Calculating and controlling your powder coating operational costs

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Anyone who owns or operates a powder coating system knows that it can be a costly process. However, few people really understand what their true costs are, which costs are more significant than others, or how to control or reduce these costs. This article will outline in broad strokes the different costs every powder coating system incurs, how to calculate these costs, and steps one can take to reduce these costs.

Definitions of operational costs

It is standard accounting practice to classify operating costs into two categories: Fixed Costs and Variable Costs. Fixed costs are incurred every hour the process is running, whether or not any product is being coated, and are accrued in dollars per hour. Variable costs are incurred for every part processed and are accrued in dollars per unit of coated surface. Fixed costs include utility costs, labor costs, and scheduled maintenance costs. Variable costs include consumable costs, pretreatment chemical costs, and miscellaneous costs. Some examples of these costs are shown in Figure 1.

The effects of productivity and efficiency on operational costs

Knowing these cost definitions, you can clearly understand that highly productive and efficient systems that produce many parts per hour can have higher variable costs than fixed costs. Of course, just the opposite is true for low productivity and inefficient systems that produce only a few parts per hour that have higher fixed costs than variable costs.

The worst scenario is when a system that is capable of producing many parts per hour is allowed to operate in an inefficient manner. In this case, the fixed costs can be substantial and with fewer parts to spread out these costs, the penalty can be significant. As an example, let’s look at a process that is capable of producing 100 parts per hour and has a fixed cost of $1,000 per hour and a variable cost of $1 per part. Under these ideal conditions, this process produces parts that cost $11 each. However, if this process has reduced production requirements that require 10 parts per hour, then the cost per part increases to $101 each. Under these circumstances, the best solution is to run at the higher, more productive, rate of 100 parts per hour but for a shorter time and shut the system down and reassign the operational personnel to other jobs.

Generally speaking, larger systems have higher fixed costs as they consume more energy and require more manpower to operate than smaller systems. However, larger systems are necessary to coat larger quantities of parts efficiently in a short timeframe. Just remember from the above example that large systems become very costly to operate under less than full productivity conditions. If you have situations that are anything less than temporary requiring frequent low productivity operations, then look to purchasing a smaller parallel operation (maybe a batch system) for these occasions or run at a reduced operating time at maximum productivity and reduce product costs, as the example above clearly shows.

Calculating operational costs

There are many reasons for calculating your operational costs. You
can validate your current finishing costs to help set appropriate product or service pricing strategies. Knowing your operational costs is the best way to identify target areas to reduce coating costs (i.e., manpower or energy costs). Understanding your costs will ensure that you are competitive in the marketplace and are using “best practices” to improve profitability. Finally, you can use operational costs to target future capital purchases that will lower costs and improve productivity and evaluate the return on investment (ROI) and payback for these investments. Any way you look at it, there are numerous valid reasons to calculate operational costs.

So how do you start? First, you need to have information about the process equipment you are using (or intend to use), such as motor horsepower, equipment size, line speed, product surface area, and product mass that is processed per hour. Second, you will need to know your manpower unit cost and requirements (number of people) for operational, maintenance, and supervisory personnel. Finally, you will have to collect your unit cost for energy, coating materials, chemical costs, spare parts, and other consumables. Collecting this information can be the most time-consuming part of the entire process, especially considering that it involves a fair amount of research.

At this point you have a decision to make on how to use the collected cost data to calculate your operational costs. You can calculate operational costs by researching scientific formulas that will take your inputs and provide operating costs in a useful format. Most people do not take this approach, as it can be very time-consuming and fraught with error if you haven’t done it before. The best and easiest approach is to find an operational cost calculator software package that has already taken the scientific formulas and simplifies the process without sacrificing accuracy or convenience. Cost Gauge Pro is just such a software package. This Microsoft Excel-based program provides expert step-by-step methodology to identify cost areas, analyze data, provide clear reporting, allows for “what if” scenarios, and is “protected” to prevent errors. It is available in three versions: Cost Gauge Pro Powder, Cost Gauge Pro Liquid, or Cost Gauge Pro Combo. Each program can be downloaded from www.powdercc.com (found under the Tools and References tab). This comprehensive tool organizes calculated results in distinct helpful categories — labor, material, energy, and miscellaneous costs — to assist the user in disseminating the information. The subtotals for each category are provided in annual (dollars per year), hourly (dollars per hour), and unit (dollars per square foot of processed surface area) cost values. Pricing for the software is available on the website and there is a free downloadable time-limited trial version that you can test drive before you purchase the full version.

**Areas where you can reduce your operational costs**

Once you have calculated your actual operational costs you can determine which areas need to be addressed in what order. I always go after the “low hanging fruit” first by selecting the highest cost categories to see how I can save money in a powder coating operation. Following are typical operational cost categories, with recommendations on how to save money, that are often the best places to start reducing operational costs.

**Labor:**
- Define manual tasks using work instructions to ensure that tasks are performed efficiently. Refine and update work instructions, as required, to incorporate productivity improvements.
- Measure productivity to establish a baseline and chart results after improvements are made to increase productivity. Count the number of parts produced per unit time per person as a means to measure productivity.
- Can automation be used to reduce manual labor tasks? Is this automation cost effective/justifiable? Is the automation proven technology or highly risky?
- Are special tools available to reduce manual labor tasks or improve productivity? Masking devices can be incorporated into part hanger tooling to reduce separate manual activities. Automatic hanging devices for small parts can improve productivity and reduce manual tasks.

**Energy:**
- Improve equipment efficiency to reduce energy consumption. Use VFD motor controls where appropriate to slow fans, pumps, and conveyors.
- Solicit utility companies for energy reduction programs and energy audits.
- Change to low, or no heat, pre-treatment chemicals if they meet your performance targets.
- Backflow rinse stages to save wastewater and make-up water costs.
- Use filtration to remove particulate and prolong pretreatment stage life.
- Use better part drainage to reduce chemical drag-out between stages and reduce dry-off oven energy.
- Set the dry-off temperature as close to 212°F to save energy; however, ensure the parts are dry when they exit the oven. Increase dry-off oven air movement and exhaust to promote faster drying.
- Zone cure oven to allow lighter parts to use less energy.
- Use more efficient IR or IR/UV energy technology if possible.
- Match cure oven exhaust rates to application requirements:
  - Non-appearance parts & dark colors = 2 to 3 air changes per hour
  - Clear coatings = 4 to 6 air changes per hour
  - Appearance & light colors = 3 to 8 air changes per hour
- **NOTE:** Do NOT adjust oven exhaust below NFPA minimum requirements.
- Adjust oven air seals to better contain heat within ovens.
- Insulate ovens that are located exterior to building using weather tight enclosures.
• Install a high efficiency air compressor.

Coating material:
• Use automatic gun triggering to reduce overspray powder.
• Use automatic gun positioning to increase transfer efficiency.
• Improve part ground to increase transfer efficiency.
• Use better coating materials:
  * Lower specific gravity
  * Better hiding power at lower film builds
  * Better particle size distribution and control for improved recovery cyclone efficiency
  * Use single-coat systems

Miscellaneous costs:
• Plug compressed air leaks.
• Reduce defects that need to be reworked:
  * Better powder sieving
  * Better operator training
  * Reliable equipment with better maintenance
  * Better housekeeping practices to reduce dirt and contaminants
  * Improved process control to maintain product quality

Summary
You have to calculate your baseline operational costs before you can analyze where your opportunities are for improvement. Running a powder coating process without knowing your operating costs is like driving blindfolded — you don’t know where you have been or where you are going. Once you know your operational costs, look for ways to improve productivity or reduce costs to increase profitability. Be sure to track progress on operational cost improvements to validate their efficacy. Follow these simple business practices and reap the benefits of better profits and improved competitiveness. **PC**

Editor’s note
For further reading, see the “Index to Articles and Authors 1990-2012,” Reference and Buyer’s Resource Issue, Powder Coating, vol. 23 no. 6

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