



Full-automatic hot bonding production line for PCR tire bead turn-up and apex applying has passed technical evaluation and appraisal

On June 16, 2026, the National Rubber and Plastics Design Technology Center (National Rubber and Plastics Technical Expert Committee) organized a technical evaluation and appraisal meeting to conduct professional technical appraisal on the "PCR Triangle Rubber Bead Flipping and Hot Bonding Fully Automatic Production Line" independently developed by Guilin Rubber Design Institute Co., Ltd. This project closely aligns with the development needs of the rubber industry market. Based on the successful implementation and application of the fully automatic bead building process technology and complete equipment for all-steel radial tires, it further realizes technological iteration and extension, expanding mature complete equipment technology innovation to the PCR tire production field.



Figure 1 The scene of the evaluation and appraisal meeting

For this technical evaluation and appraisal meeting, a special evaluation and appraisal team consisting of authoritative experts from related industries was established. The expert group conducted a comprehensive, detailed, and

rigorous comprehensive review of the overall technical level of the fully automated production line by listening to project R&D work reports, verifying the full set of technical materials item by item, observing equipment operation videos, and going through a series of standardized processes such as rigorous inquiry and in-depth discussion. The expert group focused on verifying the core key technologies of the project, equipment performance indicators, technological innovation highlights, and on-site practical application results, fully affirming the scientific nature of the production line's technical design, the stability of equipment operation, and the innovativeness of core technologies, and giving the project high praise.

The main innovations of this project are:

(1) The drum-type flipping and hot bonding process, utilizing the "wrapping-flipping-pressing" step-by-step molding logic, was adopted for the first time in China, reshaping the PCR bead production process. We independently developed an adaptive servo feeding system, a high-speed electric heating cutting device, a pressure-adjustable pressing device, and a dedicated bonding drum. These innovations addressed traditional process flaws such as inconsistent stretching of horizontal/vertical bonding strips and low pressing accuracy. The molding cycle was shortened to 7 seconds, resulting in a production efficiency increase of over 30% compared to traditional processes.

(2) Developing an intelligent control system for formulations, we have independently developed a stepless automatic diameter adjustment and fitting drum with a dual servo linkage structure. Coupled with adaptive robotic fixtures and rolling structures, a flexible manufacturing system has been established, enabling one-click switching of production specifications. The drum diameter adjustment

error is controlled at ± 0.5 mm, and the specification switching time is ≤ 5 minutes, achieving an efficiency improvement of approximately 75% compared to traditional switching methods. This meets the flexible production needs of PCR tire beads in multiple specifications and small batches.

(3) Establish a high-precision dynamic correction and head-tail compensation system for joint overlap after cutting triangular rubber strips, optimize the closed-loop control logic, and achieve a joint overlap error of ≤ 2 mm.

(4) Utilizing laser scanning technology and deep learning algorithms, we have developed a 3D intelligent visual inspection system. This system overcomes the limitations of 2D detection, achieving an online detection accuracy rate of up to 99.5% for joints and a single-piece detection time of less than 0.8 seconds. This meets the quality and efficiency requirements for PCR bead production.

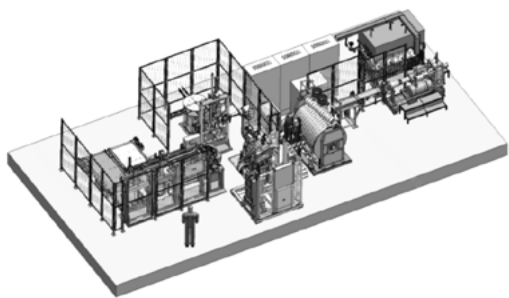


Figure 2 3D schematic diagram of the fully automated production line for PCR tire bead flip and hot bonding

This project has been granted 5 authorized invention patents, 1 software copyright, and 1 proprietary technology. At the same time, it has completed a complete closed-loop of independent intellectual property rights, spanning from underlying hardware, control software to complete process standards. It has built an independent and standardized core technological barrier integrating mechanical structure, intelligent control system, and complete production process.

After a comprehensive review, the Technical Evaluation and Appraisal Committee unanimously concluded that the overall technology of the project has reached a domestic leading and international advanced level, and agreed to pass the technical evaluation and appraisal of the project.

The successful passage of this technical evaluation and appraisal marks the successful localization and innovative application of complete sets of intelligent equipment for

tire production in the project, fully demonstrating the robust strength of the project technology and gaining high recognition and comprehensive affirmation from industry authorities.



Figure 3 Group photo of experts at the appraisal meeting

World-Leading Tech: Guizhou Tyre takes lead in tackling core technologies for special OTR tires

On June 6, 2026, the project "Key Technologies and Industrialization of Special Engineering Tires for Heavy-Duty Highways under Harsh Conditions," led by Guizhou Tyre, officially passed the scientific and technological achievements appraisal organized by the China Petroleum and Chemical Industry Federation. The expert committee led by Zhang Liquan, a CAE Member, unanimously concluded that the overall technology of the project has reached an internationally leading level. This not only marks the achievement of self-reliance and controllability in core technologies for domestic special engineering tires, but also effectively breaks the long-standing monopoly of foreign brands in the field of supporting extreme working conditions.

With the increasingly high transportation requirements for special engineering vehicles both domestically and internationally, coupled with the trend towards electrification, existing industry tire products and technologies have gradually become unable to meet the market's ever-increasing demand for product performance. Guizhou Tyre Co., Ltd. has continuously implemented technological innovation and, after more than a decade, has finally pioneered the development of "key technologies for heavy-duty high-speed special engineering tires under harsh road conditions", fully meeting the demanding usage requirements of relevant road conditions both domestically and internationally.

The special engineering vehicles represented by wide-

bodied dump trucks are China's original core engineering equipment. However, their supporting special tires have long had technical shortcomings, prone to early failure under extreme working conditions, which has become a bottleneck restricting the high-end upgrading of the industry. To this end, Guizhou Tyre led a joint industry-university-research team with Harbin Institute of Technology and Guizhou University to tackle the problem for many years. With the special fund support for major scientific and technological achievements from the Science and Technology Department of Guizhou Province, they carried out continuous joint research and technological breakthroughs, ultimately achieving original technological breakthroughs.

The project has achieved multiple original technological breakthroughs: simulating and optimizing tire structure to achieve a more uniform internal stress distribution; developing collaborative cross-linking technology to create high-performance tread composite materials, simultaneously achieving excellent properties such as wear resistance, cut resistance, and low heat build-up. Furthermore, as the first global "Lighthouse Factory" enterprise in China's tire industry, Guizhou Tyre pioneered full-process intelligent manufacturing technology for engineering tires, established an intelligent production line with an annual output of 300,000 sets of special engineering tires, and fully realized digital process control in the production process.

During the research and development process of this project, a total of 13 authorized invention patents were obtained, and two national standards were led in the formulation. Five new specifications of tires, including 16.00R29, were successfully developed, gaining mastery over the standard discourse in the segmented field. The core performance of the products, such as durability and temperature rise, surpasses national standards and international similar products. The domestic market share ranks first, and the products have successfully entered the supporting system of leading domestic and international mainstream wide-

bodied dump trucks, demonstrating a significant increase in the discourse power of Chinese tire brands in the supply chain system.

This series of products is widely used in domestic and international mining and infrastructure projects, and is exported to countries along the "Belt and Road". Its service life is significantly longer than that of traditional engineering tires. As an important industrial product carrier supporting the implementation of Guizhou's "rich ore, fine exploitation" strategy in the fields of mining, transportation, green energy, and intelligence, this series of special engineering tires, with their high efficiency, durability, energy saving, and intelligence characteristics, effectively ensures the implementation of fine mining and precise ore blending in mines, accelerating the transformation of resource advantages into industrial advantages. The project not only yields significant economic benefits but also drives the coordinated development of local upstream and downstream industries, establishes a high-value recycling system for waste resources, and demonstrates outstanding comprehensive economic and low-carbon benefits, making a prominent contribution to Guizhou Province's promotion of new industrialization and high-quality development.

This accreditation marks not only a milestone in the deep integration of "industry-university-research-application" within Guizhou Tyre, but also a microcosm of China's tire industry moving towards high-end, intelligent, and international development. As the industry's first global "Lighthouse Factory", Guizhou Tyre has not only secured the top domestic market share but also successfully tapped into the high-end mining markets of countries along the "Belt and Road". With the approaching "14th Five-Year Plan", the implementation of this original technology will undoubtedly provide strong "underpinning support" for the safety and resilience of China's construction machinery industry chain, accelerating the transformation of resource advantages into industrial strengths.