Chemical resistance test on

Ultracur3D® EPD 2006

This document is intended to provide guidance for manufacturers regarding the compatibility of the 3D printed materials with hydrocarbons and cleaning chemicals. Forward AM has performed specific chemical test for the material Ultracur3D® EPD 2006. Indications on material changes that can occur during the chemical test were studied. It remains the responsibility of the device manufacturers and/or end-users to determine the suitability of all printed parts for their respective application.

Used hydrocarbons and cleaning chemicals

Fluid
Cooling fluid
Multipurpose fat
Engine oil
Hydraulic oil
Brake fluid
Transmission oil
Acetone

Test method and specimens

75 tensile bars were printed with the material and were soaked in each fluid, one set for 30 minutes and one set for 7 days. After the soaking time the parts were removed from the test fluid and were dried to measure the weight and the mechanical properties like E modulus, Tensile strength and Elongation at break.

Figure 1 Tensile bar ASTM D638 IV

Mechanical testing

The performance of the material is stable in most tested chemicals. A slight drop in elongation at break can be observed on immersion in multipurpose fat. A noticeable increase in the elongation at break is seen when immersed in hydraulic oil.

30 minutes

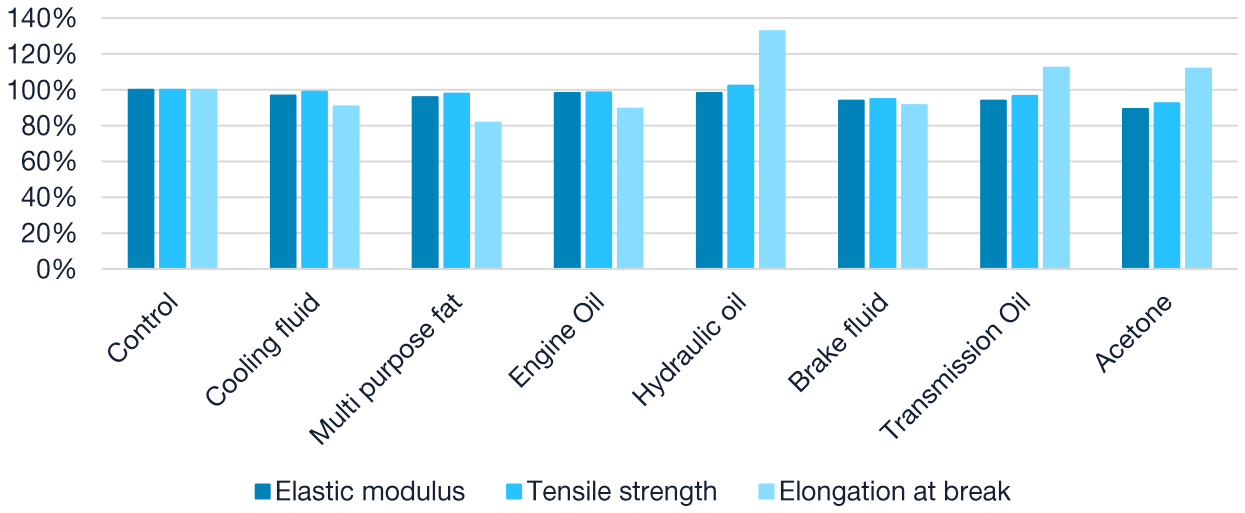

Figure 2 Change in mechanical properties in chemical fluid for 30 minutes

The mechanical properties remain constant throughout the 7 days test. A considerable increase in the elongation break was seen when immersed in cooling fluid, engine oil, hydraulic oil, and brake fluid. A considerable decrease in elongation of break is seen when immersed in multipurpose fat. A noticeable decrease in the E Modulus and tensile strength is observed when immersed in cooling fluid. The specimens showed serious deterioration in contact with acetone when tested for 7days. Hence no further test was carried out.

7 days

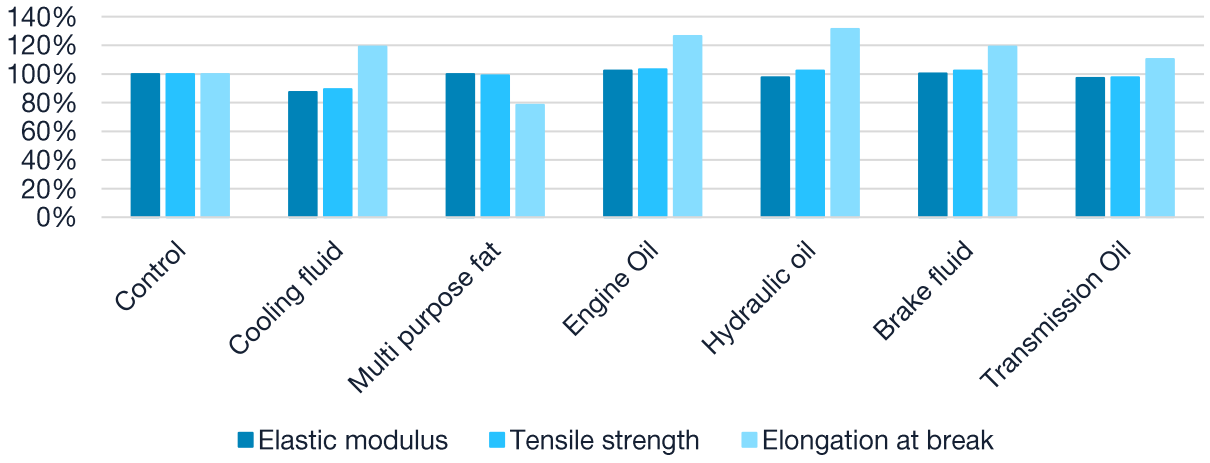

Figure 3 Change in mechanical properties in chemical fluid for 7 days

Weight

Increase in weight can be seen only after immersion in Acetone for 7 days.

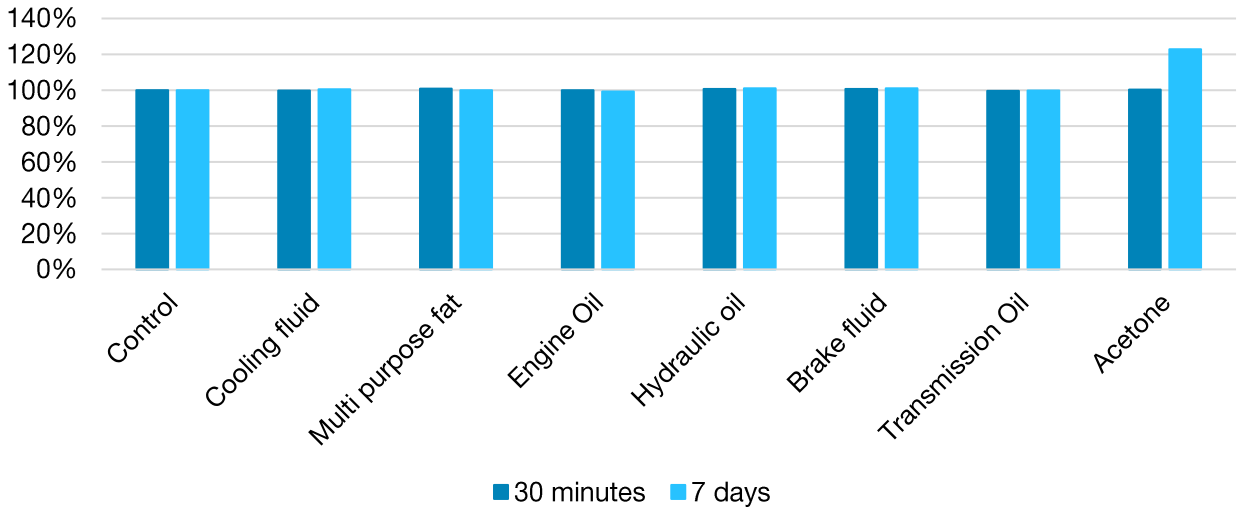

Figure 4 Change in weight in chemical fluid

Conclusion

The results of the performed tests (30 minutes and 7 days) on **Ultracur3D® EPD 2006** can be summarized in the table below.

Legend

= Change less than 10%; ↑↓ Change between 10%- 30%; ↑↓ Change higher than 30%

Ultracur3D® EPD 2006	30 minutes			
	Elastic modulus	Tensile strength	Elongation at break	Weight
Control	=	=	=	=
Cooling fluid	=	=	=	=
Multipurpose fat	=	=	↓	=
Engine oil	=	=	=	=
Hydraulic oil	=	=	↑	=
Brake fluid	=	=	=	=
Transmission oil	=	=	↑	=
Acetone	↓	=	↑	=

Ultracur3D® EPD 2006	7 days			
	Elastic modulus	Tensile strength	Elongation at break	Weight
Control	=	=	=	=
Cooling fluid	↓	↓	↑	=
Multipurpose fat	=	=	↓	=
Engine oil	=	=	↑	=
Hydraulic oil	=	=	↑	=
Brake fluid	=	=	↑	=
Transmission oil	=	=	↑	=
Acetone				↑

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