

## Project Summary for WeiChai

**Project name:** Key technologies and applications of energy conservation and emission reduction for heavy-duty commercial vehicles

**Organization name:** Weichai Power Co., Ltd.

**The essence of the project:** reduce the fuel consumption and emissions of heavy-duty commercial vehicles in the whole life cycle and resist global warming

**Problem description:** Emissions from heavy-duty commercial vehicles are one of the main causes for the excessive concentration of NOx and particulate matter. According to statistics, heavy-duty commercial vehicles in China bear 77% of the freight transport and 81% of the passenger transport, and the fuel consumption accounts for 50% of the total vehicle fuel consumption, of which NOx and particulate emissions account for more than 60% and 80% respectively. Therefore, reducing the fuel consumption of heavy-duty commercial vehicles is of great significance to environmental protection in China and even in the world.

**Measures, testing methods, analysis methods taken:**

1) Weichai analyzes the causes by using the 8D problem solving ideas, including high fuel consumption of engine body, poor driving habits, and unreasonable application conditions of vehicle matching. For the above problems, Weichai takes the following measures: ① Engine and vehicle optimization. Through the measures of engine optimization, vehicle aerodynamics optimization, and development of economic mode fuel consumption reduction strategy, the vehicle fuel saving is up to 7% - 9%, and the vehicle fuel consumption is 4% - 6% lower than that of a famous foreign brand, reaching the world-class level; ② Drivers' driving behavior optimization. Weichai finds the significant influencing factors of drivers' economic driving behavior by using the regression analysis method. Every 0.1 point of drivers' driving behavior is improved, the vehicle fuel saving is 0.12 L/(ton \* 100km). It can reduce the vehicle fuel consumption by training drivers' driving behavior. ③ Vehicle matching application research. Weichai researches the operating characteristics of different market segments, and guides users to choose engine and vehicle reasonably according to the market segments. 2) Weichai analyzes the gap and looks for the improvement space through benchmarking analysis; 3) Weichai verifies and determines the root causes improvement measures by using data analysis, causal analysis chart and regression analysis.

**Resources used:** 1) Financial investment: RMB 4.209 million in total; 2) Personnel input: 2 senior engineers, 7 engineers, 1 purchasing staff and 32 testing personnel; 3) Equipment input: 1 vehicle for vehicle optimization, 1 competitive vehicle for benchmarking analysis, 1 vehicle data acquisition system for vehicle test data collection and 2 on-board fuel consumption meters for vehicle fuel consumption record.

**Result 1:** A heavy-duty commercial vehicle can save more than 20 tons of fuel and reduce 55 tons of CO<sub>2</sub> emissions in its whole life cycle, which is equivalent to an economic benefit of about RMB 103,000. Based on the current annual production and sales of 300,000 heavy-duty vehicle engines, the company's vehicles can save 6 million t/a of fuel and reduce 16.5 million t/a of CO<sub>2</sub> emissions.

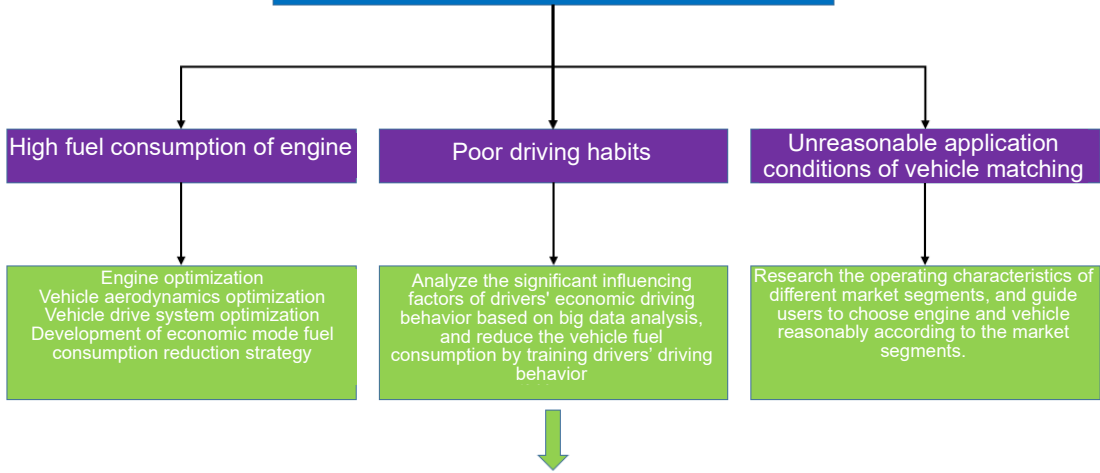
**Result 2:** 5 patents for invention, 1 technology secret, 2 enterprise specifications and 2 papers were obtained.

No.	Company	Type	Certificate title	No.
1	Weichai Power Co., Ltd.	Patents for invention	A control method and control device for electrically controlled fan of automobile	ZL201810469850.4
2	Weichai Power Co., Ltd.	Patents for invention	An intelligent throttle control method based on vehicle weight	ZL201710945101.X
3	Weichai Power Co., Ltd.	Patents for invention	An intelligent throttle control method based on road spectrum information	ZL201710945169.8
4	Weichai Power Co., Ltd.	Patents for invention	An intelligent throttle control method	ZL201710945076.5
5	Weichai Power Co., Ltd.	Patents for invention	A multi-driving mode control device	ZL201610240176.3
6	Weichai Power Co., Ltd.	technical know-how	Economic mode fuel saving control device and method of engine	—
7	Weichai Power Co., Ltd.	Enterprise specification	Part 19: Calibration of Vehicle Cooling System, Test Specification for Vehicle Rotating Hub	Q/WCG304.19-2020
8	Weichai Power Co., Ltd.	Enterprise specification	Part 68: MAP Calibration of Accelerator Pedal, Test Specification for Vehicle Calibration	Q/WCG125.68-2019
9	Weichai Power Co., Ltd.	Thesis	Influence of drivers' driving behavior on fuel consumption based on multiple regression	Journal of ShanDong JiaoTong University
10	Weichai Power Co., Ltd.	Thesis	Research on matching optimization method of vehicle engine cooling system	Internal combustion engine and power plant

**Result 3:** The successful implementation of the project has promoted the company to win the Third China Quality Award, the First Prize of the State Scientific and Technological Progress Award, the Asian Quality Innovation Award, and the World-class Global Performance Excellence Award (APQO).

**Influence on the UN Sustainable Development Goals:** The project is consistent with the UN Sustainable Development Goal 12: responsible consumption and production, which is to improve the efficient use of resources and energy, and reduce the future environmental pressure. The measures of the project can provide reference for energy conservation and emission reduction of automobile industry.

Key technologies and applications of energy conservation and emission reduction for heavy-duty commercial vehicles



Through the implementation of the project, it is estimated that a heavy-duty commercial vehicle can save more than 20 tons of fuel and reduce 55 tons of CO<sub>2</sub> emissions in its whole life cycle. Based on the current annual production and sales of 300,000 heavy-duty vehicle engines, the company's vehicles can save 6 million tons of fuel and reduce 16.5 million tons of CO<sub>2</sub> emissions.