A multiple-baseline across two groups experimental design was used to examine the effects of a multicomponent individual incentive system on the performance, safety, and satisfaction of 22 truck drivers. The intervention included incentive pay, which was increased twice; individual and group feedback; and loss of incentive pay for accidents. Drivers earned points for completing various types of jobs. The primary measure was the percentage of job points earned in less time than the baseline average, which controlled for number of hours worked and miles driven. After intervention, performance increased and remained high for nearly 4 years. Accidents did not increase when the intervention occurred, and satisfaction with pay and work were not affected by it. Labor cost savings averaged more than $5,000 a month while the incentive program was in effect, and drivers' pay increased. These results add to the substantial literature on individual incentives by documenting increased productivity sustained over a long period without accompanying increases in accidents or decreases in workers' satisfaction.

# Effects of a Multicomponent Monetary Incentive Program on the Performance of Truck Drivers

## A Longitudinal Study

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**Several applied studies** have shown that people working under individual monetary incentive conditions perform at higher rates than those working for hourly pay (e.g., Gaetani, Hoxeng, & Austin, 1985; George & Hopkins, 1989; Nebeker & Neuberger, 1985; Orphen,

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1982). Studies by Gaetani et al. (1985) and by George and Hopkins (1989) are representative of research in this area. Gaetani et al. examined the effects of feedback and a commissioned payment system on the performance (measured as the amount billed to customers per day) of two machinists in an automobile machine shop. During the baseline phase, hourly pay was arranged. Following baseline, the workers were given daily feedback on the total dollar amount billed to customers. After a brief reversal to hourly pay, a commissioned payment plus daily feedback system was introduced. A performance standard based on historical performance levels was developed, and the machinists received 5% of the amount billed to customers over this standard in addition to their hourly pay. If a worker's performance fell below the standard, his hourly pay was reduced by a percentage that represented the extent to which performance was below the standard. When daily feedback was provided, performance increased. During the brief reversal phase, performance worsened. The commissioned payment system increased performance to a level above that which was observed during the previous phases. Because performance under the commissioned payment system was only measured for 40 workdays, the long-term effects of the system are not known. Also, no measure of the workers' attitudes toward the system was obtained.

George and Hopkins (1989) used a multiple-baseline design to determine the impact of sales-contingent pay on the performance of servers in three restaurants. Sales per labor hour and the number of customers served per labor hour were recorded as dependent variables. During the baseline phase, the servers received hourly pay. During the intervention phase, hourly pay was discontinued and each server received 7% of his or her gross sales for the pay period. In all three restaurants, sales and customers served increased following the introduction of the sales-contingent pay system. Performance was measured under the contingent pay system for 6 to 10 weeks. Because the restaurant chain filed for bankruptcy shortly after the study was concluded, no follow-up data were available. In addition, as in the Gaetani et al. study, worker satisfaction was not measured.

The present study was initiated in response to a request by management of a waste disposal firm to develop an incentive program that would increase drivers' productivity (number of jobs completed)

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without increasing accidents or producing worker dissatisfaction. The president was equally concerned that the drivers be fairly compensated and share the increased profits. Hopkins (1992) indicated that the pay-for-performance literature, although extensive, provides little indication of the long-term effects of individual monetary incentives. The major purpose of the present study, which lasted for 78 weeks and collected follow-up data during an additional 116-week period, was to evaluate the long-term effects of an incentive program on multiple dependent variables of importance to workers and management.

## METHOD

### SETTING

The study took place at Michigan Disposal Service, a waste disposal firm located in Kalamazoo, Michigan. At the time of the study, the company employed approximately 150 people and provided residential, commercial, and rolloff disposal services. The present study involved only the rolloff division. Workers in this division pick up waste contained in large metal boxes, containing from 10 to 50 cubic yards, located mainly at construction sites and manufacturing plants.

The term "rolloff" is indicative of the manner in which the boxes are loaded on and off the truck. Rolloff trucks are flatbed trucks with rails on the flatbed that can be raised and lowered. A cable is attached to one end of the box and the rails are raised or lowered, rolling the box on or off the bed of the truck. Empty boxes are delivered and off-loaded at job sites, and full boxes are loaded onto the truck and taken to a landfill, where they are dumped.

### SUBJECTS

All of the drivers in the division were required by management to participate; however, voluntary consent was obtained from the drivers to include their data in the present study. All drivers consented. Twenty-two male drivers participated, although personnel changes, which are detailed in a later section, did occur during the study.

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## EXPERIMENTAL DESIGN

A multiple-baseline across groups design was used. With this design, conditions change at different times for subjects in different groups, and intervention effects are evident when dependent variables change similarly for the various groups as a function of changes in the independent variable. The multiple-baseline across groups design controls for several threats to internal validity that are not controlled for by case study or repeated A-B (intervention absent, intervention present) strategies, and is practical to use in business and industry (Komaki, 1977, 1982, 1986).

Prior to baseline, drivers were assigned to one of two groups by pulling names from a hat at a regularly scheduled drivers' meeting. The first 10 names selected were assigned to Group 1; the remainder to Group 2. This procedure was recommended by the drivers and ensured that each of them had an equal chance of being assigned to Group 1, which was exposed to the potentially lucrative incentive condition 14 weeks before Group 2. Baseline began on October 29, 1989, for both groups of drivers, and lasted 20 weeks for Group 1 and 34 weeks for Group 2.

After baseline, drivers were exposed to the multicomponent monetary incentive program described below. The intervention began on March 25, 1990, for Group 1, and 3 months later (on June 24, 1990) for Group 2. On September 30, 1990, the beginning of a new fiscal quarter for the company, the amount of the incentives was increased by 92% for all drivers. Base pay was not altered. This phase is referred to as the first incentive increase phase. The increase was not staggered across the groups because management did not want the first group of drivers to have yet another financial advantage over the second group. The increased incentives phase lasted for 30 weeks, after which the study ended.

Although the study was concluded on April 27, 1991, weekly follow-up data were collected for 116 weeks. During the first 9 weeks of follow-up, the incentive conditions of the previous phase remained in effect. On July 1, 1991, the amount of the incentives was again increased—this time by 57%. Again, base pay remained unaltered. This phase is referred to as the second increase phase. Table 1 shows the implementation dates and duration of all phases of the study.

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**TABLE 1**
**Beginning Dates and Duration of Phases**

| Group | Baseline | | Incentive System | | 1st Incentive Increase | | 2nd Incentive Increase | |
|---|---|---|---|---|---|---|---|---|
| | Date | Weeks | Date | Weeks | Date | Weeks | Date | Weeks |
| 1 | 10/29/89 | 20 | 03/25/90 | 28 | 09/30/90 | 39 | 07/01/91 | 107 |
| 2 | 10/29/89 | 34 | 06/24/90 | 15 | 09/30/90 | 39 | 07/01/91 | 107 |

### PERSONNEL CHANGES

There were 17 drivers when baseline began. Three joined the study during the baseline phase and thus, when the program was first implemented, there were 20 drivers. An additional driver joined the study in the initial intervention phase. During the first incentive increase phase, one driver joined and two drivers left. Therefore, a total of 21 drivers participated in the initial intervention phase, 20 to 22 in the first incentive increase phase, and 20 in the second incentive increase phase. Although specific personnel changes were not detailed during the follow-up phase, 20 drivers were present throughout this phase.

### GENERAL PROGRAM DESCRIPTION

Drivers received their regular base pay and earned incentives when their weekly performance exceeded the baseline average. Thus, under the incentive system, drivers could not earn less money than they had prior to its introduction. Drivers were promised that the performance standard would not be changed after the incentive system was implemented unless there was a major change in the job, which did not occur. In addition, the president assured the drivers that no one would lose his job as the result of any increases in productivity. With the exception of four recent hires, all drivers received the same base pay. Historically, the base pay of the drivers had differed. However, prior to baseline, the president increased the hourly pay of the drivers who were not at the top of the pay scale to the top of that scale. Thus any differences in pay were due to differences in performance. To reduce the likelihood that drivers would perform quickly but carelessly, drivers lost their week's incentives if they had a chargeable accident. Drivers received the incentives as part of their regular weekly pay-

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check; however, the amount of the incentives was listed separately on their pay stubs.

Prior to the study, drivers had self-recorded the number and types of jobs they completed daily. They continued to do so during baseline and the intervention. During the intervention, they also calculated whether their performance was below average, average, or above average, and the amount earned in incentives, if any. During the first 5 weeks of the intervention phase, drivers were taught to use forms that allowed them to determine their performance and incentives. When the forms were introduced, the drivers were aware that the incentive system would be implemented after 5 weeks. Because the drivers knew that the incentives were to be introduced, it would have been better, from a research perspective, to introduce them along with the forms. However, management wanted to make sure that the drivers could correctly calculate their incentives so that their paychecks would agree with their self-recorded feedback. The supervisor and the first and fourth authors checked the accuracy of the completed forms and found few errors. When an error occurred, the supervisor reviewed the error with the driver and they corrected it together. In addition to this daily individual feedback, a line graph displaying weekly average group performance was posted in a communal area.

### MEASURES OF JOB PERFORMANCE

Devising a meaningful measure of driver performance on which to base incentives was difficult because the tasks and routes of the drivers varied. Further, due to the fact that the business is customer-driven, some jobs must be completed the same day they are assigned, and thus drivers did not work the same number of hours each day or each week. The primary measure of performance—the percentage of jobs completed in less time than the baseline average, although admittedly complex—equated tasks, miles driven, and hours worked, none of which was under the control of the drivers. The various steps used to arrive at this measure are described next.

Through extensive meetings with the drivers and management, it was determined that drivers performed nine different types of jobs. Point values, which were agreed on by management and drivers, were assigned to the various types of jobs based on the relative amount of

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**TABLE 2**
**Rolloff Job Types and Point Values**

| *Job Type* | *Description* | *Point Value* |
|---|---|---|
| Check | The driver checks the status of a box to determine if it needs to be dumped. One check is recorded per jobsite regardless of the number of boxes that are checked. A check is recorded only if the box is not dumped. | 0.25 |
| Delivery | The driver delivers a box to the jobsite and then is free to take another assignment. | 0.50 |
| Switch-out | The driver replaces a full box with an empty box and leaves the full box at the jobsite to be picked up later, or returns it to Michigan Disposal Service at the end of the day when returning to Michigan Disposal Service before leaving for the day. After completing the switch-out the driver is free to take another assignment. | 0.50 |
| Dump | A full box is already at Michigan Disposal Service. The driver takes the box to the landfill and dumps it. | 0.50 |
| Relocate | The driver drives to the jobsite and moves a box to a different location at the same jobsite. After moving the box, the driver is free to take another job. | 0.50 |
| All done | The driver drives to the jobsite, picks up a full box, and dumps it at the landfill. After dumping the box, the driver is free to take another job. | 1.00 |
| Round trip | The driver drives to the jobsite, picks up a full box, dumps it at the landfill, and returns it to the jobsite. After returning it to the jobsite, the driver is free to take another assignment. | 1.00 |
| Round trip with switch-out | The driver drives to the jobsite, replaces a full box with an empty box, dumps the full box at the landfill, and returns the empty box to the jobsite. The driver is then free to take another assignment. | 1.25 |
| Loading account | The driver drives to the jobsite, waits while a box is filled, then dumps it at the landfill, or dumps it at the landfill and returns it to the jobsite. After dumping it at the landfill or returning it to the jobsite, the driver is free to take another assignment. | 1.50 |

time taken to complete them. The most commonly performed job—the Round Trip—was used as the standard and was assigned a point value of 1.0. The different jobs, their descriptions, and their point values, which ranged from 0.25 to 1.5, are listed in Table 2.

Each day, drivers recorded the number and types of jobs that they completed and their miles driven. At the end of each week, the total number of job points earned by each driver was calculated and divided by the number of hours that he worked, which was taken from a time

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card that the driver punched when he arrived and left work. The preceding calculation resulted in the number of job points earned per hour. For example, if a driver completed 29.75 job points during a week and worked 47 hours, his job points per hour would be 0.63 (29.75/47). The mean number of job points earned per hour by each group of drivers was tracked as a secondary measure of performance.

Although job points per hour provides a reasonable indication of worker performance, it does not take into account the miles driven by the driver. This is important because drivers could earn more points if they drove fewer miles. For example, earning 0.5 job points per hour would represent lower performance if a driver had driven 500 miles during the week than if he had driven 1,000. To take into account mileage differences, when the group's baseline average performance was figured, it consisted of the group's mean job points per hour given the miles driven, as described below.

For each week during the baseline period, the average number of job points earned per hour for all drivers was determined. Also determined for those same weeks was the average number of miles driven per job point earned (total number of miles driven/total job points earned). To identify the average performance for each mile driven per job point, a scatterplot was drawn and the weekly average job points earned per hour was regressed (by the method of least squares) on the miles driven per job point. As expected, the job points earned per hour decreased as the miles driven per job point increased. The regression equation that best describes the relation between the two variables is $y = 0.696 - 0.00570x$. Sixty-three percent of the variance in the points earned per hour was accounted for by the miles driven per job point.

The regression equation was used to determine the average number of job points per hour for 1 to 120 miles driven per job point, which covered the actual and foreseeable range of miles. To do this, the $x$ in the formula was replaced with the number of miles driven, and the equation solved. For example, to determine average job points per hour for 10 miles driven per job point, the following equation was used: $0.696 - 0.00570(10) = 0.639$. As described later, incentive pay was awarded to each driver when his weekly average job points per hour given his miles driven exceeded the drivers' baseline average job points per hour given the miles driven.

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**TABLE 3**
**Average Performance and Per Job Point Incentive Values for the Miles Driven per Job Point Ranges**

| *Miles per Job Point* | *Average Performance* | *Per Job Point Incentives* | | |
|---|---|---|---|---|
| | | *Initial Level* | *First Increase* | *Second Increase* |
| 1.00-12.99 | .65 | $0.28 | $0.54 | $0.85 |
| 13.00-21.99 | .60 | $0.44 | $0.84 | $1.32 |
| 22.00-29.99 | .55 | $0.57 | $1.09 | $1.71 |
| 30.00-38.99 | .50 | $0.70 | $1.34 | $2.10 |
| 39.00-47.99 | .45 | $0.84 | $1.61 | $2.53 |
| 48.00-56.99 | .40 | $0.98 | $1.88 | $2.95 |
| 57.00-65.99 | .35 | $1.12 | $2.15 | $3.38 |
| 66.00-74.99 | .30 | $1.26 | $2.42 | $3.80 |
| 75.00-83.99 | .25 | $1.40 | $2.69 | $4.21 |
| 84.00-92.99 | .20 | $1.54 | $2.96 | $4.63 |
| 93.00-100.99 | .15 | $1.63 | $3.13 | $4.91 |
| 101.00-109.99 | .10 | $1.80 | $3.46 | $5.42 |
| 110.00-118.99 | .05 | $1.94 | $3.72 | $5.84 |
| 119.00 and up | .01 | $2.08 | $3.99 | $6.26 |

The regression analysis described above resulted in average performance standards for each of 1 to 120 miles driven per job point. Rather than having 121 standards, drivers and managers agreed in meetings to group miles into ranges and to establish one performance standard for each mileage category. The average performance standard for each category was the grand mean of the average performances for all of the mileages in the category. Categories were established so that the average performance standard (number of job points per hour) decreased by 0.05 for each successively increasing mileage category. For example, the standard for the first mileage category, 1.00-12.99 miles per job point, was 0.65 points per hour, while the standard for the second mileage category, 13.00-21.99 miles per job point, was 0.60. Fourteen mileage categories resulted from this procedure. Table 3 lists the 14 mileage categories and their associated average baseline performance standards, in terms of job points per hour. The mileage categories and their associated standards were explained to the drivers and were listed in a table on the daily feedback forms.

The performance level (below average, average, or above average) of each driver was determined weekly. On Monday morning, the supervisor totaled the number of job points completed and the number

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of miles driven by each driver, and gave the totals to the payroll clerk. The payroll clerk entered these data, along with the total number of hours worked, into a computer, and the computer produced a weekly report that included, for each driver, the number of job points earned per hour, the miles driven per job point, the level of performance (below average, average, or above average), and the amount of incentive pay earned by the driver. This report also included the primary dependent variable for the study—the percentage of job points earned in less time than the baseline average—calculated for Group 1 and for Group 2.

### Interobserver Agreement

The job performance measures were based on the job points earned and the miles driven by the drivers, both of which were self-recorded. The company's billing procedures provided a mechanism for monitoring the accuracy of the job points earned. Drivers were required to submit load tickets to the billing unit for each job they completed. The billing unit also received the drivers' daily data forms. Because customers were billed for each job, a false recording would have been discovered by the billing clerk or the customer during the billing process. This did not occur during the study.

To determine whether drivers were accurately reporting the miles driven, an observer occasionally went to the truck lot before work started or after work ended, and recorded the mileage from the hubometer (an odometer attached to the rear wheel axle) on each truck. The mileage recorded by the observer was compared to the mileage recorded by the driver. The driver of each truck could be identified because each truck was numbered, and the driver wrote his truck number on his daily recording form. Three second-shift drivers shared trucks with first-shift drivers and had their trucks on the road when mileage checks occurred. For these drivers, (a) the ending reading recorded by the first-shift driver was compared to the beginning reading recorded by the second-shift driver, and (b) the ending reading recorded by the second-shift driver was compared to the beginning reading recorded by the first-shift driver on the following day.

Mileage checks began in February, 1990. For 4 weeks, checks were conducted twice a week. Because recording problems were infre-

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quent, checks were reduced to once per week. After 10 weeks, checks were again reduced in frequency and conducted every 3 or 4 weeks for the rest of the study. Observers completed 280 mileage checks for drivers who did not share trucks and 116 checks for drivers who did. No discrepancies occurred for 366 of the 396 total checks; thus the overall percentage of interobserver agreement was 92.

Drivers could falsely improve their performance data by recording higher-than-actual mileage data. Nonetheless, the mileage recorded by the driver was higher than that recorded by the observer (or second driver) for only 7 of the 30 discrepancies. Three resulted from reversals of the order of two digits; two were 1-mile discrepancies; one was a 4-mile discrepancy; and one was a 20-mile discrepancy. Of the 23 discrepancies in which drivers recorded lower mileage than the observer (or second driver), 20 ranged between 1 and 9 miles. A mechanic or truck washer may have driven the truck after the driver recorded the mileage, accounting for the small differences. Two of the remaining discrepancies were due to the reversals of two digits; the final one occurred between two drivers who shared the same truck, with one recording 11,907 miles, and the other 13,907.

### SAFETY

The number of chargeable accidents was compared for the same time period (October 8 through March 17) during baseline and 1 year later during the first incentive increase phase. The data were compared for the same time period because weather conditions in Michigan influence the likelihood of accidents, with accidents being more likely in the winter months. Chargeable accidents were defined as (a) accidents investigated by police in which the driver was found at fault, and (b) accidents not investigated by police in which the driver was found at fault after an investigation by management.

### JOB SATISFACTION

Drivers completed the work and pay subscales of the Job Descriptive Index (JDI) (Smith, Kendall, & Hulin, 1969) during the baseline phase of the study, and again during the first incentive increase. Scores for both administrations were available for 19 of the 22 drivers. One

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driver did not complete the form correctly during the first administration and, although given another copy, did not return it; one left the division before the second administration; and the third did not begin working in the division until after the second administration.

## NET LABOR COST SAVINGS

Labor cost savings were determined weekly once the incentive system was implemented by subtracting current labor costs from the preincentive labor costs. To obtain the weekly net labor cost savings, the total amount paid out in incentives during the week was subtracted from the total labor cost savings. The specific calculation steps follow.

### Preincentive Labor Costs

The actual labor cost per job point was determined for each driver for a peak work period (May 1989 through June 1989) and a slow work period (November 1989 through February 1990). For both periods, each driver's labor costs were divided by the number of job points he had earned. Labor costs included wages, FICA, worker's compensation, clothing allowance, retirement, and insurance. Next, a regression analysis was used to determine the average labor cost for each mileage level. This analysis was necessary because labor costs were higher for higher mileage jobs due to the extra driving time. The miles driven per job point were calculated for each driver for each time period, and then the labor cost per job point was plotted as a function of the miles driven per job point. The equation that resulted from fitting a regression line to the data by the method of least squares was $y = 13.771 + 0.406x$. Sixty-four percent of the variability in the labor cost per job point was accounted for by the miles driven per job point.

The regression equation was used to determine the preincentive labor costs for each mile driven per job point. To do so, the $x$ in the formula was replaced with the number of miles driven, and the equation was solved. As with the determination of the performance standards for each of the 14 mileage categories, the labor costs for each mile driven in each mileage category were averaged to obtain one labor cost for each mileage category.

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### Current Labor Costs

The current labor cost per job point was determined for each driver by dividing his labor costs for the week by the number of job points that he earned.

### Total Labor Cost Savings

Each driver's current labor cost was subtracted from the preincentive labor cost for the same mileage, and multiplied by the total number of job points that he had earned, resulting in the labor cost savings for that particular driver. The savings were summed across drivers to obtain the total labor cost savings.

## RETURN ON INVESTMENT (ROI)

ROI refers to the dollar amount that the organization saved for every dollar it spent on incentives. The ROI was determined by dividing the net labor cost savings by the total amount paid in incentives.

## DETERMINATION OF THE INCENTIVE VALUES

The incentive values were derived from an analysis of the projected labor cost savings of the incentive system. First, the preincentive labor cost per job point for each mileage level was determined as described above. Second, projected labor costs were determined for the same time period based on an estimate of the extent to which drivers could increase the number of job points they earned (see below). The projected labor costs were lower than the actual labor costs because the total labor costs, which remained constant, were divided by more job points. Third, the projected labor cost savings were determined by subtracting the projected labor costs from the preincentive labor costs. Fourth, management decided to return 25% of the projected labor cost savings to the workers; thus the labor cost savings for each mileage level were multiplied by 0.25 to arrive at the per job point incentive values. Finally, the incentive values for the mileage levels in a mileage category were averaged for each of the 14 mileage categories to determine the per job point incentive value for that category. The

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resulting initial incentive values are listed in Table 3, along with the incentive values for the two increases that occurred during the study.

### Calculation of Projected Labor Costs

The management and drivers estimated that drivers could increase their performance by an average of 0.5 job points per day once the incentive system was implemented. To arrive at the projected labor costs, 0.5 job point was added to the points earned by each driver each day during the two work periods used in calculating preincentive labor costs, and the labor costs for each mileage level were recalculated, again using a regression analysis. The labor costs for each mileage level were averaged within each of the 14 mileage categories, resulting in one projected labor cost for each mileage category.

#### DRIVERS' INCENTIVE PAY

When a driver performed above average for a week, he received a per job point incentive in addition to his base pay. The per point incentive was multiplied by the total number of points earned to arrive at the driver's total incentive pay. For example, if a driver earned 22 points, worked 40 hours, and drove 770 miles in a week, his job points per hour would be 0.55 (22/40) and his miles driven per job point would be 35 (770/22). As can be seen in Table 3, average performance for 35 miles driven per job point is 0.50 and the per point incentive is \$0.70 (for the initial incentive phase). Because the driver performed above average, he would earn \$0.70 × 22, or \$15.40 in incentive pay.

Overtime pay was affected by incentive earnings because wage laws dictate that overtime pay be based not on the hourly base pay but on the actual amount of pay earned per hour (base pay plus incentive pay). Actual hourly pay during incentive conditions was determined using the formula:

$$\frac{(\text{Base Pay} \times \text{HoursWorked}) + \text{Incentive Pay}}{\text{Hours Worked}}$$

If a driver worked more than 40 hours in 1 week and earned incentive pay, he received 1.5 of his actual hourly pay rather than 1.5 of his hourly base pay for each overtime hour. For example, if a driver

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worked 50 hours and earned $10.00 per hour in base pay and $20.00 in incentive pay, his actual hourly pay would equal:

$$\frac{(\$10.00 \times 50) + \$20.00}{50} = \$10.40.$$

Thus the driver would earn $15.60 ($10.40 × 1.5) per hour for each overtime hour.

## RESULTS

### JOB PERFORMANCE

Figure 1 shows the percentage of total job points earned in less time than the baseline average across all phases of the study for drivers in Group 1 and Group 2. Although the groups were constructed by drawing names out of a hat, drivers in Group 2 performed substantially better than drivers in Group 1 prior to the introduction of incentives. Nonetheless, the introduction of the incentive program was associated with improved performance by both groups, and the improved performance was retained across all of the subsequent incentive conditions. However, performance did not consistently increase as the value of incentives increased from the initial level.

The data in Figure 1 were analyzed by repeated measures analysis of variance (ANOVA), followed by planned comparisons using protected LSD tests. Data were analyzed separately for Group 1 and Group 2. For both groups, there was a significant overall effect: for Group 1, $F = 120.43$, $df = 3, 188$, $p < .001$; for Group 2, $F = 61.27$, $df = 3, 188$, $p < .001$). Planned comparisons revealed that the percentage of job points earned in less time than the baseline average differed significantly ($p < .05$) from the baseline level during each of the three incentive conditions.

Mean job points per hour for all phases of the study are shown in Figure 2. In general, these data show effects similar to those that are evident with the other measure of job performance. Group 1 earned fewer job points per hour than Group 2 during all phases of the study, and mean job points earned by both groups increased when incentives were arranged but did not increase further when incentive values were raised.

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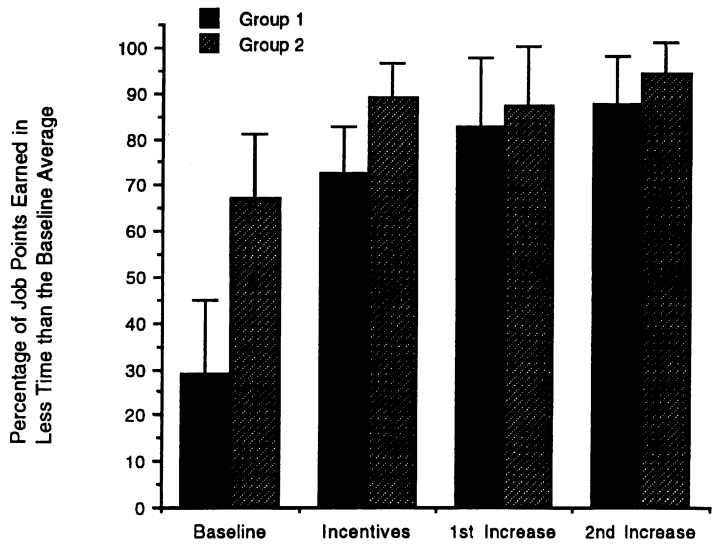


**Figure 1. Mean percentage of job points earned in less time than the baseline average (plus 1 standard deviation) by drivers under baseline and three incentive conditions.**
NOTE: Drivers in Group 2 were exposed to the first incentive condition 3 months later than were drivers in Group 1.

Analysis of variance for the job points per hour data revealed that there was a significant overall effect for both groups: for Group 1, $F = 50.56$, $df = 3, 188$, $p < .001$; for Group 2, $F = 15.51$, $df = 3, 188$, $p < .001$. Moreover, planned comparisons revealed that mean job points earned per hour were significantly higher ($p < .05$) during each of the incentive phases than during the baseline condition.

### SAFETY

During the baseline comparison period, 11 accidents (0.48 per week) occurred. During the same period 1 year later, with incentives in effect, 8 accidents (0.35 per week) were reported.

### JOB SATISFACTION

Scores on the JDI subscales can range from 0 to 54—the higher the score, the greater the level of satisfaction. During baseline, the mean

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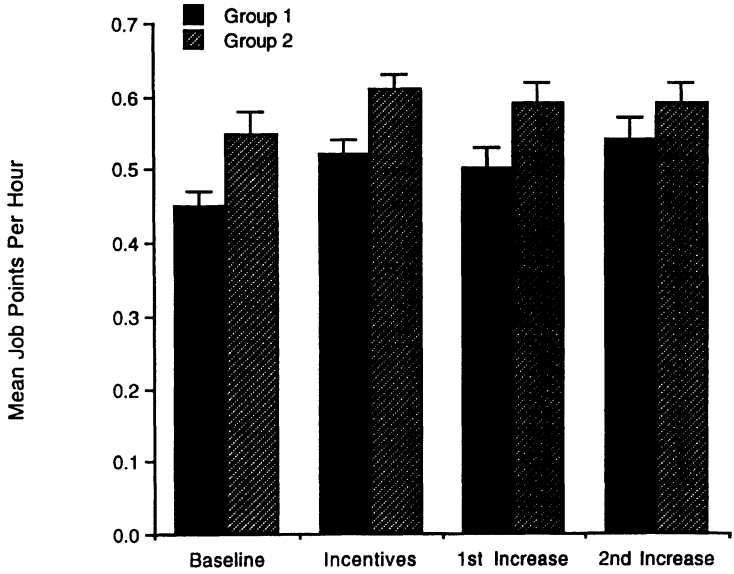


**Figure 2. Mean job points earned per hour (plus 1 standard deviation) by drivers under baseline (no incentives) and three incentive conditions.**
NOTE: Drivers in Group 2 were exposed to the first incentive condition 3 months later than were drivers in Group 1.

score on the pay satisfaction subscale for drivers in both groups combined was 26.10 ($SD = 9.94$). During the incentive condition, the mean score was 24.21 ($SD = 13.45$). A $t$ test indicated that the difference in means was not significant ($t = 0.31$, $df = 18$, $p > .05$). The mean score on the work satisfaction subscale was 32.47 ($SD = 6.06$) during baseline; with incentives arranged, it was 30.37 ($SD = 9.09$). The difference between these means was not significant ($t = 0.3$, $df = 18$, $p > .05$).

#### NET LABOR COST SAVINGS AND ROI

During the first incentive phase of the study, which lasted 5 months, the net labor cost savings were $17,631 and the ROI was 4.4:1. Net labor cost savings for the first incentive increase phase—a 10-month period—were $58,724 with an ROI of 2.8:1.

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## DISCUSSION

Several surveys have indicated that individual incentive programs are relatively widespread in the United States, and a substantial minority of workers are exposed to them (Lawler, Ledford, & Mohrman, 1989; Mitchell, Lewin, & Lawler, 1990; O'Dell & McAdams, 1987; Peck, 1990). The effectiveness of such programs in improving productivity has been well documented in laboratory simulations (e.g., Berger, Cummings, & Heneman, 1975; Campbell, 1984; Frisch & Dickinson, 1990; Pritchard, Hollenback, & DeLeo, 1980; Riedel, Nebeker, & Cooper, 1988). Moreover, several applied studies have reported similar effects. As noted by Hopkins (1992), however, few well-controlled applied studies have been conducted. With some exceptions (e.g., George & Hopkins, 1989; Nebeker & Neuberger, 1985; Orphen, 1982), the reported successes of individual incentives in actual organizations come from case studies and AB experiments (e.g., Abernathy, Duffy, & O'Brien, 1982; Dierks & McNally, 1987; Gaetani et al., 1985; Yukl & Latham, 1975). Although such studies individually provide only weak support for the effectiveness of incentive programs, the consistency of effects across studies, coupled with the results of laboratory simulations and a handful of well-controlled applied investigations, leaves little doubt that carefully designed individual incentive systems can increase workers' productivity.

The present results, collected with a modified multiple-baseline across groups experimental design, provide further documentation that individual incentives can increase productivity. They are of importance primarily in documenting that increased productivity was sustained over a long period (nearly 4 years) and in showing that increased productivity was not accompanied by worker dissatisfaction or increased accidents. Also important is the demonstration that workers appeared to understand a relatively complex incentive system; in fact, they played an active role in designing and modifying it.

Interestingly, in view of the suggestion that 30% of workers' pay must be incentive-based to produce significant effects (Fein, 1970; Henderson, 1989), drivers in the present study improved their performance in the initial incentive condition when they earned only a small portion of their total pay in incentives (2.6% for Group 1; 3.1% for Group 2). Across subsequent incentive conditions, drivers earned

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about 6% and 9% of their total pay as incentives, yet performance did not increase accordingly. These results suggest that, once pay is tied to performance, strengthening that link by increasing the amount or proportion of incentives may not lead to further increases in performance. This effect has previously been demonstrated in laboratory simulations (Dickinson & Gillette, 1993; Frisch & Dickinson, 1990) and appears to be a real phenomenon. It should be noted, however, that the range of total pay values provided as incentives in the current study was relatively small (3%-9%), and results may differ when more of the total pay is made performance-dependent.

In terms of earnings, the incentives arranged in the present study were beneficial to drivers and the organization alike. The company realized net labor cost savings of about $76,000.00 during the first 15 months with incentives arranged, as well as whatever profits were generated by the 7.3% increase in the number of jobs completed during this period relative to baseline. Drivers' pay also increased when incentives were in effect. Given the latter outcome, it is interesting that satisfaction with pay, as measured by the JDI, did not improve when incentives were arranged, even though drivers earned more money than they had in the past. Similar results were reported previously by Farr (1976), who examined the effects of individual and group incentives on both personal pay satisfaction, using a modified version of the JDI, and pay fairness, using a separate survey. Farr found that the different pay systems affected perceived pay fairness but did not affect satisfaction with personal pay. The results of the present study are consistent with Farr's, insofar as the incentive system did not affect personal pay satisfaction. Perceived fairness of pay was not measured in the current study.

Incentive systems are not panaceas. They can be hard to arrange and can create several potential difficulties, as other authors have discussed (e.g., Dickinson & Gillette, 1993; George & Hopkins, 1989; Lawler, 1990; Mitchell et al., 1990). Lawler (1990) has emphasized, however, that: "Often the negative behaviors [of workers] associated with incentive pay are not caused so much by the concept itself as by the way it has been put into practice" (pp. 58-59). Involving workers in deciding how incentives should be arranged may help to ensure that practices are acceptable. In that regard, it is noteworthy that no substantial problems were encountered in the present study, in which

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care was taken to involve both labor and management in all decisions concerning incentives.

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