This is a compilation of the major projects that I worked on while at VF Corporation Majestic Athletic, the on-field provider for Major League Baseball. The following pages include tests of a new pant fabric, tests of jersey underarm gusset material, tests of staining patterns of red clay, tests of zippers, buttons and snaps, tests of a popular MLB clubhouse cleaning solution called Slide Out, and some preliminary ideas for a new innovative MLB uniform, and more. It is important to note that the contents of this report are my personal outlines of the projects that I worked on. All the official documents, pictures, graphs, charts, and testing samples are the property of Majestic Athletic and could not be shared.
Majestic HD Fabric Case Study

Test:
New HD Fabric vs. Current On-Field Fabric

Subject:
Phillies Triple A affiliate Lehigh Valley Iron Pigs

Points of Emphasis:
Player Feedback – Comfort, Stretch, Weight, Moisture, Heat

Chemistry – Staining patterns, Stain removal, Abrasion

Study Design:

Seven position players and three pitchers were given four pairs of Majestic brand pants over the home stand from June 8 to June 14, 2011. Two of the pants were made of the new HD polyester fabric (1 white/cardinal and 1 white/navy) while the other two pair were made of the current on-filed polyester fabric (1 white/cardinal and 1 white/navy). The HD fabric is identifiable by a “HD” waistband marking. White/cardinal was worn during the weekdays while the white/navy was worn over the weekend games. The pants are to be alternated so both fabrics get wear and tear. After the homestand the pants were assessed. Every noticeable stain and abrasion was accounted for and recorded on player specific pages. There were also four player feedback questionnaires that were returned. The player specific paper work is attached to the players pants and is being stored for later reference.
Major Conclusions

- Waistband discoloration is a waistband issue not a fabric issue
- Staining patterns are similar but not identical between the fabrics
- HD fabric is naturally darker than Regular fabric
- HD fabric uses a waffle knit design
- HD fabric disperses the coloring of the stains throughout the pants
- Current on-field fabric keeps stains isolated
- HD fabric is more susceptible to abrasions such as fraying, pilling, and holes
- HD fabric seems to have slightly less stretch
- HD fabric seems to have a thicker/heavier feel
- Results were good and second round of testing is not necessary
- Slight contradictions is player feedback when comparing the pants
Majestic Nylon Gusset Testing

Test:
Antioxidant treated material vs. Untreated material

Subject:
White and Gray Nylon Gusset Fabric

Points of Emphasis:
Aesthetics – Try to replicate the yellowing of the nylon

Chemistry – Understand what causes yellowing

Study Design:

The different nylon fabrics used were white antioxidant treated, gray antioxidant treated, white untreated, and gray untreated. The untreated fabrics are the gussets that have been yellowing. The antioxidant treated fabrics are fabrics that will be used as a possible solution to the problem and will be used in all newly cut Cool Base jerseys that use a white or gray gusset. The antioxidant is called Stabilon NY-S and is supposedly designed to prevent yellowing. The four different nylon gusset fabrics were put through a series of independent tests to see if a single catalyst could induce yellowing in the fabric. The tests performed included a UV test, Oxides of Nitrogen test, Heat test, Moisture test, Oxygenated cleaner test, Color bleach test, and a Deodorant/sweat test. Each test was run independently of one another and a separate sample size of each fabric was used for each test. Never was a sample piece of fabric exposed to more than a single test.
Major Conclusions

- In all tests the yellowing seen in the gussets was not replicated for either the treated or untreated fabrics

- Nylon gusset yellowing does not occur short term but rather over a period of time

- It is unlikely that a single catalyst is the cause of the yellowing

- Most likely a combination of UV exposure, heat exposure, and natural degradation of Oxides of Nitrogen (NO, NO2) causes the problem

- Gas fade tests done in Nashville confirm Oxides of Nitrogen are a factor in yellowing in untreated fabric

- Dark color dyes (blue, black, ext.) prevent the yellowing

- Yellowing was not an issue until stocked fabrics were moved into same building as production

- Antioxidant treated gusset performed better in Nashville testing and has shown improvement on field

- If problems continue possible fabric change to polyester or olefin
Majestic Clay Staining Tests

Test:
Polyester pants vs. Red clay

Subjects:
White and Gray Polyester Pants, Infield clays from Arizona, Milwaukee, Oakland, and San Francisco

Points of Emphasis:
Aesthetics – Try to eliminate all stains and bring pants to original color

Chemistry – Understand what red clay is, study ways of stain prevention and ways of stain removal

Study Design:

1. Research red clay in general and research specifics about the four provided infield clays

2. Take strips of polyester fabric both white and gray and stain with the four provided clays. Wash using products that supposedly best remove red clay stains. The products used include: Ammonia, Iron Out, Perfect Solutions Degreaser, Murphy Oil Soap, Oxiclean, Purex Detergent, and Slide Out. No scrubbing, brushing, or pressure washing was used.

3. Perform study design 2 using different types of sprays on fabric as stain prevention. Products used include: Scotch Guard, Heavy duty silicone spray, and Food grade silicone spray.
Major Conclusions

- Red Clay has a concentration of iron that gives it the red color

- Infield clays use moisture managing conditioners that either have an iron concentration (Pros Choice) or a dye (Turfers)

- The staining is not due to dirt but rather from the irons and the dyes in the clays

- Generic cleaners and combinations of them do not perfectly remove the staining in whites but do in grays

- After all treatments as well as regular washing the stains spread throughout the white fabric

- Slide Out removes all stains that are from clays with iron but not clay stains with dyes, nothing removed the dyed clay stains

- Out of all protective sprays the food grade silicone worked best

- Silicone spray helped prevent clay penetration but once clay ground in did not aid in removal of stain

- Difference between white and gray may have to do with wick ability differences between fabrics which allows for soil
Solution Suggestions

1. Stain Prevention

   - Double sided pant material
     - **Outside** – imbedded silicone or similar material that is hydrophobic and prevents staining
     - **Inside** – regular polyester for similar feel while wearing, and to allow stain removal treatments from the inside of the pants rather than outside

2. Stain Removal

   - Detergent that fights both iron and artificial dyes
     - **Iron** – find an acid that is not as corrosive and dangerous as Slide Out that will still dissolve iron particles
     - **Dye** – talk to Turfers and MLB teams that use dyes to understand the make up, find what can dilute and break down these dyes
     - **Combination** – ideally combine findings into a soap based cleaning detergent or pre soak liquid that will both remove stains and clean
Majestic Zipper, Snaps, and Buttons Tests

Test:
Zippers, Snaps, and Buttons vs. Slide Out

Subjects:
Slide Out, current brass zippers, current brass snap parts, current nylon snap cap, current plastic buttons, sample plastic larger tooth zipper, sample protective small tooth plastic zipper

Points of Emphasis:
Functionality – Understand why zippers are breaking and eroding

Chemistry – Understand differences in plastics and metals when it comes to Slide Out exposure

Study Design:
Expose all zippers, snaps, and buttons to both Slide Out #1 and Slide Out #2. Both Slide Outs were sprayed on all the subjects and allowed to sit for a couple of hours.
Major Conclusions

- Slide Out causes erosion of the brass zippers and snap parts
- The plastic buttons and nylon snap cap are unaffected
- It is possible that continuous exposure to Slide Out can cause zipper teeth to break and sliders to fall apart
- Tested zippers look similar to sample broken zippers provided by Texas Rangers
- Both plastic zippers showed no problems after exposure
- Large toothed plastic zipper broke when using
- Small toothed protective zipper seems very sturdy
- Trial small toothed protective plastic zippers are being used in on field pants for testing with the Rangers and Astros
Slide Out

- Slide Out #1 is a dark purple diluted sulfuric acid concentration
- Slide Out #2 is a clear diluted hydrofluoric acid concentration
- The acids work in combination to first lift the stains then dissolve them
- Both acids are hazardous and corrosive and require careful handling
- Chemicals are essentially a pretreatment detergent that dissolves iron particles from red clay stains
- The chemicals do not remove dyes
- Instructions say to spray on affected areas but clubhouses are using in excess by dumping it on the pants
- The acids have no affect on the polyester pants
- The acids do have an affect on the metal parts of the pants such as the zippers and snaps
- Equipment managers do not like to use, but it is the best product on the market for red clay stains
Polyester

Chemical Formula:

\[
\begin{array}{c}
\text{O} \\
\text{II} \\
-(\text{O-R-O-C-R-C})_n \\
\text{II} \\
\text{O}
\end{array}
\]

Properties:

- Will retain shape after stretch and shrink
- Quick drying
- Naturally hydrophobic but can be moisture wicking
- Resistant to most chemicals
- Wrinkle resistant
- Mildew resistant
- Descent UV resistance
- Descent breathability
- Hard to dye
- Once dyed very fade resistant
- Slight durability issues
- Slight odor retention issues
Nylon

Chemical Formula:

\[
\begin{array}{ccc}
& H & O \\
I & & II \\
-(N-R-N-C-R-C)_{-n} & & \\
I & & II \\
& H & O
\end{array}
\]

Properties:

- Great elasticity will stretch 33% of length
- Quick drying
- Naturally hydrophilic so good moisture wicking
- Wrinkle resistant
- Mildew resistant
- Static resistant
- Very breathable
- Easy to dye
- More durable than polyester
- Not as chemically resistant
- Will degrade with extended UV exposure
- Vulnerable to bleaching and fading
- Has a tendency to oxidized which is catalyzed by light
Olefin
(Polyethylene/ Polypropylene)

Chemical Formula:

\[
\begin{align*}
\text{H} & \quad \text{CH}_3 \quad \text{H} \\
\text{I} & \quad \text{I} & \quad \text{I} & \quad \text{I} \\
\text{-(C-C)-}_n & \quad \text{-(C-C)-}_n \\
\text{I} & \quad \text{I} & \quad \text{I} & \quad \text{I} \\
\text{H} & \quad \text{H} & \quad \text{H} & \quad \text{H}
\end{align*}
\]

Properties:

- Very moisture resistant, absorbs 1% of weight
- Extremely light weight, will float on water
- Quick drying
- Wrinkle resistant
- Mildew resistant
- Static resistant
- Abrasion resistant
- Hard to dye
- Very durable
- Chemically resistant
- UV resistant
- Resistant to bleaching and fading
- Low melting point, problems may arise with friction
Majestic Waistband Findings

Test:
Elastic Waistband vs. Natural Yellowing

Subject:
Waistbands that are used in game pants

Points of Emphasis:
Aesthetics – Try to keep waistbands as white as possible

Chemistry – Understand what causes yellowing and what prevents it

Study Design:
Test different coatings and additives on waistbands to see if they initially remove the yellowing and prevent the yellowing in the long term. No tests were run by me personally but talking to a representative of the waistband manufacturer there was confirmation that the tests were run with various types of acid solutions.

Results:
Citric acid was found to immediately remove the yellow color from the elastic waistband. Over the long term the manufacturer believes it will prevent the yellowing. Citric acid is most commonly used to treat BHT yellowing. BHT serves as a UV inhibitor and antioxidant and is also found in packaging poly bags. Research if BHT is used in production of waistbands. If so try to eliminate it.
What is the Next Big Thing for Majestic?

Before that question can be answered it is best to understand and answer a few more questions.

- What kind of identity does Majestic have?
- What kind of identity does Majestic want?
- What makes Majestic better and worse than the competitors?
- Is it possible to keep the good while improving upon the bad?
- Who is the main/best competitor?
- What is the competitors best technology, best product, and most popular product in relation to jerseys?
- Can Majestic replicate or beat this product and technology?

Is Majestic Ready to Take the Next Step?
The Majestic
PRO STRATEGY UNIFORM

This is a uniform that will be designed to rival the extremely popular and technologically advanced uniforms in today’s market. It will master the latest technologies and trends in fabric and decoration while remaining faithful to the prestige, class, and history that exemplifies the sport of baseball.

The name is derived from the roots of baseball. When you think of baseball you don’t think of combat or battle, you don’t think of fast paced instinctual action, you don’t think of rowdiness and hyped up screaming or chest pounding, but what you do think of is skill and expertise, you think of class and sportsmanship, you think of tactics and approach, when you think of baseball you think of STRATEGY!

Here are a few of the strategic ideas:

- Lightweight, abrasion resistant, UV resistant, stain resistant materials
- Venting in pants and jersey for ultimate breathability and weightless feel
- Breathable name and numbers/ 4 way stretch woven twill
- Tighter tapered fit for optimal moisture wicking and cooling/ possible built in under garment
- Simple yet noticeable team specific designs, logo pinstripe, twill design, button design, reward patches
- AND MUCH MORE