



### 66% Productivity Increase in LAX Airport Scanning/Modeling Project

The 60 million travelers who pass through the Los Angeles International Airport (LAX) every year likely never think about the technology that ensures hot and cold water flows uninterrupted to lavatories, kitchens and air conditioners throughout the facility. They would, however, notice if the water stopped running. And for LAX management, that simply isn't an option.

Ten rooms equipped with massive pumps keep water moving through miles of pipes serving the eight passenger terminals, administrative offices, and central building. With many pumps and pipes approaching the end of their useful lives in 2011, LAX made plans to overhaul the outdated water plant and upgrade the pump rooms. As is true for any continuously operating facility, the challenge was performing the retrofit without disrupting water service.

"You can't just take out the old pipes and put new ones in their place," said Scott Cedarleaf, President of SkyBucket 3D, a scanning, modeling and visualization firm based in Los Angeles. "The new pipes had to be installed before the existing ones were removed."

This meant the existing pipe runs had to be precisely modeled in 3D to fit in the void space among the maze of

existing mechanical, electric and plumbing (MEP) features in each room. The location, diameter, bend and sag of each new pipe have to be exact to pass cleanly through the allotted space. A misalignment or encroachment could bring the construction to an expensive halt for re-design and procurement of new parts.

*"We estimated modeling all 10 pump rooms would take us three months, but with EdgeWise we finished the project in 30 days."*

- Scott Cedarleaf, President of SkyBucket 3D

SkyBucket adopted a method of streamlining the entire 3D modeling process for industrial plant projects by using the EdgeWise MEP software, which automates the extraction of pipe features from a laser scan point cloud. Deployed at an earlier LAX project, this fast and accurate modeling software caught the attention of construction giant Clark McCarthy, who invited SkyBucket to join its team for the water plant upgrade.

### Scanning the Pump Rooms

Each LAX pump room averages 50' in length by 30' in width. The center is occupied by one or more pumps, while the remainder of the room is crisscrossed by electrical wires, conduits, and pipes ranging from one to 24 inches in diameter.

SkyBucket selected the Leica HDS6200 phase-based scanner, a fast and rugged product designed for smaller spaces. "In each room, we usually take a center scan to get the basic geometry and then set the scanner up

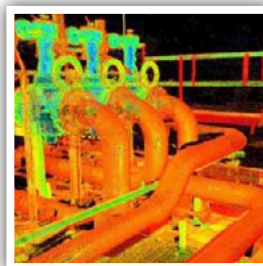
### SkyBucket 3D Workflow



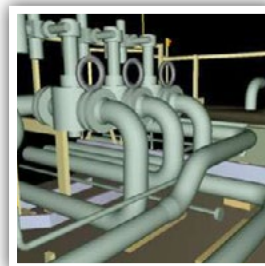
Leica HDS6200



Cyclone Register



EdgeWise MEP



Cyclone MODEL



AutoCAD

at multiple other points depending on obstacles," said Cedarleaf. Due to security restrictions at LAX, the scanning had to be completed in one visit. It took 16 hours to scan and photograph the 10 pump rooms.

## EdgeWise Virtually Eliminated Tedious Manual Tracing of Pipes

Back at SkyBucket headquarters, Leica Cyclone software was used to tie together the multiple scans for each room into a single 3D point cloud model with minimal data gaps. Prior to the availability of EdgeWise MEP, the next phase in the project would have been the most time-consuming. It also would have introduced accuracy errors. Working in a tracing application, SkyBucket technicians would have had to manually delineate and extract features from the point cloud, one pipe run at a time. This meant precisely locating each pipe section by its X, Y and Z coordinates, carefully measuring its diameter, and correctly determining elbow bends. "When extracting features manually, the tendency is to model pipes in straight lines," said Cedarleaf. "But pipes don't run that way – they sag."

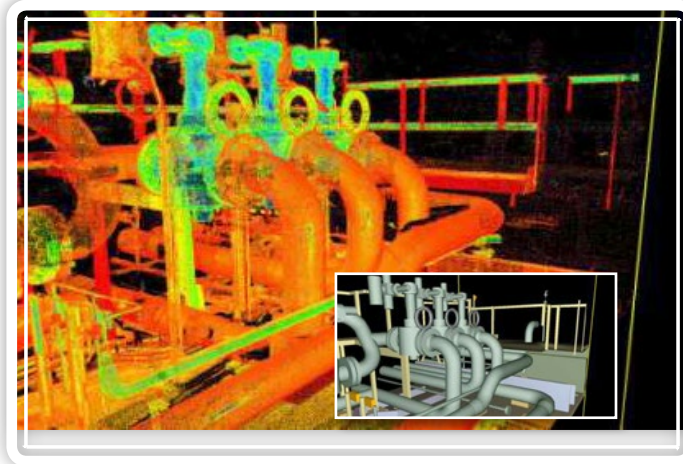
Accurately estimating the radius of an elbow, where two pipe sections join, is the other difficulty in manual extraction. Incorrectly determining the radius by just a fraction of an inch can negatively impact the fit of the two pipe sections at the connection.

## 85-to-90 Percent of Pipes Extracted Automatically by EdgeWise

The tedium and human errors related to modeling features manually from laser point clouds have been a challenge to surveying and mapping firms for decades. For the LAX pump rooms, SkyBucket technicians exported the registered point cloud from Cyclone to EdgeWise, then

set parameters to extract all cylindrical pipes greater than one-inch in diameter. From there, the extraction process was automated. The software progressed through the scans identifying, locating and extracting the pipes, and saving the extracted geometry in an editable table.

Built-in quality control tools ensured the pipe sections fit together precisely, especially at elbows where the radius measurement is exacting. EdgeWise also correlated scans in a single room to ensure that pipes partially occluded, or hidden from view, in one scan were picked up in another scan so the entire run was accurately located along its full length. The software successfully extracted even slight dips and sideways turns in the runs.



The new workflow embracing EdgeWise MEP allowed SkyBucket 3D to complete the LAX project in one-third of the time.

## 3 Months Versus 1 Month with EdgeWise

"The software takes into account all of the changes in directions and connections in the scans and then makes sure all the pipes align," said Cedarleaf. "That was fantastic for us." SkyBucket estimates that 85 to 90 percent of the pipe extraction was performed using EdgeWise automation. "Even having used the extraction software before, we estimated the 3D modeling of all 10 pump rooms would take us three months," said Cedarleaf. "But with EdgeWise we finished the project in 30 days."

From EdgeWise MEP, SkyBucket transferred the registered point cloud and solid pipe model back to Cyclone for tweaking. From Cyclone, they generated three deliverables on a per-room basis for ARUP, the architecture and engineering firm designing the plant upgrade in AutoCAD MEP. The first two files were RGB texture-mapped point clouds in .ptx format, one including all of the individual scans and the second containing the unified 3D cloud for a given pump room. The 3D solid BIM with the pipe data layers delivered in .dwg format.

To learn more or request a software demonstration, visit [clearedge3d.com](http://clearedge3d.com) or contact us at [sales@clearedge3d.com](mailto:sales@clearedge3d.com) or +1 866.944.8210.



SkyBucket 3D is a 3D capture and modeling company always striving to capture and visualize the clearest, cleanest, and most workable RGB LiDAR and photo-based deliverables in the industry. Our focus is capturing data of sets, locations, environments, heads, bodies, props, and anything else you can think of.