Sustainable Development for Automobile Industries is Strongly Dependent on Improvement and Progress of Mechanical Components

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I would like to congratulate on the 80th Anniversary of Koyo Seiko Co., Ltd.

Automobiles are now placed at the head of transportation systems in every kind of industry and in every area of citizen's life. However, considering the fact that tremendous numbers of automobiles totaling to 697 millions are in use at the end of 1997 and prospects of further increase in the future among developing nations, there will be no future dream in automobiles unless we make a radical review of automobile related technologies and try to solve their current problems common to mankind.

The position of automobile industries in Japan as a basic industry will be unchangeable in the future, and the range of related industries and businesses will continue to be wide. According to the statistics[1], of the total work force of 65.7 millions in our country, 7.38 millions are in automobile related industries with occupying 11.2% of the total work force. However, of the 7.38 millions, a little less than 0.92 millions (12%) work for production of automobiles itself, components and elements. The rest of 6.46 millions (88%) belongs to such companies or sections as users, sales and services, materials and other related areas. Thus engineers engaging purely in automobile industries will be less than 10% and these engineers are expected to play the main role in Japanese automobile industries. I cannot but say that the responsibility of engineers engaging in automobile components is very important for Japan to remain an important trading nation focused on industries.

Automobiles gain motive energy from petroleum oils and perform useful works for mankind now. But at present, against the input of chemical energy, various elements not related to original purposes are discharged as outputs. Among such exhausts, important are exhaust gas, heat, noise and environment pollutant. It is an immediate task to reduce such harmful elements discharged from automobiles besides useful output of automobiles. For the solution of environmental problems, further improvement in fuel efficiency should be considered as long as conventional motive energy is utilized.

Automobiles are no doubt a kind of machinery and their mechanisms can be classified according to mechanical components as follows;

① motive energy generation mechanism–engine, ② motive energy drive train mechanisms–transmission (gearbox), driveshaft etc., ③ working mechanisms–tires, wheel-suspension systems, ④ supporting systems for amenity–air conditioner, navigator system, audio systems.

In each mechanism of ① ② ③ ④ , there include moving parts which generate relative motion such as sliding or rolling to perform the functions expected.

For this purpose, important are measurers to reduce resistance at driving automobiles or loss of energy of mechanical components in relation to power generation process. At the time of acceleration, the weight of automobiles affects largely energy consumption. It is also an important technical task to reduce the weight of each component and mechanism considering its relationship with other functions of automobiles.

When we consider how future technology of mechanical components should be, considering social environment of automobiles as stated above,

(1) In design stage it is necessary to locate each element as near and as close to the functional location as possible to reduce loss in transmitting power.

(2) Consideration should also be given to unitizing, integrating and conjugating parts and reducing the weight as long as sufficient functional precision and durability can be guaranteed.

(3) Assurance and reliability in transmitting power should be maintained. At the same time amenity, flexibility and robustness in functioning of mechanical components should be necessary.

From the above view points, mechatronization of mechanical components will be further accelerated. From the view-point of maintenance and safety, controlling the transmission of power directly by cable or wire as seen in air-crafts may seem to be almost classical consideration in technology, but it is quite full of suggestion in accelerating innovative development of future mechanical components.

All the best wishes for technical staff of Koyo Seiko Co., Ltd.

References

1) Society of Automotive Engineers of Japan, Inc.: Automotive Engineering Handbook (Basic Theory Section), Seikosha Printing Co., Ltd.
2) Environment Agency: "Report on discharge of carbon dioxide" (1992.5)
3) Sekio Higuchi: Global Environmental Problems and Automobile Technology, JARI Research Journal, **18**, 5 (1996)

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