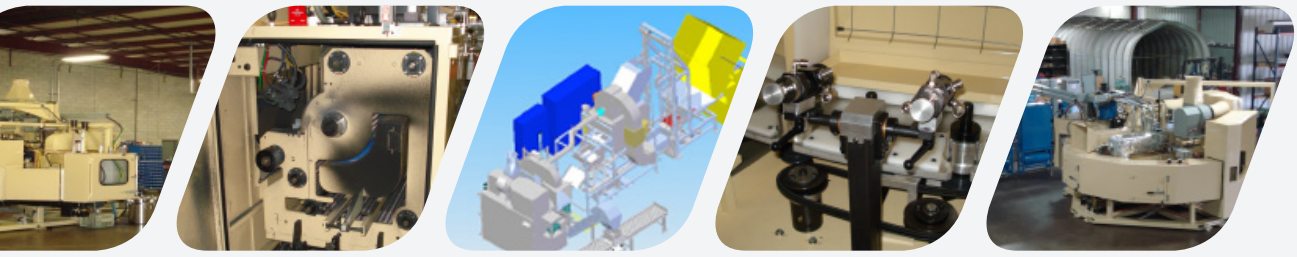
Automatic vs. Manual Spray Processes



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Automatic vs. Manual Spray Processes

In production manufacturing, there are several ways to spray a part. From the basic continuous motion Chain-On-Edge machine, spraying parts as they pass, to the more advanced robotic spray machines, individually spaying complex parts with a single arm.

In the past, the spraying was done manually with an operator holding and controlling the direction of the spray gun and spray. Although effective for smaller batches of parts, this process lends itself to variations in quality from part to part. The key to developing a robust and repeatable process is to develop machines that reduce these process variations.

The first place in any automation plan is to identify how these variations are a part of the process. Keeping items such as paint viscosity, substrate temperature, air pressure and the gun set-up consistent are primary places that can benefit from automation.

Viscosity:

Controlling viscosity is one of the most important parts of any coating process. The viscosity of the material is the fluid's resistance to flow - the internal friction of the fluid. This characteristic directly affects the coating thickness and overall quality of the part.

Typically, sprayed materials are mixed by operators and checked for viscosity using a measuring device like a Zahn cup. However, the measured results from such devices can be arbitrary and vary from operator to operator.

Substrate Temperature:

Substrate temperature during drying is another important part of the spraying process. The temperature of the substrate being coated directly affects the drying time and the coating thickness. A preheated substrate assists in achieving the target dry times. By controlling the temperature of the substrate, consistent high film builds can be laid without runs in the coating.

Air Pressure Settings in Spray Guns:

The air pressure setting of the spray gun is also a factor that often varies in a manual spray process. The air settings not only affect the quality of the part but the amount of material used. Too little pressure and the paint is not properly atomized, while too great a pressure causes much of the paint spray to bounce off of the substrate and be wasted.

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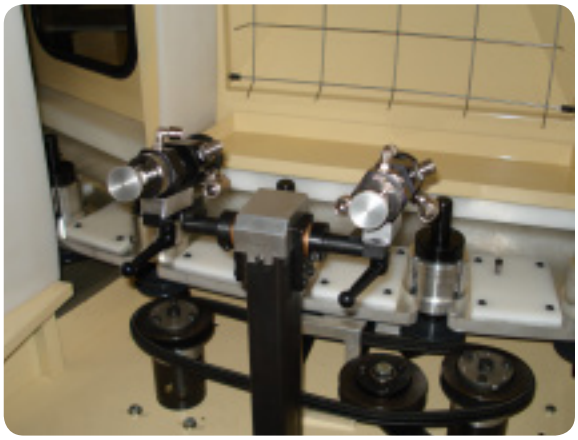
Manual Spraying Systems



For low volume products, maintaining consistent part fixturing might not be cost effective. In this case, an operators eyes, brain and hands will work together to correct for variations in the positioning and compensate.

When a part is slightly askew, the operator will compensate for the problem, by redirecting the paint appropriately. On the other hand, automated systems are basically "blind," they must assume the parts are oriented in a specific, and consistent, way.

Since it approaches each part with the same painting commands, any improperly fixtured parts will not be painted properly. Manual operators are better able to handle unexpected situations where hangers might sway or parts are poorly racked. In most cases, an operator can be as precise as a robot, but the repeatability of the end product can be affected.

These include personal vision, alertness, flexibility and even their mood from day to day. In the end, manual spraying processes are more cost effective at running low volume production, but their effectiveness is eclipsed as volumes increase.

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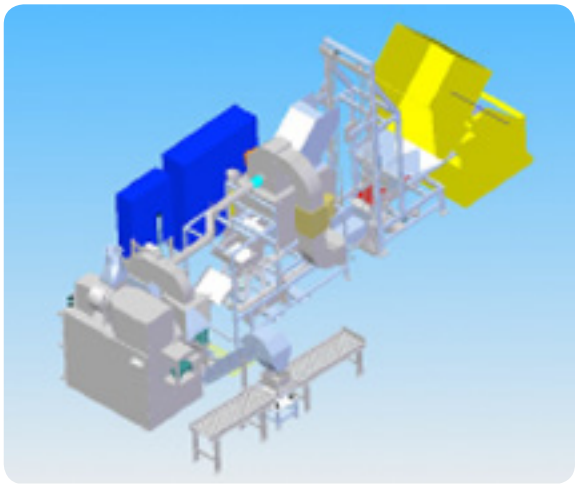
Benefits of Automating These Systems



One of the greatest cost savings in using an automated system is a reduction in wasted paint. Automated systems will spray a consistent amount of paint where and when it is required. Consistent and repeated spraying means less paint sprayed over all. Spraying less paint saves money, means less maintenance and cleanup.It also lowers filter costs and VOC emissions.

People may be able to paint as accurately as machines; however, the repeatability of automated systems saves on paint. The use of programmable guns or a robot will coat parts again and again with little variation.

Humans are less consistent and efficient with paint. An automotive component manufacturer reported annual savings of $300,000 in materials when switching from their traditional COE process. In general, savings estimates as high as 25-30 percent can be realized with automated systems when compared to human operators.

Automating a spraying system can bring consistency and efficiency, resulting in both direct and indirect, cost savings. Arnold Machine Inc. specializes in providing off-the-shelf and customized automated spraying systems. By working with the customer to reach the desired spraying goal they can provide the proper system to optimize the key processes in an automated system.

Viscosity:

The installation of a bulk-mixing unit will reduce variations in the mixing process. Mixing stations can be programmed to consistently add paint and thinner. The viscosity is automatically checked and adjusted to the entered set point. An automated system will continually check the viscosity ensuring your final solution is always mixed to the same viscosity.

Substrate Temperature:

A controlled forced air convection heating system will effectively preheat and cure the substrates. Proper ventilation and exposure will make sure this heat is applied safely for flammable coatings.

Air Pressure Settings in Spray Guns:

Automated air pressure features, include controlled pressure settings in the machine, limiting the maximum pressure of the guns. Ensuring guns are not set for over-pressure limits paint loss. These automated settings also allow the gun fan, atomization, and fluid pressures to be set through an operator interface, including them in a recipe or program.

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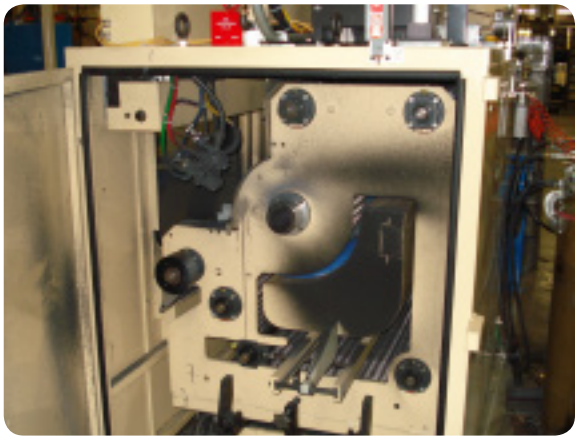
Benefits of Automating These Systems (cont.)

Gun Setup of a Spray System:



The gun setup of a system is one of the best areas for automation. Spray machines are designed to run several different setup operations, so having programmable gun positions reduces setup time and wasted material. Spray guns can be programmed to run multiple processes on the same part or within the same production line. For more complex parts, robots can be used to move the gun during the spray process to replicate coverage that could only be done by an operator in the past.

Programming Options:

One key in the repeatability of automating spraying systems is their ability to run programs again and again. Programs can be set, altered, rechecked, and optimized. With programmable gun systems, this programming consists of simple spray or no-spray commands as gun moves vertically, horizontally, or rotationally in front of the items. However, for most robotic system the programming becomes more complex with integrated path programming of six or more axis of motion.

Conclusion

The top reason for automating a spraying system is to eliminate labor costs. However, to believe that by replacing operators with robotic automation will ALWAYS reduce costs is too simplistic. For small operations with low volume of complex parts that might require hundreds of programs, the use of a robot may actually increase costs. Similarly, robots are often costly when compared to programmable gun solutions.

When replacing a $30,000 worker, three shifts a day, the cost of any gun setup automation can be quickly recuperated. However, there is a lot of automation that can be purchased for far less than the cost of a robot. It is important to investigate all of the possibilities before settling on the solution.

Regardless what type of spray machine is being used (Indexing, Chain-On-Edge, Overhead Conveyor, Robotic, Tumble, Pallet Transfer or Tube ID Lance) AMI can integrate all of the automation options listed above to control the spray application process. The challenge to designing an automated machine is always how much automation you want to install in it. In most cases, by reducing the variables with automation, will allow for a consistent part quality and an efficient process to be achieved.

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