Surface Design and Maintenance

Start with the Horse

Goal: Reduce Musculoskeletal Disease
Consistency & Optimized Biomechanics
Key to Surface Safety: Good vs. Bad Years

- Injury rates on synthetic tracks are consistently lower
  *Insensitive to Moisture*

- Dirt tracks vary between years
  - Same people
  - Same methods

*Every year a good year*

*Regardless of weather*
Consistency: Maintenance Quality System

1. Design documentation
2. Pre-meet: ready for racing
   - Biomechanical Testing
   - Ground Penetrating Radar
3. Every day
   - Weather station
   - Maintenance documentation
   - Measure moisture and cushion
Daily Measures: Automate & Quality

- Weather station, with distributed sensors
- New measurement tool: moisture and cushion in one step
- Automated moisture and equipment tracking
• What do the horse and rider feel: 
  **Performance**

• What matters to the *musculo-skeletal* system: 
  **Safety**

• THE FIVE FUNCTIONAL PROPERTIES: 
  Characterize how the footing affects the horse: 
  **Cushioning, Firmness, Grip, Responsiveness and Consistency**

Biomechanics: Phases of Gait

• Stance phase:
  – Initial ground contact
    Heel first contacts
    occur more frequent:
    high-speed
  – Secondary impact
    High speed, low load
  – Loading phase
    Low speed, high load
  – Breakover.

• Flight

http://theorythursday.com/images/stride_phases.jpg
Initial Loading May Be Critical

- Initial ground contact: Need a surface to slow the hoof
- Secondary Impact -- Rotation of fetlock: Need a surface that will support the leg and return energy
Surfaces Have Adapted

Harrowed Top Cushion Slows the Hoof

Compacted Lower Layer Supports Hoof and Provides Traction

The same layers that a turf course provides naturally

Reduce Turf Variability
Turf, Dirt and Synthetic are Different!

Need to develop a surface with consistency of synthetics.

Biomechanics of turf and dirt.