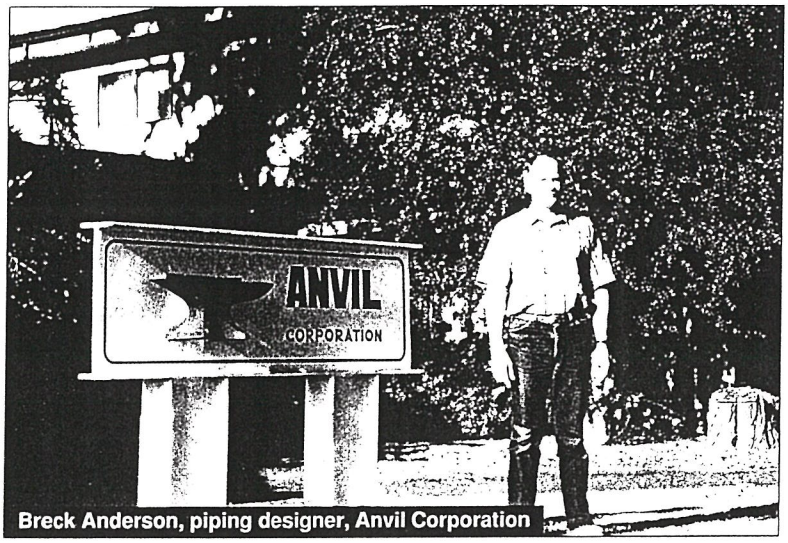
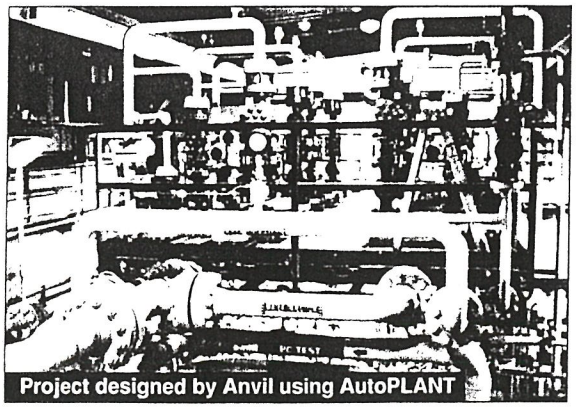
PIPE WORK



Breck Anderson, piping designer, Anvil Corporation

Anvil Corporation have found the time they spend producing piping layouts has been cut dramatically with the introduction of AutoPLANT computer-aided plant engineering software from Rebis. Anvil's Breck Anderson reports

Anvil Corporation started 14 years ago designing and building modules for North Slope offshore oil rigs. The company are now a full service engineering firm employing about 300 people. Anvil's capabilities cover all major design and engineering disciplines, including mechanical, piping, structural, electrical and instrumentation. They currently have 20 major clients that provide most of their work. Industries served by the firm include the chemical, petrochemical, oil production and paper industries. The company also have a software development group which has created a program called Teamwork that performs plant scheduling tasks.


Project designed by Anvil using AutoPLANT

Anvil were a pioneer in the computer-aided plant engineering field and first began using 2D minicomputer-based piping layout software over a decade ago. When AutoCAD became a standard in the plant design field several years ago, Anvil switched over to a PC-based AutoCAD add-on which handled piping design. The software had some very basic 3D capabilities, but these were never used due to their complexity and the program reverted to a 20-symbol library for piping components.

Enter AutoPLANT

In 1993, Anvil learnt about the AutoPLANT computer-aided plant engineering software from Rebis (formerly known as EDA). They decided to convert to it because of its ability to produce plant layouts in full 3D and keep track of the connectivity of the various lines in the plant. It took about a year to fully retrain the staff of 40 piping designers. A few engineers were so used to working in 2D, they didn't see the need to change at first but, after working with the program, everyone has become a believer. The company have customised the software to provide the layering, title blocks and general look and feel that each of their clients prefer. In-house support person Rich Scotti has written a number of routines that automate frequently-performed tasks in both AutoPLANT and AutoCAD. The seemingly monumental task of retraining the designers and customising the software for the specifications of 20 customers was not nearly as difficult as was expected.

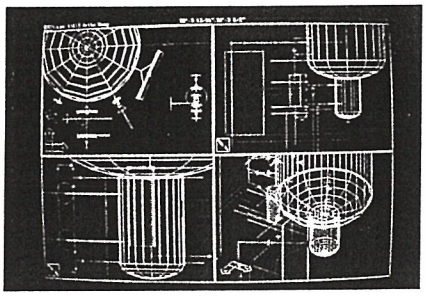
Project One

The first project on which the software was used was a redesign of a manifold building at a drill site. Anvil began the project using Rebis' P&ID software package. AutoPLANT allowed the designers to reference the P&ID during the layout phase in Rebis' module called Designer, thus eliminating the need for re-entering the data. The P&ID program lets users lay out the process without dealing with line specification and other call-outs. The user can come back later and specify many of these items on a global basis, saving a substantial amount of time. Finally, reports can be run with instruments, valves and tag numbers keyed to the

drawing, which eliminates, in most cases, the need to produce the bill of materials and other reports separately.

As this was Anvil's first project using the AutoPLANT software, they had to recreate, in 3D, most of the existing facilities using the Designer module rather than importing it. A key advantage of Rebis' Designer package is that, unlike the other PC-based package previously used, users don't have to keep track of two separate lines. The entire plant layout is produced from the start in 3D. Rather than simply entering elevation data on the drawing as before, elevation becomes an integral part of the drawing. The drawing can then be viewed from any angle to check clearances and fits. The program understands connectivity, so that, if a line is selected and the line number changed, every piece of equipment on the line will be automatically updated. Moreover, when a line is deleted, the program will remove everything associated with that line from the active database.

Left: Project designed with AutoPLANT software



Screen shot of AutoPLANT software as used at Anvil

Wireframe view

After completing the 3D model, Anvil provided their clients with their first view of a 3D wireframe representation of a plant layout. Clients were amazed at how easily they could visualise the company's designs. They were able to bring up concerns and questions that they never would have been aware of in the past until construction was underway. At this point, of course, changes would have been extremely expensive. Thus, they were able to fine-tune the design to meet precisely their needs, without increasing construction costs.

After the 3D layout was approved, Anvil sliced it up with Rebis' automatic section program, which produces Horizontal cuts or 'H-clips' and sections. Using Anvil's previous 2D program, it took many hours to produce section and H-Clips but, with AutoPLANT, once the 3D model has been generated, they can be produced in a few minutes from the 3D wireframe model. Once the plans, sections and elevations were all approved, it was time to carry out the isometrics for actual construction.

To do this, all Anvil had to do was select the routing lines and the program automatically generated isometrics. Since that first project, the company have begun using Rebis' ISOGEN module which automatically annotates the isometrics as well. The entire manifold project start-up of detail design took only three weeks, which was a much shorter timescale than would have been needed with the previous 2D software.

On more recent projects, Anvil have discovered that the ability to link textual bill of materials data, such as description, size, weight, vendor, etc. provided additional time savings. Designers have been freed from the need to enter descriptions on the drawing. Anvil designed a database program, using specifications for each component, to produce a simple flat file textual database. Whenever a symbol is entered into the drawing, the textual information is automatically linked to the drawing. This information is then used to provide further time savings in producing reports, such as by separating stainless steel components onto a different report or subtracting the length of in-line components to provide cut length data.

Time cutting

Now that Anvil have used AutoPLANT enough to come up to full speed with the program, the company are spending only about 50 per cent of the amount of time that was previously required on the piping layout part of the project. Producing the original piping layout in 3D makes it possible to generate plans, sections, elevations and isometrics later from the 3D layout with very little additional effort, thus providing the majority of the time savings. Another major benefit of the new approach is that working in 3D makes it easier for Anvil engineers and clients to visualise the layout and helps to resolve interference problems and similar issues prior to construction when changes can become very expensive.

Future moves

Anvil's instrument group will soon be using Rebis' Electrics package which eliminates the step of creating loops and schedules. They are also just pursuing the use of a digital camera to photograph the existing equipment so that the new design can be superimposed on top of the image for even greater realism.

Anvil's next step forward will be to add the electrical and instrumentation modules which should provide additional time savings in these areas. The idea is eventually to have one complete plant model that all of Anvil's disciplines can access.