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INFOGRAPHICS RELEVANT SOFTWARE USED FOR BUILDING SERVICES DESIGN

Abstract: *The authors present relevant and widely used software for designing building services-HVAC, architectural and electrical installations.*
Thunderhead PyroSim, Thunderhead Ventus, Bentley AutoPIPE, Kelton Engineering FLOCALC, Bentley OpenBuildings Designer, Bentley OpenFlows HAMMER, WaterCAD, WaterGEMS, SST Systems Caepipe, Graitec ArchiWIZARD, Graitec CADKON, Autodesk AutoCAD, Autodesk FormIt Pro, Vent-Calc, Avenir LoopCAD, Avenir HeatCAD, ISOVER Tech Calc, Energy Soft Energy Pro, *Fluid Desk Coolpack are compared, and some examples are given. For a better understanding some simullations are done. The advantages and conclusions are relevant for 2023-2024 Software Generation.*

Key words: *Infographics; Software; Buildings Services; Design.*

1. INTRODUCTION

In this paper the authors present relevant and widely used software for designing building services-HVAC,arhitectural and electrical installations.

2. INFORMATION

2.1 Pyro Sim

Pyro Sim is a user interface for the Fire Dynamics Simulator (SDS) program. The SDF field model can predict the spread of smoke, temperature, carbon monoxide and other hazards during a fire. The modelling results are used to support building safety design, determine the safety of existing buildings, reconstruct fires in investigations, and help train firefighters.

SDS simulates fire scenarios using computational fluid dynamics (CFD) optimized for temperature-dependent, low-velocity flows. This approach appears to be very flexible and can be applied to a variety of fires, from fires to furnaces to oil fires. SDS can also be used to perform non-combustion simulations, such as ventilation in buildings. The SDS calculation model and Smoke view visualization program are tightly integrated into Pyro Sim (figure 1) [01].

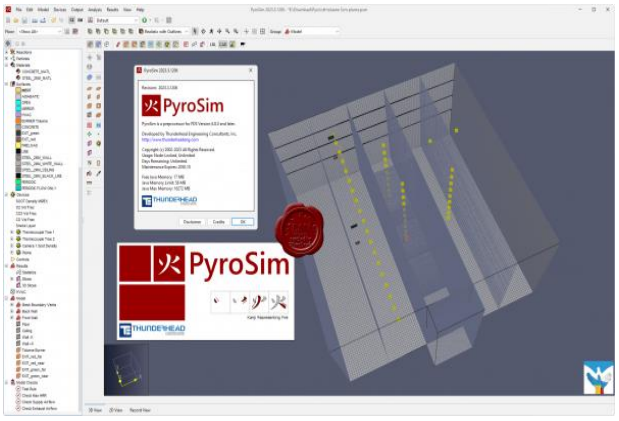

Figure 1 Thunderhead PyroSim 2.2 Ventus

Ventus is designed to provide a pressurization simulation for smoke control analysis. The simulation is performed by CONTAM, an open-source application. Like PyroSim and FDS, Ventus offers a premium user experience for industry-leading simulation software. Leveraging our expertise in providing 3D modeling applications for fire protection engineering, Ventus will exceed the requirements of CONTAM users who want to accelerate their smoke control projects.

Ventus allows users to build 3D models of pressure zones based on the actual geometry of the building.

Ventus manages multi-variable scenarios for simulating and analysing CONTAM of simplified batches.

Ventus tabulates the resulting data for multiple scenarios into digestible CSV data and 3D images.

Whether for staircases, atria or underground buildings, appropriate air handling systems shall be designed for pressurised smoke control in the event of an emergency. Ventus offers a clear and efficient path from modelling a building to understanding temperatures, pressures and densities so that the right solution can be reached (figure 2) [02].

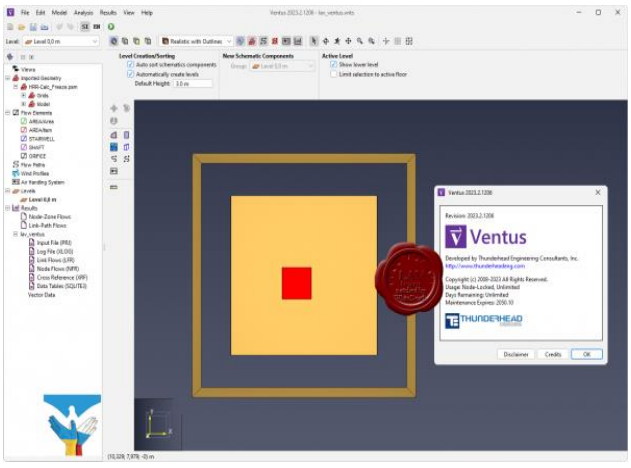

Figure 2 Thunderhead Ventus

2.3 Auto PIPE

Auto PIPE provides comprehensive software tools for calculating pressure in pipes. Increase operational efficiency and improve quality control with an intuitive modelling environment and advanced analytics tools. Easily share information between engineers, designers, and CAD designers with Auto PIPE compatibility with major industrial design applications (Figure 3) [03].

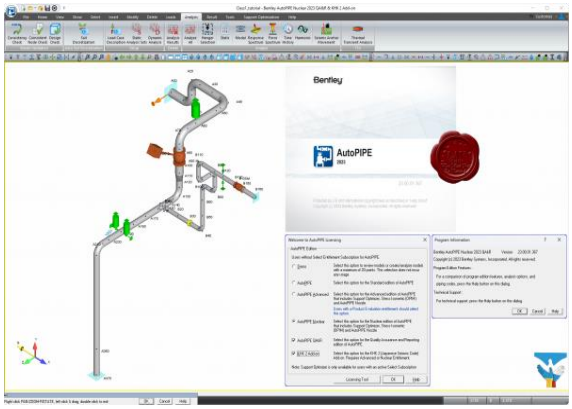

Figure 3 Bentley AutoPIPE 2023

2.4 FLOCALC.net

FLOCALC.net is the KELTON calculation package containing the most comprehensive set of calculations available to flow measurement engineers. FLOCALC.net can be provided as part of an FM² system P.net or as a standalone application. With the inclusion of FloXL.net as standard, the full range of calculations can now be used from Microsoft Excel.

The application is based on a real understanding of the complexity of flow measurement and its central importance for operators and design engineers, providing fast, accurate and reliable results. FLOCALC.net calculations are built using a common interface that allows selection of calculation options, engineering units and resolution to obtain agreement of digits to provide confidence in the calculation being validated (Figure 4) [04].

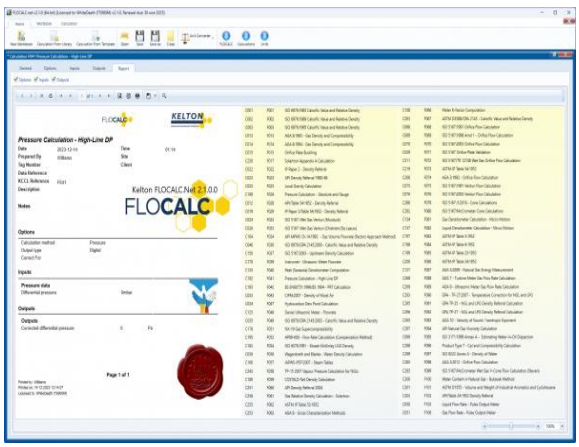

Figure 4 Kelton Engineering FLOCALC.net

2.5 OpenBuildings

Why Open Buildings is more than BIM?
The answer lies in the previous name of the program – AECO sim. As a rule, all modern BIM solutions that are positioned as comprehensive can be described with only three letters: AEC - architecture, engineering networks, construction. AEC Osim also has functionality for operation, and in Open Buildings you can easily combine a building project with large infrastructure projects into a single file. For example, there are few reasons why you should work on Open Buildings:
Simplify the design process
Connecting existing reality

Creation of architectural solutions, structural solutions, complex engineering systems
Compatible with computational design
Data management and reporting
Comprehensive compatibility and interoperability
Viewing
Perpetual licenses

One of the most important parts of Open Buildings modelling is that it has a federated workspace function. This is a workflow where different specialists can work on different parts of the project and then combine them into one comprehensive project that will contain all the design and BIM data.
Each element of the model can be provided with links that will refer either to drawings or to office documents Word, PDF, Excel and others. Hypermodeling is a unique feature of Bentley's solution, based on Power-Platform technology that overlays drawings on the model.

Open Buildings can integrate different types of files: 3D object file, Sketchup file, 3D Max file, Revit Family, DWG/DXF, gbXML (energy analysis), 3dm – Rhino.
With Bentley's range of solutions on the MicroStation platform, everyone from GIS to ENGINEERS, CONSTRUCTION, Roads and Bridges achieves interdisciplinary coordination with MicroStation's reference technology and its federated approach. Thus, the MicroStation platform and its dgn file format provide a shared media environment (Figure 5) [05].

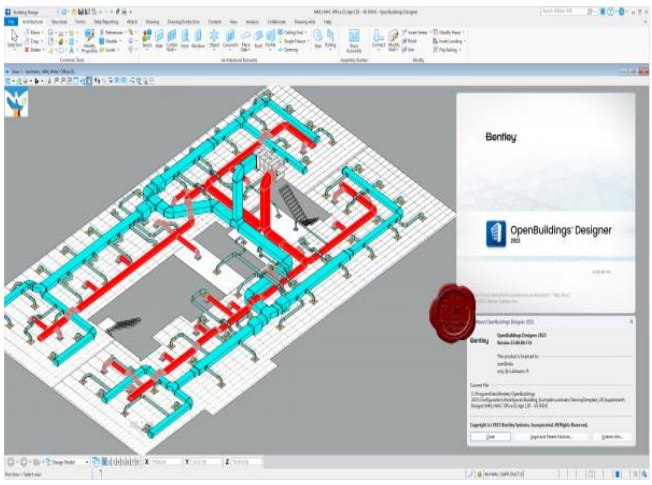

Figure 5 Bentley OpenBuildings Designer

2.6 Bentley OpenFlows Hammer

Bentley OpenFlows Hammer is a professional application that can be used to easily analyze, design and manage complex water networks. It is a complete and complete package that provides all the necessary tools and functions for the design and analysis of complex hydraulic systems.

Bentley OpenFlows WaterCAD is an easy-to-use hydraulic and water quality modelling application for water distribution systems, from fire flow analysis and component concentration to energy management and pump modelling (Figure 6) [06].

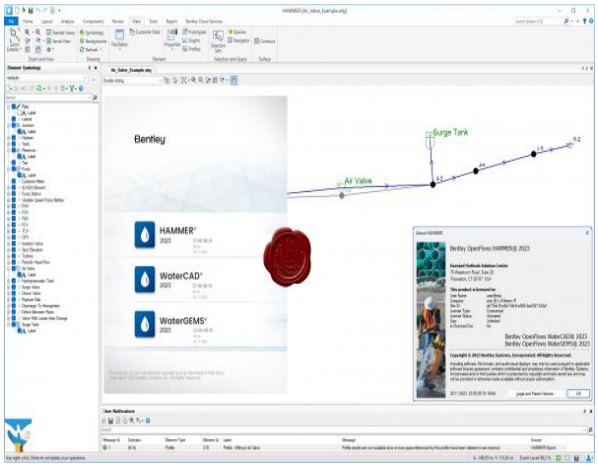

Figure 6 Bentley OpenFlows HAMMER, WaterCAD, WaterGEMS

2.7 ArchiWIZARD

ArchiWIZARD is a real-time 3D analysis software based on BIM model connected directly to architectural CAD solutions. ArchiWIZARD provides accurate analysis of thermal energy, light, solar gains and shadows, renewable energy simulation (photovoltaic and thermal solar systems).

It is a real-time 3D analysis software based on BIM models and linked to architectural CAD solutions. It analyzes heat, light, solar gains and shadows and simulates renewable energy systems (photovoltaic and thermal solar systems).

It incorporates the EnergyPlus Building Energy Simulation (STD) program to combine even more accurate analysis of building performance with the enhanced usability and interoperability capabilities of the ArchiWIZARD user interface.

CSTB evaluated ArchiWIZARD for compliance with the French RT2012 norm. It teaches about the relevance and performance of your architectural and technical decisions on energy performance, thermal and visual comfort and bioclimatic quality, starting with the sketch for new construction and renovation.

In addition, it includes a number of building element libraries, simple configuration, results presentation and report generation capabilities (Figure 7) [07].

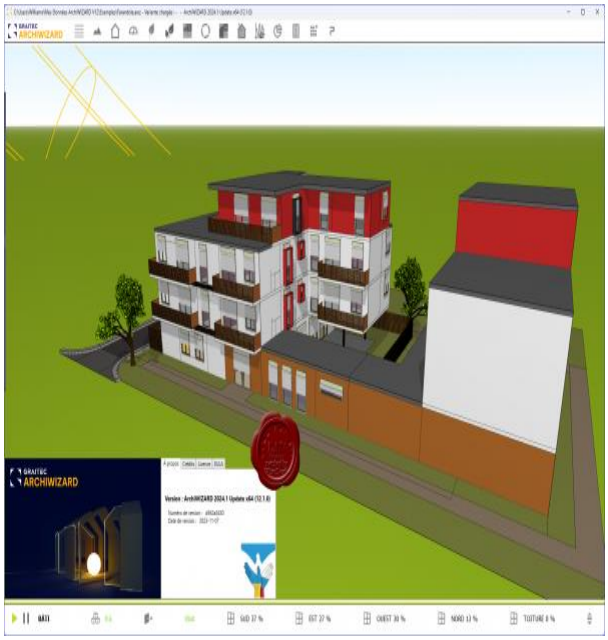

Figure 7 Graitec ArchiWIZARD

2.8 CADKON

All the powerful drawing features you know from regular CAD software, including full DWG format support, work with layers, viewing windows, and more. All commonly used functions for modifying drawings and drawings are available. These are, for example, lines, polylines, copy, move, rotate, stretch, measure, and more. You can choose between a modern control environment using tool ribbons or a classic icon environment. Support for keyboard shortcuts or the so-called "Command Suggestion" goes without saying.

CADKON+ ARCHITECTURE

All the efficient drawing features you know from regular CAD programs, including full support for the latest DWG format. CADKON+ allows you to set the drawing environment according to existing company standards. It mainly includes a layer system and settings of line types and line weights connected with it, in addition, drawing scale, units, display of elements and library sharing that is default.

MEP CADKON+MEP

A practical and efficient tool for creating project documentation in HEATING, AIR CONDITIONING and ELECTRICAL INSTALLATIONS.

The main advantages are a simple 2D design GUI, built-in calculations, and an extensive database of brands and manufacturers.

CADKON+ RC is CAD software fully compatible with DWG format. It offers its users a simple, natural and cost-effective solution for frequent requests when creating and modifying drawings. With a modern and user-friendly interface, CADKON+ RC creates all 2D and 3D elements, contains functions to navigate the drawing and view it, and also works with terms such as "layers", "attachment points", "windows", etc. [08].

2.9 AutoCAD

AutoCAD is a world leader in 2D and 3D design solutions. Being more visual, 3D modeling allows you to speed up design and documentation work, share models, and develop new ideas. There are thousands of add-ons available for AutoCAD to meet the needs of a wide range of customers. It's time to design differently - AutoCAD time.

AutoCAD allows to solve the most complex design problems. A wide variety of bodies and surfaces are shaped by creating arbitrary shapes; design verification time is significantly reduced; Parametric drawings help keep all the information you need at hand. Design ideas can be viewed in PDF format and also implemented in layouts obtained by 3D printing (Figure 8) [09].

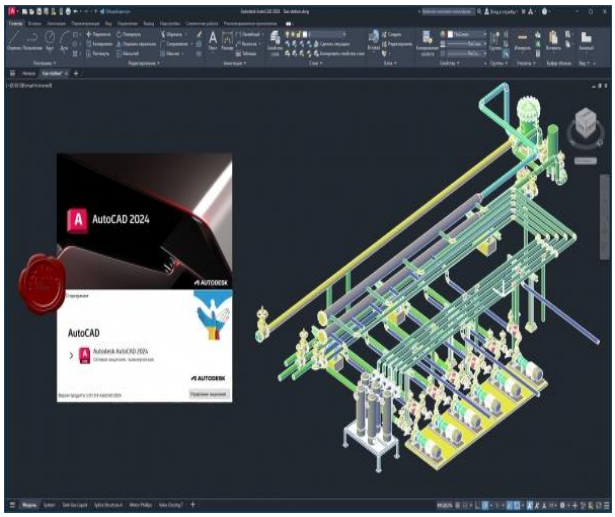

Figure 8 Autodesk AutoCAD 2024.0

2.10 Autodesk FormIt

Autodesk FormIt is designed for continuous building information modeling (BIM) supported in Revit (by synchronizing projects to the cloud). With Autodesk FormIt, you can create clear presentations for customers that will be refined during preparation and feasibility studies. FormIt lets use layout layout, analysis, and intuitive 3D sketches, then transfer the model to Revit for specification and quantity analysis (Figure 9) [10, 11, 12]..

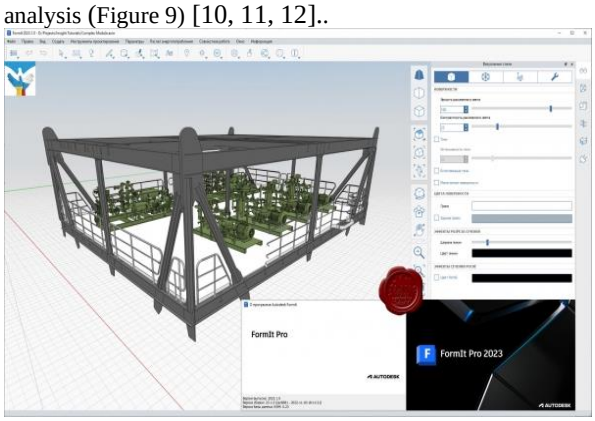

Figure 9 Autodesk FormIt Pro 2023.1

2.11 Vent-Calc

Vent-Calc allows to quickly and efficiently calculate ventilation networks.

The essence of this new product is this: just need to enter: the initial and final air flow rates, the total length of the main branches, some other information, and the program itself will generate an image of the ventilation network that is mathematically close. (Figure 10).

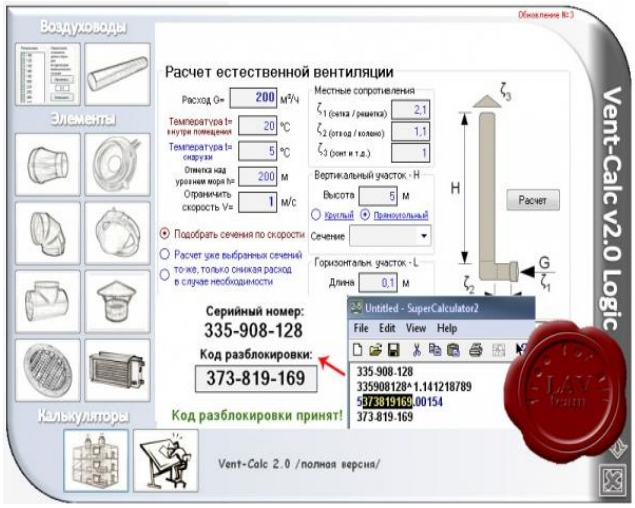

Figure 10 Vent-Calc v2.0.3

3. CONCLUSIONS

In this paper were presented very important software for designing building services-HVAC, arhitectural and electrical installations [13,14].

The presentation is not exhaustive and wanted to offer a quick look at the multitude of software applications used in the field of plant engineering.

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