

Document, Analyze and Optimize your Production Cure Process

new temp-gard, oven temperature recorder

Is the paint cured at all points of the body?

On a car body we are dealing with parts that have different geometries, thickness and might even have different substrate materials. Heat transfer is dependent on the material, the thickness and the body shape. The goal of the process engineer is to optimize the line speed at the lowest possible temperature.

In the following example the cure performance of an e-coat oven before and after some re-modeling was analysed. After re-construction the entire baking process was running a few degrees higher than before the construction. The temperature curves of an A-pillar before and after reconstruction of the e-coat oven are shown in the graph in the right column:

The paint manufacturer's recommended data for curing were as follows:

- 165 °C 12 min
- 170 °C 10 min
- 175 °C 8 min

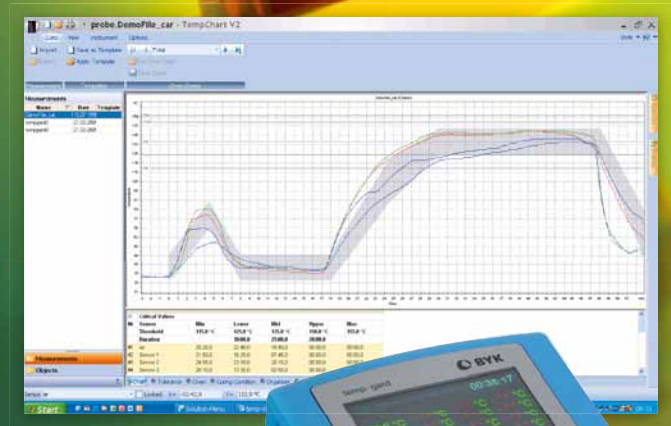
Traditional methods judge a baking process by comparing the paint manufacturer's recommended temperature/time (high – reference – low) to the actual production oven data. Based on this traditional cure evaluation 170 °C was only touched and 165 °C was only reached and surpassed for 7 minutes.

Consequently, the conclusion would have been: "Insufficient curing".

Nevertheless, the e-coat showed good sanding properties which means the system was cured. The traditional comparison does not take into consideration that crosslinking already starts at temperatures below the specified low temperature and accelerates at higher temperatures.

A new method which allows a detailed analysis of all temperature data contributing to the cure process called the "Equivalence method" was developed. The result of this new analysis was the following:

- Equivalence time = 15.6 min relative to the reference temperature 170 °C. Consequently, the coating system was completely cured.



temp-gard see page 237.

The new cure index method objectively proves that a lower temperature bake is absolutely sufficient to guarantee a well cured system.

- Reliable data on cure status allow true optimizing of the cure process: line speed and baking temperature

temp-gard

- 12 measurement probes
- Probes as well as temperature recorder meet R&R of the automotive industry: Maximum temperature variation of ± 1 °C – even after being in the oven for 60 min
- Easy handling – The temperature data is stored on a USB stick, thus the probes don't need to be disconnected. Or the measurement data can be transferred directly from the data logger to the PC.

Reference:

By Dipl. Ing. Eide Wilckens, Porsche AG, JOT, page 66 - 71, May 1998