# THE CASE FOR ONSPOT

## A fleet manager's guide to safety and traction control

ONSPOT

# Icy road basics for safe driving

To many, the white winter landscape is the definition of icy roads. There are different reasons why roads become icy based on weather conditions and meteorology. For safe driving, it's a good idea to know some theory behind icy roads. So, let's have a closer look at some common causes for roads to become icy.

**With proper knowledge and awareness, the driver can reduce the risk of accidents or delays due to slippery road conditions.**

## What makes winter roads icy?

### Snow turns into ice

Deep snow on the road could be an obstacle that needs to be plowed. But, even if many of us have experienced spinning wheels in deep snow, most accidents occur in light snowfalls. This is probably because we're more prepared and cautious in heavy snow. But, in temperatures below freezing, how can roads with dry snow become icy roads? It's a combination of two things: First, the weight of the vehicle compresses the fluffy snow into a compact layer of snow. Then, repeatedly, friction heat from the passing traffic actually melts the uppermost snow layer, which re-freezes. Eventually, a layer of ice is built up on the road. This is the most common cause for road icing.

### Freezing rain and drizzle

While rainwater can make roads slippery, rain-covered roads are far from being as slippery as ice-covered roads. Normally, when temperature is above freezing, it doesn't snow – it rains. So, how could there be ice when it rains? Meteorology, the science of weather, can explain this phenomena. Precipitation may pass several layers of air, and these air layers can have different temperatures. If temperature in the clouds are well above freezing, then it will rain. But, if temperature at ground level is below freezing, then the raindrops will freeze to ice when they hit the ground resulting in the road becoming glazed with a layer of ice.

This is the most slippery type of road icing and it may come as an unpleasant surprise. This ice glaze is sometimes referred to as 'black ice' because the black road surface is clearly visible – but not the ice itself! Consequently, it's potentially the most dangerous ice on the road.

### Rain and snow mixed

From time to time, it may snow and rain at the same time, i.e. sleet. This occurs when snow from colder air layers partially melt when reaching lower, warmer layers. In this case, the ground layer is above freezing temperature and there will be water on the road. But, it could also be the other way around; there could be rain falling from warmer layers, freezing when reaching lower, cold layers. This is a potentially dangerous situation since unfrozen raindrops will freeze on the ground. Sleet is a warning that black ice may appear!

### Freezing fog

Although dense fog is not so common at very cold temperatures, fog may glaze the road with ice. Actually, fog is water droplets that are so small that they virtually float in the air without falling to the ground. These droplets may slowly build up a thin layer of ice on the road, notably on bridges.

### Hail

Hail are lumps of ice that build up from raindrops in subfreezing layers of air. If the frozen raindrops ascend by way of updrafts, humidity will add more and more ice to the frozen raindrops and they grow bigger and bigger until they eventually fall to the ground. Although rare, hail can be the size of a tennis ball – or even bigger – and cause severe damage when hitting vehicles, buildings or people.

### Wind and snowdrift

Even if it doesn't snow and the road is apparently dry on a clear and sunny day, winds may cause snowdrifts that can potentially make the road icy. This is more common in flat regions where the wind isn't slowed down by natural obstacles like hills and woods.

### Rainwater or other water

After it has rained – but before the road has dried – the temperature could fall below freezing. If you're not aware of the outside temperature when driving, you may think you're driving on residual rainwater, and all of a sudden the road is covered with ice!

Also, there are other possible reasons for water on the road; flooded ditches, sprinklers, broken water mains etc. Whatever the reason for water on the road, at subfreezing temperatures the risk of ice remains the same.

### A good driver is an alert driver

If you understand the causes for icy roads, you can be more attentive to warning signs like change of weather, falling temperature and precipitation character. And, being attentive makes the driver better prepared for driving in slippery road conditions.

Be prepared! Always check the weather forecast. Keep an eye on the outside temperature when driving. Make sure you can increase traction if road conditions turn out miserable.

Drive safely out there!

# What is traction, friction and road grip?

Whether driving a small go-kart or a heavy hauler, you must have traction to move forward. Actually, you can't even walk without it. Traction is a commonly used word and many believe it's just another word for friction. But is it really? Let's have a closer look at friction and traction – what it is and why it's so fundamental to safe driving. We all know the feeling when tires lose grip and the vehicle starts skidding. Controlled skidding in a go-kart can be fun, but a heavy vehicle unexpectedly skidding on a road could cause a very dangerous situation. The skidding is due to the vehicle losing road grip and obviously, this has to do with tires and road surface.

## It's all about friction

First, let's dive into the physics of friction and add some rubber and asphalt. Friction as such doesn't move the vehicle forward. Friction is a resisting force that resists the relative motion of two surfaces. Simply put, when driving, the engine generates a force on the driving wheels that moves the vehicle onwards. Friction is the force that opposes the tire rubber from sliding on the road surface. However, things are not really that simple – we have two different frictions to consider; static and kinetic friction.

| **Static Friction** | **Kinetic Friction** |
| --- | --- |
| the frictional force between surfaces that are NOT moving relative to each other. | the frictional force between surfaces that ARE moving relative to each other. |

But when the wheels are rolling isn't it about kinetic friction? No. When driving on a dry road, irrespective of vehicle speed, it's the static friction that keeps the vehicle steady on course. If you look at it in a microscope – and in very slow-motion – the contact area of the tire doesn't move relative to the road surface. It's just that continuously new parts of the tire come into contact with the road as the wheel is rolling.

## Friction is critical for maneuvering a vehicle

Now you know that static friction keeps the vehicle on the proper course when driving at steady pace. But there are also other situations when friction is fundamental for making the vehicle behave the way you want:

- When you accelerate
- When you turn
- When you brake

In these situations, it is crucial that the static frictional force exceeds other forces, e.g. kinetic energy, causing loss of road grip and control of your vehicle. So, what will influence your road grip?

## Road grip is a sum of variables

Several factors - some of which are critical - can affect road grip.

1. The material of the contacting surfaces, i.e. rubber quality and road surface material.
2. The texture of these materials, i.e. the rougher texture the better road grip.
3. The force pressing the surfaces together, i.e. the weight of the vehicle.
4. Other materials between the contact surfaces, e.g. water, ice, gravel or oil spill.

In a typical driving situation, the first three factors are rather constant; our vehicle has a certain weight and certain tires, and we drive on a long road. Accordingly, we adapt our driving style to these given factors. But all of a sudden, there could be a heavy rain, and everything changes…

## Static may become kinetic

In certain conditions, there may appear something else between the tire and the road surface – rain water for example. The water works as a lubricant between the rubber and the asphalt, and the static friction is reduced as a result. Even worse, the road could be icy.

When accelerating on ice, if the applied force (the driving force on the wheels) exceeds the static friction, the wheels will lose grip and spin.

When turning or cornering, if the centrifugal force exceeds the static frictional force, the wheels will lose grip and the kinetic energy will make the vehicle slide straight onwards, despite your turning the steering wheel.

What actually happens here is that, when static friction is exceeded, another kind of friction takes over; the kinetic friction, which is also known as dynamic or sliding friction. The vehicle will slide until this kinetic friction eventually makes it stop.

In the situation of spinning wheels, they will spin until the static frictional force exceeds the kinetic frictional force (it’s achieved by throttling down) – then tires will grip.

## Coefficient of friction

How far a vehicle will slide and how slippery the road is, is determined by the coefficient of friction.

Different materials and textures provide different friction. The coefficient of friction is a measure for how much friction a material or texture provides. This coefficient is useful to scientists when developing new materials for tires and road surfaces, but for the average driver it’s enough to conclude that high friction is desirable – it keeps us steadily on the road.

## What's the difference between friction and traction?

While friction is a general physical expression, vehicle traction can be defined as the friction between a drive wheel and the road surface.

> **Traction is the friction between a drive wheel and the road surface. If you lose traction, you lose road grip.**

Now you know that it all comes down to friction. You also realize that traction as such cannot be increased by way of electronic systems. To really increase traction, you need to physically introduce something with a higher coefficient of friction under the tires. Actually, this is what you do when you sand an icy road or use snow chains – you increase the coefficient of friction. At the end of the day it's all about friction in that small area of contact between the tire and the road – and it's all pure physics.

If your vehicle loses traction, it's crucial to get it back. Have a look at some different methods to increase traction.

### "Onspot saves a lot of time"

**Jakob, Driver at Meyer Logistics**

Onspot means different things to different people. Jakob and other drivers describe their experience as "extra safety", "always there", and "it saves you at the flip of a switch."

# Traction Devices Explained
# Onspot vs. Alternatives

To many, the white winter landscape is the definition of icy roads. However, due to weather and meteorology there are different reasons why roads become icy. For safe driving, it's a good idea to know some theory behind icy roads. So, let's have a closer look at some common causes for roads to become icy.

## Preparation is Key

Preparation for ice and snow conditions should begin before you hit the road. Equipping your vehicle properly can save you time & money but more importantly give you peace of mind. Choosing a traction device will depend on the conditions you encounter in your travel area, reliability, durability, and costs of initial investment and maintenance.

Each device has its pros and cons, and none is ideal in every condition so choosing an optimal method will require careful consideration of your specific needs. Doing the same old thing may keep you from discovering something better.

| Road conditions | Onspot | Conventional tire chains | Textile tire socks | Sand spreader | 4x4 |
|---|---|---|---|---|---|
| Ice | ✓ | ✓ | ✓ | ✓ | ✓ |
| Light Snow | ✓ | ✓ | ✓ | ✓ | ✓ |
| Heavy Snow (>6in / 15cm) | × | ✓ | ✓ | × | ✓ |
| Automatic | ✓ | × | × | ✓ | ✓ |
| Manual Mounting | None | >15min | <15min | Sand refills | None |
| Weight | <150lbs (70kg) | <150lbs (70kg) | <150lbs (70kg) | >150lbs (70kg) | >150lbs (70kg) |
| Maintenance | Low | Low | Low | High | Low |

# Onspot in Depth - How it Really Works

At the flip of the switch, the chain wheel swings out. Then, strands of chain are slung under the tire, increasing traction. It's as simple as that – for the driver. But, if we take a closer look at the ingeniously simple principle behind it, we realize that Onspot requires a good dose of engineering to become such a reliable tool for safety and convenience. Here is why!

## Sometimes Moving, Sometimes Fixed

First, let's give the rotating chain wheel some consideration. When engaged, it's like a swing ride where the chains are moving freely in the air, pointing radially from the chain wheel center because of the centrifugal forces. Then, suddenly, the chain is trapped between the grip of rubber and road surface – the front of the tire's footprint. Now, the chain is doing its job by increasing the static friction between the rubber and the road's icy surface. And, at the back part of the footprint, as the drive wheel is rolling, the chain will release and swing around to the front, again and again.

## Chain wheel Positioning – Effective vs. Smooth

If the chain wheel is moved forward, a longer part of the chain strand will end up under the tire, thus increasing effectiveness. However, there's a downside to this: A part of the chain will still be trapped under the tire when the chain wheel is rotating trying to pull it free. The chain will be pulled out by force, putting excessive strain on the chain mounting. Furthermore, the chain end – that is released under tension from the tire – may bend and hit the tire side instead of ending up under the footprint, if it's not completely stretched out. This will cause an unreliable and rough operation, not to mention unnecessary wear on the tire and road surface. Actually, this is the result of a chain wheel positioned too far to the front.

By moving the chain wheel position back, the chains will release easily, resulting in a smooth and less rough operation. However, this comes at the price of reduced effectiveness since less chain would end up in the footprint. This is the result when the chain wheel is positioned too far to the rear.
Obviously, we should find a compromise.

## At Onspot, we design and manufacture a mounting system for your unique vehicle.

### What is the Ideal Chain wheel Position?

Although measurements may vary, there is an ideal chain wheel position. For instance, to spin freely on a typical 11 R 22.5 tire, the chain wheel should be positioned at the ideal height of 3 ½" to 4" above the road surface.

But, which is the ideal length-wise position for the chain wheel? Countless calculations and computer simulations have been made to find out, and a range of field tests have been carried out to prove right or wrong. From extensive research and development over the years, we can conclude that the wheel axle center line is the "golden middle" for positioning the Onspot chain wheel.

When positioning the chain wheel exactly in the drive wheel axle center line, you get the optimal combination of effectiveness, reliability and comfortable operation. Plus, you have the same function whether driving in forward or reverse.

Onspots are not a one-size-fits-all product due to the variety of vehicles used across a multitude of industries. Measurement of every truck is highly recommended because no two vehicles are identical. "At Onspot, we design and manufacture a mounting system for your unique vehicle."

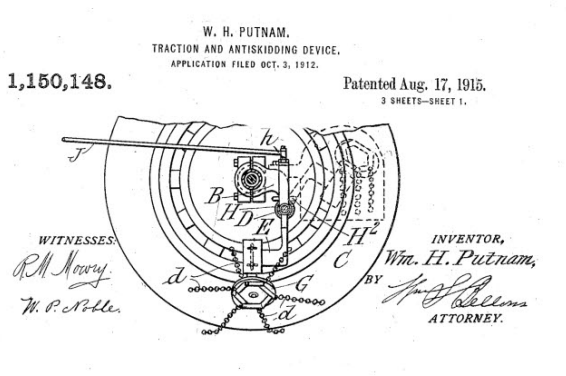
# Onspot – the original automatic tire chains

The history of automatic tire chains goes back to 1915 when patent #1,150,148 was granted to Mr. W.H. Putnum of New York for his new and unique anti-skid device. The basic idea was similar to today's chain wheel, but Mr. Putnum never succeeded in making a product ready for the market.

It wasn't until 1977 the idea came to fruition when Swedish inventor Mr. Göran Törnebäck finally mounted a fully functional automatic tire chain system onto a local milk delivery truck. The following year, 1978, he went to the US to present and market his innovation, which he called Onspot.

Since 1992, Onspot for the North American market is manufactured in the USA while Onspot for other markets is manufactured in Sweden.

For 40 years, much effort and resources have been put into R&D, and all product improvements are the result of extensive research and numerous field tests. Being Onspot – the original and pioneering automatic tire chains system – we are confident to claim that our knowledge, experience, and quality is unsurpassed.




**The choices we make when designing are based on the experience of four decades and more than 150,000 Onspots installed all over the world**

**Here are the explanations for some of these choices**

# The customized brackets

The idea of a universal bracket has been around for many years. An off-the-shelf Onspot kit that could be fitted to any vehicle may sound like the ideal solution, but why is there no such option?

## Since we never compromise on functional quality, there is no one-Onspot-fits-all solution

Located under the vehicle, Onspot is exposed to extreme elements of water, gravel, dirt, snow, and more. Under such harsh conditions, Onspot must yet be precisely positioned for optimal function. The customized bracket is a guarantee for optimal fitting and keeping of the proper position on the specific vehicle model. With a non-customized bracket, the fitting cannot be perfected, and function would eventually be impaired. Since we never compromise on functional quality, there is no one-Onspot-fits-all solution.

# The chain wheel

## Why the different number of chains?

Chain wheels are available with 6, 12, and 18 chain strands. A common misconception is that the more chains, the better bite, and traction. However, this is not entirely true.

**6 chains are enough to get proper traction but more chains provide a smoother ride**

To get the extra traction, there must always be a chain between the tire and the road surface. Accordingly, when the chain wheel is spinning, a new chain strand must be trapped by the tire before the former one is released – this is how a 6 chain wheel works. With more chains attached to the wheel, more chain strands will be trapped in the tire footprint. However, the benefit with more strands is not improved traction, but rather driver comfort. With 6 chains the ride may be perceived as jerky, while 12 or 18 strands provide a smoother ride. Numerous field tests show that 6 chains are enough to get traction. Testing has shown that a 6 strand wheel provides more bite ability, lasts longer, works better in deeper snow, and is less expensive to replace than 12 and 18 strand chain wheels.

## Why must the entire chain wheel be replaced if only one chain is broken?

The extremely rugged chains are made to stand heavy-duty use in harsh conditions, but, over time they will wear and need to be replaced. It may sound like a good idea to replace the chain strands one by one as they break, but from a functional and safety perspective, it is not a very good option. There is always a reason for a chain to break. Either they are worn and begin to reach the end of product life, or there is an external reason e.g., a massive impact from a stone on the chain wheel.

If a worn chain strand is replaced there will most likely be another chain failure soon, and accordingly yet another visit to the workshop for repair. If a chain breaks for other unknown reasons there is a risk of chain wheel imbalance and functional impairment as a result.

**By replacing the entire chain wheel you improve safety, secure proper function, and minimize return visits to the shop.**

# Greasing options

**Proper greasing is crucial to secure function and avoid failure. Onspots are designed to be conveniently greased for optimal function.**

The Onspot system contains two pivot points per side, the arm pivot and the angle joint. Due to the variety of vehicles are fitted and the varying conditions that these vehicles run in, Onspot offers three different chain system options all with pivot points that can be greased. The standard chain system uses a through bolt design for an arm pivot while the brass cap and extreme duty units use a one-piece arm. Regardless of arm pivot type, all of these chain systems have a zerk fitting at this location. When it comes to the angle joint, Onspot chooses to use a threaded plug at this pivot point. The angle joint is the lowest point on the Onspot system and, in some cases, is the lowest point on the chassis which is why Onspot chooses to plug this fitting. The threaded plug, however, can be removed and replaced with a zerk fitting, the angle joint greased, and then the zerk fitting can either remain or be replaced again with the plug.

## Chain wheel greasing

The Onspot chain wheels are designed with sealed bearings that are lubricated for life. This convenient maintenance-free solution secures function and safety as the bearings always are properly lubricated.

The high-quality sealed bearings are lubricated for life

The recommendation to engage Onspot at least once a month (even if road is dry) is to keep the sealed bearings in good condition. By activating Onspot just for a few seconds the contained lubricant is spread evenly inside the bearing and the balls will change their position, keeping them perfectly spherical.

# The chain

Over the years numerous laboratory and field tests have been carried out to find the optimal chain type and steel quality. Any type or quality has its pros and cons and the final choice could be considered as the optimal compromise. Furthermore, in different parts of the world different chain types are preferred by tradition or local road conditions.

The predominant Onspot chain type (preferred, e.g. in North America) is the twist link type. Here, the link ends have the ability to lock into one another and the twist allows the leading edges of the chain to dig or bite into the ice and snow instead of simply “rolling” between the tire and road surface like a flat chain. These twisted chains are effective in forward and reverse with a slight advantage going to forward motion which is the direction of travel for most drivers 90% of the time.

**The twist allows the leading edges of the chain to dig or bite into the ice and snow**

# Positioning of the chain wheel

The positioning of the Onspot chain wheel is in the center line of the vehicle wheel. This is no coincidence. The proper position is where the chains are optimally trapped and released by the tire – without the added pulling tension that will result if the chain wheel is positioned too far to the front or the back.

Despite numerous attempts by the R&D engineers to find a more effective position, it has been shown that the wheel centerline is the ideal position. As a positive consequence, Onspot is perfectly, symmetrically mounted and will work equally effective in forward and in reverse.

**Onspot works equally effective in forward and in reverse**

# Misconceptions explained

**? Onspot is a copy of an earlier automatic tire chains system**

! No. Onspot is the original. In contrast, several manufacturers in Europe and the US have copied Onspot and offer low-budget products to the market.

**? Automatic Tire Chains is an American innovation**

! Yes and no. A similar idea was patented in New York, 1915, but the first functional system was developed in Sweden in 1977.

**? Onspot is manufactured in Europe**

! Yes and no. Onspots for the American market are manufactured in the US (Indiana), while Onspots for other markets are manufactured in Sweden. This is a guarantee for keeping quality and service at a top level.

**? It would be cheaper and more convenient to have a universal fitting system in contrast to Onspot's customized fit**

! No, the customized fit is a prerequisite for functional reliability and longevity. Onspot provides excellent function and low total cost of ownership.

**? Onspot is not effective in reverse**

! Wrong. When correctly installed, Onspot is fully effective forward and in reverse.

## ? With Onspot you can only drive slowly

! The driving speed is limited to 35mph (50 km/h) when chains are in use. This is for security reasons when using tire chains on public roads. It has nothing to do with the system as such.

## ? The Onspot chains bite only in one direction

! Wrong. They are fully effective in both directions.

## ? Onspots cannot be greased and will wear out quicker

! Wrong. On the contrary, Onspot offers different greasing options depending on the Onspot model.

## ? Onspot chain wheel cannot be greased

! Almost correct. The sealed and totally maintenance-free bearings are lubricated for life – a most convenient and reliable solution. Yet, you *could* disassemble the bearings and grease them, but why would you?

## ? You cannot replace a single Onspot chain strand

! Correct. For reliability and safety reasons the entire chain wheel is replaced. According to Onspot's safety philosophy, the cost saving by replacing a single strand doesn't outbalance the value of having a completely safe and homogenously worn chain wheel.

**Just flip the switch**

Onspot is the original and unparalleled automatic tire chains. The ingeniously simple and reliable system is perfectly fitted to your vehicle by customized brackets. The system is engaged and disengaged just by flipping a switch – you get traction while staying safe in the cab.

Onspot is sold worldwide for use on commercial vehicles, rescue vehicles, and buses to increase safety and convenience while reducing the loss of time due to slippery road conditions.