

CASE STORY · SP BAR · PANDROL UK LTD

SECURING THE TRACK

Pandrol UK Limited is the world's leading producer of rail clips – the device that clamps the rail tracks to the sleepers (also known as rail ties in the US) and helps prevent trains from derailing. Ovako's Special Properties (SP) Round Bar have played a role in the development of these extremely tough spring clips.

Every day, millions of passengers and tons of cargo travel by rail worldwide. Critical to the safety of railways, these spring devices must be able to keep the tracks securely attached to the sleeper while continuously absorbing forces over many years. Without these fastenings, tracks could not be restrained.

Pandrol's reputation for high standards has resulted in companies such as France's SNCF, operator of the Train à Grande Vitesse (TGV), choosing Pandrol FASTCLIP clips for their high speed tracks. With world train speed records of 357 mph, the engineering demands on the fastening system are enormous.

"Our clips, once installed are expected to last at least the life of the rail", explains Mike James, Production Director Pandrol UK Ltd and responsible for purchasing the steel from which the clips are forged. "Our routine quality assurance (QA) processes test clips to 5 million cycles. That's why the standard of the steel we buy is critical to the performance of our clips."

In addition to large dynamic loads, clips must also be able to handle extreme climate conditions. Pandrol has products in regions from the Arctic Circle to Saudi Arabia. In Mongolia where Pandrol has installations, track temperatures can range between minus 50°C to plus 40°C, temperatures that could make lesser materials fail.

All these factors place a huge demand on the resilience of the clip. With the UK manufacturing business alone producing over 24 million clips a year for railroad-construction companies worldwide – and still growing – Pandrol relies, in part, on a special type of steel from Ovako known as Special Properties (SP) Round Bar. In the forging and heat treatment processes, these bars are transformed into extremely tough spring clips able to cope with intensely varying axle loads and vibration, often in extreme conditions.

"Tight control of the bar surface finish achieved through both the casting and rolling processes are critical to our finished product performance. A significant reason our products perform so well is because Ovako supplies us with high quality steel with tight dimensional tolerances and a very good surface finish", James says.

According to James, the tight dimensional tolerances provide two benefits: the consistent bar diameter and tight ovality control allow for a predictable and repeatable clip forming process. Also, these tight tolerances enable the company to achieve material savings of around 1.5 percent compared to standard tolerance round bar.

Furthermore, the unique metallurgy of the SP Bar has enabled Pandrol, through its quenching and tempering process, to create a particularly tough and resilient clip with high fatigue performance.

Ovako's UK Sales Manager, Richard Bloor, who joined Ovako in 1988 and has been working closely with Pandrol for almost 20 years, noted that over the years Ovako has been progressively improving the quality of the round bars to meet Pandrol's needs. The big breakthrough was in 2005 when Ovako started producing the SP Bar – a type of steel in which the tolerances and mechanical properties are controlled by using different process conditions to meet customer requirements.



“Controlling of the rolling temperature has meant low decarburization in the finished product and less fall-off of scale into Pandrol’s quenching tanks,” Bloor says. “This means less clogging, maintenance and downtime.”

“Very few engineering SBQ steel mills in the world are capable of providing steel to our requirements”, added James. “Ovako is one of them.”

The process

The steps in the Pandrol rail clip manufacturing process:

1. Daily deliveries of bar are received into the steel warehouse to commence a fully tracked process down five highly automated and dual-sided clip manufacturing lines.
2. The 5-plus m length SP Bars are loaded onto the automated cropping machines feeding each line and are sheared to the product length, from where they are automatically fed into reheat hardening furnaces at over 1000°C.
3. On discharge from the furnaces, the red hot bars are fed using high speed robots through the custom-built bending and forging equipment to create the required final clip shapes and identification markings.
4. After hot forming, robots transfer the still red hot clips into an oil quenching tank which converts the micro-structure to an extremely hard martensitic state.
5. The clips are automatically fed into tempering furnaces where a further transformation takes shape: from a hard and brittle metal structure to a tough and resilient spring with the final properties locked in.
6. With forming finished, the clips are prepared for electrostatic polyester powder coating in a range of colors.
7. The final stage for FASTCLIP product is assembly with the in house manufactured nylon insulators produced on the latest injection molding machines.
8. Prior to delivery to one of Pandrol’s many far-flung customers, each bag of product is scanned through automated checking equipment to confirm compliance with the customers order details.

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SP Bar

The unique aspect of Ovako’s Special Properties Round Bar, also known as SP Bar, is that they are not limited to any specific steel grade, enabling customers to customize Ovako’s advanced technology to their specific needs. They can realize specific characteristics, as well as significant cost savings, by optimizing the property of the material.

In short, SP Bar is a hot-rolled bar with enhanced properties tailored to the customers’ manufacturing process, helping them to achieve superior qualities in the following:

- tolerances
- mechanical properties
- surface quality

Ovako facts and figures

- A leading producer of engineering steel for customers in the bearing, transportation and engineering industries
- Products: low-alloy steels and carbon steels in the form of bars, tubes, rings and pre-components
- Locations: Ovako has ten production sites and a number of sales companies in Europe and the USA
- Net sales 2014: 862 MEUR
- Employees: 2,925

Pandrol UK Ltd facts and figures

- Pandrol UK Ltd is part of Pandrol International and the Delachaux Group
- The world’s leading producer of rail fastenings, with double the manufacturing capacity of the next largest competitor
- Rail clips and track fastening systems for high speed, heavy haul, mixed traffic, metro, noise and vibration solutions and turnouts
- Number of customers: 411 railway companies worldwide
- Number of clips: 2,000 million clips
- Number of countries: 101 countries
- Number of employees: over 700 globally with 170 at Pandrol UK Ltd
- Number of manufacturing sites: 12 worldwide
- Headquarters: UK
- Pandrol UK Ltd consumes around 16,000 tons (MT) of round bar per year from 13 mm to 21 mm diameter, making typically 35 different products

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