Laser Scanning & Creation of 3D Models
For
BIM and Process Facilities

Presented to:

ICES – UAE Region
Abu Dhabi
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Laser Scanning & Creation of 3D Models
For
BIM and Process Facilities

Specialised Surveying Solutions

Land and Engineering Surveying Services

3D Laser Scanning & Modeling
Laser Scanning Technology

Zoller+Fröhlich

Phase Shift Laser Scanners

- 360° horizontal x 310° vertical coverage
- >500,000 points per second measurement rate
- Range of 75 meters
- Scanning time per 360° image approx. 4 minutes
- Class 3R eye safe laser

Type of scanner dependent on needs. Time of Flight scanners have greater range than Phase Shift units, and are more suitable for some types of projects.

Z+F Imager 5006
Typical Workflow

1. Initial survey control
2. Laser scanning
3. Data registration
4. 3D Data delivery
Survey Control & Registration

Survey Targets

Register Scanned Targets

Documented Accuracy = 4/5mm
Laser Scanning Workflow (Process Facility)

1. Existing Facility
2. Laser Scan Facility
3. Create As-built Model
4. Fabricate New Module in Yard. Dimensional Control Survey may be required.
5. Fit Fabricated Component in the Field – Right 1st Time!
Laser Scanning Workflow (Buildings)

1. Point Cloud
2. Classify Points
3. Automated Polygons
4. CAD Model
5. Phototexture
Software Technology - Modelling

Process Modelling:

Extensive need to fit catalogue items (Pipes, Valves, Elbows)
Software uses fitting algorithms to determine pipe diameters.
Difficult to automate due to complexity of environment.

BIM Modelling:

Focus is on automation, e.g. ClearEdge3D, CloudCUBE, Pointools
which work on edge detection or a variation. Still require
manual finishing for an acceptable product.

**Labour Intensive**

A 3.5 minute scan can take up to 10-12 man hours to model in a
process environment
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Process Plant Modelling

Modelling performed with LFM Modeller software.

Offshore Location

Onshore Location
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BIM Modelling (Point cloud from scanner)
(Example using ClearEdge\textsuperscript{3D})

Above image from www.cleedge3d.com
BIM Modelling – Solid model from previous slide
(Example using ClearEdge\textsuperscript{3D})

Above image from www.clearedge3d.com
Other Deliverable Components

Consolidated Point Cloud
Offshore Wellhead

- ~130 Gigabytes of data
- ~3 days field scanning

Used in Engineering design to determine if new piping clashes with any existing structures.

Clash identified by software.
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Point Cloud & Intensity Image

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Benefits of 3D Laser Scanning

- Completeness of Survey
- Immediate Measurements
- Improved Safety
- Confidence in accurate as-built information
- Eliminate interference and conflicts
- Project Time and Cost Savings
- Project Risk Reduced
Case Study – Ship Deck
Case Study – Background

Purpose:
• Survey existing main deck of proposed tanker for conversion

Reasoning:
• No hard copy elevations or sections or CAD files available of deck details
• Discrepancies in “As-Built” drawings and existing deck configuration
• Quick solution needed

Scope of Work:
• Laser Scan of main deck of existing tanker
• Conduct survey during port anchorage in 24 hour period
• Convert survey data to PDMS model for delivery to Client
Case Study – Results

- 2 x teams mobilised.
- Scanning completed in 18 hours.
- Total of 145 scans captured.
- No safety incidents or interference with ships crew or operations
- Primitive PDMS model delivered in 26 days
- Project Cost US$80,000
- Project Risk Reduced
Case Study – Client Review

Engineering and Design companies now routinely use 3D models to illustrate planned works during client review meetings. These ensure that all parties have a clear understanding of ongoing plans and processes.

**COLOUR CODING OF 3D MODEL EXTRACTS FOR TP-XX, ON MOL**

**CREAM**
- EXISTING STRUCTURE AND PIPEWORK (AS ENCAPSULATED BY 3D LASER SURVEY)

**BLUE**
- EXISTING PIPEWORK TO BE DEMOLISHED DURING 2009 TIE-INS

**RED**
- NEW PIPEWORK TO BE INSTALLED DURING 2009 TIE-INS

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