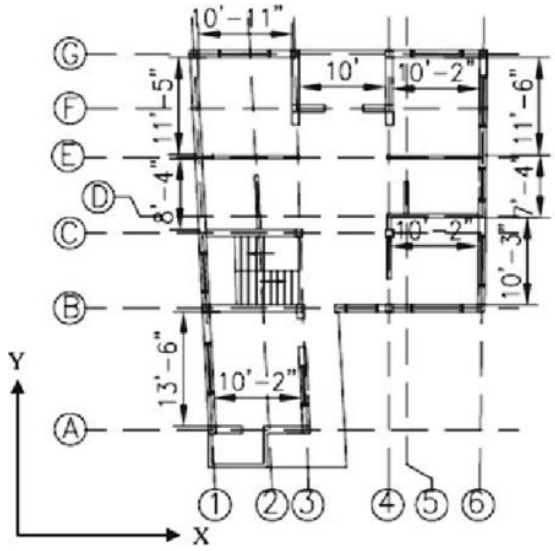
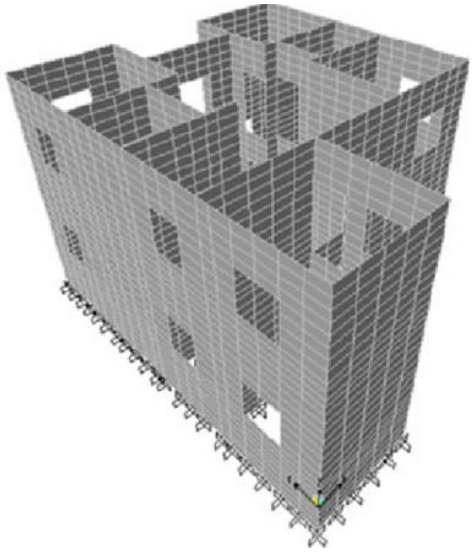
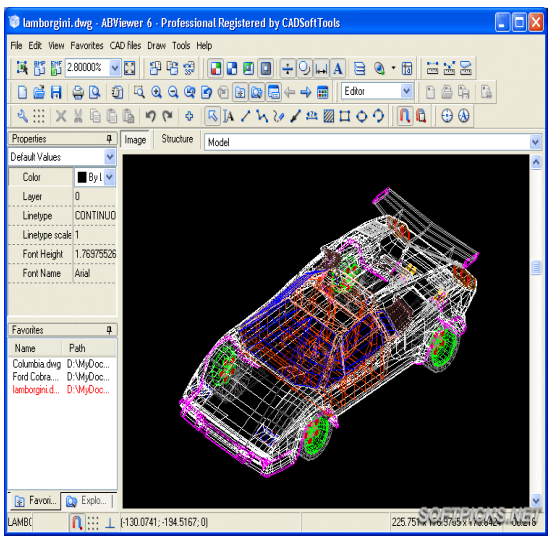
CAD/CAM Integration

CAD

Computer-aided design (CAD) involves creating computer models defined by geometrical parameters. These models typically appear on a computer monitor as a three-dimensional representation of a part or a system of parts, which can be readily altered by changing relevant parameters. CAD systems enable designers to view objects under a wide variety of representations and to test these objects by simulating real-world conditions.

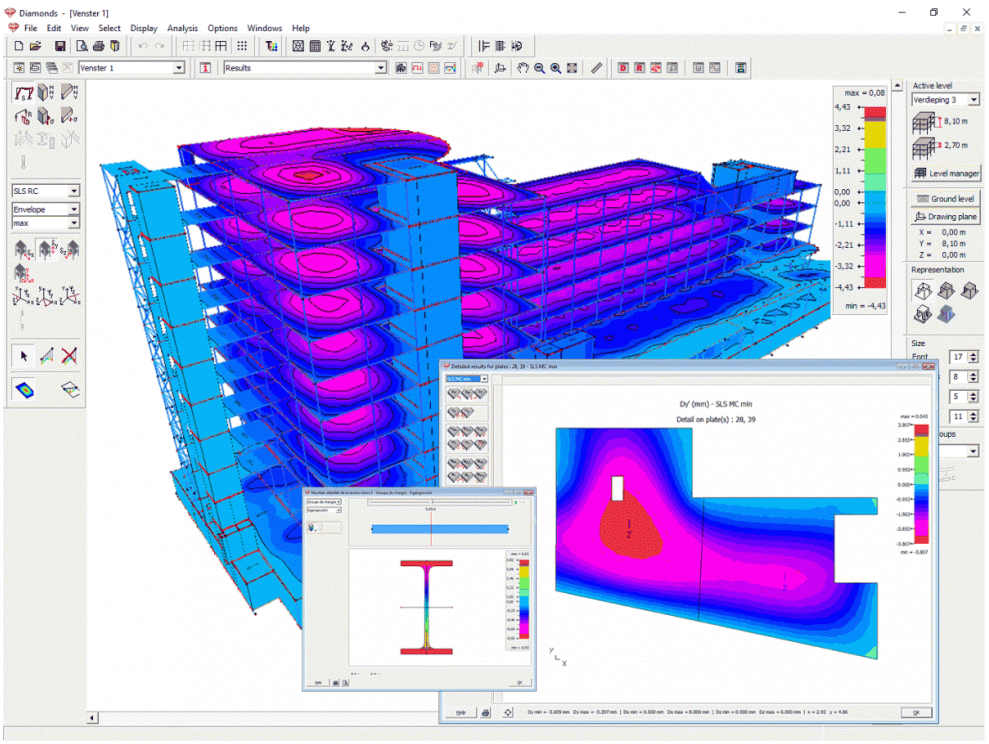


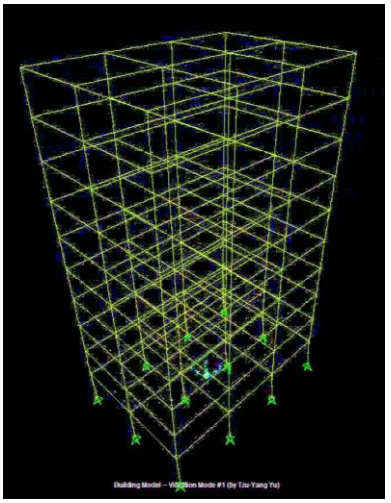


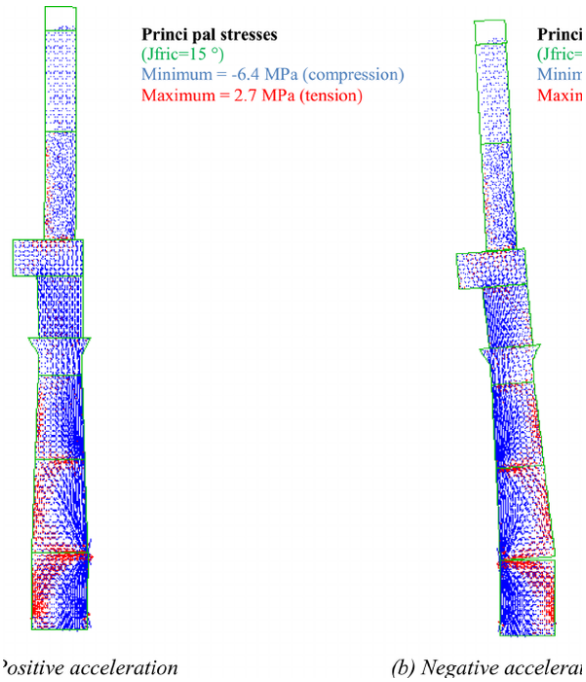


CAD/CAM Integration

CAD in Civil Engineering







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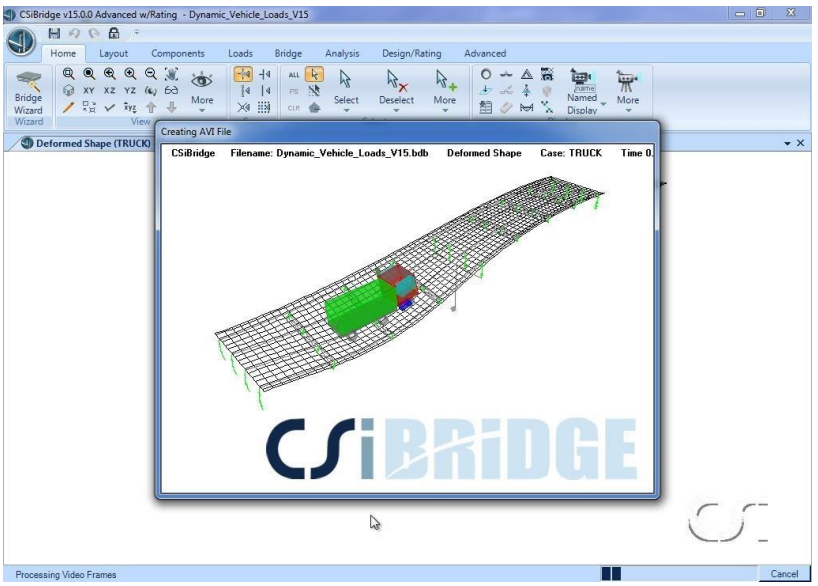
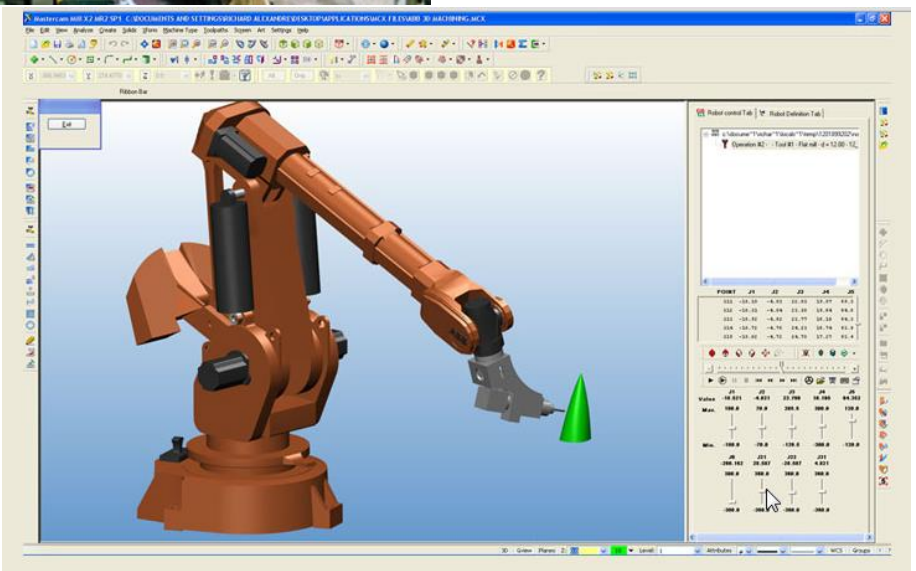


CAD/CAM Integration

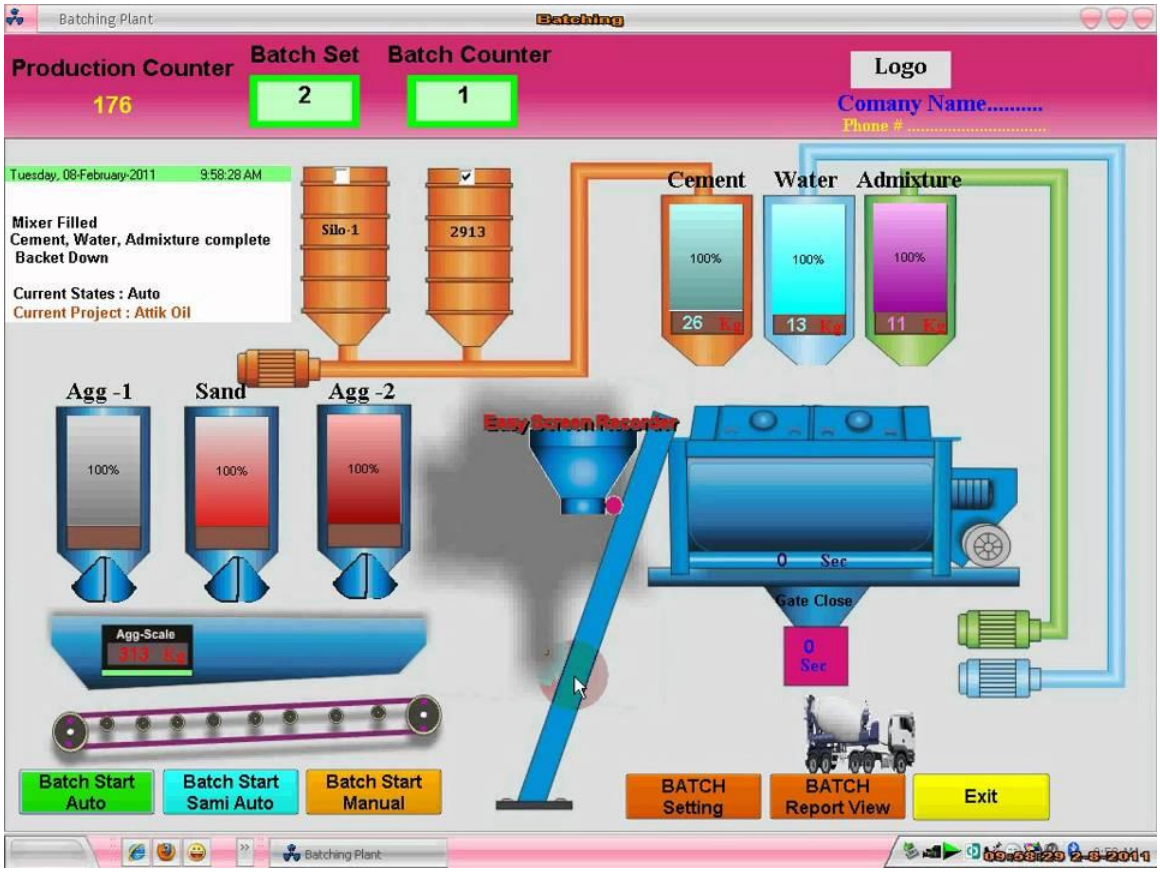
CAM

Computer-aided manufacturing (CAM) is an application technology that uses computer software and machinery to facilitate and automate manufacturing processes. CAM is the successor of computer-aided engineering (CAE) and is often used in line with computer-aided design (CAD). Computer-aided manufacturing (CAM) uses geometrical design data to control automated machinery.



CAD/CAM Integration

CAM in Civil Engineering

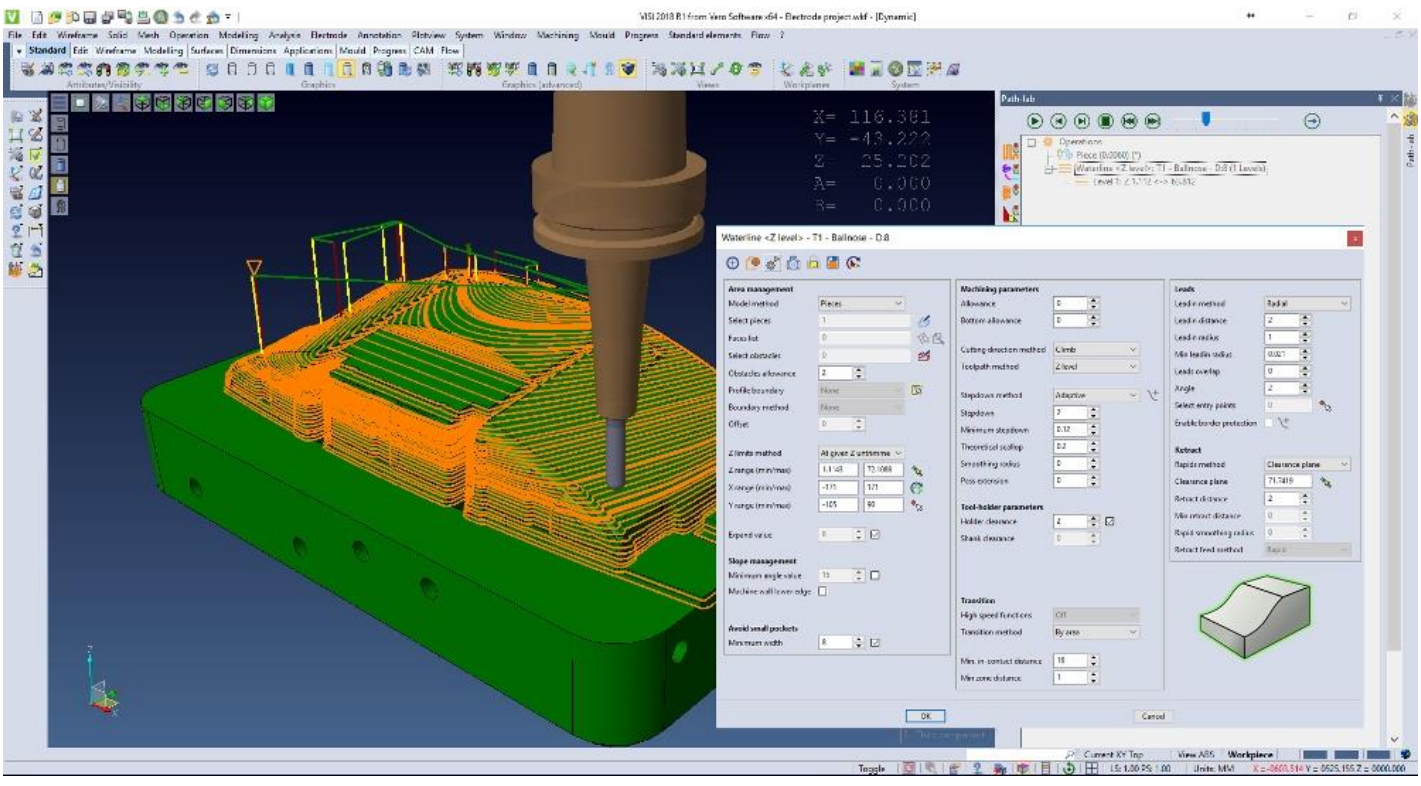


CAD/CAM Integration

CAD/CAM

The term CAD / CAM refers to the use of computers both in the design phase and in the manufacturing phase of a product. With CAD / CAM a product is designed with a CAD program and the completed project is then translated into a series of instructions that are transmitted and used by the machines dedicated to its manufacture, assembly or process control.

CAD/CAM applications are used to both design a product and program manufacturing processes, specifically, CNC machining. CAM software uses the models and assemblies created in CAD software, like Fusion 360, to generate toolpaths that drive machine tools to turn designs into physical parts. CAD/CAM software is used to design and manufacture prototypes, finished parts, and production runs.



CAD/CAM Integration

CAD/CAM

The term CAD / CAM refers to the integration of Computer-aided design (CAD) and Computer-aided manufacturing (CAM). Both of these are computer intensive. Their integration is aimed at reducing labor/manpower costs as a computer is supposed to carry out work which otherwise would be done by the operators. Although it requires initial expenditures for equipment, reduced labor cost and speedier transition from CAD to finished product (reduced execution time) may compensate for that.

An example of CAD/CAM integration is CNC. Computer Numerical Control (CNC) is the automated control of machining tools (such as drills, lathes, mills and 3D printers) by means of a computer. A CNC machine processes a piece of material (metal, plastic, wood, ceramic, or composite) to meet specifications by following a coded programmed instruction and without a manual operator directly controlling the machining operation.

Instructions are delivered to a CNC machine in the form of a sequential program of machine control instructions such as G-code and M-code, then executed. The program can be written by a person or, far more often, generated by graphical computer-aided design (CAD) or computer-aided manufacturing (CAM) software. In the case of 3D printers, the part to be printed is "sliced", before the instructions (or the program) is generated. 3D printers also use G-Code

CAD/CAM Integration

THE ORIGINS OF CAD/CAM

CAD had its origins in three separate sources, which also serve to highlight the basic operations that CAD systems provide.

- The **first source of CAD** resulted from attempts to automate the drafting process. These developments were pioneered by the General Motors Research Laboratories in the early 1960s. One of the important time-saving advantages of computer modeling over traditional drafting methods is that the former can be quickly corrected or manipulated by changing a model's parameters.
- The **second source of CAD** was in the testing of designs by simulation. The use of computer modelling to test products was pioneered by high-tech industries like aerospace and semiconductors.
- The **third source of CAD** development resulted from efforts to facilitate the flow from the design process to the manufacturing process using numerical control (NC) technologies, which had widespread use in many applications by the mid-1960s. It was this source that resulted in the linkage between CAD and CAM. One of the most important trends in CAD/CAM technologies is the ever-increasing integration between the design and manufacturing stages of CAD/CAM-based production processes.

For further details on background and advantages/disadvantages of CAD, please visit: https://www.inc.com/encyclopedia/computer-aided-design-cad-and-computer-aided-cam.html

CAD/CAM Integration

CAD/CAM in Civil Engineering

- One example in the field of Civil Engineering is Pre-cast construction i.e. structural elements manufactured in factories like walls, girders, roof slabs etc.
- One such system is the CAD/CAM interface provided by IDAT, Germany for pre-cast concrete.

Some details about this Interface (Just for Information):

- Machine data for controlling modern production equipment or circulation plants managed by central computers can be generated directly from the CAD program. This data is generated in Unitechnik or PXML format by default. These formats are supported by most modern production machines and have established themselves as sort of unofficial standard for this area of the data interface.
- The basic function of this interface is the machine file. This is a file associated with the prefabricated unit which contains a description of all data relevant to the unit (geometry, reinforcement incl. position, openings and built-in parts). These files are further processed directly by modern production equipment. Plotters, for example, use the information about the geometry and position of openings or built-in parts to plot this directly on a pallet. The same principle applies to laser projection systems, where these can, for example, also show the position of individual reinforcement rods.
- Shuttering robots, robots for the automatic placement of reinforcements as well as mesh welding systems are further examples of production machinery that can be supplied with data directly from the CAD program. IDAT also offer interfaces to machines which are not compatible with this format (mainly older equipment).

CAD/CAM Integration

CAD/CAM