TECH TRENDS

Linear Motion Rails, What's the secret for gaining more performance?

ROLLON®
LinearEvolution

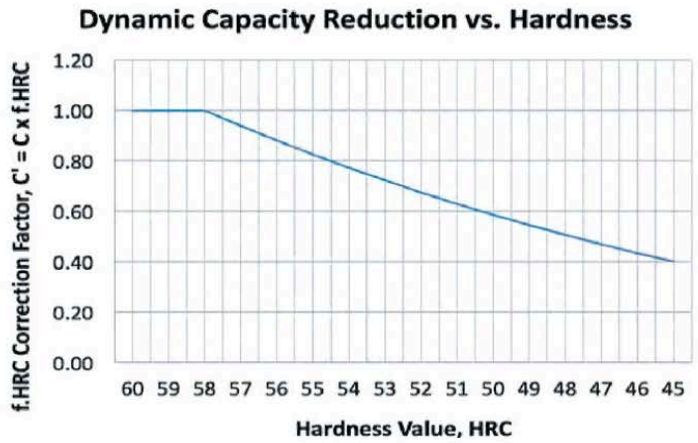
The ROLLON Group, based in Vimercate (MB-Italy) and present on the international market and in India with a direct branch in Bangalore, is specialized in linear motion systems offering one of the world's most complete ranges, which includes linear and telescopic rails, and actuators for linear motion in many sectors: industrial machines, packaging, railways, aerospace, logistics, medical and special vehicles.

The most performing Rollon's linear and telescopic guides, widely used in heavy duty and industrial applications, distinguish themselves by the induction hardening of the raceways, a heat treating process that allows remarkable achievements in quality, durability and reliability of the guides.

What does Rollon's quality depend upon?

When specifying a linear rail for your industrial application, the following characteristics indicate optimal levels of surface hardness, ensuring your bearing will operate under heavy loads with minimal wear over the course of its lifetime:

- **Induction hardened raceways.** This heat treating process brings out the tough natural properties of steel, creating a thick zone around the raceway and ensuring hardness levels are achieved at critical depth and effective hardness.
- **Material purity.** To achieve maximum hardness levels, rails should be made from high-quality, high-carbon composition steel that is specifically made for bearing applications.
- **Additional surface finish.** Induction hardened rails that undergo surface grinding will be smoother and more precise, optimizing their running quality.



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When it comes to linear motion rails, a high hardness value is critical. With unhardened surfaces, the sooner the rail will become susceptible to damage much like how potholes will develop on a road after it bears the loads of passing cars and trucks. Unfortunately, some rail manufacturing processes don't impart sufficient hardness to the rails. To gain maximum life for your linear guide, you'll want to consider the hardening process, the material being hardened and how to finish the rail in order to optimize its performance. Otherwise, if hardness doesn't extend to a sufficient depth, the component won't be able to withstand heavy loads over the course of its lifetime, which can result in time-consuming and costly downtime for your system. Not all hardening processes, materials and finishes are created equal, however. By keeping the following options in mind, quality manufacturers can make the best linear rail for your industrial application.

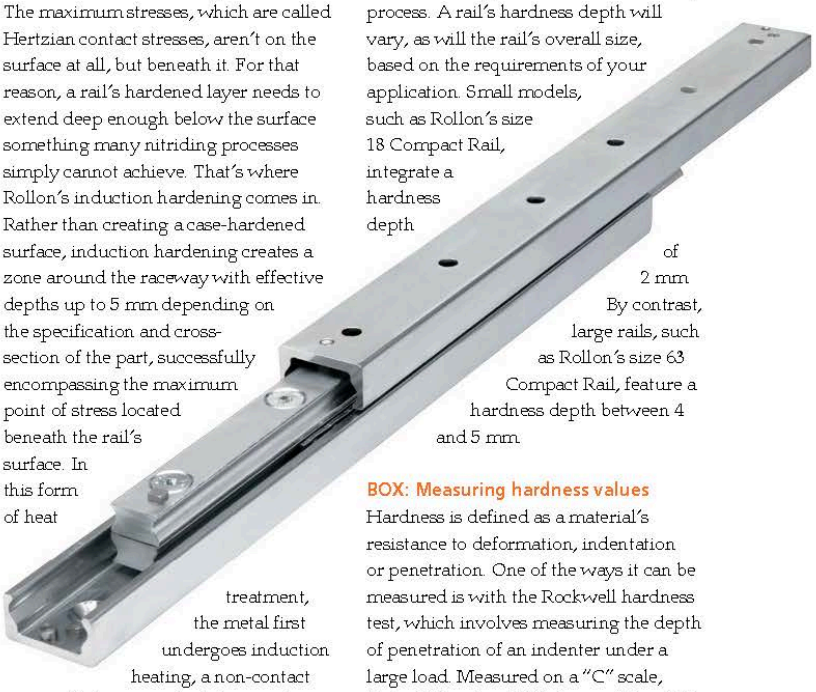
The Importance of Rollon's Induction Hardening

To harden their rails, often a manufacturer can use nitriding, a heat treating process that diffuses nitrogen into the surface of a metal (typically low-carbon, low-alloy steels), creating a case-hardened surface with thicknesses between 0.2 and 0.3 mm. When you consider the kinds of heavy loads that are applied to industrial raceways in warehouse automation, robotic cells, railway, machine tools and more, rails that have thin nitrided surfaces will tend to crack under load.

To avoid bearing failure, it's important to know the location of the point of stress between the bearing and the rail. The maximum stresses, which are called Hertzian contact stresses, aren't on the surface at all, but beneath it. For that reason, a rail's hardened layer needs to extend deep enough below the surface something many nitriding processes simply cannot achieve. That's where Rollon's induction hardening comes in. Rather than creating a case-hardened surface, induction hardening creates a zone around the raceway with effective depths up to 5 mm depending on the specification and cross-section of the part, successfully encompassing the maximum point of stress located beneath the rail's surface. In this form of heat treatment, the metal first undergoes induction heating, a non-contact process that uses an electric current to create heat in the surface layer of a conductive material.

The surface layer is then quenched, causing it to undergo a martensitic transformation and become harder than the base metal. Compared to gas furnace heating and other conventional heat treatments, induction hardening offers several advantages, including fast heating rates, low energy consumption and cost savings. It also refines the structure and mechanical properties of the treated parts.

As a result of this process, an induction hardened rail can operate under heavy loads with no damage to the raceways over the course of its lifetime. In properly sized linear bearings, typical life ratings range from thousands to hundreds of thousands of kilometers of travel, allowing for one-piece flow, rather than batch processes. Because the subsurface stresses on a loaded raceway can hit 500,000 psi, both rail hardness and hardness depth are critical values to measure during the induction hardening process. A rail's hardness depth will vary, as will the rail's overall size, based on the requirements of your application. Small models, such as Rollon's size 18 Compact Rail, integrate a hardness depth of 2 mm. By contrast, large rails, such as Rollon's size 63 Compact Rail, feature a hardness depth between 4 and 5 mm.



BOX: Measuring hardness values

Hardness is defined as a material's resistance to deformation, indentation or penetration. One of the ways it can be measured is with the Rockwell hardness test, which involves measuring the depth of penetration of an indenter under a large load. Measured on a "C" scale, Rollon's bearings fall between 58 and 62 HRC.

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