Original Product

- FORTA-AR
  - Patented August, 1982
    - Used on a number of projects through today, both Domestic & International
  - Key benefit
    - Reinforcing fibers designed to add life to asphalt, but difficult to quantify
  - Testing
    - University of Texas at Austin, 1986
Transition

FORTA-FI

- Launched in March, 2009

- Key benefits
  - Cost savings, immediate or long term or both!
    - Reduce asphalt thickness by 35%
    - Extend life of asphalt by more than 50%

- New testing
  - Arizona State University, 2008 & 2009
    - Incredible results
Selling Proposition

FORTA-FI  FIBER INFUSED

- Immediate cost savings, (35% reduction in asphalt thickness)
- Extended cost savings, (>50% longer asphalt life)
- Mixes well in both Batch and Drum plants
- One bag/dosage per ton of asphalt
- Plastic bag is integral part of new blends
- Complete product range with (3) unique blends for specific applications
- Mixes thoroughly in seconds and distributes uniformly and completely
Selling Proposition

FORTA-FI  FIBER INFUSED

- Provides 3D (isotropic) reinforcement
- No modifications needed to current asphalt mix
- No modifications needed to asphalt plants
- No modifications needed to standard placement or compaction practices
- 27 year history of successful applications
- Tested to today's tough new industry standards
- From the industry leader in structurally reinforced concrete
Product Definition

- FORTA-FI *FIBER INFUSED*
- (3) proprietary blends containing aramid and polyolefin fibers and other materials packaged in polyethylene bags
Product Definition

○ FORTA-FI  FIBER INFUSED

○ Developed for (3) specific asphalt types…
  ○ **HMA Blend**, (for Hot Mix Asphalt)
    ○ Designed for working temperatures of 250°F - 375°F (121°C - 190°C)
    ○ Mix in batch or drum plants at any production speed
    ○ Distributes uniformly and completely
    ○ Available in 3/4" (19mm) and 1-1/2" (38mm) fiber lengths for smaller/larger typical aggregate sizes
Product Definition

**FORTA-FI**  
*FIBER INFUSED*

- **WMA Blend**, (for Warm Mix Asphalt)
  - Designed for working temperatures of 212°F (100°C) and higher
  - Mix in drum plants at any production speed
  - Distributes uniformly and completely
  - Available in 3/4" (19mm) and 1-1/2" (38mm) fiber lengths for smaller/larger typical aggregate sizes
  - Formulated for all foaming methods
Product Definition

- **FORTA-FI** FIBER INFUSED
  - **PAT Blend**, (for Hot/Cold Patch Asphalt)
    - Designed for any working temperature
    - Formulated for high percentages of solubles
    - May be added in plant, or directly in rejuvenated material on site
    - Available in 3/4" (19mm) fiber lengths
Asphalt Failure Modes

- Rutting
  - Typically when ruts become 1/2” deep

- Cracking
  - Typically width, length, and number of cracks
Science

Objective

- Use advanced laboratory tests from ASU
  - Assess field performance
  - Evaluate impact on pavement design thickness
- Use laboratory and field results as input to:
  - ANY existing pavement design methodology
  - Mechanistic Empirical Pavement Design Guide (MEPDG)
10 runs were performed for each of the control and fiber reinforced asphalt mixtures as follows:

- 2 Traffic Levels, 1500 and 7000 AADT (*intermediate* & *high traffic*)
- 5 Different (AC) layer thicknesses (2”-6”)

**Project location:** Phoenix  
**Design life:** 10 years  
**Distress evaluated:** Rutting
Science Details

Rutting Evaluation

AADT=7000~50,000,000 ESAL's

Similarly for an intermediate traffic analysis, the saving would be 1.5” of AC layer thickness, or (35%)

AADT=1500~10,000,000 ESAL's

To reach no more than 0.4” of rutting during a design period of 10 years, a control AC pavement thickness would require 5.5”; whereas the fiber reinforced AC layer thickness needed would be only 3.5”, a saving of 2” (35%)
Science Details
Reduced Thickness Findings

- FORTA fiber-reinforced asphalt mixture
  - Better than the control mixture
  - Using the rutting distress criteria:
    - Reduced wearing course thickness 1-1/2” to 2”
  - FORTA-FI provides 35% material savings!
FORTA fiber-reinforced asphalt mixture

- Better than the control mixture
- Using the rutting distress criteria:
  - Same wearing course thickness showed extended design life from 10 years to 15+ years
- FORTA-FI provides >50% longer asphalt life!
Cracking Evaluation

- **Fatigue** - repetitive traffic loading
- **Reflective** - joint, crack or defect in under layers
- **Thermal** - expansion/contraction due to temperature

FORTA-FI significantly reduces crack propagation!
FORTA-FI was used in a 1 1/2" porous friction course. This airport has several unique attributes that demanded a specific asphalt mixture:

- It is located in Grand Teton National Park
- 35,000 flights annually, >300,000 emplanements
Project
Jackson Hole Air Port - Jackson, WY 5/09

- 6,450' (1,966 m) runway elevation causes planes to land at higher speeds
- 6,300' (1,920 m) runway length is relatively short for higher speeds and larger aircraft
- Accommodates both smaller planes and larger planes like 757's and A320's
Project
Jackson Hole Air Port - Jackson, WY 5/09

- 300" (7.62 m) of snow annually
- Snow plowing causes pavement to ravel
- Temperatures can swing from –40F (-40C) to 41F (5C) in the winter months, and annually from –40F (-40C) winter to 104F (40C) summer
Fiber-Reinforced Porous Friction Course, JMF:

- **Aggregate**
  - 50% ¾” rock
  - 30% ½” rock
  - 20% crusher fines

- **Asphalt**
  - PG 64-34
  - Specific gravity 1.028
  - Mixed at 325F, placed at 284F – 302F
  - 5.7% of total mix
Project
Jackson Hole Air Port - Jackson, WY 5/09

Fiber-Reinforced Porous Friction Course, JMF:

- Hydrated lime
  - Added at 0.75% of dry aggregate weight
- Reinforcing-fibers
  - FORTA-FI HMA blend
    - (FIHMA191.0SM)
    - Added at 1 lb. per ton, 0.15% per ton dry aggregate
- Density
  - 152.1 pounds per cubic foot, (PCF)
Project
Jackson Hole Air Port - Jackson, WY 5/09

Asphalt plant:
- Rate averaged 230 tons per hour, (TPH)
- Built in 1956, transported to site
- Fiber added at discharge shoot, (not recommended)
Observations:

- Very good distribution
- 1 small fiber clump found in 9,500 tons
- Any fiber build-up should be removed when noted
FORTA-FI
Typical Project Benefits

Cost
- Increased crack spacing
- Reduced sections
- Faster scheduling

Schedule
- Fewer trucks
- Reduction of materials
- Fewer cracks
- Overlay versus replacement

Performance
- Determinate
  - 3D (isotropic) reinforcement
- Indeterminate
  - Improved energy issues
  - Toughness
  - Post crack load capability
  - Crack control
  - Impact resistance
  - Fatigue & durability life
  - Inert
Thank you for your time!

- FORTA Corporation
- Tracy Lang