



# The Next-Generation Oven

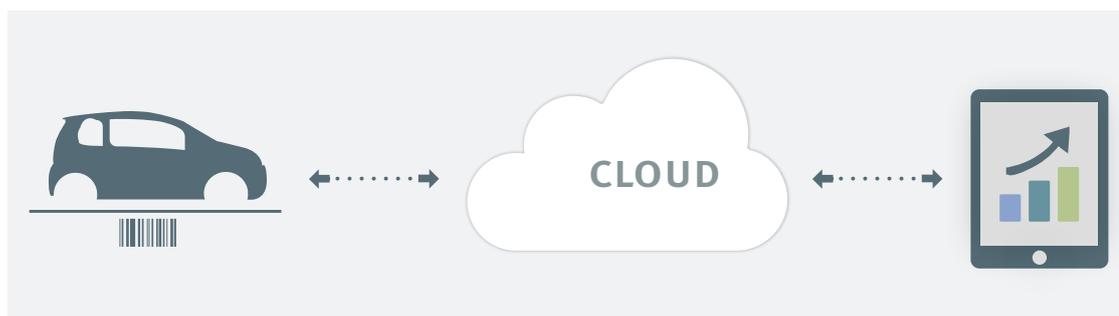
The Smart Oven is efficient, cost-effective, and ideal for the smart paint shop.

*State-of-the-art dryers are key to ensuring high-quality paint processes at OEMs and their suppliers. Coating quality is not just dependent on the method of application – a key role is played by curing. This is typically highly energy-hungry, but with correspondingly huge potential for savings. Smart Oven offers significant advantages: outstanding energy efficiency, low capital expenditure and excellent coating results – plus it can play a central role in realizing the smart paint shop vision.*

Eisenmann can boast a skillset second to none in the development and manufacture of industrial drying systems – as the engineering company was originally founded for this specific purpose in 1951. A few short years later, the portfolio was extended to include conveyor and painting technology. And quickly evolved into a global auto-industry player. If all the dryers designed and built by Eisenmann in the last ten years were to be placed in a row, the total length would be a full 25 kilometers. This success story is based on a commitment to continuous improvement of existing technologies and the development of entirely new solutions.

## In the spirit of Industry 4.0

This long list of innovations now includes the new Smart Oven. Combining multiple ground-breaking ideas, this solution reflects industry's desire for intelligent manufacturing while fulfilling expectations regarding high product quality, flexibility and efficiency – and delivering cost savings. As part of Eisenmann's broad portfolio of conveyor systems, the Smart Oven will play a pivotal part in realizing the vision of a smart paint shop in the spirit of Industry 4.0. For instance, it can be combined with the new VarioLoc – which supports the skidless movement of vehicle bodies and other components through coating processes, or the E-Shuttle conveyors for pretreatment and e-coating and the resource-efficient E-Cube for overspray removal.



A smart paint shop enables entirely new levels of efficiency.

For example, the production control system can respond to low volumes by consolidating multiple bodies to form groups prior to being fed into the oven, reducing dryer energy consumption. Body-specific process data is captured and used to control conveyor speed and swivel nozzles, maximizing product quality. Moreover, by drawing on its broad offering, Eisenmann can create a one-stop solution to each customer's specific coating challenges.

### **The Smart Oven in detail**

The methods employed to heat the dryers in the Eisenmann Smart Oven are state of the art. For example, purified gas from the dryer's exhaust-air treatment system is used to indirectly heat the fresh air fed into the dryers. Combustion air for the burner is recovered from the dryer, and the combustion gases are admixed to the dryer's exhaust air; this is then fed to the regenerative thermal oxidizer (RGO). This cuts gas consumption, and with fewer openings in the oven roof, there is very little heat loss.



### **Lower capital expenditure**

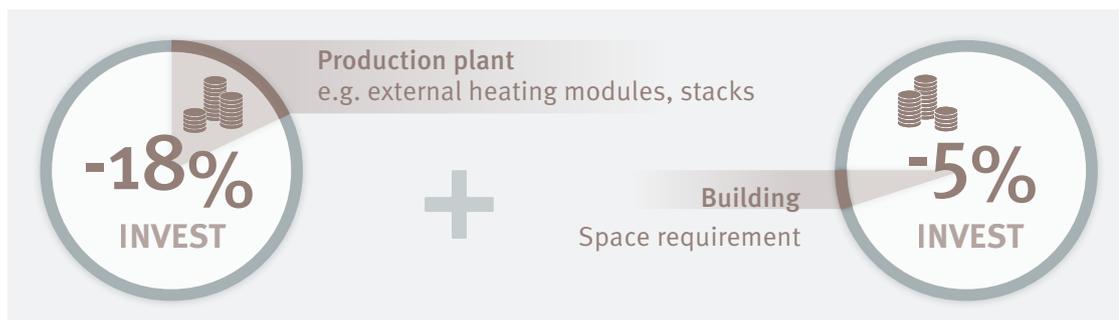
The Smart Oven requires fewer steel structures than comparable conventional designs. This was achieved by integrating the heaters, which were previously mounted externally, in the dryer tunnel. As a result, there is no longer a need for expensive steel structures for worker access, lighting, emergency exits, or sprinkler systems. In consequence, the dryer is more compact and lighter, with a smaller footprint and total volume, and with a lower weight load on the building. A further advantage is that users have greater flexibility in terms of oven layout, for example for maintenance access.

The integrated heating reduces the total surface area of the dryer and thus reduces the transmission heat loss and pressure loss of the system. Further savings are the result of less installation work and lower shipping costs; the dryer system can be pre-assembled to a far higher degree, and there is a reduced risk of leakages. As the preheated combustion air from the dryer process is returned to the RGO, roof openings and stacks for flue gas are no longer necessary. This means less expenditure on buildings and steel structures, lower exterior noise emissions, and no need for regular burner emission measurements.

The initial spare-parts kit for the fans generates additional savings. As the parts for heating and retention zones are identical, fewer spares are required in total. There is therefore lower expenditure on the parts themselves, and on storage. Moreover, it is less likely that incorrect parts are selected during installation. Eisenmann engineers have also streamlined another key area: as only one filtration stage is now required for the circulating air, fewer filters are employed, driving down costs for maintenance, inventory and storage.



These design improvements are reflected in a sharp fall in capital expenditure of up to 18 percent for a Smart Oven. In addition, the space-saving configuration of the compact dryers means up to five per cent lower spending on buildings.



A sharp fall in capital expenditure.

## Lower energy costs

Energy is a valuable commodity – and its consumption by drying ovens generates significant costs and emissions. Greater efficiency is therefore a priority. Eisenmann engineers have made a significant breakthrough by means of an integrated heating module.

The use of preheated combustion air from the drying processes eliminates the need to vent exhaust to the building exterior. The volume of exhaust air that requires purification is adjusted accordingly. As (vertical and horizontal) air circulation ducts are no longer required in the dryer, no steps are necessary in the ducts for maintenance workers. This means less loss of pressure and less cleaning effort. Elimination of external circulation air ducts brings the same benefits and also minimizes heat loss to the environment. There is a reduction in operating costs for electricity to power the fan, and for heating and cooling, and in cleaning costs. There are no maintenance costs for expansion joints.



The Smart Oven is a milestone in car-body drying technology. This new solution enables bodies to be heated more evenly while lowering energy consumption. We can therefore conserve resources and significantly reduce pollutant emissions.



## Load-dependent operation

The Smart Oven's eco-friendliness is partly attributable to load-dependent operation of the dryers. Typically, dryers only run at full load for 0.2 percent of their operating hours, around 61 percent at medium load, and almost 10 percent at zero load. This prompted Eisenmann engineers to come up with a new approach. In the Smart Oven, exhaust air volume is automatically reduced when vehicle body throughput is low. To maintain negative pressure within the dryer, fresh air intake must also be reduced. Circulating air from the dryer is mixed with fresh air to ensure constant pressure conditions. As a result, less energy is required to heat fresh air.

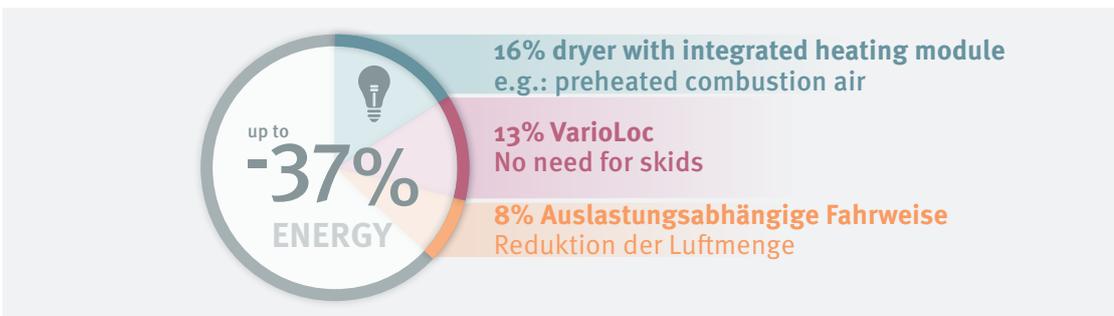




Dryers rarely operate at full load.

Energy efficiency is taken to an entirely new level when the Smart Oven from Eisenmann is combined with the modular VarioLoc conveyor system. A skidless paint shop offers significant potential savings. Conventional skids weigh around 200 kilograms, and have to be heated and cooled along with their loads. VarioLoc eliminates this waste at a stroke.

Taken together, these design features generate energy savings of up to 37 percent annually. This total includes 16 percent through the use of preheated combustion air and lower pressure loss, 8 percent through load-dependent operation, and 13 percent through deployment of VarioLoc, for a dryer employed for 60 units per hour. Expressed another way, electricity savings achieved by a Smart Oven compared to a conventional model are equivalent to the average power consumption of 167 German households, and gas savings equivalent to the demand of 313 households.



Smart Oven users can look forward to lower energy consumption.

## Built to last

Like all Eisenmann products, the Smart Oven is manufactured largely in-house, and with a high degree of automation. The result is exceptionally high build quality, backed by robust quality control and proven expertise in dryer technology. The internal structures are made with extreme precision, while automated techniques produce accurate weld seams and a completely airtight dryer. Consequently, the interior of the dryer is subject to less soiling. No condensation forms on insulating materials, ensuring durability. In sum, these various factors guarantee long service life and low maintenance. Many Eisenmann dryers, which have frequently pushed back the barriers of technology, have been in operation for 35 years and more.



## Advantages at a glance

- Less energy for heating and cooling
- Less electricity for fan
- Lower maintenance and cleaning effort/expense
- Lower capital expenditure on building
- Flexible support for Industry 4.0 vision
- Excellent oven build quality

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