AsahiKASEI

AEC 旭化成エンジニアリング

For companies adopting plastic materials for manufacture

CAE technology

Enhancing the efficiency of resin product development and design

i-LUPE™

Impact Behavior Prediction System for Polymers by Asahi Kasei Engineering Corporation

Exclusive CAE for polymer materials that enhances product development efficiency

A shift has progressed among manufacturers from metallic materials to thermoplastic resin materials (mainly plastics) when selecting source materials for their products, because of many advantages including lighter weight, lower product costs, and higher impact absorbency. In response to the trend, Asahi Kasei Engineering Corporation (AEC) has offered exclusive Computer Aided Engineering (CAE) for polymer materials including all types of thermoplastic resin materials, with its "Impact Behavior Prediction System for Polymers i-LUPE™." The CAE technology enables accurate simulation of impact behavior of polymer materials, eliminating the need to perform repeated tests. The technology is seamlessly compatible with all the processes from material design to product design, and accurately predicts the performance of final products. This enables a reduction in the amount of time spent from development to product making, as well as the amount of materials and energy consumed in tests. In turn, this enables reduction of environmental loads. The introduction cost can also be reduced as the system is LINUX-based.

*"The Constitutive Law for Polymer Material that Take into Consideration Microscopic Damages," on which i-LUPE™ is based, was given an award from the Japan Society of Mechanical Engineers (in the engineering division) in 2016.

point
Accurately predicts the impact behavior of polymer materials (mainly plastics)

point
Compatible with all types of thermoplastic polymers

point
Seamlessly compatible with processes from material design to product design

point
LINUX-based and may be introduced at a low cost

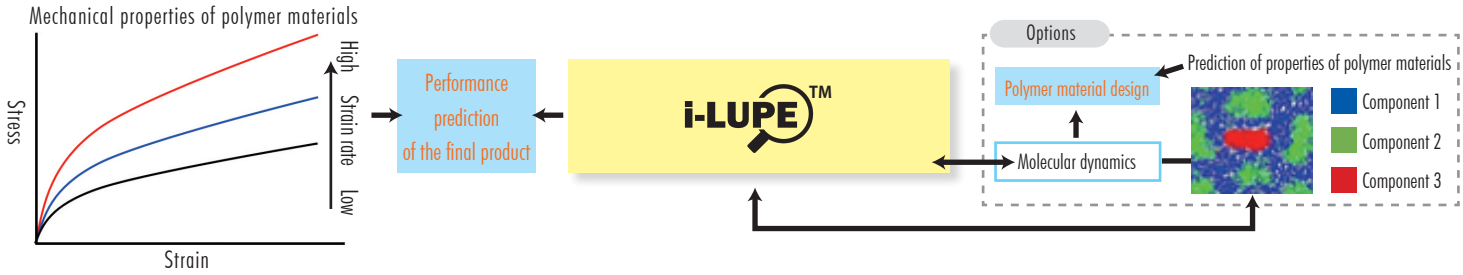
For impact behavior prediction of all types of thermoplastic polymers

Case Study

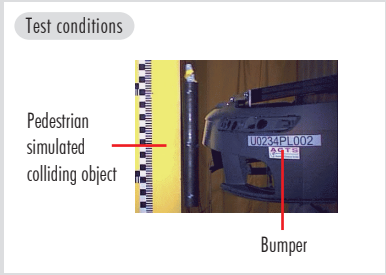
Automobiles Bumpers, trims, linings, instrument panels, pedals/brackets, seat frames, oil pans

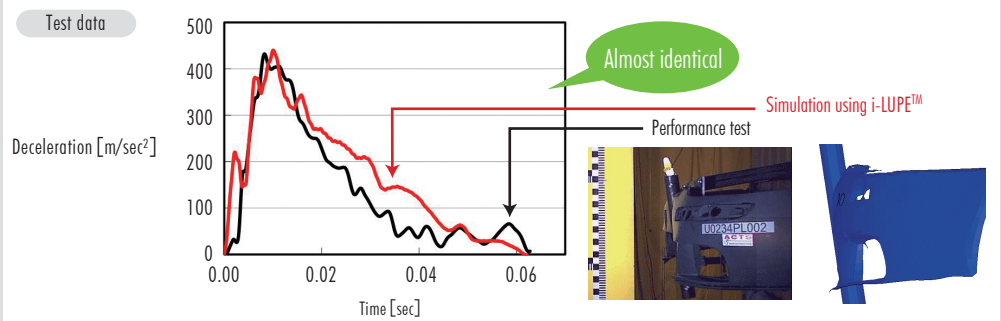
Mobile equipment Cases

Others Deterioration prediction, etc.



Prediction of pedestrian protection performance of automobiles





Outline/ Functions/ Specifications of the System

1.Outline

Mechanical responses of polymer materials were modeled using numeric expressions, with a focus on microscopic damages. Then, the model was discretized and made into a computer program that may be used with general numeric analysis programs.

2.Functions

Compatible with all types of thermoplastic polymer materials
Compatible with special materials also if the basic numerical expressions are corrected
Also applicable to anisotropic, fiber-reinforced, polymer alloy, and other composite materials

3.Specifications

Compatible general numeric analysis programs: LS-DYNA, PAM-CRASH, RADIOSS, ABAQUS
Applicable OS: LINUX (RHEL distribution)

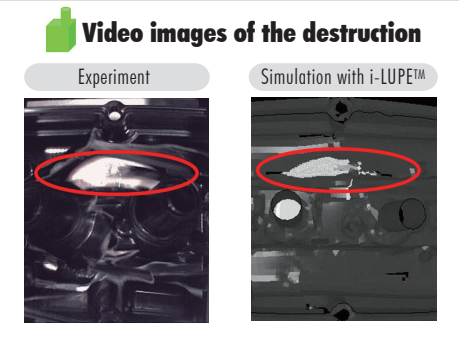
Process flow for system introduction

Research Case

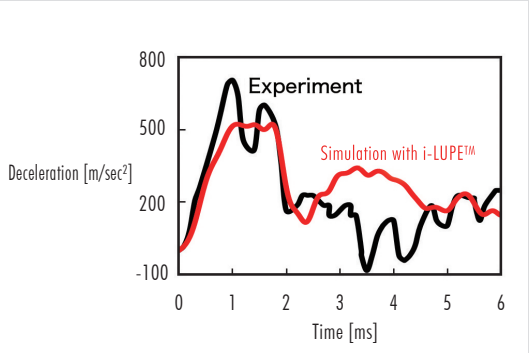
Utilizing i-LUPE™ for enhancing automobile fuel efficiency

More and more metallic automotive parts have been replaced with polymer parts, for enhancing fuel efficiency by reducing weight. The tendency is observed not only with the body and interior finishing, but also with the engine and surrounding parts, which are mainly made of metals. AEC's i-LUPE™ has been utilized for predicting the level of destruction of a fiber-reinforced resin under impact forces, when the resin is used with a cylinder head cover of the engine that is demanded to be durable. As can be seen, i-LUPE™ has been adopted for simulation in the production process of engine parts that need to satisfy stringent safety standards. This fact evidences how reliable the system has been.

In May 2017, Asahi Kasei Corporation, the parent company of AEC, announced a future-generation concept car AKXY that may be driven on roads. The concept car puts together the cutting-edge materials and technologies. i-LUPE™ is a technology that contributes toward the development of future-generation automobiles.



Comparison (images)



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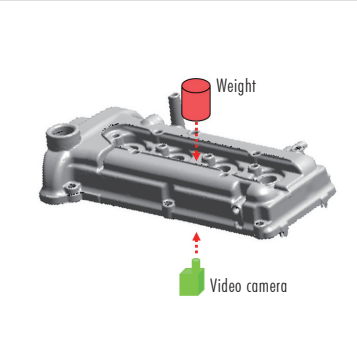

Tested on the head cover of automotive engine cylinder

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