

Laser-Scanning As-Building System

The innovation consists of a laser scanner driven by a laptop computer. The scanner is aimed at the physical object to be scanned, and the laser beam is directed over the object in a closely spaced grid of points. By measuring the time of laser flight (the time for the laser to travel from the scanner to the object and back again) the scanner determines the position in 3-dimensional space of each scanned point on the object. The result is a "cloud of points" — thousands of points in 3-dimensional space that are a dimensionally accurate representation of the existing object. This information can then be converted into a 3D CAD model that can be manipulated using CAD software, and to which the design of the new equipment can be added.

This innovation is significant because it solves the most difficult problem that has always been associated with design and construction of new equipment at an existing facility: how to accurately interface with the existing facility and avoid interferences during construction. This problem is almost always exacerbated by the fact that the drawings for the existing facility are not completely accurate, if they exist at all.

Before the existence of the laser scanner, as-building could only be performed by manually taking direct measurements in the field or by using survey instruments. Either of these methods, in conjunction with the effort to produce dimensionally accurate as-built drawings, was a very labor-intensive and expensive process. Furthermore, given the amount and accuracy of data that is gathered using the laser scanner, the resulting as-built drawings and models would have been impossible to produce using prior methods. Therefore the laser scanner reduces the costs of as-building an existing facility, while at the same time increasing accuracy and detail.

However, the greater savings from this innovation accrue during construction. Using laser scanning during the design process helps to avoid interferences that are found during construction (i.e. a new piece of equipment is designed to be placed in a location where something already exists). During construction is the most expensive and disruptive time to deal with this type of problem: A new design must be prepared, additional equipment may need to be procured, more work may need to be done, more cost is incurred, and the schedule is delayed. Furthermore, if the existing facility has been shut down to permit construction to proceed, the owner will forego income from operating the facility for a longer time. On a large project these problems can cost millions of dollars.

Finally, the laser-scanning system reduces accidents associated with engineering and construction. Areas of a plant that would require scaffolding or other means of temporary access for traditional as-built methods (with resultant fall potential) can be as-built from the ground or permanent walkways using the laser scanning system. Areas that would place surveyors using conventional techniques in danger (e.g. along active highways) can be avoided.

CYRA Technologies manufactures the laser scanning hardware and develops the associated software. CYRA began developing the laser scanning system in 1995, and the first units were shipped in 1998. Washington Group International works with CYRA to test and guide the development of many of the scanning system features, particularly in determining how to apply the system to heavy construction applications. CYRA, Washington Group, and Detroit Edison are applying the CYRA system to a major project: the SCR installation project at Detroit Edison's Monroe power plant. This is the largest and most complex application of the laser scanning system ever performed. In this project, a major portion (both inside and outside) of four electric power-generating units was scanned so that large systems for reducing nitrogen-oxide air emissions could be designed and installed. This project is shown in the innovation illustration sheet attached.

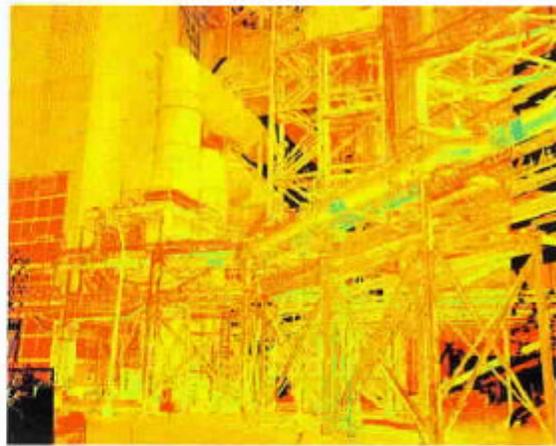
The laser scanning system has been and will continue to be used in the future in a wide variety of situations where large amounts of as-built dimensional data are required or where the area being scanned is difficult or impossible to access.

Contact: Ben Kacyra • Cyra Technologies • 8000 Capwell Dr.
Oakland, CA 94621 • 510-633-5000 • Fax 510-633-5009

Laser Scanning 3D As-Building System



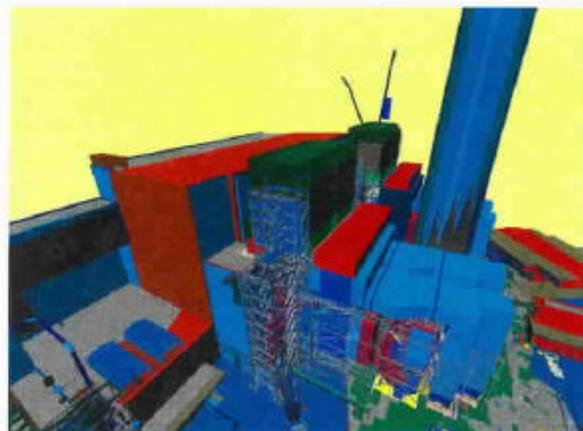
Photograph of Existing Structure



"Cloud of Points" Scan of Existing Structure



3D Model of Existing Structure



3D CAD Model of New Design
Interfacing with Existing Structure