

The Worldwide Leader in Temperature Profiling

Automotive Application Success Stories



Fluke Process Instruments



Q How did a manufacturer of air bag materials guarantee the quality and safety characteristics of the product?

A **Situation and background**

For an air bag to function correctly, it must inflate quickly and efficiently. To aid this process, the nylon substrate of the air bag material is coated with a low friction silicone layer. The silicone coating, as part of its application to the nylon substrate, goes through a critical thermal cure process. This is often performed in a tenter (stenter) oven, where the fabric is passed through a convection oven with a very low height restriction. If the silicone is under-cured, there is a risk that the surfaces of the air bag will stick together, preventing correct inflation of the air bag.

The winning solution

- Using a customized Datapaq® Oven Tracker® system (Datapaq StenterPaq System), even this difficult varying width stenter oven could now be profiled quickly and safely.
- System allows profiling at full process speed.
- No need for the system to sit on the material, so no risk of fabric damage or the profiler falling through the unsupported fabric.
- Repeatable thermocouple positioning across the fabric.

Savings made

- Process profiling is now performed without downtime, maximizing productivity and eliminating fabric burn.
- Uniform curing has reduced rejects, scrap and their associated costs.
- Process traceability provides protection against costly liability and litigation issues.

KEY FACTS

Customer's End Product

Automotive air bags

Max Temperature Reached

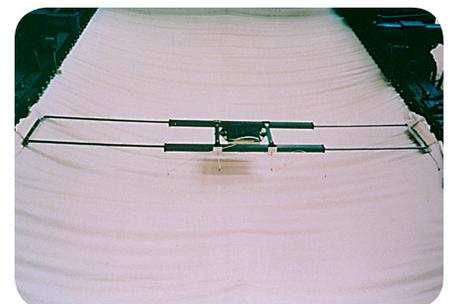
175°C/347°F

Duration of Process

1.5 minutes

PRODUCT AND BENEFITS

**Datapaq Oven Tracker DQ1860
Datapaq StenterPaq
Oven Tracker Insight™ software**



- Product temperature uniformity can be measured easily and thus optimized
- Production throughput can be maximized

SUCCESS STORY 85

AUTOMOTIVE CURING ADHESIVES AND SEALANTS



Q How can major automotive manufacturers maximize the protection of passengers through optimized curing of structural adhesives, sealants and mastics?

A Situation and background

During the paint cure process, a variety of complimentary materials need to be either heat treated or cured. Many of these materials are essential to the safety of the car, so they are as important as the paint cure process and therefore, need to be profiled. High temperature structural adhesives are used to give structural strength to areas of the car that need it for side impact resistance and to achieve the safety specifications required. Adhesives are used, since there is no space for welding on B pillar flanges. Cure of sealants, mastic and sound deadening materials provide waterproofing/reduced road noise and prevent toxic engine gases from entering the car's interior. Over curing can also produce by-products that can affect the quality of other paint processes.

The winning solution

- Using a Datapaq® Oven Tracker® XL2 system, the customer was able to ensure correct heat treating of adhesives, as well as curing of sealants and mastics.
- A standard Oven Tracker XL2 system (6 or 8 channel), with TB0090 thermal barrier was used.

Alternative solutions (application dependent) would include:

- Oven Tracker XL2 with dual interface block (16 channel), TB0083 thermal barrier
- Oven Tracker XL2 with long duration barrier TB0081 (single pass profile for profiling all ovens in one run)

Savings made

- With rework not an option in this industry, scrap costs resulting from the over curing of sealants were reduced.
- Improved passenger safety and reduced manufacturer liability issues from the correct curing of the adhesive.
- Production throughput was maximized.

KEY FACTS

Customer's End Product

Curing adhesives, mastics and sealants

Max Temperature Reached

Adhesives: 180°C/356°F

Sealants: 150°C/302 °F

Duration of Process

Adhesives: 30 mins

Sealants: 20 mins

PRODUCT AND BENEFITS

Datapaq Oven Tracker XL2
TB0090 thermal barrier
MicroMag magnetic thermocouples
Insight™ Professional software



- Product temperature uniformity can be measured easily and thus optimized

SUCCESS STORY 59

CONTINUOUS MONITORING OF PAINT CURING ON AUTOMOTIVE BUMPERS



Q How can I continuously monitor the performance of an automated paint curing process?

A Situation and background

In general, Datapaq® profiles are performed on paint lines to measure paint cure quality on an intermittent basis—for example daily, weekly or monthly. The assumption the user makes is that the process is working correctly for the period between acceptable consecutive profile runs. Obviously the more frequent the profiles the more confident the customer will be that the process is constantly in control. The desired aim of any paint QA manager would be to have live profile data from the process at continuous intervals through each shift. A Datapaq system equipped with the optional TM21 radio telemetry functionality can provide real time data from within the process.

The winning solution

- Ability to provide a profile system that could monitor every product cycle providing live product temperature data, via radio links, from the two coating oven lines, in real time, over the 9.5 hour shift.
- Datapaq system continuously runs through the cure process loop, fully protected, constantly providing product temperature data from a sample bumper with thermocouples attached.
- A trial of the Datapaq system in a serpentine oven showed that over 99% of all data was received over a 95 minute cycle, thus proving the reliability of data transmission and collection.
- Single PC and receiver able to collect temperature data simultaneously from two separate Datapaq systems, running on separate bumper lines.
- Datapaq hardware only loaded and unloaded once per shift, reducing handling wear and tear on the system and the thermocouples.

Savings made

The system can cycle six times in one shift with only one load & unload operation required. This reduces the labor required from 3 hours to 30 minutes. On this benefit alone, a leading automotive producer in the USA estimated the system would pay back in six months. The end-user is confident process yield will now increase due to the immediate notification of any process variation, from the Datapaq system.

KEY FACTS

Customer's End Product

Automotive bumpers

Max Temperature Reached

130°C/266°F

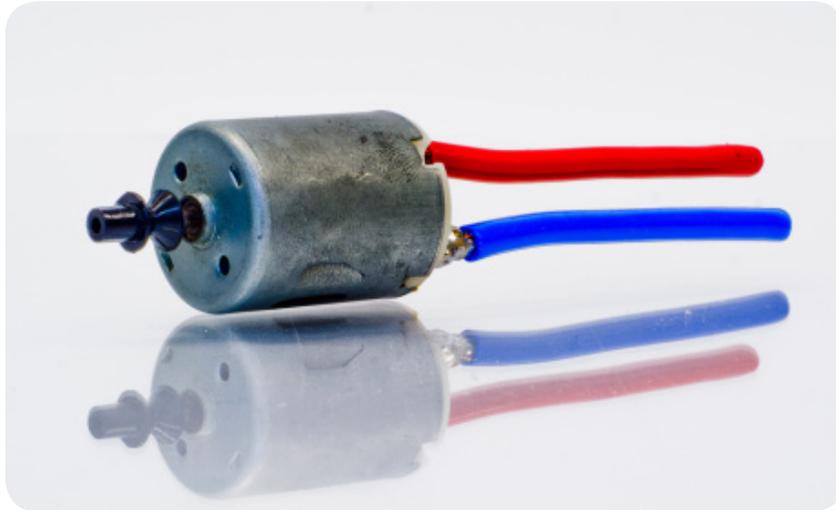
Duration of Process

Continuous 95 minutes x 6 cycles

PRODUCT AND BENEFITS

TB0081 and TP2016-TM providing sufficient capability for 9.5 hours of continuous monitoring

- Significant time/labor cost savings can be made—load/unload the system once per day, not once per cycle
- Immediate notification of any process change—eliminating scrap, increasing yield
- Every batch of product now has a full traceable record of the coating process



KEY FACTS

Customer's End Product

Electric motor parts

Max Temperature Reached

175°C/347°F

Duration of Process

Lacquer cure can be up to 8 hours long

Q How did a manufacturer supplying the automotive market measure the paint/powder and lacquer curing processes on electric motor parts?

A **Situation and background**

Electric motors are used in ever increasing numbers, particularly in the automotive industry, where long term reliability at minimum cost is the key to gaining market share. To ensure long operating life in harsh environments (temperature and humidity), the windings of the motor are lacquered and steel surfaces coated. Curing of the powder coat is fairly straight forward, but the lacquer cure can take up to eight hours. With temperatures ranging from 75°C/167°F to 150°C/302°F, this process can be challenging.

The winning solution

- The Datapaq® Oven Tracker® XL2 system, was used for both curing processes.
- Training of the operators was minimized with data from both processes provided in one common format.
- Datapaq is the industry standard for automotive, used by the majority of Tier 1 manufacturers and coating material providers, giving the end-user full confidence in the solution proposed.
- Quality assurance data generated by the Datapaq Oven Tracker XL2 system can be easily shared throughout the supply chain using a common software platform.

Savings made

- Cost of product field failure is high, so ensuring good coating cure quality was critical.
- Product value is high at the point of processing, so a reduction in reject rate resulted in significant cost savings for our customer.
- Using one profiling system saved time in training and data analysis, since there is no file conversion required when cross-checking information.

PRODUCT AND BENEFITS

**Datapaq Oven Tracker XL2
TB0090 thermal barrier
Insight™ professional software**



- Monitor all coating and curing processes with one profiling system
- Verify lacquer cure on surface and deep buried windings (not possible with IR)
- System of choice in the auto industry
- Software provides instant coating cure analysis

SUCCESS STORY 72

HOT FORMING AUTOMOTIVE PANELS



Q How can the temperature uniformity of the panel be verified prior to pressing?

A Situation and background

Hot forming is being increasingly adopted in the forming of structural panels for use in the production of automobiles. The key benefit is that very rigid structures can be made accurately with high strength lightweight steels. This ensures the car is both lightweight and strong, both of which are improvements required by legislation in many regions of the world. The process consists of the rapid heating of flat panels to 950°C/1742°F prior to pressing them into complex shapes. The Datapaq® system is used to measure the temperature uniformity of the panel through the fast heating process. Hot forming is slower than the previously used process of cold forming. Consequently, any small increase in production throughput has significant financial benefit to the end-user.

The winning solution

- The end-user can, for the first time, measure the performance of this key process.
- Datapaq has experience with fast high heat applications and was able to offer a solution from our standard portfolio of products.
- The time to set up the process at each new product introduction is reduced, thus maximizing production line utilization rates.

Savings made

In one situation in Europe, an experienced user of the hot forming process was able to shorten the heating time by 15%. This had immediate payback as the hot forming was a frequent production bottleneck, and increasing the throughput of the process improved productivity of the entire line.

KEY FACTS

Customer's End Product

Automotive specialist steel structural components

Max Temperature Reached

950°C/1742°F

Duration of Process

5 minutes

PRODUCT AND BENEFITS

TB2005-S DQ1860 datalogger Furnace Insight™ software



- Product temperature uniformity can be measured easily and thus optimized
- Production throughput can be maximized
- Set-up time for new panel types and thicknesses is reduced
- Routine process monitoring can be easily accomplished, increasing production line availability
- Trouble shooting the furnace profile is now quick, easy and safe

SUCCESS STORY 80

SIMULTANEOUS MEASURING OF TEMPERATURE AND HUMIDITY IN AUTOMOTIVE PAINT LINES



Q How can I simultaneously monitor process temperature and process humidity in an automotive paint line?

A Situation and background

Datapaq Oven Tracker® products are used by automotive plants worldwide to monitor car body temperatures in paint cure ovens, enabling the user to guarantee that the physical and cosmetic properties of the paint meet the required quality assurance standards. The application of paint onto the car body and the de-humidification prior to clear coat application and full cure, requires accurate control of both temperature and humidity. Getting the paint application conditions wrong creates significant risk of adding rework and repair, thus reducing throughput and increasing labor costs. Typically, operators use handheld devices to measure humidity at one or two points in the spray booths and de-humidifier zone. This approach is not ideal, as it requires entry into the paint line by an operator, introducing contamination risks and influencing the measurements taken. Accuracy of these measurements was claimed by the operators to be poor ($\pm 10\text{-}15\%$ RH). The data collected is manually recorded and does not give a true picture of what the product experienced passing through the process.

The winning solution

- A trial was done with the Datapaq MultiPac21 system confirming that it was possible to simultaneously measure the process humidity (%RH) and product temperature throughout the length of the process.
- Humidity and curing measurements appear together on the conventional Datapaq profile report, providing a complete picture of the process.

Savings made

- Yield was increased with more than 90% of products being coated perfectly.
- Contamination risk and lost production time due to line closure were reduced, since there was no need for an operator to enter the paint booth.
- Accurate process adjustments to reflect seasonal climatic variations could be made, maintaining full production.

KEY FACTS

Customer's End Product

Automotive bodies

Max Temperature Reached

70°C/158°F in dehumidifier
<200°C/392°F in curing oven

Duration of Process

Typically 70 minutes

PRODUCT AND BENEFITS

DP2186 with MP21-RH-UG humidity sensor



- Significant cost savings due to yield increase
- Eliminated risk of process contamination
- Single process results for both humidity and temperature in one operation

SUCCESS STORY 84

VULCANIZING AUTOMOTIVE RUBBER DOOR SEALS



Q How did a rubber extrusion manufacturer guarantee the physical properties of the product, as it is taken through a vulcanization process?

A Situation and background

Natural rubber has some serious defects; it is weak, easily becomes sticky and is not very elastic. To improve the physical properties (strength and heat resistance) of the material, it is taken through a vulcanization process. The polymeric chains of rubber undergo a cross-linking reaction, initiated by the addition of sulfur to form a stable 3D network. To increase the rate of the chemical reaction, heat is applied. Typically, a target cure schedule for the rubber is 180-200°C (356-392°F) for two to three minutes. Measurement is very difficult, due to the oven size restrictions.

The winning solution

- A low height, narrow thermal barrier enabled Datapaq® to provide a customized “fit for purpose” solution.
- Using a customized Q18 system, the customer was able to guarantee the quality of the vulcanization process with the desired cure schedule achieved.
- Multiple channels were used to measure oven and product temperature uniformity at different depths in the rubber.

Savings made

- Process verification was achieved without costly downtime.
- Product reject rate was reduced by accurate core temperature measurement.
- Formation of toxic by-products, such as H₂S (g) was prevented by controlling product temperature.

KEY FACTS

Customer's End Product

Automotive rubber extrusion components

Max Temperature Reached

220°C/428°F

Duration of Process

Max 7 minutes

PRODUCT AND BENEFITS

Datapaq Oven Tracker®
DQ1862 datalogger
TB2020 thermal barrier
PA0063/1 thermocouples



- Product temperature uniformity can be measured easily and thus optimized
- Production throughput can be maximized

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