

the firm submitting the application.
could receive an award? How does it demonstrate:

- timeliness, quality, and professional excellence
- transparency and integrity in the management and project implementation
- sustainability and respect for the environment

What services did the member firm provide to the project? Please describe briefly.

Please use additional pages as needed. Maximum 5 pages per project

I. Project Overview

The New Engine Plant of Beijing Benz Automotive Co., Ltd., was launched in April 2011 and put into operation in November 2013 with annual capacity of 300,000 four-cylinder and six-cylinder gasoline engines.

The overall processes of the project, from feasibility study, plant design to construction, were jointly completed by Beijing International Engineering Consulting Corporation and Beijing Industrial Designing and Researching Institute. The plant has been in good operating since completion in November 2013. The engines produced fully conformed to German Daimler's global quality standards. Till now, the plant has manufactured 220,000 engines with a total value of CNY8.8 billion. In respect of energy conservation and sustainability, the engine plant exceeded many expectations. The solar-powered hot water and waste-heat recycling system have saved energy equivalent to 1,990 ton standard coal; and photovoltaic power station has generated electricity of 3.12MW/h.

Our concepts in design of energy-conservation and sustainability, conforming to Benz's business concept, were highly recognized by the German partner and promoted for application in plant construction afterwards.

II. Technical Innovations and Quality Assurance for the Project

This project adopted Mercedes-Benz's top-notch production process. This new production

for the production environment. To ensure the tolerance precision at 1 micron in the engine product testing, 1) the constant temperature clean workshop should be under two-way temperature control so as to keep an absolute constant temperature environment; 2), the little air movement and disturbance was required. To ensure air quality, the air exchange should be enlarged, which would increase the air disturbance, thus being a difficulty; 3), a seamless solution should be provided for the large-area workshops so as to ensure the stability and shock-absorption for the equipment installation.

The project engineering technicians made a technical breakthrough in the construction of engine plant by means of multiple simulation experiments as well as advanced design concepts and innovative solutions.

(I) Brand-new Displacement Exchange Satisfied the Requirements for Constant Temperature and Purification. Displacement ventilation functions were in such a way that the hot air went up while the cold air went down as a result of air density difference, and then the fresh air was directly blown into the personnel activity area from bottom of the room. The unit sent the fresh air to the personnel activity area under the effect of high wind speed, Thanks to the displacement ventilating air conditioning design, the plant met the German's strict requirements in terms of air quality, constant temperature, purification and comfort etc.

(II) Innovative Latticed Column Design Enabled 360 Degree Ventilation and Reduced Airflow Disturbance. The frame columns of the plant were all specially-shaped batten plate latticed columns. The air pipes penetrated the roof top slab into the grid structure of workshop. The horizontal air pipes were placed in the structural grid and the vertical supply branch pipes were placed in the constructional column so as to take the full advantage of structural form and avoid the pipelines interference. The ventilation was changed into 360 degree ventilation from the traditional one-side ventilation so as to lower the wind speed and reduce the airflow disturbance. Moreover, the air conditioner rooms were located on the roof in several areas so

between the air conditioning pipes and saved about 7000

m² of the process area in the workshop.

(III) Utilization of Special Materials for Seamless Treatment of Large-Area Plant Ground

Showing Excellent Stability and Shock-Absorbing Effect. The project involved the complicated foundation of engine processing equipment and high requirement for stability. No protruding equipment foundation would be allowed on the plant ground; the equipment installation should be bolted on the ground at a thickness of 250mm; no expansion joints should be allowed on the ground in an area of 72m * 96m to prevent that too many expansion joints affect the stress loaded on the bolts and over-long production line increased the floor area during the equipment installation.

Through repeated studies and experiments, our engineering technicians adopted special filling materials for ground surface treatment and set up technical specifications for construction in order to ensure the integral ground stability, and achieve a good shock-absorbing effect.

(IV) 3D Design Technology Solves the Difficulties in Complicated Pipeline Layout in the

Plant. There were a lot of utility pipelines and process pipes in the engine plant, which required high-accuracy, reasonable pipeline layout (spacing) and no mutual interference, so as to ensure the safe operation and convenience for the future maintenance. The plant applied Bentley's 3D professional design software to the entire design for Benz engine plant project, providing the intuitional and efficient guidance on the construction and facilitating the examination.

III. Clean Production and Sustainable Development for the Project

The project, with the view to sustainable development and environmentally-friendly production, gave priorities to safety, environmental protection and reduction of pollutant emission throughout project design and construction phases.

(I) New Displacement Ventilation System and Recycling of Waste Gas, Liquid and Heat

The new displacement ventilation system required less air supply and operated in less cold/heat load condition. Each air conditioning unit was equipped with a heat recovery system with a heat recovery rate $\geq 60\%$. An electric two-way valve was provided for the water pipe at the end of air conditioning units, and the cold/hot water circulating pumps were frequency conversion ones. The opening of the valve could be adjusted automatically to indoor temperature, and the flow of water pump could be adjusted accordingly, so that the cold/heat energy could be saved.

The plant design allowed the filtering recycling of oil mist and other waste gas during processing, and turned waste gas into heat energy source through a heat converter to pre-heat the indoor air in winter and to realize the dual effect of energy conservation and emission reduction, It could save energy equal to 1560KW thermal load in winter.

(II) Solar-based Design for Energy Conversation

- Solar-powered hot water:

In Beijing, as the sunshine duration is over 1400 h/year, and the solar radiation is over 4200MJ/m² generally, the solar absorption plate should be used as heat source to supply hot water for shower.

- Photovoltaic power generation:

Mercedes-Benz Engine Plant planned to implement a rooftop solar power generation project, under which a solar power station covering about 50,000 square meters would be installed on the roof with a capacity of 3MW to feed the plant electricity system.

(III) Energy Management System for Dynamic Monitoring

The project design included an Energy Management System (EMS) which could dynamically monitor the consumption of energies in the plant, such as electricity (HV and LV distribution

and domestic water, circulating water, in-plant compressed air, natural gas and all important parameters necessary for production (including but not limited to temperature, pressure, rate of flow and electricity) in a centralized manner, so as to improve the information-based corporate energy management, effectively control energy costs and realize corporate sustainable development.

IV. Transparent, Fair and Efficient Management for the Project

For the construction and management of the project, the whole-process management model namely "pre-project consultation + project design + project construction & management" was adopted to realize the goal of "whole-process integrated management for the project" and reached international leading level.

During the feasibility study phase, by fully integrating existing resources of Mercedes-Benz Plant, advanced clean production process was adopted and further optimized continuously.

During the project design phase, engineering designers minimized energy consumption during production to effect clean production. During the project construction phase, the environmental monitoring concept was first introduced to effectively control the ecological implication and environmental pollution during construction. Efforts were also made to strengthen safety management and prevent major effect during construction for the objectives of the Project.

During the construction management phase, the "Transparency and Integrity", "Progress, Quality, Investment, HES and Contract" were merged into "Six Controlled Factors" for project management to ensure "Good Quality Project and Excellent Personnel". From feasibility study phase to commercial operation phase after completion, the Project was in compliance with FIDIC standards and applicable laws, and the bidding activity was held in a transparent and regulative manner without violation of laws and regulations.