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Rice Harvesting Equipment Technology in Automobile Brake System

Lijun Lin

Zhongkai University of Agriculture and Engineering, Guangzhou, China

linlijun@zhku.edu.cn

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Abstract: China is a big auto country, and timely and effective braking is especially important. In rice harvesting equipment technology (taking small rice harvester as an example), because the rice harvesting equipment often has large volume, weight under full load condition, the rice harvest in the process of frequent change of turning to wait for a characteristic, so the requirement for rice harvesting equipment braking performance is very high, many of which brake technology can be reference to the automobile brake system. The purpose of this article is to solve the existing problems of automobile brake system, and strive to create a more efficient braking system, with multiple disk brake in rice harvesting equipment, air pressure brake, hydraulic brake technology as the foundation, the automobile braking system on the improvement design, for every car brake system after improvement the strict investigation and inspection, and expand the study of the experiment. Research results show that the design of the automobile braking system based on the technology of rice harvesting equipment performance is better, and when using this modified car brake system, automobile brake time shortened by 20%, the wastage of the automobile brake pad was reduced by 25%, the body in the process of braking stability increased by 31%, to prove the feasibility of the modified brake system.

1. Introduction

In recent years, automobiles have shown a trend toward multifunctional development. In this case, the braking system plays an important role in ensuring personal safety as an important part of the vehicle. Therefore, there is an increasing demand for vehicle braking systems and the research and improvement of its performance is endless. However, previous work on the braking system of construction vehicles has focused on relying on a single conventional braking system, namely brake, to complete the deceleration and braking of the vehicle. In fact, under long-term working and transportation conditions, the frequent braking of vehicles will cause the following problems:

frequent use of brakes will lead to increased temperature, accelerated wear, reduced braking performance and increased braking of construction vehicles. If the driving condition is not good and no emergency braking is required, frequent starting and stopping will waste energy. Since the driver repeatedly switches between the accelerator pedal and the brake pedal will cause driver fatigue, the reform and upgrade of the automobile brake system has tended to trend.

The brake in the rice harvesting equipment is a mechanical device that stops or slows down the moving machinery. In order to reduce the applied force, the brakes are mostly installed on the high-speed shaft of the machine, but the heavy machinery with high safety requirements (such as small rice harvesters) are installed on the low-speed shaft close to the working part of the mechanical device [1]. The braking system plays a vital role in the safety of high-speed heavy-duty mechanical equipment. With the gradual increase in the quality and speed of construction machinery equipment brakes, multi-disk drum mechanical brakes first appeared, and then caliper disc mechanical brakes gradually appeared. In recent years, multi-disk disc brakes have been widely used in heavy loads In the field of construction machinery, compared with other brake types using caliper discs, the brakes have stable performance, wear resistance, good heat dissipation, friction plate brake temperature levels drop significantly, and long service life, under the same mechanical radial resistance size By changing the number of different friction plates and plates, mechanical braking forces of different resistances can be directly obtained, which is easy to design and realize industrial standardization and serialization. Therefore, more and more highway heavy-duty construction machinery equipment chooses to use multi-disc disc brakes [2]. In order to enable the multi-disc pressurized brake machine to be able to better adapt to the use conditions of complex working conditions such as heavy weight, high speed, harsh environment, etc., the multi-disc pressurized brake blade pressure and temperature field change analysis, friction plate The analysis and research of the pressure distribution of the whole machine, optimizing the pressure of the multi-disk marble groove and increasing the efficiency of the multi-disk marble groove pressure braking have gradually become an important research focus of industry researchers and large automobile manufacturing companies [3].

This article aims to discuss the performance and role of rice harvesting equipment technology in automotive braking systems. Among them, Yi gave a detailed introduction to the braking principle of the multi-disk braking technology in rice harvesting equipment, analyzed the current problems in the multi-disk braking system, and expounded the research methods and related technologies of the multi-disk braking system [4]. In his article, Demic proposed that the sensor control technology used in rice harvesting equipment has a crucial role in improving the performance of automobile braking systems, and introduced the research significance and research status of sensor control technology, and explained the sensor control technology for improving the sensitivity of the automobile brake system is of great help. Compared with the traditional brake system, the braking effect has been significantly improved [5]. Kaimal explained in detail the working principle of the hydraulic transmission braking system, and pointed out that a significant advantage of the hydraulic transmission is good controllability. With the help of hydraulic components and various circuits, it is easy to realize hydraulic feedback control, thereby reducing the automobile the time it takes to move [6]. Ravi proposed that rice harvesting equipment technology can be perfectly integrated into the automobile braking system, so that the braking performance of the automobile can be greatly improved. This combined technology should be encouraged and actively promoted [7].

The main research content of this article is the specific effect of the technology used in the automobile brake rice harvesting equipment. Different from previous researchers, this paper has designed a new braking system based on the previous research results. Many innovations: The computer outputs the ideal control target command through the computer operation for the first time, so that the vehicle can achieve the effect of automatic braking in the entire working range. In order

to design a new braking system, this paper takes the lead in establishing a detailed finite element model of the vehicle gearbox housing and analyzing its load and structural characteristics. For the first time, the method of mutual verification of simulation and experiment can be used to obtain the pressure distribution trend more accurately, which provides accurate theoretical and experimental basis for improving the service life of multi-disc brakes.

2. Theoretical Basis

2.1. Related Technology of Rice Harvesting Equipment

The braking system of the small rice harvester directly affects the performance and driving safety of the harvester. Tire self-propelled rice combine harvesters generally use front wheel hydraulic caliper disc brakes to achieve vehicle braking. The braking system has low braking efficiency (ie, long braking time and long braking distance), and poor reliability [8]. Especially when driving on roads with poor road conditions, reversing in field work, and emergency braking when turning, it is impossible to stop quickly, which is easy to cause accidents; sometimes, the driver must use the parking brake to help rapid parking. It is very inconvenient to brake with both hands and feet. The brake system of the rice combine harvester is mainly composed of a brake pump, a brake cylinder, an oil injection cup and a connecting pipeline. The braking system is an important part of the combine harvester, and its working state directly affects the performance and driving safety of the harvester. The brake system works by the hydraulic pressure generated by the human foot. When the pedal is stepped on, the plunger will move and compress the spring under the action of the pedal lever; at the same time, the plate valve closes the plate width assembly under the action of the tower spring. The chamber and the lower chamber are isolated: the plunger continues to move to the right, and the working chamber generates hydraulic pressure, thereby exerting a braking effect [9].

The various hydraulic power transmission and braking devices of the rice hydraulic harvester in the process of equipment production technology are also very important components. Because the product has large hydraulic output power, small size, light weight, flexible and convenient installation, stable work, and can work Convenient and automatic realization of stepless automatic speed regulation, simple operation, convenient for manual operation automation and many other advantages are widely used in the hydraulic brake monitoring system of rice harvesters, and agricultural machinery is also widely used in hydraulic transmission technology [10]. The use of three-axis hydraulic transmission technology on the new agricultural machinery helps to effectively improve the transmission performance of agricultural machinery units and improve production efficiency. It has strong adaptability, and the quality and safety during operation meet the technical requirements of industrial agronomy. At the same time, the operation of agricultural machinery is labor-saving and convenient [11]. In the hydraulic power transmission device, the automatic independent hydraulic drive deceleration method of the motor wheel side completely eliminates the automatic deceleration of the automatic gearbox, differential, etc. at the drive axle and even the car wheel side, which improves the efficiency of hydraulic transmission, reduces the labor cost of mechanical equipment, and facilitates The mechanical components are reasonably arranged, installed, and designed with a large degree of freedom. In most applications, the braking stability of the traveling vehicle can be increased, the adhesion of the vehicle can be improved, the gap between the vehicle and the ground can be increased, and the braking lubrication effect can be greatly improved at the same time. Therefore, it can be considered to simplify the mechanism that uses mechanical power brakes. It will be considered very necessary for brake vehicles that are inconvenient to use other mechanical power brakes or have special requirements for the performance of mechanical brake mechanisms due to mechanical structure limitations. .

Multi-disc brakes can also be widely used in the brake management system in corn and rice seeding and harvesting production equipment. The multi-disc mechanical brake is mainly a mechanical brake device used to stop or accelerate the mechanical acceleration of the automobile in motion. In order to effectively reduce the pressure applied by the main shaft, most of the brakes are installed on the high-speed brake shafts of heavy machinery, but some heavy machinery that requires high brake safety performance (for example, large heavy-duty brake elevators, mine brakes) Hoist, etc.), it needs to be installed on the low-speed brake shaft that is relatively close to the main working part of the heavy mechanical brake device [12]. With the gradual increase in the quality and speed of the construction machinery equipment brakes, first, multi-disk drum mechanical brakes appeared, and then multi-disk mechanical brakes gradually appeared, and in recent years, multi-disk brakes have been widely used in various In the field of construction machinery, compared with other types of ring caliper disc brakes, the brakes have stable performance, wear resistance, good heat dissipation, friction plate brake temperature levels drop significantly, and long service life. Under the same mechanical radial motion size, by changing the number of different friction plates and plates, mechanical braking forces of different resistances can be directly obtained, and it is easy to automatically realize the standardization and serialization of machinery. Multiple disc brakes are required. However, the multi-disc friction brake itself still has deficiencies, such as its greater wear in the friction lining. Due to the uneven pressure distribution in the friction lining during the replacement of the multi-disc brake, the automatic replacement of the multi-disc friction lining the frequency is relatively high, and the service life of the braking device and the whole machine is low. In order to make the function of the multi-disc mechanical brake better suitable for rice production machines and harvesters that are suitable for heavy loads and high speeds, the temperature field motion analysis, friction plate position and friction plate of the multi-disc mechanical brake installed in the whole machine The technical research on the distribution of pressure motion is particularly important.

2.2. Components and Working Principle of Traditional Automobile Braking System

The car slope braking monitoring system is mainly used to prevent a car from temporarily decelerating or stopping downhill during forced uphill driving, to keep the maximum speed of a car during downhill driving basically stable, and to force The braking of a car stopping downhill on the in-situ slope includes a control mechanism that can stay or not move on a slope. With the rapid construction and development of highways in China, the continuous increase of road speeds and the increasing density of road traffic flow, in order to effectively ensure the safety of road traffic, the safety workability and reliability of the control power system of automobiles also become increasingly important. Only with a good braking system performance, a brake monitoring system and a reliable working electric car can it be able to give full play to other power control performance. The brake system is a mechanical actuator used in the traditional system of automobile front wheel braking to control the directional movement of the vehicle or control the trend of the movement direction by generating power obstruction. The main types of brakes include brake friction type, hydraulic type and brake electromagnetic type. Friction type rotary brakes can be divided into three categories: friction drum type and rotary disc type according to the structure and shape of their internal rotary brake elements. The two rotating brake elements in each friction pair element of the drum type brake are a drum brake disc and a drum, where the surface of the friction pair is generally a cylindrical surface and each rotary brake of the disc type brake The element is a disc-shaped disc brake disc with a friction pair surface mainly composed of a cylindrical end surface.

Any traditional system of medium braking should have the following four basic components: the

energy supply device is introduced one by one including the energy supply, the energy required to adjust the medium braking system, and the traditional energy supplier and medium system for improving braking Various important components in the dynamic state. Among them, the main part that produces the energy of automobile braking cycle is also called automobile braking regenerative energy. The control brake device contains various main components that specifically produce the action of the deceleration brake and can control the effect of the deceleration brake, and the transmission device contains various main components including the energy information transmission system from the brake to the deceleration brake. Components, brakes-various components that can block the driving force of the braking vehicle or control the direction of the movement of the friction force to stop the driving force, which also includes the various retarding systems used in the auxiliary deceleration brake system. The more complete pressure brake system also has various additional brake devices such as braking force and power speed adjustment control devices, pressure alarm devices, pressure brake protection devices and so on. Under the influence of extremely high temperature conditions, brake pads and brake drums are more prone to extremely complex brake deformations, which are prone to directly cause automobile brake performance degradation and brake chattering, etc., which cause the automobile brake system efficiency to decline significantly. In addition, after continuous use of the drum brake for a long period of time, it is necessary to periodically readjust the internal gap of the brake shoe, and it is even necessary to remove the entire drum brake drum and clean up and remove a large amount of brake powder accumulated.

The disc car brake chassis system may be a type of large car disc brake chassis system that is called a lot. As the name implies, it is named because of the shape of its chassis. It is controlled by various hydraulic brakes. The main brake components include hydraulic brake disc, cylinder, brake caliper, tubing, etc. The brake disc is made of aluminum-magnesium alloy stainless steel welded and fixed firmly on the brake wheel, which rotates with the brake wheel at high speed. The pump needs to be fixed on a bottom plate bracket of a brake to make it stationary. The two pressure friction plates on the brake caliper are pressed against the two sides of the two brake discs respectively, and the brake piston of the cylinder pump must bear the certain hydraulic pressure brought by the centrifugal oil pipe or the delivery pump pushes the two friction plates against the brake disc to break the friction that occurs. It looks like it is clamped by a pliers or pliers during the action. A brake disc during rotation is forced to stop temporarily. Disc air brake has the advantages of fast heat dissipation, light weight, simple structure, and easy adjustment. Some people still have the air brake disc on the disc air brake. Do not open many large small holes in order to accelerate the heat dissipation of the air vent fan and thereby improve the efficiency of the disc brake. The main test research objects of this high-speed brake application test bed are a drum-type high-speed brake and a disc-type The high-speed brake plays a high-speed brake assist role for both cars, and the various external forces related to direct contact with the brakes of other cars can only be obtained directly by braking other objects connected to or in contact with other cars. The main force is to break the object. The corresponding wheels on the ground will also exert a backward inertial reaction force, which is the power produced by the ground. The power for ground cooling is automatically transmitted through a wheel to the axle or wheel suspension. For the electric frame and the entire body, the entire electric vehicle body is forced to generate a certain amount of automatic deceleration and speed pressure to achieve automatic deceleration of the entire vehicle.

3. Experimental Arrangement

3.1. Experiment Apparatus

This article uses the virtual prototype technology to design a brand-new brake system based on

the multi-disc brake technology, hydraulic transmission brake technology, and pneumatic brake technology in the rice harvesting technology. In order to verify this new the braking effect of the braking system is studied in this paper with a small car equipped with this new technology as an experimental object. Experimental equipment: This experimental operating instrument adopts a powerful portable integrated instrument, produced by Deveron, which integrates computer, signal conditioning, A / D conversion, and software, and simultaneously collects and analyzes many different signals. Its own DEW ESoft V7.0 software can be interfaced, variable reluctance type, CYAT5-20 semiconductor strain gauge oil pressure sensor, GMA-70AB type grating angular displacement sensor, torque sensor, strain pattern, Y6D-1 type 2 Setting of test parameters of dynamic strain gauge, MS-68 decelerometer, resolution, sampling period and so on. For the specific experimental requirements of the full hydraulic combined braking system of the mobile mixing station, this experiment uses 38 conventional interfaces of the portable integrated instrument for the signal detection of the pressure sensor, and 2 counting interfaces for the signal detection of the engine speed and speed sensor. The specific settings will not be described in detail. In order to ensure the accuracy of the data and avoid the influence of other factors during the experiment, the measurement point should be as close as possible to the measured component to ensure the accuracy of the experimental data. Based on the analysis of the above-mentioned mobile mixing station combined brake system, for the full hydraulic wet brake system, the inlet and downstream outlet pressure of the filling valve, the accumulator pressure, and the brake pressure need to be measured. For the hydraulic auxiliary brake system, the walking drive needs to be measured. The system pressure of the pump and the servo pressure of the servo variable oil cylinder, meanwhile, use the engine's own speed sensor for speed signal acquisition. The instrument table used in this experiment is shown in Table 1.

Table 1. Instruments used in the experiment

Serial number	Instrument name	Quantity	Remarks
1	Data collector	1	Install software
2	Display	5	220-volt power supply
3	Voltage inverter	2	12VAD-220V AC
4	Data transmission line	Several	5V-40MPa
5	Speed sensor	10	/
6	Wrench	2	Engine

The full hydraulic wet brake system of the small and medium-sized car in the experiment is the dual-circuit brake system of SAFIM, and the brake pump is the gear pump of PEMCO. When the brake system is not in use, the flow rate after the brake pump is filled will be Supply downstream tooling device. The downstream tooling device is composed of three parts: the waterway system, the slewing of the truck and the lifting of the hopper. According to the experimental results, the full-load slewing working pressure is the highest, about 6MPa. Constituent impact, the above analysis shows that the pressure of the downstream working system is lower than the filling pressure of the filling valve, and it will not affect the system in actual work. After completing the arrangement of the test points, the experimental conditions must be reasonably arranged. Under the conditions that the experimental conditions can be met, the layout of the experimental conditions must be as perfect as possible. On the one hand, in order to obtain comprehensive data, on the other hand, the analysis of the system is more complete. The braking experiment of this sample car is mainly carried out on horizontal concrete ground, and it is subdivided according to different braking methods, vehicle status, engine speed, and speed of stepping on the brake pedal.

3.2. Experimental Content

In order to prove the feasibility of the new automobile braking system (tentatively called "new brake") designed in this paper, experiments are needed to provide test basis. This article mainly studies the pressure distribution of the new brake on the external tooth friction plate during braking. This chapter needs to use the pressure distribution test method to prove the correctness and accuracy of the above pressure distribution simulation, and provide experiments for the pressure distribution simulation of the external tooth friction plate accordingly. This test method can not only provide the test basis and test method for the simulation study in this paper, but also provide the test basis for other studies of new brakes, such as the temperature field study and research of multi-disc brakes. The sealing performance of the disc brake and the research on the new brake support structure can provide test methods and theoretical basis for the research of other sheet components. The test device shall be composed of power mechanical system, control system, data acquisition and processing system, etc. In the performance test, the test piece should be tested under conditions that do not cause surface burnout. When the contact area reaches 80% of the surface area, the standard for testing the contact area is reached. The standard of the measuring point on the test piece is to measure the thickness of the measuring point with a micrometer, accurate to 0.001mm.

The new brake pressure distribution test in this paper is mainly divided into four steps: the proposed test method, the feasibility analysis of the test method, the external tooth friction plate calibration test, and the external tooth friction plate pressure distribution test. Through the research of the existing experimental methods, three test methods are proposed. These three special test methods can be used for sliding tests on three thin-film sliding parts at the same time; we use the three special test methods we proposed Simultaneous analysis of sliding simulation on a small test ring, comprehensive analysis of the performance advantages and disadvantages of the three test methods by measuring the four test parameters of axial sliding strain, radial sliding strain, total axial strain, and measuring the voltage of the contact surface; At the same time, through the small test ring test on the three test benches at the same time, the comprehensive analysis of the test data of the three special test office method programs is carried out, and a special test method program that can be closer to the loading of real components is obtained, and the internal or external teeth are determined. The test method scheme of the pressure calibration distribution diagram of the sliding friction plate component; at the same time, this special test method scheme can be used to perform the pressure calibration loading test of the external or internal tooth sliding friction plate component, and the test data is compared with the simulation data to prove the above simulation The analysis method is correct. The test is carried out with a small test ring when determining the test method, mainly to achieve high efficiency and speed when determining the test method, and it is more convenient and simple to drill holes on the small test ring, and it can also be more simplified when performing the test. Friction elements are mostly used in brake pads of small cars, brakes of machine tools and motors, clutch linings, etc. The most common form of failure in practical applications is that the inner ring belt wears seriously and the whole machine cannot be used normally. The pressure distribution test method is used to obtain the distribution of the contact pressure of the friction pair under different working conditions. The extracted test data provides test support for the pressure boundary conditions of the friction element, making the contact pressure of the friction pair a controllable factor, and recording the experimental data.

3.3. Experiment Related Data

In the experiment, we will use some small cars as experimental targets and observe the braking effect of the new braking system. In the vehicle energy consumption test, the vehicle speed must be higher than 50 km / h (GB13594 requires 30 km / h and does not affect the results). Above 0.3, all

brakes can be fully broken within time t. During braking, all wheels are under the control of the new braking system. The detection test is a type 0 test and the braking time is t calculated by the following formula 1.

$$t = \sum_{J+1}^{V-N} \frac{D_{\mathrm{f}}}{D} * I\mathrm{nfo}\ （D_{\mathrm{f}}）+ \sum_{N}^{V} D^2 \tag{1}$$

If and only if the speed of vmax is greater than 160km / h, vmax is taken as 160km / h for calculation. The value of t cannot be greater than 15s, and of course it cannot be greater than 15s. It needs to continue in two stages. The joint test for comprehensive utilization of adhesion generally requires that the strength adhesion utilization factor must be zero or not greater than 0.35 (ewer is 0.3) or 0.8 strength butt test pavement or butt test surface can be carried out, and the high and low strength adhesion utilization factor Do not dock on the road. The maximum running speed of the first test shall not exceed 120km / h. If the adhesion efficiency coefficient does not exceed 0.5, it is an efficient adhesion efficiency coefficient, that is, the coefficient kh≥0.5. The adhesion efficiency coefficient is not necessarily greater than 0.5 times when kh is the inefficient adhesion efficiency coefficient, that is, kh / kl≥2 per time. The design requirements of this kind of docking type pavement: it should control the wheels to cycle from the entire kh type pavement to the entire kl type pavement to maximize the force cycle on the wheel brakes, the new wheels controlled by the new wheel brake circulation system Can no longer be locked, the new wheel brake circulation system can make the system complete cyclic motion work on the entire kh type road surface, when controlling the vehicle to cycle from one type of road surface to another type of road surface at high and low speeds, Calculate the speed when the vehicle is running and the duration of the maximum brake application. When the brake wheels travel continuously from the entire KL high-speed road surface to the entire kh high-speed road surface (the vehicle speed when the wheel enters the entire kh high-speed road surface is about 50km / h), the wheel brakes are continuously applied at the maximum speed force, and the new high-speed brake cycle The brake wheels controlled by the system can no longer be locked. The new high-speed braking cycle system can make the system work continuously on the entire kl high-speed road surface at a complete high-speed cycle. The maximum speed of the braking vehicle is 100km / h at high speed and 20km / h at low speed. From continuous movement of a high-speed road surface to continuous operation of another road surface, calculate the speed of the wheel during operation and the duration of the maximum action of the brake.

Additional high-speed torsional braking road diagonal test: The additional torsional diagonal test is not specifically mentioned in the relevant laboratory requirements, it is only a harsh experiment, and the required conditions are many, which can generally be verified as two at the same time. The multi-channel new emergency brake compensation system is used experimentally, requiring the brake car to travel at high speed on the additional low-level or high-low additional torsional braking road with an adhesion coefficient, that is, the wheels with diagonal lines are at the specified high and low levels Or two low and high adhesion coefficients, high-speed emergency braking at 50km / h speed, the braking vehicle controlled by the new emergency braking compensation system may have to be locked. The technical requirements of the experiment are mainly divided into two main research questions: the research purpose of the specific experiment and how to select the experimental section. The purpose of the experimental research is mainly to clearly verify whether we have locked a wheel and ensure that the vehicle continues to run stably, so we do not need to verify whether the vehicle is driving on the road surface after the car enters the rear section with different speeds attached to the control system Temporarily stop. The main focus of this phase of the experiment is whether the vehicle sees that the wheels have been locked before entering the

pavement of the docking stage and the verification point where the road surface alternately rotates during the docking stage and ensures that the vehicle runs at high speed, so the selection of the docking section As long as it considers the formation of a road section that satisfies the high and low speed adhesion strength coefficient of the stable docking point, the length and other special conditions can also not be considered comprehensively (generally only 2 times the length of a vehicle). Many of the widely studied and widely used and most important content models for expressing richness are the luger model, which refers to the model for determining the friction force based on the characteristics of the fluid physics field; it is based on the physical characteristics of the friction model, expression as shown in formula 2.

$$F(X^{N}) = \frac{\sum_{j=0}^{X} C_{nj}(uj^{i} - u^{i})^{2}}{\sum_{j=0}^{X} C_{nj}(dj^{i})^{2}} \tag{2}$$

Where F is the friction force and the unit are N.

According to the Luger model, it is easy to obtain the relationship between the adhesion coefficients and slip rate of different road surfaces and the adhesion coefficient and slip rate of different speeds. The adhesion coefficient k is determined by the ratio of the maximum braking force Fmax of the non-locking wheels and the corresponding load FN on the brake shaft, so that the maximum braking force value can be obtained.

4. Analysis of Simulation Results

4.1. Analysis of Research Results of Rice Harvesting Equipment Technology in Automobile Brake System

The experimental research in this paper shows that the braking process of the car is that the brake provides the braking force acting on the tire and forms friction with the ground, and the reverse friction force on the ground acts on the car to stop the car from moving. Ground reverse friction is related to braking force and road surface adhesion coefficient. In the braking process of the combine harvester using the front wheel hydraulic caliper disc brake system, the contact force between the brake disc and the friction pad increases with the increase of the pedal force, and the increase trend is basically the same. Under the speed conditions of II and III gears, the left and right brakes have good synchronization. When the pedal force is less than 100N, the response time is less than 0.6S, the braking distance is less than 7.33m, and the maximum braking deceleration is 2.86 / s. The data table of simulation experiment results of rice harvesting equipment technology in the automobile braking system is shown in Table 2.

Table 2. Simulation experiment result data table

Delay time and braking effect	Adjustment times	Dry concrete	Braking frequency
Front wheel(0.15s)	Braking time	1.492	5
Rear wheel(0.15s)	Dead time	10.685	5
Front wheel(0.19s)	Braking distance	1.382/1.563	3
Rear wheel(0.19s)	Wheel torque	1.306/1.487	4

The new brake system combined with rice harvesting technology provides an innovative design that ensures the stability of the brake gearbox structure and saves maintenance costs because the gearbox components are not prone to failure or damage. The steering clutch drive mechanism allows you to walk and break the vehicle quickly and steadily. The brake assembly uses a plurality of partition plates and friction plates that are alternately combined, and cooperate with each other to

provide good braking stability. The power input mechanism realizes stepless speed change and improves the output of the braking system. By comparing and analyzing the simulation results of the virtual prototype with the actual vehicle test results, if the measured pedal force is 95.6N and the simulation value is 100N, the vehicle will break at the second and second speeds. I will. The accuracy of the virtual prototype simulation model provides an effective method for designing and evaluating the performance of automotive professional chassis braking systems. It can be seen from the experiment that the new automobile braking system combined with rice harvesting equipment technology can shorten the braking distance; the specific data is shown in Figure 1.

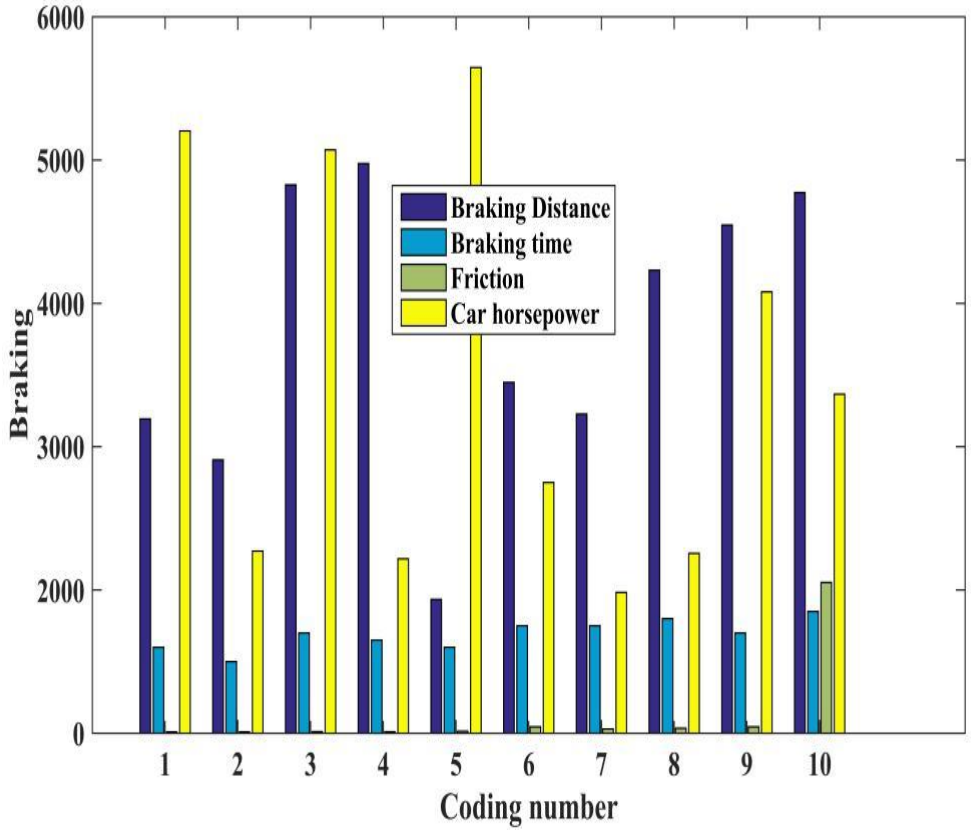

Figure 1. New car braking system can shorten braking distance

From the data in Figure 1, it can be seen that the new car braking system combined with rice harvesting equipment technology can shorten the braking distance, which has been reduced from the original 9.56 meters to 7.28 meters.

From the test point of view, the brake system of the car combined with rice harvesting technology fully meets the requirements of the car brake. When braking with a conventional braking system, a higher braking deceleration can still be issued. From the test curve, it can be seen that all wheels have not locked. When checking anti-lock features on various road surfaces, the brake system of the car combined with rice harvesting technology works well, the car does not deviate from the test track, and the wheels do not lock, which can also be obtained from the test Seen from each test curve. It can be seen from the figure that the change in wheel speed is small, and the speed of the pressure adjustment device is fast, but the basic trend is still the same. The wheel speed drops after being separated from the vehicle speed and then the wheel speed is rising, and the wheel speed is doing cycles. Sexual decline and recovery. Due to the limitation of test conditions, the pressure regulating mechanism could not be measured. The braking acceleration of

the new automobile braking system combined with rice harvesting equipment technology has been improved. The specific effect is shown in Figure 2.

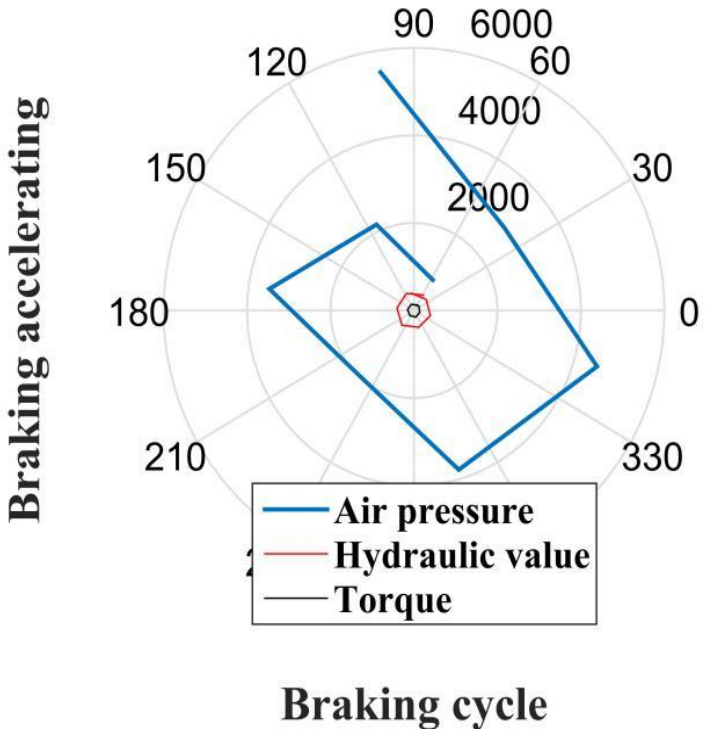

Figure 2. The braking acceleration of the new car brake system has increased

From the data in Figure 2, it can be seen that the maximum braking deceleration of the new automotive brake system combined with rice harvesting equipment technology has increased from 2.14m / s2 to 2.86m / s2.

4.2.Evaluation and Analysis of Application Effect of Rice Harvesting Equipment Technology in Automobile Brake System

The braking performance of an automobile mainly depends on the braking torque of the brake and the attachment conditions of the wheels to the ground. When the ground can provide sufficient adhesion, an appropriate increase in braking force can effectively improve the braking efficiency of the harvester. The rear wheel brake device is added on the basis of the original front wheel brake, so that the service brake system of this model changes from the front wheel brake to the front and rear wheel four-wheel brake, so that the braking force of the whole vehicle can be appropriately increased to achieve The purpose of enhancing braking efficiency and improving braking reliability. The running speed of the rice combine harvester is relatively low, generally not more than 20km / h, and they use wide-section low-pressure tires. The adhesion coefficient is large. Appropriately increasing the braking force will not affect the original braking stability of the harvester. Practice shows that breaking the front wheels while breaking the rear wheels can improve the braking efficiency and reliability of the harvester. Even if the front wheel brake friction disc is stuck with oil, mud and other foreign objects and the braking force decreases and the braking efficiency decreases, the brake system can still play a better braking effect; the study shows that the new technology combined with rice harvesting equipment technology The automobile brake system can reduce the failure rate of the automobile brake system, and improve the safety of safe vehicle driving from the

side, as shown in Figure 3.

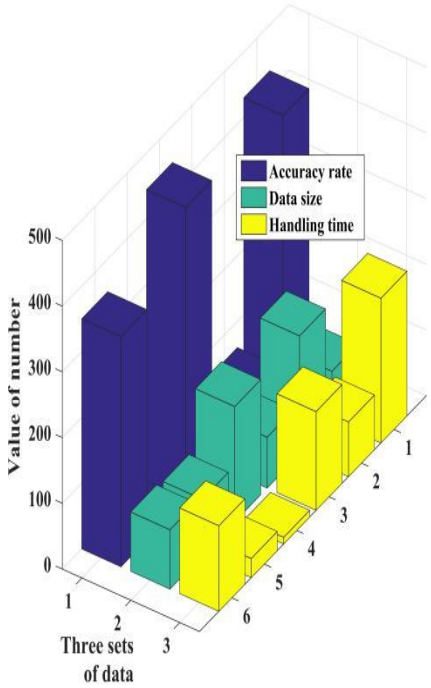

Figure 3. New car brake system can reduce the failure rate of car brake system

As can be seen from the data in Figure 3, the new automotive brake system combined with rice harvesting equipment technology can reduce the failure rate of the automotive brake system, and the failure rate of the automotive brake system can be reduced by 18%.

In this new lateral braking device system that combines the braking technology of modern rice straw harvesting machinery and equipment, a lateral braking setting is adopted for the main clutch shaft and the steering gear main shaft and is also used to introduce the laterally transmitted braking force into the output and turn The gear and the main gear are respectively connected to the middle of the brake clutch shaft and the main shaft of the steering gear and are used to produce lateral rotation at the same time. When high-speed walking is required, the steering drive main gear is combined with the high-speed steering drive gears on both sides, that is, the car can directly achieve high-speed walking; when the car needs to turn at high speed, the high-speed steering drive gear on one side is directly disconnected from the high-speed steering drive The main gear, so that the driving force of the high-speed steering drive main gear will not be directly transmitted to the high-speed steering drive gear on one side, and the other side keeps the continuous output of the driving force because the gear is in the meshing drive state, so that it can Achieve high-speed steering. In order to provide powerful power for alternating braking, the brake start and stop components realize the automatic braking start and stop of the entire system. They also include a brake partition plate with multiple alternating braking combinations and a friction plate. The new car brake system combined with rice harvesting equipment can effectively reduce the brake noise, the effect is shown in Figure 4.

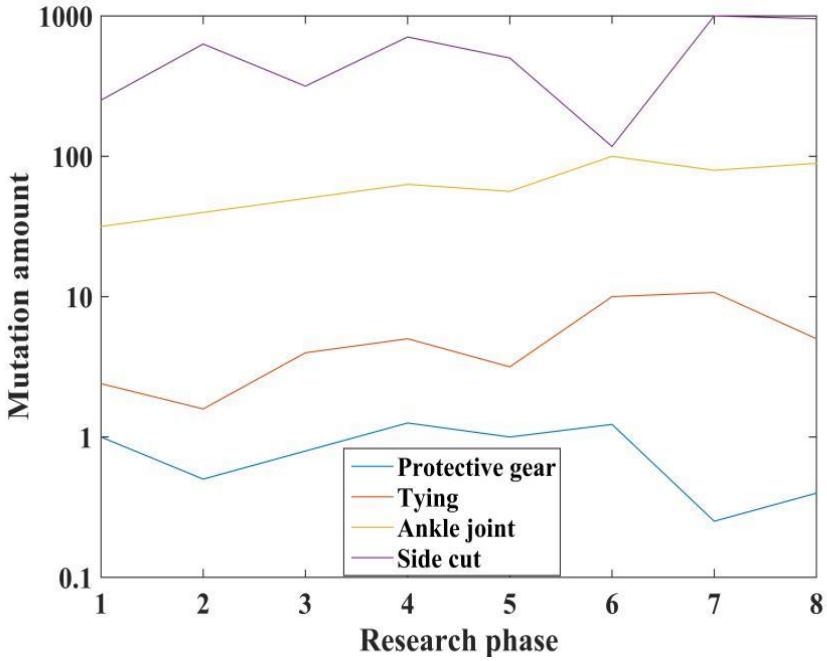

Figure 4. New car brake system can effectively reduce brake noise

It can be seen from Figure 4 that the new automobile braking system combined with rice harvesting equipment can effectively reduce the brake noise and reduce the brake noise by 46%.

5. Conclusion

(1) The braking system of the vehicle is one of the most important components of the vehicle owner. The braking performance of the automobile is determined by the braking system of the automobile. The new automobile braking system combined with rice harvesting equipment can effectively improve the braking performance of the vehicle. Its feasibility has been confirmed by experiments and is worthy of popularization.

(2) The results of the study show that when the car brake system is improved by using rice harvesting equipment technology, the braking time of the car is shortened by 20%, the loss of the brake pad of the car is reduced by 25%, and the stability of the body during the braking process is increased by 31% Proved the feasibility of this improved braking system.

(3) The new car braking system combined with rice harvesting equipment technology can shorten the braking distance. The braking distance is reduced from the original 9.56 meters to 7.28 meters, and the maximum braking deceleration is increased from the original 2.14m / s2 to 2.86m / s2. It can reduce the failure rate of the automobile brake system. The failure rate of the automobile brake system can be reduced by 18%, which can effectively reduce the brake noise and reduce the brake noise by 46%.

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Data Availability

Data sharing is not applicable to this article as no new data were created or analysed in this study.

Conflict of Interest

The author states that this article has no conflict of interest.

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