

# Article: time-based adhesive selection

The latest issue of **FAST** magazine comes complete with this article about time-based adhesive selection. Factors like shelf life, working life and cure speed are often relevant to your production. It only takes five minutes to [read it](#).

ADHESIVES

## CONSIDER THIS...

When specifying an adhesive, shelf life, working life and cure speed are selection factors to consider. A good understanding of these factors can help manufacturers improve productivity and reduce waste. Here Peter Swanton, managing director of Inhertra, explains the time-based considerations when working with adhesives.

Every adhesive will come with a shelf life. The shelf life is the length of time from the date of manufacture during which the material is under warranty to behave according to the technical data sheet, assuming the storage conditions have been met. It also appears on the label as the expiry date — referring to the date that the shelf life ends — as an unmanufactured date. If the date shows less a manufacturing date, you can find the shelf life and calculate the expiry date.

An adhesive that meets its shelf life in the original packaging, and has been stored under recommended conditions, may still begin to see negative effects beyond the shelf life. The effects can be merely inoperative or be part of a slow decay in performance. Changes in the adhesive may include longer cure times, failure to cure, gelling in the package, changes in viscosity, expansion/contraction or decrease in performance. While adhesives don't usually become completely inoperative at the end of their shelf life or the end of the shelf life, this puts the clock in overdrive up to the cure.

We are often asked if it is still alright to use an adhesive past its expiry date, especially when production needs are pressing, and the supply chain has not got a fresh batch immediately in hand. A quick test (if it is an adhesive) would be to check cure speed under your exact processing conditions and compare it with your original process conditions test records. A cure rigours test would be to do so many finished parts on the original production as you can to see if it still meets your needs. A guide would be the testing you did initially to validate the adhesive in the application. After all, this is the only and ultimate test of suitability of the adhesive for your needs.

Nonetheless, the use of the expired product would still be at your risk. Many businesses do not care to take this risk, weighing up the cost of more material or production delay against the loss of reputation by missing a post-quality problem.

The conditions the adhesive is stored in can affect the shelf life. Temperature increases can impact both stability and efficiency. For best results, ensure that your adhesives are stored correctly according to the manufacturer's recommendations. Choosing an adhesive with a limited shelf life will cause working with a supplier with an appreciation of the inevitable supply chain challenges.

**"While pot life and working life are often taken to mean the same thing, there are distinctions between the two."**

### WORKING LIFE AND POT LIFE

While pot life and working life are often taken to mean the same thing, there are distinctions between the two. Both refer to the period of time after mixing or preparing an adhesive for use during which the material remains suitable for application.

Adhesives based on diisocyanate like epoxy, polyurethane, and methacrylate are often two-part systems and are mixed, the clock starts ticking. Cure inhibitors and the material starts to thicken, raising viscosity increases.

In this case, pot life is a clear point filled by the clock at the start of the cure, as it is defined as the amount of time it takes for the initial raised viscosity to double, and it is reaching the end reason. There are variations on this theme — the rate is affected by the mass of the material mixed and the temperature, so these factors should either be considered or defined (e.g. being used at 40°C) if you want to make comparisons.

Many of these treatment materials will generate heat (exotherm) during the cure process, and as the temperature will increase during curing, and more this exotherm is related to the resin mass, the more you mix, the shorter the pot life. UV curing adhesives, which are typically single part and require no mixing, might be said to have an indefinite pot life.



range, what it takes can be for your program.

Pot life can act as a guide in specifying your working life. We use a practical expectation will be useful. Working life is generally shorter than pot life. There are risks in using a material beyond its stated pot life, even if it is still in its original unapplied form. If the resin taking has gone too far before application, then adhesion and other physical characteristics may be compromised.

Not all manufacturers quote pot life or working life in the same way, so be careful of making data about comparisons and use the figures as a guideline. Always use the material in your application and talk to an authoritative supplier. If the performance requires, you may use a material with a shorter pot life than what the product, then use freely manufacturer's increased material weightings from frequent mixing, double replacement or two-stage systems on mixing, mixing and dispensing methods.

### CURE TIME

Cure time can vary from almost "instant" (epoxy/urethane adhesives, normally UV curing adhesives) to hours or even days (two-part adhesive temperature epoxy or single part silicone UV adhesive resin).

There is a distinction to be made between "handling time" or "basic time", and cure time. The former refers to the time

it takes for the adhesive to cure enough so that the parts can be moved with reasonable ease, perhaps to a handling area for full cure to occur, or to the next stage of the manufacturing process.

In a low mold, adhesive cure time would fit in with the production line speed as determined by the rate time. Adhesive specifications always about comparisons, however, another selection factor (e.g. performance, regulatory compliance) may have trumped the ideal cure time factor.

This may mean production benchmarks, with the curing, increased UV, and the reaction required resources (space, time, energy, if assembly line or factory are required). For longer adhesive handling time, usually means more steps with the associated costs.

If there are several steps, does not curing adhesives like epoxycyclohexane adhesives or UV light curing adhesives not other production efficiency.

When the assembly requires a two-part structural adhesive based on epoxy or methacrylate chemistry, then time to allow a release to be done between working life and cure time.

Fast cure time after mixing also implies a short working life, and this may present a number of processing challenges. Higher volumes of production problems can cope with this, under validation of customer production will require careful planning to order to reduce material waste. Some of these two-part structural adhesives have cured readily accelerated by heat, although this may lead to be done offline in batch

reticles allow curing in the oven, or the assembly, by induction heating.

Recent innovations of adhesives have focused "hot melt" curing mechanisms to adhesive production benchmarks. For example, a UV light cure to give fast cure time through another cure type.

There is not always better, it is possible for an adhesive to cure too quickly. For example, if you are working on a very large manufacturing job, where it takes so long to apply and spread the adhesive before applying and positioning the laminates, you will need an adhesive with a working life longer than its cure time.

### CONCLUSION

Shelf life, working life and cure speed are selection factors to consider when specifying an adhesive. It is worth noting that the cost of purchasing the adhesive is often more than the cost of purchasing the adhesive, so using these factors to guide production efficiency will save both time and money, reduce material waste and reduce productivity.

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