Innovation in Bridge Preservation

Employing Existing and Innovative Materials & Products - An Industry Perspective

by

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Existing Condition of Infrastructure

Bridges	# of Deficient Bridges	Area of Deficient Bridges (sq. ft.)
NHS	22,158	464,245,153
Non-NHS	121,731	502,979,698
Total	143,889	967,224,851

Assuming $150/ft^2 to replace, the total cost of replacement is **$145 billion**.

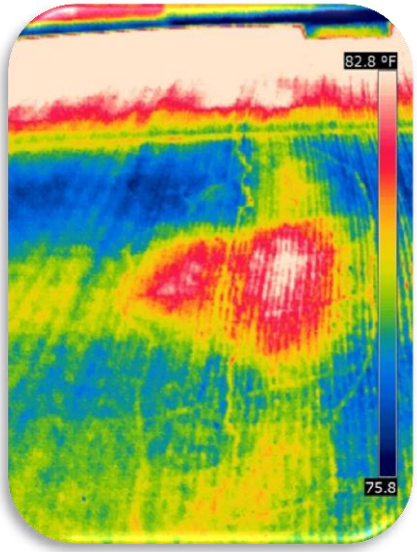
Total Area of Bridges in the U.S.

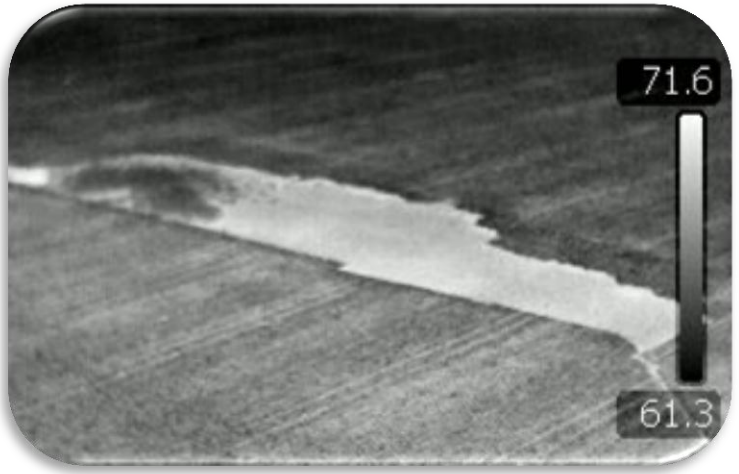
Bridges	Area of Bridges (sq. ft.)
NHS	1,869,635,043
Non-NHS	1,952,066,583
Total	3,821,701,626

Assuming $150/ft^2 to replace, the total cost of replacement of all bridges is **$573 billion**.

Typical Condition of Bridges

Typical Condition of Bridges





Typical Condition of Bridges

Goal

1. Identify challenges in employing existing and innovative methodologies or products.
2. Identify existing methods to use proprietary products/methods.
3. Limitations of existing avenues.
4. Identify further steps for all stakeholders to work together towards effective bridge preservation program.

Advantages of Better Products/Service

- Advanced product performance
  - Higher strength, higher ductility
- Easier, faster
  - Reduced physical labor
  - Less curing time, reduced mixing time
  - Innovative use of new/existing equipment
- More effective product for a given problem
  - Ability to design better & cost effective solutions

Manufacturer Challenges

- Manufacturer's goal is to have the product approved in a QPL category since this allows repetitive business.
- No timely or common approval process between the 50 states.
- Complexity of entering 50 different states and sometimes several districts in each state.
- Increased cost in bringing the innovative product into the market.

Manufacturer Challenges

❖Acceptance Process:

- If owners wait to use patented/innovative product, the patent time of 20 years is shortened.
- Shorter time to recover R&D cost.

Manufacturer Challenges

❖Return on Investment

- Current bidding process relentlessly drive the lowest cost:
  - ✓Consider - Applied cost
  - ✓Consider - Long term performance
  - ✓Compare – Life cycle cost of various products and not the initial cost

Unwanted Outcome

- Manufacturers - reformulate innovative products awaiting QPL.
- Disadvantage of not being first is compensated by saved time and resources.
- Challenges in stopping patent infringement!

Consultant's Challenge

- Solutions to reduce or stop deterioration are sometimes proprietary (process or specific materials are patented).
- Products is not in Owner's APL/QPL.
- Need for standard procurement procedure require an added level of clearance for new/proprietary products/methods.
- This can be time consuming.
- Deters the use of proprietary methods/products.

Using Proprietary Methods/Products

- Extensive documentation prior to applying to approval.
- Time consuming approval process.
- May delay letting date.
- Agency may seek a less effective solution or delay the entire project.

National Technical Product Evaluation Program (NTPEP)

- New products do not have track record.
- Limits the use of new and existing materials and process that do not have a proven track record.
- States are using NTPEP and AASHTO programs to help prove effectiveness.

NTPEP Program Methodology

- Establish a group of 10 states interested in qualifying a particular product.
- Provide a written work plan for the product evaluation to be balloted by the NTPEP committee.
- Designate a Lead State. Select a testing facility, an independent Lab or consultant to perform evaluations.

NTPEP Program Methodology

- Designate a lead to work with AASHTO staff to submit performance data.
- Send a notice to appropriate vendors regarding the evaluation program.
- Product is submitted, evaluated and reported in Data Mine.

NTPEP

- Timeline for testing and approval is too long.
- Competitors release new products making the NTPEP approval obsolete.

NTPEP

- Applied Process Engineering Laboratory (APEL) allows manufacturers to submit their product for evaluation through AASHTO – or state posting of Certification for projects or programs.
- AASHTO's Technology Implementation Group (TIG), is another venue if a state has used an unproven product and is willing to nominate it for the program.

Competitive Bid Process

- Agency typically needs at least three (3) suppliers.
- Several bids are required.
- Cost competitiveness may lead cutting out needed steps for proper installation.
- Poor or non-performance issues that limit product's use.

Adopting Innovation

- The value of innovative methodologies and products can outweigh initial cost.
- Life cycle analysis can show the true value of a product or process to be fairly evaluated.
- Owners adopt “innovation funds” to encourage the use/testing of innovative products/methodologies.

Cost Effective Preservation Options

A) Course of Action for Lowest Life Cycle Costs

Bridge Element	Description	Initial Cost	Additional LCC (50 Yrs)	LCC - MOT cost	Total LCC Cost
Deck	Patch+LMC+ICCP	$ 1,104,008	$ 41,810	$ -	$ 1,145,818
Pier Caps	Patch + ICCP	$ 435,200	$ 76,655	$ -	$ 511,855
Pier Columns	Patch + ECE + Seal	$ 291,392	$ 130,987	$ 26,971	$ 449,350
Abutments	Patch + ECE + Seal	$ 77,769	$ 34,959	$ 13,486	$ 126,213

B) Course of Action for Lowest Initial Cost

Bridge Element	Description	Initial Cost	Additional LCC (50 Yrs)	LCC - MOT cost	Total LCC Cost
Deck	Patch + LPC	$ 986,973	$ 594,670	$ 126,431	$ 1,708,074
Pier Caps	Patch Repair	$ 195,200	$ 340,598	$ 224,499	$ 760,297
Pier Columns	Patch Repair	$ 27,632	$ 260,527	$ 224,499	$ 512,658
Abutments	Patch Repair	$ 1,305	$ 41,564	$ 224,499	$ 267,368

Material/ Contractor Limitations

- Contractor's unfamiliarity - increases cost of the new product or process (will decrease over time).
- Lack of effective inspection/oversight - Improper use, substandard installation lead to poor performance (an essential step).
- Retaining a bridge preservation specialist who keeps up with the development, challenges, and performance of materials is necessary for successful bridge preservation program.

Repairs Based on “Like New“ Conditions

- For a successful bridge preservation program, “applying appropriate treatments and activities at the appropriate time” is necessary.
- Quantify the actual conditions and future deterioration rates - understand what performance attributes are necessary to solve deterioration problem.
- Repair methods should be based on actual conditions and/or performance needs.

Stakeholders Role

- Stakeholders (owners, manufacturers, and consultants) must work together to overcome impediments to achieve successful infrastructure preservation.
- Owners and stakeholders are aware of this problem and moving towards removing some of the impediments.
- In 2011, FHWA administrator Victor Mendez said,”Innovation is critical to our work at FHWA, and we not only encourage it but will work with our state partners every step of the way to make it happen.”
- In December 2011, AASHTO issued a letter highlighting the FHWA initiative to deploy innovative solutions.
- Industry, regulators, and owners all have a part in delivering/deploying innovative solutions to make bridge preservation a success.

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Thank You to all!

If I missed anyone, please let me know!