



Attwood Equestrian Surfaces Inc.

Technical Presentation



Company History

- Founded by Nick Attwood in 1992
- Nick was previously R&D Scientist for En Tout Cas, first synthetic equestrian surface company
- Over 400 facilities installed, predominantly in the U.S.A.
- Customers include many top-drawer competitors and trainers
- Unrivalled focus on science & innovation, and pre/after-sale service



Products

- **Pinnacle™**
 - High quality silica sand and fibers coated with proprietary polymer
 - All premium (not recycled or re-used) materials so composition tightly controlled & known
 - All materials completely safe. Does not contain tyre scrap or PVC wire insulation which have known toxicological issues (see later)
 - Properties do not change depending on weather
 - Dust-free & does not require watering
 - **Green version available**



Products

- TerraNova

- Polymer-coated silica sand and fibre
- State-of-the-art polymer technology
- Economical
- Superb cushioning and grip
- Properties that change little with temperature
- Dust-free & does not require watering
- Ideal for indoor/covered use

TerraNova
High Performance, Affordable Footing for Equestrian Athletes



Products

- Sand Blend

- Blend of high quality silica sand with polyester fibers and felt (GGT or Eurotex®)
- Moisture within footing, combined with fibers provides cohesion
- Very versatile ride depending on moisture level and grooming
- Resists freezing
- Additive helps to prevent drying out
- Very economic & competitively priced

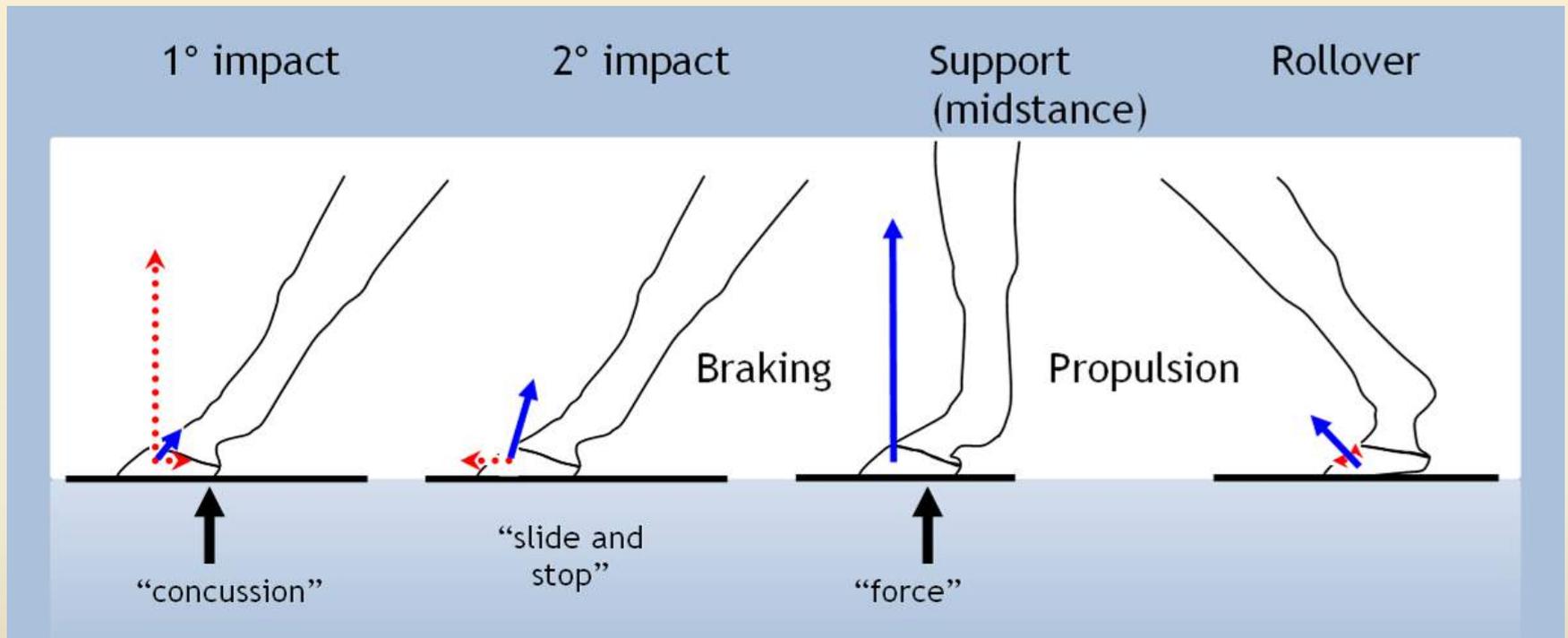


Requirements of footing

- High shock absorption/low concussion (1° impact)
- Optimum shear strength (2° impact & roll-over)
- Optimum rebound (midstance)
- Properties maintained for all temperatures
- Properties maintained over lifetime



Phases of stance during galloping



Peterson et al 2012

FEI Research

FEI is commissioning research to determine important properties of surface & what values these should be. They hope to end up with a 'specification of properties' for an equestrian surface. Properties suggested so far:

- **Impact firmness**
 - The shock experienced by the horse & rider when hoof contacts surface
- **Grip**
 - How much the hoof slides during landing, turning & pushing off
- **Cushioning**
 - Level of support vs level of 'give'
- **Uniformity**
 - Regularity across the whole surface
- **Responsiveness**
 - How springy the surface feels
- **Consistency over time**
 - How much the surface changes with time & use



Requirements of footing cont.

- Dust free
- Minimum maintenance
- Long life
- Safe ingredients



Attwood's Scientific Approach

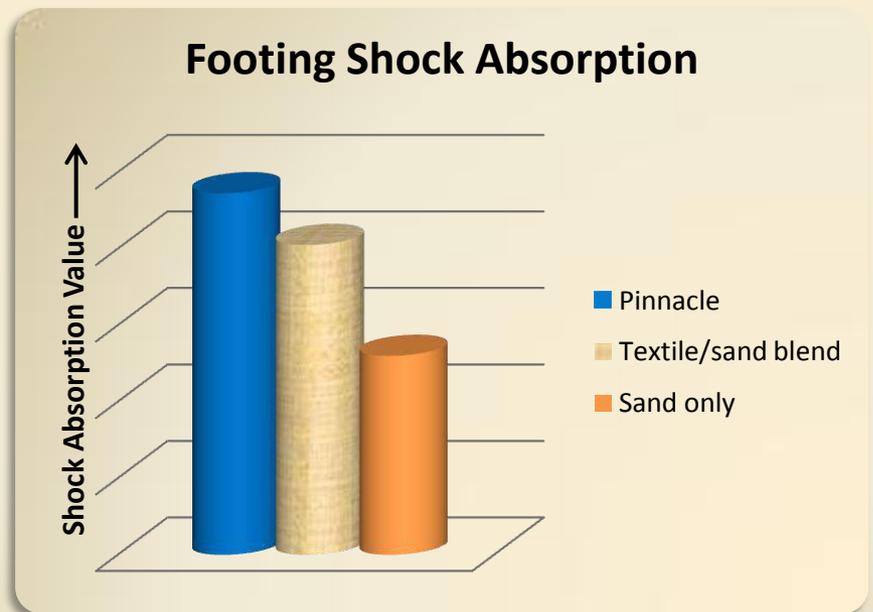
- We believe we have industry-leading scientific understanding of the property – performance profile of synthetic equestrian surfaces
- Check out the following pages and see if our competitors understand as much about the science of synthetic surfaces as we do!
- And remember, the following is just the information we're prepared to share publically – we know a whole lot more than this!



Shock Absorption

Impact Firmness & Cushioning

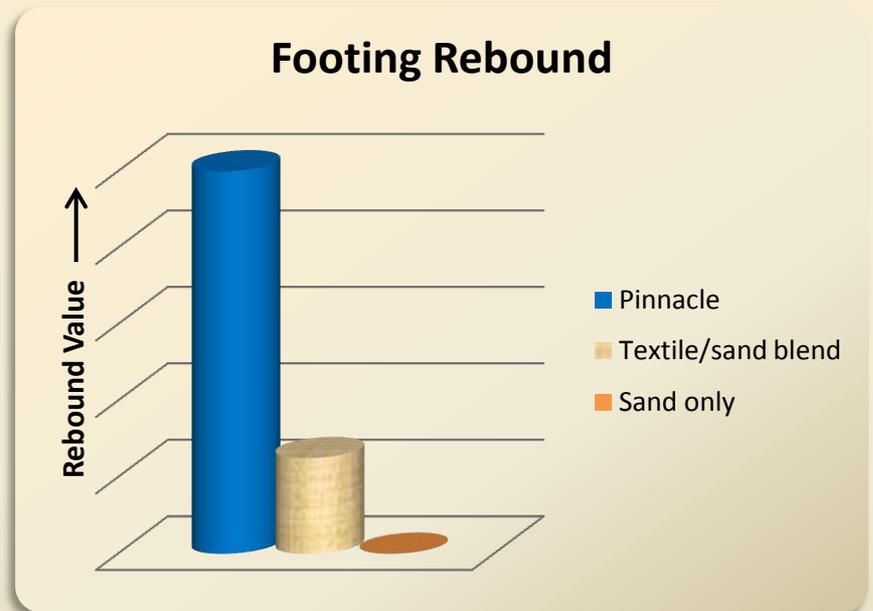
- Wet sand has low shock absorption/high concussion
- Inclusion of fibres & felt (GGT™) in sand improves shock absorption
- Pinnacle™ product has highest shock absorption/lowest concussion



Data on file

Rebound Responsiveness

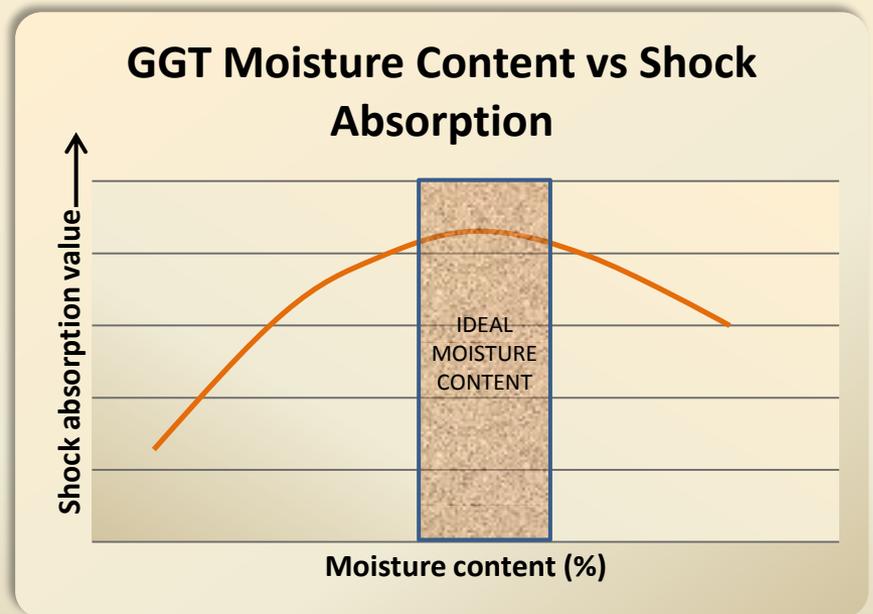
- Wet sand has no rebound
- Inclusion of fibers & felt (GGT™) in Sand Blend improves rebound
- Viscoelastic Pinnacle™ has highest rebound



Data on file

Variation of GGT™ sand blend shock absorption with moisture content

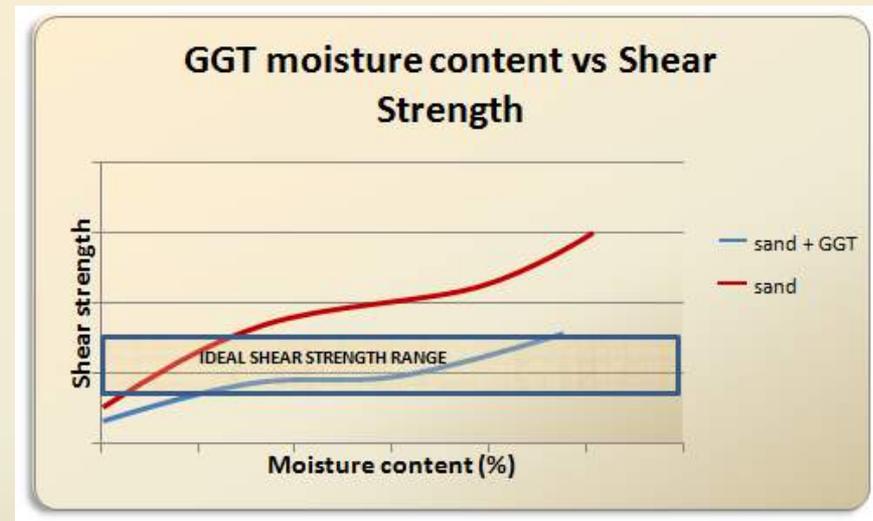
- Ideal shock absorption requires optimum moisture content



Data on file

Variation of GGT™ Sand Blend Shear Strength (Grip) with moisture content

- GGT™ sand blend remains in optimum shear strength zone over wide range of moisture
- Sand-only in optimum shear strength zone only over a narrow range of moisture content



Data on file

Warning! Not all Additives are Equal

- It is the free fibres that provide cohesion & cushioning to a footing
- Many additives on the market contain little, if any fibres, and are full of cheap 'filler' like tyre scrap or PVC wire sleeve
- The pictures are of commercially available additives - each picture contains the *same* amount of additive – but they look different
- That is because they contain different proportions of cheap filler – **in fact to get the same level of footing cohesion you would need FOUR times the amount of Additive 1 as Additive 3!**
- So when you buy additive, make sure you ask what proportion is fibres



Additive 1



Additive 2



Additive 3

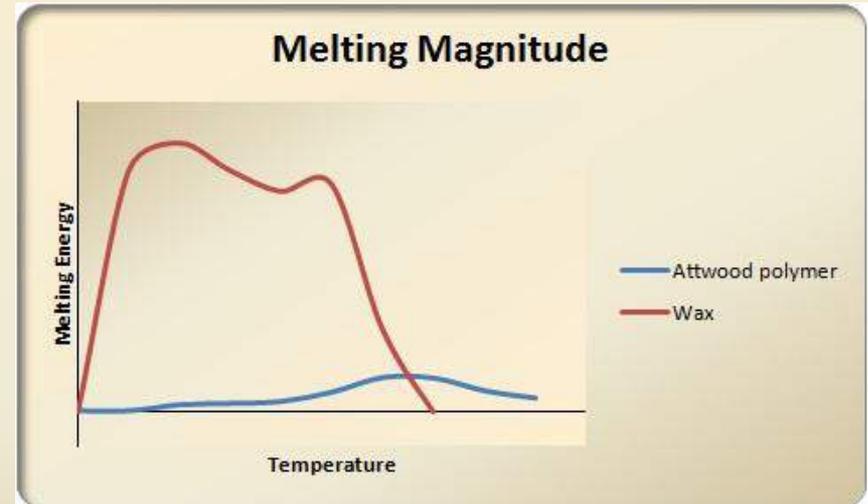
Sand/Additive Blend Footing Summary

- Sand/additive blend relies partly on water for footing cohesion
- Correct level of water vital for optimum footing performance – level should be maintained within specification limits
- Correct water level different for different sands & additives
- Additive important – fibres for cohesion and shock absorption
- Correct level of additive important for optimum footing performance
- Attwood is an approved installer of premium GGT™ additive



Melting Behaviour of Wax vs Pinnacle Polymer

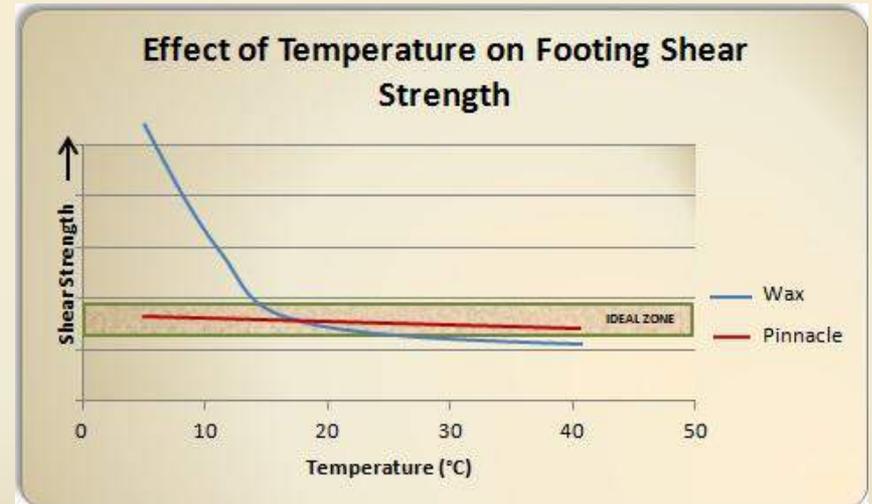
- Wax – think of a candle before and after lighting – it melts!
- Wax used in footing turns from solid to liquid in hot weather. Footing characteristics change dramatically
- Polymer used in Pinnacle™ does not melt – footing characteristics barely change with temperature
- Graph shows melting of coating – area under curve a measure of amount of melting



Data on file

Variation of Pinnacle™ and Wax Footing Shear Strength with Temperature

- Shear strength of Pinnacle™ varies very little over typical temperature range
- Wax-based footing shear strength varies greatly over same temperature range



Data on file

Footing Longevity

Footing sample is subjected to accelerated wear test that simulates long term outside use

Wax-based



Separated sand containing no wax coating

Pinnacle™



Footing unchanged

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Pinnacle™ comparison with Wax-based footings

Pinnacle™ footing

- Visco-elastic polymer coating gives footing unrivalled shock absorbency and rebound
- Will not significantly harden when cold, nor melt when hot
- No tendency for polymer coating to 'strip' from sand & fibers
- Requires no watering, even in the hottest climates
- Dust free

Wax-based footings

- Wax is not visco-elastic - poorer shock absorbency & rebound
- Will significantly harden when cold, and melt when hot
- Tendency for wax coating to 'strip' from sand & fibers/additives
- Requires watering in hot climates to cool down the surface
- Dust free (usually!)

Pinnacle or Sand Blend

Pinnacle™ Footing

- Does not require watering
- Superior shock absorption & rebound
- More expensive to install
- Cheaper maintenance

Sand blend

- Requires watering
- Correct level of water in footing vital to properties
- Good shock absorption & rebound
- Cheaper to install
- More expensive maintenance

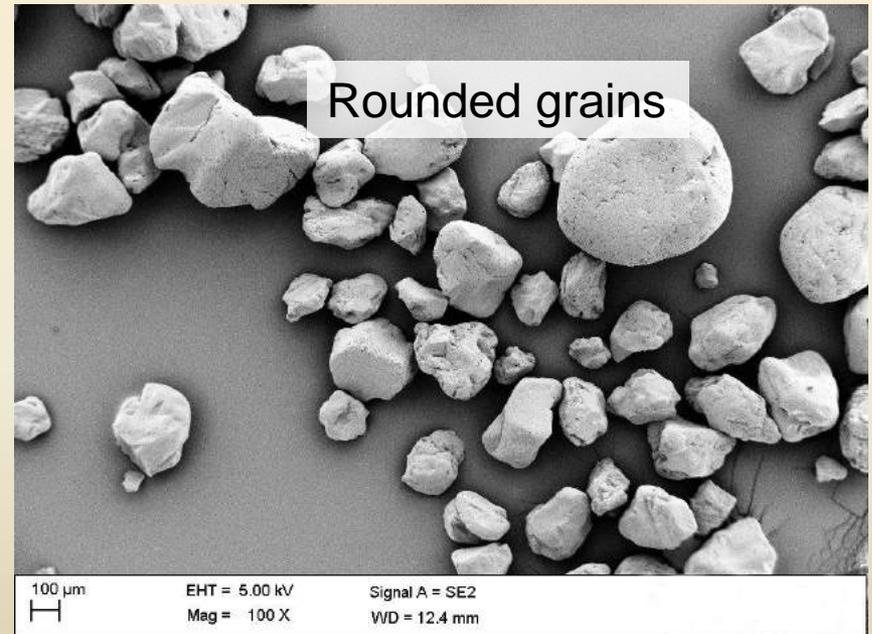
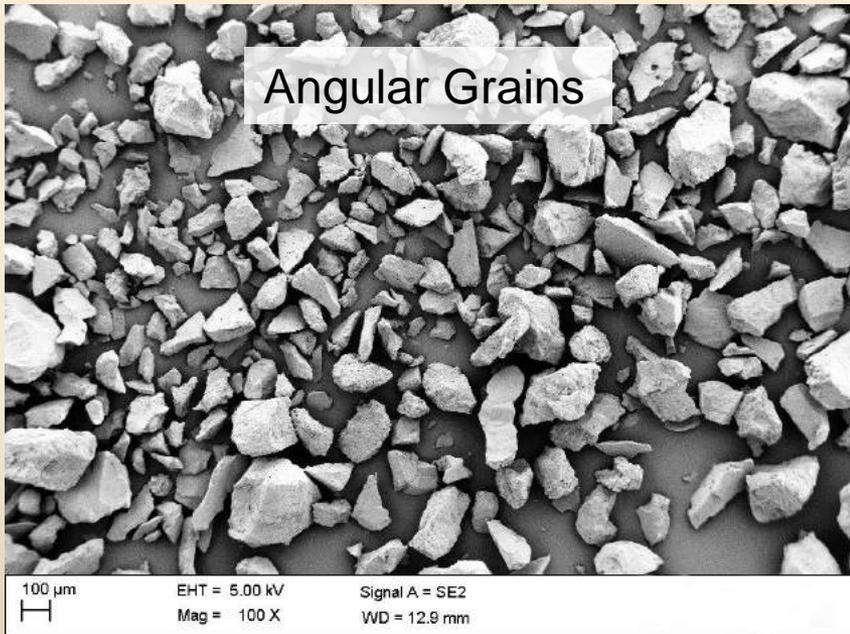
Not all sands are equal.....

Particle shape

Mineralogy – especially % silica

Particle size distribution

Colour



Sand Properties

- Sand particle shape & size affects cohesion
- Fine particles can lead to dust
- Higher % silica = longer lasting
- Lighter colour = cooler surface



Equestrian Footing and Health Safety & Environment

- You might think that health, safety & environment (HS&E) considerations do not apply to equestrian footing
- You'd be wrong.....many footing types contain recycled materials such as waste automobile tire or electrical cable insulation which can have HS&E problems.....



Recycled Tire Facts

- Recycled tire material contains 25% – 33% oil
- Oils used in tires contain polyaromatic hydrocarbons (PAHs) that are highly hazardous (carcinogenic, teratogenic, bioaccumulating)
- EHHI report (2007) found volatile carcinogenic compounds emitted into the air, and leached into the groundwater from recycled tire products.
- Metals also found in recycled tire (zinc, selenium, lead, cadmium)



Plasticisers in PVC wire insulation



- Certain phthalate plasticisers contained in PVC wire insulation are classified by the EU as Class 1B reproductive agents
- Several of these are being banned by 2015 unless special authorisation is obtained
- The U.S. FDA has warned of increased health risks to patients exposed to certain PVC plasticisers
- Japanese car manufacturers have ceased the use of PVC in car interiors

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