

FISITA 2008 Abstract: Crash Durable Structural Adhesives – Fatigue and Durability Evaluation of a 7 Series Car Body

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BETAMATE™ crash durable structural adhesives (CDAs) from Dow Automotive are applied to the vehicle body structure and provide significant increases in the amount of impact energy that can be absorbed. By bonding adjacent layers of sheet metal with a continuous bead of CDA, manufacturers also can improve body stiffness and durability as compared to spot welding. This offers OEMs the ability to save mass and total cost by down gaging the sheet metal in many locations.

As CDA technology continues to advance, information from in-service vehicles is also becoming available. By correlating data gathered from accelerated aging cycles and data taken from vehicles which have seen a significant service life, we can draw important conclusions about the durability of CDA's.

This paper will focus on results gathered from a teardown analysis of a 2002 BMW 745i, which completed 107,000 miles of service life in Louisiana, USA, under hot and humid climatic conditions. Strength characteristics of the adhesively bonded joints were measured as a function of position in the vehicle and compared to performance from fresh adhesive bonded in the same specimen configuration.

A best-case baseline material performance was determined by laboratory simulation of actual manufacturing conditions and all material performance results taken from the vehicle were compared to that baseline distribution. Comparisons were made to similar test samples exposed to accelerated aging tests and a correlation is drawn between the five-year, 107,000 mile service life and a corresponding cyclical corrosion cycle test time.

In support of the main teardown objective, information will also be presented relating the effects of external forces such as heat, humidity and salt spray on the adhesive system and the resulting bond to metal structures.

This is a very relevant body of research, as it conclusively shows that CDA's maintain a very high level of performance over the life of the vehicle. It also provides a starting point for determining the correlation between accelerated corrosion testing via cyclic corrosion test cycles and what is actually found in the vehicle after a substantial service life in a demanding environment.