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Journal of Mechanical Engineering Research
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REVIEW

The Change and Prospect of "Automobile Electromechanical Maintenance Skills Competition" under the Chinese Model

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ARTICLE INFO

Article history
Received: 9 August 2019
Accepted: 28 August 2019
Published Online: 30 November 2019

Keywords:
Automobile
Electromechanical maintenance
Skill contest
Change
Development

ABSTRACT

This paper analyzes the origin, status, changes and characteristics of the automotive electromechanical maintenance skills competition in China, and presents the developing trend in the future.

1. The Origin of Automotive Electromechanical Maintenance Skills Competition in China

With the advancement of China's reform and opening up, China's automobile industry has also developed rapidly in the 1990s, and the performance and high-tech content of automotive products have been significantly improved. As the use of automotive products, its performance will gradually decline, and the service life will be gradually shortened. In order to maintain the car's good performance and technical conditions and extend the service life of the car, the maintenance of automotive products has become an issue of public concern. The auto repair industry practitioners quickly changed from early single mechanical maintenance and electrical maintenance to mechatronics maintenance, that is, electromechanical maintenance. The occupational capacity and skill level of automotive electromechanical maintenance practitioners also became an urgent problem to be solved. The Ministry of Education recognizes that this is a matter of national prosperity so it take immediate measures to deal with it. For example, learning the "three-element system" in Germany, introducing the "TEAM 21" tutorial from Toyota, and organizing domestic experts to analyze and construct the knowledge system of such occupations as well as to promote and advance the level of professional skills by holding vocational skill competitions. In July 2007, the "First National Secondary Vocational School Automobile Application and Maintenance Skills Competition (Toyota Cup) [1] was successfully held by the Ministry of Education, FAW Toyota Co-organizer and Chongqing Industry Polytechnic College. Since then, the "Auto Maintenance Skills Competition" has been launched in China. In November 2009, it was spon-

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DOI: https://doi.org/10.30564/jmer.v2i2.1123

sored by the Transportation Vocational Education Teaching Steering Committee,the first national transportation vocational college "FAW Toyota Cup" automobile maintenance skill competition was held in Chengdu, Sichuan province [2], which opened a new chapter in such kind of competition.

2. The Current Situation of Automotive Electromechanical Maintenance Skills Competition in China

2.1 Types and Holding Methods of Automobile Electromechanical Maintenance Skills Competition

Nowadays there are various kinds of automotive electromechanical maintenance skills competition in China, and its organizational form and participants have changed a lot.

Classified in accordance with the mode of organization and the scope of the participants: There is a skill competition within the unit, which is sponsored by an independent unit and aimed at holding the vocational skill competition among the internal personnel; There are county-level regional skill competitions, organized by county-level administrative departments. These competitions are designed for personnel (students or in-service employees) of relevant units within the administrative area; There are provincial-level skill competitions, organized by provincial administrative departments. These competitions aim for personnel of relevant units within the administrative area of the province. Due to the large number of participants and the long competition time, such competitions usually allocate fixed quota to each region and then conduct provincial-level competitions; There are national-level skill competitions, organized by the administrative departments of the relevant ministries and commissions of the state. These competitions involve relevant personnel from all over the country, such competitions will also allocate fix quotas of the participating teams to the provinces and municipalities directly under the Central Government, and then conduct national-level competitions. There are world-class skill competitions, which are undertaken by the state and are aimed at professional skill competitions involving people from the same industry around the world. Such competitions are also required to allocate the number of teams to all participating countries and then conduct competitions on the host countries.

Classification from the participants, there are two major categories: student skill competitions and in-service employee skill competitions. The skill competition for students in school is organized by the administrative department of education so as to evaluate and improve the teaching quality, encourage students to be more interested in their profession; The in-service employee skill competition consists of two types: the teaching skill contest of the professional teachers in and the automobile maintenance skill competition of the front-line employees. Such kind of competitions usually organized by the the internal organization of the unit or local industry associations and trade union organizations.

2.2 The Changes of Automobile Electromechanical Maintenance Skill Contest Competition

In July 2007, the competition for the first secondary vocational student auto repair skill competition was divided into two types: individual project and group project: the personal project is the basic skill competition for automobile maintenance, that is, the inspection of engine parts, including the dismantling and installation of the cylinder head of Toyota 5A engine, the inspection of engine cylinder wear and the fault diagnosis of the electronic control system of Toyota Vios engine; The group project is a two-person joint maintenance project for Toyota Vios Auto for 40,000 kilometers [3]. In November 2009, the first vocational high school student auto repair skill competition included two practical projects, one was the disassembly and repair of the A340E automatic transmission, and the other is to diagnose and eliminate the fault diagnosis of automotive power modules (including engine electronic control system and automatic transmission control system) [4]. Nowadays, whether it is a skill contest for students in school or a skill contest for in-service employees, the form of the competition has changed from simple content to fault diagnosis of complex control systems in vehicles [5].

2.3 The Characteristics of the Automotive Electromechanical Maintenance Skills Competition

Nowadays China's Automotive Electromechanical Maintenance Skills Competition presents the following characteristics:

(1) A wide range of participants with a large number of participants. In a county-level administrative region, there are dozens or even hundreds of enterprises engaged in automobile maintenance business, and hundreds or thousands of employees engaged in mechanical and electrical maintenance. If each enterprise sends 1 or 2 people to participate in the competition, there will be more than 100 people in each competition. If a provincial motor maintenance skill contest is held for employees, the number of participants can be imagined. Therefore, this kind of competition is also called a "skills contest for millions of workers in * regions". For the students in the school, the motor vehicle

 DOI: https://doi.org/10.30564/jmer.v2i2.1123

maintenance skill contest is held at least in the administrative region of the local urban area, besides the intra-school competition, and then at the provincial level and the national level. As far as Sichuan Province is concerned, there are as many as 222 schools with automobile specialty, of which 56 secondary vocational schools with automobile specialty are established under the direct management of Sichuan Human Resources and Social Security Department, and 166 higher schools with automobile specialty are established under the direct management of Sichuan Education Department [6]. This shows that the number of students participating in each skill competition is large.

(2) Each competition will cost a lot of manpower and financial resources so these competitions are often sponsored by companies or government authorities.Each competition will spend a lot of manpower and financial resources, often enterprises sponsor the competition or the competent government departments allocate special funds to support the competition. As mentioned above, owing to the large number and wide range of participants, it is time-consuming, laborious and costly to organize a skill competition. In order to solve this outstanding problem, in the early skills competitions, enterprises often provide equipment sponsorship, technical support or financial support, and crowned with the "×× Cup" skills competition. Nowadays, with the enhancement of national strength and the prosperity of the industry, the competent government departments often allocate special funds for competitions to support competitions, such as those organized by local trade unions. The skills competition for millions of employees and the competition organized by the competent departments of the people's and social sciences. Skills Competition for Secondary Vocational Students and Competition organized by the competent department of Education College Students Skills Competition, etc.

(3) The top contestant will finally stand out after strict selection, earnest assessment.High-level competitions need to select contestants from the middle level of low-level competitions, and ultimately determine the level. Because of the large number of participants, wide range, time-consuming, laborious and money-consuming in each competition, in order to avoid lengthening the front and reducing the fairness of the competition, the measures of allocating the number of participants first and then concentrating the competition are often adopted to organize the competition. First of all, the low-level competition screens the Lady, and then in the high-level competition to select the best, ranking.

(4) The setting of each competition event fully reflects the will of the expert team in the organizer and the contractor, and request wich the technical method in the competition is the only feasible way. Through the competition, we can check the skill level of the competitors in certain aspects of automobile maintenance and repair, and it is the only way to select the person with ability. Several factors should be considered in the setting of events: (A) the equipment conditions provided by the organizers; (B) whether most of the participating units have the equipment designated by the organizers; (C) what the organizers and the expert teams of the organizers intend to let the competitors compete, which reflects the will of the expert teams; (D) whether the organizers have the equipment designated by the organizers. In order to check the regularity and rationality of the players' maintenance operation, the team of experts should consider that the players can only adopt the only feasible path to complete the competition operation when setting the content of the competition, and not solve many problems (or can not complete the same maintenance and inspection work in many ways).

For example, in the basic skills of mechanical and electrical maintenance, the project of "engine cylinder wear detection" should be set up. It is necessary to check whether the athletes can use measuring tools regularly, whether the process of testing operation is reasonable, and whether they can read measuring tools quickly and accurately. Correct and reasonable operation specifications should be as follows:

(a) Check whether all the preparatory items are in place, including cloth, maintenance and inspection work sheet, measuring tools (vernier calipers, micrometers, internal diameter scale), workpiece to be tested (engine cylinder block and work bench), etc.

(b) Use clean cloth to clean the workpiece (engine cylinder to be tested) and measuring tool.

(c) Check and align the "zero" or "zero marking" of vernier calipers.

(d) Use vernier calipers to measure the diameter of cylinder head of the cylinder to be measured (the measuring position is shown in Figure 1). Fill the readings in the inspection work sheet quickly and accurately, and lock the vernier calipers temporarily, place them reasonably on the workbench and wait for use.

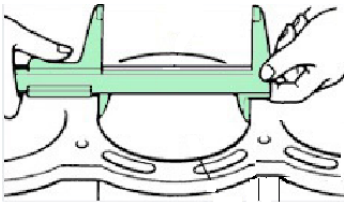

Figure 1. Measuring the diameter of cylinder head with vernier caliper

(e) Assemble the inner diameter scale and make sure

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that the length of the measuring rod in free state is 0.5-1.0 mm larger than that measured by vernier caliper. The correct form after assembling is shown in Figure 2.

Figure 2. Internal Diameter Scale Assembled

(f) Calibrating the "zero position" of the micrometer, even using the standard measuring rod to calibrate the reference reading of the micrometer, the method of calibrating the micrometer is shown in Figure 3, and then using the readings measured by the vernier caliper as the basic size to set the reading of the micrometer and calibrate the length of the micrometer to measure the rod.

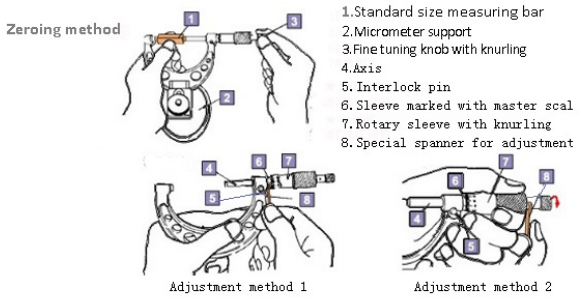

Figure 3. Zero-calibration method of micrometer

This shows that the above steps of (e) and (f) can be interchangeable without harming elegance and ultimately will not affect the detection accuracy.

(g) The assembled inner diameter gauge is placed in the micrometer which has set the basic size, and the percentage indicator of the inner diameter gauge is zeroed, that is to say, the percentage indicator is aligned with the "0" marking of the dial. The calibrated percentile state of the inner diameter gauge is shown in Figure 4.

Figure 4. Percentimeter status after calibration of internal diameter scale

(h) The calibrated inner diameter gauge is put into the cylinder to be tested according to the method shown in Figure 5. When the inner diameter gauge pointer is in the most shrinking position, the indicator reading is read and recorded in the maintenance and inspection work sheet.

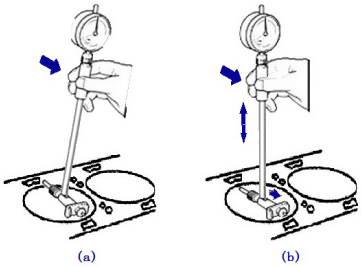

Figure 5. Correct method of inserting inner diameter gauge into cylinder

(i) After all the test data are obtained, the whole contest test work will be completed by calculating and perfecting the work order.

It is worth noting that when the inner diameter gauge is put into the cylinder for testing, the upper, middle and lower detection sections should be determined correctly, and each section should be measured at least one point in two measuring reference directions. That is, the crankshaft axis direction and transverse direction (perpendicular to the crankshaft axis direction). Usually the upper section is 10-15 mm away from the cylinder head (the upper plane of the cylinder block), the middle section is in the middle of the cylinder, and the lower section is 10-15 mm away from the bottom of the cylinder. In order to improve the accuracy of locating the maximum wear position in the cylinder, each measuring reference direction of each section should be deflected from right to left at a certain angle (15 to 20 degrees is appropriate), and the maximum reading is used as the measurement value in this direction.

For example, in the comprehensive troubleshooting of automotive mechanical and electrical maintenance, the power assembly, active safety (including braking and lighting) and comfort system (air conditioning) are set up. Mainly examines the contestants from the acceptance of work tasks, to the fault detection, diagnosis, elimination of the whole process of work ideas. For on-the-job employees, they should independently complete all the tasks of contest maintenance. For the students in school, three groups are often used to complete the task of competition maintenance. One of them is responsible for fault diagnosis and maintenance work flow (train of thought), and the other two cooperate with the implementation of the task of fault detection, diagnosis and elimination.

It is also worth mentioning here that in the course of the competition, the actual operators and report writers

 DOI: https://doi.org/10.30564/jmer.v2i2.1123

lack on-site communication, and the evaluation of the report is a separate referee, which is also not on-site. Therefore, there are some limitations in the evaluation of the team's overall performance.

There are many technical details on the issues discussed above, which will not be elaborated here.

(5) Any competitor is not only an individual, but also a team. The team includes competitors, coaches, logisticians and so on. Every competing team wants to be successful in the competition, so the level of performance of the competitors in the competition reflects the level of the competing team from one side. The following questions will be reflected by the contestants in the end.

(A) The attention, concern and support of the leaders of the units are indispensable to the success of the participating teams in the competition. If the leader only delivers the target task with a caring attitude, usually less than on-site supervision or care, it will inevitably affect the morale of the coaches and competitors as a whole team, then the winning ticket will not be grasped. Leaders should not only pay attention to their concern, but also to their peripheral work. They should probe into the interior of the formulation of the technical plan of the competition and make good relations so that they can obtain first-hand materials than other teams, or even lead the formulation of the technical plan, and even understand the composition of the referee team and other important information.

(B) The selection of coaches is a key link to achieve the goal. This requires leaders to have a deep vision, a clear understanding of the autumn, be good at learning horses from Bole, and employ people appropriately.

Those who can be selected as coaches must also possess the following basic qualities:

(a) Only with a high degree of Ideological and political awareness can we recognize the importance of achieving the goals and tasks.

(b) Only with a strong sense of responsibility and mission can we carefully study the technical documents of the competition in the coaching work, tighten every small link, tighten the wonderful string of "details determine success or failure", and regard the completion of coaching work as the current historical mission.

(c) Only by possessing excellent professional accomplishment and knowing how to teach and what to teach, can we not disgrace our mission.

(d) To have a noble sense of teachers' morality, to cultivate and educate people as their own responsibility, to accomplish the task of the target task first, and to form a good mentor-friend relationship with the players, coaches and players all want to think about one place, strive for one place, and ultimately can be invincible.

(C) The selection of competitors is the most important link in the overall work of the competition. The selection of players can be carried out in many ways, forming a echelon construction mechanism within the unit, making the selection of players a benign mode of operation. First, the principle of voluntariness, in line with the basic requirements of the competition (such as age, length of service) in the collection of volunteers to fill in; secondly, individual recommendation, unit leaders, colleagues according to the usual assessment and observation can recommend potential personnel to the ranks of competitors; thirdly, the preliminary screening of personnel to do the corresponding. Basic knowledge testing, and stratified training, so that players firmly rooted, and gradually grow. At the same time, the selected competitors should also have corresponding qualities, such as broad national feelings, love for the motherland and home, sober understanding and ideological awareness of the correct relationship between everyone and family, confidence and determination to obey command, to be able to fight and to win in battle, good physical quality and automobile opportunities. Electrical maintenance is also a very hard work to test the physical fitness and endurance of practitioners. Therefore, players preparing for battle should strengthen physical exercise and strengthen their health consciousness.

(D) Logistics support system and the staffing of security personnel are also important links that can not be ignored in the formation of participating teams. In the logistic support system, we should fully consider the supply and replenishment of materials and consumables needed in training, and also consider the incentive measures to the team, to solve the worries of the participants, and to promote all members to advance bravely, overcome difficulties and finally achieve brilliant victory.

(E) Each contest will have two major events: theoretical test and skill contest. Therefore, contestants are required to have solid theoretical foundation and excellent skill level.

(F) First, second and third prizes will be set up in every competition. Usually the first prize accounts for 10% of the teams (or players), the second prize for 20% and the third prize for 30%.

(G) The original intention of each competition is competition style (team cooperation spirit, execution level of members), competition quality (whether the competitors can reflect the quality consciousness of customer first, safety production first, product quality first) and competition level (whether the competitors have a certain degree of comprehensiveness in mastering relevant knowledge or not). Width and depth, race skills (competition competitors in vehicle maintenance skills in the normative and

DOI: https://doi.org/10.30564/jmer.v2i2.1123

proficient level, etc.).

3. The Future Development Trend of Automotive Mechanical and Electrical Maintenance Skills Competition in China

Throughout the above-mentioned motor vehicle mechanical and electrical maintenance skills competitions, relevant technical documents will be issued before the competition, and the setting of the events and the scope of the competition will be limited to a certain extent. In my opinion, there are still considerable limitations, which is not conducive to the real selection of outstanding talents or large-scale craftsmen. Therefore, the future automotive electromechanical maintenance skill contest will be normalized in order to comply with the requirements of the 20 articles of the State Council vocational education. Competition will be organized by a third party to'... Invitational tournament or'... Challenge competition can be organized in the form of students and staff competing on the same platform. The pre-competition technical documents only mention the scope and basic requirements, and do not mention specific event settings. Relevant personnel within the organizer of the competition do not participate in any competition, and the organizer or the main responsible person should comply with the People's Republic of China. The confidentiality law [8] restricts the completion of the relevant work, and can not be related to the interests of any participating units and competitors, ultimately ensuring the openness, fairness and fairness of the competition.

4. Summary

Although the form of motor vehicle maintenance skill contest is various, the core of the contest is to promote the improvement of professional level and skill ability of motor vehicle maintenance and testing posts, and to play an active role in the development and growth of China's automobile maintenance industry, in shaping the position of technical experts and craftsmen in the industry, and in revitalizing the motherland. Effect. In order to truly reflect the selection and reuse of talents, a more fair and just competition mode will be adopted.

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