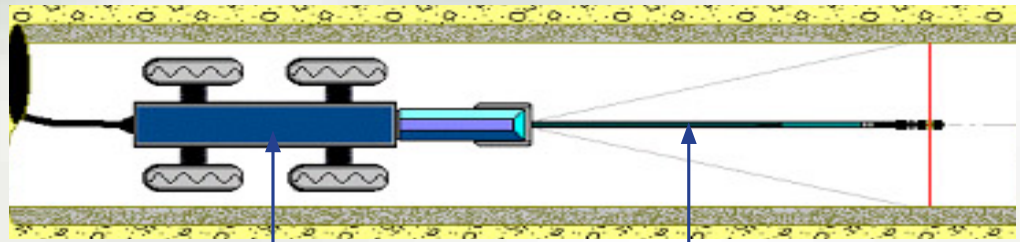


# Laser Profiler System



CCTV INSPECTION CAMERA

LASER PROFILER

*The concept - simple and easy:*

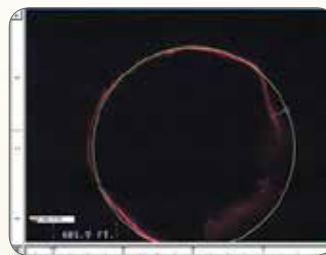
- A ring of laser light is projected onto the internal pipe surface
- Laser image is in the field of view of the camera while the camera moves through the pipe
- Analysis is performed on the ring of light using the Laser Profiler software to build a digital pipe profile
- For use with live or pre-recorded to video (tape, CD, or DVD)

The Laser Profiler is designed to provide the contractor, municipality, or consulting engineer with the ability to determine internal pipeline conditions prior to and/or after rehabilitation. The Laser Profiler is a stand-alone, snap-on tool for use with a CUES CCTV survey system and CUES camera to collect survey data and create pipeline reports containing the measurement of faults and other features inside the pipeline. This includes measurements of pipe size, laterals, water levels and other features, as well as automatic analysis of pipe ovality and capacity up to 30 times per second. The Laser Profiler simply attaches to your existing CCTV Camera and the resulting CCTV images are analyzed using innovative machine vision software.

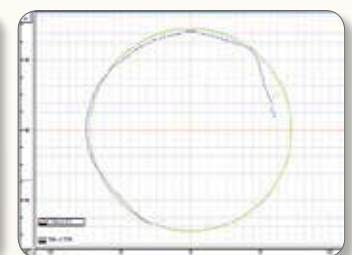
## Features & Benefits:

- Can operate in pipe sizes ranging from 6" through 72"
- High-strength carbon fiber and aluminum construction
- Internally battery powered (rechargeable); no electrical connections are required; no moving parts
- Software can be used on a TV inspection vehicle or on a remote computer
- Can capture a single frame of video from videotape, previously stored file, CD, DVD, etc, when utilized on a remote computer
- Designed to project a laser light in a radial plane perpendicular to the CCTV camera's line of sight and create a red line on the inside wall of the pipe; laser is designed to provide sufficient intensity to view the video image with normal CCTV camera lighting
- Easily attaches to your existing CUES CCTV Camera or Transporter
- Designed to capture and display a single frame on the data monitor for measurement and analysis in industry standard formats to include JPEG, BMP, or TIFF formats
- Text can be placed anywhere within the captured video image
- A line graph displays the cross-sectional amplitude over the entire length of the pipe run from entry to exit access
- Designed to obtain the actual degradation of the pipe by utilizing the laser profiling and measurement tools
- Certified by WRC

*Examples of quantifying lift in liner using both the manual and the automated digital measurement methods. The 3-D model can be seen below.*



Manual



Automated



# Laser Profiler System

Laser Profiler Base System includes the following:

For 6"-15" pipe: Camera mounting assembly, single laser head, battery charger, 3-D measuring software, rod extension for 10", 12", 15", barrel distortion target, calibrator target, AC adapter, and hardware case

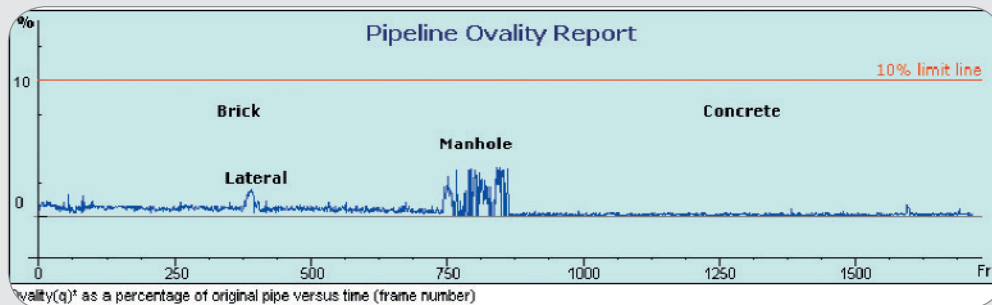
For 8"- 42" pipe: Laser wand, triple laser head, battery charger, 3-D measurement software, barrel distortion target, calibrator target, AC adapter, camera skid assembly 8"-30", skid plate assemblies for 36" and 42", skid adapter plate, and hardware case

## THE SOFTWARE -

**Manual Measurements** - Precise measurements can be taken from a single frame captured from the prerecorded or live video. This includes pipe size verification, size of laterals, water levels, holes, and off-set joints. The captured frame, with its measurement data, can then be stored as a JPEG or BMP file. Manual measurements can be performed on the captured digital profile to an accuracy of 1mm\*.

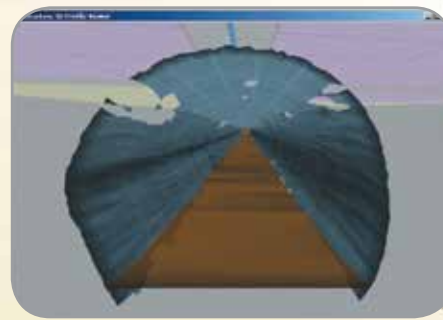
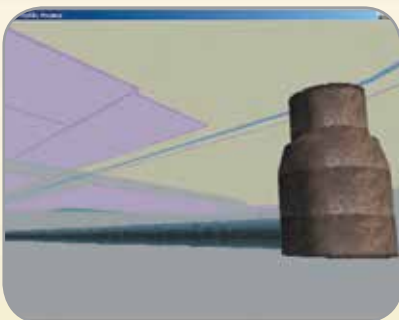
**Automated Analysis**- The software uses machine vision. Machine vision is used to find the video image of the laser profile (red laser line). Each frame of the inspection video is analyzed to build a digital profile of the pipe. From this profile, the Laser Profiler built-in functions display the following:

*Ovality analysis in a 30" brick and concrete pipe*



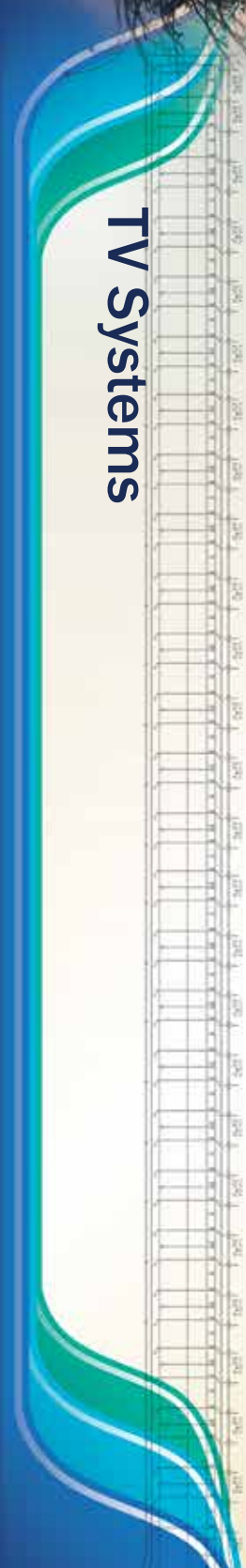
- Ovality - The Ovality function calculates the "q" (as per ASTM F 1216, the internationally recognized standard for CIPP rehabilitation).
- Capacity - The Capacity (X-sectional Area) function calculates the cross-sectional area for each profile and normalizes the results against the expected internal pipe area.
- Interfaces with CUES software
- Delta - The Delta calculation finds the maximum and minimum pipe radius for each profile.

## THE LASER PROFILER 3D DEVELOPMENTS



**3D Modeling**- Using the digital profile, the Laser Profiler creates a fully interactive 3D model of the pipe. This allows the user to navigate through the selected pipe within its local environment, thereby providing a new perspective to traditional CCTV inspections.



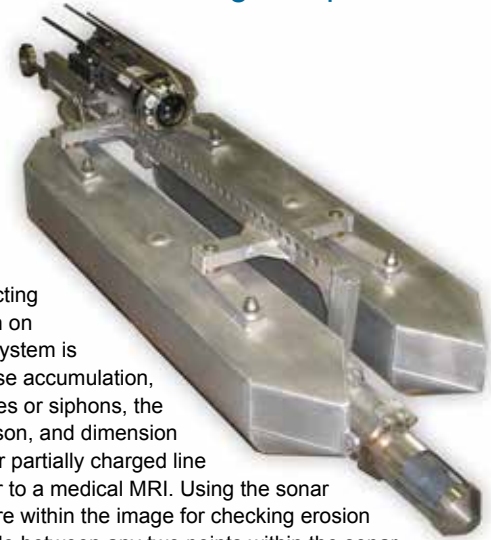


**PIPE PROFILERS**



**Sonar Profiler System**  
for Submerged and Semi-submerged Pipes

*...provides a two-dimensional profile of the interior pipe wall similar to a medical MRI!*



While CCTV is the standard acceptable method of visually inspecting pipelines above the waterline, it cannot provide visual information on internal pipe conditions below the waterline. The Sonar Profiler System is designed to provide accurate dimensional data on silt level, grease accumulation, pipe deformation, offsets, etc, below the waterline. In charged lines or siphons, the Sonar Profiler System provides the visual profile, profile comparison, and dimension data of significant items or defects. A sonar inspection of a fully or partially charged line provides a two-dimensional profile of the interior pipe wall similar to a medical MRI. Using the sonar software, a circle overlay is projected, sized, and moved anywhere within the image for checking erosion or remaining wall thickness. Accurate measurements can be made between any two points within the sonar image. Thus, offset, debris level, size of blockage, grease level, defects and so forth can be quantified. In partially charged lines, the Sonar can be combined with CCTV to provide a simultaneous composite image of the pipe both above and below the waterline! Two (2) different sonar systems, (1) for submerged pipelines and (1) for semi-submerged pipelines, are available to survey pipelines measuring 12" up to 18' in diameter. Both systems provide 'real time' cross-sectional views of the pipe by utilizing high resolution/short range sonar. For semi-submerged pipelines, the non-submerged portion of the pipe is displayed on the video monitor as a standard video image.

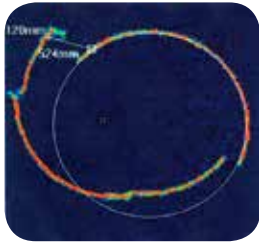
**Features & Benefits:**

- Operates with CUES Standard CCTV to provide underwater profiles of pipe interior and conditions
- Operates in pipes, lines or siphons from 12" though 18' without flow interruption
- PAL or NTSC outputs for recording on standard VHS or S-VHS recorders
- Real time continuous interior scanning over full 360 degrees in under 1 second
- Direct image capture to hard disk for recording still frames on CD at full resolution
- Screen display of distance location from entry point for positive location confirmation
- Operates both in fully charged and partially charged lines
- Analysis can be performed in a CCTV inspection vehicle or on a remote computer
- Collects, stores, and prints pipeline inspection data (footage count and inclinometer data) & video images for display/report generation
- Stores inspection files on disk to be exported into other computers
- Surveys approximately 4 inches/per second
- Includes an inclinometer designed to collect pitch and roll data
- User can display distance measurements and/or draw a circle around the pipe image to determine pipe diameter
- User can add titling information to the video or to a computer report while printing
- Operates off of 115 or 240 volts AC current
- Underwater Scanner Unit provides communications with the scanner, sampling of the acoustic signals, and interfacing to the cable counter for each Sonar System

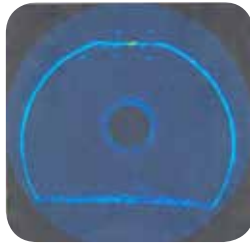


**PIPE PROFILERS**

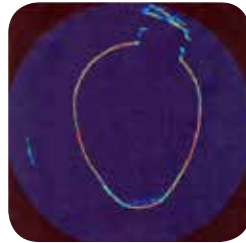
## Sonar Pipe Profiles



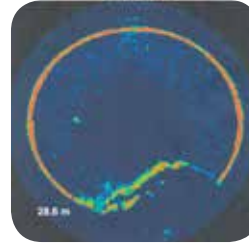
Broken Pipe w/ Circle & Measurement



40 Inch Siphon



Pipe Image with Lateral Opening



GRP Pipe w/ Debris



### SONAR SYSTEM for SUBMERGED PIPE

- Base system includes the following equipment: Underwater Scanner Unit, Collapsible Sonar Siphon Float, Sonar Processor/Monitor, Skid Set, and all necessary interconnect cables
- Specifically designed to survey fully submerged (all water, no air) pipelines and/or pipelines containing heavy silt without disrupting the service
- Capable of inspecting fully submerged pipelines from 24" to 18' in diameter
- Includes a collapsible Sonar Siphon Float with slightly positive buoyancy designed to accommodate different pipe sizes; the Float is designed to position the sonar in the center of the pipeline to ensure accurate measurements
- Includes a specially designed skid set to align the Sonar System in 12"-60" submerged pipelines
- Designed to operate as a multi-conductor 'stand-alone' system

### SONAR / TV SYSTEM for SEMI-SUBMERGED PIPE

An optional system is available as an integrated Sonar with video for use in submerged and large semi-submerged pipelines

- The base system includes the following equipment: Underwater Scanner Unit, Sonar Processor/Monitor, Picture in Picture system, and all necessary interconnect cables
- Designed to survey large semi-submerged (part air/part water) pipelines without disrupting the service
- Capable of inspecting large semi-submerged pipelines from 24" up to 18' in diameter.
- For use in conjunction with a camera transporter float and pan & tilt camera in larger pipelines; the float is designed to position the camera above the waterline and the sonar below the waterline
- Designed to display live television pictures of the pipeline and the sonar image with the Picture in Picture (PIP) display
- Uses the USATI (United Sonar and TV Inspection) survey method for semi-submerged pipelines greater than 24 inches in diameter. With USATI, the camera is positioned above the waterline and the sonar is positioned below the waterline to provide a 360-degree survey of the pipeline. The sonar image is superimposed on the picture to display views above & below the waterline on one monitor!
- Designed to operate as part of a multi-conductor TV Inspection System

**TV Systems**





## CUES AMP™

CUES AMP™, the worlds most versatile and unique autonomous multi-purpose pipeline mapping system delivers exact 3D positional data. The gyroscopic based pipeline mapping system is designed for rapid and accurate XYZ location of your wastewater system.



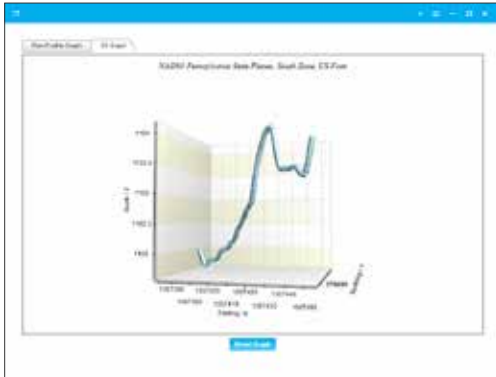
TV Systems

**The Accurate Mapping Probe (AMP™) provides precise and efficient 3D location of any underground pipeline asset quickly and easily, including wastewater, utilities and directional drilled lines. AMP's accurate data can be used for as-built drawing verification and defect locating including pipe sags, misaligned joints, horizontal and vertical design problems and hydraulic modeling. The system includes interchangeable wheel sets allowing AMP™ a wide operational range from 3" in diameter to 58" in any and all pipe materials including VCP, iron, plastic and concrete.**

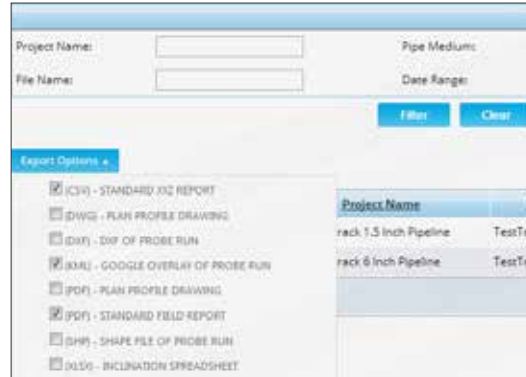
- Use AMP™ for precise location of your underground pipeline assets for proactive sewer repair and replacement
- Identify the critical problems, such as inclination, sags, bends, etc. in your wastewater system
- The CUES AMP™ data can be used with your centralized system of record keeping and be accessible to all decision makers to assure proper defensible spending
- Identify short and long term concerns to be considered in future CIP and O&M budgets
- Integration of exact positional location with CCTV-identified anomalies and CUES asset-based Granite XP decision support software allowing for accurate and cost-effective spot repairs
- Use data for as-built drawings and confirm that installations meet location specifications
- Project specific custom carriers available upon request



AMPVUE™



• AMPVUE™ 3D Graph



• AMPVUE™ Data Transfer Download Screen

TV Systems

**AMPVUE™**, a cloud based free service for all users of CUES AMP™ is available to manage all the data produced by the CUES AMP™. This tool provides industry standard enterprise GIS outputs, multiple CAD formats and standard detailed reports.

- Provided as a free service to all users of the CUES AMP™
- AMP™ data is immediately converted and available for download in industry-standard GIS & CAD formats
- Cloud technology, accessible via a web browser
- Manages all data produced by the CUES AMP™
- Permits non-technical users to easily access data
- Standard reporting modules, allowing easy documentation of projects performed with the CUES AMP™
- Easy data integration (import/export) with any existing enterprise GIS

**AMPVUE™ Professional** is available for any size operation requiring a GIS (Geographic Information System). AMPVUE™ Professional provides a cost effective web-based GIS platform at a competitive cost and includes all of the functionality in AMPVUE™, plus:

- All-in-one information repository, includes modules for Document and Photo Libraries
- Easy to use web-based GIS display (can integrate data from any other location/mapping technology)
- Allows for seamless integration of legacy information (e.g. old CAD maps)
- Allows for creation/use of custom, industry-specific queries and reports
- Municipalities without a GIS can be up and running with minimal cost
- Automated bend radius analysis modules utilizing CUES AMP™ results
- Custom reporting modules can be created for various industry-specific Key Performance Indicators (KPI)

