Turf Talk

CRYOGENIC VERSUS AMBIENT RUBBER

VOLUME 2

FieldTurf Tarkett

UNITED IN SPORT

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CRYOGENIC VERSUS AMBIENT RUBBER vol. 2

There are a several factors which contribute to the safety and performance characteristics of an artificial turf field. None of which are more important than the composition and quality of the infill. The infill is the athlete's source for cutting, planting, shock absorption and energy restitution. While the majority of the competition uses a loose and spongy all ambient rubber system, FieldTurf only incorporates a patented layered infill system that is comprised of silica sand and premium cryogenic rubber.

When it comes to a field's infill, FieldTurf goes to great lengths to guarantee its customers that nothing but the highest quality materials are used in order to assure consistent and reliable results. Cryogenic rubber is the highest and rarest grade of rubber granule. When you grind up a rubber tire approximately only 4% of that tire is suitable for cryogenic rubber processing while the remaining 96% is set aside for ambient processing. Due to the limited supply of cryogenic rubber the product is not easily obtainable. FieldTurf however, has gone to great lengths in order to secure large quantities of this rare, high quality product.

During the grinding phase ambient rubber is simply processed through a high powered rubber cracker mill. The result is a jagged inconsistent rubber granule which has the tendency to degrade rapidly over time. When used as an infill component, ambient rubber has the propensity to float and scatter as the air bubbles located within the rubber facilitate simple infill migration. The process of grinding the rubber is referred to as ambient because all size reduction steps take place at or near ambient temperatures, i.e. no cooling is applied to make the rubber brittle before grinding.

The process of creating a cryogenic rubber granule requires a substantial amount of time and technical manipulation. First, a rubber tire is grinded through a mill. Then the smooth clean particles are separated from the dirty jagged ambient ones. Once separated, the rubber is then frozen to a temperature of below –80 degrees Celsius (-112 degrees Fahrenheit). Cryogenically freezing the rubber allows for a cleaner more glass-like partition of the rubber. While the rubber is still frozen it is placed through a specialized mill which then carefully and cleanly cuts the frozen rubber into small, smooth and rounded particles. The cryogenic freezing process also helps to prevent the formation of any loose or stray rubber strands which reduce the overall quality of the rubber.

When it comes to the topic of drainage, Cryogenic rubber works to promote effective and consistent drainage by eliminating the potential for migration caused by water. The cryogenic rubber's smooth and rounded shape facilitates a consistent flow of water through the infill without raising and displacing any rubber. The loose and jagged rubber strands found in ambient rubber make it highly vulnerable to migration and floatation caused by the air bubbles in water. Even though the specific gravity of ground rubber is about 1.14 (slightly heavier than water) if there are enough air bubbles attached to the rubber, it will float. As the ambient system drains, the rubber floats and is easily dispersed. As a result, empty pockets may form which can be extremely hazardous to the athlete.

Figure 1: Ambient rubber (on the left) compared to Cryogenic rubber (on the right) as it responds to water

Figure 1 more clearly depicts the difference and discrepancy between ambient and cryogenic rubber as it reacts to water. The glass on the left consists of ambient rubber while the glass on the right consists of cryogenic rubber. When mixed with water the ambient rubber

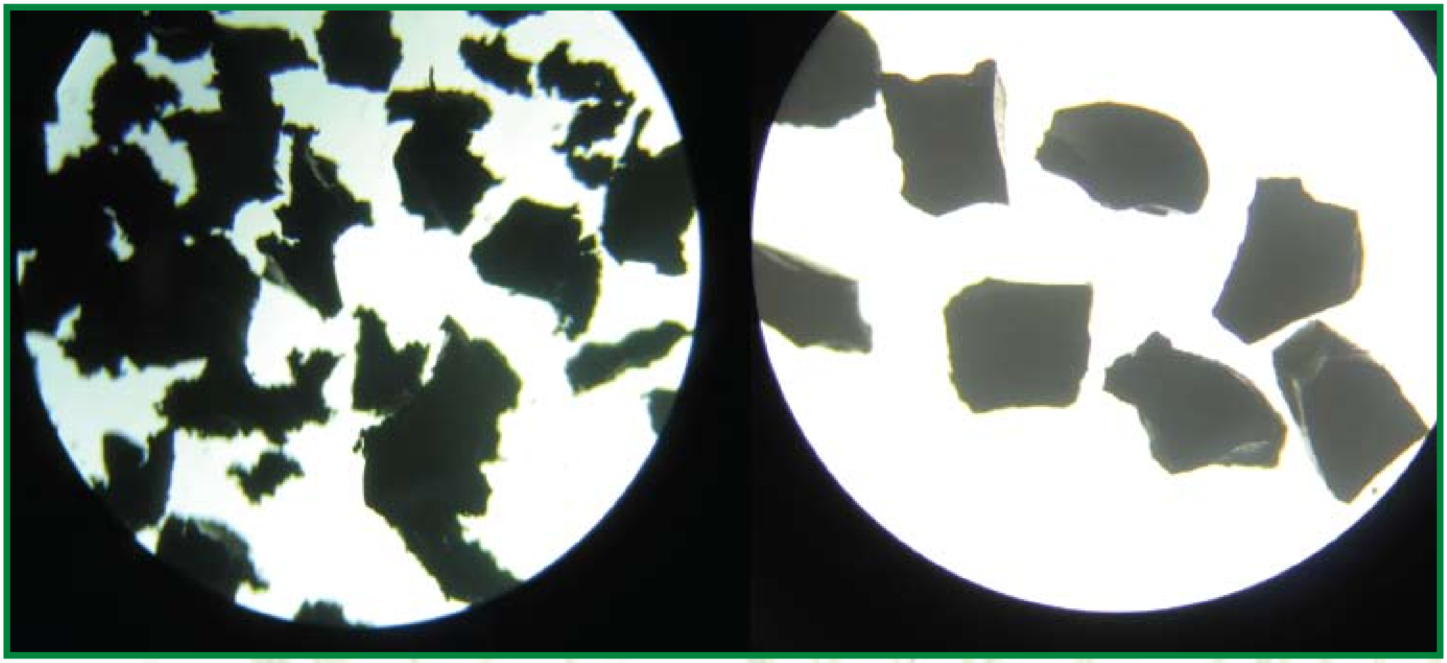

Figure 2: On the left - Ambient rubber. On the right - Cryogenic rubber

proved to be highly susceptible to migration as it floated easily to the surface of the glass. The cryogenic rubber on the other hand, was able to maintain its composure and position even in the presence of water.

Another benefit of cryogenic rubber revolves around its ability to effectively combine with silica sand. Sand is an integral component to the infill mix as it facilitates proper energy restitution. Without sand the infill tends to be overly soft to the point where excessive amounts of energy are needlessly expended. Using the analogy of running on the beach, an all rubber system can be compared to running in the loose and tiring soft sand, where as FieldTurf's sand and cryogenic rubber system can be compared to running along the shore line. The round and consistent shape of the cryogenic rubber assures that the silica sand and cryogenic rubber synthesize in a way that promotes consistency within the infill. By essentially playing off one another, the silica sand and cryogenic rubber come together to form a solid bond. It is that bond which holds the field's fibers firmly in place while offering a safe cushion for the athlete's body, joints and muscles. Ambient rubber's largely inconsistent size does not allow it to smoothly combine with sand. As a result, the sand and rubber which may be situated within the field can easily shift and disperse when played on.

When it comes to cleanliness and safety FieldTurf doesn't take chances, which is why FieldTurf fields are only installed with cryogenic rubber. There is a substantial difference in the cleanliness levels of cryogenic rubber versus ambient rubber. Ambient rubber is mass produced and doesn't require a great deal of manipulation to create. As a result the granules of ambient rubber which have been torn and shredded from a rubber tire contain many particles besides rubber. While cryogenic rubber consists of rounded, smooth pieces of rubber, ambient rubber contains traces of dirt, steel and other metals which were not removed in the grinding process.

The following images are of ambient and cryogenic rubber as seen through a microscope. As you can see in Figure 2, the ambient rubber is dirty with jagged edges that facilitate infill migration while the cryogenic rubber is smooth and rounded.

It is clear that a significant difference exists between ambient and cryogenic rubber. The cryogenic freezing process manipulates the rubber in order to produce a clean, round, consistent and non abrasive rubber granule which doesn't float or shift when played on. Ambient rubber is dirtier and jagged. It often contains traces of unwanted metal and has the tendency to float when mixed with water or air. As a result, fields that incorporate an ambient rubber infill often tend to be less consistent and are more likely to experience field deterioration and infill migration than fields installed with cryogenic rubber.

Figure 3: Ambient rubber infill migration towards the extremity of this all rubber field.

Figure 4: The FieldTurf at Dick Bivins Stadium is 10 years old! It consists of a Cryogenic rubber and silica sand layered infill. Even after 10 years there exists no signs of infill migration!

Characteristics of Rubber Infill

Parameter	Ambient Rubber	Cryogenic Rubber
Operating Temperature	Ambient, max. 120° C	Below - 80° C
Size Reduction Principle	Cutting, tearing, shearing	Braking cryogenically embrittled rubber pieces
Particle Morphology	Spongy and rough, high specific surface	Even and smooth, low specific surface
Particle Size Distribution	Relatively narrow particle size distribution, only limited size reduction per grinding step	Wide particle size distribution (ranging 10 mm to 0.2 mm) in just one processing step
Maintenance cost	Higher	Lower
Electricity Consumption	Higher	Lower
LN2 Consumption	N/A	0.5 – 1.0 kgLN2 per kg tire input