Update of Third Party Confirmation of the Micro vs. Overlay Study

AEMA-ARRA-ISSA
Bailing out Main Street
Preservation & Rehabilitation 2011
Tucson, Arizona
February 25, 2011

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Presentation Outline

- Eco-Efficiency Overview
- NSF Certification
- Eco-efficiency of Micro-Surfacing Example

Integration of the Three Pillars

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Sustainable Development

Economy

Environment

Social Responsibility

Eco-Efficiency is a Life-Cycle Approach

Production Basic Chemicals

Production End-Products

Use Phase

Recycling/Disposal

Raw Materials and Energy Production

Environmental Categories

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Environmental impact over the entire life cycle*

Consumption of Energy	Emissions	Toxicity Potential	Risk Potential	Consumption of Raw Materials	Land Use
• Cumulative energy utilization plus remaining energy content • Fossil and renewable resources are included	• Described by categories - Air - Water - Solids	• Definition for hazardous materials used by EU law • Maximum possible hazard used	• Risk assessment approach • Based on published statistical data (e.g. insurance associations)	• Materials are weighted according to reserves and global consumption	• Index calculated by assessment criteria and impact factors

**Data acquisition and calculation is done according to ISO 14040 and 14044 (ecological part)*

Assessing Environmental Impacts

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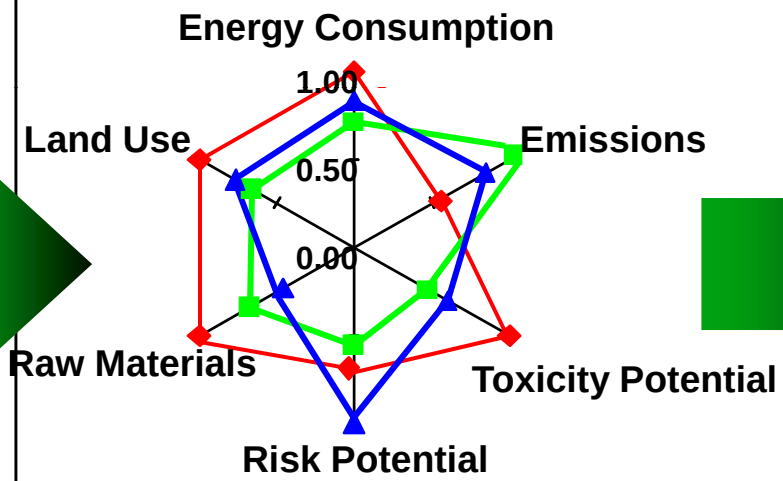
Parameters considered

- Raw Materials
- Energy consumption
- Land Use
- Emissions
- Toxicity
- Risk potential

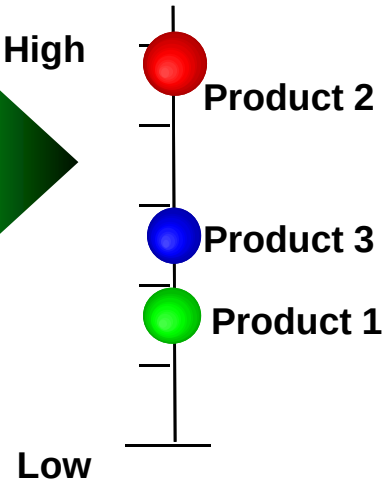
Ecological footprint



1.0 = greatest environmental burden

Ecological advantage

Relative environmental impact

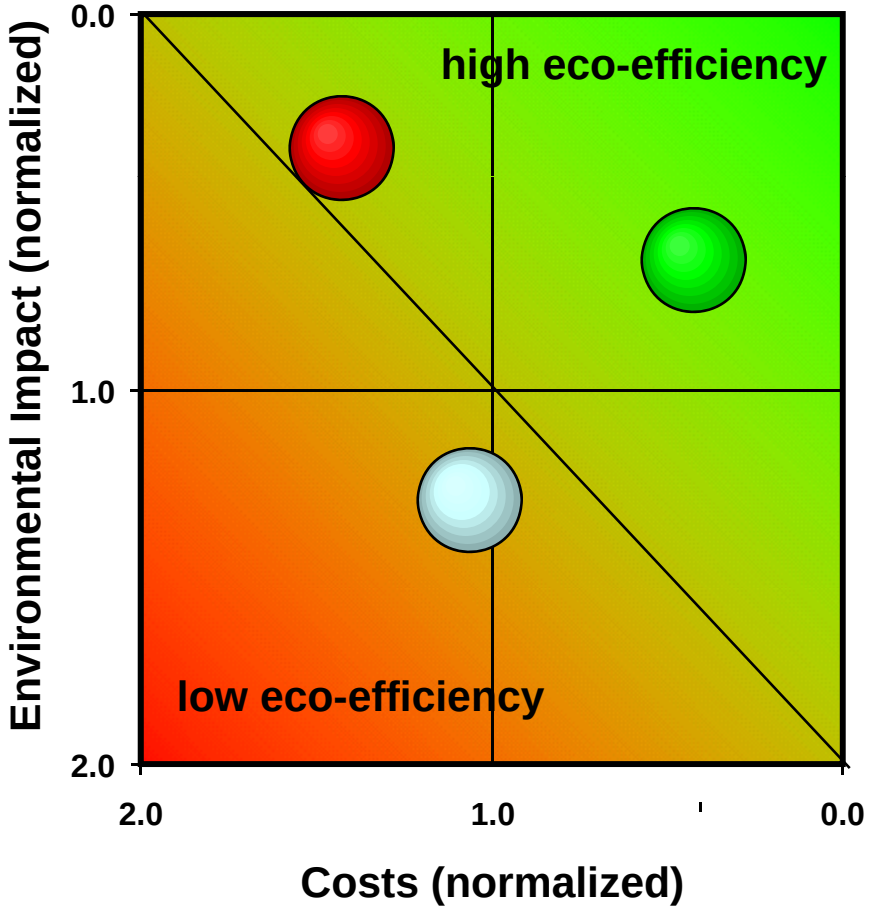


Life-cycle data is gathered in six environmental categories and depicted on an ecological footprint. The data are then weighted, aggregated and normalized to obtain an overall environmental impact.

Eco-Efficiency Portfolio: Costs and Environmental Burden

Customer benefit :

1 functional unit for ….



- Alternative A
- Alternative B
- Alternative C

The most eco-efficient product has the lowest environmental impact and cost. Eco-efficiency is measured from the diagonal line.

Alternative A is most eco-efficient.

Eco-Efficiency Analysis (EEA)
Sustainability assessment of innovations

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Roland Berger
Strategy Consultants

Joint concept
1996

www.tuv.com
TÜV
Berlin
ID:5711150561

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Independent third party validation

- Comparative assessment of equally weighted economic and ecological aspects of products and processes
- Consideration of the entire life cycle (LCA in accordance with ISO norms)
- Eco-efficiency is analyzed from an end use perspective, so comparison is done for a defined level of output
- Standard tool at BASF with over 400 analyses completed worldwide.

Strategic instrument for decision making

Öko-Institut e.V.
Institut für angewandte Ökologie
Institute for Applied Ecology

Constant progress with partners

Nominee 2006
International co-operation
EUROPEAN BUSINESS AWARDS FOR THE ENVIRONMENT

Acceptance and acknowledgment

NSF International
Global Leader in Public Health

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- Independent, not-for-profit organization certifying products for over 65 years
- Standards development in water, food, environment and other public health areas (>50 consensus ANSI standards)
- Headquartered in the US, with locations worldwide, servicing 12000 companies in 100 countries
- Strong focus on commerce informed by collaborations with the US EPA, FDA, CDC, the World Health Organization as well as trade associations and other institutions around the globe.

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NSF Sustainability

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Products

General
- NSF305 Personal Care
- USDA Organic
- Compostability
- Flushability
- EnergyStar
- WaterSense

Green Chemistry
- CleanGredients
- EPA DfE Formulator

Sourcing
- SFI Forestry
- MSC Fisheries

Built Environment
- LEED Reviews, GBCI
- NSF14 Reclaimed Pipe
- BIFMA-e3 Furniture Level
- NSF/ANSI140 Carpets
- NSF332 Resilient Flooring
- NSF342 Wallcoverings
- *NSF336 Furnishings*
- *NSF/GEI Indoor Air Quality*
- *NSF347 Single Ply Roofing*
- *NSF375 Sustainability Assessment Water/ Wastewater Infrastructure Products*

Management Systems, Activities, Processes, etc.

General
- ISO14001 Environmental Management Systems
- OHSAS 18001
- ANSI/AIHA Z10 Occupational Health/Safety
- ANSI14065 GHG Inventories/Project Validation/Verification
- NSFP-352 Eco-Efficiency

Chemical Industry
- RC14001
- RCMS®
- *NSF/GCI355 Greener Chemicals*

Food, Beverage, Ag
- HAACP/SQF

2nd Party
- Gap Assessments
- Internal Audits
- Compliance Audits
- EHS&S Training

Italics = pre-launch.

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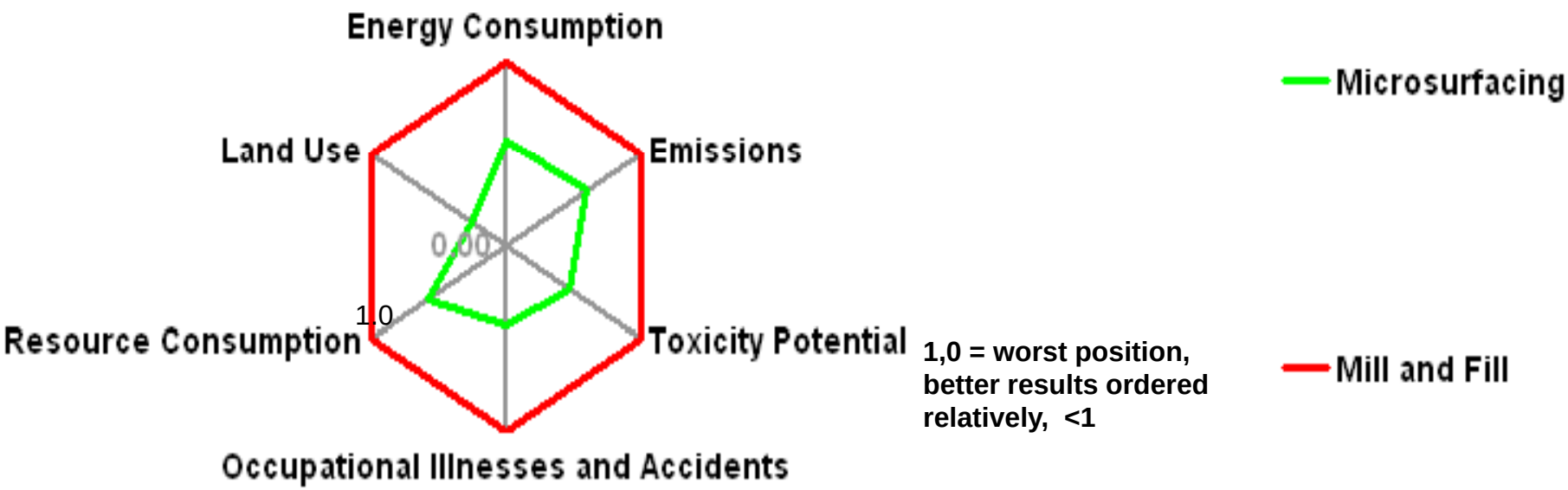
The Eco-efficiency of Micro-surfacing

Environmental Fingerprint

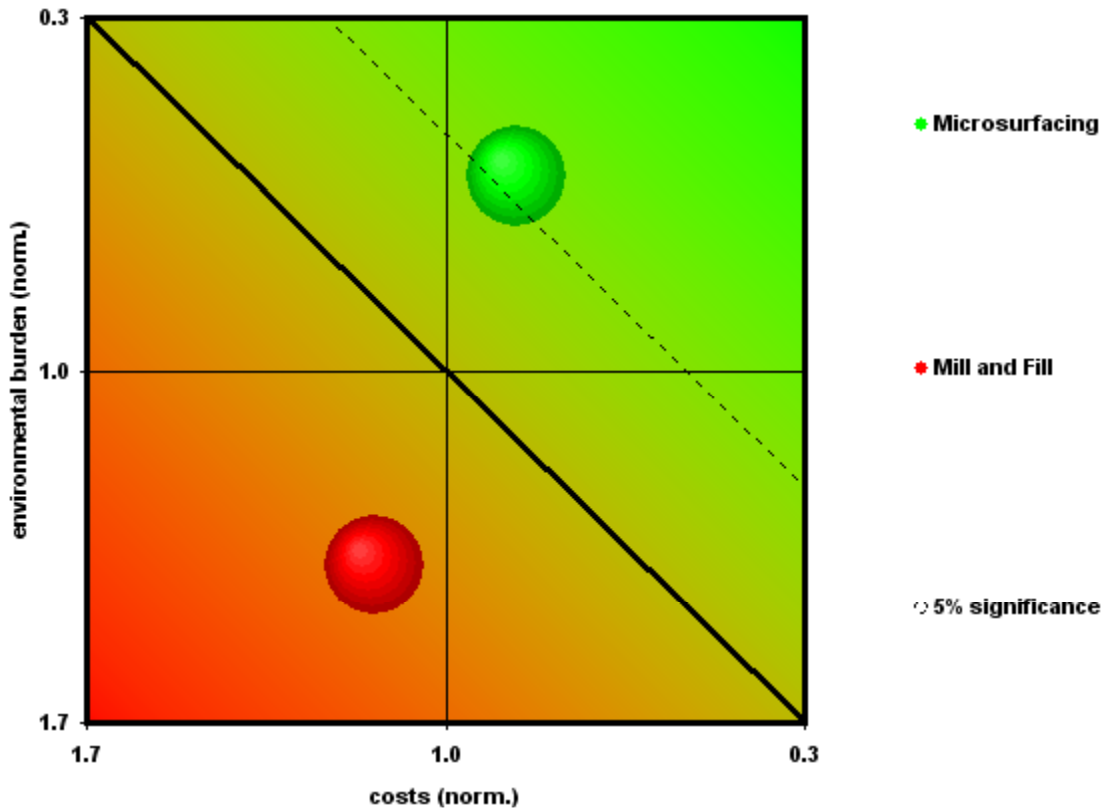


1,0 = worst position, better results ordered relatively, <1

Microsurfacing clearly demonstrates lower environmental burden in all impact categories relative to the Mill and Fill (hot mix overlay) alternative.

Portfolio: Base case

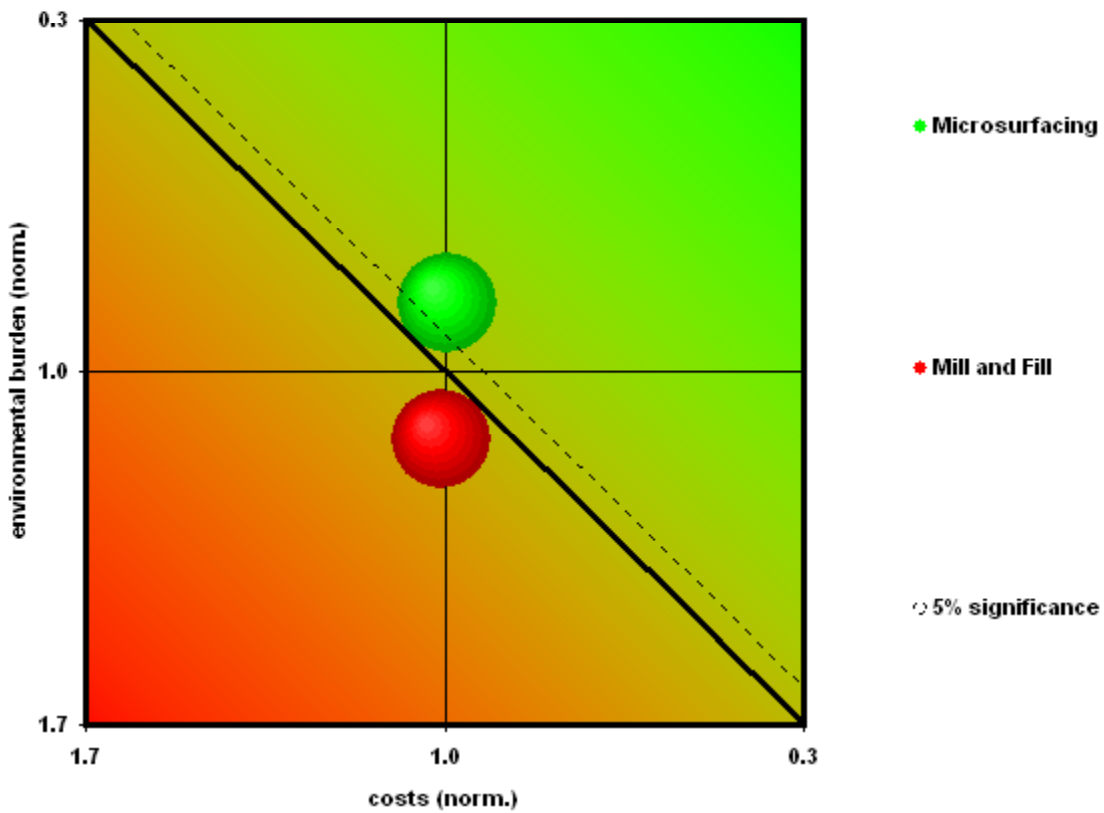
•Preventive maintenance of a 1 mile stretch of a 12 foot lane of an urban road to a similar profile and performance using best engineering practices over a 40 year period



For this study, the micro surfacing alternative is the most eco-efficient.

Portfolio Scenario 1:
17 year durability for Mill and Fill

•Preventive maintenance of a 1 mile stretch of a 12 foot lane of an urban road to a similar profile and performance using best engineering practices over a 40 year period



Significant improvement in relative eco-efficiency of Mill & Fill. However, for this scenario, the micro surfacing alternative is still the most eco-efficient.

Conclusions: Micro surfacing is the more eco-efficient pavement preservation technology !

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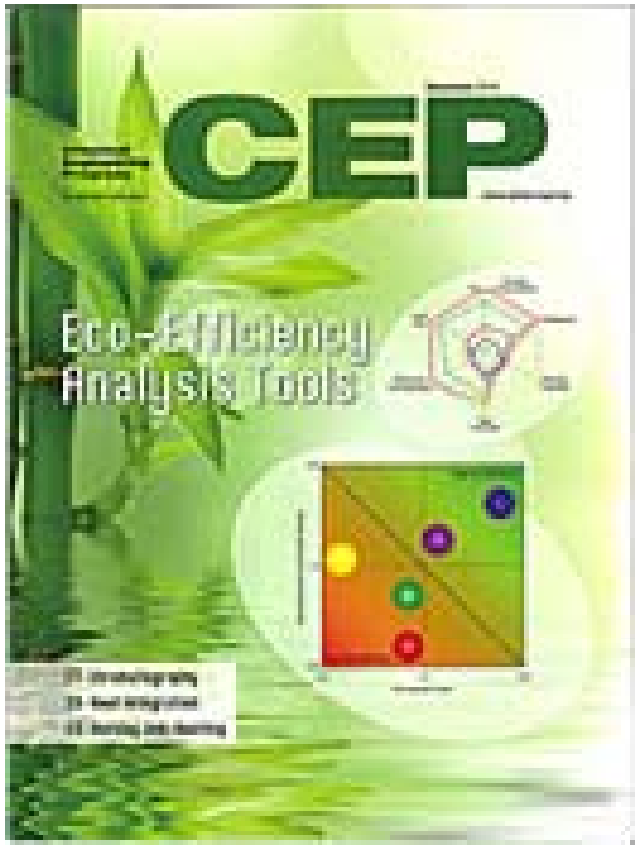
- **Based on the 1 mile stretch of a 12 ft urban lane, micro surfacing relative to Thin Hot Mix Overlay (Mill and Fill) will:**
  - Requires over 1.2 million pounds less material
  - Save energy and reduce dependence on fossil fuels
    - savings equivalent to annual consumption of energy in 110 US homes
    - 280 barrels of oil less for every lane-mile
  - Significantly reduces waste and material sent to landfill (34 tons)
    - equivalent to waste produced by 1 person over the same 40 years
  - Have a smaller carbon footprint. Reduction equivalent to:
    - carbon sequestered annually by over 22 acres of pine forest
    - taking over 20 cars off the road for 1 year.

New Article on Eco-Efficiency

- Chemical Engineering Progress
  - December 2010 Article on Eco-Efficiency – Cover Story
  - http://www2.basf.us/AcrylicsDispersions/asphalt/eco-efficiency.html



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