# MEASURING MANHOLES IN A GLANCE

Inspection system provides 3-D views and complete inspection data in a simple package

#### By Luke Laggis

o utility is immune from manhole problems. From I&I and elevation to reconstruction and rehabilitation issues, you're all dealing with them. And with several manholes per mile of pipe, that adds up to a whole lot of potential problems.

Inspection technology has evolved significantly over the past decade, and CUES is pushing the curve further with its new SPiDER manhole inspection system. *MSW* recently spoke with Pierre Mikhail, director of CUES' Manhole Inspection Division, about the new system and how it can help utilities inspect manholes more efficiently.

### What was the idea behind the development of this inspection system?

**Mikhail:** We wanted to create a smart manhole inspection system that is truly wireless, simple to use, and can measure entire manholes in one glance instead of point to point, providing the condition assessment of manholes both before and after rehab.

# What issues does the **SPiDER** resolve over previous manhole systems?

**Mikhail:** The system isn't tethered to a power or data cable so there is no calibration required. The SPiDER doesn't have to remain centered in the manhole during deployment. There is no inspection review required at the end of the inspection, so all inspections should pass if the user deploys the unit as trained.

The SPiDER is capable of evaluating the manhole video quality and adjusting one or several of its 25 LED lights simultaneously, automatically and instantly with no user controls. When the manhole wall is difficult to see, the SPiDER deploys a pattern generator to ensure a dense point cloud. These adjustments are evaluated by the SPiDER for every frame of data it

# TECH CLOSE UP

PRODUCT: SPiDER

MANUFACTURER: CUES 800/327-7791 www.cuesinc.com

**APPLICATION:** Inspecting manholes

**BENEFITS:** Wireless inspection can measure manholes at a glance.

collects, and adjustments are instantaneous. This frees the user from having to adjust iris, focus, exposure or light intensity. This simplicity means training to use the equipment on site requires only minutes.

The SPiDER also creates a mesh that allows the user to evaluate changes in manhole shape in a custom color gradient that symbolizes change in distance.

### What are the advantages of a wireless system for manhole inspection specifically?

**Mikhail:** Off-road inspection is a big challenge for manhole inspection teams. A wireless system removes the need for a cable reel, and a footage encoder isn't required to determine the depth of the device in the manhole.

#### How is inspection accuracy improved with the SPiDER?

Mikhail: The unit uses four stereoscopic cameras positioned in a spher-

(continued)

The CUES SPiDER manhole inspection system includes two sets of batteries, control tablet, tablet charger, post-processing computer, tripod, electric winch and carbon-fiber poles.



The SPiDER's four stereoscopic cameras generate point clouds. After the inspection is completed, the SPiDER automatically post-processes the inspection data and provides a 3-D video, 3-D image and the 3-D point cloud that can be exported to CAD or transferred to a measurable mesh.

ical formation. Stereoscopic cameras generate point clouds, which are solid images rather than sparse one-color points like previous systems. The denser the point cloud, the better the accuracy. SPiDER accuracy is less than 5 millimeters and usually as accurate as 1 millimeter in standard manhole widths of 3 to 4 feet. tion from the four stereoscopic cameras. After the manhole inspection is completed, the SPiDER automatically post-processes the inspection data while the next manhole is being inspected. After post-processing, the unit provides a 3-D video, 3-D image (which can be unwrapped or viewed in 3-D space), and the 3-D point cloud that can be exported to CAD or transferred to a measurable mesh.

### How does the system measure hydrological information for I&I studies?

**Mikhail:** The user can review the video to observe the pressure of the I&I. The 3-D imagery can be used to measure the size of the infiltration.

#### Can you walk me through the setup for a typical inspection?

**Mikhail:** The unit can be set up as a truck-mounted or tripod system. Truck-mounted units are deployed from the rear of a truck positioned at a manhole. The tripod setup requires the SPiDER to be mounted at each



manhole. Once the manhole is opened, the user positions the SPiDER over the manhole opening and selects "Start Recording." Additional information such as manhole number, address, etc., can be customized and entered by the user via text or drop-down fields. The SPiDER is then deployed at 10 feet/ minute using an electric winch. When the SPiDER reaches the bottom of the manhole (tablet provides distance from bottom in real time), the user stops the electric winch and selects "Stop Recording." The unit is then removed from the manhole.

#### How long does it take to inspect a manhole with the system?

**Mikhail:** The majority of the time required to inspect a manhole is the mobilization time between manholes. Once a manhole is opened, the SPiDER

#### What are the differences between the data collected by the SPiDER and a traditional manhole camera?

**Mikhail:** Most manhole inspection systems use multiple sensors to gather information. Usually it is a photographic camera paired with a point cloud generating device such as a Lidar laser. The laser creates a sparse one-color point cloud. The SPiDER uses stereoscopic cameras that collect the photographic imagery and 3-D positioning to generate a solid-image color 3-D point cloud. Since the point cloud is a solid image with minimal spacing between points, it is far more accurate — as low as 1 millimeter. More importantly, the color point cloud can be converted to a mesh, which will be the new standard deliverable to provide manhole condition assessment pre and post rehab.

#### What type of software is required to read the inspection data?

**Mikhail:** The SPiDER uses a web browser tool for user review of the inspection. This tool is provided with the unit.

## Does the system create a 3-D model of the manhole, or is data overlaid on traditional video footage?

Mikhail: The SPiDER provides a live video tablet review during inspec-

inspects at 10 feet/minute. Users can inspect 30 off-road manholes per day with a tripod setup, and more than 50 on-road manholes with a truck-mounted system.

#### How many manholes can be scanned on a single charge?

**Mikhail:** The SPiDER is powered by a pair of batteries that last for seven hours with the unit powered on all day. It includes two sets of batteries for up to 14 hours of runtime, and a smart charger that can charge one set of batteries in less than three hours while the other set is in use.

#### How is the information stored and shared?

**Mikhail:** The raw data is stored on the SPiDER, not on the tablet. After post-processing, the data is downloaded to a portable drive. The SPiDER auto-manages the data so it is user-friendly for the field crew.

#### What's included with the system?

**Mikhail:** The SPiDER includes two sets of batteries, control tablet, tablet charger, post-processing computer, tripod, electric winch, carbon-fiber poles (up to 30 feet deep). Everything necessary to perform SPiDER inspections is included in two wheeled cases. ◆