BIM and Building Performance Optimization

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EcoDomus, Inc.
Why EcoDomus?

The only global Lifecycle BIM firm with several offices in the USA, Europe and the Middle East, subsidiaries in Asia Pacific (Sydney, Singapore, and Hong Kong), and partners around the world.

1. EcoDomus has delivered more As-Built BIM for FM / COBie projects than all other software companies in the world combined – Unique Experience

2. EcoDomus is working with the top clients in the world and is implementing best practices from the leading facility owners – Best Practices

3. EcoDomus PM/FM software has more BIM/FM/COBie features than any other BIM software – Higher Quality of Data at Lower Cost
Facility is a complex combination of interrelated systems: HVAC, Electrical, Structural, Plumbing, FF&E, Information Technology, etc.

To optimize building performance, facility managers need information about all facility elements and how these elements are combined into systems, where they are located, what are their properties.

BIM can describe that – unfortunately it is not easy to implement and continuous Quality Control is required to create and maintain proper BIM.

And this data needs to be sustained over the whole building’s lifecycle.
EcoDomus is a Common Data Environment (CDE) for managing Asset Information Models (AIM) and Project Information Models (PIMs)

**Design**
- BIM is created for visualization, coordination and as a reference for construction
- Design-intent attributes are entered

EcoDomus’ Role:
1. Check model data for program compliance and handover to construction
2. Visualize design intent in a browser-based 3D viewer for contractors and FM
3. Collect information outside of BIM authoring tools

**Renovation & Upgrades**
- Planning renovations in 3D BIM
- Enhanced condition assessment

EcoDomus’ Role:
1. Provide accurate as-built information for redesign
2. Synchronize as-built updates with the other apps: CMMS, Energy, etc.

**Construction**
- BIM is updated to 3D as-built
- Installation and Cx attributes are provided
- Linking asset and project documents to BIM

EcoDomus’ Role:
1. Check model data for handover to O&M
2. Visualize models in a browser-based 3D viewer for project collaboration (GC/subs)
3. Collect information outside of BIM authoring tools, link documents to BIM objects

**Operation & Maintenance**
- 3D visualization for work orders
- Shutdown planning
- Disaster response
- BIM for energy analysis

EcoDomus’ Role:
1. Visualize models in a 3D viewer for O&M/property management, including integrated data from BAS/CMMS
2. Generate reports (regulatory, procurement, energy analysis, etc.)
EcoDomus Software Solutions

**EcoDomus PM**
software app for:
- COBie Management & Handover
- BIM Data Quality Control
- Converting CAD to BIM
- Documents Link to BIM
- Energy Analysis
- Field BIM Data Entry

**EcoDomus FM**
software app for:
- Easy Access to BIM for Everyone
- BIM for Work Orders
- Energy Simulation vs. Actual
- BIM/GIS Integration
- Maintain Up-to-date As-Builts
- Assets Linked to Laser Scans
Each object has data associated with it: asset properties, documents, what building systems it is a part of, what other assets and locations this object is affecting, related work orders, etc.

Search for locations and assets and see through the walls (use object transparency). Isolate individual items or whole systems, showing the rest in semi-transparent mode.

Use game-engine-like avatars to walk/run around the building.

Jump to any location within the building using viewpoints.

See the real-time and historical values from the corresponding sensors.
Integration of Information

**Enterprise Resource Planning (ERP)**
Oracle Financials, SAP R/3, NetSuite, IFS, Microsoft Dynamics, Infor, etc.

**Geographical Information System (GIS)**
ESRI ArcGIS, Google Maps, Oracle Spatial

**Building Information Model (BIM)**
Autodesk Revit, Bentley AECOsim, Graphisoft ArchiCAD, Tekla, IFCs

**Space Management (CAFM/IWMS)**
Oracle Unifier, TRIRIGA, ARCHIBUS, Planon, Manhattan, etc.

**Maintenance Management (CMMS)**
IBM Maximo, Oracle Unifier FMRE, FSI, TMA, AssetWorks, Anacle, etc.

**Project Management (PM)**
Oracle Unifier, Procore, PMWeb, Trimble Proliance, Prolog, e-Builder, etc.

**Building Automation System (BAS)**
Honeywell EBI, Siemens Apogee, Schneider Electric StruxureWare, OPC, BACnet, etc.

**Electronic Document Management Systems (EDMS)**
Documentum, Alfresco, Lascom, Autodesk A360, Aconex, ProjectWise, etc.
EcoDomus Data Quality Control Reports

### Data Quality Control

- **Type**
  - Supply Air Ventilation Registers Rectangular: SA REG 24 x 24 Face II Connection
  - Supply Air Ventilation Registers Round: SA REG Round 6"
  - Supply Air Ventilation Registers Round: SA REG Round 8"
  - Switchboard Pull Section: SWBD Pull Section
  - Terminal Cabinet Security: SECURITY TERM CAB
  - Thermostat TSTAT Generic
  - Transformer Dry Type: KFMR T-1EL 14
  - Transformer Dry Type: KFMR Transformer 150 KVA
  - Transformer Three Phase Substation Main Service C: KFMR Main Service C
  - Transformer Three Phase Substation Main Service D: KFMR Main Service D
  - Transformer Three Phase Substation Main Service E: KFMR Main Service E
  - Variable Air Volume Terminal Units
  - Variable Air Volume Terminal Units
  - Volume Control Damper Round Exhaust: VD Standard Round Damper Exhaust
  - Volume Control Damper Round Return: VD Standard Round Damper Return
  - Volume Control Damper Round Supply: VD Standard Round Damper Supply

### Quality Control

**Electrical Equipment**
- Unacceptable: 20 (64.6%)
- Acceptable: 11 (35.4%)

**Lighting Fixtures**
- Unacceptable: 71 (12.7%)
- Acceptable: 467 (87.3%)

**Mechanical Equipment**
- Unacceptable: 11 (11.2%)
- Acceptable: 87 (88.8%)
Rule-based Filters / Custom Saved Queries

Create rules and use them as saved queries to monitor quality throughout the project

- Example below shows doors (OmniClass contains the word “door”) that do not start with “DR” as requested by the owner's requirements
EcoDomus Virtual Reality Interface
Create Useful BIM
EcoDomus BIM and Data experts have unmatched experience in preparing models and datasets for the successful handover. BIM for FM modeling has unique requirements that most modelers do not know, and as a result, most so-called BIMs have limited value for FM.

Many Ways of Data Entry
EcoDomus PM allows entering data via a web browser interface, mobile devices, or export COBie Excel files, update them, and re-import into EcoDomus to update values.

Quality Control
EcoDomus PM’s automated quality control features allow for checking attributes and documents for compliance with facility owner’s requirements.

Optimization
EcoDomus PM and BIM Connector help filter data to reduce unnecessary data collection, focusing attention on the required data.
EcoDomus Interface for Laser Scans

**Point Cloud Benefits**

1) Cheaper and faster than BIM.
2) Highly realistic view.
3) Ability to measure distances.

**BIM Benefits**

1) Ability to generate drawings.
2) Can isolate (hide / show) objects.
3) Better navigation.
4) Less manual data entry work.
What data is required: asset types, attributes, document categories, system levels, zone types? What are the nomenclature rules for assets, spaces, systems, etc.?

How is the data prepared and collected: is BIM geometry adequate for data export? Are MEP systems connected? How to establish relationships between objects?

What are the milestones, incentives and penalties for data checking?

Who provides the data and who checks and validates it (Responsibility Matrix)? Who updates the 3D model? Who collects field data?

Where is the data managed: in EcoDomus PM? Excel? Revit?
Example of Detailed BIM Requirements

- Classification-based selection of asset / space types
- Each selected type has asset-specific fields mapped
- All selected fields are mapped to COBie
Camden Federal Complex BIM SOW

**Project Name/Item.** Lifecycle Energy Performance Assessment with FM&SP

**Background.** The project will develop best practices to track energy performance from design through operations by integrating BIM and Smart Building technologies. The Office of Design and Construction (ODC) will work with Facility Management and Services Program (FMSP) to conduct a pilot project for evaluating energy analysis models and comparing them against actual building sensor data. The results of this pilot will provide a way for GSA to assess sustainability and energy performance strategies and their impacts during operations, providing feedback on best practices for energy modeling during design.

**Objectives.** As it relates to the facility management, operations and maintenance phase of the building life cycle, to improve building operations by more effectively and efficiently utilizing the Camden Federal Complex building’s energy and asset information. To this end, the specific goals of the project are as follows:
Sample Project: GSA Camden Courthouse

- Create a calibrated energy model that would provide a way to compare an ideal, simulated building performance vs. actual performance to identify areas of concern.
- Energy model is created using BIM (simplified) and EnergyPlus.
- The same model is used by facility managers to perform maintenance tasks (including accessing BIM on Tablet PCs like iPad).
Sample Project: GSA Camden Courthouse
More than 3,000 people were evacuated from Moscow Domodedovo International Airport after a small fire erupted in the baggage sector and covered an area of about 15 square meters. The smoke got into the ventilation system and airport facility managers did not react quickly to prevent the spread of smoke into the main terminal. More than 50 flights have been delayed from the international airport, the second largest in Moscow and Russia.
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