Plant Operations Report

Explanations of Numbers — How Costs Are Allocated — Suggestions and Tips for Using the Report

This report and the Benchmarking data on p. 6 of each issue of the Footwear Industry Report are your most valuable tools for diagnosing the efficiency of your plants and production operations and for staying on top of how well you are managing the company’s production activities. You and your co-managers should always, without fail, review the information on this report as part of your preparation for making the upcoming year’s decisions — you cannot hope to craft a shrewd production strategy and manage the company’s plant operations efficiently without an understanding of what drives production costs and how production costs in one plant compare with production costs in your other plants.

This Help document consists of two sections. The first deals with understanding the ins and outs of all the numbers being reported. The second deals with suggestions and tips for using the information in making decisions on how to run the production side of the company’s business.

Understanding the Numbers on the Plant Operations Report

This report provides a thorough rundown of plant operating statistics—the amount of plant capacity, the status of plant upgrades, the amounts invested in plant capacity, worker productivity and compensation statistics, assorted branded and private-label production data, and branded production costs.

While some of the numbers in this report are fairly self-explanatory, there are some numbers reported here that require discussion and comment about what they mean, how they were calculated, what causes them to change, and how they can be used to guide decision-making and your efforts to run the production side of the business.

You should pay particular attention to the discussion of the numbers in the Branded Production Cost section to be sure you understand what the cost numbers mean, where they come from, and what company co-managers can do to lower them. There is information about plant economics and branded production costs in this section not covered elsewhere. And there is discussion of which plant costs are allocated between branded production and private-label production (some are and some are not) and how the costs are allocated.

Plant Capacity Information. In the first bank of data on Plant Capacity, the amount of production capacity available for your company’s use in any of the four geographic regions in any year is equal to:

- Plant capacity at the end of the prior year plus
- Any newly constructed capacity coming on line in the current year (after undergoing construction in the prior year) plus
- Capacity purchased (in the form of used capacity purchased at the beginning of the report year) minus
- Any capacity that was sold off (in the form of used equipment that was disposed of at the beginning of the report year).

All of the numbers regarding pairs of capacity do not include use of overtime, so the total production capability of the plant capacity available when operated at full overtime is always 20% more than the capacity numbers shown on this report.

Plant capacity in a region in the upcoming year, as you can see in the last two lines of the Plant Capacity section, is always equal to capacity in the current year plus any capacity that was under construction in the region in the report year. You and your co-managers can, however, increase/decrease the amount of capacity available at the beginning of the upcoming year by either

1. Purchasing plant capacity from the merchants of used equipment if it is available—purchased capacity is available immediately and can be utilized throughout the year the purchase is made, or
2. Selling some or all of the existing capacity at a plant to used capacity merchants (who stand ready to buy used capacity in increments of 100,000 pairs at a price equal to the undepreciated book value of the capacity).
**Plant Upgrades.** There are four options for upgrading existing plants and equipment as shown below:

<table>
<thead>
<tr>
<th>Option</th>
<th>Benefits</th>
<th>Capital Investment</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Reduces the number of defective pairs by 50%</td>
<td>One-time capital outlay of $2.5 million per million pairs of plant capacity</td>
</tr>
<tr>
<td>B</td>
<td>Reduces production run set-up costs by 50%</td>
<td>One-time capital outlay of $5.5 million per million pairs of plant capacity</td>
</tr>
<tr>
<td>C</td>
<td>Boosts S/Q rating by 1-star</td>
<td>One-time capital outlay of $5.0 million per million pairs of plant capacity</td>
</tr>
<tr>
<td>D</td>
<td>Increases worker productivity by 25%</td>
<td>One-time capital outlay of $3.5 million per million pairs of plant capacity</td>
</tr>
</tbody>
</table>

This report indicates which upgrades have been undertaken at which plants and whether any plant upgrades were initiated in the report year.

*A maximum of two upgrades can be chosen for any one plant.*

*Only one option per year may be undertaken at the same plant.*

*Upgrade options take effect the year after being ordered and undergoing construction/installation.*

*No upgrades may be ordered for a new plant during the year it is being constructed.* An upgrade option can be ordered for a new plant the first year the new plant is on line or any year thereafter.

**Plant Investment Information.** The section on Plant Investment shows how much your company has invested in production capacity in each region where your company has a plant.

- Gross Investment in plant and equipment in a region represents the original capital cost of the plant, expenditures for plant upgrades, and the cost of any plant additions (that were either self-constructed or obtained via the purchase of used footwear-making equipment) less the value of any capacity sold off (to the merchants of used footwear-making equipment). Gross plant investment is depreciated on a straight-line basis at the rate of 5% annually (given the assumed 20-year life of all plant investments).

- Net investment in plant capacity represents the undepreciated value of the plant. If your company has a 2-million pair plant with a net investment of $40 million and if you opted to sell off 500,000 pairs of capacity to the merchants of used footwear-making equipment, then you would receive 25% of the net plant investment or $10 million from the sale.

- The last line of the Plant Investment section indicates how much construction work has been ongoing during the report year for plant upgrades and newly constructed additions; the full amount of construction work in progress will be added to gross investment at the beginning of the upcoming year and will result in added annual depreciation costs for the plant.

**Labor Statistics.** There’s little to explain here that is cannot be readily deduced from the presentation of the numbers. What is worth commenting on, however, is that the compensation and productivity of the work forces at the North American plant and the Asia-Pacific plant are sharply different. The productivity of your company’s North American workforce was 60% higher than that of the Asia-Pacific workforce in Year 10, but the compensation costs of $20,100 for North American workers was over 5 times that of the $3,700 compensation of worker at the Asia-Pacific plant. This translates into higher labor costs per pair produced — as you can see by comparing the labor cost numbers in the breakdown of branded production costs in the bottom section of the report for the North American plant versus the Asia-Pacific plant.

Worker productivity at a plant is important because it determines the size of the workforce needed to staff plant operations. For instance, if your company elects to produce 2 million pairs of shoes at its North American plant and the annual productivity of North American workers averages 4,000 pairs annually, then it will take a workforce of 500 people to produce the 2 million pairs. But if base pay increases can, over time, help boost worker productivity to an average of 5,000 pairs, then only 400 workers will be needed to produce 2 million pairs. A smaller workforce can translate into lower total payroll costs and lower labor costs per pair produced if the cost-reducing gains in productivity outweigh the cost-increasing impact of the higher compensation per worker.

Annual worker productivity (that is, how many pairs each worker, on average, produces in a given year) is influenced by five factors:

- *Annual percentage increases in base pay.*
• How much emphasis is placed on incentive compensation (as measured by the percentage of the company’s total compensation package accounted for by incentive pay).

• The total annual compensation of workers relative to industry-average compensation levels in the geographic region where a plant is located.

• The annual amount the company spends per worker on best practices training

• Installation of plant upgrade option D.

The numbers shown for cumulative best practices training at a plant represent average expenditures at the plant per worker and per pair produced, respectively, over all years such training has been done at the plant. Your company first began best practices training in Year 10, so the cumulative numbers reflect the Year 10 effort plus any amounts spent on training price then.

• Cumulative best practices training expenditures per worker is an important number because it reflects the ongoing effort at a plant to ingrain the use of best practices in the work force; higher cumulative expenditures per worker over time can boost worker productivity as much as 3% annually.

• Cumulative best practices training per pair produced is what drives reductions in materials waste; higher cumulative spending per pair produced has the effect of helping lower materials waste and can cut materials costs at a plant by as much as 20% annually over a period of years. However, it generally requires best practices training expenditures of about $0.30 per pair before this particular benefit of best practices training kicks in. The achieved and projected materials cost savings stemming from cumulative expenditures for best practices training per pair produced are always reported in a box in the upper right corner of the Branded Production decision screen.

The numbers shown for cumulative spending for best practices training at each plant, together with the information and on-screen calculations on the Branded Production screen, will help you evaluate the cost effectiveness of more/less expenditures for best practices training.

Production Statistics. The information in this section gives you a solid overview of the production activities at each plant during the report year. It shows branded and private-label pairs produced at regular time and overtime, the pairs rejected and reject rate percentages, the percentage of plant capacity that was utilized to make branded and private-label footwear, the number of models produced, and the S/Q ratings of the footwear produced at each of the company’s plants.

You should make a habit of monitoring reject rates at each plant each year and whether the reject rate is rising or falling. Historically, reject rates have been higher at the Asia-Pacific plant than at the plant in North America. The reject rates at a plant are a function of five factors:

• The size of the incentive payment per non-defective pair produced — Higher piecework incentives help reduce the reject rate because the company’s policy of not paying an incentive for defective pairs motivates workers to pay close attention to their workmanship, observe best practice procedures, and not engage in “hurry-up” procedures to boost their incentive compensation.

• Spending for TQM/Six Sigma quality control efforts — In addition to the positive effect that TQM/Six Sigma programs have on S/Q ratings, greater expenditures for TQM/Six Sigma programs also act to lower the number of pairs that end up being rejected.

• The emphasis placed on best practices training per worker — Putting workers through additional best practices training helps lower reject rates because of the associated improvements in workmanship and production methods. However, just as with progressively higher spending for TQM/Six Sigma, the benefits of progressively more training in the use of best practices are subject to diminishing marginal returns.

• The number of models/styles comprising the company’s product line — The more models produced, the less skill and experience that workers have in producing each model and the more mistakes they are prone to make. However, the tendency for reject rates to rise as more models are added to the product lineup can be combated by increasing incentive pay per pair and/or boosting spending for TQM/Six Sigma programs and/or boosting expenditures for best practices training. Likewise, if a company reduces the number of models/styles in its product line, it can usually trim spending for its TQM/Six Sigma program and/or cut back best practices training and/or slightly reduce incentive pay per worker without materially hurting reject rates.

• Whether plant upgrade Option A has been installed (this upgrade option entails installing equipment to cut a plant’s reject rate by 50%) — The projected cost savings for this plant upgrade option, given current reject rates and other plant operating factors, are shown on the decision screen for capacity sales/upgrades/additions.
It is possible to reduce plant reject rates to 1% or less, but it remains for company co-managers to explore to what extent such efforts would be cost-effective.

Branded Production Cost Statistics. This section of the report should always merit your full attention because it provides detailed cost breakdowns of making branded footwear at each of your company’s plants. Note that there are two columns of cost data—one for total dollars of cost and one for costs per branded pair produced (after allowing for rejects). The columns of data for the geographic regions where you have plants are the most pertinent because they convey the costs at each plant; the numbers in the “Overall” column on the right provide the total dollars of cost for all plants and the companywide average cost numbers per branded pair produced.

- **Materials Costs** — The different cost numbers for standard versus superior materials reflect different base prices and the upward/downward adjustments in base prices due to the percentage mix of standard-superior materials usage and the strength of demand for footwear materials:
  - The going market prices of standard and superior materials in any one year deviate from their respective base price whenever the worldwide percentage mix is anything other than the “norm” of 50% for standard materials and 50% for superior materials. The going market price of superior (or standard) materials rises 2% above the base for each 1% that worldwide use of superior (or standard) materials exceeds 50%. Simultaneously, the global market price of standard (or superior) materials drops 0.5% for each 1% that the global usage of standard (or superior) materials is below 50%. Thus, worldwide materials usage of 56% superior materials and 44% standard materials results in a global market price for superior materials that is 12% above the prevailing base price for superior materials and a global market price for standard materials that is 3% below the prevailing base price for standard materials. Similarly, worldwide usage of 60% standard materials and 40% superior materials results in a global market price for standard materials that is 20% above the base price and a global market price for superior materials that is 5% below the prevailing $12 base. Hence, greater than 50% usage of superior materials always widens the price gap between superior and standard materials, and greater than 50% usage of standard materials acts to narrow the price gap.
  - Materials prices fall when global production levels drops below 90% of global production capacity and materials prices rise when global production levels rise above 110% of global plant capacity. Should global shoe production fall below 90% of the footwear industry’s global plant capacity (not counting overtime production capability), the market prices for both standard and superior materials will drop 1% for each 1% that global shoe production is below the 90% capacity utilization level. Such price reductions reflect increased competition among materials suppliers for the available orders. On the other hand, when global production levels exceed 110% of the industry’s global plant capacity (reflecting use of overtime production), the prices of both standard and superior materials will go up 1% for each 1% that global production levels exceed 110% of global production capacity. Thus once overtime production exceeds a global average of 10% of installed plant capacity worldwide, then material suppliers are able to exert pricing power and can command higher prices. In the event global production reaches the 20% overtime maximum, the prices of standard and superior materials will be 10% higher than they would otherwise be.

You can always track how these two factors have affected recent materials prices by consulting the Materials Price information on page 4 of each issue of the Footwear Industry Report.

**Key Points About Materials Costs:** The total costs for standard and superior materials in the first column of cost data at each plant represent the prevailing global price the company pays for standard and superior materials times the total number of branded pairs produced, however, if your company has spent a cumulative total of $0.30 or more per pair produced on best practices training at a plant, the total costs for standard and superior materials are adjusted downward by the amount of materials waste reduction that has been achieved. In the second column are the per pair costs for standard and superior materials; the per pair costs of materials represent total expenditures for standard/superior materials divided by the number of branded pairs produced after rejects.

The per pair costs for standard materials and superior materials are not necessarily the same at all plants for three reasons:
  - Using different percentages of standard and superior materials to make branded pairs at each plant.
  - The reject rates are lower at some plants than others. The per pair costs for materials at a plant are calculated by (1) dividing total expenditures for standard materials by the number of branded pairs produced after rejects and (2) by dividing total expenditures for superior materials by the number of branded pairs produced after rejects. The lower the reject rates at a plant, the larger the denominator in these per pair calculations and the lower the materials cost per pair.
  - Because your company may not have exerted the same cumulative effort at each plant to train workers in the use of best practices. One of the benefits of best practices training is that it leads to less materials waste, which effectively reduces materials costs per pair produced. Cumulative best practices training per pair produced is what drives reductions in materials waste. As cumulative spending per pair produced rises progressively above $0.30 per pair produced, growing ability on the part of plant personnel leads to less materials waste and net
reductions in materials costs per pair (which could amount to as much as 20% lower net materials costs if the company’s best practices training effort at a particular plant is very aggressive—perhaps in the range of $1.00 to $1.25 per pair produced).

If your company’s percentage use of standard and superior materials is the same at two or more plants, then any differences in materials costs per pair are a direct reflection of the different amounts of the cumulative spending for best practices training per pair produced at different plants. Any such differences are reported in the last line of the Labor Statistics section of this report.

- **Labor Costs** — Labor costs have two components: (1) labor costs for base pay and incentive pay during regular time production and (2) labor costs incurred during overtime production. Labor costs per branded pair produced at overtime are always higher than at regular time because your company pays workers 1.5 times the hourly base pay equivalent for all overtime production. Also, the labor cost per branded pair is always based on pairs produced after rejects are deducted rather than on total pairs produced.

- **Best Practices Training Costs** — These cost numbers for branded production show total plant costs for best practices training and per pair costs. The per pair costs are particularly important for gauging the effort put on best practices training aimed at reducing materials waste and lowering materials cost per pair—you can compare these numbers for the your company’s plant to see where the effort was highest/lowest in the report year. The total amount the company spent for best practices training in the report year is allocated between branded production and private-label production according to their respective percentages of total pairs produced—thus, if 95% of the total pairs produced at a plant are branded then 95% of annual plant supervision costs are allocated to branded production. The total dollar amount shown for best practices training represents the portion of total plant expenditures for best practices training for the year allocated to branded production. Best practices training costs per branded pair are equal to the amount of best practices training expenditures for the plant allocated to branded production divided by the number of branded pairs produced (after rejects).

- **Plant Supervision Costs** — Costs for plant supervision are directly related to the number of workers at a plant. These costs are equal to $6,000 per worker at plants in North America and Europe-Africa and $2,000 per worker at plants in the Asia-Pacific and Latin America—however, these per worker amounts are subject to change by your instructor as the game progresses. Annual plant supervision costs are allocated between branded production and private-label production according to their respective percentages of total pairs produced—thus, if 95% of the total pairs produced at a plant are branded then 95% of annual plant supervision costs are allocated to branded production. The total dollar amount shown for plant supervision represents the portion of total plant supervision costs for the year allocated to branded production. Plant supervision costs per branded pair are equal to the total dollars of plant supervision cost for a plant allocated to branded production divided by the number of branded pairs produced (after rejects).

- **Enhanced Styling/Features Costs** — These cost numbers reflect how much company co-managers opted to spend per branded model/style produced. The total dollar amount equals the expenditure per branded model/style that was entered on the Branded Production screen during the decision process multiplied by the number of branded models/styles produced at the plant. The per pair number represents the total dollar expenditures for branded styling/features produced at the plant divided by the total number of branded pairs produced (after rejects).

- **TQM/Six Sigma Costs** — The total amount company co-managers spent on TQM/Six Sigma quality control programs at each plant in the report year is allocated between branded production and private-label production according to their respective percentages of total pairs produced—thus, if 90% of the total pairs produced at a plant are branded then 90% of plant costs for TQM/Six Sigma quality control programs are allocated to branded production. The total dollar cost shown for plant TQM/Six Sigma quality control programs represents the portion of total costs for TQM/Six Sigma quality control for the year allocated to branded production. TQM/Six Sigma quality control costs per branded pair are equal to the total costs for TQM/Six Sigma quality control allocated to branded production divided by the number of branded pairs produced (after rejects).

- **Production Run Set-Up Costs** — Production run set-up costs per plant are $1 million for 50 models, $2.5 million for 100 models, $4 million for 150 models, $6 million for 200 models, $8 million for 250 models, $10.5 million for 350 models, and $14 million for 500 models. The size of the plant does not matter in determining production run set-up costs, only the number of models. The amount shown represents production-run set-up costs for the number of branded models/styles produced at each plant (production run set-up costs for private-label pairs are shown on the Private-Label Sales Report). The production run set-up costs per pair represent the total production run set-up cost number divided by the number of branded pairs produced after rejects.

- **Plant Maintenance** — Costs for plant maintenance are equal to 5% of gross plant investment plus another 0.25% for each year of age past 5 years. As of the end of Year 10, the plant in North American was 10 years old and the Asia-Pacific plant was three years old. However, plant maintenance is only 25% of the normal amount in the event you and your co-managers opt to temporarily shut down production at a plant for one or more years. The total maintenance costs are allocated between branded production and private-label production according to their respective percentages of total pairs produced—thus, if 90% of the total pairs produced at a plant are branded then 90% of total maintenance costs are allocated to branded production. The total dollar amount shown for plant
Using the Information on This Report to Enhance Decision-Making

This report is particularly valuable for staying on top of what is going on at each of your company’s plants and for gaining clues about whether actions are needed to drive down certain costs components at one or more plants. The information in this report allows you to:

- **Depreciation Costs** — The depreciation costs at a plant equal 5% of gross plant investment. Plants are assumed to have a 20-year life and are depreciated on a straight-line basis. Annual depreciation costs are allocated between branded production and private-label production according to their respective percentages of total pairs produced—thus, if 85% of the total pairs produced at a plant are branded then 85% of annual depreciation costs are allocated to branded production. The total dollar amount shown for depreciation represents the portion of total plant depreciation charges for the year allocated to branded production. Depreciation costs per branded pair are equal to the amount of total depreciation charges for the plant allocated to branded production divided by the number of branded pairs produced (after rejects).

- **Costs Incurred Due to Rejected Pairs** — The two numbers here are particularly valuable since they indicate how much higher the company’s production costs are because of the materials and labor effort involved in making defective branded pairs that can never be sold. The per pair cost number represents how much higher that reject rates have driven the total production cost per branded pair available for shipment to the distribution warehouses (reported on the line above). The reject cost numbers, if deemed too large for a particular plant, should guide the efforts of company co-managers to better contain plant reject rates via higher incentive payments, greater spending for TQM/Six Sigma and/or best practices training, cutbacks on the number of models/styles produced, or investment in upgrade Option A.

**Using the Information on This Report to Enhance Decision-Making**

This report is particularly valuable for staying on top of what is going on at each of your company’s plants and for gaining clues about whether actions are needed to drive down certain costs components at one or more plants. The information in this report allows you to:

- **Compare the costs of producing branded pair at each plant and see where the cost differences arise.** As a general principle, you want to operate low-cost plants at maximum capacity and try to shift production from high-cost plants to low-cost plants whenever the opportunity permits.

- **Compare worker productivity and compensation at each plant** and maintain a close watch over the extent to which labor costs differ at the various plants. The per pair labor costs for branded production at the different plants are shown in the bottom section of the report.

- **Be alert to what the use of overtime does to branded production costs and the difference in overtime labor costs at different plants.**

- **Compare the reject rates at different plants** — usually plants with the highest rejects are strong candidates for actions to reduce the reject rates. Use the numbers for Costs Incurred Due to Rejected Pairs in the Branded Production Costs section at the bottom of the report to see the impact of higher/lower reject rates of branded production costs and what the savings potential is from actions to reduce the branded reject rate.

- **Track what is happening to cumulative best practices expenditures per worker and per pair produced at each plant over time** both of which are important in deciding how much effort to put into best practices training. Compare the costs per worker and costs per pair numbers for best practices training (in the Labor Statistics section of the report) to see if your company’s training effort is the same in all plants. Plants with a higher cost/expenditure per pair produced are able to achieve bigger materials cost savings due to waste reduction relative to plants where per pair expenditures for best practices are lower.

- **Be alert to production-run set-up costs per pair produced at each plant.** At the North American plant, for example, producing 2 million pairs and 50 models entails production run set-up costs of only $0.50 per pair, whereas producing 2 million pairs and 500 models entails set-up costs of $6.25 per pair. At the bigger Asian-Pacific plant, however, producing 4 million pairs and 500 models results in set-up costs of just $3.13 per pair.

  **If a major element of your company’s strategy is to have a broad product line, you can combat the added cost per pair associated with production run set-up costs by investing in plant upgrade option B that reduces production run set-up costs by 50%**.

  **But there is another big downside to adding more models to the product line besides the production run setup costs — the more models produced, the lower that worker productivity will be and the higher the rejects rates will be.** Worker productivity declines as the number of models increases since workers have less experience and skills in producing each model (which dampens the number of pairs they can produce annually on average, as discussed in more detail below). The reject rate rises as more models are produced because workers are prone to make more mistakes in workmanship during the many different production runs requires for each model/style (all the factors affecting reject rates are discussed in more detail below). However, the tendency for reject rates to rise as more models are added to the product lineup can be combated by increasing incentive pay...
per pair and/or boosting spending for TQM/Six Sigma programs and/or boosting expenditures for best practices training (see the discussion below for more details). Likewise, if a company reduces the number of models/styles in its product line, it can usually trim spending for its TQM/Six Sigma program and/or cut back best practices training and/or slightly reduce incentive pay per worker without materially hurting reject rates.

- Be alert to the fact that one of the side benefits of higher worker productivity at a plant (which acts to reduce the number of workers needed to staff a plant) is reduced plant supervision costs. Since plant supervision costs are based on the number of workers at a plant ($6,000 per worker at plants in North America and Europe-Africa and $2,000 per worker at plants in the Asia-Pacific and Latin America), then higher worker productivity/fewer workers at a plant translates into lower plant supervision costs. Given that plant supervision costs can amount to several million dollars annually at a plant, there’s added cost-saving potential associated with higher worker productivity. It is up to you and your co-managers to decide how the benefits of higher worker productivity measure up against all the costs associated with pursuing progressively higher worker productivity.