slide now exists. We again are trying in every place possible to minimize the use of water. Looking at the next slide you see the water falling into a galvanized tank underneath the eviscerating trough. We have gone beyond the normal trying to find out how we can save water into experimental uses. Of course, this is strictly a USDA-unapproved system at the moment in which case we have made a study of the water coming from the birds, being washed off the birds, and out of the chiller; and it was being used back in the gizzard-splitting section only to flush the contents of the gizzard down into the pan. Not every point on the gizzard-splitting machine received the reused water or the continued-use water. A full study has been made and is being written up, and you will get the results of this study in the future. We have very favorable results from the study up to the point, and I'm sorry to say I cannot say more at this time.

In this slide is another view of where we would like to eliminate or minimize water. It shows ice being put into the chillers through a slush water system. This plant gets no credit for the amount of water used against the amount required. As soon as a device is developed or engineered to measure the slush ice, we can reduce the amount of water running into the chillers by the quantity that you see flowing as slush ice.
Again, one of the major systems that was changed in the plant where we cannot necessarily take the credit for here was the use of CO$_2$ as a cooling agent for shipping their products from the plant to the distribution point, etc. Here, you do not have ice that would be made out of water. CO$_2$ is taking care of the cold temperature needed. Not 100 percent, but I would think at the time being 80 or 90 percent of your pack is shipped with CO$_2$ snow. Seventy to 80—it is in that neighborhood. So you can see that a lot of ice will not be made, thus reducing the water use.

Here is something that took place that was a little unusual. They were pulling the heads off chickens in a trough where the water was washing these heads down to the transportation system. Instead of washing that head all the way down the drain, we just started pulling them off dry ahead of it. As it turned out, now all of the heads are carried out dry. This change stopped putting out a lot of BOD.

Just what is it that makes the real difference? During this year it has taken us a lot of time, and we have made a lot of changes. Basically, one of the things that has been the most important of all is that our solid content has dropped drastically. Our BOD has been dropped considerably. But more important is the fact that during this same study the City of Durham increased their water cost by 20 percent and added on the $80 per thousand pounds of BOD. Now I will not go any further in trying to give you the results because this is the part that Roy will come back to tell you about. I will say that with all due respect this work could not have been done had it not been for the fine cooperation of Mr. Byron Hawkins and the inspectors in this plant, our birds could not have gone out of that plant in a good wholesome manner. Remember, we have not reduced water usage tremendously. I would rather say that we have reduced misuse of water tremendously. I think that tells more than anything else. If there are any particular questions about the demonstration grant, I want you to feel free even now or at a later time to be able to feel that you can go to the plant, see for yourself some of the changes that were made, and that are proved and are in operation. I'll be glad to answer any that I can for a very brief period of time right now.
**Question:** What was the USDA's reaction to recirculating the chiller discharge into the scalding for make-up scalding water?

**Answer:** This, I understood, was being done before we came into the plant. The reaction is that it is a favorable operation when it's properly handled. That was being done earlier. I'm not saying what their reaction was in the manner it was being done.

**Question:** Do you have anybody to go into individual plants and assist them in pointing out or maybe recommending how they could improve their in-plant operations?

**Answer:** When you say we, do you mean the university?

**Question:** Yes

**Answer:** Roy, would you like to answer this one?

**Mr. Caravan:** We have help available to assist any individual plant in doing this. Yes, we do but it would be a few months off. We would like to get the report finished after evaluating the data. I think that if you contact Dr. Tarver or myself, we will follow through.

**Question:** You say you removed the heads in dry form. Of course, there's got to be some kind of conveyor system, but how far are you moving those heads and what type of conveyor?

**Answer:** These heads are being pulled off, and they fall directly into a container that is being carried out periodically, frequently from the plant by hand. They are being dumped directly into the by-product trailer section.

**Question:** Is this in the picking area or in the eviscerating area?

**Answer:** It is in the defeathering or picking area.

Let me emphasize one thing in all this. I think Dr. Harner is very liberal in his approach to this project. To say something is all right is to give you an automobile with all four tires flat. It's a good automobile with nothing wrong with it, literally. But the tires just won't let it run. I think the design or engineering and anything that you say about what is done in a plant is as important as saying that it is okay or it isn't okay. If it is done correctly and done in a manner
that it does not interfere with the wholesomeness of the bird, I think you're going to find that your engineering and your design work is going to have a lot to do with whether or not Dr. Harner's inspectors can or cannot agree or approve of an operation. That is one of the reasons I didn't say more about the particular part where we were talking of containers to use water in the gizzard splitting operation because there is a lot to be said in terms of the engineering involved.

Dr. Harner, I think this is part of what you were trying to say in this respect, and as I understand the inspector in the plant did say that this one was working in a way that would make it favorable.

**Question:** At the present moment we are referring to some kind of a flush on the head puller and that it is effective. We will wait for the whole report that goes to Washington for evaluation. We don't want any of the unapproved changes made in other plants until this time!

(USDA, Dr. Harner)

**Answer:** I agree with you, and that's why I made my point very clearly on the engineering. It's really an important part of any planned plant change.
Biological Evaluation
Dr. Marvin L. Speck
Department of Food Science

It is a privilege for us to be a part of this study and report to you now some of the findings, in a very condensed manner I might add, that we were able to make. I would like to say it appears that there still is not any better method for determining the actual (consumer) safety of a product, particularly a product such as poultry, than by the use of microbiological content. For this reason, I am sure we were involved in the project.

Let me review with you, before getting into the actual results, some of the microorganisms with which we were concerned and why. This will be old hat to many of you.

We were interested in the total numbers of the microorganisms present both in rinse water in various points throughout the plant as well as on the final carcass. The total number of bacteria present is one of the overall measurements that can be used to determine the sanitary quality of any given food. The fewer microorganisms that are present, the more likelihood that good sanitation has been used in producing the food and, furthermore, the better likelihood that the product is going to have adequate and desirable shelf life during its storage before the consumer receives it.

In the poultry operations, there are a number of sources that can add to microorganisms, particularly of the bird itself. First of all, the feathers will harbor a tremendous number of microorganisms so that the total outside portion of the carcass is going to be a source of great numbers of microorganisms. Many of these could be very undesirable. The next largest source of microorganisms is the intestinal tract and also the respiratory tract. So it is from these sources that most of the microorganisms gain entrance to the carcass as it is finally produced by you and offered to the consumer.

The next group of organisms that we were interested in monitoring was the coliform bacteria. The coliform bacteria are residents primarily of the intestinal tract; and if we can determine the numbers of coliforms and find low numbers, it is indicative that we are controlling contamination from this source.
Finally, we monitored the occurrence of salmonella on the final carcass. I think I probably don't need to emphasize to you people the importance of salmonella today in the surveillance of many foods. It so happens that poultry is particularly susceptible to salmonella, and many poultry even in an apparently healthy state will harbor salmonella. In this day of consumerism (or Naderism) we can't overlook the importance of these microorganisms to the consumer. Actually, there is very good reason. I shouldn't allude to our regulatory agencies and to Mr. Nader in such a light manner because salmonella is one of the most debilitating illnesses today. I'm not saying there is a high mortality rate. The number of work days lost by the American public due to food poisoning and food infection, especially by salmonellosis, is very high. I would like to point out one further thing, and I don't want to throw scare tactics at you people; but you're going to have to hear of another organism before long that can even surpass salmonella in causing food-borne illnesses. This is clostridium perfringens. In 1970 more people in the United States were made ill from food infections by clostridium perfringens than by salmonella or staphylococci, either one. This was the first time salmonella had been surpassed as a food-borne infection.

I think we have to agree that what has happened in this study has been a very encouraging reduction not only in bacterial counts but also in the occurrence of salmonella in the final carcass. I think that this alone ought to be enough encouragement to adopt the type of changes that have been made in this plant. I would like to quickly add, however, that I think this is no reason to be unconcerned about the remaining organisms that are present. I think that you people of the poultry industry are going to want to find additional ways and additional improvements within your plants whereby you can reduce this type of thing even further. Not only will this be more protection to you against possible penalty from regulatory agencies or consumers but I'm sure that it would also aid you in having a product that has a much longer shelf life.

**Question:** This new organism that you mentioned--new to us--what is it and what does it do?
Answer: This organism is the old gas gangrene organism, but it doesn't cause gas gangrene from eating poultry; and it won't hurt you as long as it hasn't multiplied and grown to large numbers. We are eating this organism all the time. But C. perfringens is an organism that will grow into large numbers when products are held at a high temperature. Now you may say that this is no problem of mine, and maybe it isn't in the poultry carcass itself. But one of the first incidences of C. perfringens food poisoning was in barbecued chicken being held at such high temperature for a long period of time in a supermarket. I'm quite sure that there are many sources of C. perfringens other than the chicken itself. This has, however, come to be a marketing and a food preparation problem; the organism does not grow during processing of the carcass itself.

Question: Would this not be a problem for canning of chicken?

Answer: It could very well be a problem for canning of chickens, particularly if you are going to use vacuum packages and not use very low temperatures for storage. C. perfringens is an organism that thrives when no air is present.

Question: Could not also fish or fish products have this problem?

Answer: You're probably thinking of botulism, aren't you? I don't recall any cases, but you might have information I don't.

Question: How were the coliform counts made?

Answer: They were made from the rinse water itself, and in some of these places from the drippings from the carcass.

Question: Do you have any percentages on the coliform and E. Coli counts of the carcass?

Answer: We did not differentiate here. I'm not too sure that this would have given us any real valuable information because coliform bacteria, whether they're fecal or nonfecal, can originate in the intestinal content as well as on the feathers. We were using this as it's normally used today in the food industry that is an index of sanitation.
I'd like to discuss the overall results now and try to tie together some of the things that Mr. Macon and Dr. Speck have said. First, going back to our objectives, we identified the water use, areas of misuse of water; we helped to eliminate areas of water misuse; we helped to identify the source of the waste, and in many areas we have eliminated practices that led to waste. We're mainly talking about wastes that would get into the effluent. In other words, we were looking for water-borne waste. Now if you take a dry waste and keep it out of the water like we were doing with the head pullers, you prevent wastes from getting into the water. Also, the work that Dr. Speck did in the microbiological area was very important in that it helped establish parameters within which we were working from the microbiological standpoint. Hopefully, it will help establish the wholesomeness of the product. I think further work in this area will be done.

Getting into the area of reduction and to summarize the results, I think we will first look at what we did with the plant. It may be interesting to you who know about the City of Durham to realize that this plant consumes approximately 10 percent of the production of the city. We reduced the water from 838,000 gallons per day or something more than that to in the neighborhood of 580,000 gallons per day. This total reduction is 30 percent or a little greater. The amount of $\text{BOD}_5$ coming out of the plant in pounds were reduced from 4000 pounds a day to 1500 pounds. If you figure this up, this is greater than a 65 percent reduction in wastes. The $\text{BOD}$ of the effluent at the present time has been reduced from 600 to 300; and hopefully, with the final system we are putting in now it will be reduced below this. Grease of 200 mg/l was reduced to 90.

I did a little figuring on the effect of all the plants in North Carolina. We're just talking about North Carolina! The savings in water alone if all the plants could reduce their water by 30 percent

* Slides were used for this talk, and many were not satisfactory for reproduction.
would be in excess of one billion gallons a year. If we could get our reduction in BOD, it would be in excess of one million pounds of BOD a year. Again, using my wide BOD range, it could be as much or greater than six million pounds of BOD a year. We feel that it's quite a reduction.

Now for the reductions in the various areas of the plant, look at Table 1. In the evisceration area the use of improved nozzles in the final bird washer reduced the potable water consumption from 50 GPM to 30 GPM. That's quite a reduction in itself, just by changing the nozzles. The hand washers, as John Macon mentioned, were changed from 285 to 100 GPM. These results were from one of the first series of nozzles we tried, and now we've gone lower than that. In other words, we were almost at 300 GPM before, and we're below 100 now. So that's a tremendous difference in itself.

Table 1

<table>
<thead>
<tr>
<th>Area of plant</th>
<th>Activity</th>
<th>Reduction in potable water use</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>From</td>
</tr>
<tr>
<td>Evisceration</td>
<td>Use of improved nozzles:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Final bird washers</td>
<td>50 GPM</td>
</tr>
<tr>
<td></td>
<td>Hand washers</td>
<td>285 GPM</td>
</tr>
<tr>
<td></td>
<td>Cycling of side pan wash</td>
<td>90 GPM</td>
</tr>
<tr>
<td></td>
<td>Rearrangement of giblet</td>
<td>360 GPM</td>
</tr>
<tr>
<td>Scalding and defeathering</td>
<td>Use of improved nozzles in whole bird washers</td>
<td>45 GPM</td>
</tr>
<tr>
<td></td>
<td>Substitution of recirculated eviscerating flume water for fresh water and new design on feather flume</td>
<td>94 GPM</td>
</tr>
<tr>
<td></td>
<td>Use of chiller water in scalder to replace fresh water</td>
<td>40 GPM</td>
</tr>
<tr>
<td>Cleanup</td>
<td>New high-pressure cleaning system with foam</td>
<td>112,000 GPD</td>
</tr>
</tbody>
</table>
Question: What measurements do the figures you are using now represent?
Answer: Gallons per minute. That's just for hand washing.

Question: What was the other area you mentioned?
Answer: That was the final bird washing.

Cycling of the side pan wash was originally about 90 GPM. Now it has been reduced down to 30 GPM. Of course, this would depend on the effect of the cycling and everything, but this is on one particular set of conditions.

In the rearrangement in the giblet handling, we made a small reduction there. Another area where we made an impact was in the eviscerating flume water, and John changed the design on the feather flume also. We eliminated the fresh water that was going into the feather flume just by a few improvements and eliminated 94 GPM. They just had some hoses stuck in the thing trying to flush the feathers down because they weren't going out. So just a little rearrangement there got rid of 94 GPM. You start multiplying that times sixty, and you come up with a figure of 6000 GPH.

The high pressure cleaning system that went in reduced the clean-up water from in the neighborhood of 110,000 GPD to approximately 46,000 to 50,000 GPD.

Our bench mark studies presented some interesting points that we just want to look at in Table 2. The total water consumption is about 840,000 gallons per day. I think the important point is that the eviscerating trough itself accounted for approximately 200,000 gallons of this 840,000 total. This consisted of the hand-wash outlets and the side pan wash. The other area with a tremendous amount of water use is the gizzard machine and the gizzard splitters where there is 194,400 or almost 200,000 so the eviscerating trough and the gizzard operation consume almost 50 percent of the total water used in the whole plant.

Another thing I'd like to point out is for those of you associated with hoses, a hose used for ten minutes uses 340 gallons. One hose used for one hour is 2000 gallons of water. How many times in your poultry plant do you see hoses just running? Realize that that's
### Table 2
Measured water use for poultry processing

<table>
<thead>
<tr>
<th>Process</th>
<th>Source</th>
<th>Flow Rate (GPM)</th>
<th>Total Volume (gal)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Killing Station</td>
<td>Fresh</td>
<td>2.0</td>
<td>1,080</td>
</tr>
<tr>
<td>2. Scalders</td>
<td>Fresh</td>
<td>38.7</td>
<td>20,898</td>
</tr>
<tr>
<td>3. Pickers</td>
<td>Fresh</td>
<td>38.0</td>
<td>20,520</td>
</tr>
<tr>
<td>4. Feather Flume</td>
<td>Chiller Effluent</td>
<td>94.3</td>
<td>50,922</td>
</tr>
<tr>
<td>5. Neck Scalders</td>
<td>Fresh</td>
<td>1.5</td>
<td>810</td>
</tr>
<tr>
<td>6. Whole Bird Washers</td>
<td>Fresh</td>
<td>37.3</td>
<td>20,142</td>
</tr>
<tr>
<td>7. Defeather Cleanup Hose</td>
<td>Fresh (1 @ 1 hr.)</td>
<td>34.0</td>
<td>2,040</td>
</tr>
<tr>
<td>8. &quot;Hang-Back&quot; Belt</td>
<td>Fresh</td>
<td>9.1</td>
<td>5,460</td>
</tr>
<tr>
<td>9. Eviscerating Trough</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. Hand Wash Outlets</td>
<td>Fresh</td>
<td>285.0</td>
<td>153,900</td>
</tr>
<tr>
<td>b. Side Pan Wash</td>
<td>Fresh</td>
<td>90.0</td>
<td>48,600</td>
</tr>
<tr>
<td>10. Final Bird Wash</td>
<td>Fresh</td>
<td>100.0</td>
<td>54,000</td>
</tr>
<tr>
<td>11. Lung Vacuum Pump Effl.</td>
<td>Fresh</td>
<td>14.2</td>
<td>7,668</td>
</tr>
<tr>
<td>12. Gizzard Machine &amp; Giblet Flumes</td>
<td>Fresh</td>
<td>360.0</td>
<td>194,400</td>
</tr>
<tr>
<td>13. Evisc. Cleanup Hose</td>
<td>Fresh (2 @ 30 min. ea.)</td>
<td>72.0</td>
<td>2,040</td>
</tr>
<tr>
<td>14. Giblet Chiller</td>
<td>Fresh &amp; Ice</td>
<td>4.5</td>
<td>2,430</td>
</tr>
<tr>
<td>15. Neck Cutter</td>
<td>Fresh</td>
<td>4.0</td>
<td>2,160</td>
</tr>
<tr>
<td>16. Chillers</td>
<td>Fresh &amp; Ice</td>
<td>72.1</td>
<td>38,934</td>
</tr>
<tr>
<td>17. Packing Ice</td>
<td>Ice</td>
<td>15 lbs/box</td>
<td>6,111</td>
</tr>
<tr>
<td>18. Bird Pickup (10% in chillers)</td>
<td>Fresh</td>
<td></td>
<td>8,640</td>
</tr>
<tr>
<td>19. Packing Cleanup Hoses</td>
<td>Fresh (3 @ 10 min. ea.)</td>
<td>102.0</td>
<td>1,020</td>
</tr>
<tr>
<td>20. By-product Cleanup Hoses</td>
<td>Fresh (1 @ 10 min.)</td>
<td>34.0</td>
<td>340</td>
</tr>
</tbody>
</table>

Normal processing day runs from 7:00 a.m. - 4:00 p.m. = 725,600 (1,340) GPM

Water Meter Readings: a. Processing (7:00 a.m. - 4:00 p.m.) = 725,600 GPD
b. Cleanup (4:00 p.m. - 7:00 a.m.) = 112,200 GPD
Total = 837,800 GPD
2000 gallons of water an hour going down the drain from that hose laying on the floor. Also, why do you not have nozzles on the ends of the hoses? Why is this water wasted? An employee is too lazy to go over and turn it off because in thirty minutes he's going to want to use it again so he leaves it running.

For those of you that are interested in technical details, if you'll look at Table 3, you will note some of our benchmark results. Look at the BOD of the scalder entry, and you know where the birds enter the scalder with their bloody necks. Also, note the BOD of the giblet chiller which was the highest of our sample locations.

Table 3
Benchmark data.

<table>
<thead>
<tr>
<th></th>
<th>BOD (mg/l)</th>
<th>COD (mg/l)</th>
<th>Solids (mg/l)</th>
<th>Grease (mg/l)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total</td>
<td>Dissolved</td>
<td>Suspended</td>
<td></td>
</tr>
<tr>
<td>1. Scalder Entry</td>
<td>1,182</td>
<td>2,080</td>
<td>1,873</td>
<td>1,186</td>
</tr>
<tr>
<td>2. Scalder Exit</td>
<td>490</td>
<td>986</td>
<td>1,053</td>
<td>580</td>
</tr>
<tr>
<td>3. Whole Bird Wash</td>
<td>108</td>
<td>243</td>
<td>266</td>
<td>185</td>
</tr>
<tr>
<td>4. Final Bird Wash</td>
<td>442</td>
<td>662</td>
<td>667</td>
<td>386</td>
</tr>
<tr>
<td>5. Giblet Chiller</td>
<td>2,357</td>
<td>3,959</td>
<td>2,875</td>
<td>1,899</td>
</tr>
<tr>
<td>6. Chiller I</td>
<td>442</td>
<td>692</td>
<td>776</td>
<td>523</td>
</tr>
<tr>
<td>7. Chiller II</td>
<td>320</td>
<td>435</td>
<td>514</td>
<td>331</td>
</tr>
<tr>
<td>8. Feather Flume</td>
<td>590</td>
<td>1,078</td>
<td>894</td>
<td>382</td>
</tr>
<tr>
<td>9. Eviscerating Flume</td>
<td>233</td>
<td>514</td>
<td>534</td>
<td>232</td>
</tr>
<tr>
<td>10. Plant Effluent</td>
<td>560</td>
<td>722</td>
<td>697</td>
<td>322</td>
</tr>
</tbody>
</table>

But these just give you some idea of the magnitude of the differences between the various areas. There weren't a lot of differences besides these two areas except for the whole bird wash water. It is very clean in terms of chemical characteristics. Also, the eviscerating flume water was found fairly low. One of the reasons for this is the tremendous quantity that was involved in evisceration.

We've used some terms that we've thrown out today, and I just thought I'd like to go through these again. The multiple use of water:
what is a multiple use of water? Multiple use of water would be when you take potable water and you get to the second chiller, it's recycled through the first chiller, then recycled back to the scalding. You take the same water and run back through your feather flow-away and out the drain. This is what we call a multiple use of water. Are you getting the maximum benefit of water when you take it into your plant? These are some of the things we tried to look at, and maybe other areas in the plant may come up. At the present time this is one particular sequence you can go through. You don't have to take in all that potable water.

In reuse of the water, you've got the ice conveying system, and this is where you collect the water and go back and flow your ice back through again. In other words, you're careful you haven't got this water contaminated, and you keep this ice coming in. Another example is in your feather flow-away system. You could recycle this water just to flush your feathers away. That's what's called the reuse of water.

Now you get into a continued use. You can cut your water and go through a sequence something like this. We won't go into that too much. This is just a continued use, and you can explain it here. We have to be careful that we don't get into trouble with regulations, although we feel some of these regulations should be checked out rather closely. I think there's a lot of things we don't know yet about some of these areas of water use, reuse and continued use.

Slide B helps depict the total plant operation from the period of setting up to March of 1971. The heavy line represents water used, and the dashed line waste discharged. Note the fluctuations in the curves. Generally, I think you can see that the trend is down to just over eight—in that neighborhood—eight gallons per bird received. Waste discharge was up about .045 pounds of BOD per bird, and now we're about at .025. Hopefully, these will be reduced slightly as far as what goes into the city system by the time our final system is finished. We're in the process of this now.

The water, sewer and surcharge costs are shown in Slide C. Now I think Dr. Seagraves did a good job of explaining what the water costs are, what sewer charges and surcharges are. Most of you who are in a city know when you buy water you are charged for water and sewage.
Slide B. Quantity of Water and Waste Per Bird
<table>
<thead>
<tr>
<th>Item</th>
<th>July 1969</th>
<th>December 1970</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water</td>
<td>$3,069</td>
<td>$2,157</td>
</tr>
<tr>
<td>Sewer</td>
<td>3,377</td>
<td>2,372</td>
</tr>
<tr>
<td>Surcharge</td>
<td>-</td>
<td>853</td>
</tr>
<tr>
<td>Total</td>
<td>$6,446</td>
<td>$5,382</td>
</tr>
</tbody>
</table>

Slide C. Water, sewer and surcharge costs for selected months.

Now for those of you who have a surcharge, you will add this additional figure which is a surcharge. This is before we started the project, right at the beginning. You can see that the water bill was running $6,446 a month. This is after some changes were made, and it's running $5,382. You say that's not much difference? Remember that we mentioned before that the water and sewer costs went up by 20 percent and the surcharge was enacted. At this time if the changes hadn't been made that were made in that short period, we figured out this bill to be in excess of $11,000. So you can see that this difference is better than $6,000. This will give you a feel of what it would have been. The surcharge alone would have been about $3,600. The water and sewer charges would have been over $8,000.

Question: Was the same volume of water used in comparing these costs?

Answer: That's what I'm saying. This shows a reduction. In other words, the same number of birds were processed, and we've set the water and the wastes by that amount and reduced the bill by that much.

There was originally some plant effluent concentration, but you have seen the reduction. Remember that this does not even reflect the total reductions, but it gives you some feel for changes that were made from May to October with the Durham City Ordinance BOD surcharge of $80. Now some of the major process changes were not made such as in the blood-collection system, the changes in the feather flume, grease
collection at the final bird washer and the plant effluent settling basin which is in progress.

Some of the equipment modifications that resulted in water conservation were in the scalding operation, the bird washers, the change in nozzles, the hand washers, the giblet processing and handling—we're in the process of doing that—the final bird washer, change in nozzles, and the plant clean-up system. I hope to show you how we changed the figures there.

The object is to get the feathers off the screen, get the water out and get them into the truck going to the rendering plant without letting all of the feathers go through in the system. I think that many of you have heard that the city doesn't like loose feathers.

If we go to the final product of fresh poultry in the CO₂ dry packs, remember it's not packed in ice. You don't have the water running all over the place; but like we said, we can't take a lot of credit for this. Buyers forced this issue.

This is the blood tunnel a normal day before we installed stunners. This is the original wall; you can see blood all over it. You can see the feathers. You can see the birds with blood all over the feathers; and you know they're getting ready to go into the scalders. This is one reason the BOD is so high entering into the scalders.

This is a picture going through the same door. The wall would be right here. Notice how clean the birds are compared with the previous picture. The stunner made the difference.

The next shot shows the floor. This is not the same wall you were looking at, but it is around the corner; and it was in the same shape as before. There is our stainless steel trough, blood collection tunnel or whatever you would call it.

Remember the initial condition; note these birds; see how clean they are. You see very little blood on the birds. By not having the blood on the birds, it means it doesn't go into the scalders, and it doesn't get washed down the drain. Also, you can see the clean walls; you see the blood collecting in the containers. Also note that before the stunner you noticed blood accumulated on the walls, and now it's contained down in the bottom of the trough. It's much easier to collect like this, and you don't have nearly as much of a cleaning job.
We've still got some problems. Recently, I saw a plant employee holding his finger over the end of the hose while washing the floor. I'm really not criticizing him, but I'm just saying that this is an area where we can make further improvement. We should put a nozzle on the hose; we should have a smaller hose; we should control the pressure, but we do need to clean the floor. The question is do we need as much water to clean the floor as 35 GPM? Also, I noticed blood dripping on the floor in a particular location. Maybe we can do away with this or at least contain this blood. These are some problem areas.

We're not saying that everything possible has been done, but what we'd like to say is that we have seen the results as demonstrated. We think they're positive as they have resulted in savings.

We'd like to make a few recommendations: (1) We feel like there should be further investigation into the reuse of water or into the possibility that maybe water could be used over more than once. We think this would take some detailed work. (2) We feel that any plant in the food processing business should have one person in the organization responsible for the water and waste program. I say program, and I emphasize the word "program." You don't just appoint somebody; they've got to have a little authority to get something done. They've got to put in a few meters, a few valves, and control things, and they've got to go ask why do you do this. The hardest job you're going to have is with the employees. You can tell them to do it; but if you don't give them the reason, they're not going to do it tomorrow. This is an important thing that you get this done on a continuing basis. (3) Most plants, especially any plant using as much water as a poultry plant, will need to put in some type of method to monitor the flow, especially of the effluent. This can save you money; this can keep you up with what's going on; and if you've got a person responsible so he can run the tests, he can tell you if some waste parameter is getting out of line such as if somebody dumps blood down the drain. You can tell this because of your effluent. When we come out with our management guides and when you request some information, we challenge you as management to follow these guides as best you can to challenge our findings as were stated earlier. Hopefully, we can all come up with the kind of answers that we need to help minimize water usage and help cut down on the
wastes. To management also, when you've got this water and you've got this problem, if you don't do it now, excuses won't be excused; explanations won't explain; and all your objections will be overruled. This is the way the regulatory people in the water and waste area are going to have to be if they're going to get the job done, to do it now!

Before I close here let me say a couple of words of thanks:

To the Water Resources Research Institute who helped co-sponsor this gathering here today with poultry processors--Professor Dave Howells. They gave us the go-ahead to get going on the project, and this is what got us going.

To the Gold Kist organization, especially Mr. Byron Hawkins, plant manager, and Mr. Harold Chitwood; and we also want to recognize Mr. Lawrence Carter who was our in-plant project director.

To the Environmental Protection Agency for their funding of this project, to Mr. Harold Snyder and Mr. George Keeler.

To North Carolina State University whose cooperation made this possible, especially to Dr. Bill Crosswhite who is not here to tell his part. It's amazing what he did in so short a time to get this project developed. I can't believe the headaches he went through. To Mr. John Macon who we express our deep appreciation, to Dr. Tarver for his efforts and to Dr. Speck, and to Dr. Roberts and Dr. Tousaint for helping work out the joint agreement that helped forge the interdepartmental cooperation.

To USDA, Drs. Harner and Brooks for their efforts in helping us try some of these things and for being open-minded about everything.

To the City of Durham and Mr. Leslie Matthews for his efforts. He helped by telling how the plant had been doing and helped monitor the plant effluent. We appreciate his help.

And to everyone else who helped on the project, thank you.
INDUSTRY PROBLEMS AND CONCERNS - WATER AND WASTE MANAGEMENT
Background
Mr. Byron Hawkins
Gold Kist Poultry

I would just briefly tell you that we were quite happy to participate in this project which is coming to a close now at the end of two years. Quite frankly, I would be most indiscreet if I didn't say there wasn't an ulterior motive in getting into this from the standpoint of me as a poultry plant manager because our City of Durham has to charge for water and for treatment of the wastes. It was beginning to cost, and I was looking for some help. I think the boys from the university who have done such a good job on this were looking for some work to do in this field from the standpoint of the interest that is being brought to bear on us from all over the country concerning wastes and pollution and what not. I would like to say that from Gold Kist we enjoy and appreciate our university in Raleigh for the help they give us and also from the USDA in inspecting and seeing that Gold Kist Poultry is always wholesome when it reaches the consumer in any form that we might offer it to them.

I would also like to point out that what we have done in this project at Durham has not been pleasant at times, and some of it won't be profitable for your plants. The only way you can save as much money as we have in Durham is if you were not using as much water as we were to start with, run it up to high and then bring it back down. It depends on where you start in these studies as to the results that show. I do believe that there are many of you that are operating poultry plants that really would be amazed to know exactly how much water you are using, exactly where you are using it, and how you are misusing it. These are the things that I hope you would get from this. I would also like to say that it is a demonstration grant, and after completion we would welcome any of you by notifying us of anything that you might like to know that we have done during this. I think that just this week I saw somebody that has something to do with city water somewhere that is already suggesting that in the future there might be a possibility of two sources of water depending on the use of the water. It might not be a potable drinking water in every case that we would want; say, for instance, the mud on the wheels of the chicken truck in the back
yard. These are things to think about because we are truly using a resource that is a God-given resource and should be conserved at any time and any way that we can. We have had the cooperation of everybody in our plant that works with us to do this. I think that we have proven that it can be reduced and reduced without harming the final product. This is the reduction that we want. We would not want to reduce it if we did not improve the finished product. I think this study has proven that. It may take other studies to get this accepted, but I think this will come. Progress sometimes moves slow, but I think that it will come.

Again, I say the reason that I was interested in this is that I'm in competition with six other Gold Kist plant managers, and you'd be surprised at the way these big bosses can find ways of comparing just how good a man you are or how good a manager you are--you know, all of the devious methods of getting you to cut costs. This was the reason that I was so interested in this. I'll be quite frank with you.

I would just like to say instead of by-product recovery and waste water use, I'd just like to call it product recovery. We found out in this study that we were losing a lot of good products. First to me is the feet recovery which we sell, the feather recovery which we sell, and the fat recovery which we hope to recover and sell. Anything that we can recover and sell, we're all for.

I was just looking on the surcharges, and I was hoping that Mr. Matthews might be late so I could talk about him a little for the City of Durham; but he got here too early so I'd just like to change my record and say that he has been a great help to us in making us conscious of the feet, heads and feathers which on occasion reach his waste treatment facilities at the north Durham station. We had a great deal of assistance from the City of Durham, and I'd like to say that we appreciate that.

At the same time I'm not doing this for any reason except just to recognize a few people that are here. There are two people here, Mr. Carpenter and Mr. Peterson from Carborundum and I'm not plugging their product, but we are going to use their final separator in this project. It'll be another month or two before it's in. There are a couple of other people here that are with equipment people; and since I've mentioned these, I have to, in the face of equal opportunity,
mention the others that I see here. Dick Lloyd is also here with the poultry equipment people. Mr. Dawson is the one that I personally know has done some excellent work in water conservation. If you haven't talked to him, do so because he has some good ideas. Dr. Wesley from VPI has done a lot of work on this, too. So this is not the only place that some of this has been done, but we welcome you, and we are willing to share it with you.
USDA Rules and Regulations - Now and the Future

Dr. George Harner
Regional Supervisor for Inspection
Consumer Protection Programs
U.S. Department of Agriculture

It's a rather nice turnout today, and you can certainly see that we're all interested in water and water conservation, water purity and waste disposal. Several years ago, Byron Hawkins called me and said that he'd like to have some people come over and talk. Those people were from North Carolina State University, and they came over to see how the USDA was going to react to their proposed study. We went over it thoroughly and made some suggestions as to what they could do and could not do. They have been back several times since. I have been to the Gold Kist plant at least three times myself to see what they have been doing. Of course, the officer in charge and inspector in charge have been there quite often. We've been very pleased with the attitude of the research group. They have been most cooperative.

As I said before, I'm still waiting for the actual write-up of the study so we can go to Washington with it and see what the Facilities Group is going to do with it. That's why I made the suggestion a while ago that certain of these things you can do now, and certain of the things they are doing in the Gold Kist plant are not allowed, yet. This will be determined as we receive the full write-up from North Carolina State study; and of course, it will go upstairs to the facilities and equipment section to be studied thoroughly. After this determination is made, we'll disseminate to you what is allowed at this time and what isn't.

As for the present regulations, they are in the handbook. Let me just go over them very fast. We do require potable water supply to the plant which has to be certified, of course, by the Public Health people. If you have to chlorinate the system with chlorine, we don't like to go over about twenty parts per million because you do start getting eye irritation of the plant personnel.

On the reuse of water that we presently allow, let me just read this to you. Water for chilling units: Overflow water from the poultry chilling unit may be reused under the following conditions: (1) to aid in the movement of heavy solids in the eviscerating trough
but not for flushing intersurfaces and side panels of this trough. (2) After removal of visible solids by screening of the chill water: (a) you can use it in your scald tank; (b) flushing feathers from the defeathering machine apron; (c) feather flow-away; (d) washing down the floor in the picking room or (e) hardening of penning wax. Water from the condensers can be reused when you have certain vacuum breakers in the system for the specific uses mentioned above for screened chill water. It also may be used for any purpose in the plant where artificially heated water is permitted if the officer in charge is provided with a copy of the water potability certificate issued under the authority of the state health agency. Artificially heated water is not permitted for chilling poultry. I think we all know that. During eviscerating processes, artificially heated water coming in direct contact with the product shall not exceed 108°F, which is the body temperature of the bird itself.

Whenever you are reusing water, pumps and pipes that can be broken down and cleaned daily are required. They must be dismantled and cleaned daily! In certain industries, certain towns have five regulations where you can have a connection between your potable water and your nonpotable water, aligned with certain safeguards.

That's about all we have as far as reuse of water is concerned at the present time. We hope this study will provide a lot more uses for it. John Macon did mention a reuse of water in washing the debris from inside the gizzards.

I'm a little sorry to tell you this, but at one of the director's meetings a couple of months ago, I was asked if they had completed the study at Gold Kist and why hadn't they had a summary of it. Of course, I said I hadn't received it myself. We got to talking about this gizzard situation. Washington voiced a very large concern over the reuse of water in this particular operation so gentlemen, you may have a little bit of trouble with that.

At the present time if you are interested in cutting water down on your goose necks, we are allowing controls as a whole other than hand-operated controls on the goose necks. You saw the hip operative type a while ago. I've had seven calls from processors wanting to use the hand-operated control. The decision has been made that the hand
controls cannot be used. We've even had them taken out of several plants. If they are found in your plants, then you will be asked to take them out.

There is a need for foot-operated controls that if they are engineered properly, and if you have good maintenance on the goose necks will save you a lot of water and do a very good job. We are open to suggestions to look at the different types of nozzles, for use on goose necks or for your inside-outside bird washers in your eviscerating room. Lots of savings can be made there. I still say, gentlemen, that one of the big savings that has been emphasized all through the meeting here is that you get your help trained to turn off at noon and during other times when you are not processing. We still go into plants at noon where every water outlet is running full blast and the water is going down the drain. It is of no use whatsoever. So the employees that you have in your plant have to be trained to turn off the water. When you're talking about water, you're also talking about natural resources. There's still lots of lights in certain areas at night, lights that could be turned off and that burn all night long. So you're cutting down on your water and electric bills besides saving the natural resources.

I understand there's one plant in Georgia, and Harold may know where this is as told by Bartie Wood, which has a pressure control valve on their main supply outside the plant. They say this saves a lot of water. So that is another thought from Bartie Woods, who is our facilities man. There is a time-sequence valve, I understand, that is in use; but I haven't seen it. I think there was one out in Missouri at the Fact Finding Conference last year. I was there, but for some reason I missed it. I think you do something to the valve with either your foot or your elbow, and it runs two and a half seconds and automatically turns off. Bartie also told me that there is experimentation going on now with an electric eye that the employee puts his hand over and that automatically turns on the goose neck for several seconds.

That's about all I could get out of Bartie concerning the future. The Gold Kist study is going to have a large impact on the use of water. USDA will have to look at the study itself on paper and probably do some of our own experimentation before we say that you can do this.
or you can't do that. Our primary object is the production of unadulterated wholesome packed birds for everyone to eat so a lot of these things that they have experimented with do have some weight on contamination and adulteration efficiency. We hope soon, gentlemen, to see this study in writing, and then things can move on just a little bit faster.
"July 5, 1970, Secretary of the Interior Walter J. Hickel announced that he was promulgating water pollution control regulations that were proposed first in President Nixon's Environmental Message to Congress February 10, 1970. The regulations apply to the Federal Construction grants program; which is designed to help communities build sewage treatment plants."

The new rules require that:

"---No new Federal grant may be made to any system designed to treat industrial wastes only. If some industrial wastes are to be treated as part of the system's operations, industry must pre-treat those wastes to ensure they would not interfere with efficient operation."\(^2\)

"---A system of 'Cost recovery' must be implemented wherever some industrial wastes are to be treated in a new plant built with Federal aid. Such cost recovery by the municipality would assess the industries a share of the operating costs, and costs of amortizing the debt, in proportion to their contributions to the total cost of waste treatment."\(^3\)

In order for municipalities to meet the requirements of this Federal statute, a sewer use ordinance to regulate and control wastewaters discharged into the sewer system must be enacted and enforced, and a reasonable charge must be made to cover the cost of handling and treating industrial wastewaters.

Of all public utilities, wastewater collection and treatment systems are the most abused through misuse. The reasons for this misuse are: (a) the misbelief that a public sewer can carry away any unwanted substance or object; (b) the lack of adequate regulations

---

\(^1\)Office of the Secretary, Department of the Interior, "News Release," July 5, 1970.

\(^2\)Ibid.

\(^3\)Ibid.
setting forth the proper uses and limitations of the system; and (c) the lack of complete enforcement of these rules and regulations. Industry must not be allowed to discharge wastes to a sewer system that renders the community wastewater plant incapable of performing service for which it was designed.

In order to protect the city's treatment facilities and the downstream users of surface water, Durham has a "Sewer Use Ordinance" enforced by the Industrial Waste Control Division of the Department of Water Resources.

Durham's Ordinance does provide for the acceptance of all wastewater from industry if it is treatable by biological treatment. The city feels that it is in the wastewater treatment business while industry is primarily interested in producing goods.

Every municipality or sanitary district with a combined domestic and industrial wastewater treatment facility should have an industrial waste control program with adequate rules and regulations.

In order to administer an industrial waste control program, industry must cooperate with the municipality. Industry must keep the municipality informed as to the expected quantity of waste as well as the quality of waste.

Industry should provide on each of its industrial waste outlet sewers a manhole or sampling chamber located outside or near its plant boundary line. Each sampling chamber should contain a Parshall Flume, accurate weir, or similar device with a recording and totalizing register for measurement of the liquid quantity. Also, a sampling device to accurately collect and composite samples should be provided.

Industry should avoid discharging materials into the sewer that are prohibited in the ordinance. Poultry plant waste contains the following materials which must be removed prior to discharging into the sewer: feathers, chicken entrails, heads, feet, excessive blood, grease, rags, bones, etc.

The chicken processing plant in Durham does pretreat their waste in order that feathers and chicken parts do not enter the sewer system.

---

Future plans include grease removal. In the past, Durham had many wastewater treatment failures due to treatment process units being suddenly filled with feathers and chicken entrails. The capacity of some of the outfall lines has been seriously reduced due to grease accumulations. The poultry processors must provide a fail-safe system with enough back-up units in order that none of these materials enter the sanitary sewer system or storm drains.

The public will no longer tolerate sewer lines overflowing into the streets due to stoppage that does occur with a slug of feathers or chicken entrails entering the sewer system. Wastewater treatment facilities must operate with very high efficiencies at all times; consequently, stoppage due to accumulations of chicken parts cannot be tolerated.

The public has become concerned because of feather accumulations on road banks and in streams. The poultry industry must develop methods to contain these feathers.

In summary, cities and sanitary districts with combined domestic and industrial waste treatment facilities without an ordinance will adopt a sewer use ordinance. These ordinances will be strictly enforced. All cities and sanitary districts will use some form of surcharge based on BOD and/or Suspended Solids in order to assess industry their fair share of the handling and treatment cost of industrial wastewaters. In the future, all materials discharged to the sewers or surface waters will be evaluated to determine their environmental impact.
I'd like to discuss some of the federal regulations, particularly the Corps of Engineers permitting procedure which many of you may have recently been involved in and the relationship between the State Department of Water and Air Resources and the Corps of Engineers as it relates to what is discharged in the streams.

The Department of Water and Air Resources is the primary state agency in the field of water and air pollution control in North Carolina. Water pollution control in the state is based on a stream classification system which was developed on the basis of best usage. Each stream was classified according to the primary uses which were being made of the stream at the time of the statewide pollution survey. Water quality standards were developed for each classification of stream which would insure that the water would be kept suitable for the purpose for which it was being used. Those uses requiring water of high quality for use as public water supplies and recreation were classified as A and B, respectively. Uses requiring water of lesser quality for use as fishing or fish propagation and fish survival were classified as C and D, respectively. The water quality standards for each class designate the limits for various parameters which must be complied with in the stream such as dissolved oxygen, pH, temperature and other parameters.

In addition to the stream classifications and related water quality standards, the Board of Water and Air Resources has adopted a regulation that requires a minimum of secondary treatment or equally effective treatment and control be provided for all significant sources of sewage, industrial wastes or other wastes regardless of the assigned classification of the stream in which the wastes are discharged. In cases where a higher degree of treatment is necessary to maintain the water quality standards in the receiving stream, that degree of treatment will be required.

It should be noted that the water quality standards of North Carolina have been accepted by the Environmental Protection Agency as being
adequate. The question is often asked, "When must adequate treatment be provided?" The answer, of course, is now. Sources of untreated or inadequately treated wastes must be corrected as soon as possible after they are discovered. The practice of in-plant waste reduction and water conservation cannot be overemphasized. The degree of treatment required for a waste stream is almost directly related to the strength of the wastes before treatment. In-plant reductions in strengths and volumes of wastes an industry discharges through its own treatment system or through a municipal sewage treatment system can drastically cut the expense of proper wastewater disposal.

The area of pretreatment of industrial wastes prior to discharge through a municipal treatment system should not be overlooked. In this area, it's often economically reasonable to pretreat high strength industrial wastes or all wastes from the industry. This, in many cases, can be done cheaper than the industry can pay the surcharge for this excessive amount of waste.

I want to say a little bit about the Corps of Engineers permitting system, although I don't know all the aspects or all the answers to questions that you might raise concerning that system. The Corps of Engineers has recently implemented this system which requires that persons discharging water into navigable waters or their tributaries must obtain a permit from the U. S. Army Corps of Engineers. This system applies to all streams whose water eventually flows to a navigable waterway. In fact, I believe this applies to every stream. The present procedure that the Corps employs is somewhat different from the regulations which the State of North Carolina has with regard to permits and regulation of waste discharges wherein the Corps permit procedure specifies that all sources of water discharged to the stream must be covered under a permit issued by the Corps of Engineers. The state permitting procedure refers to wastewater, and this has been a rather confusing point recently as many of you have been filling out applications to the Corps of Engineers for Corps permits.

In the case of other Corps permitting procedures, each application to the Corps of Engineers for a discharge permit is reviewed by the appropriate state agency involved with pollution control. The state, after making a review of the application, must determine whether
or not the discharge complies with the existing state regulations and water quality standards. If the state determines that the discharge does not meet state regulations, they so advise the Corps. The Corps of Engineers permit system is set up so that they will not issue a permit for discharge if the state objects to issuing such a permit. In addition, of course, the application to the Corps of Engineers is also reviewed by federal agencies—EPA, primarily—and as far as the state is concerned, when they are reviewing an application submitted to the Corps, this application or information regarding it is also circulated to many other agencies for comment prior to the state's commenting to the Corps.

The area of in-plant waste reduction is very important, and one of the areas is water reuse which should not be overlooked. The discharge of cooling water to the sewer system or a waste treatment plant run by industry actually can tax the facilities with excessive hydraulic loads if the facilities were not designed for these loadings.
SUMMARY
Mr. Byron Hawkins
Gold Kist Poultry

I'd just like to say that it's real nice to notice that we are getting attention. Sometimes it's not the type that we might think we'd like to start with, but we have the Dean of the School of Agriculture and Life Sciences at Raleigh now and Professor Howells from the Water Resources Research Institute so their interest is ours, and they are trying to help us.

John Macon and Roy Carawan gave us a good talk on what they have done. In doing this, they just wouldn't believe the many times when I was discouraging them from trying to accomplish some of the things that we wanted to do—even I wanted to do—but I said that we couldn't do them, but they went ahead and did them anyway.

Dr. Speck from the Food Science Department, I think, has certainly added prestige to our data on the biological work, and we need this in our industry because I think some of our regulatory agencies in the past have discounted many good hard hours of work that have been done by industries and people closely associated with industries as being industry oriented, and we are not always of this nature. We do have individuals in the organization that will try to slip a little by Dr. Harner now and then. I don't know of anything that will ever stop this, but we will control it. We need this prestige to help us get some of our ideas through. Certainly, many times we want to do things and without our economics boys to tell us, maybe we'll figure out it's not worth doing so it's good to know some of these things, too.

Dr. Harner can never tell us what we can do, but he can certainly tell us what we can't do. But I would just like to point out that truly he and his office have our business at heart, and they will work with you. I know there are times when you think that you're on different teams; but believe me, he is with us. On the report that he mentioned there—the GAO Report—I don't know what the GAO stands for, but it's for "chewing all out" in most cases.

Concerning my good friend Mr. Matthews, if the rest of the country would operate like our City of Durham does on water and sewer on a pay-as-you-go deal, I believe we would be in better shape today than maybe
our country is on many, many programs. This is a good way to go, and their department operates that way in Durham. For many years he has monitored our plant, and he knows more what I'm doing many times than I do myself. He often tells us. This is a big help. It looks like what the Corps of Engineers is going to start doing is to start monitoring him to monitor us; and it's going to back right on up some way. So I don't believe there's any way to beat it, is there?

Mr. Mills and the boys seem to have raised a lot of questions. But it looks to me like some of these boys, from what I read in the papers, that's discharging any water around that New Hope Dam down there, somebody had better be picking up feathers and everything else. They're making a lot of headlines these days. These are important things. There are people that can help you with this that are in our industry and out of our industry. Don't hesitate to ask.

Mr. Harold Ford was here earlier, but he might have slipped out now. I certainly wanted us to recognize him. We think a lot of him in the poultry industry as executive secretary of Southeastern Poultry, and also Mr. Muryl Shumaker of Southeastern Poultry Times. We certainly appreciate their interest in anything that we do in North Carolina.
The poultry industry of North Carolina is our second largest agricultural industry and contributes nearly $500 million in total income to our state's economy. The industry is young and is growing at a steady rate. Many problems face the industry, but none seem to be quite as important today as our subject: "Poultry Plant Water Utilization and Waste Control."

The problem of waste disposal, waste utilization, water conservation and reduction of overall waste loads, is a real challenge for the poultry industry. This conference today certainly has illustrated that the industry here in North Carolina, in cooperation with Gold Kist, the Water and Air Pollution people, EPA and municipal officials, is willing to work on the problem. We do have a positive program going to attack the problem from a long-range standpoint.

We really owe Mr. Byron Hawkins and the Gold Kist Poultry organization a big debt for their part in this research program. They have invested considerable amounts of money in this overall research program. As we review the results presented this afternoon, it is evident that the processing plant has also profited by using the water conservation methods and waste reducing procedures developed. Over a period of a year one could calculate a savings of several thousand dollars as a result of this research program. From that standpoint, we hope that the effort has resulted in a profit rather than a loss. Rarely do we realize the results from research so quickly.

The poultry industry in North Carolina is growing at a steady rate. It is estimated that the demand for eggs and poultry meat will continue to grow as our population increases. In addition, the consumption of chicken and turkey is increasing each year on a per capita basis. We are in an excellent location here in North Carolina to share in the total growth of the industry and want to assist the industry to grow in a sound and profitable manner. With this growth, provisions must be made for maintaining our environmental quality. The population in general is becoming more concerned about ecology, and we as an
industry must evaluate our program in maintaining the quality of our water, air, and other natural resources. We must ask ourselves, "How can we be better neighbors?"

The poultry industry must develop positive programs for improving the industry image. Agriculture has enjoyed a favorable image with the general public for a long period since most of us or our ancestors had an agricultural background. The present generation is not agriculturally oriented and is not willing to accept standards of earlier generations. It is evident that the total poultry industry needs to take a close look at our public relations and image with the general public. We are all aware of the severe blows to our image during the past few months. These include unfavorable cholesterol publicity, PCB's in poultry meat and eggs, and the unfavorable publicity on poultry inspections as publicized by Mr. Ralph Nader.

The industry and our educational institutions have been promoting a positive publicity program in recent months. We have a well-organized industry that provides wholesome products for the American consumer at reasonable prices. We have an excellent story to tell.

A very important factor in creating a good image and one that we often put off until tomorrow because we have more important things to do today is improving the general appearance of our business locations and places of business. We need to go on an extensive beautification program. We all know what this does to us from the standpoint of our overall image with the general public. If I have a sloppy yard, my neighbors get perturbed with me; but if I have a nice looking yard, I have a better image in my community. The same thing is true for your processing business and our total poultry industry. The poultry processing industry should really go on a campaign to beautify every processing installation in the industry. We must not neglect problems affecting profitability to accomplish this goal but staying in business may depend upon the image you build with the general public. Just a few dollars and a little effort in this area would go a long way in helping us develop a better image as an industry. In other words, we've got to start being a better neighbor. Whether it's the poultry processing industry, a poultry producer, hatchery or other phase, we need to place heavy emphasis on a better neighbor program. In the long run, you know this will pay dividends for us.
Solving problems in any industry often requires cooperation between many people and organizations. We in the poultry industry might well place more emphasis on good psychology in dealing with our neighbors and associates. If we're having problems with various areas of the industry, possibly we should sit down with the city officials that run the waste disposal or waste treatment plant and ask them for their suggestions. Many times an approach such as this will generate many ideas and solutions for problems as well as contribute to our overall image.

Research is undoubtedly the key to developing solutions to our poultry waste problems. We would appreciate your suggestions during the workshop sessions. There are two possible approaches that we can take in attacking the waste problems: (1) from a short-run standpoint we must consider waste disposal, but (2) in the long run waste utilization should provide the only satisfactory solutions. We must find uses for our industry wastes and by-products. In accomplishing this as an industry you should never let the pressure off yourself, those of us in the university, the private research organizations or the organizations within the industry. You ought to constantly be pushing and encouraging research on waste utilization. The Institute of American Poultry Industries or the Poultry and Egg Institute sponsor research programs. As institute members, you should be encouraging them to explore this problem and put research support into waste utilization. Let's find solutions from a utilization standpoint.

One concern we should mention is the handling of poultry manure from our production operations. This waste problem is really plaguing us. We have tried drying and selling it as a garden fertilizer and using it as livestock feed. These uses have been successful, but we really need to take a new approach to this problem and look at it from the utilization standpoint. Possibly there are indirect ways that we can convert manure into useful products. We should encourage extensive research in this area.

Your presence here this evening certainly indicates that you are interested in doing something about the water conservation and waste utilization problems. You should ask yourself what you're going to do at your plant and start looking and talking about various ways of
improving your water conservation, lowering your waste load and finding use for some of those products that you've been discarding. We all want to make a profit, and we all want to stay a part of the poultry industry if we can keep it profitable.

Attitude plays a very important role. This, again, goes back to part of the image that we're trying to build. We should set goals for attacking the problem of water consumption or reducing the waste load. It's often been said that you ought to set your goals so high that you may wonder how you'll ever reach them. If you really work on the problems, you will reach the goals; then you can set your goal even higher. Let's attack these problems positively and really get our industry out in the forefront where it should be.
WORKSHOP SESSIONS

The participants of the workshop were divided into three groups and charged with answering the following questions:

1. Evaluation of water utilization and waste control research and additional information needs in production processes, marketing, new equipment and processes, monitoring systems, management guides.

2. Future research priorities for the industry relating to water utilization and waste control.

3. What are the problems which need to be solved by the poultry industry as compared to solutions which the single firm can adopt?

4. What steps should be taken to improve communications and cooperation between the various groups affecting and affected by changes in water and waste management in the poultry industry—processors; city, state and federal agencies; service firms; manufacturers; consultants?

5. Responsibility of industry with respect to wastes and charges for the same. Should members of the poultry industry advocate surcharges? What are the implications of surcharges to the poultry industry?
DISCUSSION GROUP I
Professor David H. Howells, Secretary

1. a. How would you evaluate the current water utilization and waste control research?

The feeling was expressed that Gold Kist became interested in the project principally from an economic standpoint, that for the plant to remain on the municipal system under existing conditions and remain competitive, it had to do something. This thread of economic significance ran throughout all of our comments. This work will be of the same utility to all processing plants; for example, a plant having its own private well supply in terms of the water used. The real essence of the Durham work is time, meaning that a plant will be most concerned with those problems that are "snapping at its heels." The work involved at Gold Kist can have tremendous impact on the entire industry. There is a potential for major economic savings. These can be made with comparative ease.

The question was raised as to whether it would be useful to provide for some inter-industry exchange of unit water and waste data. There was some doubt about this. It was felt that the circumstances were quite different between plants; and again, it is economics; it is the cost per bird, not gallons per bird, that is involved. The importance of monitoring plant changes and insuring follow-up performance to prevent backsliding is very important.

b. Is there a need for additional information on production processes, marketing, new equipment and processes, monitoring systems, management grades?

One person expressed the opinion that there probably is a need in all of these areas and that many plants are not aware of what is presently available in the way of ideas and equipment. Another person felt that the industry is growing more sophisticated all the time. The study that was undertaken at Gold Kist was quite straightforward. Industry should recognize that this is what it must do and not wait for the university, the state, the federal government and others to force their hand. Until management makes that decision, the industry will be in trouble.
It was felt that industry and plant ownership is not necessarily oriented toward progressive water and waste management. They must see the need; and again, in dollars. They'll see the need when economics are perfectly clear to them. The observation was made—and there was some apparent agreement—that the most neglected equipment in poultry processing plants will normally be that dealing with waste control. There was some feeling that federal funds made something possible at Gold Kist that would never have been done otherwise. The poultry industry is more involved with production problems which they feel are more important at any given point in time than water and waste control. This push, the money provided by the Environmental Protection Agency and the university interest and effort, brought this about.

It was felt that there's a need for a central point of coordination between the multiplicity of local, state and federal programs to provide accurate interpretations of regulations and requirements rather than having to depend on fragmentary sources for this information. The industry should take greater advantage of technical expertise at the university, particularly associated with this project. There was a feeling of considerable uncertainty as to what to expect from regulatory agencies as to effluent requirements.

2. What are the future research priorities for the industry relating to water utilization and waste control?

   a. Reducing the BOD in the effluent down to domestic levels. This is speaking in the context of municipal systems, principally, so as to avoid a surcharge.

   b. To make possible further reductions in water use while maintaining product quality. In other words, less water carriage for both waste and product, possible substitutes for water cooling, etc.

   c. Critical assessment of USDA standards to determine their validity and possible reductions in water use without destruction of quality.

   d. Reductions in cost of materials and equipment needed for water and waste control with particular emphasis on materials substitution.
3. What are the problems which need to be solved by the poultry industry as compared to solutions which the single firm can adopt?

The group felt that there are some kinds of activities that an industry-wide representation rather than any individual plant could bring about such as dealing with regulatory agencies and inspecting agencies concerning standards and criteria. There needs to be an industry-wide approach to the control of feather loss in the transportation of live birds. Also needed is some reliable industry-wide information to guide individual plants on the use of chemicals for clean-up. Apparently, there is a good deal of confusion on this.

4. What steps should be taken to improve communication and cooperation between the various groups affecting and affected by changes in water and waste management in the poultry industry-processors; city, state and federal agencies; service firms; manufacturers; consultants?

It is believed by the group that there are very few people in the regulatory agencies who have a first-hand acquaintanceship with the poultry processing industry and its problems; and that some kind of a cooperative training activity, whereby these people could get some first-hand exposure might make the interpretation of their regulations and their implementation more realistic. This is particularly pertinent to water pollution. In other words, they suggested familiarization with the industry on a first-hand basis. Another point is that there needs to be a very close cooperation between the industry and the regulatory people; that industry should not wait for a crisis; that industry people should be acquainted with and gain understanding and confidence, mutual self-confidence, in regulatory agency people before a crisis develops. Earlier actions by industry may well have created an air of suspicion by regulatory agencies; in other words, avoidance of responsibility. Yet, it's up to industry to take steps to develop mutual confidence and good faith.

I think it's noteworthy that in this panel there was no air whatsoever of recrimination against regulatory agencies. There was a full acceptance, a tendency to fully accept industry responsibility without any apologies.

We have an obligation to follow up the Gold Kist project. Certainly not the least of which would involve university extension to
move results into practice. I think it's safe to say there was a
general feeling that everyone involved in this project--industry,
the university, the federal government--deserve a hand of commendation.
DISCUSSION GROUP II

Mr. Austin White, Secretary

Group II did not go through each question and give specific answers for each one. The questions were discussed as a group, and we came up with a single answer: We need to set a goal to work toward 100 percent recycling of our water. That will eliminate a lot of our problems, but there will be many problems on the way to reaching this goal. No single plant or single multi-plant company could achieve this goal by itself. It can only be achieved through cooperative action. In this industry it takes a lot of work to get everybody together to provide the funds and the facts. Even the whole industry's helping finance the research probably would not be enough, but funds are being made available for research projects. The EPA is making grants for research. Much work would need to be done to coordinate these efforts. In order to receive the funds and get permission to make trials, many facts would need to be gathered that the plants, individually, are not equipped to do. In this area one of our most useful tools is North Carolina State University, although more help could probably be found in working along these lines. This would be a big project for State to undertake.
DISCUSSION GROUP III
Mr. Harold Ford, Secretary

Our group was fortunate in having two people present from the Environmental Protection Agency, and they kept us on track with some of their thinking and what we might anticipate. Our group felt like there has certainly been an excellent track record set here and is badly needed by the industry. Let's keep all systems on go.

1. a. How would you evaluate the current water utilization and waste control research? (b) Is there a need for additional informational needs in production processes, marketing, new equipment and processes, monitoring systems, management guides?

There might be other areas of research underway in other sections of the poultry industry, and we need that information such as VPI and others that are working in the same field. There needs to be some coordination in gathering together this data and dispersing it to the industry. In other words, there are techniques that can be used, and we need to get the information out quick. Industry members should begin to think about contributing funds to this type research. An additional project suggested was the one dealing with salmonella testing. We are told that EPA is quite concerned about the salmonella that might find its way into lakes, especially the recreational lakes. Maybe some work needs to be done there. The research should be done at a place where research facilities are available. Certainly, here in North Carolina you have demonstrated that you have the people and the facilities.

Keep an eye on the end product. I believe the point was meant that recycling is perhaps great, but we don't want to sacrifice any end product quality to do so. Waste treatment is under attack now, and great need for advanced waste treatment is needed. EPA should have a better communication program on what its findings from the vast research projects are.

Processors need to have officials to come in and explain the programs and what other plants would have to do to qualify for research money from EPA (and we're thinking here of North Carolina processors). We're told that there is possible money available, but how do you go about getting it? What has to be done?
2. What are the future research priorities for the industry relating to water utilization and waste control?

The major need is to first identify what our research needs are. Suggested projects would be a low-cost rapid monitoring system to determine the BOD and salmonella. Others are: research on advanced waste treatment, research on lagooning of wastewaters might be a good project for someone to take on, perhaps a similar project with another plant; research with a plant that has its own rendering plant on the premises. We think this would create a different water situation. Many of them are flowing their wastes to the rendering plant with this excess amount of water (pretty good transportation). Research is needed on the regulations that have been written and the interpretation of these regulations for the industry.

3. What are the problems which need to be solved by the poultry industry as compared to solutions which the single firm can adopt?

It was agreed that the problem of waste utilization must be attacked by the industry itself. Some plants and some companies are big enough to work on the issue, but answers will have to be found when industry puts its shoulders together.

4. What steps should be taken to improve communications and cooperation between the various groups affecting and affected by changes in water and waste management in the poultry industry--processors; city, state and federal agencies; service firms, manufacturers; consultants?

Getting out the information and the cooperation in more workshops like you've had today. Put it on convention programming. Between government agencies I think it's been demonstrated here that the agencies can work together and do and are ready to work with you. I seriously doubt that the USDA Inspection Service would have granted Gold Kist the authority to do some things if other government agencies had not been involved in this. Just Gold Kist alone might have been turned down. As for manufacturers and consultants, certainly, we've got a few of them in the audience; and they need to be encouraged to attend this type of meeting. Maybe they're working in other industry plants and can pass on some ideas from another industry.
5. What is the responsibility of industry with respect to wastes and charges? Should members of the poultry industry advocate surcharges? What are the implications of surcharges to the poultry industry?

The responsibilities lie with the industry and each individual engaged in making a livelihood from the industry. The government agency responsibilities seem to be primarily in the enforcement of regulations, aiding in the financing of research and the dissemination of data. The industry certainly has a lot going for us at this time. The attitude of industry is good, and it's ready to work on the problem. However, a point was made that the industry should not get a black eye over this problem since poultry waste does not contribute to the overall problem as much as human waste.
LIST OF PARTICIPANTS

Mr. Jerry Anderson
Holly Farms
Glen Allen, Virginia 23060

Mr. Arch D. Bynum
Gold Kist Poultry
Durham, North Carolina 27701

Mr. Jim Andrews
Holly Farms Poultry Ind., Inc.
Wilkesboro, N. C. 28659

Mr. Roy E. Carawan
Department of Food Science
North Carolina State University
Raleigh, N. C. 27607

Mr. Jerry Arney
Gerber Products Company
Box 2689
Asheville, N. C. 28802

Mr. Norm Carpenter
P. O. Box 1269
Knoxville, Tennessee 37901

Dr. Hershel Ball, Jr.
Food Sciences Department
N. C. State University
Raleigh, N. C. 27607

Dr. Robert E. Cook
Poultry Science Department
North Carolina State University
Raleigh, N. C. 27607

Mr. Isaiah D. Bartlett
City of Durham
Durham, N. C. 27704

Mr. Adrian Cotter
Gerber Products Company
Box 2689
Asheville, North Carolina 28802

Mr. Frank A. Bell, Jr.
Room 509
Crystal Mall #2
Arlington, Virginia 22210

Mr. W. A. Crider, Jr.
Douglas Foods, Inc.
Douglas, Georgia 31533

Mr. Bob Blades
Bayshore Foods, Inc.
Easton, Maryland 21601

Mr. C. G. Dawson
Food Equipment, Inc.
Dallas, Texas 75221

Mr. Gary Bottomley
Holly Farms Poultry Ind., Inc.
Wilkesboro, N. C. 28659

Mr. L. W. Eye
Rocco Farm Foods
Edinburg, Virginia 22824

Mr. Leon Boyd
Department of Food Science
N. C. State University
Raleigh, N. C. 27607

Mr. Joe Felton
R. S. Noonan Engineering
Donaldson Center
Greenville, South Carolina 29602

Dr. Wayne Brooks
USDA
Raleigh, N. C. 27611

Mr. Harold Ford
Southeastern Poultry Association
Decatur, Georgia 30030

Mr. Jack Burton
Southeastern Poultry
Charlotte, North Carolina 28202

Mr. Jose P. Gonzalez
Central Soya Company
Pt. Wayne, Indiana 46802

Mr. Jim Butler
Holly Farms
Temperanceville, Va. 23442

Mr. Bob Greene
EPA
Atlanta, Georgia 30304
Mr. Taylor Grizzard  
Wampler Foods, Inc.  
Hinton, Virginia 22831

Dr. George Harner  
Reg. Supt. for Inspection  
Consumer Protection Programs  
USDA  
P. O. Box 25231  
Raleigh, N. C. 27611

Mr. Glen Hatcher  
NCDA  
P. O. Box 27647  
Raleigh, N. C. 27611

Mr. Byron Hawkins  
Gold Kist Poultry  
Durham, North Carolina 27701

Mr. Warren Henries  
Watson Seafood & Poultry Co., Inc.  
P. O. Box 26386  
Raleigh, N. C. 27611

Mr. Don Hilburn  
P. O. Box 1659  
Fayetteville, N. C. 28302

Mr. Dan Holder  
Route 1, Box 209  
McLeansville, N. C. 27301

Mr. Charles W. Hollis  
U.S. Army Corps of Engineers  
P. O. Box 1890  
Wilmington, N. C. 28401

Professor David H. Howells  
Director  
Water Resources Research Institute  
North Carolina State University  
Raleigh, N. C. 27607

Mr. Bill B. Humncutt  
P. O. Box 69  
Monroe, North Carolina 28110

Mr. A. J. James  
Luck's, Inc.  
P. O. Drawer A  
Seagrove, N. C. 27341

Mr. H. S. Kennett  
N. C. Department of Agriculture  
P. O. Box 27647  
Raleigh, North Carolina 27611

Dean J. E. Legates  
School of Agriculture & Life Sci.  
North Carolina State University  
Raleigh, North Carolina 27607

Mr. Dick Loy  
Gainesville Machine Company  
McLeansville, North Carolina 27302

Mr. John Macon  
Department of Economics  
North Carolina State University  
Raleigh, North Carolina 27607

Mr. William T. Marshall  
Diamond Starr  
Raleigh, North Carolina 27611

Mr. Leslie A. Matthews  
Ind. Waste Control Division  
City of Durham  
1900 E. Club Boulevard  
Durham, North Carolina 27704

Mr. George E. McCabe  
Bayshore Foods, Inc.  
Easton, Maryland 21601

Professor F. E. McJunkin, Assoc. Dir.  
Water Resources Research Institute  
124 Riddick Building  
North Carolina State University  
Raleigh, North Carolina 27607

Mr. William S. Merritt  
Rose Hill Poultry Corporation  
P. O. Box 40  
Rose Hill, North Carolina 28458

Mr. T. M. Miller  
Route 1, Box 99 (Ocean)  
Newport, North Carolina 28570

Dr. William C. Mills  
208 Scott Hall  
North Carolina State University  
Raleigh, North Carolina 27607
Mr. Kurt Moerk  
Department of Food Science  
North Carolina State University  
Raleigh, North Carolina 27607

Mr. Mike Neal  
Watson Seafood & Poultry Co., Inc.  
P. O. Box 26386  
Raleigh, North Carolina 27611

Mr. Fred J. Pepoon  
N. C. Department of Agriculture  
P. O. Box 27647  
Raleigh, North Carolina 27611

Mr. Ron Peterson  
P. O. Box 1269  
Knoxville, Tennessee 37901

Mr. Glenn T. Petty  
N. C. Department of Agriculture  
P. O. Box 27647  
Raleigh, North Carolina 27611

Mr. Cole Porter  
Rose Hill Poultry Corporation  
P. O. Box 40  
Rose Hill, North Carolina 28458

Dr. W. M. Roberts, Head  
Dept. of Food Science  
North Carolina State University  
Raleigh, North Carolina 27607

Dr. James A. Seagraves  
Department of Economics  
North Carolina State University  
Raleigh, North Carolina 27607

Mr. Ray E. Shaw, Jr.  
Drawer W-2  
Greensboro, North Carolina 27402

Mr. Muryl Shumaker  
Poultry Times  
Gainesville, Georgia 30501

Mr. Tim Smith  
EPA  
Atlanta, Georgia 30304

Dr. Marvin L. Speck  
Department of Food Science  
North Carolina State University  
Raleigh, North Carolina 27607

Mr. Wayne Sprinkle  
Holly Farms Poultry Ind., Inc.  
Hiddenite, North Carolina 28636

Mr. James M. Stewart  
Research Associate  
Water Resources Research Institute  
124 Riddick Building, NCSU  
Raleigh, North Carolina 27607

Dr. Fred R. Tarver, Jr.  
Department of Food Science  
North Carolina State University  
Raleigh, North Carolina 27607

Mr. Johnie Thompson  
Wilson Laurel Farms  
Robbins, North Carolina 27325

Mr. Karl A. Voss  
Morgan & Sons  
Greensboro, North Carolina 27420

Mr. David Walker  
NCDA  
P. O. Box 27647  
Raleigh, North Carolina 27611

Mr. Ebern Watson, Jr.  
Watson Seafood and Poultry Co., Inc.  
P. O. Box 26386  
Raleigh, North Carolina 27611

Mr. Merritt Watson  
Rose Hill Poultry Corporation  
P. O. Box 40  
Rose Hill, North Carolina 28458

Mr. Olen Watson  
Watson Seafood and Poultry Co., Inc.  
P. O. Box 26386  
Raleigh, North Carolina 27611

Mr. Lindo Webster  
Webster Poultry Company  
Pittsboro, North Carolina 27312

Dr. Lewis Wesley  
VPI Poultry Department  
Blacksburg, Virginia 24061

Mr. Austin White  
White Poultry Company  
Rockingham, North Carolina 28379
The information in this publication is for educational purposes only. Reference to commercial firms, products or trade names is made with the understanding that no discrimination is intended and no endorsement by the N. C. Agricultural Extension Service is implied.