Cost of Ownership from Turf to Dirt
STMA 2020
“Technological Change”

Sections:
- History / Story / Timeline
- Construction: The Good, The Bad, & the Ugly. 1 shot to get it right
- Artificial and the allurement of it. Pros & Cons
- Design: Thinking outside the Box
- Material Selection: Making sense of long-term Cost of Ownership
  - What is the most sustainable viable solution moving forward for you?
  - If a total remove and replace is not feasible what are my options?
  - Packaged Products: know what’s in the bag
- Questions / Discussion

My Story / History and Experience
- Groundskeeping 22 years
- Contractor / Renovating Fields at all levels from IA to PA to SoCal
- Distribution: A new outlook working with SFM’s, Contractors, Architects
- Working for supplier / manufacturer gaining new perspective
- Field Design
  - Interesting and considered majoring in Landscape Architecture
  - Worked with many different architects from different angles
- Field Builders / Contractors
  - Partnered with as Groundskeeper
  - Worked as one
  - Partnered with from Distribution side
  - Now working with from Manufacturers side

The Astro Dome: Technological Change?
- First Synthetic Field 1966
- Appeared state of the art
- Marketed well
- Pride taken to clean the rag
- Over the next 20 years this carpet was installed in many MLB, NFL, and D1 fields
- During this same period golf gained momentum w/ engineered soils

USGA Engineered and introduced the USGA spec for golf greens in 1960

USGA vs Push-up Green

<table>
<thead>
<tr>
<th>USGA</th>
<th>Push-up Green</th>
</tr>
</thead>
<tbody>
<tr>
<td>Turf grass</td>
<td>Turf grass</td>
</tr>
<tr>
<td>Sand</td>
<td>Sand</td>
</tr>
<tr>
<td>Depth: 2 cm</td>
<td>Depth: 2 cm</td>
</tr>
<tr>
<td>Soil: engineered</td>
<td>Soil: standard</td>
</tr>
</tbody>
</table>

1/10/2020
USGA Green Vs Push-up Green

Push-up Green: Local / Native material piled up to plant putting green

- Different across country
- Can vary green to green on 1 golf course
- Soft after rain
- More worm castings
- More weed seed in rootzone
- Inconsistent mgt green to green
- Inconsistent ball roll and bounce in different weather conditions

Engineered Rootzone based on soil science

- Enhanced Performance
- Structural Stability when wet
- Consistent despite weather
- Predictable
- More tolerant to wear & tear
- More resistant to compaction
- Play more rounds of Golf
- Can be duplicated indefinitely

NFL and MLB prior to engineered soils

Thanksgiving Mud Bowl – 1968
Detroit Lions vs Philadelphia Eagles

Spring training in Florida 1960's

1990-late 90's

- Turfgrass Mgt Clemson University 1990-1994
- Sports Turf not a word in my class
- Valuable experience golf course / turf plots
- Sports Field internships were tough to come by
- Worked 1 summer Greenville Braves
- 1995 First Head job on new field in Sioux City
  - Sub Par grade, poor transition from turf to dirt, Ag lime infield material
- 1996 Head job Iowa Cubs AAA
  - 50+ year old field built on dump

Late 90's - 2005ish USGA Rootzones

Replaced native soil fields & carpet

- Pitt, Cinc, St. Louis, KC, Philly, Seattle, Houston, Minnesota & DC converted to 100% Natural
- This occurred at a rather quick pace with much success
- MLB and NFL shifted back to predominantly natural surfaces
  - The rug became too hard
  - USGA rootzones caught on

Many good natural fields from 2000-present

Innovation of the first engineered infield soil introduced to our industry in 2004

- Similar benefits for the baseball industry as engineered soils provided for golf
- 2005 introduced to MLB
- Less Migration / Disruption
- Structurally stable when wet
- Little if any dust
- More resilient
- Predictable / Consistent
Loose & Shifty native / local material vs. Resilient engineered infield material

Engineered infield material provides stability in adverse weather conditions
- Excellent traction
- Playability maintained
- Consistency maintained
- Resiliency maintained
- Most importantly SAFE

2006ish to present:
- MLB continued the trend to natural
- NFL shifted back to artificial with new infill systems
- In 2015, (MLB) 27 out of 30 teams had an engineered USGA Rootzone
- By 2018, (MLB) 25 out of 30 teams had an engineered infield profile
- In 2020 there will be 25 all-natural MLB fields and 5 artificial
  - 5 MLB teams with artificial have hybrid system with natural skin
  - Indoors, limited sunlight, massive amount of events
  - Maintain >70% of game played on natural surface
  - Corporate dollars?

Construction: The Good, The Bad, and The Ugly...
- PNC Park
  - Plan provided by architect had been implemented in past
  - Experienced contractor selected
  - Experienced consultant hired to provide step by step project mgt
  - I was fortunate to learn the process avoiding the school of hard knocks

Sections:
- History / Story / Timeline
- Construction: The Good, The Bad, & the Ugly. 1 shot to get it right
- Artificial and the allurement of it. Pros & Cons
- Design: Thinking outside the Box
- Material Selection: Making sense of long-term Cost of Ownership
  - What is the most sustainable viable solution moving forward for you?
  - If a total remove and replace is not feasible what are my options?
- Packaged Products: know what's in the bag
- Questions / Discussion
I was not aware of the infield issues I had at the time

- Required grading 2-3x/year
- Chipping & Shiftiness was norm
- Sloppy / Mucky after rain
  - Required more tarping
  - Lots of conditioner used
- Small window for ideal moisture
- Required frequent rolling
  - Visqueen required at times
  - Results were not long term

Managing my 2nd opportunity for a new field build

- Same design cut and paste from PNC w/ exception of turf type
- While not custom design I was familiar with plans & spec
- Low bid contractor selected
- I was capable to properly manage the project based on experience at PNC

Why verify subgrade for proper compaction?

- 4” column of engineered infield mix should have equated to 225 tons
- By the time project finished 350 tons of mix was installed
- Was not close to tolerance
- Verifying proper compaction and level of subgrade makes sense for all parties involved

Why Verify proper infield Subgrade?

- Things can get buried quickly
- Inferior pipe installed not per spec
- Going right the first time would have saved the contractor time & $5
- Was this due to a mistake or a blatant decision to increase margin?
- Not for me to judge

Project Mgt
How does this happen?

Perfect time to check and adjust irrigation

Pressure Test
Locator Tape in drainage lines

Easy to check for positive flow

Test rootzone in random 500 ton stockpiles

Price to pay for inferior rootzone.
Catch it now or pay later
- Contractor put rubber in center of mound
- Entire mound had to be shifted
- Good addressed before sodding
- Just 1 example of inexperienced baseball field builder

Rectangle Fields vs Baseball

2000 feet of edge flush w/ no contamination

Verify rootzone subgrade: 400 tons short; 1 week delay
Premium Packing clay wasted in subgrade = additional $  

Sand Based sod should be required for USGA Rootzone  
- Why plug up the largest investment of a project  
- Restricts vertical drainage into engineered rootzone  
- Today there are many options for high quality sand-based sod compatible with USGA Rootzones  
- Require a sod sample and testing

Minimum 3 accountability visits to sod farm

The Grow-In period can be a painful process without proper experience or care

Inferior Craftsmanship can lead to major inconvenience
Substandard craftsmanship comes w/ high price

Implementing best practices for install does not cost more or take more time

Design flaws can rear ugly head in year 1

MLB Infield

• 2006
• Local / Native source
• Proper testing not performed or required on this job
• Pebbles and high silt

Common practice for selecting contractor has simply been low bid. What is the price to pay?

• Substandard craftsmanship due to:
  • Incompetency / Lack of experience
  • Rectangle field experience vs baseball
  • Artificial experience vs natural
  • Blatantly cutting corners
  • Improper or no project management
  • Best practices not implemented during install and grow in period
  • End user inherits additional costs and burden moving forward

Sections:

• History / Story / Timeline
• Construction: The Good, The Bad, & the Ugly. 1 shot to get it right
• Artificial and the allurement of it. Pros & Cons
• Design: Thinking outside the Box
• Material Selection: Making sense of long-term Cost of Ownership
  • What is the most sustainable viable solution moving forward for you?
  • If a total remove and replace is not feasible what are my options?
• Packaged Products: know what’s in the bag
• Questions / Discussion
Artificial: Pretty Picture
Proposed to solve all problems including playability in snow/rain

Getting lost in trade show can lead to carpet

- Natural solution involves due diligence to properly assemble
- Artificial solution offers 1 stop shop to properly assemble
- 90's artificial very little if any presence at trade shows
- Today there is a large presence at trade shows

College Field lost in time. Where to go from here?

Baseball

Softball

Sustainable?

- Some facts from the Courier Times newspaper article
- $60/ton for disposal fees in landfill
- This has led to dumping on private land
- Not easy to recycle like natural field when doing a reno

Factor in surface Temps

- Twitter: @erinbwilder
- Photo 1 – Current Air Temp - 87
- Photo 2 – Asphalt - 144.2
- Photo 3 – Artificial Grass - 154.4
- Photo 4 – Natural Grass - 94.6
- June 2019
Turfgrass Producers International (TPI) Case Study. www.TurfGrassSod.org

Sections:
- History / Story / Timeline
- Construction: The Good, The Bad, & the Ugly. 1 shot to get it right
- Artificial and the allurement of it. Pros & Cons
- Design: Thinking outside the Box
- Material Selection: Making sense of long-term Cost of Ownership
- What is the most sustainable viable solution moving forward for you?
- If a total remove and replace is not feasible what are my options?
- Packaged Products: know what’s in the bag
- Questions / Discussion

Design: What has been common practice?
- High Costs
- Cut and Paste (ex. Pirates to Padres)
- Written up by folks with little if any hands on SFM experience
- Custom design is expected for building not field
- Inferior materials somehow make their way into project
  - Value Engineering: what this really means is scope reduction or value reduction
  - Contractors putting in what they want in the end
  - Inferior rootzone or depth

Seems like common sense to us.
Water should move away from field

Popular does not mean the right choice.
Hybrid System with agility training areas

Today Design can be sourced out with:

- Lower Costs
- Drawn up and written from a SFM's and coaches' perspective
- Involves owner/end users input to take ownership
- Offers different options with specific facility/end user in mind
- Provides options for 100% natural and hybrid systems/combos
- Implements certified installation by CSFB/CSM with experience
- Comes with more valid/pertinent warranties and guarantees
- Implements proper project management
- Requires grow in period monitored by experienced representatives
- Provides hands on and classroom training with maintenance manual
- Clearly lays out best practices for maintenance moving forward with costs

What decision makers determine outcome?

Sections:

- History/Story/Timeline
- Construction: The Good, The Bad, & the Ugly. 1 shot to get it right
- Artificial and the allurement of it. Pros & Cons
- Design: Thinking outside the Box
- Material Selection: Making sense of long-term Cost of Ownership
  - What is the most sustainable viable solution moving forward for you?
  - If a total remove and replace is not feasible what are my options?
- Questions/Discussion

Material Options and Estimates

<table>
<thead>
<tr>
<th>Synthetic Surface</th>
<th>Natural Surface</th>
</tr>
</thead>
<tbody>
<tr>
<td>• $10-$22 / sq ft to install</td>
<td>• $5 - $10 / sq ft to install</td>
</tr>
<tr>
<td>• Requires less maintenance</td>
<td>• Requires more maintenance</td>
</tr>
<tr>
<td>• Easier to predict outcome</td>
<td>• Tougher to predict outcome</td>
</tr>
<tr>
<td>• Standard build / design</td>
<td>• Many options for build / design</td>
</tr>
<tr>
<td>• Comes with warranty</td>
<td>• leaves end user confused</td>
</tr>
<tr>
<td>• Working with 1 individual from start to finish of project</td>
<td>• Can be intimidating</td>
</tr>
<tr>
<td>• Other failures raise red flag</td>
<td>• No standard build design</td>
</tr>
</tbody>
</table>

Material Selection

- 100% Artificial cost range $10-$22 / sq ft depending on infill
- Makes sense for inner city fields with 5 sports, JV, Men’s, Band, events
- Hybrid System (all synthetic turf with natural dirt skinned areas)
- >70% of the game played on natural surface the way it was meant to be
- Hybrid System with natural grass and dirt in fair with artificial in foul
  - Natural grass and dirt with carpet in букеты and bionics
  - Utilise carpet for training agility areas
- 100% Natural Playing Field (total cost to install $5 - $10 / sq ft)
- Infield Material Selection (engineered vs native)
  - Native material costs .75 cents - $1.50 / sq ft for 4” columns
  - Engineered material costs $1.50 - $3.50 / sq ft to for 4” columns
What is the sustainable and viable long term solution?

**Artificial**
- Initial investment $1.2 million
- Save $ on maintenance moving forward
- Spot repair required for Baseball
- 10 years later $400K for new rug
- Cost of greater injury risk?

**Natural**
- Initial investment $750K
- $450K savings = $45K/year to for materials and supplies/maintenance
- Proper Design, Certified Install Project Mgt., Grow in, and Best practices implemented:
  - 10 years later investment still in place
  - Save $400K to replace surface

You will lose when attempting to compare Apples to Oranges. Be well informed to clearly differentiate.

**Native / Local Harvested Mixes**
- Migration issues
- Slower recover after rain events
- Structural instability
- Rapid Lip Build up
- Higher maintenance
- Less predictable

**Engineered Infield Material**
- A soil that stays in place
- Structurally stable when wet
- Little if any dust
- Less Maintenance
- Higher performance
- More predictable

Cost of ownership of Native @ .75 cents - $1.50 / sq ft vs Engineered @ $1.50 - $3.50 / sq ft for new infield profile.

- You have invested > $5 / sq ft for the rest of your field
- Don’t cut yourself short on just 10% total sq ft (>70% game played)
- Catch up with the times and say goodbyes to the push up green
- More forgiving and resilient
- Less migration
- More consistent
- Increase the value of your facility to host more games
- Give an edge for recruiting
- Re-entry faster after rain; play more games
- Reduce tarp pulls up to 30%

 Minor League and Division 1 Fields Following 1.5” of Rain Overnight
- Reduce man hours sunrise & sunset tarping
- Reduced life of tarp
- Significant reduction in calcined clay required to make infield playable
  - Less contamination than calcined clay
  - Keep front office staff inside selling tickets
  - Based crew morale
  - Healthier Turfgrass w/ less tarps
  - Keep edges cleaner pulling less
  - Save water: let mother nature do the job
  - Reduce hours watering turf and dirt is a sin.

A good infield skin has:

- These are the benefits of a balanced base soil.
- **Trueness**
- **Playability**
- **Raglan**
- **Control**
- **Consistency**

What are the obstacles?

- No industry standard like Golf
- Reliance on trial and error
- Limited regional harvested mixes
- Cost / ton of native vs engineered
- Underuse of Soil Testing
- Wide range of soil specs
- Comparing the cost of a flip phone to a smartphone
  - Native / Local harvested mix vs engineered soils
What makes a legitimate engineered infield mix?

• Engineered based on science to create a well-balanced soil
• Designed to create structural stability that is sustainable over time
• What aspects are factored into the process
  • Mineralogy of the Clay source
  • Sand size and shape
  • % of the specific Sand, Silt, and Clay
  • Silt to Clay Ratio
• Can be duplicated indefinitely across the Country like USGA Rootzone

Art or Science?

A belief exists that achieving good infield skin is an art.

However, a good infield skin is the result of applying the principles of soil science.

July 2019

“One of the greatest evolutions in the game of baseball that doesn’t get talked about much is the playing surface. Amazing how far infields have come in a short period of time”

-Kevin Youkilis
10 year MLB Player / All Star
2004-2013

Performance after a Game

Engineered Infield Mix

Harvested Infield Mix

Loose and Drifty when Dry

Inability to control backspin

No Bad Hops with Cleat Marks

Structural Stability after rain. Save 1 game instant ROI

Engineered Infield Mix

Harvested Infield Mix

Loose and Drifty when Dry

Inability to control backspin

No Bad Hops with Cleat Marks

Separation of native

Material plies and sheets off when it dries out. Quickly goes from too muddy and wet to hard and separating.

Improper soil structure also contributes to massive amounts of material migration

1/10/2020
Engineered Infield Mix

Harvested Infield Mix

Sections:

- History / Story / Timeline
- Construction: The Good, The Bad, & the Ugly. 1 shot to get it right
- Artificial and the allure of it. Pros & Cons
- Design: Thinking outside the Box
- Material Selection: Making sense of long-term Cost of Ownership
  - What is the most sustainable viable solution moving forward for you?
  - If a total remove and replace is not feasible what are my options?
- Packaged Products: know what's in the bag
- Questions / Discussion

Case Study - Myrtle Beach High School

Material Migration

Material Washout

Base path is low

Good for a 2 inch cap

Lots of work ahead to play after rain

Field Survey

Plateau built up over time

Result of Migration

Sampling

1. Remove Conditioners
2. Collect 10 random samples at 3 inch depth
3. Fill bucket and mix together
4. Fill a 1-qt. plastic zip bag
5. Seal bag well and send to lab for testing
Ripping off band aid should be clearly explained and communicated in early stages

Remove Lip
Remove Infield Mix

Applying engineered amendment & thorough incorporation

- Proper amendment selected based on soil science
- Evenly applied across graded surface
- Thoroughly blended into 3" depth
- Fills pore space
- Provides well balanced soil with proper structure
- Increased Stability
- Increase duration of moisture retention
Project wrapped up Nov 12th. 1.3” rain on Nov 13th
Nov 14th playable no migration

Sections:
• History / Story / Timeline
• Construction: The Good, The Bad, & the Ugly. 1 shot to get it right
• Artificial and the allurement of it. Pros & Cons
• Design: Thinking outside the Box
• Material Selection: Making sense of long-term Cost of Ownership
  • What is the most sustainable viable solution moving forward for you?
  • If a total remove and replace is not feasible what are my options?
• Questions / Discussion

Calcined Clay

Benefits of amending w/ Calcined Clay
• Increases CEC
• Increased pore space in soil profile
• Increase oxygen in soil profile
• Additional pore space combats black layer
• Promotes vertical drainage
• Permanent modified profile w/ only 3% loss of calcined in 20 years
• These benefits make sense in a rootzone not an infield

The evolution of calcined clay

New approach
• Directions for use: Evenly apply 5-7 bags per 1000 sq ft to top surface of infield. Do not till product into infield profile.
• Till into rootzones at 1 ton per 1000 sq ft at a 6” depth to relieve compaction, increase CEC, and promote vertical drainage
**How to determine what data is relevant?**

ASTM C-88
- The Sulfate Soundness test saturates the aggregate in a solution of sodium or magnesium sulfate followed by oven drying. This simulates expansion of water on freezing.
- Reports % lost to degradation of particle as if it was in rootzone
- No abrasive action

ASTM 7428 Micro-Deval Test
- The Micro Deval Test is the measure of resistance and durability of an aggregate resulting from the combination of actions including abrasion and grinding with steel balls in the presence of water.
- Reports % of product lost to degradation of the particle
- Abrasive action to simulate what particle goes through on infield surface

---

**Cost / ton calcined vs engineered amendment**

**Calcined**
- $350-$450
- Questionable results
- Been somewhat of an industry standard for 30 years

**Engineered Amendment**
- $200-$300
- Positive results
- Fairly new technological change

---

**Latest Innovations for Packing Clays**

- Highest performing packing clay now available for more end users
- No time spent in house prepping
- Allows end user without MLB staff to implement
- R.O.I. in year 1
  - Reduce hours to repair boxes and mounds
  - Reduce material needed for these areas from 5 bags to 1 or 2 bags

---

**Minimal disruption = reduced product usage & time**

---

**Delivering the Message**
Sections:

- History / Story / Timeline
- Construction: The Good, The Bad, & the Ugly. 1 shot to get it right
- Artificial and the allurement of it. Pros & Cons
- Design: Thinking outside the Box
- Material Selection: Making sense of long-term Cost of Ownership
  - What is the most sustainable viable solution moving forward for you?
  - If a total remove and replace is not feasible what are my options?
  - Packaged Products: know what’s in the bag
- Questions / Discussion