UDC 621.311.22 https://doi.org/10.33619/2414-2948/80/33

# RESEARCH ON VENTILATION AND HEAT DISSIPATION PERFORMANCE OF TRAILER POWER STATION

**©Liu Fangzhou,** *Jiangsu University of Science and Technology, Zhenjiang, China; Ogarev Mordovia State University, Saransk, Russia, 1578244580@qq.com*

# ИССЛЕДОВАНИЕ ПРОИЗВОДИТЕЛЬНОСТИ ВЕНТИЛЯЦИИ И ОТВОДА ТЕПЛА ПРИЦЕПНОЙ ЭЛЕКТРОСТАНЦИИ

**©Лю Фанчжоу,** *Цзянсуский университет науки и технологии, г. Чжэньцзян, Китай; Национальный исследовательский Мордовский государственный университет им. Н.П. Огарева, г. Саранск, Россия, 1578244580@qq.com*

*Abstract.* The results show that the use of CFD software to simulate the ventilation and heat dissipation of the trailer power station cabin, Get the flow field and temperature field in the cabin, The position of the highest temperature in the vehicle cabin can be determined quantitatively, which provides a useful reference for the design of the cabin structure of the trailer power station and the arrangement of the equipment in the vehicle. Moreover, the simulation results are in good agreement with the experimental results. It shows that the selected Realizable k-ε Turbulence Model can more accurately simulate the air flow field in the cabin of the trailer power station. It also shows that the model simplification method used in the calculation and the setting of analytical conditions are reasonable.

*Аннотация.* Результаты показывают, что использование программного обеспечения CFD для моделирования вентиляции и рассеивания тепла в кабине силовой установки прицепа, получение поля потока и поля температуры в кабине, положение самой высокой температуры в кабине транспортного средства может быть определено количественно, что содержит полезную информацию о конструкции кабины прицепной электростанции и размещении оборудования в автомобиле. Кроме того, результаты моделирования хорошо согласуются с экспериментальными результатами. Это показывает, что выбранная Realizable k-ε модель турбулентности позволяет более точно моделировать поле воздушных потоков в кабине прицепной электростанции. Это также показывает, что метод упрощения модели, использованный в расчете, и установка аналитических условий являются разумными.

*Keywords:* trailer power station, ventilation and heat dissipation, flow field, temperature field, CFD.

*Ключевые слова:* прицепная силовая установка, вентиляция и теплоотвод, поле течения, температурное поле, CFD.

## *Introduction*

Trailer power station is a new type of motorized diesel power generation equipment, which can provide quiet power guarantee for a variety of emergency power supply users. It is the main power guarantee method for anti-terrorism and stability maintenance and field operations, and it is also a backup power source for various major activities [1, 2]. In the development process of the silent type trailer power station, it is an important task to study and solve the contradiction between the noise control of the cabin and the ventilation and heat dissipation. The traditional experimental test can only be implemented after the prototype car is manufactured, so the development cycle is long and the cost is high. Therefore, in the design process of the cabin of the trailer power station, the ventilation and heat dissipation characteristics of the cabin are analyzed to find out the problems existing in the ventilation and heat dissipation and their causes. It provides a basis for the finalization of the cabin structure and the general arrangement of the equipment in the cabin and avoids excessive changes in the final stage of development [3]. Therefore, it is necessary to numerically simulate the air flow field in the cabin of the trailer power station, and then analyze the ventilation and heat dissipation effect in the cabin.

Experts and scholars at home and abroad have done some research on the related topics of ventilation and heat dissipation of cabin structure. Yuan Xiayi et al. [4] studied the flow field and temperature field distribution in the engine compartment of the car and found that the ventilation and heat dissipation effect can be improved by adding a deflector. Xiao Honglin et al [5]. For power battery packs in different arrangements, Different heat dissipation characteristics are compared and analyzed by studying the flow field and temperature nephogram. Zhang Kun et al. [6] aimed at the problem that the temperature of a certain type of engine compartment is too high under the idling condition. The simulation calculation of the flow field and temperature field is carried out, and the method of adding a choke plate is proposed to improve the air flow and improve the heat dissipation effect. Song Sihong et al. [7–9] studied the distribution of air flow field and temperature field in the cabin of military communication power supply units with different structures. The heat dissipation effect is analyzed, the structure of the cabin is improved, and the best scheme is proposed. Ren Chengqin et al. [10] studied the surface convective heat transfer coefficient and the cabin space flow coefficient of the engine compartment under different ambient temperature and vehicle speed conditions. It is found that appropriately increasing the area of the ventilation grille on the rear wall of the engine compartment or adjusting the position of the radiator can improve the ventilation and heat dissipation effect of the engine compartment. Jarrett and Kim [11] proposed an electric vehicle battery pack temperature control method, Heat is transferred from the battery pack compartment through the cooling plate by designing the grooved cooling plate. D. Ghosh [12] and Sungjin Park [13] used computational fluid dynamics (Computational Fluid Dynamics, CFD) method to study the heat dissipation of hybrid electric vehicle battery pack, It was found that the ventilation and heat dissipation can be improved by changing the air flow. The above analysis of flow field and heat dissipation mainly focuses on automobile engine compartment, military communication power generator set compartment and electric vehicle battery pack compartment, etc. There are few studies on ventilation and heat dissipation of trailer power station compartment. This paper mainly takes the air flow and thermal environment in the cabin of the trailer power station as the research object, and comprehensively considers the influence of the air inlet and exhaust port and the heat of each component of the unit on the ventilation and heat dissipation effect of the equipment. The simulation calculation of the air flow in the engine room and the muffler cabin in the cabin is carried out, and the heat dissipation of the diesel generator set and the two-stage exhaust muffler in the cabin is analyzed. The ventilation structure of the rear wall of the unit cabin is optimized, and finally the calculated results are verified by experiments and comparative analysis.

 Т. 8. №7. 2022
https://doi.org/10.33619/2414-2948/80

*Model Establishment and Analysis*

*Geometric Model*

The cabin of the trailer power station is divided into three parts by the partition, which are the operation cabin, the crew cabin and the anechoic cabin. This paper mainly studies the air flow and equipment heat dissipation in the crew cabin and the anechoic cabin, so the part of the operation cabin is ignored in the modeling and analysis of the air flow field and temperature field. Without affecting the air flow field and temperature field in the cabin, in order to more accurately reflect the distribution of the flow field and temperature field in the cabin, the cabin model of the trailer power station is simplified [14]. Figure 1 is a simplified model of the trailer power station cabin.

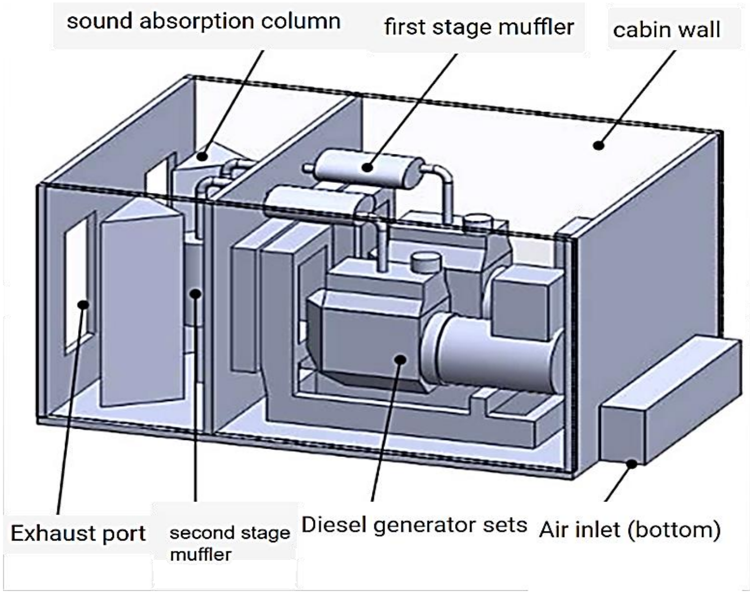



Figure 1. Simplified model of trailer power station cabin

*Mathematical Model*

*Governing Equation of Flow Field Calculation*

Due to the complex air flow in the cabin, the air flow in the cabin is regarded as an ideal incompressible turbulent flow [15]. In the Cartesian coordinate system, the governing equations can be expressed as. Mass conservation equation:

$$\partial\rho/\partial t + \mathrm{div}\boldsymbol{u} = 0 \tag{1}$$

Momentum conservation equation:

$$\partial(\rho v_i)/\partial t + \mathrm{div}(\rho \boldsymbol{u} v_i) = \mathrm{div}(\mu_{\mathrm{eff}} \cdot \mathrm{grad} v_i) - \partial p/\partial x_i + S_i \tag{2}$$

Energy conservation equation:

$$\mathrm{div}(\rho \boldsymbol{u} h) = \mathrm{div}(k \cdot \mathrm{grad}T) + S_h \tag{3}$$

In the formula: $\rho = \rho(p, T)$； $\mu_{\mathrm{eff}} = \mu + \mu_T$； $p$ is pressure，Pa； $T$ is the temperature，C； $\boldsymbol{u}(v_1, v_2, v_3)$ is the velocity vector； $\rho$ ， $\mu$ are the density and laminar viscosity, respectively 1.194 kg/m$^3$ and 1.911×10-5 Pa·s ; $\mu_T$ ， $\mu_{\mathrm{eff}}$ are turbulent viscosity and effective viscosity, respectively, Pa·s.

*Turbulence Model*

Due to the relatively complex structure of the cabin of the trailer power station and the large number of equipment in the cabin, the shape of the wall surface changes drastically. In order to accurately simulate the air flow in the cabin, the Realizable k-ε model [16] is selected, and its expression is as follows:

$$\frac{\partial}{\partial t}(\rho k)+\frac{\partial}{\partial x_j}(\rho k u_j)= \frac{\partial}{\partial x_j}\left[\left(\mu+\frac{\mu_t}{\sigma_k}\right)\frac{\partial k}{\partial x_j}\right]+ G_k+G_b-\rho\varepsilon-Y_M+S_k \tag{4}$$

$$\frac{\partial}{\partial t}(\rho \varepsilon)+\frac{\partial}{\partial x_j}(\rho \varepsilon u_j)= \frac{\partial}{\partial x_j}\left[\left(\mu+\frac{\mu_t}{\sigma_\varepsilon}\right)\frac{\partial \varepsilon}{\partial x_j}\right]+\rho C_{1\varepsilon}S_\varepsilon- \rho C_{2\varepsilon}\frac{\varepsilon^2}{k+\sqrt{v\varepsilon}}+C_{1\varepsilon}\frac{\varepsilon}{k}C_{3\varepsilon}G_b+S_\varepsilon \tag{5}$$

In the formula: $G_k$ is the turbulent kinetic energy due to the mean velocity gradient Producer of $k$ ; $G_b$ is the generation term of turbulent kinetic energy $k$ caused by buoyancy; $Y_M$ represents the contribution of pulsatile expansion; $C_{1\varepsilon}$ 、 $C_{2\varepsilon}$ 、 $C_{3\varepsilon}$ is an empirical constant；

$\sigma_k$ and $\sigma_\varepsilon$ are the Prandtl numbers corresponding to $k$ and $\varepsilon$ , respectively. Usually, the constants can take standard values: $C_{1\varepsilon}=1.44$ 、 $C_{2\varepsilon}=1.9$ 、 $\sigma_k=1.0$ 、 $\sigma_\varepsilon=1.2$ ； $S_k$ and $S_\varepsilon$ are source terms.

*Overall Scheme of Ventilation and Heat Dissipation Design of Trailer Power Station*
*Main Parameters of Trailer Power Station*

(1) Dimensions:

Length: 4170 mm Width: 1950 mm Height: 1600 mm, the structure of the trailer power station cabin is shown in Figures 2-5.

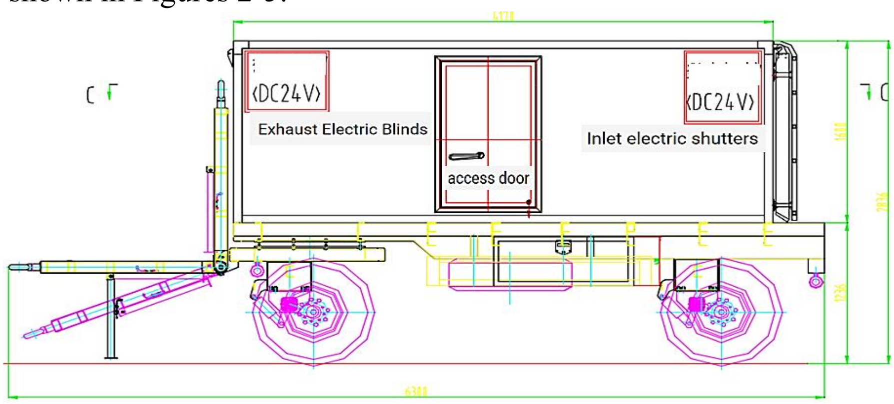



Figure 2. Trailer power station structure diagram

Т. 8. №7. 2022
https://doi.org/10.33619/2414-2948/80

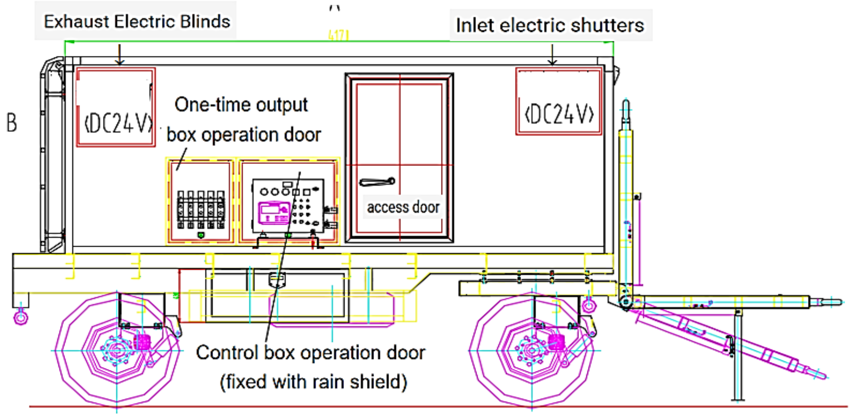



Figure 3. Trailer power station structure diagram

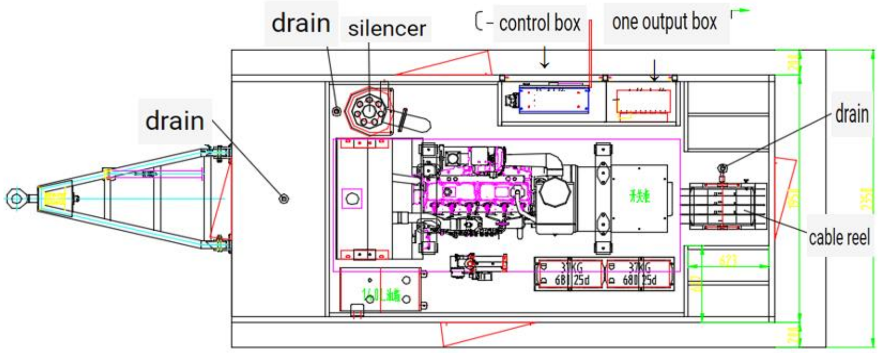



Figure 4. Trailer power station structure diagram

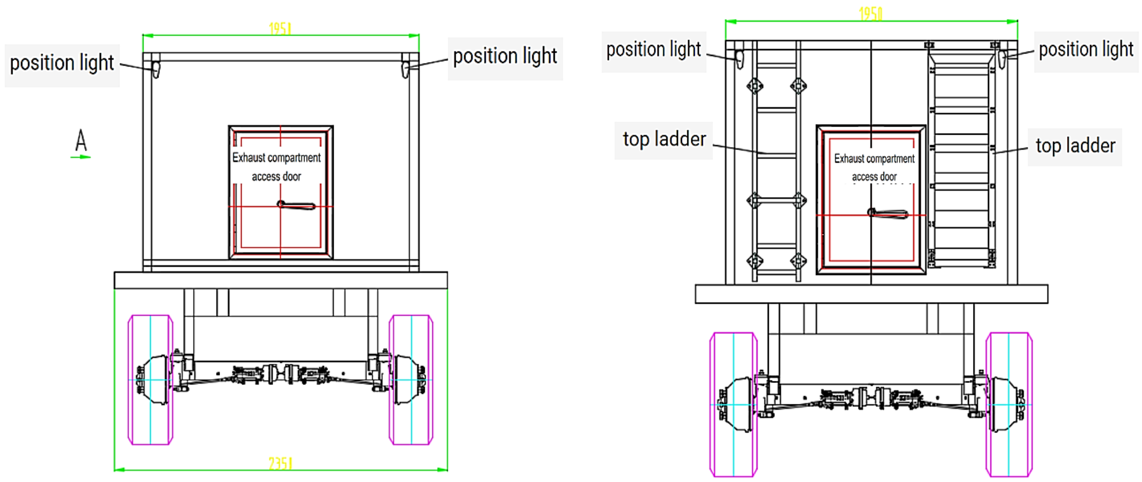



Figure 5. Trailer power station structure diagram

(2) Main vents parameters

The main vents of the trailer power station are the intake electric shutters and exhaust electric shutters on both sides of the cabin. The specific dimensions are shown in Table 1.

Table 1

MAIN VENT PARAMETERS (mm)

| vent | quantity | width | high | Remark |
|---|---|---|---|---|
| Inlet electric shutters | 2 | 556 | 600 | The number of shutter blades is 16 |
| Air outlet electric blinds | 2 | 607 | 500 | The number of shutter blades is 13 |

*Fan Performance Parameters*

The fan shroud is φ710 mm, and the performance indicators such as air volume, static pressure and power consumption under different fan speeds are shown in Table 2. When the engine speed is 1500 r/min, the fan speed is about 2337 r/min.

Table 1

FAN PERFORMANCE INDEX

| *speed of the fan r/min* | *Air volume $m^3/s$* | *static pressure Pa* | *Power consumption Kw* | *Static pressure efficiency %* | *speed of the fan r/min* | *Air volume $m^3/s$* |
|---|---|---|---|---|---|---|
| 1500 | 2.29 | 312.0 | 2.20 | 32.6 | 1500 | 2.29 |
| 1800 | 2.76 | 449.0 | 3.80 | 32.6 | 1800 | 2.76 |
| 2100 | 3.22 | 610.7 | 6.03 | 32.6 | 2100 | 3.22 |
| 2400 | 3.70 | 797.2 | 9.00 | 32.7 | 2400 | 3.70 |

*Simulation Analysis of Ventilation and Heat Dissipation Performance*

On the premise of not affecting the air flow and temperature field in the cabin, the cabin model is simplified. The principle of simplifying the model is to focus on the main cooling equipment that has a greater impact on the temperature field and the equipment that has a greater impact on the air flow field, and ignore the equipment that has less impact on the temperature field and flow field.The simplified model of the crew in the cabin is shown in Figure 6.

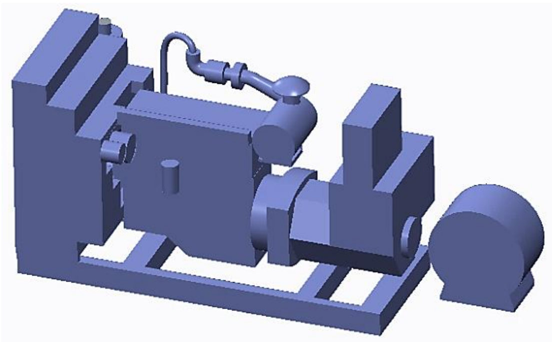


Figure 6. Simplified model of cabin crew

*Calculation Assumptions*

In order to facilitate the calculation and analysis, the following assumptions are made when the numerical simulation of the flow field and temperature field in the cabin of the trailer power station is carried out:

1. The diesel generator set and other equipment in the cabin are running stably, the heat exchange on the contact surface between the air and each equipment is converted into pure fluid heat transfer and convection heat transfer, ignoring the radiation heat transfer on the equipment wall [17].

2. The flow field calculation area is the fluid area inside the trailer power station, which can be assumed to be the flow field and temperature field distribution of the air in the fluid area away from the wall, so the thickness of the equipment wall is not considered.

3. The air density in the cabin is constant and does not change with temperature, so the air flow in the calculation area can be considered as Incompressible steady state flow.

*Computational Meshing*

On the basis of the simplified model, the shell is extracted and materialized, and the cavity model of the fluid channel is obtained. and use software for mesh division. The mesh adopts a tetrahedral unstructured mesh, and during mesh division, mesh subdivision based on curvature adaptation of the geometric model is performed. The number of grids is 4.6 million and the grids are as shown.

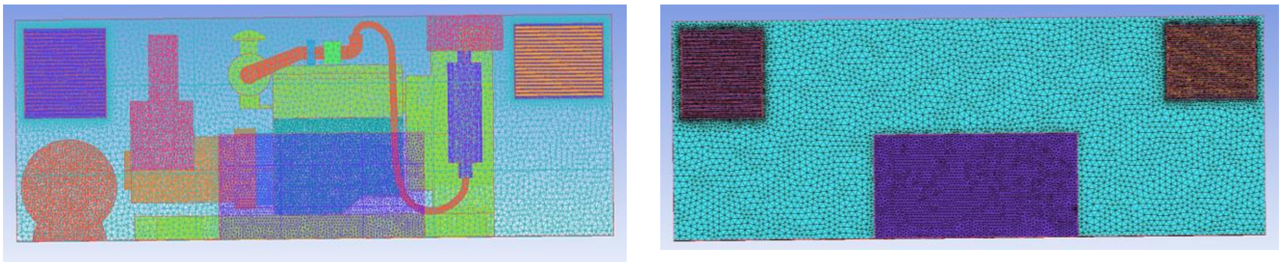


Figure 7. Mesh model of fluid channel

*Boundary Condition Setting*

Due to the complex air flow in the cabin, the air flow in the cabin is regarded as an ideal incompressible turbulent flow. The standard κ-ε two-equation turbulence model is used to simulate the air flow in the cabin. The model algorithm adopts the coupled SIMPLE algorithm of flow and pressure, and activate the energy equation. The ambient temperature is room temperature 300K (26.85 °C), standard atmospheric pressure.

In the calculation model, the air inlet adopts the mass inlet boundary condition flow, including the air volume required for diesel engine combustion and diesel generator set cooling.

The wall boundary condition adopts two boundary conditions of heat flow and temperature, diesel engines and generators use heat flux boundary conditions, these will be estimated based on the diesel engine heat balance. The temperature boundary conditions are used for the turbocharger, exhaust pipe and muffler, which are obtained by test measurement. The outlet boundary condition adopts the outflow boundary condition, and the outlet is the air inlet of the diesel engine and the air outlet on the rear side of the passenger compartment, and the flow rate is calculated according to the actual outlet flow. Fan boundary conditions are set according to actual parameters, including flow and pressure jumps. The specific settings of boundary conditions are shown in Table 3.

Table 2

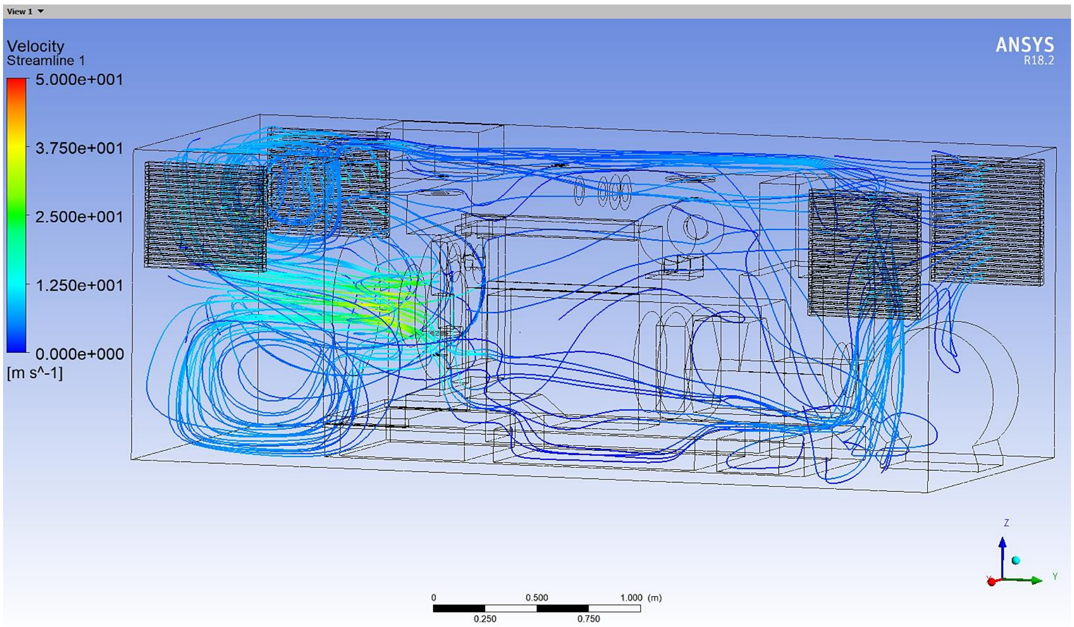
SETTING OF BOUNDARY CONDITIONS

| *Category* | *Condition* |
|---|---|
| Grid | Tetrahedral unstructured mesh, number 4.6 million |
| Inlet Boundary Condition | Mass inlet boundary condition, flow rate 5.1 kg/s |
| wall boundary condition | Cylinder head and cylinder block are heat flux boundaries; turbocharger, exhaust pipe and muffler are temperature surface boundaries; 695°C before vortex, 527°C after vortex; coolant heat dissipation 92Kw, intake intercooling heat dissipation 39 kw |
| Exit Boundary Condition | The flow rates of the diesel engine air intake and the rear side exhaust of the cabin are 0.06 and 0.94 respectively |
| Fan Boundary Conditions | Air volume 3.7 $m^3$/s; pressure jump 797 Pa |

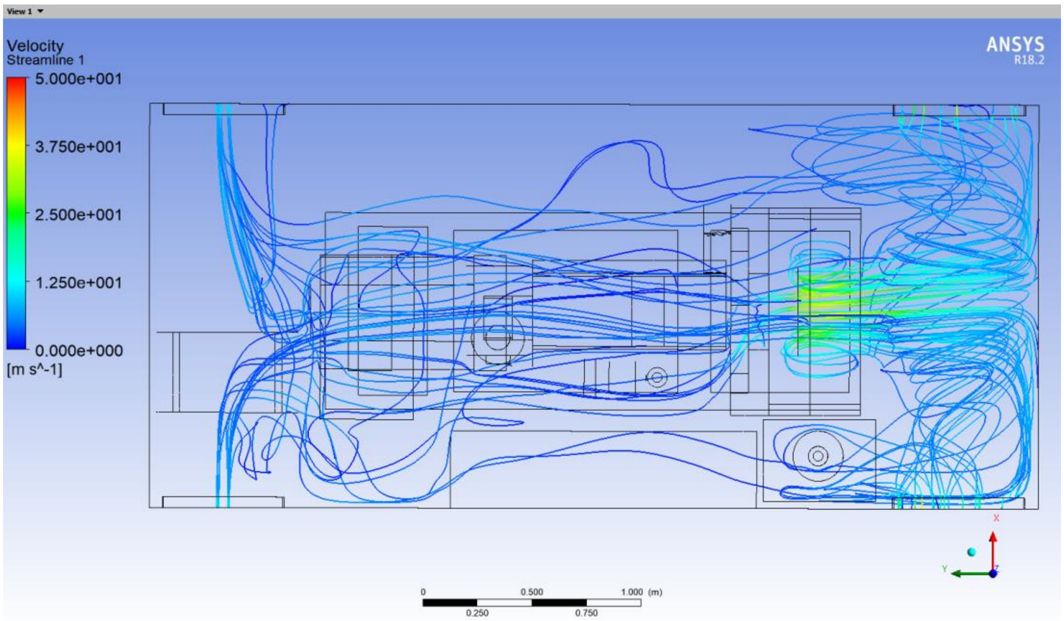
Т. 8. №7. 2022
https://doi.org/10.33619/2414-2948/80

*Analysis of Flow Field and Temperature Field*

Figure 8 is the air flow trajectory diagram, Figure 9 is the air flow field diagram, and Figure 10 is the temperature distribution diagram. It can be seen from the air flow trajectory diagram that the air flow trajectory in the cabin is relatively regular. When the airflow enters the cabin through the air intake louver, a small part of the airflow enters the diesel engine through the diesel engine intake, and most of the airflow flows along the surface of the generator set. Another part flows from the bottom of the generator. After the air flow cools the generator set, when close to the radiator, Due to the suction effect of the radiator fan, the airflow accelerates, flows through the radiator fan into the rear of the cabin, and flows out through the louver exhaust port. The air velocity inside the cabin is 5–15 m/s, and the speed in the center of the fan can reach more than 30 m/s.

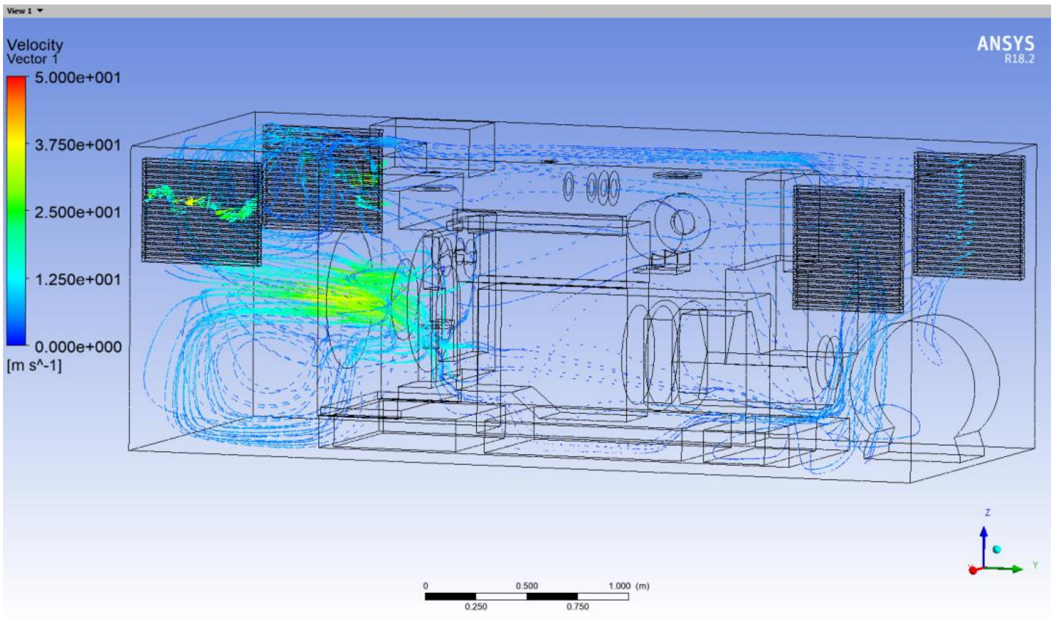



(a) Front view

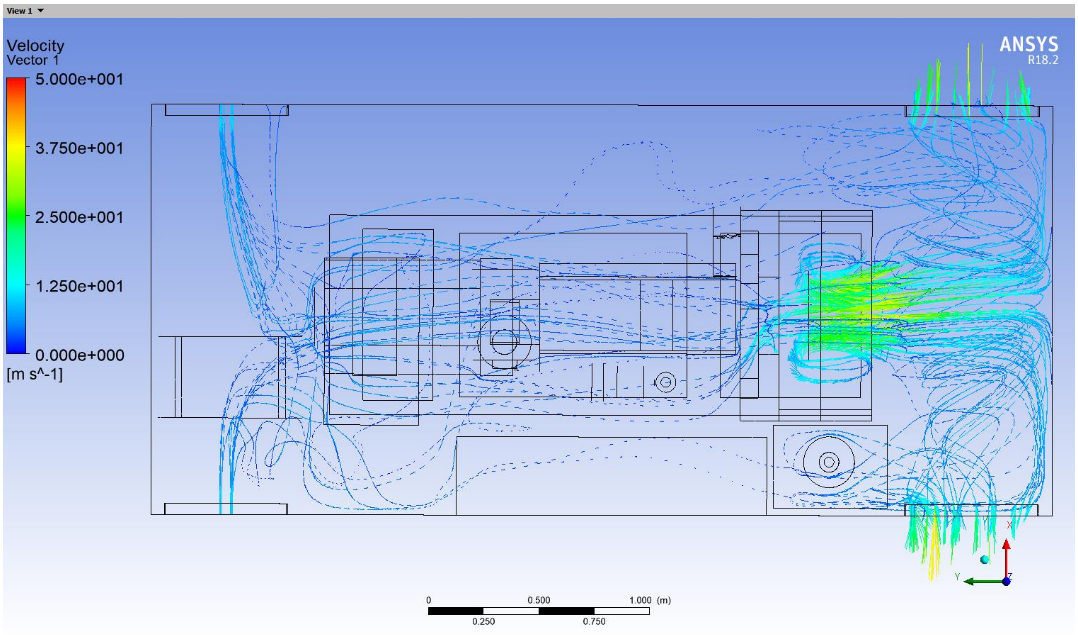



(b) Top view

Figure 8. Trajectory diagram of air flow in the cabin



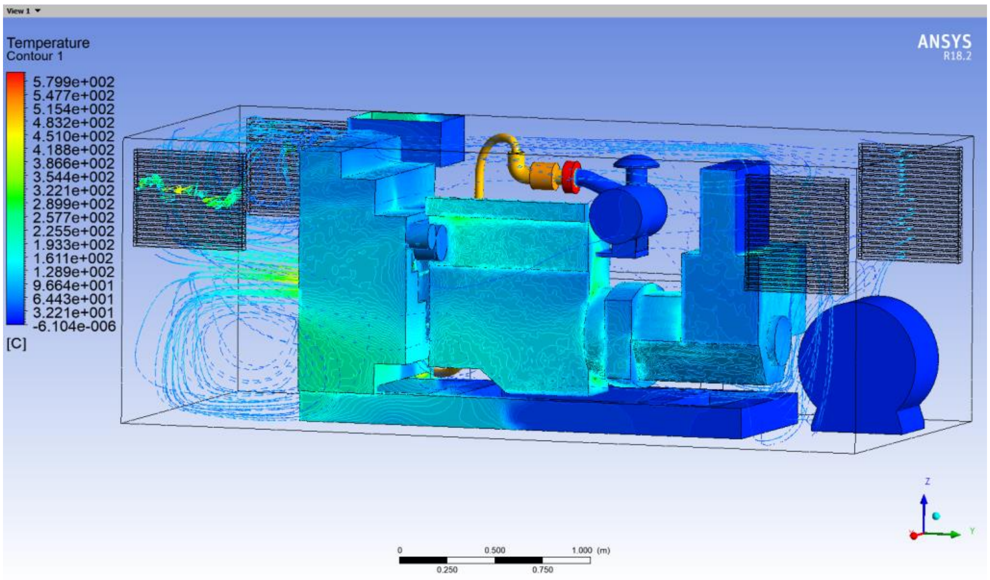

(a) Front view



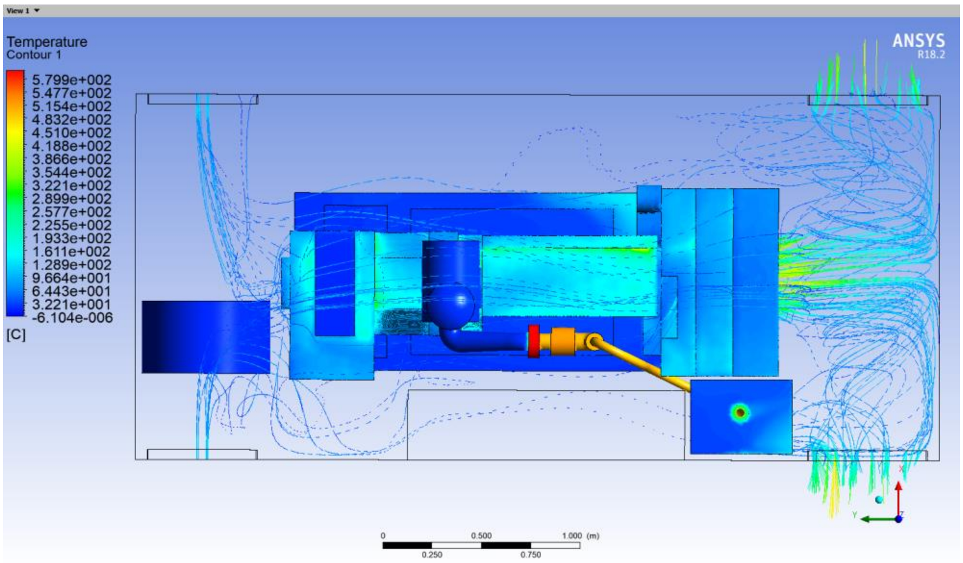

(b) Top view

Figure 7. Air flow field in the cabin

From the simulation analysis results of the temperature field, when the ambient temperature is 300 °K, the surface temperature of the unit in the cabin is within the allowable operating temperature range. Among them, the higher temperature areas are mainly distributed near the turbocharger, exhaust pipe and muffler. The temperature before vortexing is about 680 °C, and the temperature after vortexing is about 515 °C.The surface of the generator set and the surface of the diesel set are significantly affected by airflow ventilation and heat dissipation. The average temperature is below 80°C, the temperature near the cylinder head is slightly higher, and the local temperature will be about 10 °C higher. Figure 11 is the cloud map of the surface temperature distribution of the generator set.




(a) Front view




(b) Top view

Figure10. Temperature distribution in the cabin

*Conclusion*

Aiming at the ventilation and heat dissipation problems in the cabin of the trailer power station, numerical simulation and analysis of the air flow field and temperature field in the cabin of the trailer power station are carried out to verify whether the ventilation and heat dissipation requirements are met, and the following conclusions are obtained:

1. The simulation of the heat dissipation of the trailer power station cabin was successfully completed by using CFD software. The flow field and temperature field in the cabin are obtained, and the position of the highest temperature in the cabin can be determined quantitatively, which

provides a useful reference for the design of the cabin structure of the trailer power station and the arrangement of the equipment in the vehicle.

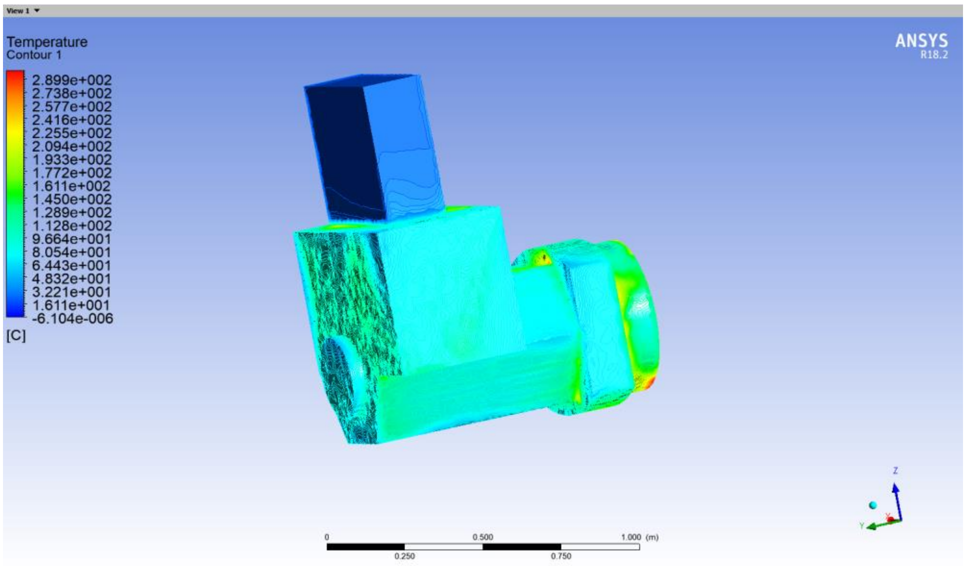



Figure 8. Generator surface temperature distribution map

2. The flow field in the cabin reflects the distribution and flow of air in the cabin, and the temperature field reflects the heat dissipation of the equipment in the cabin. Combining the air flow field and temperature field, the heat dissipation problems of the trailer power station can be found, and then the ventilation and heat dissipation structure is improved by designing an axial flow fan on the rear wall of the unit cabin to improve the effect of ventilation and heat dissipation.

3. The simulation results are in good agreement with the experimental results, indicating that the selected Realizable k-ε turbulence model can more accurately simulate the air flow field in the cabin of the trailer power station, It also shows that the model simplification method used in the calculation and the setting of analytical conditions are reasonable.

*References:*

1. Rui, T., & Ruisheng, W. (2012). On High-low Temperature test method of a certain type of military Power Van. *Equipment Environ Eng*, *1*, 102-104.

2. Wang, X. F., Gu, J., & Qian, Z. (2011). Application analysis on emergency power vehicle. *East China Electric Power*, *39*, 2135-2137.

3. Xiao, Honglin, Li, Hongliang, & Wang, Yuan, et al. (2011). An Investigation into the Numerical Simulation of Flow Field in Passenger Compartment. *Automotive Engineering, 33*(1), 31-37.

4. Xiayi, Y., Zhengqi, G. U., & Yi, Y. A. (2009). Numerical simulation on vehicle underhood cooling. *Automotive Engineering*, *31*(9), 843-844.

5. Xiao, Honglin, Guo, Mingming, Li, Hongliang (2011). A Numerical Simulation Study on the Heat Dissipation Characteristics of Power Battery Pack in Electric Vehicles. *Automotive Engineering, 33*(11). 999-1002.

6. Zhang, Kun, Wang, Yuzhang, & Yang, Xiaoyu (2011). Improving Underhood Cooling Performance by Using CFD Technique. *Automotive Engineering, 33*(4), 314-317.

7. Song, Sihong, Sheng, Weidong, Gao, Kai, et al. (20040. Finite Element Analysis of the Flow Field of the Military Communication Generator Set Cabin. *Electro-Optic Technology Application, 19*(2), 57-60.

8. Ma, Xiaowei, Sheng, Weidong, & Xu, Jiafeng, et al. (2007). Numerical Simulation and Optimized Design for Inner Temperature Field of Trailer Electric Power Plant. *Movable Power Station & Vehicle,* (4), 14-16.

9. Song, Sihong, Sheng, Weidong, & Wang, Jianli, et al. (2005). Numerical Simulation of Ventilation and Heat Dispersion of the Cabin for Military Communication Generator Set. *Computer Simulation, 22*(4), 120-123.

10. Ren, Chengqin, Cai, Dehong, & Liu, Jingping, et al. (2012). Experimental and Numerical Study of the Cooling Performance of Automobile Engine Cabin. *Journal of Hunan University (Natural Science), 39*(4), 314-317.

11. Jarrett, A, & Kim, I Y. (2011). Design Optimization of Electric Vehicle Battery Cooling Plates for Thermal Performance. *Journal of Power Sources, 196*(23), 10359-10368.

12. Ghosh, D., Maguire, P. D., & Zhu, D. X. (2009). Design and CFD Simulation of a Battery Module for a Hybrid Electric Vehicle Battery Pack. *SAE Paper,* 1, 1386.

13. Park, S., & Jung, D. (2013). Battery Cell Arrangement and Heat Transfer Fluid Effects on the Parasitic Power Consumption and the Cell Temperature Distribution in a Hybrid Electric Vehicle. *Journal of Power Sources, 227*(4), 191-198.

14. Wang, Xiancheng, Suo, Wenchao, & Zhang, Gengyun (2007). Numerical Simulation of Airflow Field and Structure Improvement in Engine Compartment of Armored Vehicles with Electric Transmission. *Acta Armamentarii, 28*(6), 744-748.

15. Jian, Qifei, Wang, Qiang, & Chen, Huiping (2007). 3-D Flow Field Analysis and Numerical Simulation in Fuel Cell Air Inlet Manifold. *Chinese Journal of Power Sources, 31*(1), 64-68.

16. Cai, Dehong (2012). Cooling Performance Research of Automotive Engine Cabin Based on Coupled Model. Changsha: Hunan University.

17. Liu, Zhenjun, Lin, Guofa, & Qin, Datong, et al. (2012). Study on the Temperature Field of Lithium-ion Battery Pack in an Electric Vehicle and Its Structural Optimization. *Automotive Engineering, 34*(1), 80-84.

*Список литературы:*

1. Rui T., Ruisheng W. On High-low Temperature test method of a certain type of military Power Van // Equipment Environ Eng. 2012. V. 1. P. 102-104.

2. Wang X. F., Gu J., Qian Z. Application analysis on emergency power vehicle // East China Electric Power. 2011. V. 39. P. 2135-2137.

3. Xiao Honglin, Li Hongliang, Wang Yuan, et al. An Investigation into the Numerical Simulation of Flow Field in Passenger Compartment // Automotive Engineering. 2011. V. 33. №1. P. 31-37.

4. Xiayi Y. et al. Numerical simulation on vehicle underhood cooling // Automotive Engineering. 2009. V. 31. №9. P. 843-844.

5. Xiao Honglin, Guo Mingming, Li Hongliang. A Numerical Simulation Study on the Heat Dissipation Characteristics of Power Battery Pack in Electric Vehicles // Automotive Engineering. 2011. V. 33. №11. P. 999-1002.

6. Zhang Kun, Wang Yuzhang, Yang Xiaoyu. Improving Underhood Cooling Performance by Using CFD Technique // Automotive Engineering. 2011. V. 33. №4. P. 314-317.

7. Song Sihong, Sheng Weidong, Gao Kai, et al. Finite Element Analysis of the Flow Field of the Military Communication Generator Set Cabin // Electro-Optic Technology Application. 2004. V. 19. №2. P. 57-60.

8. Ma Xiaowei, Sheng Weidong, Xu Jiafeng, et al. Numerical Simulation and Optimized Design for Inner Temperature Field of Trailer Electric Power Plant // Movable Power Station & Vehicle. 2007. №4. P. 14-16.

9. Song Sihong, Sheng Weidong, Wang Jianli, et al. Numerical Simulation of Ventilation and Heat Dispersion of the Cabin for Military Communication Generator Set // Computer Simulation. 2005. V. 22 №4. P. 120-123.

10. Ren Chengqin, Cai Dehong, Liu Jingping, et al. Experimental and Numerical Study of the Cooling Performance of Automobile Engine Cabin // Journal of Hunan University (Natural Science). 2012. V. 39. №4. P. 314-317.

11. Jarrett A., Kim I. Y. Design Optimization of Electric Vehicle Battery Cooling Plates for Thermal Performance // Journal of Power Sources. 2011. V. 196. №23. P. 10359-10368.

12. Ghosh D., Maguire P. D., Zhu D. X., Design and CFD Simulation of a Battery Module for a Hybrid Electric Vehicle Battery Pack // SAE Paper. 2009. №1 P. 1386.

13. Park S, Jung D. Battery Cell Arrangement and Heat Transfer Fluid Effects on the Parasitic Power Consumption and the Cell Temperature Distribution in a Hybrid Electric Vehicle // Journal of Power Sources. 2013. V. 227. №4. P. 191-198.

14. Wang Xiancheng, Suo Wenchao, Zhang Gengyun. Numerical Simulation of Airflow Field and Structure Improvement in Engine Compartment of Armored Vehicles with Electric Transmission // Acta Armamentarii. 2007. V. 28. №6. P. 744-748.

15. Jian Qifei, Wang Qiang, Chen Huiping. 3-D Flow Field Analysis and Numerical Simulation in Fuel Cell Air Inlet Manifold // Chinese Journal of Power Sources. 2007. V. 31. №1. P. 64-68.

16. Cai Dehong. Cooling Performance Research of Automotive Engine Cabin Based on Coupled Model. Changsha: Hunan University, 2012.

17. Liu Zhenjun, Lin Guofa, Qin Datong, et al. Study on the Temperature Field of Lithium-ion Battery Pack in an Electric Vehicle and Its Structural Optimization // Automotive Engineering. 2012. V. 34. №1. P. 80-84.

*Работа поступила в редакцию 25.05.2022 г.*

*Принята к публикации 30.05.2022 г.*

---

*Ссылка для цитирования:*

Liu Fangzhou Research on Ventilation and Heat Dissipation Performance of Trailer Power Station // Бюллетень науки и практики. 2022. Т. 8. №7. С. 364-376. https://doi.org/10.33619/2414-2948/80/33

*Cite as (APA):*

Liu, Fangzhou (2022). Research on Ventilation and Heat Dissipation Performance of Trailer Power Station. *Bulletin of Science and Practice, 8*(7), 364-376. https://doi.org/10.33619/2414-2948/80/33