PROJECT NAME:	Retrofit of the Monroe Power Plant	
PROJECT DESCRIPTION:	• Accurate as-builts for better retrofit design & construction planning	**1**
	• Easier conceptual design using as-builts 3D models	
SCOPE:	180' tall x 500' long, 3D Microstation files as deliverables	
OWNER:	Detroit Edison	
PROJECT DATE:	October, 1999	

"We would have spent a big chunk of the engineering budget on the mapping of the existing plant in the past. We won't be even at one percent of the engineering budget on this project."
Bruce Klein, Project Manager, Raytheon Engineers and Constructors

"3D plant design had driven rework on greenfield projects from six percent to less than one percent. Now that we can apply 3D models to retrofit work, similar levels of improvement are possible in the retrofit area, as well."
Greg Lawes, Project Leader, Raytheon Engineers and Constructors

BACKGROUND: When Detroit Edison was faced with a major retrofit to comply with new NOx emission regulations for their Monroe Power Plant, they decided on a different approach. They hired Raytheon Engineers & Constructors Inc. to provide an as-built 3D MicroStation model of the plant with the help of the *Cyrax* 3D laser scanning system and to use this as the base for the retrofit design.

PROJECT: The challenge of obtaining as-built information for the existing Monroe Power Plant was daunting: the scrubber and associated structure with piping that needed to be captured were part of a 13 story high structure with very restricted access.

Raytheon engineer, Greg Lawes, who spearheaded Raytheon's use of the system, was able to move the scanner to various locations around the plant and capture portions of it as 3D "point-clouds." Some of the scans were taken from the ground floor looking straight up to the full 180 foot height of the structure. Even at these distances *Cyrax* delivered very accurate data. The point-clouds are instantly 3D-viewable (full rotation, fly-around, pan, and zoom capability) plus they contain valuable 3D geometry information. Raytheon was able to extract point-to-point distances from clouds of points as soon as a scan was done (scans typically took about 10 minutes each).

Individual scans were stitched together with other scans taken from different locations, thus giving a complete 3D image of the project. The Raytheon team used just 51 scans to assemble the final 3D point-cloud of the scrubber and surrounding structures. Raytheon engineers used CyraMODEL software to convert the point clouds into MicroStation models. The Cyra Software allowed Raytheon Engineers to convert points into geometrical objects such as pipes, steel-beams, valves, flanges and other elements. The *Cyrax* point clouds also allowed a "model-as-needed" approach. These partial 3D models can be very cost effective yet very powerful inputs for the conceptual design phase of revamp projects.

Raytheon's Project Manager, Bruce Klein, estimates that the combination of time savings during modeling and fewer change orders during construction, due to the greater accuracy of the design, will conservatively save at least $10 million.

PROJECT FACTS

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Field time:	5 days
Number of scans:	51

CYRAX BENEFITS

• Estimated $10 million savings from fewer change orders during construction and time savings during modeling
• Safer measurements of hard to reach areas
• Higher confidence in the model of the plant's current state
• Export to MicroStation® and AutoCAD® for design work
• Estimated 50% savings in modeling time
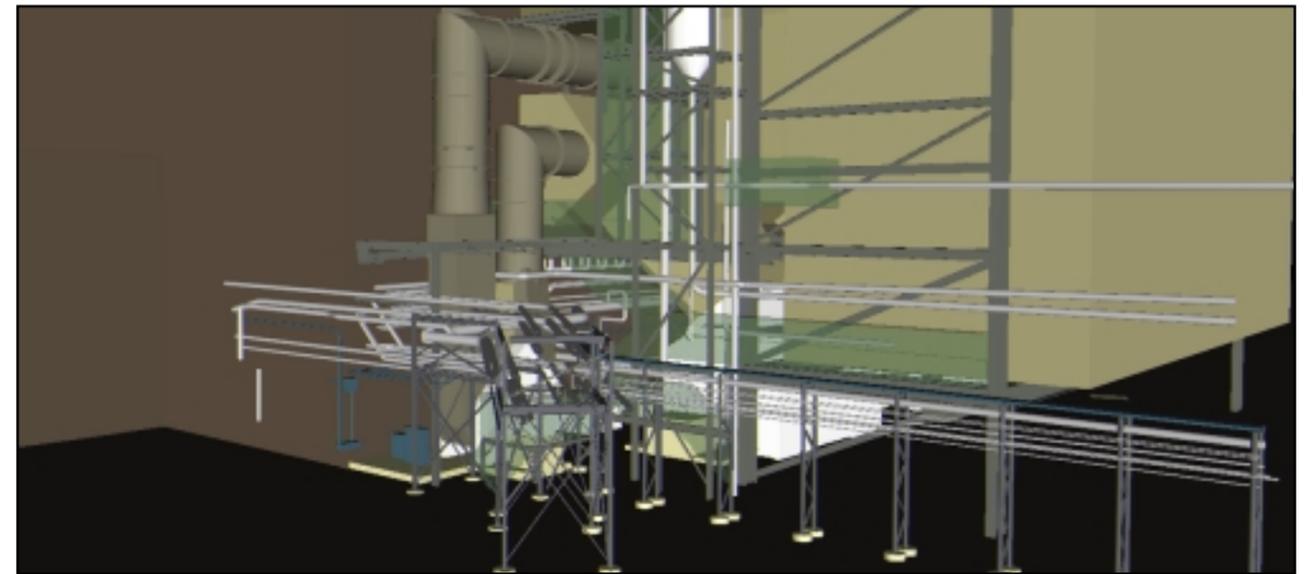
Model of the 13 story high proposed new addition.

Actual Cyrax camera view of existing structure.
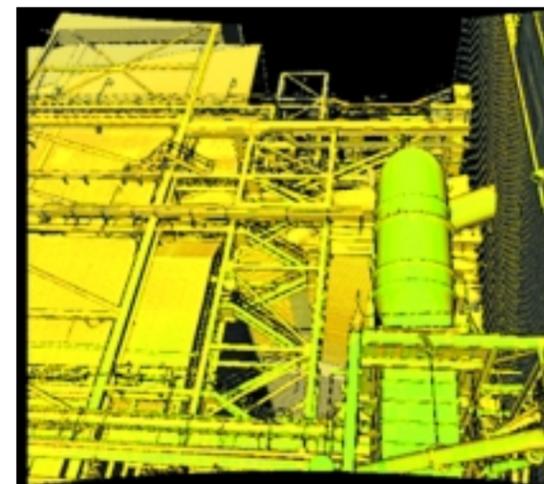
Shrinkwrap (wiremesh) view of the same structure (left) and the resulting 2D section view in Microstation (above).