Creation of lightweight automobiles

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(1) Purpose

Roughly 20% of all CO_2 emissions are from automobiles. Therefore, improving the fuel efficiency of automobiles is an effective way to reduce CO_2 emissions. Since acceleration loss and rolling resistance increase in proportion to vehicle weight, reducing vehicle weight is an effective means of reducing CO_2 emissions (Fig. 1).

(2) Social and technological requirements for technical issues

To improve such performance issues as collision safety and steering stability, automobile weights have tended to increase in recent years. Materials, structural designs, and production technologies that simultaneously achieve both performance and fuel efficiency are necessary.

(3) Potential mechanisms for achieving key parameters

· Structural design and production technologies are expected to reduce the weight of automobile component materials, curtail the amount of materials used, and to ensure the lightweight materials used possess the necessary rigidity and strength.

・Material technology: Weight reduction by substituting iron and steel components with aluminum, plastic, and other materials that possess small specific gravities or by reducing component thickness by using high-tension steel.

・Structural design: Use of **[1]** Computer Aided Engineering (CAE) for multi-purpose performance optimization in areas such as collision safety, vibration and noise reduction, strength and steering stability, and improved productivity.

・Production technology: Continuous welds with improved rigidity achieved using lasers or structure bonding agents and the formation of high strength materials of various shapes.

(4) Future society outlook

For electric vehicles and hybrid electric vehicles (HEV) that have increased weight due to their batteries, advances in structural design technologies using CAE and materials technologies, including processing technology, are expected to simultaneously achieve safety, operational performance, comfort, and low fuel consumption.

[References]
Society of Automotive Engineers of Japan: Automobiles in 2030 - Scenario of Automotive Technology Developments by Specialists in the Second Field of Technology
Automotive Technology Vol. 62, No. 3 (2008) Feature: Challenge for Higher Fuel Efficiency

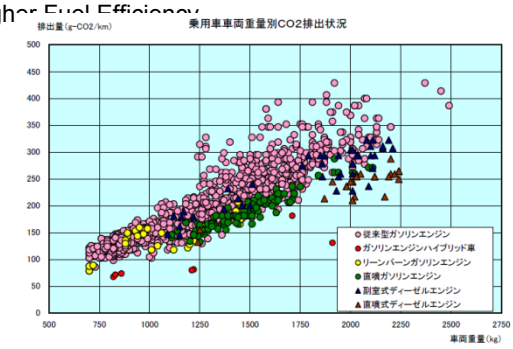

Fig.1. CO_2 emissions by passenger vehicles
MLIT: http://www.mlit.go.jp/jidosha/nenpi/nenpilist/05.pdf
(Quotation not yet approved)

			Baseline		Climate plan		
			2007		2015	2030	2050
[Name of the technology/solution] Creation of lightweight automobiles	Savings	Consumption if old technologies are sustained (BAU)	100		130	150	200
		Consumption after implementing new technology and measures			90	90	100
		Net saving			40	60	100
	Cost (Investment, operation & maintenance, fuel)				110	130	150
	Cost Per PJ saved				-	-	-
	GHG reduction potential	Emission if old technologies are sustained and with current trends (BAU)	100		130	150	200
		Emission after implementing new technology and measures			90	90	100
		Total Reduction			40	60	100
	Cost of GHG reduction				110	130	150