A balanced approach to resource management

John Lowens, projects and sales engineer at Sprimag Spritzmaschinenbau GmbH, describes how this approach has been applied to the design and installation of a new automated finishing line for car parts . . .

Terms such as "resource management", "energy efficiency", "carbon footprint", "greenhouse gases", "environmental impact" and so on, often pop up in newspapers and magazine these days. It is easy to take each of these separately; however, in doing so it may be at the expense of one, or all of the others. In the end, like most things in life, a balanced approach giving consideration to all aspects provides the best overall results.

A well thought-out painting line exhibits very well the relationships between these issues. Consideration of resource management automatically leads to the consideration of carbon dioxide, greenhouse gases and energy. All too often, it is forgotten that energy is also a resource. Such considerations should lead to the optimised use of these resources, which in turn greatly reduces the environmental impact of the line.

Another important resource – often overlooked – is floor space. Space is a resource that not only has a financial aspect, but also an environmental one. The more space a line occupies, the more energy (heating, cooling and illumination) is required. The less energy required the smaller environmental impact.

Sprimag works to produce a balanced system. Recently, Sprimag installed a finishing line exemplifying such a balanced approach to resource management. The line's purpose is to coat automobile plastic radiator grilles with very sensitive finishes, such as 'piano black'.

The system consists of a robot mounted CO_2 "snow cleaning" pretreatment module, a robot spray cabin with a two component mixing system, a convection cure oven and a conditioned air supply unit.

The use of a CO_2 snow cleaning system instead of the more traditional power-wash process greatly reduces the amount of energy and resources required.

The benefits of CO_2 snow cleaning

The use of a CO_2 snow cleaning system instead of the more traditional power-wash process greatly reduces the amount of energy and resources required. Gone are the heated wash sections, the cascaded rinsing system, the deionised water generator, the drying section, plus the chemicals required for such a system.

The CO_2 snow cleaning system is also a very compact solution requiring significantly less space than a power-wash system. Mounting the CO_2 nozzle on the arm of a robot enables the robot to fly over the profile of the parts holding the nozzle at a constant distance from the surface. Thus, ensuring optimum cleaning results regardless of the complexity of the parts, while at the same time, wasting very little CO_2 through unnecessary over-spray. The CO_2 itself is, "environmentally neutral" and the CO_2 is supplied from a storage tank made up with CO_2 taken from the air; hence its release is just returning it back to where it came from.

The spraying of the parts has always been an area where much consideration has been made of resource management, and this system is no exception. The use of a spraygun – HVLP naturally – mounted on a robot arm ensures best results with minimal over-spray. The use of dry exhaust filtration and air recirculation into the spray cabin reduces the demand for conditioned make up air from the air supply unit. However, it does not stop there. By means of an air-to-air heat exchanger the exhaust air heats or cools the incoming fresh air. As the line will be running in a balanced state, the amount of replacement fresh air will be the same as the exhausted air. It is only the natural inefficiency in the energy transfer across the heat exchanger that requires additional energy.

Resource management considerations have also been applied to the two component mixing system. This system uses dosing valves that accurately dose the components in the required ratio together only while the spraygun is active. The mixing system stops mixing immediately when the spraygun stops spraying. Hence, the paint is only mixed when required, virtually eliminating the over production of mixed paint, which, depending on its pot life, may have to be dumped. The continuous monitoring of the actual weights of the components being mixed provides additional resource management. Coriolis mass-flow meters measure the individual masses of the components, adjusting the mixing ratio to compensate for changes in viscosity, thus ensuring that not too much or too little of each component is used.

The HVLP spraygun mounted on a robot arm ensures optimum results with minimal over-spray.

The cure oven consumes by far the largest amount of energy of any component in a painting line. It is a veritable "black hole" as far as energy is concerned. Its energy consumption is so significant that is plays a role in the environmental impact of a coating. Powder coatings, due to not having any volatile organic components, are generally considered to be more environmentally friendly than paints, particularly solvent-based paints. However, when energy is also taken into consideration the situation is no longer so clear-cut. In a modern well-insulated cure oven it is not the residence time that is the determining factor for the energy consumption, but the temperature that must be reached. Paints, either water or solvent-based, are generally cured around 80°C to 100°C. Powders, on the other hand, require temperatures in the region of 160°C to 180°C; approximately 30% more energy is required.

Continued on page 36.

A balanced approach to resource management

Continued from page 34

The energy consumption in the curing of the coatings is unavoidable. Here resource management is more about energy optimisation. Accurate calculation and sizing for the air re-circulation are vital to ensure that no more energy is consumed than is absolutely necessary. Also critical is ensuring that energy is not lost through heat bridges in the structure of the oven, or through poorly sealing seals on access doors.

One area where energy is continually lost is the exhaust. The European Standard EN 1539 *'Dryers and ovens in which flammable substances are released. Safety requirements'* specify that for a combustible substance its gaseous content within the oven should be no more than 10% or 25% (depending on the oven's design and construction) of Lower Explosion Level (LEL). This figure is then used in the calculation of the required exhaust volume. The figure includes a number of safety margins; in actual operation, the exhaust volume is significantly greater than is strictly necessary. A gas component concentration measurement device placed in the exhaust may measure the concentrations in the airflow, and optimise the exhaust volume (usually reducing) accordingly, while at the same time, ensuring that the concentrations remain well within the required limits.

By following these concepts, Sprimag is able to produce systems that produce high quality finishes while at the same time being friendly to the environment.

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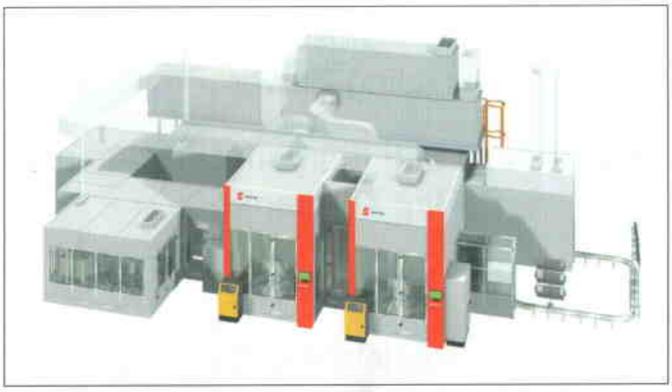

The Sprimag system described in this article comprises a robot mounted CO_2 "snow cleaning" pretreatment module, a robot spray cabin with a two component mixing system, a convection cure oven and a conditioned air supply unit.

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IKEA's European logistics centre features EISENMANN advanced order picking system

As well as being one of the leading international suppliers of general finishing technology, plant engineering company EISENMANN also specialises in environmental technology, thermal processing systems and material flow automation.

A recent example of the latter area of the company's expertise can be seen at the Swedish furniture group IKEA, which supplies its branches Europe-wide from its logistics centre in Dortmund, Germany. One of Europe's biggest logistics facilities for advanced order picking, the centre includes a total of 3500m of EISENMANN electric monorail systems (EMS), which operate on a "pick by light" principle.

The systems are employed for the transportation, supply and despatch of products using what the company describes as a "goods to man" order picking principle. The EMS is guided to 384 order picking positions in 48 bays, in which orders are placed directly onto automatically readied shipment pallets. These are also forwarded by fully automated shuttles and lifting stations. In line with the "pick by light" principle, the order pickers receive orders on the EMS trolley on which they also confirm that the selected order has been completed.

Because of its high order picking capability, the "goods to man" approach provides highly efficient and rapid handling of logistic processes, especially when combined with the fast and reliable electric monorail system.

The facility incorporates EISENMANN control and software systems and embraces over 500,000 pallet deposit positions in five racks, supplied by 68 storage and retrieval units. Eisenmann also supplied around 2000m of flat conveyor systems and the 272 EMS trolleys, which can transport loads of up to 800kg. With a throughput of over 300 pallets per hour, the EMS system shortens response times to delivery and ensures short delivery times from the logistics centre to the branch. ***Tel: 01785 283790.*** *www.eisenmann.com*

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