



Dr. Jorge B. Sousa

PAST AND FUTURE OF RUBBER PAVEMENTS

I need help ????



Doctor/Patient confidentiality agreement

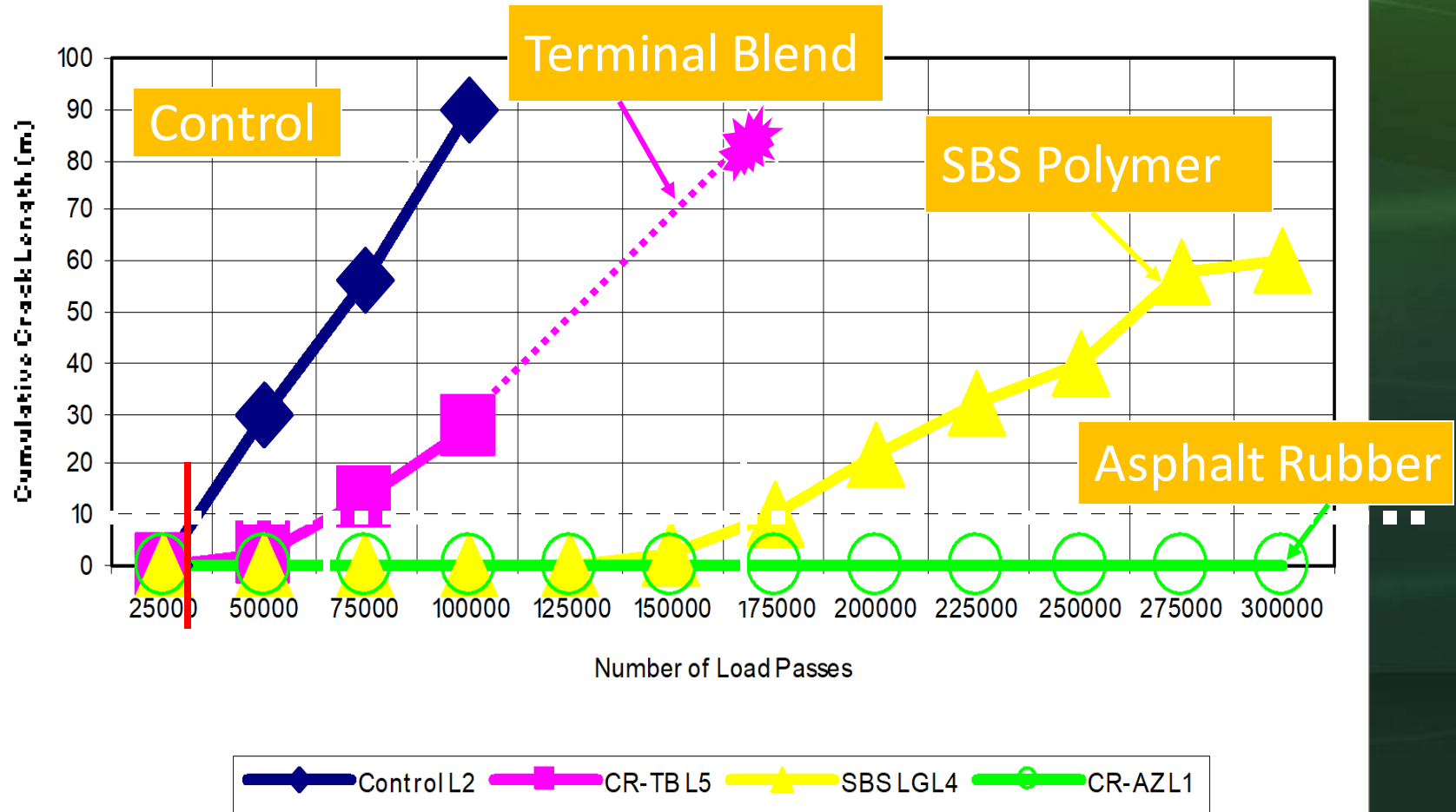
Psychiatry

session 1



ALF Test Results 2004

TPF-5(019) Accelerated Loading Facility Status Report Jan. 2005



GuangDong 7 month performance

15 cm E. T.

Some Cracks Few
potholes

5 cm AR-GAP
AR- SAMI
(6 cm)

16 cm E. T.

MANY Cracks Many
Potholes

4 cm SMA
SBS

6 cm AC

6 cm AC

(16 cm)

19 cm E. T.

NO Cracks NO
Potholes

5 cm AR-
GAP

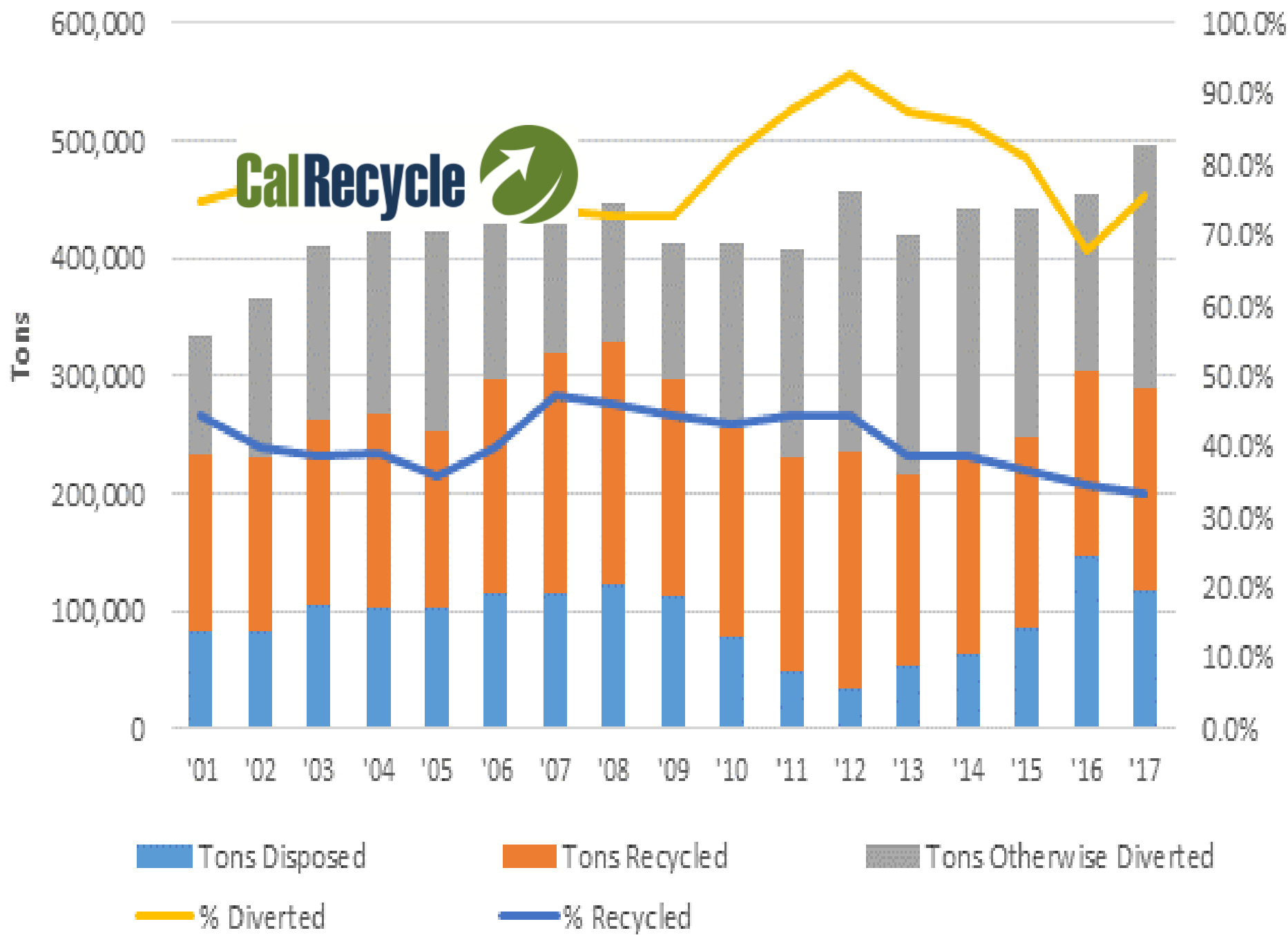
4 cm AC
AR-SAMI

(10 cm)

Rubberized Asphalt Benefits

- Cost Effective - \$\$\$\$\$
- Less Reflective Cracking, Less Raveling
- Less Maintenance/More Durable
- Smooth Ride, Good Rut Resistance
- Good Rut Resistance
- Good in hot & cold climates
- Less Splash & Spray Better Drainage
- Less Noise
- Engineering Use for Old Tires
- Sustainable and Environmentally Friendly







AB-338

*(f) For purposes of this section, “asphalt containing crumb rubber” means a paving material that uses an asphalt rubber binder containing an amount of reclaimed **tire rubber that is 15 percent or more by weight of the total blend**, and that meets other specifications for both the physical properties of asphalt rubber and the application of asphalt rubber, as defined in American Society for Testing and Materials (ASTM) Standard Specification for Asphalt-Rubber Binder*

Tire Derived Material	BTU Gain/Loss per pound of rubber
Alternate Daily Cover	-790
Tire Derived Fuel	+13,500
Crumb Rubber Modifier in A-R	+133,400 to +243,400

Enhanced RAR Solutions

400,000 ???

If all tires discarded every year in California were properly used in pavements we could save enough energy to provide electricity to

**70 - 90% California
residential houses !!!!**

(with new energy guidelines implemented)

□ Clearly this is working great. Asphalt Rubber works!

- Why they only use 35%?

- Why no other State adopted these specs?

Psychiatry

session 2



The past



The Solution:

- *USE OF REACTED AND ACTIVATED RUBBER...that it can be used directly into the pugmill of a contractor's plant.*
- *A proper reacted and activated treatment will ensure that the rubber is already swelled with bitumen so it will not absorb any more bitumen.*
- *It will also be treated to blend well and disperse very well and effectively into bitumen*
- *Large quantities can then be used without any real limitation beyond the need of enough bitumen to wet all surfaces, does really making the binder much more "elastic".*

REACTED and ACTIVATED RUBBER

(components in optimized proportions
and activating environment)



Bitumen



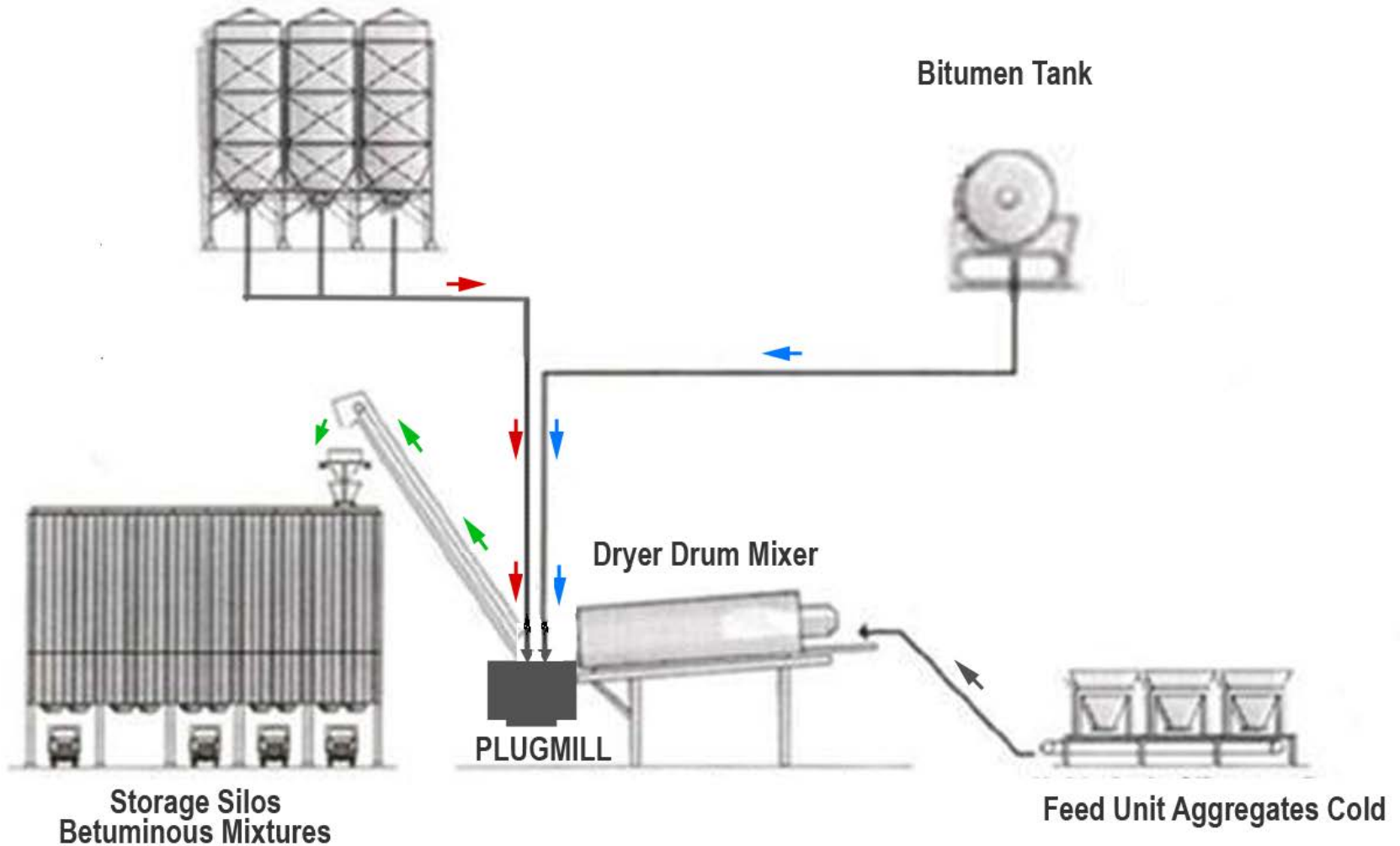
Crumb Rubber



FILLERS



RAR

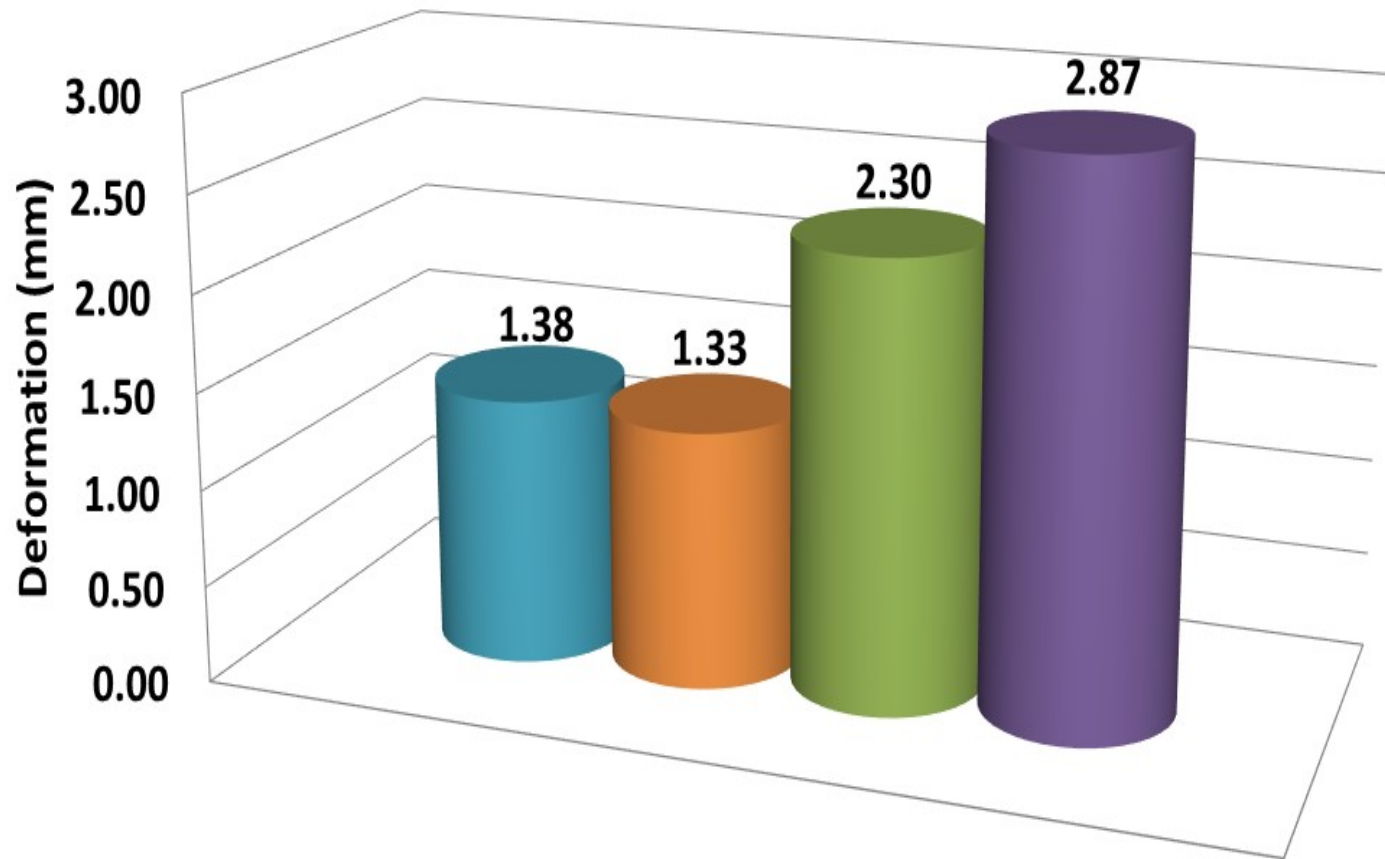


RAR X CAN BE PLACED DIRECTLY INTO THE CONTRACTORS PUGMILL

The future

RAR





Asphalt Mixtures

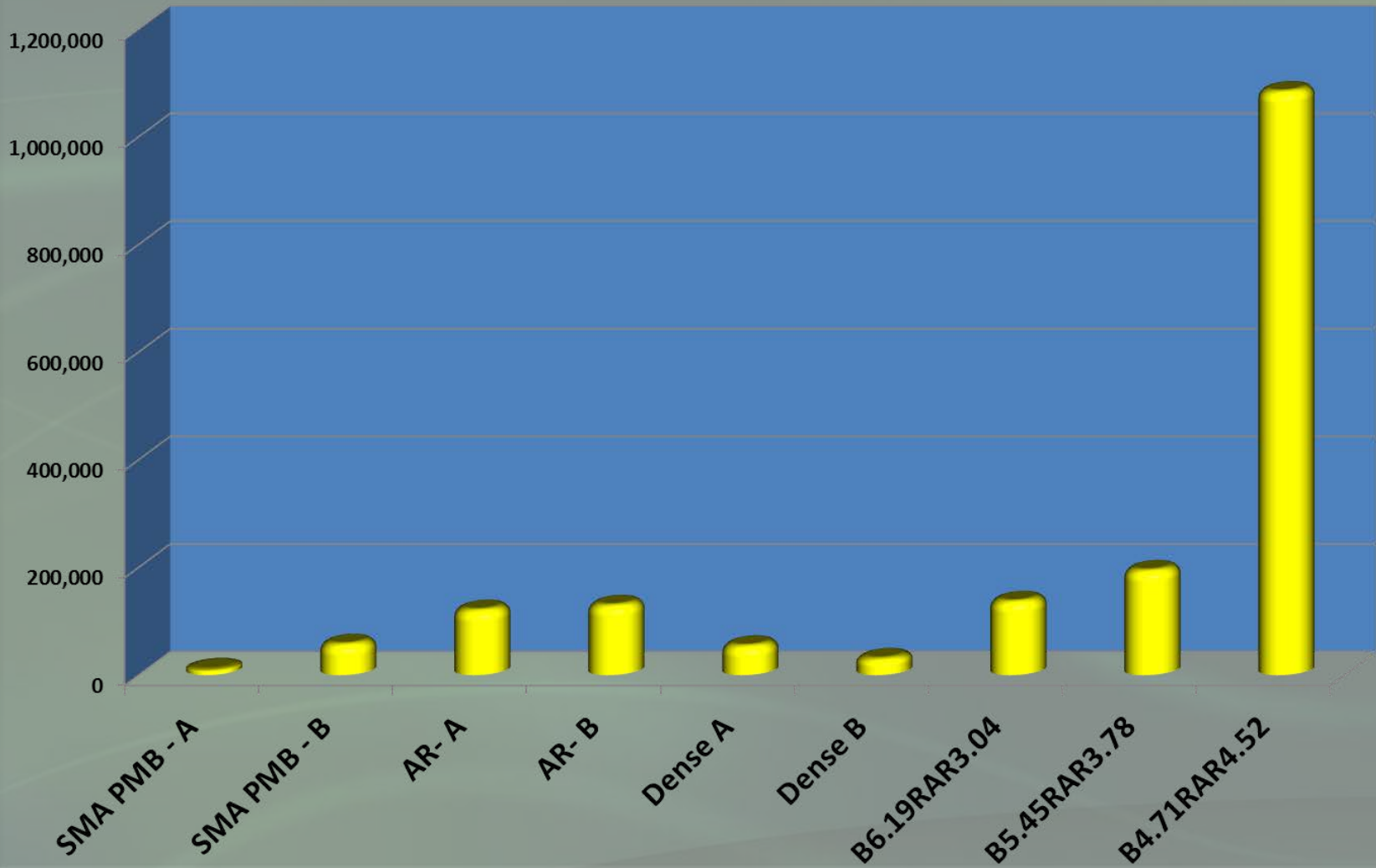
■ GAP with RAR

■ ThinGap with RAR

■ SMA with AMBS

■ SMA with Fibers

Flexural Fatigue 10 Hz, 20 C, 500 Micro Strain



RAR MIXES HAVE BETTER FATIGUE LIFE THEN ANY OTHER MIX EVER TESTED

Why no one is interested in making better asphalt rubber more easily and saving money?

Psychiatry

session 3



Jakarta / Indonesia

Gap Graded 9.25%
(35% RARX)

Marshall Design

I – Mix Design

>>>>> 9.25% BINDER (35% RARX)

Oven





SAMI Chip



RAR GAP Compaction



Open Traffic



Why no one cared...??

Why no one followed up on
this great success?

Psychiatry

session 4



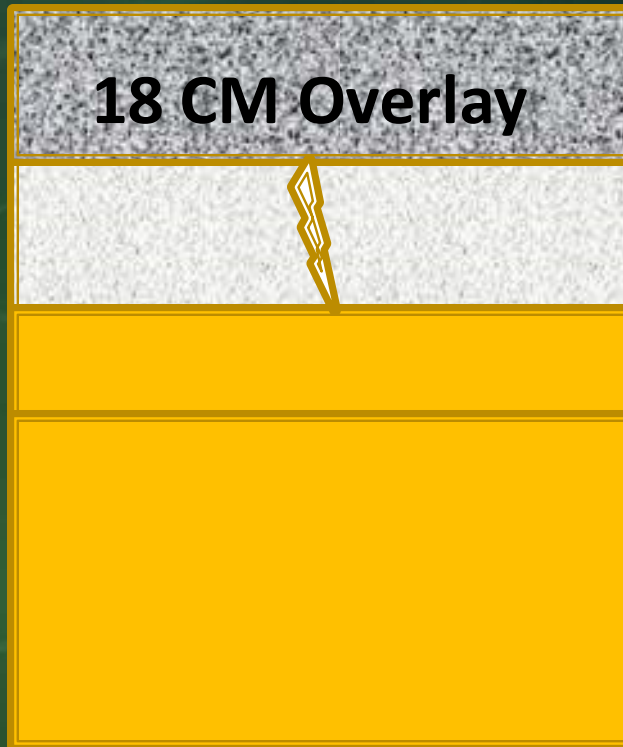
sacyr



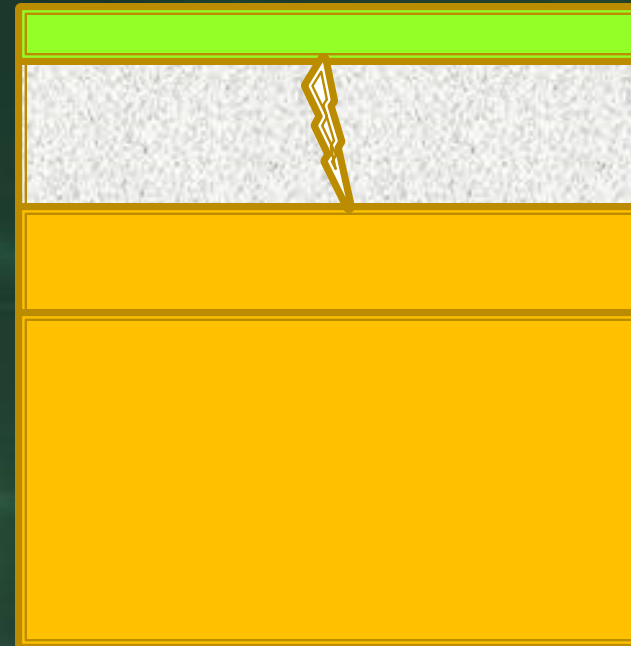
COST EFFECTIVE DESIGN WITH



Conventional Design



6 cm RARX-GAP



Rehabilitation with



Why not everyone else wants to
save 12 MILLIONS USD in 80 km of
freeway rehabilitation?

Psychiatry

session 5



COP27: Prioritise climate or face catastrophe - UN chief



“

There has been a tendency to put climate change on the back burner," he said. "If we are not able to reverse the present trend, we will be doomed."

KEVIN E. TRENBERTH

National Center for Atmospheric
Research (NCAR)



Costs of Climate Change

- Climate change is happening
 - It is caused by human activities
- For many events we can estimate that the difference from climate change is 5 to 20%.
 - But this means records are broken
 - Thresholds are crossed
 - Things break/flood/burn; people die!
 - **EXTREME NON-LINEARITY**
 - So instead of US\$1B in damage, the damage is \$100B
 - The real cost of climate change is grossly underestimated by economists.

Blistering heat waves in India and Pakistan

March-May 2022

Record heat (49°C in Delhi)
>90 dead
Birds falling from sky
Crops ruined



Industry

Combustion of fossil fuels and industrial processes are responsible for about **78% of climate-warming emissions** over the past several decades.

- using materials more **efficiently, reusing, recycling, minimising waste**; currently **under-used** in policies and practice
- **basic materials**: low- to zero-greenhouse gas production processes at **pilot to near-commercial** stage
- achieving **net zero** is challenging





710 NORTH
Pasadena
←

EXIT 12C
Atlantic Ave
↗

This idea came to me yesterday....
Do you think I should present it to
someone or is it too crazy?

Psychiatry

session 6



***I SOLVED THE
GOLBAL
WARMING
PROBLEM!!***



An aerial photograph of a multi-lane highway with traffic. The highway runs vertically through the center of the image. There are several cars and trucks visible on the road. The highway is flanked by green trees and grassy areas. In the background, there are fields and some buildings.

EISENHOWER DEFENSE HIGHWAY SYSTEM

INTERSTATE
HIGHWAY
SYSTEM DEFENSE
AGAINST
CLIMATE CHANGE

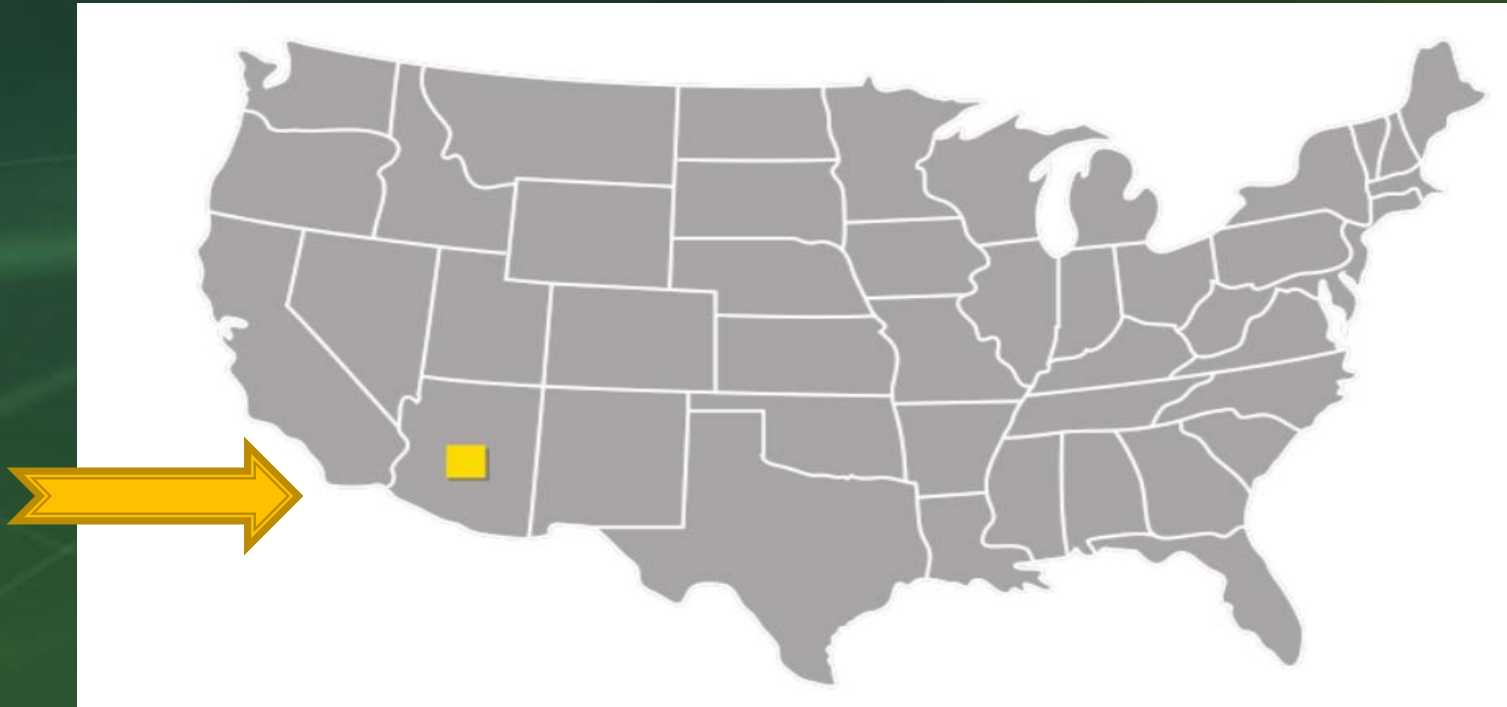
INTERSTATE
HIGHWAY
SYSTEM
DEFENSE
AGAINST
CLIMATE
CHANGE

If all divided
rural
highways are
covered it
will generate
about 50%
of all
required
energy in
USA



EISENHOWER
STARWARS
LAZER
DEFENSE
HIGHWAY
SYSTEM





CEP Chemical Engineering Progress Bonus
issue 2022

Fig 15 page 58

Mark Holtzapple, PhD at all

Why can we get so much Money
easily for the **EISENHOWER**
STARWARS LAZER
DEFENSE HIGHWAY SYSTEM
powered by solar panels over the
freeway
?

Should I present these future benefits?

- No need to build more power plants
- Sustainable reuse of tires in roads
- Roads last longer (less maintenance)
- All weather dry roads
- Solar energy for free and NO CO2 emission.. Saves the planet from global warming
- Energy for laser defense (available in the roads for the electric car when not at war) (unlimited defense funding)



He is
beyond
help!!!!

Jorge





PAST AND FUTURE OF RUBBER PAVEMENT

Dr. Jorge B. Sousa



Are there dark forces in my brain???

