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WHITE PAPER

An engineered solution to the hazards of static build-up in non-marking forklift tires

INDUSTRY

Material Handling

CHALLENGE

Static electricity build-up in non-marking forklift tires in high intensity applications

SOLUTION

A patented technology to eliminate the hazards of static electricity

FEATURED PRODUCTS

Solideal PON 775 NMAS and RES Xtreme NMAS by Camso

WHITE PAPER

An engineered solution to the hazards of static build-up in non-marking forklift tires

BY MATERIAL HANDLING PRODUCT LINE TEAM, CAMSO

Non-marking tires are a requirement for about 30% of forklift applications, especially in warehousing, paper mills and chemicals & food processing plants. The build-up of static electricity, common to this type of tire, creates a significant hazard for personnel safety and facility downtime.

Any solution to the static problem must also balance challenges in the tire's thermal properties, wear resistance and production costs.

Camso engineering combined new ideas in rubber compounds, performance design and manufacturing processes to develop a patented technology and to offer the first complete range of non-marking anti-static tires that prevents the safety hazards of static electricity build-up.

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The hazard associated with static build-up in non-marking tires has long been a thorn in the side of operators and managers in material handling facilities.

Non-marking tires are the preferred choice in most indoor applications, and the indoor segment has been growing considerably for the past 20 years. Connected closely to the growing use of non-marking tires, the static charges on a forklift can be strong enough – as much as 50,000 V – to cause severe injury to personnel. Operators often take pains when they dismount to ensure that they break off contact with their truck before they set foot on the floor.

The static electricity issue becomes more pronounced as applications become more intense. High-intensity indoor operations* are another growing trend with larger equipment, heavier loads, longer runs and frequent, high-speed maneuvering with little idle time.

Shocks to operators are just part of the dangers of static build-up. Facilities handling volatile fumes and chemicals have to be cautious too. Propane-powered trucks are vulnerable to gas leaks from their own fuel tanks, as well as gas in the vicinity of a filling station. Paper and textile mills, where non-marking tires are especially prevalent, are also subject to spark hazards, as static discharges can set off the fine dust that these materials produce. In facilities that handle electronic components, static charges can wipe out circuits, data chips and firmware. Equipment and facilities are also vulnerable. Control boards and sensors that are built into the forklift itself can be disabled by a static charge. Control devices, elevators and alarms installed in the facility can even experience a major power outage.

A multi-faceted challenge

Static interference with a customer's elevator controls brought the issue into focus for the R&D team at Camso, a world leading manufacturer of forklift tires. Thierry Miche, Product Line Executive Director – Material Handling at Camso explained that the need for conductive non-marking tires came up during a product review with a customer. "We took the issue to our R&D team, and established very quickly that there are multiple facets to consider in developing the right solution. Along with addressing the issue of static build-up, we would have to consider thermal efficiency and wear life of the tires, all while preserving the essential non-marking quality."

Black or White?

All forklift tires generate static electricity in normal operation. However, traditional black tires continuously discharge their static, so it doesn't build up to dangerous levels, thanks to the carbon black used as a filler material. Carbon black give tires their color and helps to improve wear properties, and it also makes the tires conductive. As a result, any static that is accumulated in the tires is dissipated just as quickly.

But carbon black can also create problems in some applications, especially in high hygiene environments or in handling materials that must avoid discoloration by black dust from the tires. Non-marking tires are a requirement for about 30% of all forklift applications. While they offer clean running, leave no marks behind or black dust and are ideal for electrical and rental fleets, they also generate static electricity. Indeed, the accumulation of static electricity is common in non-marking tires because of the silica used as a reinforcing filler in place of carbon black, which has isolating properties. Static electricity generated by friction is thus stored rather than dissipated, making shocks, sparks, power outages and facility damages ever-present hazards.

A persistent problem

For many years, the problem of static build-up has simply been part of the material handling industry. Non-marking tires have a significant role in warehousing, paper mills and food processing plants; their tendency to create static is just part of the price you pay for those benefits.

Previous efforts to solve the problem of static have met limited to no success. Operators who slam their forks onto the floor, in an attempt to ground the vehicle, simply damage their equipment to no avail. The forks are insulated from the drivetrain and undercarriage, so grounding the forks provides no pathway for the static current to discharge.

Commonly seen, users will attach chains or grounding straps under the truck. Doing so can be somewhat more successful, but only to a limited extent. These tend to wear down or break off, creating a new inspection item for maintenance staff, or they collect dust and debris over time that gradually insulates them from the ground.

An engineered approach

Like most safety issues, the solution to hazards of static electricity must be addressed at multiple levels. When Camso first undertook the development of the non-marking anti-static tires, the goals of the program were to improve safety, extend wear life, and reduce premature failure due to heat. Thierry Miche notes that the customers who most often use non-marking tires tend to also run the most high intensity applications. These mills and warehouses often operate larger trucks, carrying heavy loads at higher speed runs and with rapid maneuvering and increased duty cycles. The new non-marking solutions had to overcome the challenges of the most demanding environments where thermal failure is prevalent, and where high amounts of static are generated. When tires wear out quickly or if they fail, the facility pays a premium in operating costs and unscheduled downtime.

Camso engineers began reworking tire design and ran live tests with customers to ensure maximum tire lifespan in these high intensity applications.

SOLIDEAL PON 775 NMAS

But then, the team had to turn the new and improved non-marking tire into an anti-static tire. This was no simple challenge; the design had to offer a way to take static charges to the ground. Adding some kind of pathway for electrical conductivity required some novel design concepts, again, at multiple levels. The team tested in the field several prototypes to come up with a final design featuring a telltale dot on the face of the tread. This "black dot" reveals the presence of a carbon black channel, integrated through the tire steel band. Offset to one side of the tire tread, this dot makes contact with the floor on each rotation of the tire. Although the contact is momentary, it's enough for the tire to discharge any accumulated static.

Next, the production engineers required an innovative way to manufacture the tire in production. This required an automated method of integrating the conductive pathway, and to do it economically.

The breakthrough

Camso field-tested the prototypes, and then the initial production models, before unveiling the first patented non-marking anti-static press-on tire, the Solideal PON 775 NMAS, in April of 2018. Miche reports that feedback from customers and operators has been enthusiastic. "The new PON 775 NMAS," he says, "is not only the world's first non-marking anti-static tire, it also outlasts any other non-marking tire. It resists chunking, cutting and abrasion, and virtually eliminates the safety hazards and the downtime related to static build-up. With this patented anti-static technology, thermally-efficient construction and an abrasion-resistant tread compound, the PON 775 NMAS represents a major

innovation and breakthrough in the industry."

Next step: a resilient solution

Having solved the problem of a press-on NMAS tire for the North American marketplace, the Camso team turned its attention to an even larger customer need. Class IV forklifts equipped with press-ons are the most common machines in the United States and Canada, where facilities tend to operate heavier equipment in high-intensity applications. In the rest of the world, especially in Europe and Latin America, resilient tires are preferred.

The differences in the design of press-on and resilient tires presented some new, unique challenges for Camso R&D and product line. The basic strategy was clear: to implement the same non-marking anti-static technology into a resilient construction. But, unlike solid press-on tires, resilient forklift tires are built up with layered plies of differing materials. Also, while press-ons present a uniform, smooth tire face, resilient tires feature molded tread patterns. A new resilient NMAS would have to combine the ride quality, stability and performance of existing tires, while introducing new anti-static properties.

Building on success

Camso elected to base its development program on one of its most popular non-marking tires in Europe: the Solideal RES Xtreme. The Xtreme is known for providing enhanced operator comfort, low vibration and lower heat build-up for increased tire life.

> The production experts at Camso were able to devise a method to adapt the RES Xtreme design with a cylindrical anti-static plug of highly conductive black rubber connected all the way through the plies from the steel wheel to the tread face. As in the original press-on NMAS model, the black plug provides a path to dissipate accumulated electricity on every rotation.

Dubbed the Solideal RES Xtreme NMAS, the new tire was field tested with a customer in Germany who was also experiencing issues with static electricity along with the challenges of the lifecycle of NM tires in high intensity use. The tests were again conclusive. It was a success in terms of eliminating static electricity and the customer has begun to switch its fleet to the new RES Xtreme NMAS tires.

The best of all worlds

With the addition of the Solideal RES Xtreme NMAS to its tire portfolio, Camso becomes the first tire manufacturer to offer a complete range of solid non-marking anti-static (NMAS) forklift tires. "The Solideal PON 775 NMAS received an unprecedented welcome in the market," says Thierry Miche. "Customers worldwide are finally getting an extreme performance, non-marking tire line-up that also prevents and solves the safety issues related to static electricity build-up."

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*To help customers evaluate their tire needs based on a specific application, Camso recently launched a web-based **usage intensity calculator**, a tool that quantifies factors such as load capacity, length of runs, maneuvering and idle time, and combines them on an intensity scale relative to other typical forklift users.