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Progress In Poultry

"THROUGH RESEARCH"

EGG SHELL DAMAGE - 1. During Washing

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INTRODUCTION

Between May 1974 and February 1976, Cooperative Extension of the University of California conducted an extensive field study of the effects of washing on shell damage in table eggs. This project followed an earlier one to assess shell damage in mechanized egg handling systems (see P.I.P. Report No. 6 - February 1977).

No attempt was made to evaluate all possible combinations of variables and correlations involved with the question; therefore, this project should not be considered to be an experiment designed to measure exact relationships. Instead, it is merely a survey of conditions and related factors associated with the performance of a very high proportion of the state's egg washers at the time.

This report covers the washer aspects of the study only. A subsequent report will discuss the original egg breakage observations following gathering.

PROCEDURES

A six-hundred egg sample was used in testing each washer. This sample was supplied to us by the producer/processor and may have had some of the more obvious cracks and leakers separated during gathering.

One hundred and seventeen washers were studied involving some seventy thousand eggs. Each sample was carefully hand candled by Extension personnel and all original shell damage was suitably marked and identified by the type of crack. The six hundred eggs were then placed on the washer by hand at the normal loading site.

Following washing, the eggs were removed by hand and recandled. Original cracks were reexamined and any further damage to them was noted. All new cracks were separated and identified by type.

Each original and newly cracked egg was weighed and the thickness of the shell measured by an Ames thickness gauge following air drying. Membranes were left intact. A thirty-egg random sample of sound shelled eggs was selected to represent the weight and shell thickness of the non-cracked portion. These data were then expanded to represent the balance of the original sample.

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Cracks were defined as follows:

Collision	= Indented, radiating pattern
Wire	= Indented, linear pattern
Line	= Not Indented, linear pattern
Toe	= Circular opening
Smash	= Severe indented damage
Loss	= Shell membranes broken, liquid exuding

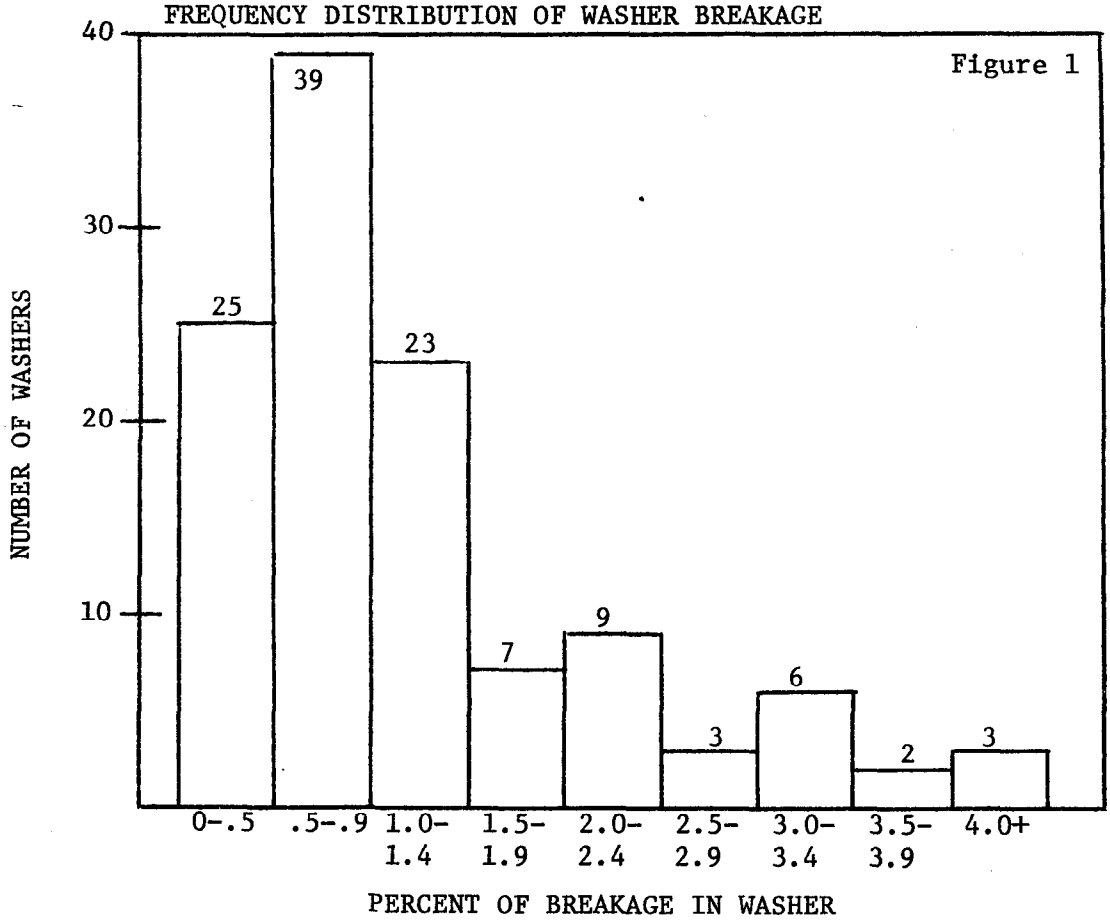
Other data recorded included age and molting history of flock, strain of chicken, make of washer, water temperature, date and location of processing plant.

RESULTS

Many factors contribute to the damage of eggs during washing. These include the strain of chicken, age of flock, shell thickness, egg weight, make of washer, washer temperature, season and molting history. An endless number of combinations of these contributing factors makes the analysis of any one factor extremely difficult.

In addition, there is the unknown factor of equipment maintenance. Extremely high levels of breakage can usually be attributed to this problem. It is suggested that the techniques used in this study can be effectively utilized as a quality control program within egg producing and processing firms as a method of reducing breakage during various phases of handling.

The average amount of breakage occurring during washing in this study was 1.24 percent of all sound eggs tested (1.10 percent from non-molted flocks). In addition, 8.3 percent of all eggs already broken were turned into losses (no value) during washing. Of the 117 washers tested, we observed a range from 0 to a high of 7.8 percent. Figure 1 illustrates the number of washers in each breakage category.



Seventy-five percent of the washers experienced less than 1.5 percent breakage. The remaining 25 percent may have been tested under a combination of circumstances favoring higher amounts of breakage or were in need of servicing. Further testing using eggs from other flocks may be necessary to narrow down the causative factors in individual cases.

Factors Affecting Washer Breakage

1) Strain of Chicken

Six strains of Leghorn chickens were involved in this study. No inference should be made by the reader that these data apply to these same strains today. Table 1 compares the amount of new cracks and losses which occurred in the washer by strain. These results were adjusted to equalize age at 55 weeks and include non-molted flocks only. We observed no significant differences by strain.

PERCENT BREAKAGE BY STRAIN OF CHICKEN — Table 1

STRAIN	CRACKS (%)	LOSS (%)	TOTAL* (%)	NUMBER OF FLOCKS
Kimber	.74	.04	.77	6
Shaver	.98	.07	1.09	22
Hyline	.95	.08	1.03	24
H & N	.71	.05	.75	13
DeKalb	.73	.20	.92	7
Babcock	1.69	.15	1.85	14
AVERAGE	1.01	.09	1.11	86

* Cracks and loss may not equal total because of rounding and adjustment methods (non-molted -- flock basis).

If we look at the individual eggs broken during washing relative to their shell thickness and to the strain of the flock which produced them, we see significant differences in the amount of breakage in certain shell thickness categories. This may indicate strain differences in the importance of shell thickness as a factor in breakage (Table 2).

EGG BREAKAGE BY STRAIN AND SHELL THICKNESS* — Table 2

	STRAIN						
SHELL THICKNESS (Inches)	Kimber (%)	Shaver (%)	Hyline (%)	H & N (%)	DeKalb (%)	Babcock (%)	ALL
Less Than .0120	9.5	10.1	17.4	2.1	13.6	14.9	9.2
.0120 - .0129	.6	2.9	2.9	2.4	1.6	4.0	2.6
.0130 - .0139	1.0	1.4	1.5	1.4	1.7	1.6	1.5
.0140 - .0149	1.0	.7	1.1	1.0	.7	1.4	1.0
.0150 - .0159	.4	.5	.6	.4	.8	1.3	.7
More Than .0159	0	.7	.6	.2	0	.9	.5
AVERAGE	.7	1.1	1.0	.9	1.1	1.6	1.1

* Non-molted -- individual eggs.

Overall breakage was not significantly different between the strains, but breakage of eggs within specific shell thickness categories showed significant strain differences. The most pronounced example of this is in the very thin category (less than .0120 inches) where the H & N flock ratio of breakage to their average was only 2.3:1 as opposed to the Hyline flocks with a ratio of 17.4:1.

2) Age of Flock

When analysis of the flock averages is based on age, we note a significant linear increase of breakage due to increasing age (Table 3).

PERCENT BREAKAGE BY AGE* Table 3

AGE (Weeks)	NUMBER OF FLOCKS	AVERAGE SHELL THICKNESS (Inches)	CRACKS AND LOSS (%)
20 - 39	10	.0147	.68
40 - 59	45	.0147	1.08
60 - 79	30	.0145	1.23

* Non-molted -- flock basis.

Table 4 illustrates the effect of age on eggs within each shell thickness category. The majority of eggs (87%) were from hens between 40 and 79 weeks of age. Increasing age had a significant influence on the risk of breakage within several shell thickness categories when the results from the three youngest groups were compared (Figure 2).

PERCENT BREAKAGE BY AGE AND SHELL THICKNESS* Table 4

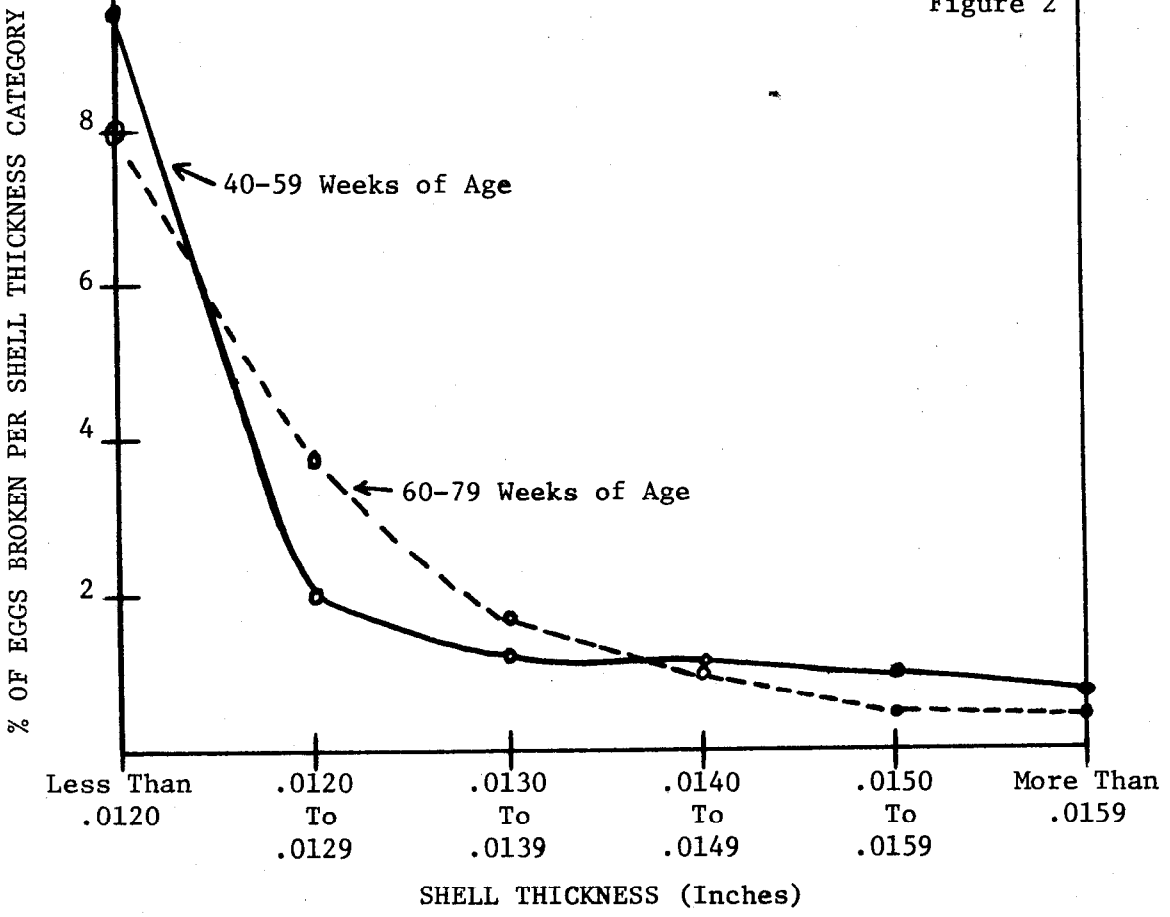
	AGE (Weeks)				
SHELL THICKNESS (Inches)	20 - 39 (%)	40 - 59 (%)	60 - 79 (%)	80 + (%)	AVERAGE (%)
Less Than .0120	7.3	9.6	8.0	100.0	9.2
.0120 - .0129	1.6	2.0	3.8	5.0	2.6
.0130 - .0139	.8	1.2	1.9	100.0	1.5
.0140 - .0149	.6	1.1	1.0	2.6	1.0
.0150 - .0159	.5	.8	.5	.5	.7
More Than .0159	.1	.6	.5	1.6	.5
AVERAGE	.6	1.1	1.2	2.7	1.1

* Non-molted -- individual eggs.

Figure 2 illustrates the amount of washer breakage which occurs in the various shell thickness categories for two different age groups. This figure emphasizes the extreme breakage problem in the thinner shell categories.

PERCENT BREAKAGE BY AGE & SHELL THICKNESS

Figure 2



Separation of the individual cracked egg data by age and egg weight revealed an interesting relationship. Eggs of different weights within the younger age group had the same risk of breakage while those in the older group experienced a statistically significant doubling of breakage in the larger weight class.

PERCENT BREAKAGE BY AGE AND EGG WEIGHT* Table 5

EGG WEIGHT (Grams)	AGE (40-59 Weeks) (%)	AGE (40-59 Weeks) SHELL THICKNESS (Inches)	AGE (60-79 Weeks) (%)	AGE (60-79 Weeks) SHELL THICKNESS (Inches)
55 - 59	1.1	.0142	.8	.0133
65 - 69	1.1	.0146	1.5	.0138

* Non-molted -- individual eggs.

Analysis of all eggs sampled showed that, within a given age group, eggs of larger size had thicker shells. The above table, though, indicates that the larger eggs from the older flocks also have a greater risk of breakage, indicating the possibility of other non-measured factors as possible contributors to the higher amount of breakage observed.

3) Shell Thickness

We have shown that shell thickness can be an important contributing factor to egg shell damage as it relates to strain of chicken and the age of flock. If the distribution of cracked eggs by shell thickness is compared with the distribution of sound eggs by shell thickness, we observe that eggs with shells less than .0140 inches represented almost half of the number of cracked eggs as opposed to only one-quarter in the sound egg sample. This indicates a significantly higher risk of breakage in eggs with shells less than .0140 inches of thickness (Table 6).

DISTRIBUTION OF SHELL THICKNESS IN SOUND AND CRACKED EGG SAMPLES Table 6

SHELL THICKNESS (Inches)	SOUND EGGS (%)	ORIGINAL CRACKS* (%)	WASHER CRACKS (%)
Less Than .0120	1.1	8.7	9.9
.0120 - .0129	4.9	11.4	11.8
.0130 - .0139	18.8	27.4	25.0
.0140 - .0149	29.0	26.3	26.7
.0150 - .0159	30.6	18.6	18.9
More Than .0159	15.6	7.6	7.7
TOTAL	100	100	100

* Cracks found after gathering from the same flocks (non-molted -- individual eggs).

The two cracked egg samples are not statistically different. This can be readily seen in Figure 3.

DISTRIBUTION OF EGG SHELL THICKNESS IN SOUND & CRACKED EGGS

Figure 3

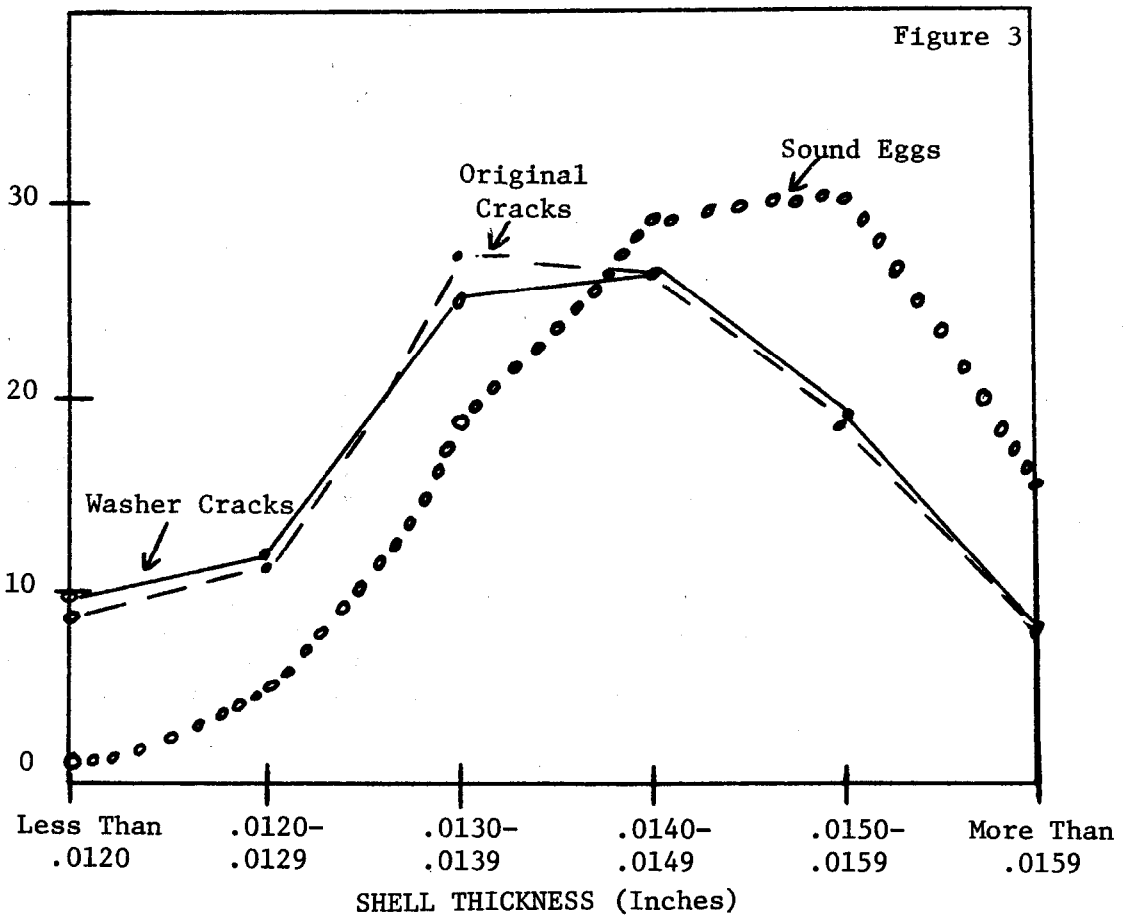


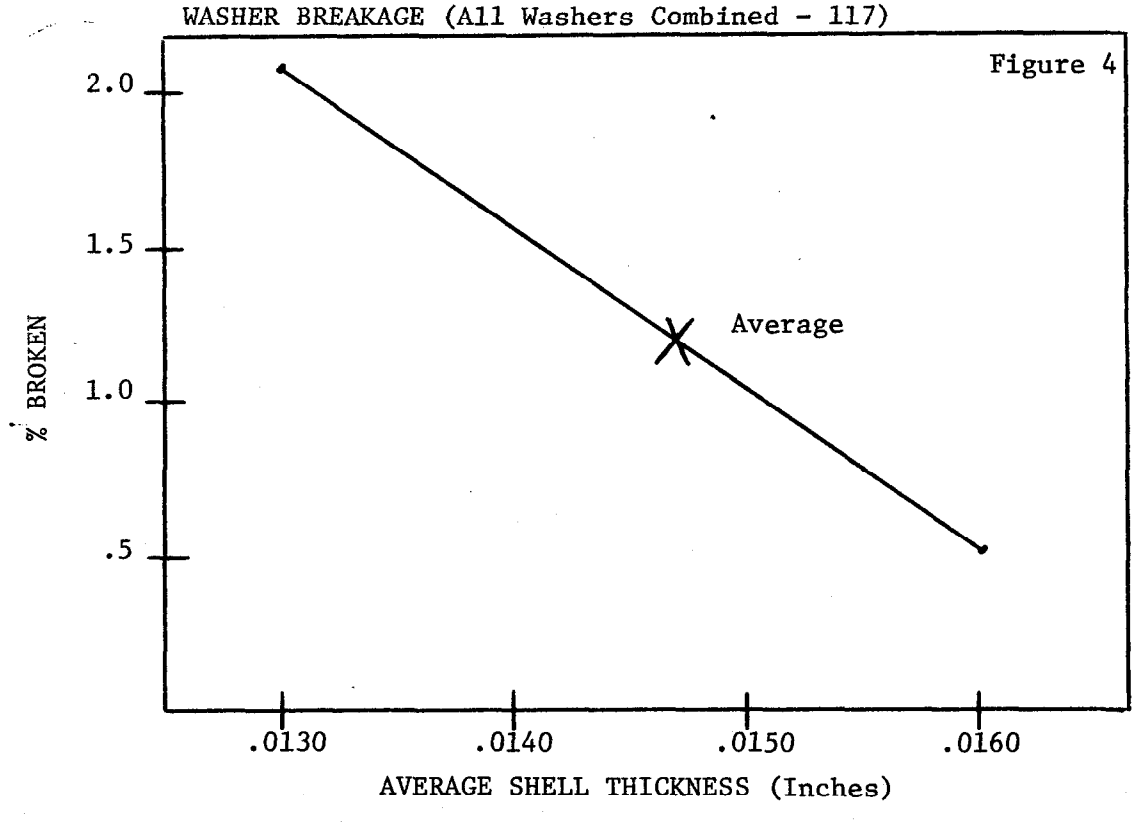
Table 7 lists the percentage of egg breakage within each shell thickness category and the overall contribution of each category to the total. The thinnest shell category (less than .0120 inches) had a breakage rate 8.4 times the average (1.1 percent) and contributed 9.9 percent of the total broken eggs, even though it only represented 1.5 percent of all eggs.

EGG BREAKAGE BY SHELL THICKNESS* Table 7

SHELL THICKNESS (Inches)	DISTRIBUTION OF ALL EGGS (%)	% CRACKED OF CATEGORY (%)	% CRACKED ÷ AVERAGE (%)	% OF TOTAL WASHER CRACKS (%)
Less Than .0120	1.5	9.2	8.4	9.9
.0120 - .0129	5.2	2.6	2.4	11.8
.0130 - .0139	19.3	1.5	1.4	25.0
.0140 - .0149	28.9	1.0	.9	26.7
.0150 - .0159	29.9	.7	.6	18.9
More Than .0159	15.2	.5	.5	7.7
TOTAL OR AVERAGE	100	1.1		100

* Non-molted -- individual eggs.

Egg shell thickness had a significant effect on the amount of breakage observed in the washer. With this knowledge, it is possible to predict more reliably the actual percentage of shell damage that will occur from specific flocks producing eggs of known shell thickness. Figure 4 is based upon the average shell thickness of a thirty-sound-egg sample per flock and correlates this measurement with the total cracks and losses observed after washing. This analysis includes both molted and non-molted flocks. The correlation between shell thickness and breakage accounted for slightly over five percent of the total variability between flocks, thus leaving considerable variation due to other causes.



4) Egg Weight

Egg weight has been discussed relative to the age of the flock producing the individual egg. On a flock basis, we found a significant linear effect of increasing egg weight on the amount of breakage (Table 8).

PERCENTAGE OF CRACKS AND LOSS BY EGG WEIGHT* Table 8

AVERAGE EGG WEIGHT (Grams)	SHELL THICKNESS (Inches)	WASHER BREAKAGE (%)	NUMBER OF FLOCKS IN SAMPLE
52 - 56	.0145	.64	4
57 - 61	.0145	.95	45
62 - 66	.0148	1.33	36

* Non-molted -- flock basis.

This, though, could be predominately an age effect since egg weights increase with age. Eggs in different weight classes did break at significantly different rates relative to shell thickness, indicating structural or physical size effects (Table 9).

EGG BREAKAGE BY SHELL THICKNESS AND WEIGHT* Table 9

	EGG WEIGHT (Grams)			
SHELL THICKNESS (Inches)	55 - 59 (%)	60 - 64 (%)	65 - 69 (%)	ALL EGGS (%)
Less Than .0120	4.3	7.4	19.1	9.2
.0120 - .0129	2.0	2.6	3.5	2.6
.0130 - .0139	1.1	1.6	1.7	1.5
.0140 - .0149	.9	.9	1.7	1.0
.0150 - .0159	.6	.7	.9	.7
More Than .0159	.6	.4	.7	.5
AVERAGE	.9	1.0	1.4	1.1

* Non-molted -- individual eggs.

5) Make of Washer

A variety of washers was included in these tests. Some used only a spray for washing while others used a combination of brushing and sprays. Most showed the same general pattern of increasing breakage with thinner shelled samples, but none could be shown to be significantly different from the others (Table 10).

PERCENT BREAKAGE IN DIFFERENT WASHERS* Table 10

WASHER	CRACKS (%)	LOSS (%)	TOTAL (%)	NUMBER OF SAMPLES
FMC	.54	.08	.62	9
Seymour	1.16	.11	1.27	28
Kuhl	1.00	.06	1.10	24
Featherlite	.97	.11	1.08	22
AVERAGE	1.00	.09	1.10	83

* Non-molted flocks only, adjusted for age -- 55 weeks.

6) Washer Temperatures

Previous studies have shown an increase in shell breakage when eggs were subjected to wash water 50° F. or more above the temperature of the egg. We observed water temperatures ranging from 60° F. to 142° F. and no significant differences in breakage (Table 11). There was a slightly lower breakage percent in those eggs washed at temperatures below 100° F.; however, we did not measure the initial temperature of the eggs to correspond to the other studies mentioned.

PERCENT BREAKAGE AS AFFECTED BY WASH WATER TEMPERATURES* Table 11

TEMPERATURE	CRACKS (%)	LOSS (%)	TOTAL (%)	NUMBER OF SAMPLES
Less Than 100° F.	.61	.06	.67	9
100° - 110° F.	.92	.05	.98	24
More Than 110° F.	.88	.09	.97	21
AVERAGE	.86	.07	.92	54

* Non-molted -- flock basis.

7) Season

We observed no significant seasonal differences in the number of cracked eggs produced during the washing procedure (Table 12). Even though egg shells were five percent thinner in the summer than in the winter, those eggs did not break at a significantly different rate in the washers.

PERCENT BREAKAGE AS AFFECTED BY SEASON* Table 12

SEASON	CRACKS (%)	LOSS (%)	TOTAL (%)	NUMBER OF SAMPLES	SHELL THICKNESS (Inches)
Winter	1.11	.06	1.17	30	.0150
Spring	.88	.14	1.02	15	.0148
Summer	.84	.09	.97	20	.0142
Fall	1.12	.09	1.21	21	.0146
AVERAGE	1.01	.09	1.11	86	.0147

* Flock basis, adjusted for age -- 55 weeks.

8) Molting History

Interestingly enough, the shell thickness of the thirty molted flocks was exactly the same as the 87 non-molted flocks -- .0147 inches. More breakage was observed in the eggs from the molted flocks, but this proved not to be statistically significant (1.63 percent versus 1.11 percent).

Type of Crack

Broken eggs were grouped into five shell-damage categories following washing. These were analyzed by the age of flock, strain of chicken, shell thickness and make of washer.

1) Age

When cracked eggs were grouped by type and the age of the flock that produced them, eggs from older flocks had a significantly higher proportion of line cracks and correspondingly less collision cracks than eggs from younger flocks (Table 13).

DISTRIBUTION OF VARIOUS TYPES OF CRACKED EGGS FOLLOWING WASHING AS AFFECTED BY THE AGE OF THE FLOCK* Table 13

TYPE	AGE OF FLOCK (Weeks) 20 - 39 (%)	40 - 59 (%)	60 - 79 (%)	79 + (%)	AVERAGE
Collision	50.0	34.8	32.5	12.5	34.3
Wire	0	0	.5	0	.2
Line	42.1	62.0	59.9	81.3	60.3
Toe	0	.4	1.4	0	.7
Smash	7.9	2.9	5.7	6.3	4.4
TOTAL	100	100	100	100	100

* Non-molted -- individual eggs.

In the older flocks, sixty to eighty percent of the cracks were line cracks as opposed to only 42 percent for the very young flocks. In terms of actual breakage, the percentage of collision cracks is fairly constant with age while the percentage of line cracks increases with increasing age.

PERCENTAGE OF CRACKS ASSOCIATED WITH FLOCK AGE AND TYPE OF CRACK* Table 14

AGE (Weeks)	COLLISION (%)	LINE (%)
20 - 39	.30	.25
40 - 59	.38	.68
60 - 79	.39	.72
Over 79	.34	2.20

* Non-molted -- individual eggs.

2) Strain of Chicken

As noted before, strains appeared to differ in susceptibility to egg breakage based on shell thickness. Apparently, strain differences also existed in the type of breakage which occurred (Table 15).

DISTRIBUTION OF EGG BREAKAGE IN THE WASHER BY TYPE OF CRACK AND STRAIN OF CHICKEN* Table 15

TYPE	STRAIN						AVERAGE
	Kimber (%)	Shaver (%)	Hyline (%)	H & N (%)	DeKalb (%)	Babcock (%)	(%)
Collision	50.0	40.9	36.6	24.6	25.5	30.4	34.3
Wire	0	0	.7	0	0	0	.2
Line	50.0	53.8	58.6	66.7	66.0	65.6	60.3
Toe	0	0	0	4.3	0	.8	.7
Smash	0	5.3	4.1	4.3	8.5	3.2	4.4
TOTAL	100	100	100	100	100	100	100

* Non-molted -- individual eggs.

The H & N and DeKalb strains had a significantly smaller proportion of collision cracks than the Kimber and Shaver strains. This should not be confused with the total breakage shown in Table 1. Table 15 is based upon all washer cracks observed, regardless of the age of the flock. If only the flocks 40-59 weeks of age are considered, a different pattern emerges (Table 16). In this case, the strain difference was highly significant.

DISTRIBUTION OF EGG BREAKAGE BY TYPE OF CRACK AND STRAIN*
(40-59 Weeks of Age) Table 16

TYPE	STRAIN					
	Kimber (%)	Shaver (%)	Hyline (%)	H & N (%)	DeKalb (%)	Babcock (%)
Collision (C)	55.0	47.8	25.9	41.7	47.4	23.5
Line (L)	45.0	47.8	72.2	58.3	52.6	71.6
TOTAL	100.0	95.6	98.1	100.0	100.0	95.1
Ratio L:C	.82	1.00	2.79	1.40	1.11	3.05

* Non-molted -- individual eggs.

In the Kimber, Shaver, H & N and DeKalb strains, the ratio of line to collision cracks was approximately 1:1; whereas in the Hyline and Babcock strains, the ratio was almost 3:1. The changing relationship between strains would indicate that not only was there a strain difference in the type of crack produced but there was also a strain x age interaction.

3) Shell Thickness

In general, there is a significantly increasing ratio between the proportion of line to collision cracks as shell thickness increases (Table 17). In addition, the percentage of smashed eggs also declined with increasing shell thickness.

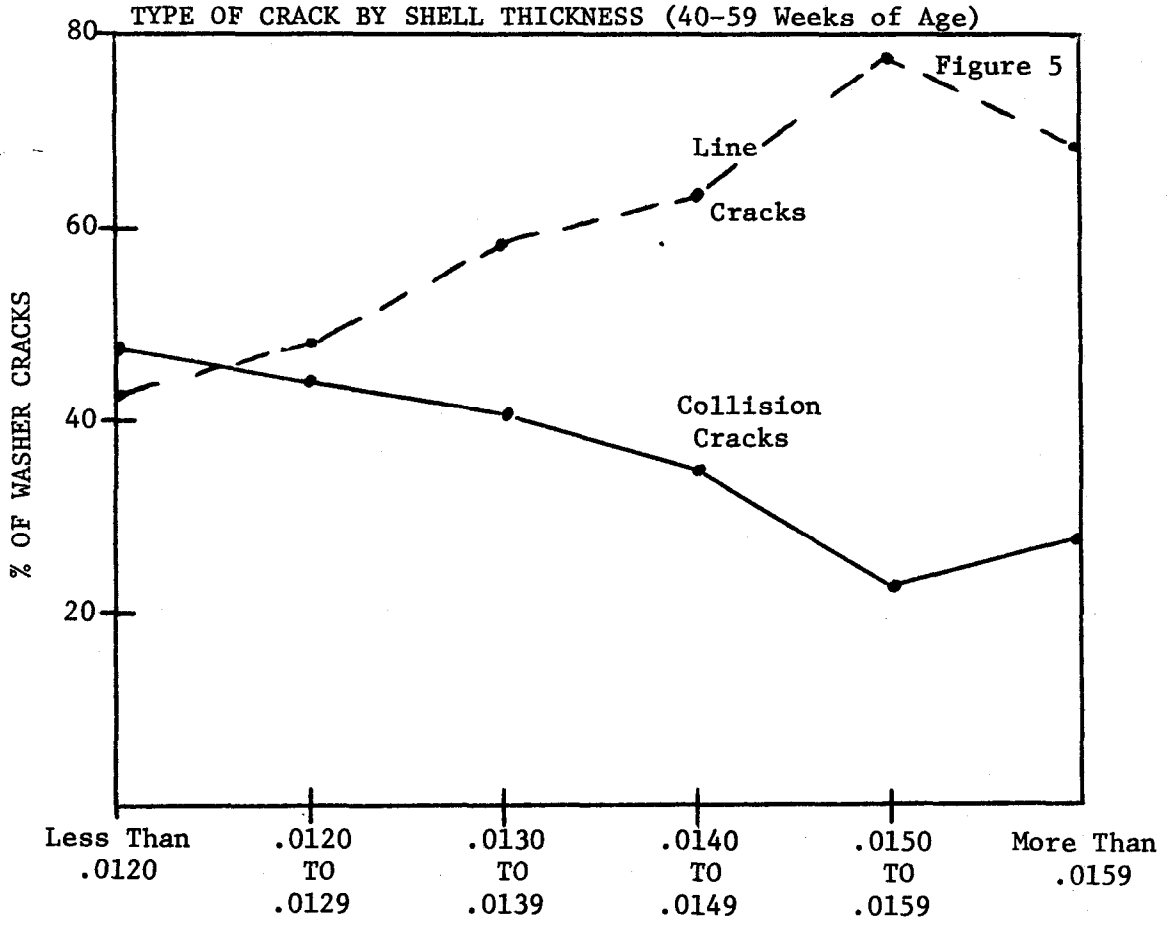
DISTRIBUTION OF THE TYPE OF CRACKS FOLLOWING WASHING BY SHELL THICKNESS*

Table 17

TYPE	SHELL THICKNESS (Inches) LESS THAN .0120 (%)	.0120 TO .0129 (%)	.0130 TO .0139 (%)	.0140 TO .0149 (%)	.0150 TO .0159 (%)	MORE THAN .0159 (%)	AVERAGE (%)
Collision (C)	36.5	40.3	35.9	37.1	29.3	27.5	34.3
Wire	0	0	0	0	1.0	0	.2
Line (L)	53.8	56.5	61.0	59.3	68.7	67.5	60.3
Toe	1.9	0	0	.7	1.0	2.5	.7
Smash	7.7	3.2	3.1	2.9	0	2.5	4.4
TOTAL	100	100	100	100	100	100	100
Ratio L:C	1.47	1.40	1.70	1.60	2.34	2.45	1.76

* Non-molted -- individual eggs.

This relationship can be further demonstrated by isolating a specific age group--40 to 59 weeks of age (Figure 5).



4) Make of Washer

The type of crack also appeared to be related to the type of washer. The FMC produced 3.4 times more line cracks than collision cracks, whereas the corresponding figure for the Seymour was only 1.5. These differences, though, were not statistically significant (Table 18).

DISTRIBUTION OF THE TYPE OF CRACKS FOLLOWING WASHING BY MAKE OF WASHER* Table 18

TYPE OF CRACK	WASHER				AVERAGE
	FMC (%)	Seymour (%)	Kuhl (%)	Featherlite (%)	(%)
Collision (C)	21.9	37.1	34.9	31.1	34.3
Wire	0	.5	0	0	.2
Line (L)	75.0	56.1	61.8	62.1	60.3
Toe	0	.5	0	2.3	.7
Smash	3.1	5.9	3.3	4.5	4.4
TOTAL	100	100	100	100	100
Ratio L:C	3.42	1.51	1.77	2.00	1.76

* Non-molted -- individual eggs.

The type of crack may be associated with the point in a collection-processing system where the shell damage occurs and with the type of stress causing the shell to break. Thus, observation of the type of crack may assist in locating the source of the problem.

Change of Crack to Loss

A third aspect of the breakage problem in cleaning eggs is the further downgrading of previously cracked eggs into a loss category. Loss eggs have no value. When cracked eggs were not removed from the system prior to washing, 8.3 percent of these eggs turned into losses during the washing procedure.

1) Age

Looking at this question relative to the age of the flock, we see a significantly increasing conversion of cracks to losses with increasing age (Table 19).

CHANGE OF CRACKS TO LOSS IN WASHER BY AGE OF FLOCK* Table 19

AGE (Weeks)	%
20 - 39	5.3
40 - 59	8.8
60 - 79	11.3

* Non-molted -- individual eggs.

2) Shell Thickness

The change of cracks to loss was quite high in the very thin shelled eggs as shown in Table 19. These differences were highly significant (Table 20).

CHANGE OF CRACKS TO LOSS IN WASHER BY SHELL THICKNESS* Table 20

SHELL THICKNESS (Inches)	%
Less Than .0120	24.2
.0120 - .0129	9.4
.0130 - .0139	9.1
.0140 - .0149	5.1
.0150 - .0159	5.9
More Than .0159	8.2
AVERAGE	8.3

* Non-molted -- individual eggs.

3) Make of Washer

The make of washer had a highly significant effect upon the number of cracked eggs turned into losses. The Seymour produced significantly more losses when compared to the Featherlite, but overall effects in total cracks (Table 10) and loss in value (Table 22) showed no statistically significant differences between the various makes of washers.

CHANGE OF CRACKS TO LOSS IN WASHER BY MAKE OF WASHER* Table 21

WASHER	%
FMC	8.9
Seymour	12.7
Kuhl	10.0
Featherlite	6.0

* Non-molted -- individual eggs.

Loss in Egg Value

The final consideration of this study deals with the question, "How much does egg breakage in the washer cost?" The answer must take into account the number of new cracks and losses produced as well as the percentage of original cracks turned into losses. In this latter case, we assumed that none of these original cracks were removed prior to washing. The following values for eggs were used in this analysis:

Sound Eggs - 45¢ Per Dozen

Cracked Eggs - 25¢ Per Dozen

Loss Eggs - Zero Value

Our definition of a loss was any egg that exuded liquid or any egg not accounted for. Table 22 gives the results for each type of washer for the non-molted flocks only.

LOSS IN EGG VALUE BY MAKE OF WASHER* Table 22

WASHER	NUMBER	¢/DOZEN
FMC	9	.22¢
Seymour	28	.37¢
Kuhl	24	.31¢
Featherlite	22	.29¢
TOTAL	83	.32¢

* Flock basis, adjusted for age -- 55 weeks.

On the average, washing eggs resulted in a loss of value of .32¢ per dozen, which equals 6.4¢ per hen per year if one assumes twenty dozen eggs produced per hen. No overall significant differences were observed between the various washers. Table 23 gives the distribution of the loss in value for all 117 washers tested.

LOSS IN EGG VALUE DURING WASHING (¢/Dozen)* Table 23

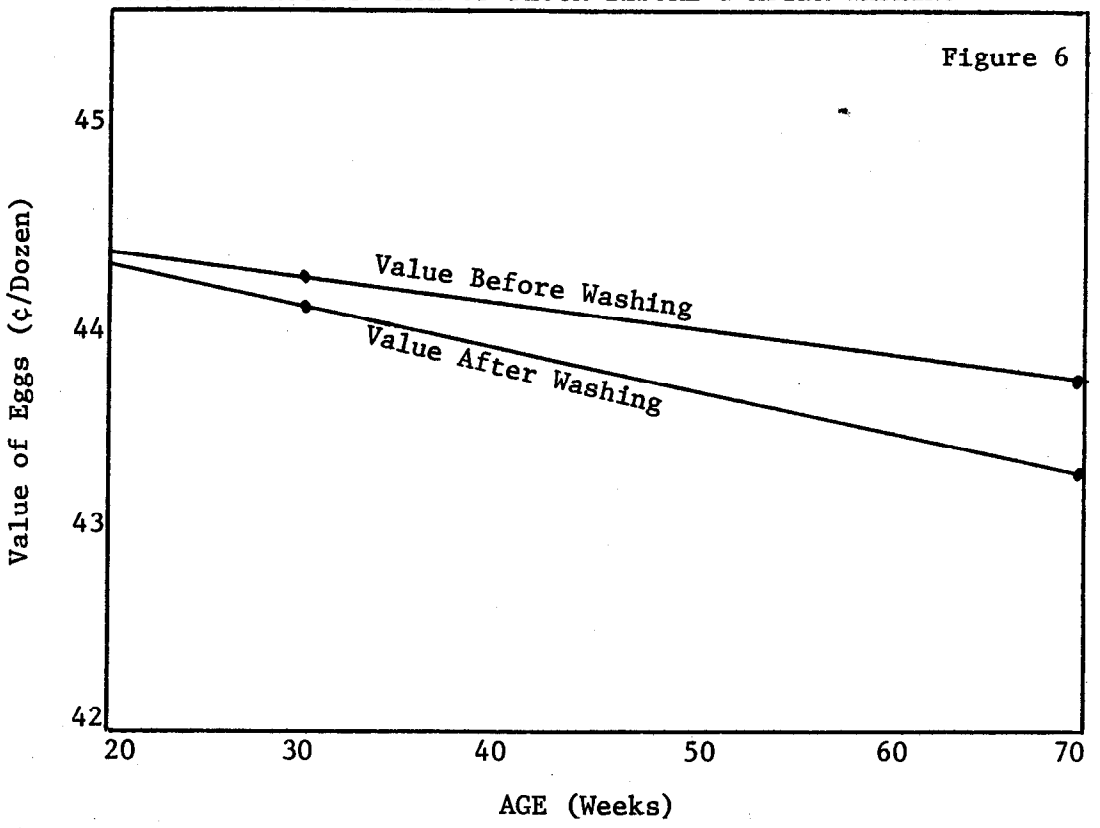
LOSS IN VALUE (¢)	NUMBER OF WASHERS
0 To .25	56
.26 To .50	35
.51 To .75	14
.76 To 1.00	9
1.01 To 1.25	0
1.26 To 1.50	1
1.51 To 1.75	1
1.76 To 2.00	0
Over 2.00	1
	117

* Flock basis -- all flocks.

Loss in value because of egg breakage occurred both prior to washing and following washing, and value decreased at both points with increasing age of flock (Figure 6).

VALUE OF EGGS BY AGE OF FLOCK BEFORE & AFTER WASHING

Figure 6



Each additional ten weeks of age subtracted .07 cents per dozen from the average value because of increased washer damage (Table 24).

LOSS IN EGG VALUE DURING WASHING BY AGE OF FLOCK* Table 24

AGE (Weeks)	LOSS IN VALUE (¢/Dozen)
20	.07
30	.14
40	.21
50	.28
60	.35
70	.42

* Flock basis -- all flocks.

SUMMARY

Washing eggs is an essential aspect of processing eggs in the United States. If done incorrectly, though, it can result in excessive shell damage with resulting loss in value.

Much of this damage can be eliminated by careful maintenance of the equipment, frequent inspections similar to the type discussed in this report and by routine removal of all cracks prior to washing.

Poorly maintained equipment together with poor quality eggs can lead to serious losses for individual handlers. Care must be taken to properly analyze the problem and to avoid placing the blame on the wrong factor.

Correctable problems can be exceedingly expensive if allowed to exist for any lengthy period. Correction of a one percent problem in a plant producing 5,000 cases per week is worth $300 -- more than enough to justify a routine trouble-shooting program.

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