INSIDE VIRGINIA

Devices aid monitoring of bridges

Madison Heights project is site of first one in state

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TIMES-DISPATCH STAFF WRITER

LYNCHBURG — Kurt Hudson slipped a little, oddly shaped white box through the gridwork of green-coated steel rods and strapped it in place.

The device was the first of four computerized micro-instruments a small Virginia technology company is installing in the new Pleasant Valley interchange bridge.

The experimental monitors are designed to provide the Virginia Department of Transportation with key information on the structural health of its bridges.

The highway agency hopes they lead to big savings for state taxpayers.

"Corrosion of the rebar in the reinforced concrete in bridges is a very expensive problem," said Dr. Gerardo Clemena, a senior research scientist with the Virginia Transportation Research Council in Charlottesville.

"Our intent is to minimize, if not eliminate, that expensive problem," he said.

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By measuring five different conditions in concrete bridge decks, Virginia Technologies Inc.'s ECI-1 can, for years at a stretch, keep tabs on the rusting away of reinforcement steel, according to engineer Robert A. Ross, the Charlottesville company's president.

Ordinarily, "most corrosion detection is low tech and slow tech," said Dr. Robert G. Kelly, a University of Virginia engineering professor and expert on corrosion.

Kelly is one of the monitoring system's co-inventors, along with Ross and Hudson.

Their high-tech gizmos buried in the Pleasant Valley bridge's freshly poured concrete will be able to tell the agency quickly what's happening inside its expensive bridge.

The corrosion monitoring system, which Virginia Technologies is donating for the test, will also sense that information without having to tear the span apart, engineers said.

The new bridge is in the relocated U.S. 29-U.S. 460 intersection, part of the $190 million Madison Heights Bypass project VDOT has under construction on U.S. 29.

The National Research Council has estimated the cost of damage — primarily caused by corrosion — to America's aging bridges at about $20 billion and is increasing at the rate of $500 million per year.

Other authorities put the nation's bridge repair costs as high as $200 billion.

According to the National Bridge Inventory Study Foundation, making needed repairs to Virginia's 11,855 bridges would cost $2.8 billion.

Corrosion is the deterioration of a material, usually a metal, through a chemical reaction with its environment.

Salt used to de-ice bridges is the main cause of concrete bridge deterioration, experts say.

Virginia Technologies' monitors measure and report five conditions — including moisture, temperature, corrosion-rate indicators and chloride concentration — affecting rusting of embedded steel reinforcing bars.

With that information, engineers can identify where bridge-damaging salt or other agents are eating away at the structure faster than anticipated.

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Technicians will place the self-contained instruments within the bridge deck — in areas vital to the structure's strength or that are likely to be corrosion prone — before they pour the deck's concrete.

An epoxy-potted, water-tight plastic case protects the instrument without degrading the bridge deck's structural integrity.

The electronic instrument packages weigh less than a pound.

They are linked in a network to a battery-powered data logger outside the bridge. A small solar collector provides electricity to recharge the battery.

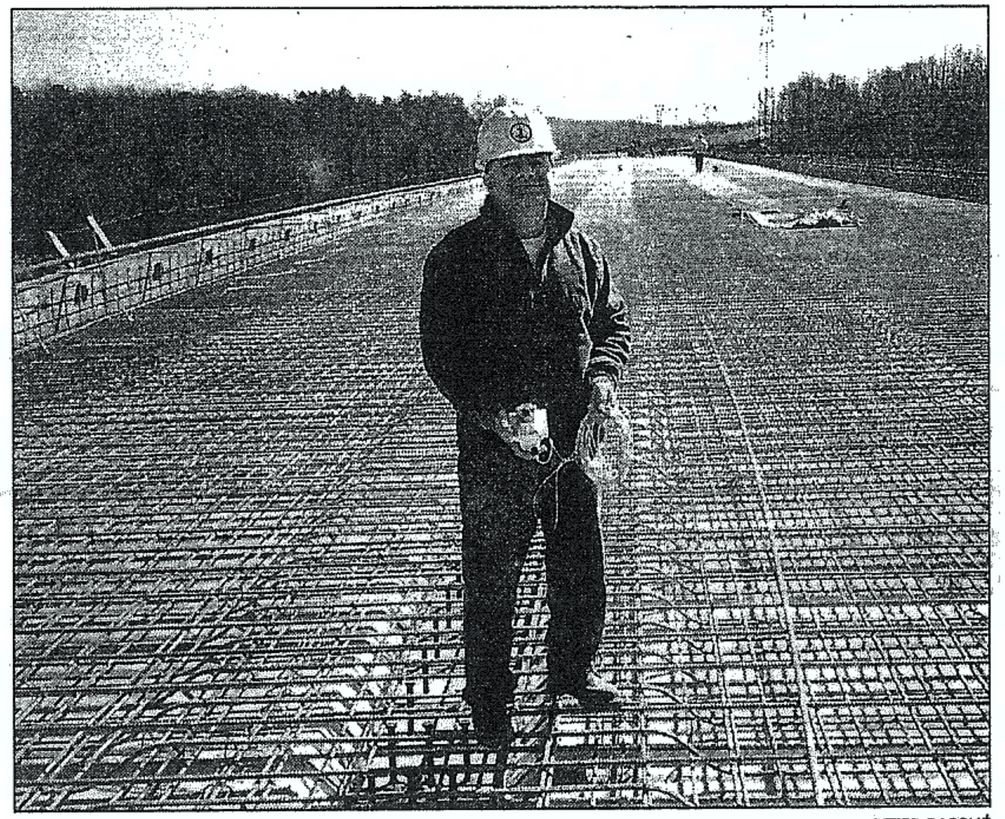
Through a cell-phone modem, engineers can collect the system's corrosion reports remotely: "Kurt never has to leave his desk in Charlottesville," Ross said.

From the resulting "corrosion map" of the structure, bridge engineers will be able to figure out when, where and what kind of upkeep the span needs.

"It's part of . . . an intelligent maintenance system," said Ross, a former U.Va. research scientist.

Armed with knowledge of how fast a bridge's rebar is corroding, engineers will be able to predict how much life is left in the structure without undertaking costly, tedious tests that themselves degrade the bridge.

"It's going to be beneficial to us to know the type of conditions existing on a given bridge," Clemena said, "so we can apply corrective measures . . . before it gets too expensive."



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Robert A. Ross, president of Virginia Technologies Inc., holds one of the devices his company is donating for use at a new bridge in the Lynchburg area. The computerized system will monitor the bridge's structural health.

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