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Research Article

Analysis of Crop Production Machinery with Controllable Cross Section

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Abstract: In this study, we have a analysis of crop production machinery with controllable cross section. The exhaust gas flow rate can increase the speed of the turbine. The way to change the exhaust gas flow rate is to control the amount of air inlet by changing the position of the blade swing angle. In this way the direction of the intake air changes as the blade swing angle changes. Another method to achieve this is to increase the air velocity into the turbine by changing the size of the turbine nozzle vent. The control of air velocity using this method relies on the vent itself to adjust the size of intake vent, which allows constant flow direction controlled by the blade. The controlled section exhaust food production machinery sensor would solve the problem of low speed and low boosting power of low condition exhaust gas food production turbocharger. It controls the size of the intake end of the turbine nozzle vent and the velocity of exhaust gas to adjust the speed of turbine accordingly, which further increases the boost level.

Keywords: Air flow direction, air velocity, controlled cross section, exhaust gas food production machinery

INTRODUCTION

Supercharger technology has been widely adopted in the diesel engine because it has many advantages such as energy conservation, improve power and reduction of exhaust emissions. Practice has proved that the use of the effect is obvious and the development goes faster and faster. Supercharging the value required from the development trend of higher and higher. The biggest supercharging has reached 3. 0 MPa, which makes a serious additional mechanical and thermal loads, low operating conditions and transient characteristics of the engine performance deterioration and other issues. Therefore, the proposed requirements for pressurized systems is a good all-conditions performance. In order to meet the different needs of the engine speed. Variable supercharging food production machinery is appeared in1989. Variable food production machinery can increase the flow rate of the exhaust gas to increase the supercharging valuere by reducing the exhaust port width of the food production machinery nozzle ring which engine at low speeds such that, to control amount of sliding sheet opening to get it. When the engine is running at full speed food production machinery exhaust port size increased to ensure the supercharger does not exceed the demand. Controllabe cross section food production machinery has the advantage of improving the performance of the engine at low speeds.

Today food production turbochargers have become smaller and smaller, higher speed. Speed is up to 280000 rpm. Gasoline engine with a food production machinery compressor air ratio has reached 2-2. 5:1. Diesel engine with a food production machinery compressor air ratio has reached 4-6:1. Currently food production machinery on a car engine usage has reached over 50 % (Sun, 2001).

In this study, we have a analysis of crop production machinery with controllable cross section. The exhaust gas flow rate can increase the speed of the turbine. The way to change the exhaust gas flow rate is to control the amount of air inlet by changing the position of the blade swing angle. In this way the direction of the intake air changes as the blade swing angle changes. Another method to achieve this is to increase the air velocity into the turbine by changing the size of the turbine nozzle vent. The control of air velocity using this method relies on the vent itself to adjust the size of intake vent, which allows constant flow direction controlled by the blade. The controlled section exhaust food production machinery sensor would solve the problem of low speed and low boosting power of low condition exhaust gas food production turbocharger. It controls the size of the intake end of the turbine nozzle vent and the velocity of exhaust gas to adjust the speed of turbine accordingly, which further increases the boost level.

THE WORKING PRINCIPLE OF THE FOOD PRODUCTION TURBOCHARGER

Exhaust gas food production machinery is actually an air compressor. By increasing the intake air compressed air engine piston chamber. exhaust gas food production machinery exhaust emissions by using inertia momentum driven turbine engine turbine

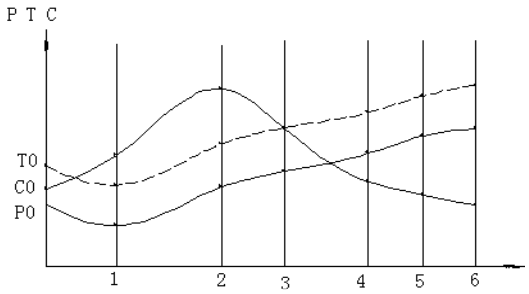


Fig. 1: Compressor aerodynamic parameters change map; P: Static pressure; T: The temperature; C: Speed; 1, 2 point changes state gas static pressure blade working chamber, the temperature, speed. 3-6 is a change in the status of the diffuser and flow tract (Song, 2005)

rotating interior. A turbine driven by the impeller rotation coaxial. After allowing pressurized air be feeding the engine cylinder. When the engine speed be increased, the discharge amount of exhaust gas be increased, the rotational speed of the turbine be increased as well. At this point increasing the pressure and density of the feed air engine cylinders. A corresponding increase in the amount of fuel and the engine speed. The corresponding engine output increased (Qiu, 2010).

In the exhaust gas food production machinery systems, there is no mechanical connection between the food production machinery and the engine. Exhaust food production machinery and exhaust air flow through the internal combustion engine is coupled with a self-adjusting. The rotational speed of the food production machinery and the engine speed is no direct contact, the use of exhaust gas energy is working. Changes in gas pressure in the entire flow path, temperature, velocity is shown in Fig. 1.

Exhaust gas food production machinery centrifugal compressor most be used. Its outlet pressure can reach 140-300 KPa, high up 500 KPa.

FOOD PRODUCTION MACHINERY WITH CHANGEABLE SECTION

Figure 2 is a food production machinery with controllable cross section assembly figure. Figure turboshaft assembly free is installed in order to show the position of the variable section. Supercharged variable food production machinery has an intake valve means for changing the exhaust port. Intake valve port role is to regulate the exhaust gas flow rate and direction. Help to improve the working conditions of low engine performance, increase utilization of displacement, to control exhaust gas turbine engine speed purposes.

When exhaust gas into the food production machinery engine running at low speed, the machine is less exhaust. Food production machinery boost value of less than engines. To solve the low engine food production machinery boost conditions the problem of low value can be improved using two pressurizing

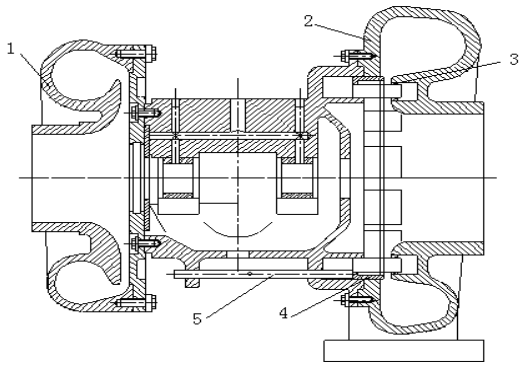


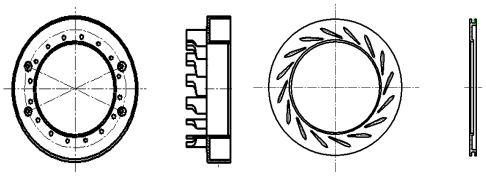
Fig. 2: Variable supercharging type food production turbocharger; 1: The compressor housing; 2: The exhaust gas compressor housing; 3: Guide ring; 4: Move ring; 5: Move the lever

method (Ke-Long and Li-Jun, 2011). One is a composite turbocharging system. Composite pressurization system driven by a mechanical supercharger and exhaust food production machinery boost mode combination. Mechanically driven supercharger is only used when the engine is low conditions.

When the engine operating conditions to achieve the exhaust gas food production machinery work requirements, mechanically driven supercharger stop working. Composite pressurized system can reliably achieve a low engine operating conditions supercharging requirement. The disadvantage is mechanically driven supercharger need to provide a power source. Pressurization system is relatively complex. The variable geometry food production machinery geometry is a modification of the structure is actually common type food production machinery. Still belong to a single food production machinery system.

Variable geometry food production machinery exhaust regulator exhaust port is installed in the exhaust gas at the collar housing of the nozzle ring. By changing the exhaust gas exhaust port opening size regulator varying the flow rate and direction of the turbine chamber of the intake air. To improve the turbine speed purposes. Now, there are two approaches. Section regulator uses a geometry selected turbine chamber while changing the intake flow rate and direction. While the other is just a way to change the intake flow rate.

According to the Department of particle momentum theorem: $K = \sum_{i=1}^{n} m_i v_i$. Where n is the particle system within the quality points, m_i for quality particle system within the i-th particle. v_i is speed that point. Momentum is a vector particle system. With the momentum vector velocity vector v direction. Thus the momentum of the gas velocity and direction of the impact of the gas turbine is relation (Theoretical Mechanics Department of Harbin Institute of Technology, 1983).



(a) (b)

Fig. 3: Axial movement controller components with variable cross-section

TAPERED NOZZLE RING CHANGEABLE SECTION CONTROLLER

Tapered nozzle ring changeable section controller is installed in the turbine housing. Figure 2 is a variable cross-section vane axial movement controller structure. Axially movable control variable cross-section of the controller is changing the axial position of the blade, while the sealing ring is axially movable to change the amount of opening of the nozzle ring, to achieve the nozzle flow area of the control loop. Figure 3 is a schematic cross-section with variable axial movement of the controller. It is composed of two parts, the drawing is a schematic diagram showing a blade ring. Figure 3b is a part drawing guide ring.

Elade ring include mobile rings and leaves. The leaves is welded in the up part of the mobile ring. Mobile ring is used to control the size of the nozzle ring opening. The guide vane ring with the vane opening match hole blades can move within the aperture. Guide ring face and mobile ring composed flow channel. Blade guide ring is mounted on the housing. Axial movement of the nozzle ring smaller amount of side section controller gas leak. Gas velocity along the direction of flow is relatively concentrated. The guide vane ring and the elastic ring is connected to the turbine housing. The problem is to lose elasticity and cause the connector body off under high temperature (Su-Ying and Li-Jun, 2011).

PERFORMANCE ANALYSIS OF CHANGEABLE SECTION CONTROLLER

Flow rate and flow rate of the exhaust gas is the main factor affecting the speed of the impeller. Improve low speed engine food production machinery boost value method to use more variable cross-section of the nozzle ring. There is the fixed width on the food production machinery exhaust nozzle ring housing. The large diameter of the turbine is located downstream from the nozzle ring. This bladeless round exit velocity exhaust nozzle ring with only two related to engine exhaust. It will be low velocity displacement engine exhaust when its exports position low. engine displacement of its high velocity exhaust outlet when it is high. Its output speed is completely determined following the displacement of the engine exhaust gas. Itself can not achieve the output speed adjustment. Tapered controller to solve the problem is the working conditions at low engine food production machinery boost pressure to improve results. According to kinetic energy theorem:

$$E = \frac{1}{2} m\upsilon^2$$

Due to the low quality of the engine when the exhaust gas is less than the quality of working conditions rated conditions when. Thus the flow through the nozzle ring to reduce the exhaust gas flow rate decrease. Boost the value amounted to less than expected. Another equation is the speed υ. Speed υ greater impact on kinetic energy. If the speed υ doubling the kinetic energy increased by two times. Under the same conditions as the gas engine excluded. Adjust the flow area of the nozzle ring can improve the flow rate of the gas.

On the other hand the direction of gas flow rate also affects its efficiency. This aspect can be based on the momentum theorem substance as an explanation. The quality and speed of the particle is called the product of the particle momentum. Particle momentum is a vector. Its direction is consistent with the direction of the velocity of the particle. Expression is:

$$K = m \cdot \upsilon.$$

Motion of an object under the force caused, not only with the magnitude and direction of the force, but also on the length of time and force related. The product of the force and effect of time to measure the force during this period of accumulation effect. The product of the force and effect of time called the impulse force. Impulse is a vector. Consistent with the direction of the force and its direction. Suffered force turbine is a function of time for the vector integration:

$$S = \int_0^t F \cdot dt$$

Particle momentum theorem to establish a relationship between impulse and momentum changes in the role of particles in the particle force:

$$m \cdot \upsilon - m \cdot \upsilon_0 = S = \int_0^t F \cdot dt \quad (1)$$

According to the principles mentioned above. Run the engine at low condition when its less exhaust emissions. Reduce the area of the nozzle ring to increase the flow of air velocity. When the engine is running at full speed of a food production machinery supercharging port guaranteed not to exceed the

demand increases. Advantages of the variable cross section of the intake air of the food production machinery is to increase the ability to increase the engine at low speeds.

Variable food production machinery compared with ordinary food production machinery can be changed to increase an area of the intake port sliding nozzle ring. Under the same conditions as the volume of gas flowing through the flow area decreases the flow speed. The following equation shows the relationship between velocity and volumetric flow rate and flow area between:

$$\upsilon = V/A = w \cdot \rho / A \quad (2)$$

where,
υ : Velocity, m/s
V : Volume flow rate, m^3/sec
A : Flow area, m^2
w : Mass flow rate, kg/sec
ρ : Gas density, kg/m^3

Gas flow rate and volume flow rate is proportional to the flow area is inversely proportional. Under the same conditions as the volume flow, the flow area to reduce the velocity increase is doubled twice. Impulse gas increased by 2 times. It can increase the speed of the turbine engine to achieve conditions that require low food production machinery boost the value (Qiu *et al*., 2011).

CONCLUSION

Exhaust gas food production machinery technology development to promote its application areas and applications. Improvements attempting in technology has been made in the exhaust gas food production machinery engine performance continues to increase and adapt working conditions and terms. Controlled section exhaust gas food production machinery is one of them. This design aims to increase exhaust flow rate by the way of to change the area of exhaust vent. Taking the kinetic energy theorem and momentum theorem explained variable geometry food production machinery boost capacity to improve working conditions at low engine works. The volume and flow of gas to the study. Increasing the gas under certain conditions of gas flow velocity is to change the flow area. Quality and speed direction impulse theorem substances substance are determinants impulse vector. Which is the direction of the velocity vector direction impulse. Therefore, the two variable geometry design point is to control the flow area and flow direction can be adjusted.

Axial control variable area controller is moving sealing ring and change the size of the nozzle vane ring exhaust port on the turbine housing to increase the intake flow rate through the axial turbine chamber. The angle of the blade is fixed. The opening angle of the flow direction of the gas flow leaves. Blade and blade guide with mobile ring rings seal better airflow path, a small amount of gas side leakage. Along the direction of gas flow vane angle intensive. The angle of the blade is fixed and it can not be adjusted.

The changeable section controller may be implemented on a variable area turbine housing nozzle ring control. The purpose of improving the exhaust food production machinery boost value reaches low engine operating conditions.

REFERENCES

Ke-Long, Y. and Q. Li-Jun, 2011. Turbocharger turbine shaft critical speed calculation and analysis. Proceeding of the 2nd International Conference on Mechanic Automation and Control Engineering (MACE, 2011), pp: 906-908.

Qiu, L.J., 2010. Reconstruction of turbocharger design exploration. Adv. Mater. Res., 102-104: 60-63.

Qiu, L.J., J. Yang and S.Y. Xu, 2011. The analysis and design of turbocharger thrust bearing. Adv. Mater. Res., 308-310: 1333-1336.

Song, S., 2005. Supercharged Internal Combustion Engine Technology. Tongji University Press, China.

Sun, J., 2001. Automobile Engine Principle. Anhui University of Science and Technology Press, China.

Su-Ying, X. and Q. Li-Jun, 2011. Turbocharger turbine shaft seal structure and analysis. Proceedings of the 2nd International Conference on Mechanic Automation and Control Engineering (MACE, 2011), pp: 909-911.

Theoretical Mechanics Department of Harbin Institute of Technology, 1983. Theoretical Mechanics. Higher Education Press, China.