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New Opportunities and Incentives for Remanufacturing by 2020's Car Service Trends

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Abstract

This contribution presents the results of a four-year R&D-project undertaken by a team of six scientists, expert engineers and practitioners of car service technologies. Under the guidance of the authors they explored needs and challenges of tomorrow's (2020's) car service. Three new categories of car service needs, mainly triggered by electronic and mechatronic car components, could be identified: Spare parts driven, technology trend driven and phenomena driven new service needs. Ten challenging representatives within these categories were thoroughly analyzed and new service options and approaches as solutions for 2020 and beyond could be developed. Rounding up these in five new clusters of car service technologies of tomorrow it could be shown, that in particular Remanufacturing will both receive new opportunities and incentives, because being stimulated by new service solutions, and that Remanufacturing will also considerably contribute to sustainable car life cycles of the future. The contribution will accordingly present examples from new car components such as double clutch transmission, power steering, LED-headlights, turbo chargers, driver assistant systems, carbon fiber bodyparts, common rail injectors, electro mobility components.

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1. Introduction

By the year 2020, one billion passenger cars will roll on our roads worldwide. Comprehensive engineering efforts continuously have to provide appropriate technologies to keep this impressive fleet running on the necessary levels regarding reliability, safety and ecology – and all this within economic constraints from their owners and drivers.

Today's cars consist more and more of electronics: meanwhile to such an extent, that already today fifty percent of car repair work time is actually spent with the help of computers, as recent studies have shown. At the same time, innovation speed accelerates, product and market cycles become shorter and shorter, and autonomously driving vehicles are on the horizon.

Where is Car Service 2020 heading to? What kind of future Knowhow, skills and new technologies will be needed? Can spare part supplies for an exploding variety of car models still be handled at affordable cost? Such questions formed the background of a comprehensive four year project entitled "Car Service Engineering 2020" proposed by the authors in 2010 and granted to them by the Bavarian Ministry of Economy and Innovation to work out from 2011 to 2015. Key findings and results, described in a German final report, which in its details is intended to serve as a competitive edge for the Bavarian Car Service Market players and therefore is still restricted for Bavarian internal use, are presented here for the first time on an international stage.

2. State of the Art of Car Service

With electronic hardware and software penetrating passenger cars in recent years, car service work has moved from experience and craftsmanship towards computerized failure diagnosis and replacement of identified (or suspected) components. “Components” being replaced are in most cases no longer small parts like spark plug cables, bulbs, carburetor gaskets, bearings, clutch discs and such. Instead comprehensive (and expensive) subassemblies are being replaced: the whole ignition/distribution system, the complete steerable LED-headlight, the entire (Common Rail-) injection system, an entire engine because of a simple bearing failure, or the whole double clutch transmission, to use the range of previously small service parts listed above. Also the individual (and affordable) repair of engines or gear boxes on the work bench of an experienced car service garage has gone lost – both OEM-dealers and independent service operators meanwhile prefer to sell a new unit as an expensive replacement to the customer.

This practice is neither customer-oriented nor environmental friendly, but a waste of values, skills and material/energy resources.

3. Methodologies

To find answers if new car service technologies with a horizon 2020 can be identified and/or developed to meet the challenges described in the previous chapters, a four-year R&D project has been undertaken under the guidance of the authors, using a sequence of several methodologies

- a survey of the main challenges in more detail by questioning 1254 car service centers by mail and interviewing 50 car service experts in person at their workplaces. This survey covered 2520 car service cases
- an evaluation and assessment of the annual emergency road service statistics, provided by the roadside assistance of the German Automobile Club “ADAC”. This statistic covered 3.9 million car failures on the road and their reasons
- service case studies of 50 failed car components, identified as “typical” for representing today’s cars’ problems by the previous survey and assessment, inside the authors’ own institute and laboratories
- rating the 50 service case studies and selecting the ten most frequent/most challenging ones
- R&D and experiments regarding suitable new service technologies/remanufacturing options for these ten service cases and their failed car components who at present are not repaired but just replaced by new and expensive/comprehensive subassemblies
- developing ten new service processes for the most frequent service cases at the authors’ laboratories and their outside partners. Clustering them into five new forms/approaches of future car service, in order to make these approaches also applicable to service cases and problems outside those ten which have been solved in detail already during the project.

4. Questioning the Main Challenges

A team of six scientists from the University of Bayreuth, experts from Fraunhofer Applied R&D, and practitioners/instructors of car service technologies from the Chamber of Crafts in the region questioned more than one thousand car service workshops about their main challenges regarding 2020, their key observations regarding future spare parts supply and their experiences and expectations regarding computerized vehicles. This was done by both sending out a questionnaire to car service workshops, inviting the recipients to “invest 20 minutes of your time for 20 questions regarding the year 2020” – and by visiting them for structured interviews. Both OEM dealers of eleven automotive brands and also independent garages had to be surveyed, figure 1. The project attracted high interest and support from media (including TV), so that during the seven month period of collecting the main challenges also private car owners approached the project team, adding important findings from their (mainly expensive) experiences with service work on their computerized cars to the survey.



Fig. 1: Car Brands and Independent Garages interviewed in Order to Cover the Entire Car Service Market

In addition, the mentioned statistics from emergency roadside services showed that meanwhile classic failures like engine breakdowns are in a minority of just 8% of car breakdown reasons, while electronic and electric reasons represent more than 60%, figure 2.

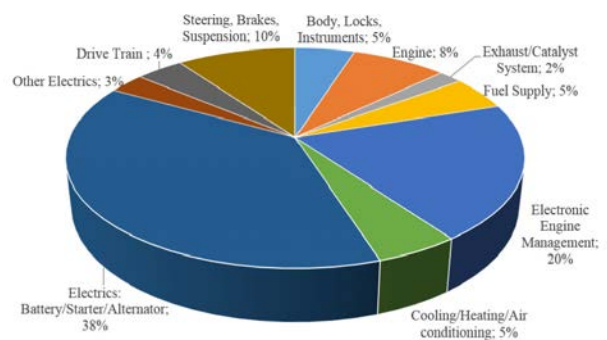


Fig. 2: Reasons for Roadside Car Emergencies (rounded percentages according to ADAC Germany).

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