Reinforcements

The R&D Tax Credit aspects of U.S. bridge design, construction & maintenance

By Charles R. Goulding, Michael Wilshere & Andrea Albanese

Modern bridge design, construction and maintenance in the United States is an innovative and evolving industry. Given the deteriorating infrastructure in the country, volatile weather conditions and increasing traffic volumes, engineers are being pressured to find innovative ways to address challenging national issues.

According to the latest American Society of Civil Engineers report card, America's cumulative grade for infrastructure is a D-plus. The condition of bridges in the country, although slightly better, is only a meager C-plus, according to the same report.

In 10 years, one in four of our nation's bridges will be 65 years or older. In addition, almost 70,000 bridges in the country are considered "structurally deficient," according to statistics from the Federal Highway Administration. That equates to about one in every nine bridges in the nation.

But despite the concerns, there is a glimpse of resolve. New emerging technology can help the United States manage its growing infrastructure problem. Advances in bridge design, engineering and construction, smart bridges, and intelligent self monitoring systems could significantly supplement broader national policies to address the issues. These technological innovations may be eligible for federal and state Research and Development Tax Credits, which are available to help stimulate these efforts.

The Research & Development Tax Credit

Enacted in 1981, the federal Research and Development (R&D) Tax Credit allows a credit of up to 13 percent of eligible spending for new and improved products and processes. Qualified research must meet the following four criteria:

- New or improved products, processes or software
- Technological in nature
- Elimination of uncertainty
- Process of experimentation

Eligible costs include employee wages, cost of supplies, cost of testing, contract research expenses and costs associated with developing a patent. This past December, President Obama signed the bill making the R&D Tax Credit permanent.

Beginning this year, the R&D credit can be used to offset Alternative Minimum tax and startup businesses can utilize the credit against payroll taxes

Bridge design & construction

Modern bridge design and construction involves a wide range of innovative technologies. From design stage, construction and final testing after construction, innovation is occurring all throughout.

Environmental instability, increasing traffic volumes, and evolving contemporary architecture has increased the need for innovation in the structural engineering of bridges.

For example, on the Tappan Zee Bridge in New York, bridge traffic has reached over 138,000 vehicles per day, far more than the Tappan Zee was designed to support when opened in 1955. As a result, hundreds of millions of dollars have been spent to maintain the structure in recent years. The cost of maintaining the current bridge for the foreseeable future rivals the cost of a new bridge with no improvements under current traffic conditions.

Recognizing this, Governor Cuomo has scheduled the new bridge for completion in 2018. Already, more than 1,000 steel support pilings have been driven into the riverbed, pile caps have been installed, and work has begun on the iconic 419 foot main span towers.

These types of projects are excellent candidates for the R&D Tax Credit. At the design stage, architects and engineers use high-tech analytical software to define complex bridge geometrics, boundary limitations, and load conditions. During construction, superstructure designs often evolve based on actual conditions that fluctuate from what was predicted with CAD modeling software.

After construction, analysis must be performed on a range of different parameters such as loading and soil conditions, pile behavior, suspension effects, creep and shrinkage analysis, etc.

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Smart bridges

Modern technology is making bridges around the country increasing intelligent and self-aware. These bridges have the ability to collect data about their dynamics, conditions and traffic flow. Small sensors scattered throughout bridges continuously measure physical conditions such as erosion, vibration, and strain.

This produces a stream of data that can be analyzed by intelligent software programs to provide detailed monitoring and alert engineers when maintenance is needed. In addition, automatic incident detection (AID) and innovative video technologies also are integrated across bridges, in order to achieve an optimized traffic flow.

Tolling technologies

Tolling technologies are also evolving. Payments, collections, traffic management, customer service, and enforcement all involve constantly developing technologies. The goal of most of these new integrations is to relieve congestion at the toll booths without the addition of new highways, lanes, and pavement projects.

E-ZPass, which recently celebrated its 25th anniversary, was an exceptional breakthrough technology when it first entered the market in the early 1990s. Since then, new vehicle identification technologies have continued to evolve and improve.

Some ideas on the horizon involve incorporating the use of social media to deliver tolling messages, charging per mile, and the integration of vehicle infrastructure and smart toll lanes that would have the ability to open and close based on traffic patterns.

New and improved technologies can help the United States manage its growing infrastructure problems. Federal and state R&D Tax Credits are available to help support and stimulate modern bridge design, construction, and maintenance innovation efforts. **FC**

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