

TIRE RUBBER IN ASPHALT: THE ROAD AHEAD

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Elastiko®
Engineered Crumb Rubber Technology

HOPEFUL NEWS REGARDING RUBBER IN ASPHALT

- ▶ 20 YEARS OF LITTLE OR NO GROWTH IN RUBBER ASPHALT NATIONALLY
- ▶ WHY?
 - ▶ BINDER PRE-MIXED WITH TIRE CRUMB RUBBER (TERMINAL BLEND RUBBER)
 - ▶ SOLD INTO AN OCCUPIED MARKET SEGMENT
 - ▶ PRE-MIXED WITH BINDER
 - ▶ DIFFICULT TO USE, NOT POPULAR
 - ▶ COMPARABLE PERFORMER AT A HIGHER PRICE
 - ▶ SOME MISUNDERSTANDING OF RUBBER'S ROLE IN PAVEMENT PRESERVATION
- ▶ DRY PROCESS RUBBER HAS ADDRESSED SHORTCOMINGS
 - ▶ LESS EXPENSIVE
 - ▶ POPULAR WITH CONTRACTORS
 - ▶ EFFECTIVE IN THE FIELD
- ▶ SIGNIFICANT MARKET PENETRATION WITH RUBBER ASPHALT HAPPENS
 - ▶ WHERE RUBBER (USUALLY TERMINAL BLEND) MANDATED BY LAW
 - ▶ WHERE DRY PROCESS SPECIFIED AS A MODIFICATION OPTION

THE DRY PROCESS IN PRODUCTION



POLYMER MODIFIED ASPHALT BINDER CRACKING BEHAVIOR



CRUMB RUBBER MODIFIED ASPHALT CRACKING BEHAVIOR

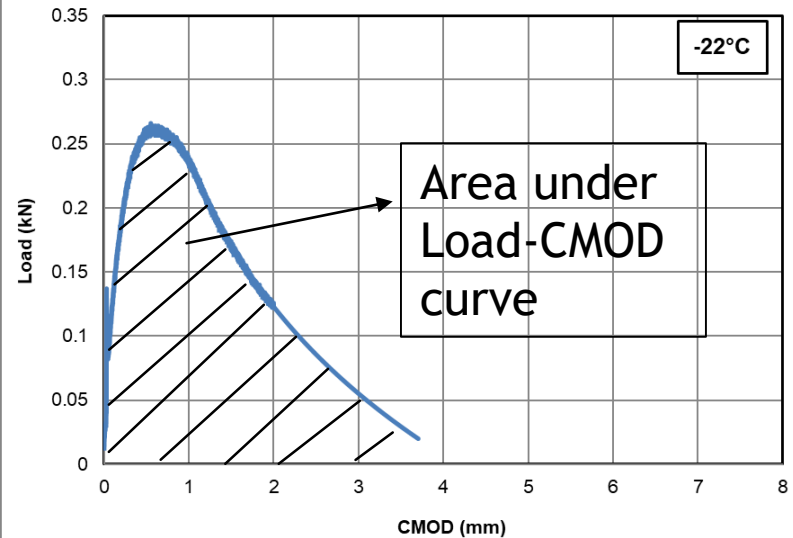


IMPACT OF RUBBER ON ASPHALT PERFORMANCE

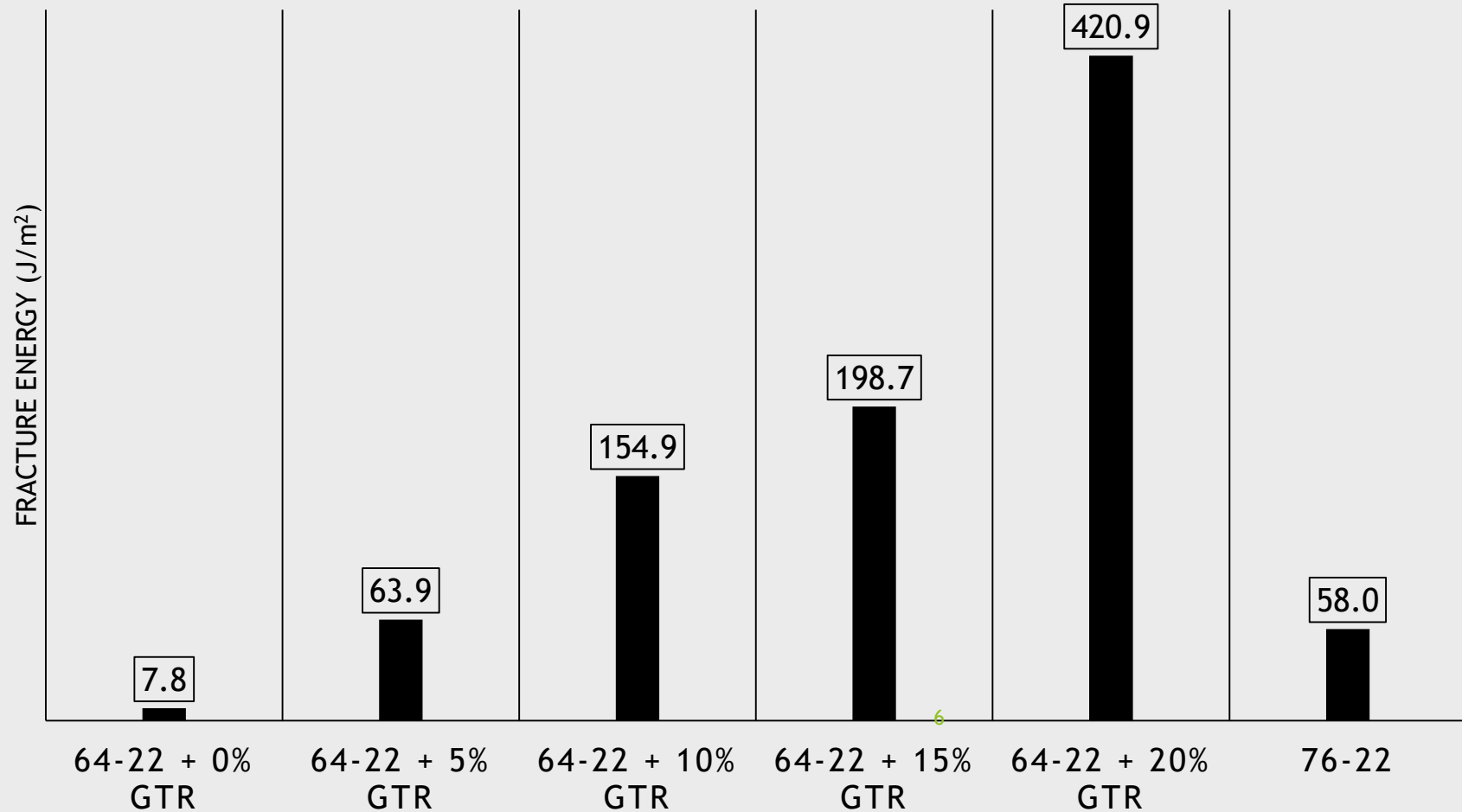
Fracture Energy (J/m²) =

$$\frac{\text{Area under Load - CMOD Curve}}{\text{Lig. Length} * \text{Thickness}}$$

Load vs CMOD



FRACTURE ENERGY



EXTENSIVE, SUCCESSFUL FIELD EXPERIENCE

- ▶ SEVENTEEN YEARS OF FIELD EXPERIENCE
 - ▶ HUNDREDS OF MIX DESIGNS
 - ▶ THOUSANDS OF LANE MILES OF MAJOR HIGHWAYS
 - ▶ DURABLE APPLICATIONS IN EXTREME ENVIRONMENTS
 - ▶ EXTENDED USE IN MEDIUM AND LIGHT DUTY ROADS
 - ▶ DEEP MARKET PENETRATION IN OCCUPIED MARKET SEGMENTS
 - ▶ INTERNATIONAL PROJECT WORK
-
- ▶ *ELASTIKO^R CRM ASPHALT IS A PROVEN MARKET TECHNOLOGY*

UNCERTAINTIES AHEAD?



GLOBAL COMPETITION FOR REUSE MARKETS

- ▶ INCREASING NUMBERS OF GLOBAL MFG COMPANIES RECOGNIZE UPCOMING THREATS FROM GROWTH IN POPULATION AND ENVIRONMENTAL SERVICE DEMANDS
- ▶ PRODUCT STEWARDSHIP SEEN AS A STRATEGIC IMPERATIVE
- ▶ FORWARD-LOOKING COMPANIES ARE STAKING OUT REUSE MARKETS AS A PART OF STRATEGIC PLANNING PROCESSES
- ▶ BEST TO WORST-CASE OPTIONS
 - ▶ RECYCLE/REUSE MARKETS AS PROFIT CENTERS
 - ▶ CASH-NEUTRAL RECYCLE/REUSE MARKETS
 - ▶ LOSS LEADER RECYCLE/REUSE MARKETS
- ▶ HIGH VERSUS LOW VOLUME OPPORTUNITIES

TIRE INDUSTRY STRATEGIC POSITIONING FOR REUSE

- ▶ THREE MAJOR LARGE-VOLUME TIRE RUBBER REUSE OPPORTUNITIES:
 - ▶ PYROLYSIS
 - ▶ ASPHALT ROAD APPLICATIONS
 - ▶ CIVIL ENGINEERING APPLICATIONS
- ▶ EACH OPPORTUNITY WILL TAKE TIME, CAPITAL TO DEVELOP
- ▶ EARLY INNOVATORS/ADOPTER COMPETITORS ALREADY WORKING THIS SPACE (PLASTICS)
- ▶ COMPETITORS TO TIRE INDUSTRY ALREADY POSITIONING THEMSELVES TO PUSH TIRE RUBBER OUT OF THESE MARKETS

CAN CRUMB RUBBER MODIFIED ASPHALT COMPETE WITH PLASTICS?

RUBBER ASPHALT

CONS

- ▶ 2% MARKET PENETRATION
- ▶ MINIMAL GROWTH FOR 20 YEARS
- ▶ PAST HISTORY: UNCOMPETITIVE TECHNOLOGY/PRICE
- ▶ UNPOPULAR WITH PRODUCERS
- ▶ LIMITED CAPITAL INVESTMENT

PROS

- ▶ DRY PROCESS PROVE-OUT FIELDWORK IN PLACE
- ▶ EXTENDED ROAD LIFE PROVEN
- ▶ IMMEDIATE/LONG TERM ECONOMIC BENEFITS DOCUMENTED
- ▶ PROVEN MARKET PENETRATION

PLASTIC ASPHALT

CONS

- ▶ UNPROVEN IN LAB, FIELD
- ▶ NO MARKET PENETRATION
- ▶ NO PRICE, USER HISTORY
- ▶ TOO SOON FOR GROWTH FORECAST
- ▶ DOTS: CHANGE-RESISTANT INDUSTRY

PROS

- ▶ TECHNOLOGY ACCELERATOR: MAJOR CAPITAL INVESTMENT SUPPORTING DEVELOPMENT, FIELD TRIALS
- ▶ CLAIMS FOR GREATLY EXTENDED ROAD LIFE
- ▶ CLAIMS OF SIMILAR ECONOMIC BENEFIT

RUBBER ASPHALT MARKET GROWTH

- ▶ CURRENT DOT SPECIFICATION RATES SLOW
- ▶ CONTRACTOR ADOPTION/PENETRATION RATES HIGH
- ▶ DRY PROCESS WILL REDUCE TERMINAL BLEND PENETRATION, PMA
- ▶ CURRENT MARKET PENETRATION: 2% OF RECYCLED TIRE MARKET
- ▶ PROJECTED TEN YEAR GROWTH: 16% OF RECYCLED TIRE MARKET
- ▶ PLANT INFRASTRUCTURE BUILD-OUT COST: \$280 MILLION
- ▶ EXPECTED INDUSTRY ANNUALIZED ROI ON CAPITAL INVESTMENT >50%

POTENTIAL ASPHALT IMPACTS ON RUBBER REUSE MARKETS

- ▶ CURRENT GROWTH RATES SUPPORT A DECADE-LONG SCALE-UP IN US
 - ▶ 1 - 2 BILLION LBS. OF CRUMB RUBBER PER YEAR BY 2030
 - ▶ 15-30% OF WASTE TIRE STREAM
 - ▶ A PORTION OF GROWTH: REPLACING LESS EFFECTIVE RUBBER TECHNOLOGIES
- ▶ TARGETED CAPITAL INVESTMENTS MAY ACCELERATE GROWTH CURVE
 - ▶ USER INFRASTRUCTURE DEVELOPMENT
 - ▶ SPECIFICATIONS AND STANDARDS DEVELOPMENT
 - ▶ TRAINING INFRASTRUCTURE DEVELOPMENT
- ▶ *LACK OF PURSUIT INVITES COMPETITION*



THANK YOU!

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