ASIA PACIFIC OIL & GAS CONFERENCE

3D design software triples Unocal Thailand's performance of platform designers

Paul Anthony describes offshore drilling platform engineering improvements at Unocal Thailand, as a result of switching from manual drafting methods to 3D plant design software. He is a consultant with Anthony Design Services of Bakersfield, California, US.

Using manual drafting methods, Unocal Thailand was adding two or three new offshore platforms each year to its natural gas fields in the Gulf of Thailand.

By converting to the 3D plant design system, AutoPLANT, from Rebis, Walnut Creek, California, the company will increase this to between eight and 11 platforms annually, with a slight increase in its design staff.

The company's piping designers, who formerly needed between 600 and 800 hours to prepare drawings for a new platform, now complete them in 80 to 160 hours, not including time spent on development specification data and model base.

AutoPLANT, which works on top of AutoCAD, improves productivity by using a 3D model as the foundation for a project.

From the model, piping designers now generate isometric drawings virtually automatically.

Bills of materials are also generated very quickly through the software's link to a textual database.

Rebis is the new corporate name for Engineering Design Automation (EDA) and Applications Development (ADev), which recently merged.

With more than 60 offshore drilling offshore platforms already in place, Unocal Thailand is planning a significant expansion of its natural gas production over the next five years.

The company will build nearly 35 new platforms in that time. Most of the platforms are of the same basic design.

Platform structures vary only slightly depending on water depth.

Most instrumentation and electrical equipment has been standardised.

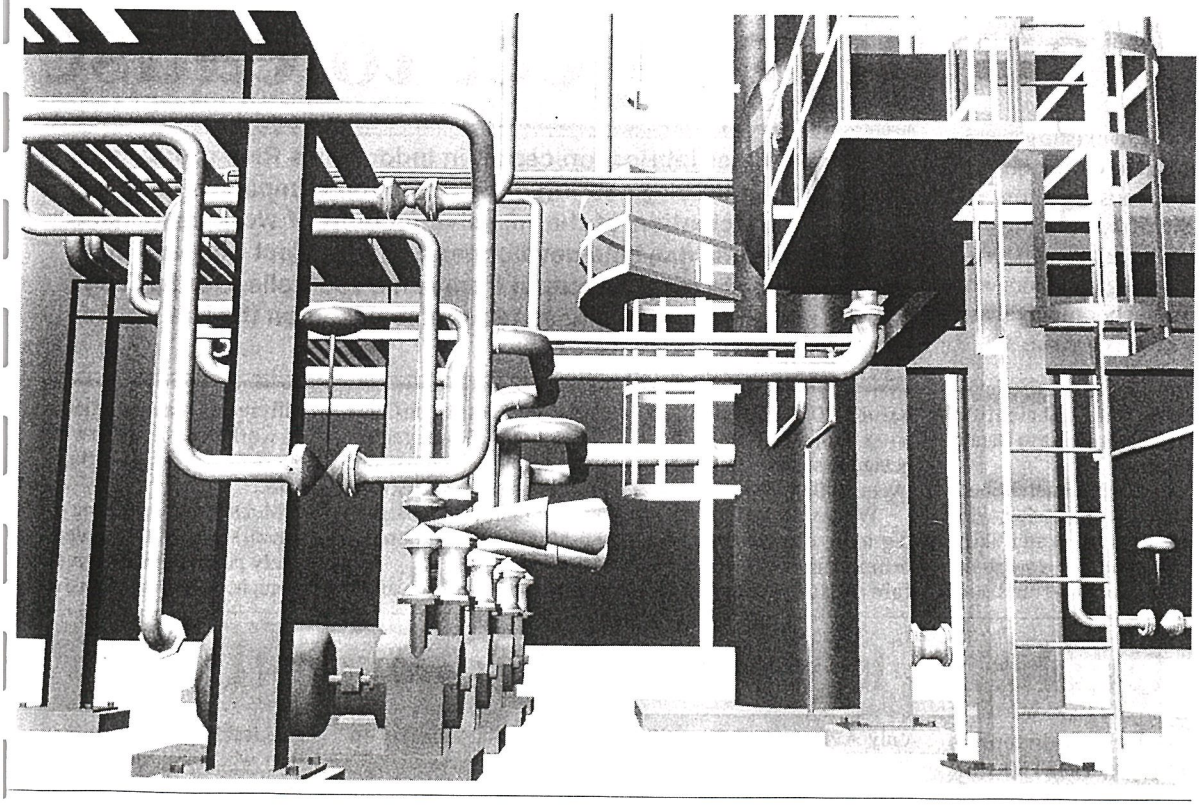
Most of the topside design work required to create a new platform involves piping, which is handled at Unocal Thailand by a department of four people.

The piping requirements for a new platform depend on its location in the field.

At the edge of a field, the platform will normally have a single 10-inch export line central to a processing facility or another wellhead platform.

Platforms in other locations within the field may have entirely different piping configurations.

The exact platform piping configuration is dependent upon the number of incoming and outgoing pipelines.



The exact combination of incoming and outgoing pipelines is field and location-dependent but normally varies from the case of the single export line given but to three or four incoming and one or two export lines.

For each platform, the design team creates two sets of piping drawings — one for bid and another for construction. A complete platform set contains more than 550 drawings.

Using manual drawing, three platforms were built each year, with a typical set of 292 piping drawings taking 600 to 800 hours to prepare.

An increased development programme, however, now requires that from eight to 11 platforms per year be engineered, constructed, and installed.

To enable the piping design department to handle the planned increase in platform construction, the company began a major drawing office automation project, introducing the AutoCAD/AutoPLANT system in mid-1993.

Unocal chose these software packages because AutoPLANT adds the specific, time-saving functions needed for plant design to the well-known CAD package, AutoCAD from Autodesk Inc, Sausalito, California.

AutoPLANT's use of 3D design and its link to a textual database were the key to improving the productivity of the piping designers.

Another major factor for going to CAD was the repetitive nature and similarities between wellhead platforms.

The major components requiring development time of the specs and model are nearly identical for each platform. Thus we felt CAD would be a very effective option.

AutoPLANT's 3D capability makes such a dramatic difference in productivity because once a 3D model is complete, drawings can be generated very quickly from the model.

Unocal Thailand requires three types of drawing for piping: plan drawings, sections and isometric drawings which are used for pipe fabrications and assembly.

In a typical bid package there are 12 P & IDs, eight plan drawings, seven sections, and 200-250 isometrics.

Isometrics are the most difficult to produce manually because the designer has to mentally add the third dimension.

The company is using AutoPLANT's P & ID module to draw all the sheets for each type of platform module.

For each new platform design, they simply select the appropriate module sheets, then go into the software and change the title block.

P & IDs describe the basic flow of natural gas through the platform and establish pipe sites and sizes of construction materials.

Plans and section drawings are produced in true three-dimensional format.

Rather than simply entering elevation data on the drawing as before, the elevation becomes an integral part of the drawing so that it can be viewed from the front or any other angle to check clearances and fits, ie. clashcheck.

This is important because of the confined nature of offshore work, with it compressed space and potential for interferences.

The time required to develop the 3D model was about the same as the time previously required to produce orthographic layouts.

The significant time savings with the 3D model approach was the isometrics.

Since the AutoPLANT model already contains the third dimension, producing isometrics is done almost automatically by simply blocking off symbols which are to be included.

Additional time savings come from linking the orthographic drawings and automatically rippled through the related isometrics. It is now easier to check the isometrics using AutoPLANT as well.

Interferences can be easily detected by rotating the 3D model into different perspectives, and using a clash detection feature.

AutoPLANT's link to a text database provide equally significant time savings.

Designers have been freed from the need to enter descriptions on the drawings.

Instead, a secretary types the specifications for each component into a simple flat-file textual database.

After this initial information is entered, only modifications need to be entered into the database. Whenever a symbol is entered into the drawing, the textual information is automatically linked to the drawing.

This information can then be used in reports such as the bill of materials, valve and specialty lists, instruments lists and line designation schedules.

Data can be manipulated to save engineering time such as by separating stainless steel components onto a different report or subtracting the length of in-line components to provide cut length data.

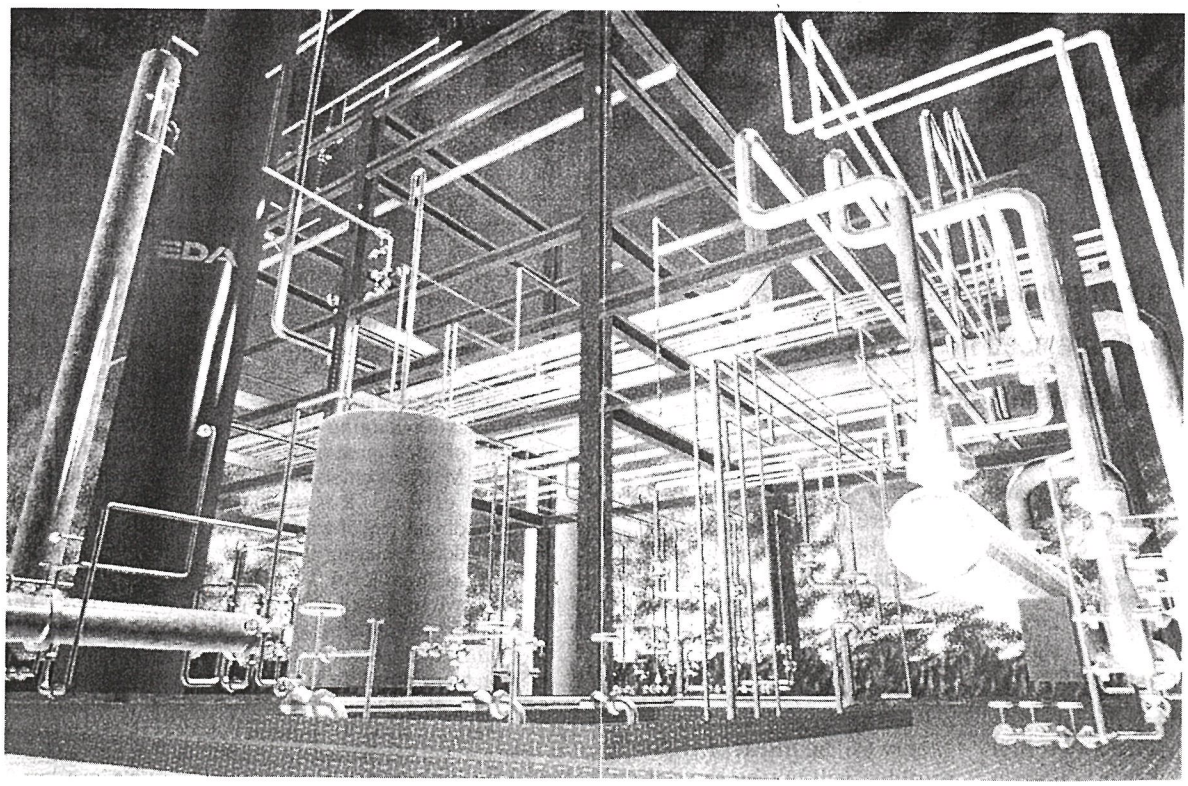
If an error is discovered in a specification, it can be corrected simply by typing the correct data into the database.

The change is automatically updated, throughout all drawings.

The conversion from manual drafting and bill of materials generation to 100 per cent AutoPLANT was completed by the fourth quarter of 1994.

So now, Unocal Thailand has their basic 3D platform designs in AutoPLANT that will form the basis for all new platforms.

This will be a modular so that for any new project, designers may pick and choose various parts to ultimately create all the new piping drawings in 80-160 hours.



Visualisation and client review of a chemical processing plant using AutoPLANT and Renderstar. (photo courtesy of Modern Medium and AEC/Technologies).