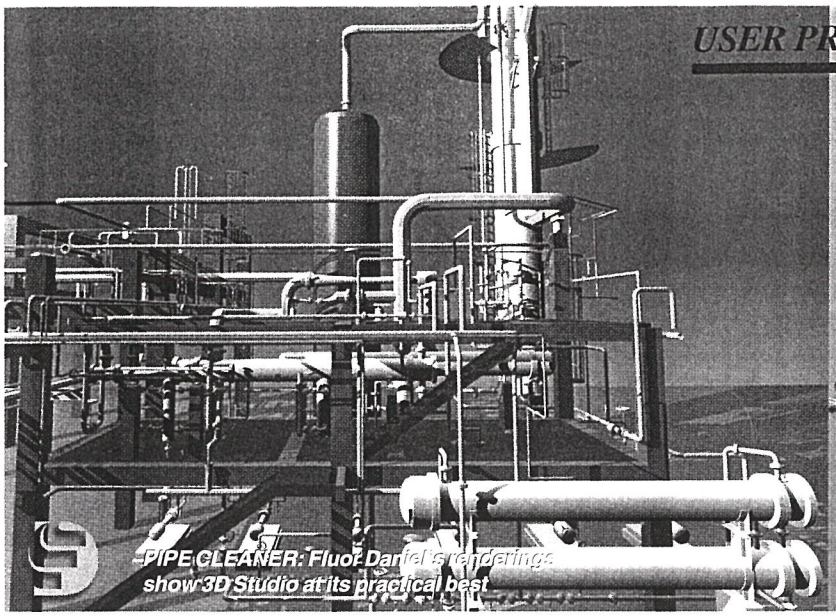
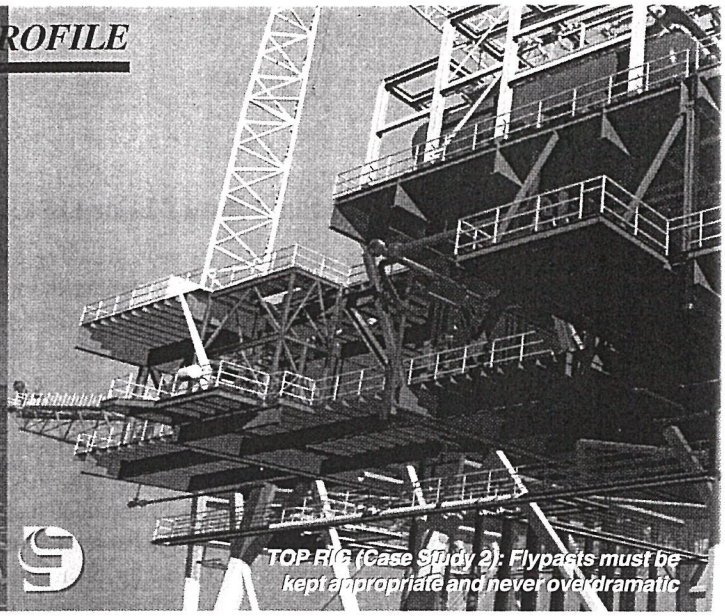


PIPE CLEANER: Fluor Daniel's renderings show 3D Studio at its practical best



TOP RIG (Case Study 2): Flypasts must be kept appropriate and never overdramatic

Showing the Sites

Fluor Daniel has repeatedly demonstrated how effective 3D visualisation — using AutoCAD, AutoPLANT and 3D Studio — can be in gaining and retaining design contracts. IAN CONSTANTINE describes the company's experience with Australian projects.

Fluor Daniel is an Australian leader in the use of CAD systems in engineering and construction for the petrochemical, mining, pulp and paper and food industries and has been using CAD for over ten years. The use of 3D visualisation techniques returns real productivity gains throughout the production process.

In Melbourne and Perth, Fluor Daniel has more than sixty DOS-based, 486/66 PCs running AutoCAD Release 12, connected in a Novell network environment. Beyond this, through a wide-area network (WAN), the Australian operation communicates with the other Fluor Daniel companies worldwide, allowing access to almost three hundred unique fileserver systems, for data- and workload-sharing.

A recent series of CAD *User* seminars, conducted by the author, demonstrated the company's combined use of AutoCAD, AutoPLANT and 3D Studio on three projects. These case studies clearly illustrate the benefits of this state-of-the-art CAD technology.

Case Study One: Gas Plant for a Major Oil Company

The upgrade of existing gas facilities was Fluor Daniel's first project where AutoCAD, AutoPLANT and 3D Studio were used in unison.

After customising AutoPLANT software to the client's requirements and implementing training courses for designers, Fluor Daniel designed and modelled six areas using a combination of AutoPLANT software and AutoCAD 3D modelling techniques. 3D Studio was then used to produce a walkthrough of one of the models to demonstrate Fluor Daniel's 3D CAD capabilities fully to the client.

The client was delighted with the result. For the first time, they could realistically visualise the new facilities prior to construction.

An interesting challenge had also to be overcome. Delays in loading the model meant that there was only one day left for rendering the walkthrough. The deadline was met and the presentation went well — with less than an hour to spare.

The lesson was learned: leave plenty of time for setting up and rendering.

Case Study Two: New facilities added to offshore platform

This project was for additional facilities to an offshore oil platform.

Following further customisation of the AutoPLANT software to suit the new client's needs, Fluor Daniel produced six models which extensively utilised AutoCAD 3D modelling techniques.

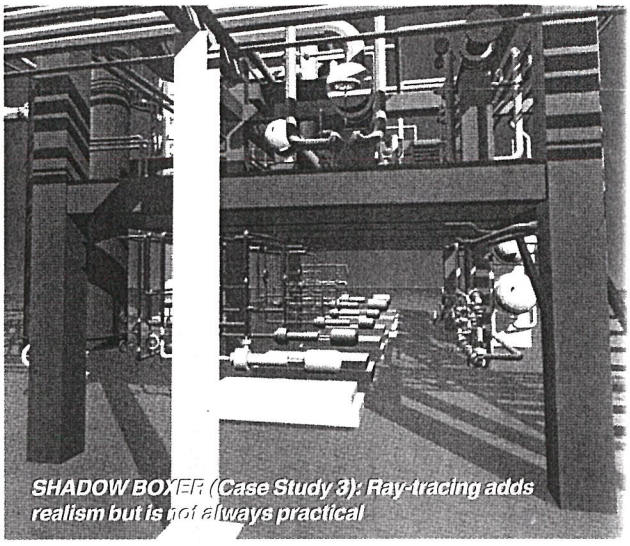
After an initial, 16-frame walkthrough, a more detailed 80-frame design was produced in 3D Studio.

This was then taken to the site — the offshore platform — on a notebook PC.

The client was impressed. Not only had complex designs on a portable computer been transported to the site concerned, but he also had the opportunity of "walking through" his new control room. The area was compact and had no windows, so there were space and functionality concerns.

Again, an invaluable lesson was learned from this exercise: take care when being adventurous with the path for the walkthrough. An early path, simulating a flypast, before swooping down along the main deck, left everyone feeling disorientated, to say the least.

A less adventurous, but more useful, walkthrough was produced which stepped through the model. The client confirmed that he preferred to keep his feet firmly on the ground.



SHADOW BOXER (Case Study 3): Ray-tracing adds realism but is not always practical

Case Study Three: Process Plant for a Major Oil Company

The most recently completed project was the second for Fluor Daniel's onshore client. This was, in itself, an immediate benefit, because most of the customisation was already in place.

Four models of varying complexity were produced. Considerable benefits came from the use of automatic piping material downloading from the models into Fluor Daniel's material management system.

Lighting and colouring improvements gave a more realistic effect. This was achieved by producing still images of various views of the model before planning the walkthrough.

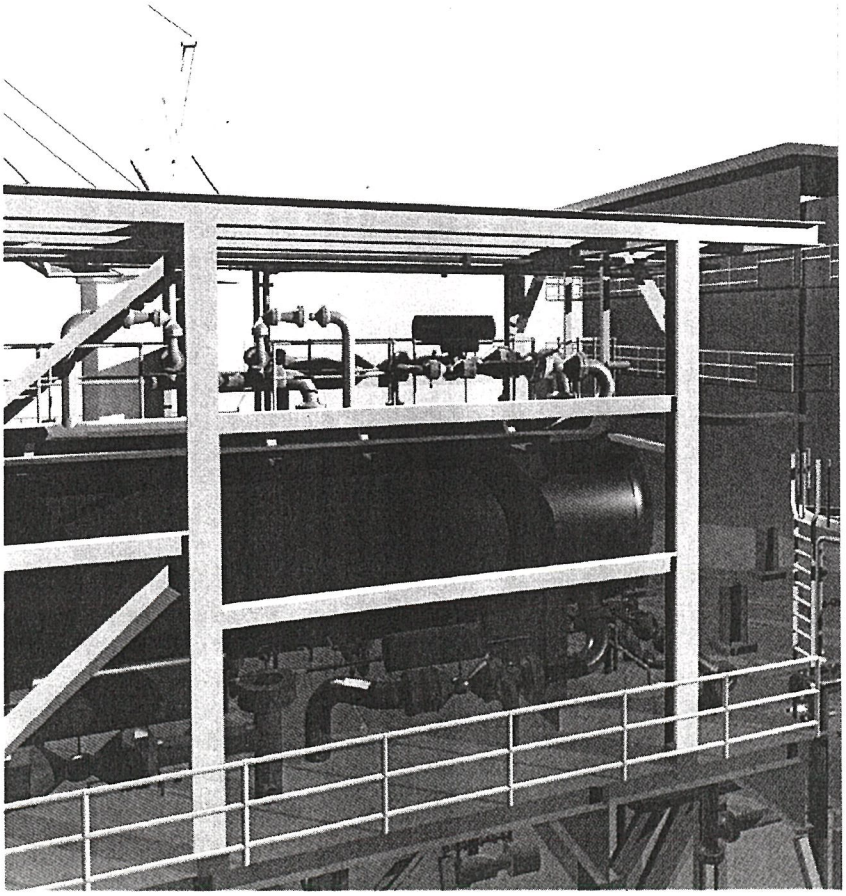
The walkthrough was produced with ray-traced shadows, which look good, but slow the rendering time. Without ray-tracing, probably 30% more frames could have been processed. The company concluded that it is better to produce a longer, albeit less aesthetically pleasing, walkthrough, which is more likely to suit the engineering and commercial needs of the client.

Ian Constantine is Fluor Daniel's principal designer and piping CAD coordinator.

The Learning Curve: Useful tips for 3D Studio — Fluor Daniel's experience

Task	Tip	Explanation
Loading a DXF file	Load DXF file by layer	Each layer in the AutoCAD drawing with a unique name is converted into a separate object in 3D Studio, allowing ease of material assignment if an organised layering structure is used in the drawing.
Using AutoCAD colour defaults in 3D Studio	Load ACADCLR.MLI	This materials library has 256 specially named materials whose colours match the AutoCAD DXF palettes. If this material library is not loaded, the default material (flat white plastic) is assigned to the 3D Studio objects created.
Setup time	Plan ahead	The setup process can be time-consuming. Loading the drawing, creating lights and cameras, testing and adjustment all take time to achieve the desired effect.
Path planning	Create inside AutoCAD	Use a 3D polyline inside AutoCAD to design the path through the model then load it into 3D Studio.
Ray-tracing shadows	Only if really necessary	They are good for high-resolution images but they slow rendering time and are not much use in a walkthrough planned for a design review.

Who do the CAD software firms look to when Beta testing their new products?



FLUOR DANIEL

The Gateway, 312 StKilda Road (GPO Box 1320L)
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AutoCAD helps THC to off-shore success

explains, "We estimated the initial number of hours required, but with the benefits of AutoCAD we made a 25% time saving. This was primarily achieved by using automated detailing in such a way that 75% were automatically produced to 90% completion."

Plant design

For the pipework, the second and more complex phase of the project, another AutoCAD-based third-party application was used: AutoPlant from Rebis. Again, further customisation was undertaken for THC's specific use and to obtain full compliance to the requirements of the off-shore industry.

As well as providing an instant bill of materials for every nut, bolt, valve and pipe for the job, AutoPlant allowed client part numbers to be cross referenced with work in progress information from materials management. This ensured that all materials and equipment required for the job arrived on site at the correct time, preventing any delay in the fabrication and manufacturing process.

In effect, THC's AutoCAD systems were fully integrated with their in-house stock and materials database system, and information regarding the process of the project is available quickly and, more importantly, accurately and absolutely up-to-date.

Using AutoPlant and AutoCAD, THC were able to benefit in other ways. On-site production problems and late design changes – which so often crop up in any design project – are now actioned and resolved in less time by the drawing and engineering offices, resulting in minimal delay to critical production programs and leading to further reduced costs.

Another benefit, as George Day explains, was the reduced time in producing the thousands of drawings required by the project. "2400 isometrics were created. This involved drawing, checking, implementation and development. Before the use of AutoCAD this would typically have taken at least 40% more time."

Looking to the future

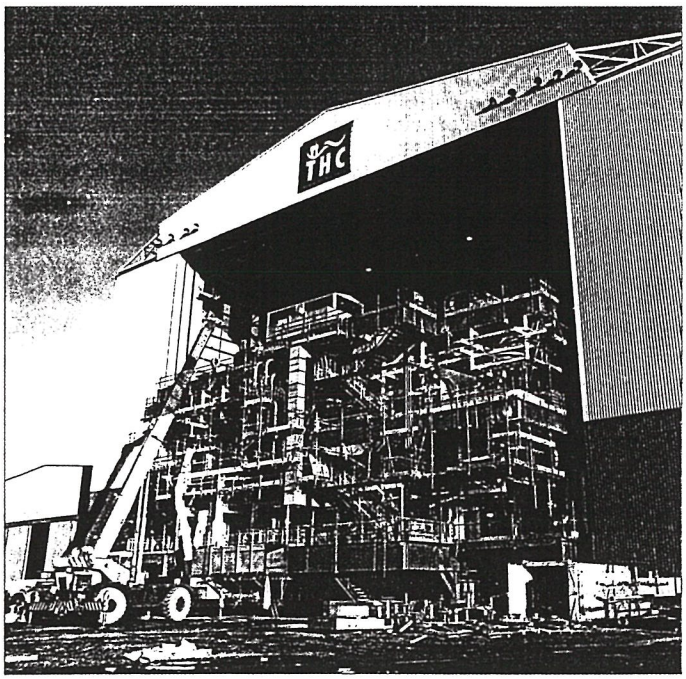
"Our aim is to extend our CAD system and functionality to increase control over centre of gravity information and to minimise interdiscipline clashes. We are developing this skill and will be capable of running a full clash check by July. The production deck is, at present, ahead of schedule and nearing completion.

The drawing office is currently producing 'as-builts' to be ready for sail away of mid August 1995."

With such an advanced CAD system, it is easy to forget that, until recently, THC were still using drawing boards. As George concludes, "the implementation of our CAD system has gone a lot further and a lot faster than planned. With a project of this size, we were expecting to encounter many difficulties along the way. The integration, however, was better and smoother than expected."

Although some may have initially lamented its passing, to the people who now work on the Douglas Production Deck, it is inconceivable to think of going back to the drawing board. Indeed, the youngest of them have never really used one outside of a college classroom. A new generation of designers are being prepared by colleges and training centres to operate AutoCAD and their new skills are in high demand in all areas of engineering.

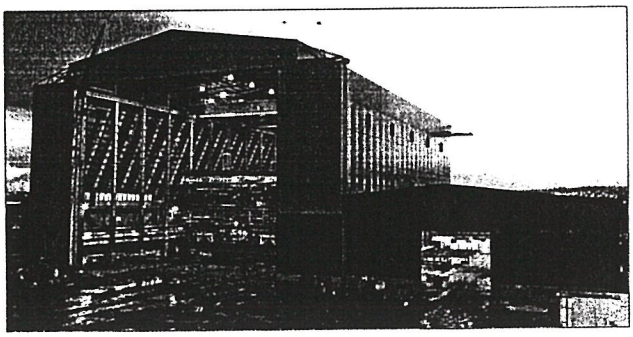
Throughout the country, thousands of engineering companies are finding the success on the scale achieved by THC is only possible by making full use of these skills. ■



"We estimated the initial number of hours required, but with the benefits of AutoCAD we made a 25% time saving."

AUTODESK INDUSTRY REPORT

THC Fabricators, Hartlepool



At Hartlepool in Cleveland, in a building by the docks that could comfortably hold the Starship Enterprise, a giant structure is being built with the help of AutoCAD and a range of third-party applications.

Offshore structural engineering company, THC, won the £45 million contract from the Hamilton Oil Company to build the Douglas Production Deck for the Liverpool Bay gas field, partly because of their expertise in the use of CAD. Their skill in this area gave THC the opportunity to present a comprehensive build statement, complete with a set of 3D drawings depicting the various build stages – whilst only at the initial bid stage. By using AutoCAD, THC had the ability to bring the work on-site at the earliest stage of development, in order to proceed with the engineering construction phase of the project. In an industry where production time is so important, AutoCAD has helped THC achieve greater success.

An oil production platform is like any highly sophisticated chemical plant site, but with one important difference: it is designed to stand on stilts in the middle of the ocean where it has to withstand extreme changes in the environment.

The entire structure holds numerous tanks and vessels connected by a complex network of pipes which are in turn controlled by countless valves. Add to this heavy cranes, hydraulic devices and the electrical network of a mini power station all crammed onto a platform of only thirty metres by sixty metres and you have some idea of the complexity of this construction project.

Although no stranger to CAD, a job of this size – expected to take nearly two years to complete – required considerable research and investment by THC in the latest CAD systems available.

George Day, THC Drawing Office Manager, explains, "THC's prime reasons for increasing CAD capability can be broken down into two main factors. The first was to increase productivity of the drawing and engineering offices. With increased productivity a large project becomes easier to manage logistically. The second was that we intended to produce an overall material list for the project using the CAD system. This was extremely important as we were entirely responsible for the materials, and a CAD system gave us the potential to integrate this into our company material management system."

"Before the use of AutoCAD this would typically have taken at least 40% more time."

AutoCAD: the logical choice

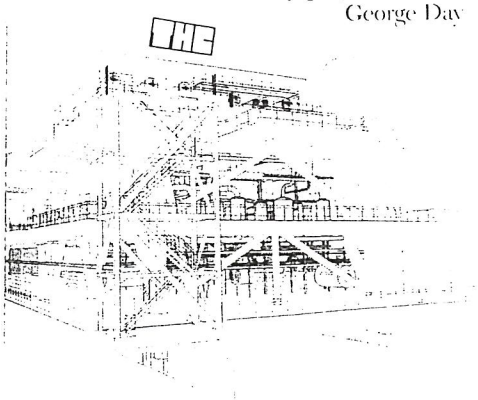
Not surprisingly, AutoCAD was chosen for the work. "AutoCAD was our logical choice for a company CAD platform as we rely, in the main, on contract labour in the drawing office," explains George. "By choosing AutoCAD we immediately ensured we had access to CAD trained draughtsmen – the only additional training required was for any third-party AutoCAD application, and this was minimal."

One of the greatest benefits of AutoCAD is its vast range of third-party applications, enabling the software to be customised for a specific industry discipline. For THC this was particularly important, due to the immense diversity of their project, and therefore a number of third-party applications were used.

Structural design efficiency

The gargantuan 10,000 tonnes structure now filling the main workshop was set-out as the first phase, using Multi-Steel, an AutoCAD third-party application from Computer Draft Systems. Multi-Steel was then further customised to meet the particular specifications laid down by THC, and the operators trained on-site in its use.

THC calculate their efficiency in many ways, with one of the most important being the measurement of the number of hours used to complete any project. As George Day



The scope of this complex design project can be seen from this AutoCAD drawing. The production platform weighs some 10,000 tonnes