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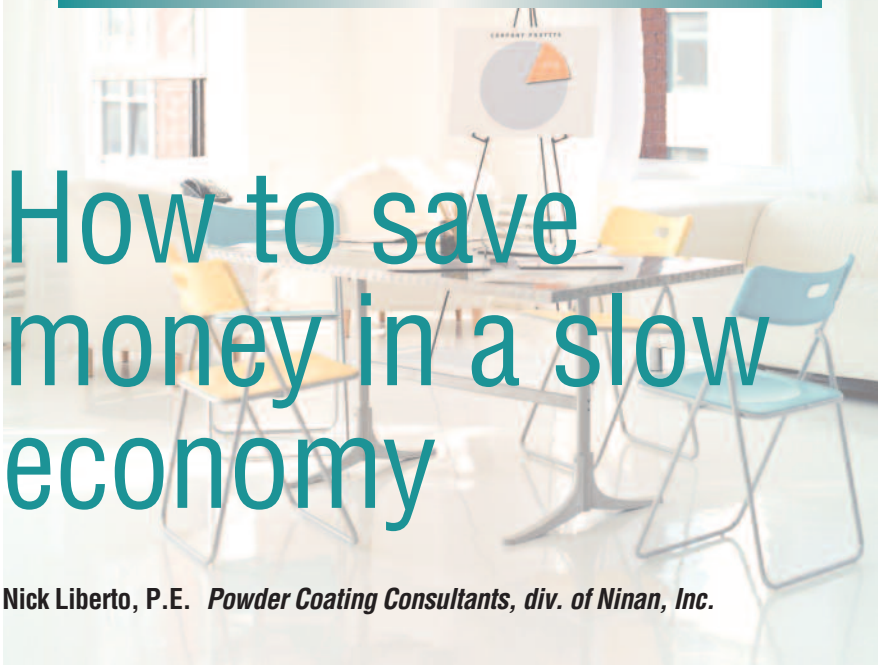
Guest Column



How to save money in a slow economy

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The economic statistics state that the economy is on the rebound as gross domestic product (GDP) is showing some positive signs. The stock market has almost gained back most of its losses since the "meltdown" started. While these facts are true, most of the effects have yet to trickle down to the manufacturing sector. At least they haven't significantly improved the manufacturing sector as yet. What better time to reduce costs in operating your process to improve profitability or just to make it easier to survive in these uncertain economic times.

Fixed versus variable costs

Looking for ways to operate your powder coating process more efficiently to save money is the best way to improve profitability or survivability. The two most significant costs in operating a powder coating system are labor costs and energy costs. These "fixed costs," measured in dollars per hour, accumulate for every minute your system is running, regardless of how much product you coat. They are very different from the "variable costs," measured in dollars per square foot, which accrue for every part you run through the process. Variable costs are the cost of your consumables like powder, pretreatment chemicals, water, blast media, etc. If you start your process and run no parts, you still accrue fixed costs, but you don't accrue variable costs. Comparing the two, you'll see that fixed costs are much higher than variable costs when you run your process. Therefore, any efforts to manage and reduce these fixed costs will yield the most benefit to your bottom line.

Areas where fixed costs can be managed to save money. Following are the areas in your process that should be closely managed to reduce your fixed costs significantly:

Labor. Judging by the current unemployment statistics, most manufacturing companies and custom coaters have already addressed this cost center. Labor statistics show that approximately 9 percent of Americans are out of work. This is a significantly higher rate than you see when the economy is good. However, if you still have labor that isn't productive (making you money), then you have to consider reducing head count. This can be a very difficult decision, as you're probably down to your core personnel already and now are looking at cutting muscle and bone instead of just the fat. Unfortunately, these economic times require ruthless action to ensure your survivability. This may mean it's time to lay off your family members as well if they don't contribute to the bottom line.

Training. Cross-training shop and office personnel to perform multiple tasks makes the employees you have left more flexible, productive, and useful to your business. Sprayers should also maintain the wash chemistries, sweep the floor, package the parts, etc. Office personnel may have to pitch-in on the line where necessary. Specialists aren't affordable in these economic times. Finally, people who know how to execute their job well make fewer mistakes. Fewer mistakes mean lower operational costs as both rework and scrap are reduced.

Operating time (productivity). Turn your system on only when you have sufficient product to coat. Run your process fully loaded during all times. Turn all equipment off when your production run is over. Operate fewer hours per day or fewer days per week. It's much cheaper to run your line fully loaded for a couple of days or hours than to stretch the parts out to fill the available time. A simple example will prove this point. If your process costs $1,000 per hour to operate (fixed cost = labor and energy), and the system is designed to operate at 1,000 parts per hour, each part has $1 in fixed cost. However, this same system operating at 100 parts per hour ensures that each part will have $10 in fixed cost. This is a no-brainer.

Energy costs. This cost area has the most potential to affect your bottom line besides labor savings, even if you have to spend some capital or expense money to reap the full benefit of the savings. Following are areas where energy costs can be reduced significantly:

Spray booth. The most energy consumption in a spray booth is related to the exhaust fan. The motor on

this fan, or fans depending upon the size of the booth, can be anywhere from 5 horsepower (hp) to 50 hp each. The motor size is designed to produce enough energy to contain the powder within the spray booth and transport it to the powder separator/recovery system under several conditions. Some of these conditions can be influenced by you to reduce your energy consumption. For instance, operating your booth with the lowest static pressure possible will reduce energy consumption. Static pressure is related to the losses in moving air; therefore, dirty filters will result in higher static pressure losses than clean filters. Changing filters before they're completely plugged will ensure that the fan uses less energy.

Exhaust fans are also sized to produce containment air velocities of typically between 100 and 150 feet per minute (FPM), even though code requirements allow containment velocities to be as low as 50 FPM. These fan sizing calculations take into account the size of all the booth openings, booth cleaning requirements, the door used at touch-up stations, etc. Suffice it to say that the larger the booth openings, the more air required to contain the powder within the booth. Some designers are very conservative when sizing their fans and calculate fan size assuming all doors are open all the time. Add to these facts that you may not actually need openings this size all the time, and there are some significant energy savings available just by closing booth doors and by reducing the part opening. If you can reduce the containment air requirements, then installing a variable frequency drive (VFD) to control your motor speed will allow you to operate your fan at a slower speed, resulting in significant energy savings of 50 percent or more.

Convection ovens. Ovens consume natural gas or electricity to heat parts either to dry them before coating or to cure the coating after application. This consumption can be significant, depending upon oven size and part mass. The first area that can be improved to reduce energy consumption in ovens is to have enough insulation in the walls, roof, and floor. Typical convection ovens have 6 inches of mineral wool insulation in the walls and roof, and 4 inches of mineral wool insulation for the oven floor. Surprisingly, many ovens don't have any insulation on the floor. If this is the case at your plant, installing insulated panels on the floor can provide immediate payback in energy reduction. Energy losses through the oven floor can be considerable, as the floor is attached to the world's largest heat sink, THE ENTIRE WORLD. This means as long as the earth's temperature is lower than your oven temperature, heat energy will be lost trying to heat the world to the same temperature as your oven.

Energy losses through the oven floor can be considerable, as the floor is attached to the world's largest heat sink, THE ENTIRE WORLD. This means as long as the earth's temperature is lower than your oven temperature, heat energy will be lost trying to heat the world to the same temperature as your oven.

Another area to save energy in convection ovens is to reduce oven exhaust rates to support the type of powder coatings you're spraying. For instance, high appearance light colors require up to eight air changes per hour, while non-appearance dark colors require only three air changes per hour. Reducing the air change requirements of your oven ensures that the heat stays in your oven. Don't go overboard with this, as all ovens must meet the minimum exhaust requirements listed in National Fire Protection Association (NFPA) guidelines. Oven exhaust rates also affect the time it takes to purge your direct-gas-fired convection cure oven. NFPA guidelines state that you must change the air in your oven four times to remove any gas before you can ignite the burner. If your oven exhaust fan is set to exhaust at a rate of four changes per hour, this means your purge cycle will be 1 hour, an obviously long time. There are several ways to prevent purge times from exceeding a normal 15 minutes and still reduce oven heat loss during normal exhaust requirements. One way is to use a two-position motorized damper to switch between the two different exhaust rates. The second way is to use a VFD on the exhaust fan motor to operate at 100 percent during purge and then automatically dial back to support operational exhaust rates. Finally, two-speed fans (high/low) or two fans (with both fans running during purge and only one running in operation) will also work in this application.

The next area to save energy in ovens is to verify that your entrance/exit heat seals are operating properly to contain the heat within the oven. The most energy efficient heat seals are recirculation type heat seals in which the heat is captured and returned back into the oven through the use of air curtains. However, if you have an oven with canopy type heat seals that capture the heat and exhaust it from your plant, then you should consider upgrading to the recirculation type heat seal to save energy.

Infrared ovens. If you're using infrared (IR) ovens as a preheat booster or as your main heat source to cure your powder coatings, take comfort in knowing that these devices are inherently energy efficient compared with convection ovens. That doesn't mean that there isn't room to improve the efficiency of these devices, however. First, you should minimize the use of preheat IR booster ovens only to parts that actually require this extra energy. Batching parts by mass will allow you to turn off the booster when you don't need it to cure parts.

If you have a fast-acting electric IR oven, consider zoning to turn off emitters that are unnecessary to heat smaller (or shorter) parts. Moreover, these types of IR ovens lend themselves to recipe-driven programs that can cycle on/off emitters to accommodate different part mass and size to deliver only the required energy necessary to cure the powder coating. Look into these energy-saving methods for your particular situation and you'll save money.

Washers. Washers can consume considerable energy to heat the process tanks. Simply insulating the heated tank walls and washer housing can significantly reduce energy consumption in spray washer systems. If you use immersion tanks, then insulate the tank walls and use an insulated cover on the tank when not in use to reduce heating demand. Simply turning off spray or agitation pumps when not needed can also keep the solution at proper temperature without constant heating.

Look for alternative heat sources to assist heating your washer tanks. Having a common boiler to heat multiple tanks with zoned plate and coil heat exchangers can prove cheaper than having individual burners for each heated tank in some installations. Having a plant boiler with some extra capacity can be a source for this heat, especially if it can produce steam energy. Many have tried to use heat from cure or dry-off ovens to heat washer tanks, with widely varying results, but most have been unsuccessful.

Using VFD controls to slow pump motor speed to reduce nozzle pressure in spray washers is more energy efficient than using gate valves to throttle back pressure. Gate valves reduce the pressure output of the pump going into the spray piping, but the pump still runs at maximum output, consuming maximum energy.

Back-flowing rinse tanks to previous working stages as make-up water is a tried-and-true method to reduce water use. Consider using higher chemical concentration to reduce impingement pressure and solution temperature while still obtaining clean parts. The cost of the increase in chemical consumption can be easily offset with the reduced energy requirements. Look for low-temperature chemistries to replace standard chemicals and lower operational costs.

Using a recirculation system in spray wand pretreatment systems can save both water and chemical use. Several companies currently make devices that collect, filter, screen, segregate, and otherwise prepare this normally waste material into a closed-loop process.

Write us

I know that there are probably many other ideas out there to reduce operating costs. Therefore, in future columns, I'll add any other comments and ideas from readers who write us with their recommendations. Let's face it, we're all in this boat together, and now is the time to share our experiences with each other to ensure our industry survives these uncertain economic times. Saving pennies and nickels can result in significant savings in time that may be the difference between survival or death in the cycle of business life. **PC**

Editor's note

For further reading, see the "Index to Articles and Authors 1990-2009," Reference and Buyer's Resource Issue, *Powder Coating*, vol. 20, no. 9 (December 2009), or click on the Article Index at [www.pcoating.com]. Article can be bought online. Have a question? Click on Problem Solving to submit one.

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