Technology Integration

The ASI hosted industry forums over the last year in Queensland, New South Wales, Victoria and Western Australia to examine technology integration in the steel industry. The workshops analysed the efficiencies that might be gained in the supply chain through the sharing of computer numeric controlled (CNC) data. Queensland, which has a strong steel detailers' institute, took the lead with these forums.

The driving force came from the steel distribution sector in Queensland. The distributors took the view that they have invested considerable resources in equipment and process to enable them to work with world's best practice and advances in technology. In many instances they are waiting for the rest of the industry to catch up.

The view of the Queensland Institute of Steel Detailers (QISD) was that before moving forward the Technology Integration Forum needed to have a sound understanding of the technology currently in use by all sectors of the steel construction industry. In response to this the QISD prepared a breakdown of the various outputs available from steel detailers by category. These categories can be downloaded from the QISD website available at www.qisd.org.au and click on QISD Technology Integration.

The five categories include steel detailer outputs ranging from hard copy drawings to 3D models and demonstrate the extensive range of options and value adding today's professional steel detailing companies can offer clients. "The document makes it simpler for all parties using the services of detailers," said Clayton Roxborough, QISD President. "To be most effective and to avoid misunderstanding, fabricators and distributors should refer to the document and specify their requirements at the time of tender by referring to one of these categories."

Leo Wilson, a technology consultant with Mincom engaged by the ASI as consultants on the ASI Data Integration Project, defined the issues.

Mr Wilson said that the QISD consensus was that until their fabricator clients demand the high technology sought by the steel merchants there is no push to alter the established detailing practices. Currently the technology push appears greater than the market pull, especially for smaller detailing enterprises.

Mr Wilson said that: "The QISD adoption of these predetermined ways to offer the industry output from their 2D and 3D software modelling packages has set a new benchmark for the steel value chain in Australia. It also throws down the gauntlet to the other states to adopt similar output standards to improve supply chain efficiencies and increase the industry competitiveness."

"While states such as Western Australia operate a more integrated supply chain, where the exchange of CNC data between detailers, fabricators and merchants is more common practice, the southern states of New South Wales and Victoria still have their work cut out as they operate in a more fragmented environment."

"The opportunity exists for the southern states to take the lead from Queensland and establish a common data output model (CDOM) for detailers. While the benefits of adopting such a model were discussed in the Data Integration Project workshops recently conducted in New South Wales and Victoria, the detailers in each region have not yet combined to develop a formal model similar to Queensland," Mr Wilson said.

"Preliminary findings of the Data Integration Project indicate South Australia could well tackle the issue of developing standard output levels for steel detailers earlier than the larger states. Representatives in that state identified the need to band together as an industry value chain and adopt new business practices, or risk losing business to other states or overseas competitors. South Australia could well be the next state to establish a CDOM for steel fabricators and merchants, similar to those in place now in Queensland to improve industry efficiencies and effectiveness," Mr Wilson concluded.

The ASI Data Integration Project is very much a work in progress with a report from the workshops currently underway. This will be available for dissemination to the industry later in the year.

Resource projects were early users of 3D modelling

A Better Way to Manage with FabTrol MRP

In most areas of manufacturing, material requirements planning (MRP) software is considered standard equipment. Steel fabrication has been an exception because the available MRP options have been poorly suited to the unique challenges of the industry. With the release of FabTrol MRP, that is now changing.

Released in the US, in 1984 FabTrol MRP is the first full-featured MRP-based software developed specifically for the steel fabrication industry. In a single integrated modular solution, it offers estimating, project drawing, and materials, production and shipping control.

Estimating

The customised material database enables the preparation of more bids faster, without adding staff. The software improves detailed labour estimating by operation and time-saving entry functions. It allows accurate, consistent bidding and pinpoint control over hard costs and variable rates.

Drawing management

The developers claim schedule time is saved by fast, error-free imports from the detailers' software. False starts on the shop floor are avoided with detailed approval tracking, automated revision control, and system wide access to drawing images for easy reference.

Material management

Material costs can be reduced with optimised nesting, efficient material planning, and easy remnant tracking. The software automates and integrates purchasing and stock control to save time and effort. Material traceability is automated by purchase order and other parameters. Purchasing, stock, and other data can be exported to accounting software for better balancing and cash flow management.

Production management

An integrated suite of production modules allows fabrication planning and management to be updated. FabTrol MRP offers a full-featured production management system, including rule-based routing to work areas, batch management, enhanced cut lists and computer numeric control (CNC) output, progress tracking, shop capacity planning and other features.

Shipping management

As assemblies are produced shipping loads can be planned efficiently or in advance to streamline their production. Shipping paperwork is automated with quick, clean report templates and reliable shipment tracking. The shipping system's integration with production enables organised and planned fabrication based on load required-by dates and more.

Reports from the early adopters endorse FabTrol's effectiveness with two of the largest US fabricators, Paxton & Vierling Steel Co of Omaha Nebraska and S&S Steel of Hurricane, Utah endorsing the product as: "the single best improvement in the last ten years" (Paxton & Vierling Steel) and "makes it possible to keep on top of everyday functions required at our fabrication facility" (S&S Steel). Richard Barrett - Managing Director of Barrett Steel Building in the United Kingdom who was in Australia in 2003 for the Australian Steel Conference said of FabTrol that it "has redefined the possibilities of steel fabrication management software."

Brisbane Steel installed FabTrol in October 2006 because of the sheer volume of work going through their 70000 square metre fabrication facility. Lindsay Alan, Brisbane Steel's Operation Manager said that: "FabTrol has been a great advantage on both small commercial projects through to a large aircraft hanger. The program enables us to deliver our range of commercial, industrial and mining projects faster and more efficiently. FabTrol is a key element in enabling us to deliver quality steel on-site. on time."

Gay Constructions, a 50 year old Brisbane based steel fabricator is using FabTrol to manage all their drawings, materials, production and shipping. FabTrol integrates their operations from drawing registers right through to dispatch control to site. The system has assisted the company to complete complex mining and commercial projects throughout Queensland.

Steel fabricators want to increase profits, decrease costs, shorten project schedules, and improve quality. The tools are there to turn these goals into reality but so far Australian fabricators have been slow in accepting the new tools.

The Fourth Dimension is Time

In the ongoing quest to improve project planning and to anticipate site problems, a growing number of construction professionals are using computer technology to build projects digitally before construction begins. In the USA, but less so in Australia, four-dimensional CAD, which combines 3D computer-aided design with the time element of scheduling software, is gaining a foothold at construction sites after years of incubation in academia and niche sectors of the construction industry.

New PC-based 4D tools are helping designers, contractors and owners visualise how projects are built. But, the experts say, the major time investment needed to build 4D models may limit its widespread acceptance.

One of the early US adopters, DPR Construction Inc based in Redwood City, California, says 4D is most useful on complex projects. "It really helps with coordination and sequencing issues," says Peter Allen, project manager for DPR Construction. On the $72-million Bay Street entertainment and retail complex in Emeryville, California, DPR used 4D CAD to help win the job and shave several weeks off the project schedule, he says.

Built in 2002 the complex comprised several steel-framed retail buildings, a five-level concrete carpark and a steel-framed movie theatre complex located above a three-level concrete parking station. The project required tight scheduling of concrete placement and steel erection. By running a 4D simulation using InviznOne software developed by Walt Disney Imagineering "we found we could accelerate the steel in the theater area and save three weeks," Allen said.

Disney's InviznOne tool, the forerunner of Common Point, is one of several products that perform 4D modelling. While operating procedures vary, most 4D products link 3D building components with activities from a computer-generated schedule to simulate construction of buildings and other structures. 3D CAD data from AutoCad, Microstation and other platforms can be imported into the 4D software and arranged so building components correspond with construction activities. A concrete floor slab, for example, might be subdivided into pour zones, rather than shown in its geometric design layout.

Schedule data can also be imported from various platforms such as Primavera Project Planner and Microsoft Project, as well as generic text files, says Kathleen Liston, a 4D consultant who helped develop InviznOne at Disney Imagineering. Each activity in the schedule can be linked with one or more corresponding objects in the 3D model, enabling the construction sequence to play out like a movie.

The virtual construction scenes can help teams plan interim activities such as concrete formwork, crane operations and material construction sequences. They have to know where to work so as not to box workers out from the site. On a Phoenix hospital where DPR built a new wing, 4D alerted the contractors to the fact that the mast of a giant construction crane would interfere with the flight path of the hospital's evacuation helicopter. The early alert allowed the hospital to file a revised flight plan and avert a problem.

In the US contractors appear to be the primary champions of 4D CAD, but increasingly owners and designers are becoming involved. Computer chipmaker Intel Corp used PM-Vision from CSA Inc to plan a new $400-million-plus laboratory facility near Portland in Oregon. Art Stout, Intel's director of emerging technologies, says 4D modelling "eliminated a lot of design conflicts and physical mockups" on the project.

Stout says CSA's database-oriented approach offers long-term benefits by allowing embedded maintenance schedules, operational schematics and other disparate documents within the model. He prefers the term "XD," signifying multiple databases working in concert over a project life cycle, to 4D.
But benefits need to be weighed against the time investment to build models. Allen says DPR spent over 300 man-hours building a 3D model of Bay Street, primarily because only 2D CAD data was available. "But we'll recoup it in time savings," he said.

The availability of 3D design data has been a stumbling block, says Martin Fischer, director of Stanford University's Centre for Integrated Facilities Engineering and a longtime 4D researcher who was in Australia in 2004 talking to the CRC Construction Innovation Conference. Much of today's 3D CAD data is based on simple CAD entities and not on still-evolving industry-standard object definitions, he says. Also, owners are often unwilling to pay for true 3D design and liability-conscious designers are often unwilling to share data, he noted.

Several other vendors have introduced 4D tools in recent years. Bentley Systems Inc has upgraded Schedule Simulator and merged it with its Dynamic Animator program for enhanced visualisation. Intergraph Corp, Balfour Technologies and Visual Engineering also offer 4D software. Some firms have bypassed commercial 4D tools and developed in-house solutions.

But not all projects lend themselves to the 4D, for example long, narrow highway and transportation projects. Ultimately the take-up and development of the technology will depend on a number of industry variables, including the robustness of the programs, commitment to training, the skill and expertise of operators, the availability of 3D data, the construction industry's willingness to change the way they do business and last but not least, cost. The future will depend on what clients are willing to pay.