

Effects of Auxiliary Gin Equipment On Grades of Cotton

Western Oklahoma, 1947 and 1948

By

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By JOHN D. CAMPBELL, Assistant Economist*

Cotton farmers in Western Oklahoma sometimes compare the grades of individual bales as a guide for choosing the gin they patronize. Comparison of average grades from gins having various combinations of equipment provides farmers another guide for choosing between gins. Such a comparison can also be used by gin operators as a guide in selecting gin equipment.

The information on the equipment of gins that was used for making the following comparisons was obtained by personally surveying 176 of the 191 active gins in 14 Western Oklahoma counties¹ in the latter part of the 1948 season. All of the active gins were visited, but the managers were not present at some gins at the time of the visits. Information was also obtained on the equipment used in 1947 whenever that information was available. The information on grades was furnished by the Altus and Oklahoma City cotton classing offices of the United States Department of Agriculture.²

Twenty-five combinations of gin equipment were found in this survey, but nine combinations included 136 of the 176 gins. The nine combinations included from nine to 27 gins in each group. The common combinations were fairly simple, since the only differences between them were the presence or absence of one or more of the following items: air-line cleaner, drier, a master extractor, and after cleaner (Table I).

Grades had been reduced to grade indexes when received from the cotton classing offices. Grade indexes are used for reducing grades to a comparable basis.³

* Information obtained from individual, cooperative and company gin operators and the cotton classing offices of the United States Department of Agriculture at Altus and Oklahoma City was used as the basis of a large part of this report. The assistance of all who provided information and assistance is appreciated.

¹ The 14 counties were: Blaine, Beckham, Caddo, Comanche, Cotton, Custer, Dewey, Greer, Harmon, Jackson, Kiowa, Roger Mills, Tillman and Washita.

² United States Department of Agriculture, Production and Marketing Administration, Cotton Branch.

³ Calculations and interpretations made with the grade indexes—averages, etc.—are the responsibility of the writer. In the grade indexes as used, Middling equals 100, Strict Low Middling, 94; and Low Middling, 85. For further explanation see "Cotton Quality Statistics, United States, 1940-41," U.S.D.A., p. 2.

TABLE I.—Nine Most Common Combinations of Gin Equipment, Average of Grade Indexes, and Number of Cleaning Cylinders in 14 Western Oklahoma Counties; 1947 and 1948 Seasons

Equipment combination ¹	Seasons and average	No. of gins with combinations	Average of grade indexes ²	Average no. of cleaning cylinders
1. (ABCDMXf)				
Air-line cleaners				
Boll-breaking cleaner	1947	18	95.0	11
Drier	1948	23	95.8	11
Master extractor	Average	20+	95.4	11
After cleaner				
Extractor feeder				
2. (-BCDMXf)				
Boll-breaking cleaner	1947	27	95.0	13
Drier	1948	27	95.6	13
Master extractor	Average	27	95.3	13
After cleaner				
Extractor feeder				
3. (ABC-MXf)				
Air-line cleaner	1947	14	94.5	9
Boll-breaking cleaner	1948	15	94.7	10
Master extractor	Average	14+	94.6	9+
After cleaner				
Extractor feeder				
4. (-BC-MXf)				
Boll-breaking cleaner	1947	11	95.6	10
Master extractor	1948	11	94.7	10
After cleaner	Average	11	95.1	10
Extractor feeder				
5. (AB-D-Xf)				
Air-line cleaner	1947	18	95.1	6
Boll-breaking cleaner	1948	14	95.7	7
Drier	Average	16	95.4	6+
Extractor feeder				
6. (-B-D-Xf)				
Boll-breaking cleaner	1947	12	95.4	7
Drier	1948	13	95.8	7
Extractor feeder	Average	12+	95.6	7
7. (AB---Xf)				
Air-line cleaner	1947	10	94.1	6
Boll-breaking cleaner	1948	12	93.8	6
Extractor feeder	Average	11	93.9	6

(Table continued on next page).

TABLE I, Cont'd.

Equipment combination ¹	Seasons and average	No. of gins with combinations	Average of grade indexes ²	Average no. of cleaning cylinders
8. (-B---Xf)	1947	9	92.6	7
Boll-breaking cleaner	1948	9	95.3	7
Extractor feeder	Average	9	93.9	7
9. (-B-DMXf)				
Boll-breaking cleaner	1947	10	94.4	14
Drier	1948	11	94.2	13
Master extractor	Average	10+	94.3	13+
Extractor feeder				

¹ Code letters are convenient for making comparisons and as here used have the following meanings: A, air-line cleaner; B, boll-breaking cleaner; C, after cleaner, after master extractor, and before extractor feeders; D, driers; M, master extractor; and Xf, extractor feeder.

² Grade indexes used here were calculated by adding and averaging the grade indexes of individual gins. Grade indexes were adjusted to the average staple length of 28.6 thirty-seconds inch at the rate of 1/10 grade for each 1/32 inch, according to findings reported in *Current Farm Economics* (Oklahoma), October, 1945, pp. 111-117.

Weather conditions are a major factor in the general level of cotton grades. Weather starts affecting grades in the spring by permitting or preventing early plantings or causing replantings. It is also an important factor in grades during the growing season, and it is a major factor in the harvesting season. Unfavorable weather was a factor in the low grade indexes of 89.1 and 89.3 in 1945 and 1946 for District 1⁴ of Oklahoma. Under the more favorable weather conditions in 1947 and 1948, the grade indexes of District 1 were 95.1 and 95.4 or an average of over one-half grade higher. Whatever the weather conditions, however, ginning is the last process involved in making the grades of baled cotton.

GIN EQUIPMENT ITEMS

Several items of gin equipment such as gin stands, a press, fans, etc., are found in all active gins in Western Oklahoma. In addition to the regular or necessary items, many gins have one or more additional or auxiliary machines. The common auxiliary machines used were air-line cleaners, driers, master extractors, and after cleaners. Master extractors, also called "big bur machines," could have been considered regular equipment before the use of extractor feeders became so widespread, but a good many gins did not have master bur machines in 1948. Since boll-breaking cleaners were included in all of the common combinations, they are here considered regular equipment.

There were some auxiliary machines that were found in only a small number of gins. Among these less common machines were "impact" cleaners, combined cleaning-extracting and drying units, and lint cleaners.

DRIERS

Driers and master extractors were added more often in 1947 and 1948 than any other auxiliary machines. They were also added more often in 1945 and 1946.⁵

The average of grade indexes for 1947 and 1948 of four comparable groups of gins with driers was 95.4 compared to 94.4 for the four comparable groups of gins without driers, or 1.0 grade index

⁴ District 1 of Oklahoma as used by the U. S. Department of Agriculture, P.M.A., Cotton Branch, in cotton quality reports consists of Blaine, Caddo, Comanche and Cotton Counties and the other cotton counties west of those. It corresponds rather closely to the 14 counties included in this study.

⁵ A comparison similar to this report was made for 1945 and 1946 seasons and published as Okla. Agri. Exp. Sta. Mimeo. Cir. M-169, "The Effect of Cleaning and Conditioning Equipment of Gins on Cotton Grades in Oklahoma." This study has been continued to check farther the results reported from the previous comparison and to find out the differences, if any, that developed with differences in weather and changes in machinery.

point in favor of gins with driers (Table II). This was less than half of the 2.2 found in 1945 and 1946.⁶

A difference of 1.0 in grade indexes at this level of grades—between Strict Low Middling and Middling—and the average staple length (28.6 of 32nds of an inch) would have amounted to about \$1.25 increase in the value of a 500-pound bale in the 1949 loan rates or on the Oklahoma City quotations for October 20, 1949.⁷ This does not make any allowance for loss in weight of bales from drying, if any. On the basis of the loan rates in 1947 and the difference that season of 0.9 in the average of grade indexes of the first four groups with driers in Table II in favor of gins with driers, the increased value per bale (making no allowance again for loss in weight from drying) would have been \$1.08. In 1948 the difference of 1.1 in grade index would have amounted to \$1.05 per bale in the 1948 loan rates.

If all costs—interest, depreciation, fuel, power, labor, etc.—and allowances for loss in weights were deducted from the increased values as calculated above, it is doubtful whether much, if any, net returns would be indicated. However, these two years alone do not show the average improvement to be expected. If the increased values per year per bale shown above are averaged with the increased values found for 1945 and 1946,⁸ the average for the four years would indicate an increased of \$2.64 per bale in gross value but without any allowance for loss in weight from drying.

The above discussion does not include any value for the easier and faster ginning of cotton by gins with driers. This is sometimes rather important. Many gin operators used very little fuel for their driers in 1947 and 1948 and a few used none, thereby reducing or eliminating fuel costs.

On the basis of the four years, 1945 to 1948 inclusive, it seems that operators of small volume gins may not find driers profitable, but medium and large volume gins will likely find driers profitable and/or necessary to hold their volumes of ginning. If operators of small volume gins cannot increase their volumes enough to carry the added expense and/or if they will cease operations before the driers are worn out or re-sold at a comparatively good price, driers will likely prove unprofitable to them.

The differences between the average grade indexes of different types of driers was less in 1947 and 1948 than in 1945 and 1946.

⁶ *Op. Cit.* Calculations from data in Table 2, p. 6.

⁷ Calculated on the basis of quotations issued by U. S. Department of Agriculture, P.M.A., Dallas, Texas, in "Cotton Quotations" and "Weekly Cotton Market Review," Vol. XXXI, No. 12, and loan premiums and discounts for 1949.

⁸ *Ibid.*, Okla. Agri. Exp. Sta. Mimeo. Cir. M-169.

TABLE II. Average of Grade Indexes of Gins With and Without Driers; 1947 and 1948 Seasons

Other Items in Combinations of Gin Equipment

	ABCMXf Air-line cleaner Boll-breaking cleaner Master extractor After cleaner Extractor feeder	-BCMxf Boll-breaking cleaner Master extractor After cleaner Extractor feeder	AB--Xf Air-line cleaner Boll-breaking cleaner Extractor feeder	-B--Xf Boll-breaking cleaner Extractor feeder	-B-MXf Boll-breaking cleaner Master extractor Extractor feeder	Average of first four combinations
Gin With Driers						
In 1947	95.0	95.0	95.1	95.4	94.4	95.1
In 1948	95.8	95.6	95.7	95.8	94.2	95.7
Average	95.4	95.3	95.4	95.6	94.3	95.4
Gin Without Driers						
In 1947	94.5	95.6	94.1	92.6	—	94.2
In 1948	94.7	94.7	93.8	95.3	—	94.6
Average	94.6	95.1	93.9	93.9	—	94.4

This corresponds to the lower amount of improvement from all auxiliary equipment in the latter years. However, it appears that driers designed to expose the cotton longer to the hot air when heat is used and, with some cleaning action combined with drying, improve grades slightly more than the other types.

MASTER EXTRACTORS AND AFTER CLEANERS

Since four of the five common combinations of gin equipment in Table I that had master extractors also had after cleaners, their effects are considered together for most of this discussion. The short "special" type extractors were included as master extractors, but the units combining cleaning, drying and extracting were not included in these groupings.

In 1947 and 1948, master extractors and after cleaners seemed to contribute little if any to the improvement of grades in those gins equipped with driers (Table III). But in gins not equipped with driers, master extractors and after cleaners appear to have increased grades on the average by about 0.9 of a grade index point or the equivalent of about \$1.10 per bale on the 1949 loan rates, or October 20, 1949 market prices. The difference in the average of grade indexes varied rather widely between the years. Among gins without driers, those with master extractors and after cleaners made 1.7 higher average grade index than those without those items in 1947; but in 1948 the difference was only 0.2. The difference in the values per bale for these differences in grade indexes would have been \$2.04 for the 1.7 in the 1947 loan rate but only 16 cents for the 0.2 difference in 1948. The average for these two years would have been \$1.10 per bale.

Among gins without driers, the average improvement of 0.9 in grade index points between gins with and without master extractors was the same in 1947 and 1948 as it was in 1945 and 1946. But in the earlier years the gins with driers also made higher average indexes of grades when they included master extractors and after cleaners. So it seems from the four years' data that gins without driers can improve their grades enough to raise their grade indexes around 0.9 points (or around \$1.00 per bale on the basis of recent premiums and discounts) by using master extractors and after cleaners. Gins with driers will realize very limited improvement in grades from master extractors and after cleaners in years when conditions are favorable for good grades, but the improvement amounted to an average of 1.0 point in grade indexes in the unfavorable seasons of 1945 and 1946.

The above discussion of master extractors, like that for driers, does not include any deduction for the losses in weight of bales, if any. Such losses would likely be less for master extractors than

Table III. Average of Grade Indexes of Gins With and Without Master Extractors and After Cleaners and With Master Extractor, but Without After Cleaner; 1947 and 1948 Seasons

Other Items in Combinations of Gin Equipment					
	AB-D-Xf	-B-D-Xf	AB---Xf	-B---Xf	-B-D-Xf
	Air-line cleaners	Boll-breaking cleaners	Air-line cleaners	Boll-breaking cleaners	Boll-breaking cleaners
	Drier	Drier	Boll-breaking cleaners	Extractor feeder	Drier
	Extractor feeder	Extractor feeder	Extractor feeder		Extractor feeder
Gins With Master Extractors and After Cleaners					
In 1947	95.0	95.0	94.5	95.6	—
In 1948	95.8	95.6	94.7	94.7	—
Average	95.4	95.3	94.6	95.1	—
Gins Without Master Extractors and After Cleaners					
In 1947	95.1	95.4	94.1	92.6	—
In 1948	95.7	95.8	93.8	95.3	—
Average	95.4	95.6	93.9	93.9	—
Gins With Master Extractors but Without After Cleaners					
In 1947	—	—	—	—	94.4
In 1948	—	—	—	—	94.2
Average	—	—	—	—	94.3

those for driers. Also, no value is placed on the assistance rendered by master extractors and after cleaners in saving wear on extractor feeders and for the extent that they facilitate ginning in other ways.

The grade index of the last equipment combination in Tables I and III had lower grade indexes than for the other gins with driers, and also lower than those without driers but with master extractors and cleaners. A much larger proportion of this group of gins—about three-fourths—had “special” short type extractors. No after cleaners were included in this group. The data available do not provide an adequate basis for determination of the factor or factors responsible for the lower grade indexes. It does raise the question as to the advisability of using this combination.

LINT CLEANERS

The first lint cleaners were installed in Oklahoma in 1948, but only one gin installed lint cleaners that year. Others have been installed at one or more gins since 1948. A great deal of interest exists in lint cleaners, however, and several may be installed in 1950. Logic would indicate, and it has been suggested by some of the men in the gin industry, that there are both advantages and disadvantages to the use of lint cleaners. The amount of improvement that lint cleaners can make in grades varies widely with the condition of the cotton being ginned. Losses in bale weights offset part of the gains from the use of lint cleaners, as do their costs. While some gin operators may secure additional volume from the installation of lint cleaners, all ginnerers cannot do so. There is the basic question as to whether lint cleaners can be operated as efficiently in gins which operate a few months per year as they can in mills that operate longer periods. Furthermore, discounts on low grades may decrease if lint cleaners come into general use and thereby reduce the margin for gains from their use by individual gins.

However, the indications are that the value of the improvements from lint cleaners will exceed their costs by considerable amounts on the basis of 1949 premiums and discounts for medium and large volumes, and probably on volumes somewhat less than 1,000 bales.

AIR-LINE CLEANERS

There is no evidence in the averages of grade indexes (Table I) that air-line cleaners improve the grades of cotton. Rather, the average of the grade indexes was 0.3 higher for the gins without air-line cleaners in 1947 and 1948. Some operators were of the opinion that air-line cleaners remove sand and thereby save wear on machines used later in ginning. The available data do not provide a means for evaluating this aspect of air-line cleaners.

OTHER AUXILIARY DEVICES

The number of gins equipped with combination units that dry-extract and clean was very limited, and the accompanying equipment varied so much that adequate comparisons could not be made. Observations and the very limited data, however, raise the question as to whether all three operations can be performed as efficiently in such a unit as they can in separate machines.

"Impact" cleaners were also too limited in number for valid comparisons. The very limited indications appear favorable, but numbers were too limited to get a measure of their average effects. Many operators used only spiked cylinders in boll-breaking cleaners. Only a few used boll-crushing cylinders.

NUMBERS OF CLEANING CYLINDERS

The average numbers of cleaning cylinders for each group of gins is shown in Table I. In the analysis of the number of cleaning cylinders, each group was analyzed individually, but no relation appeared to exist in 1947 and 1948 between the number of cleaning cylinders used and the grades produced in either year.

TYPES OF CONDENSERS

Three types of condensers are in use in Western Oklahoma. They are called (1) "up-draft," (2) "side-draft," and (3) "down-draft." The terms as used describe the direction the air is exhausted after bringing the lint to the condenser above the bale press.

In 1947, the combination of gins having air-line cleaners, boll-breakers and extractor feeders had only up-draft condensers. The other groups all had one or more of each of the three types of condensers. That season gins with side-draft condensers had the highest average grade index in five of the other eight combinations. Gins with up-draft and down-draft condensers had the highest average grade index in one group each, and they tied with the same average index in one group. In 1948, the same combination as in 1947 had only up-draft condensers. Gins with side-draft condensers in 1948, in seven of the other eight combinations, averaged having the highest grade indexes within the combinations.

The number of gins by types of condensers within the combinations were very small in some groups each year, but it appears that side-draft condensers assist in the improvement of grades more than the other types.

ADDITIONS, REPLACEMENTS, AND REMOVALS

The judgments of gin operators as to the relative value of the various items of auxiliary gin equipment are reflected to a large

extent by the additions, replacements, and removals without replacements of such items.

Driers ranked highest in the numbers added in 1947 and 1948 and totaled 27 for the two years (Table IV). Four driers were replaced with other driers considered to be better. No driers were removed without replacement.

Master extractors ranked second in additions, with a total of 15 being added in the two-year period. Six of the 15 were of the short "special" type. Four master extractors were removed but replaced, and one of the special types was removed without being replaced.

Nine after cleaners were added and four replaced, while none were removed without being replacd. Six air-line cleaners were

TABLE IV. Cleaning and Conditioning Equipment Added, Replaced or Removed in 158 Gins in 1947 Season and in 166 Gins in 1948 Season¹

ITEM	Number Added		Number Replaced		Number Removed NOT Replaced	
	1947	1948	1947	1948	1947	1948
Air-line cleaners	6	—	3	3	5	—
Boll-breaking cleaners ²	4	—	2	2	3	1
Driers	23 ³	4 ³	3	1	—	—
Master extractors	12 ⁴	3	3	1	1 ⁶	—
After-cleaners ⁵	6	3	3	1	—	—
Extractor feeders	2	—	2	3	—	—

¹ NOTE—In 1947, 63 of the 158 gins on which information was available regarding changes in machinery, made one or more changes in the items listed; 95 of the gins made no changes. In 1948, 17 gins made changes, and 149 made no change in the items listed.

² Very few gins have boll "crushing" cylinders now. Boll-breaking cleaners refers to cylinder cleaners after separators or droppers, but before master extractors or extractor feeders where master or "Special" extractors are not used.

³ In 1947 about one-fourth of the driers added were combined cleaner-drier-extractor units called "Jembos". Two of the four installed in 1948 were of that type.

⁴ In 1947 six of the master extractors added were of the "Special" type hardly half the length of most master extractors. Those installed in 1948 were all regular master extractors.

⁵ After cleaners in this report refers to cylinder cleaners located between master extractors and feeders.

⁶ This was the "Special" type.

added, six replaced, and six removed without being replaced. Feeder extractors were added in two gins and replaced in five.

Additions, replacements and removals without replacements in 1947 and 1948 and also in 1945 and 1946 indicate a rapid trend toward the addition of driers and a rather strong trend toward the addition of master extractors, and general satisfaction with the

performance of both. Gin operators seem to maintain the number of after cleaners, but opinions on air-line cleaners were divided fairly evenly for and against their use. Extractor feeders seem to be generally preferred over drum feeders.

DESIRABLE COMBINATIONS

It is very doubtful if there is one combination of gin equipment that is economically best for all gins in Western Oklahoma. Some gin operators would lose money on the installation of all the items they may need to make high grades, because their current volumes are insufficient to carry the additional costs and adequate additional volume is not available. The use of lint cleaners may change the combinations of other equipment necessary for turning out top grades.

In view of the comparisons made for the four years, and the above limitations, it appears that gins handling average and above-average volumes need driers, master extractors, after cleaners and side-draft condensers in order to provide a preferred quality of ginning service. Lint cleaners may also be required in some gins in order to obtain optimum values. Cotton farmers will very likely find that lint cleaners materially improve the grades of some cotton.