Chemical Resistance Applications

Application Note

Skill level

Time

Cost

Overview

Chemical environments are some of the most demanding workspaces, as the ability of printed prototype models to resist chemical attack depends on numerous chemical and environmental conditions and factors.

Chemical resistance is considered a functional concern rather than an aesthetic one. Rapid prototype (RP) models designed to evaluate functional use within a chemical environment are subjected to various conditions, such as temperature, reagent combinations and concentrations, and exposure time, all of which affect chemical resistance. Due to the wide range of variables that affect the shape of RP models, there is a need to more accurately establish parameters, such as usage, combination of chemicals and their resultant reactions and the geometry of the RP models, including surface finish, wall thickness and resin.

Typically, there is a correlation between the temperature of a chemical reagent and its reactivity. The higher the temperature, the greater the chemical reactivity and the more aggressive the chemical is to RP model. Correspondingly, most chemical resistant coatings lose their chemical resistance as temperature increase. Many chemicals, such as biocides, can affect the color, gloss, texture and performance of a chemical resistant coating as well as the printed RP model itself.

Viewed in this light, the items mentioned above may affect the chemical resistance post process.

Figure 1. Applying chemical resistance spray

Figure 2. Applying chemical resistance spray on assembled parts

Applications

Today, chemical resistance applications of RP models are growing in importance. The choice of suitable applications with adapted material properties, like chemical resistance, ensures that the application requirements are met.

For durable parts and patterns, or test parts for aggressive functional testing, a post process provides an excellent answer. Chemical resistance to corrosive agents, such as oil, gasoline and acids offers a viable solution for functional prototypes that can withstand robust performance demands.

The high chemical resistance provided by the post process also extends the use of aerospace, automotive and medical prototypes. These industries are among the first users expected to exploit this solution. The aerospace industry and the automobile manufacturers are expected to take advantage of its petroleum resistance and its ability to function when in contact with different chemicals. Printed PolyJet™ models, coated with a treated resistant coating, have resistance to harmful environmental exposure and may withstand moisture and chemicals.

The use of chemical resistant coating on RP models as an insulation to withstand the presence of aggressive materials, such as acid, bases, water, salt water and fuel, expands the range of applications for RP

Figure 3. Coating the inner surface of the bottle

models. Such a coating may serve the automotive, industrial, appliance, customer goods and other related industries that apply abrasion, chemical, corrosion, oil resistant and water repellent coatings to their products.

The Process

The workable solution for chemical resistant coating can be achieved by using the Fine-L-Kote™ (Item Number: TECSPR06500 aerosol spray, from http://www.techspray.com/). It is also available in aerosol forms for prototypes and small runs.

Fine-L-Kote™ SR is a transparent durable coating that offers chemical resistance and is recommended for harsh environments. This type of SR resin coating has excellent moisture and fungus resistant properties and is UL recognized. The coating's flexibility allows for vibration, movement and rapid changes in temperature. The coating process is performed by applying a thin layer of the chemical resistant coating and then waiting 72 hours for final curing before exposure to chemicals. This coating is applied by aerosol achieving a thin layer that has minimal effect on part details. The result is a smooth coating that is easily applied to complex surface shapes.

This transparent coating provides cost-effective chemical resistance with a convenient method of application for prototype, design and touch-up work. It is specially formulated to provide a homogeneous finish.

Chemical resistance:

- Excellent resistance (no attack) to diluted and concentrated acids, alcohols, bases and esters
- Good resistance (minor attack) to aldehydes, ketones and oils
- Limited resistance (moderate attack suitable for short-term use only) to aliphatic and aromatic hydrocarbons, mineral oils, and oxidizing agents

Figure 4. 72 hours later, the bottle is chemical resistant

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