



Made in China

China's economy has grown strongly again in 2004. More and more households are able to afford a car and the demand is increasing steadily. It is estimated that 20 million cars will be produced and sold in China by 2020. This in turn will result in enormous growth in the tire industry. China is already the third largest tire market in the world and constantly improving technologies as well as sophisticated machines guarantee further success.

Tianjin Saixiang Technology Co, Ltd in the Chinese seaport Tianjin is the market leader in the sector of medium and high-end tire production plants in China.

Saixiang Technology annually manufactures more than 200 production plants, mainly for the Chinese market, but also for well-known global companies like Bridgestone and Michelin. An increase of 15% in export business is expected for the next few years. Due to the attractive nature of the Chinese market, especially for foreign companies, it is extremely important for Saixiang Technology to be competitive. Therefore, the machines are constantly kept up-to-date technologically, in order to achieve higher quality and quantity.

Safety demands Accuracy

A tire is an essential safety component. A single tire consists of more than 30 components, which are produced in elaborate and complex production processes. High demands have to be met in order to guarantee quality, safety and durability.

B&R's complete solution rigorously improved the production facility for tire beads in regard to precision and handling characteristics.

Rubber Compounds

A lot of steps are necessary before a tire can be assembled. The individual

rubber components are mixed under high heat and pressure in a so-called Banbury mixer. The rubber mixtures are produced according to each tire's area of application.

Extrusion

The rubber compounds produced during the mixing procedure are then processed by an extruder to form the individual tire components, such as tread and sidewall.

The extrusion of rubber materials requires special process know-how. After the extrusion process and the appropriate cooling and post processing, the tire components need to be cut to the correct length.

Calender Process

A tire must be able to cope with heavy loads. Therefore a fabric and steel substructure is necessary, the so-called carcass. To ensure the proper tire pressure, an airtight rubber layer is pressed onto this textile and steel carcass using a coating calender consisting of heated steel roller. Following the coating calender process, the airtight carcass is then cut to the required length.

Tire Bead Production

A bead is used to ensure that the tire is anchored firmly to the rim. The bead's core consists of firm steel cables covered in rubber. The bead's circumference and shape are of prime importance, since marginal deviations can result in a tire that does not fit onto the rim or sits on it too loosely. Quality and safety are of the highest priority. Thanks to B&R's components, Saixiang Technology was able to achieve an enormous improvement.

The Automation

B&R's challenge was to develop an accurate, fast and flexible control system.



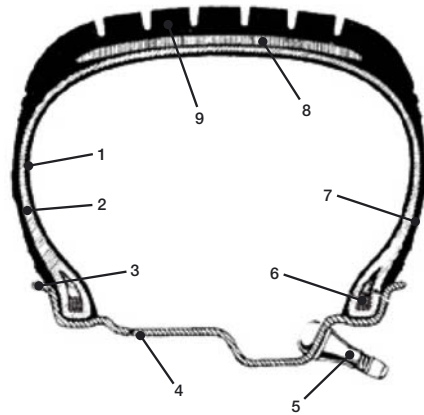
Easy and intuitive operation was also of prime importance. The implementation would require a lot of know-how and experience.

Steel cables are wound in a honeycomb shape to achieve the required strength and shape of the bead. The cross section of the bead can be rhombic, hexagonal or octagonal. Depending on the type of tire, the diameter of these steel cables ranges from 1.25 to 1.8mm. Winding patterns can be selected directly on the user panel and can therefore be changed quickly and easily. ACOPOS servo drives were used to guarantee high levels of accuracy and speed during the winding process. When winding the steel cables, high rates of 200-300 revolutions per minute (approx. 5 revolutions per second) have to be achieved to guarantee quality as well as sufficient quantities. A servo axis serves as the main drive, feeding the steel cable, and a second axis positions the steel cable to achieve the selected winding pattern.

ACOPOS guarantees the dynamics and precision necessary to produce complex winding patterns. Even the minutest manufacturing tolerances for this critical tire component can be met, due to the accuracy of the EnDat encoders integrated to the motors.

Communication with the central unit, a Power Panel PP281, and the two

Cross Section of a Tire



- | | |
|----------------|--------------|
| 1 Rubber layer | 6 Bead core |
| 2 Carcass | 7 Sidewall |
| 3 Rim flange | 8 Steel belt |
| 4 Bead seat | 9 Tread |
| 5 Valve | |

ACOPOS servo drives is handled via ETHERNET Powerlink.

Another advantage of the B&R solution is the user-friendly 10.4" Touch Screen that can easily display Chinese characters thanks to multi language support.

Assembly and Vulcanization

After these and a number of smaller processes are completed, the individual components are ready to be assembled.

The assembly consists of 2 phases: during the first phase the reinforcements, inner layer, bead, bead adhesion strip and sidewalls are assembled, then the steel belts and tread are assembled by a different machine during the second phase. Fitting a tire takes more than 100 individual steps.

One last step is necessary before the tire can be tested: vulcanization. All the tire components are pressed and smelted together under high pressure and temperature. In doing so, chemical reactions change the structure of each component and the tire receives its final shape, resilience, durability and tread.

Numerous machines then perform a series of quality and safety checks to verify that all demands are met.

By further developing the tire bead production facility, Saixiang Technology can meet its customers' steadily increasing demands and increase productivity. www.rpm.com.cn

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