



Trend: Color on demand

Batch size = 1

Industry 4.0

Performance by design



Ready for “Industry 4.0” and the smart factory with Nordson dense phase technology

“Industry 4.0” develops solutions that use proven mass production methods to manufacture customized products – in extreme cases with a batch size of 1. In that context, personal color selection is playing an increasingly important role in many markets – and also posing new challenges for powder coating operations.

With its HDLV® pumps, Nordson’s highly efficient dense phase technology is available for systems ranging from manual application to fully automated, robot-controlled coating units: a perfect example of pioneering coating technology that combines maximum productivity and flexibility with optimum profitability.

In the 1910s, when a journalist timidly asked why the Model T only came in one color, Henry Ford replied with the now famous phrase: “Every customer can have his car painted any color they want as long as it’s black.”

The journalist purportedly let it go at that, and for the millions of people who bought the first large-scale production automobile manufactured in mass quantities, the importance accorded individual color selection also paled in comparison with the high practical benefit provided at a low price: When the last “Tin Lizzie” rolled off the production line in 1926, black remained the only color option.

Since the days of “Industry 2.0” – just like after what eventually came to be known as the age of mass production that Henry Ford helped launch – the demands of customers have changed dramatically. Today it goes without saying that they configure even the most complex technical devices to match their strictly personal preferences. Cars are still a good example: At the height of the current wave of automation driven by platforms and modules (Industry 3.0), the VW Group offers 156 different steering wheels, an Opel Astra can be ordered in 360 different combinations of engines and optional equipment (while a 3-Series BMW is available in 453 different configurations), and there is a Maserati Quattroporte with over 4 million variants – to say nothing of the variation that can be achieved through combinations. “All together, the number of different ways we can combine components is 10 raised to the 20th power,” according to the Head of Complexity Management at Audi, Klaus Alders, who was quoted at the time. And the Variant Manager at BMW, Franz Decker, even estimates the number of options available to him as “10 raised to the 32nd power.”

Customization in its ultimate form: Batch size = 1

The more product individuality a manufacturer accords its customers, the greater the resulting complexity costs. And those costs were precisely what Henry Ford so successfully fought against.

That’s the way things were – till now.

The smart factory or “Industry 4.0” – the great transformation that has already taken hold of production and work processes and is attracting the attention of about half of all German companies – has become a top priority, above all in the manufacturing sector. It aims to maximize production flexibility by seamlessly networking people, machines, systems and services. “Industry 4.0” is characterized by sensory-perceptive and intelligent machines (“artificial intelligence”) arranged together and with others in a continuous exchange of data (“Internet of Things”). Their objective is to achieve “individually customized mass production” (“mass customization”), i.e. to apply the beneficial effects of mass production (economies of scale, learning curve advantages) toward the manufacture of extremely individual products. Ideally, even the customer is integrated into this network, selecting their configuration online to control the machinery that then produces their desired product right before their eyes.

This enables the manufacturer to produce a previously unimaginable range of products without having to maintain uneconomically large component inventories. And ultimately, why not “Batch size 1” – i.e. a product produced only once for a single customer?.

More economical coating as a step toward mass customization

With many articles of everyday life, a personally selected color expresses the individual taste of the owner. In the case of supplied parts and technical components, painting is indicative of origin (manufacturer’s color) and underscores the intended quality appeal.

Since demands for the customizability of products are rising right along with more intense competition and cost pressures, the cost-effectiveness and flexibility of coating systems are playing an increasingly decisive role. The solution lies in the streamlining of processes ("lean manufacturing") and the minimization of down-times, while effective material usage also helps reduce production costs and raise profit margins.

This also places high demands on an equipment system, because the investment in a state-of-the-art powder coating unit is amortized by

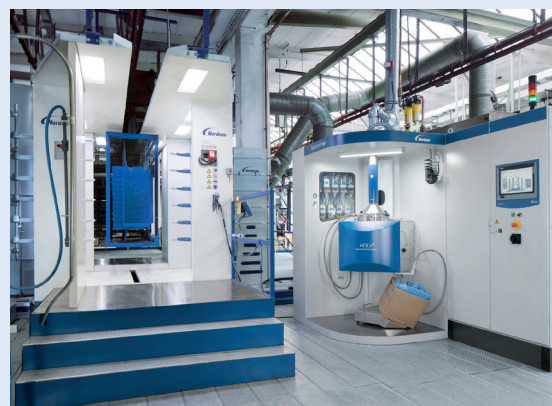
- fast coating processes and high output
- uniformly high coating quality and thickness without rework
- a high degree of automation requiring minimal intervention by operating personnel
- economical operation that consumes a minimum of resources
- careful application of materials
- the ability to change colors rapidly – even more than once during a shift
- fast and thorough cleaning of the equipment
- easy maintenance, and
- extremely durable components.

In order to take full advantage of flexibility and economic potentials, it is important not only to optimize individual components, but also to fully integrate and harmonize entire powder coating systems. That means powder materials, lines, pumps, guns, extraction technology and booths.

Nordson dense phase technology: Integrated, efficient, flexible

The key to Nordson's high-efficiency powder coating is dense phase technology with its characteristic HDLV (High Density Low Velocity) pumps, which has dramatically improved both processes and results.

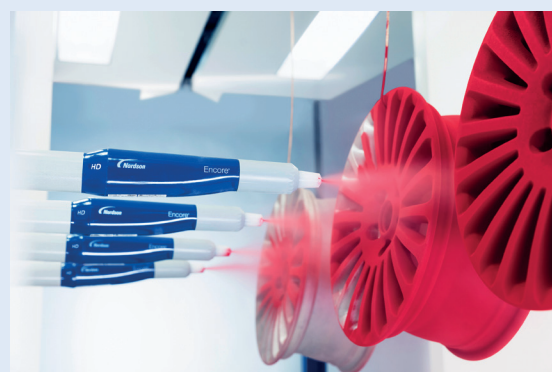
Enabling powder material savings of up to 45%, this technology operates at much lower air pressure (and requires less energy), gives users accurate control over the quantity of powder coating supplied and allows them to work with even greater precision.



Powder coating units with state-of-the-art Powder-Pilot® HD control system and integrated network interface for production data acquisition, system status monitoring and remote diagnosis.



Nordson HDLV pumps are virtually maintenance-free, which means they also enhance quality, flexibility and production benefits over the long term.



Advanced nozzle technology enables Encore® HD guns to achieve unsurpassed first application efficiency and uniform coating thickness.

Instead of a conventional venturi pump, it uses a two-chamber pump in which four air-operated pinch valves open and close in pairs. As soon as an inlet valve opens, the discharge valve closes, powder is drawn in and stored. In the next work cycle, the powder is forced out of the first chamber while the second chamber is being filled. This results in constant, linear powder delivery, ensuring high application efficiency with low powder consumption – and maintains that performance for extended periods under an extremely wide range of settings, even when processing thin film powders.

Nordson's HDLV pumps are virtually maintenance-free, which means they also boost quality, flexibility and production benefits over the long term. The only components subject to wear are the pinch valves, which are designed for a service life of about 4,000 hours. They regularly last well beyond that figure, however, thereby minimizing expensive maintenance and downtime.

When used in combination with the specially developed Nordson powder guns, HDLV pumps offer even greater benefits. These include reduced color contamination, more uniform coating thickness and better coating of Faraday cages. Color changes are also especially fast and the self-cleaning feature keeps them trouble-free.

Hoses with a diameter of just 6 millimeters supply the guns and produce a fine, soft mist. This adheres better, thereby raising application efficiency, facilitating the coating of complex geometries, minimizing the amount of work required, increasing the production rate and reducing powder consumption.

The powder application rate is easily regulated by means of the control system, so no mechanical adjustments are required.

The technology is ideally suited for fully automated production and helps achieve even the most ambitious lean manufacturing objectives..

Intelligent control, essentially independent of operator qualifications

Equipped with many sensors, a modern powder coating unit determines all relevant control parameters for material supply, application and booth, and continuously provides production and system status data to a central control system. Integrated network interfaces make it possible to monitor the unit and greatly facilitate remote diagnosis.

An industrial touchscreen enables control of all coating process parameter, such as supply and atomizer air settings, electrostatics, and gun stroke and triggering, as well as color change sequences. Preset and widely adaptable programs make it easy to optimize performance for an extremely wide range of products and powder materials. And last but not least, such a highly automated system lowers the qualifications required of the equipment operators.

Bottom line

Whether manual, automatic or fully robot-controlled, Nordson's perfectly harmonized dense phase components provide powder coaters with the right technology to coat even the smallest batch sizes flexibly and economically and to take full advantage of the opportunities that "Industry 4.0" offers.



The soft spray at low velocity improves application efficiency in the initial coating operation.

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