Thermoelectric Generators for Heavy-Duty Vehicles – A Systemic Approach and Development

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INTRODUCTION

Future trucks are meant to satisfy high requirements in terms of cost-effectiveness, as well as pollutant emissions, whereby the conflict of objectives can no longer be resolved solely by in-engine measures only (Fig. 1). While fuel consumption is the major component costs and a holistic system consideration is included (Fig. 2). The focus on the TCO means to concentrate on application-related development. Increasing the efficiency of the TEG in the application by a limited coolant side represent the development goal.

STATE OF THE ART

The research is focused on electric peak power $P_{\text{ELmax}}$ of the TEG (Tab. 1). The consideration of the net power $P_{\text{NET}}$ transient behavior or long term stability of the technology is rare. In addition the essential TCO-evaluation represents a research gap.

METHOD

The TEG development approach is based on real driving data from conventional diesel and alternative gas-powered long-haul trucks. A TCO model to evaluate the performances are included. Exceptions are vehicle, e.g. electric power, weight, back on-board system, which present tasks of future work.

CONCLUSION

As results the TEG electric energy raise the efficiency of the DT and the GT as well as the coolant impact. The TEG largest negative impact is the weight of the component, $P_{\text{R}}$. The additional power for the coolant pump $P_{\text{DTEG}}$ represents very low values. The dynamic results constitute the fuel saving.

TEGs for long-haul trucks can comply the requirements, 1.2 % for the DT and 1.8 % fuel saving for the GT in the targeted amortization time of 2 years could be obtained.

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REFERENCES