**Study on multi-function air dryer of commercial vehicle**

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**Abstract:** As is known to all, a vehicle air brake system usually contains moisture. To help solve the problem, it is common to use air dryer to dry compressed air effectively and completely remove the moisture of braking system. However, the existing air dryer has many defects such as low drying efficiency, high cost, complex structure and difficult assembly. In order to solve these problems, our company began to study new Air Dryer, meanwhile, to improve the service life of air dryer.

**1. Research background**

As is known to all, a vehicle air brake system usually contains moisture. The moisture and oil will cause many problems such as the sealing parts cracked, the pipeline blockage, and the Valves no actuation, eventually, leading to the components of automobile braking system cannot guarantee theirs normal function during the service. To help solve the problem, it is common to use air dryer to dry compressed air effectively and completely remove the moisture and oil of braking system. However, the existing air dryer has many defects such as low drying efficiency, high cost, complex structure and difficult assembly. In order to solve these problems, our company began to study new Air Dryer, meanwhile, to improve the service life of air dryer.
2. Construction and operating principle

While the vehicle equipped with multi-function air dryer starting to run, the engine drives air compressor to provide air for air reservoir. First, the compressed air which generated by compressor is entering into the dryer by supply port 1, meanwhile, the condensate water of compressed air drop onto the exhaust piston 5. Second, the compressed air flows up to cartridge 12, removing oil and minor impurities by passing the Oil filter non-woven fabric 11. Then, the air enters into chamber C of cartridge 12 via chamber B, and then adsorbing the moisture which is contained inside of the air through the molecular sieve 10. Finally, the compressed air push open the check valve 9 and output from delivery port 21 and 22.

In use, the user should pay attention to: 1) the drying cylinder should be replaced regularly, generally every year; 2) The oil and water separator and antifreeze valve can be removed after installing the drying cylinder. 3) We should regularly check the storage cylinder water (we generally recommended once a month), When water is found in the nearest cylinder, it is indicated that the desiccant has failed and the drying cylinder should be replaced in time ; 4) After a number of tests, we have obtained that the maximum knob tightening moment for the installation of the dry cylinder is 15N.m. So when installing a dry cylinder, please do not exceed 15N.m.

3. The main research content

A. The air dryer adopts a new cartridge, which consists of a shell, a cover, a molecular sieve for water absorption, a cap, a non-woven cloth for oil absorption, a fixed base, a shell for a drying cylinder, a rubber unidirectional valve and a connecting ring.

Features: 1) It used the fixed base to replace the upper cover, the lining net and the lower cover, and reduced the installation cost and the organization cost of the parts and components. The fixed base was made into plastics to improve installation efficiency; 2) The non-woven cloth used for oil absorption is directly wound on the fixed base and then mounted into the inner shell of the dry cylinder to fix it,
which is convenient to assemble, reduces the assembly cost and increases service life; 3) The bottom of the whole cartridge is sealed with a check valve made by rubber material, and it can use the fixed base to prevent the failure of check valve; 4) The material of the fixed base is plastic, not only improves the production efficiency of it, but also reduces the cost of assembly. The device does not need to install antifreeze valve, oil-water separator, high pressure controller, moisture storage cylinder and automatic water release valve, which simplifies the pipeline, improves the reliability of the system, and increases the service life of the product.

B. The inlet of the dryer is equipped with an inlet joint. When the dryer is unloaded, the intake joint acts as a unidirectional valve, which can reduce the load of the air compressor.

C. The whole of the dryer can be divided into two parts, both of which are connected by bolts. The upper part mainly comprises a dryer shell, a drying cylinder and a dryer valve body. The lower part mainly includes the pressure-regulating structure and the exhaust piston part. This structure is not only helpful to the disassembly of the product, but also saves the space of the valve body, reduces the processing procedure of the valve body, and can greatly reduce the failure rate of the valve body.

D. A filter is added to the exhaust port to filter large-scale impurities, and the rubber parts on the exhaust piston are prevented from being damaged by the impurities.

4. product advantage
The multi-function dryer sets the oil filter device to the shape of the annular cylinder which can enlarge the contact area between the oil filter device and compressed air to a greater extent, and can better filter the oil contained in compressed air. Oil filter non-woven fabric uses imported non-woven fabric with high filter oil function, more effective filter oil pollution in the air, compressed air will pass through three filters, the air will be more pure. This is a kind of protection for other parts in the automobile pipeline. It can avoid pipeline water extending to vehicle braking system, and protect important components in the system, and increase the life of braking system. After the development of this product, the vehicle can be avoiding early failure because of the oil and impurity.

The added filter oil non-woven fabric allows compressed air to filter impurities and oil before filtering water. At the same time, when backblowing, impurities can be removed. The oil and water are discharged from the exhaust port together. The oil filtration performance of the molecular sieve is increased: the oil filter quantity is 10 times the weight of the molecular sieve material, and the filter oil drying cylinder is recommended to be replaced for one year. The service life of the dry cylinder is twice as long as that of the ordinary drying cylinder.

5. Conclusion
Multi-function air dryer is a fully new product which was developed in a short time by Ruili Group ruian Auto parts Co., Ltd., It can not only ensure the effective use of the molecular sieve regeneration function of the dryer, but also avoid the prolongation of the pipeline water in the vehicle braking system and increase the life of the brake system.

Our company's R & D has been market-oriented, customer-centric, the development of products will be welcomed by users, and we have a huge sales network, this product will definitely bring good economic benefits for the company.

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