

MEMORANDUM

Date: February 22, 2006

Subject: Car Wash Capacity

To: Matt Ford

From: Jaclyn Tetzl & Stacey Theissen

Introduction

As requested, questions concerning capacity decisions about starting a car wash business have been investigated. The focus of the investigation was on whether there should be one or two car wash lines, what the break-even point is for one and two car wash lines, and how the profitability would change if the selling price went up and the variable costs went down.

Findings

Break-even results. The break-even volume of cars that need to be washed for one wash line is 2,034, and 3,560 cars need to be washed to break even with two wash lines. The break-even volumes are easily obtainable for both one and two wash lines with the expected demand range of fourteen to eighteen cars per hour. However, one wash line will break even with a lower number of cars washed and begin yielding a profit after washing only 2,034 cars.

Capacity results. Within the demand range of fourteen to eighteen cars washed per hour, the car wash business would be most profitable with only one wash line.

Optimistic scenario. When the selling price is increased to \$8.95 and the variable costs are decreased to \$2 per wash, the break-even volume is 864 cars for one wash line and 1,511 cars for two wash lines. It is most profitable to have two wash lines when the demand is eighteen cars per hour.

Discussion

Method. Monthly output and input data were obtained from the information you presented. Total profits for each projected demand range were calculated for both one and two wash lines. Break-even was also calculated under normal operations. For further analysis we calculated profits with optimal revenues and lowered costs.

Break-even results. The break-even volumes show the minimum number of cars washed in order to not incur a loss. At the break-even volumes, both profits and losses equal zero. With the expected demand of fourteen to eighteen cars, both one and two wash lines would be above the break-even volume; therefore, operating either one or two wash lines would yield a profit. The break-even volumes for the business with one and two wash lines were determined using the fixed costs that would be incurred for each line divided by the difference between the selling price and the variable costs. As mentioned, for one line the break-even volume is 2,034, and

analyzed further by dividing the break-even volume of 2,034 by the maximum capacity of 300 washes would yield approximately seven cars per hour. For two lines, the break-even volume is 3,560, and analyzed further by the same process is approximately twelve cars per hour. Both of these break-even volumes are easily obtainable because they are below the projected demand range of fourteen to eighteen cars per hour, but operating with one wash line would yield a profit after washing a lower number of cars. The break-even results appear in Table 1.

Table 1: Break-even Results

| | <u>One Line Car Wash</u> | <u>Two Line Car Wash</u> |
|---|--------------------------|--------------------------|
| Break-even Volume | 2,034 | 3,560 |
| Number of Cars Needed to be Washed Per Hour to Break-even | 7 | 12 |

Capacity Results. The capacity results with the projected demand of fourteen to eighteen cars appear in Table 2. Total profits were calculated by subtracting total costs from total revenues.

Table 2: Profits Within Demand Range

| | <u>One Line Car Wash</u> | <u>Two Line Car Wash</u> |
|---------------------------|--------------------------|--------------------------|
| Total Revenue for 14 Cars | \$24,990 | \$24,990 |
| Total Costs for 14 Cars | \$18,600 | \$23,100 |
| Profit for 14 Cars | \$6,390 * | \$1,890 |
| Total Revenue for 15 Cars | \$26,775 | \$26,775 |
| Total Costs for 15 Cars | \$19,500 | \$24,000 |
| Profit for 15 Cars | \$7,275 | \$2,775 |
| Total Revenue for 18 Cars | | \$32,130 |
| Total Costs for 18 Cars | | \$26,700 |
| Profit for 18 Cars | | \$5,430 |

*Sample Calculation: $\$24,990 - \$18,600 = \$6390$

It is clear when looking at the table that the profits for one car wash line are considerably higher than the profits for two car wash lines for the projected demand of fourteen to eighteen cars per hour. Only when the demand goes above the relevant range in the table would a two-line car wash be more profitable. This is because one car wash line can only wash up to fifteen car washes per hour; whereas, two car wash lines could feasibly wash thirty cars per hour if there was a demand for it.

Optimistic scenario. If it becomes possible to increase the selling price to \$8.95 per wash due to positive word of mouth from customers and the variable costs could be decreased to \$2 per wash as a result of new washing technology, the profits would increase considerably with both one or two wash lines. We calculated these results using the same method as for the capacity results. The optimization results appear in Table 3.

Table 3: Break-even Volume and Profits for Optimistic Scenario

| | <u>One Line Car Wash</u> | <u>Two Line Car Wash</u> |
|---|--------------------------|--------------------------|
| Break-even Volume | 864 | 1,511 |
| Number of Cars Needed to be Washed Per Hour to Break-even | 3 | 6 |
| Total Revenue for 14 Cars | \$37,590 | \$37,590 |
| Total Costs for 14 Cars | \$14,400 | \$18,900 |
| Profit for 14 Cars | \$23,190 * | \$18,690 |
| Total Revenue for 15 Cars | \$40,275 | \$40,275 |
| Total Costs for 15 Cars | \$15,000 | \$19,500 |
| Profit for 15 Cars | \$25,275 | \$20,775 |
| Total Revenue for 18 Cars | | \$48,330 |
| Total Costs for 18 Cars | | \$21,300 |
| Profit for 18 Cars | | \$27,030 |

*Sample Calculation: $\$37,590 - \$14,400 = \$23,190$

With these optimal revenue and cost conditions, it would be more profitable to have two wash lines if the demand was eighteen cars per hour. However, the likelihood of demand always being at the upper end of the relevant range is low, and one wash line is more profitable closer to the average and lower end of the relevant range.

Limitations. There is a seasonal limitation. The demand for a car wash would probably be higher in the summer and you could wash well above the demand range. Due to the fact that there would be such a high demand a car wash business could sell their car washes at a higher price to yield a higher profit. We have also assumed for this analysis that the demand will always be between fourteen and eighteen cars per hour; however, when you get outside the demand range the profits may begin to fluctuate more. For example, if there was a demand for maximum capacity, then a two-line car wash could wash thirty cars and yield a profit of \$53,550.