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Opening photo: When designing a large-sized coating booth, as happens to Savim in the field of the railway vehicles, it is no longer sufficient to perform a mere mathematical calculation to determine the airflow, air change, and electrical and thermal power values.



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Alternative and Innovative Technologies Implemented in Coating Booths for Railway Vehicles

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When designing a large-sized coating booth, as happens to Savim in the field of the railway vehicles, it is no longer sufficient to perform a mere mathematical calculation to determine the airflow, air change, and electrical and thermal power values (ref. **Opening photo**). It is necessary to analyse each parameter and see how any unnecessary waste can be avoided without sacrificing the booth's efficiency and safety. In particular, the size and shape regularity of railway vehicles should be taken into consideration. For obvious reasons of size, these booths are equipped with several identical ventilation and heating devices installed along its length, in order to cover the entire coating application area. Conventional booths alternately act as a coating booth, a flash-off station, and a drying oven. By taking into consideration the size and shape regularity of the structure to be coated, however, it is possible to create different properly sized segments and to assign them to various operating phases. This ensures three important advantages:

- Saving electrical and thermal energy.
- Simultaneously performing coating and flash-off operations in different areas of the same booth.
- Reducing the staying time of each



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Figure 1: The coating booth becomes like a series of adjacent identical booths without any separation between them.

vehicle in the booth and therefore the lead time, thus increasing the paint shop's productivity. This enables to reduce the plant's energy consumption, process times, and management costs. The expertise of Savim and its new heating and air diffusion technologies make all this possible. The application of new technologies is always costly, since new equipment must be implemented in the booths, but the considerable savings guaranteed make this a very convenient, profitable, and easily amortisable investment.

The new air delivery plenum concept creates air intake flows from the booth's ceiling without generating any interference and turbulence among its various segments. The system is managed by a PLC that can handle each area and modify the operating parameters through a point-to-point process. The PLC also enables to pre-set the air speed and air change values also based on the different types of coatings used. The coating booth becomes therefore like a series of adjacent identical booths without any separation between them (**Fig. 1**).

Each of these booths has an autonomous functioning, identical or different from the others. The PLC manages the cycle, whereas the operator only gives consent based on his position (**Fig. 2**). Savim made this possible by creating air delivery plenums with a technology fine-tuned over the last fifteen years in the coating of large workpieces and in the field of composite materials. The air entering the plenums passes through micro-perforated diffusers that evenly distribute it among the filters and introduce it in the booth in a perfectly perpendicular way, from top to bottom. This is especially important when it is



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Figure 2: Each of these booths has an autonomous functioning, identical or different from the others. The PLC manages the cycle, whereas the operator only gives consent based on his position.

“**Conventional booths alternately act as a coating booth, a flash-off station, and a drying oven. By taking into consideration the size and shape regularity of the structure to be coated, however, it is possible to create different properly sized segments and to assign them to various operating phases. This ensures three important advantages: saving electrical and thermal energy; simultaneously performing coating and flash-off operations in different areas of the same booth; reducing the staying time of each vehicle in the booth and therefore the lead time, thus increasing the paint shop’s productivity. The expertise of Savim and its new heating and air diffusion technologies make all this possible.**”

also necessary to control the humidity in the booth. Controlling and managing accurately the amount of circulating air enables to limit and maximise the investment and management costs of expensive and costly equipment. This also applies to the booth’s air heating equipment: for decades, Savim has used direct fire heating units that ensure energy savings, as confirmed by a 30% reduction in consumption costs, as well as constant temperatures in the booth (Fig. 3). Direct fire heating units have a nearly 100% yield. They do not require a conventional combustion chamber with tube bundles nor a flue exhaust chimney, replaced

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by a micro-flame burner. The exhaust air exhaust chimneys are also used. A control unit continuously monitors the operating parameters and air quality levels. The attainment of the right temperature is almost immediate and manageable with precision, since there are no heavy exchangers with their related thermal flywheel, which also lengthens the air heating and cooling times.

These concepts can be applied successfully not only to large-sized booths, but also to smaller booths and systems for coating components. ○



Figure 3: Direct fire heating units for Savim’s coating booths.