Corvette Track 3D Asphalt Paving

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SITECH Mid-South
Scotty’s Contracting

- Located in Central Kentucky
- Heavy Highway Contractor
  - Asphalt Paving
  - Grade and Drain
  - Quarries
  - Asphalt Terminal
- Owned by Houchens Industries
  - Largest ESOP in US
  - 16,000 Employees
Scotty’s Technology

- **45 GPS Equipped Machines**
  - Trimble GCS900
  - Excavators, Dozers, Graders, Compactors, Drills
- **11 Caterpillar Pavers with PCS400 (2D Averaging)**
- **2 PCS900 Pavers (Trimble 3D Paving)**
- **3D Milling**
- **13 Base Stations and Rovers**
- **8 SPS930 Robotic Total Stations**
- **Multiple Software Platforms**
National Corvette Museum
Bowling Green, KY

- Owns and Manages the Motorsports Park
- Located beside the only GM plant manufacturing the Corvette
- Destination for Corvette and car enthusiasts
Yes, it is where a sinkhole swallowed 8 corvettes
What caused it??
NCM Motorsports Park

- Set of reconfigurable road courses
- 20 acre paved lot – skid pad/autocross area
- Multiple Uses
  - Car Clubs
  - Motorcycle clubs
  - Corporate events
  - Driver training
  - Manufacturer testing
  - Corvette Racing Team
Multiple Track Configurations
Design

- Concept began in 2007
- Purchased 184 acres in 2012
- Track Designer
  Steve Crawford
- Local Site Designer
  DDS Engineering
- Room for growth!
Preparation for Construction

- Scotty’s was asked by the NCM to give input for construction
- Fast “track” schedule
- Begin before design complete
- To begin clearing in June 2013
- To be complete by July 2014
Preliminary Work

- Received electronic data from designer
- Produced the best 3D model possible at that stage of design
- Able to give accurate budget numbers
- Input on balancing site
- Played a major role in project development
Scope of Work

- 184 acre site
- .5 million cubic yards of excavation
- Utilities
- Over 1 mile of storm pipe
- Lime stabilization
- 85,000 tons of base stone
- 60,000 tons of asphalt
- Repaired over 90 sinkholes
Creating a 3D Model

- Key to a successful project
- Model changed continuously throughout the project
- Detailed and standardized models help get the most out of machine control
- Endless applications
  - Estimating
  - Value Engineering
  - Planning
  - Mapping
  - Staking
  - Grading
  - Paving
Output and Mapping

- Necessary for planning
- Best tool for communicating
Earthwork

- Mass earthwork began in August 2013
- Trimble GCS900 machine control on all dozers, compactors, excavators and graders
- 90% of earthwork complete by November 2013
Stakeless Job

- Very detailed site
  - Curves, vertical change, “boxed out template”
- Would have required thousands of stakes
- GPS rovers on site with foremen and grade checkers
- $200,000 or more savings in labor alone
Challenges

- **Multiple influences on track design**
  - Corvette Racing, Owners, Modeling
- **Led to many changes**
  - Track Alignment, Cross Slopes, etc.
  - Quickly updated model and sent the information to the field
  - Design finalized in November 2013
- **Communication and connectivity** were critical
- **Wet weather**
- **Sinkholes**
Stone Base

- 8” Dense Graded Aggregate
- 80,000 tons in 3 weeks
- All graded with UTS
- Tolerance less than 0.02’
- Quantity within 1% of estimate
Making the Decision to Pave 3D

- Signature Project Scotty’s Contracting
- Challenging Design
  - Very flat cross slopes, 36-40’ wide
  - Constant transitioning
- Owners requested the smoothest surface possible
  - No official tolerance specified
- Can we maintain continuous echelon paving?
- Will there be a production sacrifice?
- Our first time, what will the growing pains be?
- Let’s do it!
How 3D Paving Works

- Robotic total stations give horizontal and vertical guidance to pavers
  - Leapfrog for continuous paving
- Highly accurate slope sensor transfers grade to the edges of the screed
- Valve module controls the screed to design elevation
- Continuously check behind the paver
Pavement Design

- **Template**
  - 2” base asphalt (64-22)  3D Paving
  - 1.5” Leveling (82-22)  2D Paving
  - 1.5” Wearing (82-22)  2D Paving

- **Mix Design**
  - 75 Blow Marshall with high stability
  - ½” Nominal size mix
  - PG 82-22 highly modified, highly polymerized

- **Aggregate**
  - Used high silica limestone with properties similar to granite
  - Durability and grip
Paving Equipment

- 2 Cat 1055D and 1055E Pavers
  - Paving in echelon
  - Each 18-20’ wide
- 2 Weiler E2850 Material Transfer Vehicles
- 4 Cat CB64 Vibratory Asphalt Compactors
Paving Preparation

- 3D Model Quality Control
  - Intersections
  - Contours
  - Triangles

- Equipment Calibration
  - Total stations
  - Pavers

- Training
  - Understanding the technology
  - Builds confidence
Control is Important

- Control point spacing no greater than 500’
- Used multiple DiNi level loops
  - Verify no subsidence before paving
- Set multiple 6” steel poles for instrument points
Trial 3D Paving on Paddock

- Set up identical to track paving
- Cat AP1055D and AP1055E Pavers in echelon
- Trial run on 20 acre skid pad area
  - Joint match critical for reconfigurable track
- Success!
  - Perfect joint matching
  - Elevations within 0.02'
Setting up for the Track

- First course using 3D system
- Six surveyors, begin at 3 a.m.
- As many as 17 SPS930 total stations
3D Track Paving

- Check, recheck and then check some more
- Monitor thickness as well
3D Results

- **Maintained Production**
  - Goal was to move at normal pace set for compaction – 15 fpm
  - Up to 4,800 Tons of Asphalt per day
- **Typically within 0.02’ or less**
- **Base Asphalt Quantity within 0.3% of Estimate**
- **Ultimate Smoothness!!**
2D Paving

- Trimble PCS400 system
- Used on leveling and surface courses
- Idea was to maintain smoothness achieved by the 3D course
- Less risk
The Final Product

- Praises from the Experts
  - Brian Prowell, Track Paving Consultant
  - Corvette Racing
  - Mitch Wright, General Manager

Track paving will be completed today!!!! I have been involved with a number of track paving jobs and paving Contractors, this is THE most beautiful and SMOOTH race track paving job I have ever seen. Big thank you all the crew at Scott's Contracting and Stone for all the hard work. Paddock and pit lane should be finished up over the weekend.
Questions?