Since the days of the cave dweller, people have applied materials of one type or another to protect and decorate their possessions. Although many advancements in spray finishing equipment have resulted since those early days, one thing that has always posed itself as the most difficult challenge: How do we finish our products to give it that ultimate protection and decoration that will make it outsell the competition.

Many coatings and methods of applying these coatings to substrates have evolved down through history. With the dawn of the Industrial Revolution, newer coatings and processes emerged. Compressed air atomization became popular in the early part of the twentieth century that allowed finishers to speed up production to keep up with demand. In the middle part of this century, newer finishing processes emerged to compete with compressed air. Airless and electrostatic spraying proved worthwhile to many manufacturers. Later, the need to reduce emissions through higher transfer efficiency brought about the process of air assisted airless and high volume low pressure (HLVP) atomization.

What is new in spray equipment? The last major breakthrough was the invention of the spray gun to compete with the paint brush. In the decades since, changes in the finishing industry have progressed on a continuous pace. Today, spray equipment is easier to use, more ruggedly built, allows us to achieve better atomization of coatings, and provides higher transfer efficiency.

As new and improved coating materials have entered the market, spray application equipment has been adapted to spray them. Today we have an extensive supply of air and fluid nozzles available to handle almost every coating. When production became mechanized, spray finishing equipment met the challenge with automation. When regulations called for reduced emission of volatile organic compounds (VOCs), manufacturers of spray equipment found new ways to improve the transfer efficiency of spray equipment.

Although the basic principle of operation remains unchanged, spray equipment has become highly refined and diversified. New manual and automatic spray gun designs and nozzle combinations meet the requirements for optimum coverage of an almost endless range of water based and solvent based paints, lacquers, stains, two-component materials, adhesives, and other materials.

To understand which spray finishing system is best suited for a particular situation, it is necessary to review the advantages and limitations of each process.
tion. Wrong. Actually a tax disaster waiting to happen. Why?

Someday, when you try to get the real estate (invariably, depreciated down to a low tax basis and appreciated in value) out of the corporation, you will run straight into a double tax. Again — why? Well, the first tax will hit the corporation when the real estate is sold (or transferred to the stockholders). Problem is, the sales proceeds are stuck inside the corporation and there are only two ways to get those proceeds: via a dividend or a corporate liquidation. Sorry, both are subject to a second tax. A transfer of the property to the stockholders also triggers a second tax at the stockholder level.

So, what's the answer? Imagine a business owner (Joe) who is married to Mary. Joe should take title at the time the real estate is purchased. Here are some of the tax goodies that can come Joe's way over time:

1. When Joe retires, the rent he collects is not subject to the social security tax (or other payroll taxes), nor does the rental income interfere with his social security benefits.
2. Joe can borrow (tax-free) against the property if he needs the cash.
3. A sale of the property is subject to only one capital gains tax, which Joe can report on the installment method if he takes back a mortgage for a portion of the purchase price.
4. When Joe dies, his heirs get a raised basis. Say Joe bought the property 25 years ago for $100,000, and it is now fully depreciated down to $20,000 (the cost of the land). The value of the property on his date of death is $420,000. Now, get this — that built-in $400,000 of profit escapes income tax. Forever! And get this — Mary now owns the real estate (free of income tax and estate taxes) with a brand new tax basis of $420,000. Just as if she had bought the property for that price. Yes, she can depreciate the property using her new $420,000 tax basis, which will shelter her rental income.

And, oh yes, when Mary dies, the law allows her to repeat the raised-tax-basis trick all over again when she leaves the property to the kids.

Now you know why owning real estate in a corporation is not only a tax trap, but it also prevents you from reaping a tax harvest during your life and at your death.

Want to learn more tax tricks that will save you a bundle? Read these Special Reports: (1) How To Take Money Out Of Your Closely Held Corporation; (2) The 25 Best Tax-Saving Ideas Of The '90s; and (3) Your Business ... America's Best Tax Shelter ($27 each or $57 for all three). Write to Book Division, Blackman Kallick Bartelstein, 300 South Riverside Plaza, Chicago, Illinois 60606.
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actually deposited on the intended surface. Low transfer efficiency due to the high turbulence of the high air pressure leads to excessive paint waste, frequent and costly spray booth filter replacement and waste disposal costs and violation of federally mandated laws requiring less pollution.

Recently, the need for finishers in many areas of the country to comply with stricter emissions regulations has forced them to change to more efficient spray systems. Several new processes have recently emerged that offer great potential.

**HVLP**

The first process is commonly called high volume low pressure (HVLP) atomization. HVLP atomization works similarly to conventional air spraying with several notable exceptions. First, jets of high pressure low volume air exiting a nozzle are not replaced by soft columns of high volume low pressure air. Secondly, larger interior diameter air hoses feed specially constructed spray guns that restrict the atomizing air pressure within the spray gun, or have its pressure restricted before its entry. Finally, air used to atomize the coating can originate from high speed turbine operated blowers or from existing air compressors.

Despite the manufacturer, all HVLP systems used between 15-301 cfm (volume) and 1-10 psi (air pressure) to atomize a soft highly efficient air spray. Although exceptions exist, many turbine operated HVLP systems have found a home in smaller finishing operations due in part to their portability. Air restricted HVLP systems have become popular in larger plants because of their ability to use existing shop air, keep up with moderate production speeds and their ability to spray higher solids' coatings. Newly released HVLP air assisted airless spray guns allow for higher production speed while also giving users HVLP compliance when necessary.

**LPLV**

Another process is commonly referred as low pressure low volume (LPLV) atomization. It can also be considered a low pressure air assisted airless system. LPLV atomizes material with jets of low pressure low volume compressed air strategically impinged into a flattened cross sectional fluid stream exiting the spray gun.

Fluid pressure range from 20-70 psi, air pressure from 5-15 psi and air volume consumption between 3-8 cfm. When compared to air assisted airless and compressed air atomization the figures here show that it truly is a low pressure volume atomization process. As with turbine operated HVLP sprayers, LPLV systems are also very portable. LPLV is ideal for spraying low viscosity coatings such as stains, sealers, latexes and some top coats on a low production finishing line or custom finishing operation.

Both methods described here offer unique advantages such as high
transfer efficiency (65-75%), spray well into recesses without excessive bounce back, reduced material costs, lower emissions, reduced booth maintenance and hazardous waste costs and are easy to operate. As improvements are made in both systems, look for improved atomization quality.

Occasionally, these newer systems may not match the ultimate finish quality of compressed air atomization. However, when used according to manufacturers specifications, most finishers are finding these systems to adequately meet their needs and the EPA’s.

**Airless Spraying**

In the early 1960s a method of spray finishing was developed called airless spraying. As the name implies, this method does not use compressed air to develop a spray pattern. Hydraulic pressure is used to atomize the paint by forcing it under high pressure (600-4000 psi) through a small orifice spray nozzle tip located at the front of the airless spray gun.

As the coating is released into the atmosphere it is sheared into tiny droplets that have sufficient momentum to carry it to the surface. The amount of material exiting the tip is controlled by the tip’s orifice, pressure and viscosity of the coating. The size of the spray pattern is controlled by the angle drilled into the tip.

The main advantage of airless spraying is its speed. It is the fastest method of atomization available. Other advantages include less bounce back, the ability to spray into recessed areas and the ability to spray heavy coatings in outdoor environments. Airless spraying has been used extensively by maintenance painters and also in industrial applications.

The main limitation of airless atomization is its coarse atomization. Therefore, it is not recommended using this process when a fine automotive or furniture finish is desirable. However, not all situations call for fine finish. Automotive undercoating is a good example. Another example is furniture finishers who need to quickly apply a wiping stain to case goods.

Airless spraying also poses the possibility of hydraulic paint injection. Never let any part of the body come in contact with the high pressure coating as it immediately exits the spray gun or hose.

**Air Assisted Airless**

Recent developments in finishing equipment include a process that combines two finishing processes. Air Assisted Airless, when used under ideal conditions, employs the best features of compressed air and airless spraying. This method uses a specially designed gun and pump. The fluid is delivered to the spray gun at medium pressures (150-1000 psi) where it is approximately 80% atomized by an airless tip. Atomization is completed by introducing low amounts of atomizing air (5-30
psi) into the spray pattern.

The result is a finely atomized pattern that closely resembles that of compressed air. This process also reduces fog and overspray, allows spraying into cavities, provides a higher film build per pass, while consuming up to 50% less air that an ordinary compressed air finishing system. All this adds up to improved transfer efficiency and costs savings. We can also include the process of electrostatic air assisted airless for even greater transfer efficiencies.

**Electrostatic Spraying**

Electrostatic application of coatings has ushered in new economies in finishing. This method has long been an advantage in finishing metal products. The high transfer efficiency of electrostatic spray finishing not only saves material but is a major help in reducing VOC levels (due to the reduction of the coatings used) in the exhaust from spray booths. Regions of the United States classified by the EPA as non attainment zones may have to choose either HVLP or electrostatic finishing to comply with the law.

The operation of an electrostatic spray gun is simple. The coating is charged to a high voltage low amperage direct current either before or immediately as it exits the spray gun. The object to be painted must have an opposite charge for the paint to collect on the areas that would normally not be coated such as the sides and back. The net result is improved transfer efficiency.

As with other spray equipment, electrostatic applicators are constantly undergoing improvements. Smaller, safer, more maneuverable hand guns are now in use. Some even use air operated turbines mounted directly on the spray gun that provide the necessary voltage. This eliminates the high voltage power supply and cable to the gun. Electrostatic HVLP is also available for those operations that require high transfer efficiency along with electrostatic “wrap.”

The developments of compact high speed, electrostatic rotary bells and discs are adding a new dimension to this method of applying coatings. Transfer efficiencies as high as 95% are possible with these units. This equipment also makes it possible to effectively atomize the new high solids and water borne coatings that are becoming popular.

**Plural Component Spraying**

The rapid growth in the use of plural component materials such as polyesters, epoxies, polyurethanes, etc. has created new equipment for precise metering, mixing and dispensing of the two or more components. Such equipment ranges from simple but accurate metering pumps delivering a given ratio, to highly sophisticated computerized systems that allow selection of a wide range of component ratios that accurately monitor and report each step of the finishing operation. The spray guns must mix the two component coatings either internally or externally depending on the chemical formulations used. The ratio between the two component materials can be fairly equal or can be far apart. Plural component spray guns and pumps must be designed to accurately handle these ratios so uses benefit from these coatings.

**Powder Coating**

Powder coating is the fastest growing method of finishing today. Powder coating uses the principles of electrostatic attraction to attract dry paint (that is in a fine powder form) to a conductive part. After the powder is attracted to the substrate, it is then cured with heat or other energy to fuse the powder to the part. The benefits of powder coating are that it contains no solvent,
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when used with a properly operating reclaim system can be considered almost 100% transfer efficient, requires no air make up in the spray booth, is extremely durable and is easy to apply. Many industrial and automotive applications are switching to powder coating because of EPA requirements and the durability it provides.

The main limitation of powder coating is that the parts must be conductive. Unlike a liquid system, unless the part is conductive, the powder will not cling to the substrate before the cure cycle.

Also, the cost to convert to powder coating is high. When the total cost over time is examined however, the cost to finish parts is equal to a liquid system. Powder coated finishes may appear coarse in some applications.

As time passes, finish quality will improve and more manufacturers will choose powder coating.

**Conclusion**

As we approach the 21st Century, we will see a major emphasis placed on cutting emissions, (through the reduction or elimination of solvent based coatings) improving quality through increased operator training and improving transfer efficiency of finishing operations. Improving transfer efficiency will not only cut material and disposal costs, but also allow manufacturing plants in many states to remain open for business. Recently enacted EPA regulations in some states now require methods of application to provide a minimum of 65% transfer efficiency. Thus many manufacturing plants will want to reexamine their finishing operations to see if they can switch to more efficient and less polluting methods of atomization. There will continue to be many changes and mergers in existing equipment and methods as new materials and technologies come from the research and development laboratories of the world. Many revolutionary developments in electronics and computerization will be adapted to product finishing to improve automation, finish quality, and lower cost.

Despite the misinformation sometimes associated with today’s new spray application systems, all have their advantages and limitations. What may be suitable in one plant or operation may not be suitable in another. Equally important is the idea that despite the process selected, and the equipment supplier, all require maintenance. There is no maintenance free spray equipment in existence for sale today.

Armed with this knowledge and a little common sense, you can examine your own finishing operations and see what improvements can be made to save you time and money, improve finish quality and allow you to meet EPA emissions requirements.