



# ENGINEERING BULLETIN

Bulletin No. 12.19.14

## SAFETY ALERT

# Effects of “Black” steel used in brake pads

EFFECTIVE: DECEMBER 2014

REV: A

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### Introduction

Recent studies have shown an increase in the use of “black” steel in the manufacturing of brake pads. The Global Brake Safety Council, using certified independent labs, has tested brake pads from a cross-section of major brake pad manufacturers. This resulted in uncovering a major safety concern related to the use of “black” steel in the manufacture of brake pads.

**Latest studies illustrate that the use of black steel in disc brake pads create a serious safety hazard.**

*“Rusted steel behind the linings can cause them to expand, creating more pressure to be borne by the swollen area and further increasing the wear rate or the tendency to crack. That sequence of events is called rust-jacking”*

NHTSA (National Highway Traffic Safety Administration)



**Quality engineers at the OEM level have stated that rust-jacking is a major safety issue.**

### What is “black steel”?

During the final stages of steel production, a hot rolling process can be performed on the metal slab at high temperatures (900 to 1100°C) to form plates/sheets. At these temperatures, atmospheric surface oxidation will occur resulting in formation of magnetite (black iron oxide) on the surface of plates. In a corrosive/humidity saturated environment, this black oxide does not act as a barrier because of its porous structure.

Usually the presence of iron oxide on the surface would reduce the effectiveness of surface finishing (such as painting, electroplating or glue/adhesive attachment). Therefore, pickling or shot blasting is usually applied after the hot-rolling process. Pickling is done by immersing the black steel into a strong acid solution to dissolve the oxide



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layer (chemically), resulting in a bright surface finish. In the next step to prevent further atmospheric oxidation the alloy will be dipped in the oil that acts as a moisture barrier.

While the shot blast process removes some of the oxide layer from black steel (mechanically), the steel will not be free of the scaling and rust which remain embedded in the outer layer of the steel.

Also during the disc brake shoe stamping process, the coining of lugs and embossments further embeds the scaling and rust into the blind holes.

### **Industry Regulation**

There are two leading regulatory bodies in the automotive industry. SAE, Society of Automotive Engineers, is a global organization of engineers and technical experts in aerospace and automotive (including commercial vehicle) industries. NHTSA, a regulatory body focused on motor vehicle and highway safety.

As an example, SAE standard J1713A – Structural testing of passenger car and truck disc brakes – states the following:

***“This SAE Recommended Practice specifies a procedure for determining structural strength and fatigue life of disc-brake caliper assemblies which are satisfactory for vehicle usage. It is applicable to new caliper assemblies which are employed in passenger car and truck brake systems utilizing hydraulic brake fluids. Brake design and vehicle performance requirements are not included. Specification limits are left to the discretion of the responsible manufacturer.”***

**Global Brake Safety Council recommends the implementation of pickled and oiled steel as the standard material for disc brake shoes.**

A full scientific report will be available to the industry in January 2015.

*Global Brake Safety Council (GBSC) was established with the intent to uphold the highest standards in brake safety and dedicated to responsible manufacturing in the automotive industry. Utilizing over 150 years of combined industry experience, this group of technical experts is composed of: professional engineers, OE design engineers, product development, and R&D professionals. This team is committed to raising awareness of issues that are critical to public safety through education.*

*Members of this council are recipients of the Automotive News PACE Award in the Manufacturing Process Category for providing a compelling example of an innovative solution to an unsatisfactory but accepted process in the automotive industry.*

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