

# Smart Surveys on the Goodwyn Alpha Platform

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In the continuous quest to provide cost effective and technically advanced engineering services, Transfield Worley Woodside Alliance (TWWA) have successfully completed a state of the art offshore survey using Hazmap survey technology. This survey, a first for the Asia Pacific region, has produced an enormous quantity of interactive digital image data. The data has immediately been put to work on the \$220 million Goodwyn Low Pressure Train project.

The technology has provided a wide range of technical, logistical and HSE benefits all of which translate into economic efficiency.

After reviewing a range of survey technologies on the market around the globe, TWWA contracted As Built Solutions (in association with Longdin and Browning (Surveys) Ltd) in UK to conduct surveys on the Goodwyn platform on the North West Shelf using the Hazmap system. Hazmap technology allows the user to review calibrated images captured using specialist theodolite cameras. These images can be used to identify 3D coordinates, which are subsequently used for taking detailed measurements and exported to 3D CAD models.

## THE TECHNOLOGY AND ITS FUNCTIONALITY

The As Built Solutions Hazmap technology allows bulk capture of survey data using specialized digital video cameras. The cameras are set up in an array of stations and take 360° spherical images. The output is a database of images managed by proprietary software, which are used to identify coordinates of any points required to an accuracy of 5 mm. While 5 mm is the suppliers stated accuracy, TWWA have achieved better than 3 mm accuracy using the system. The system allows a massive amount of data to be captured quickly



Hazmap Browser depicting Goodwyn A facility. The red triangles are adjacent survey camera stations, smaller ones are further away (some are on the level below the deck shown). (Image courtesy of TWWA)

which can then be developed into a 3D CAD model to the required level of detail without having to revisit the site.

The database of images is available to users over the corporate intranet. This way any interested personnel can access the image browser for their own use whether they are part of the engineering and design teams, maintenance, asset focal points, HSE advisors or even just a have casual interest.

The survey data is simply delivered in a browser environment with other measurement and CAD interface application modules available for detailed design purposes. The browser environment allows the user to view the images in a seamless fashion, view 360° around a location, and even walk through areas as if they were actually there. The survey stations go up to 6 m in elevation and wide-angle lenses allow the viewer to look up and down from each position.

Discipline designers primarily use the browser software to take detailed measurements whilst the Rapid Router

package enables an existing pipe run to be quickly modeled in its 'as built' state to a high degree of accuracy and then transferred to the CAD model to allocate materials and produce the fabrication isometric. Again this is achieved without visiting the facility after the initial survey.

The system can interact with existing 3D spatial data such as survey reports or survey datum points which can then be overlaid against the images to allow immediate point recognition. The image archive can also be searched for images based upon a known 3D point and then all images containing that point are presented to the user.

## THE EQUIPMENT

The equipment deployed offshore required Category 2 hot work permit. The equipment consists of a camera mounted on a theodolite connected by cable to a 'boxed' PC operating at 240V 50Hz.



Detailed images of the same location capture from different camera stations allow rapid and precise identification of a point and its co-ordinate to be calculated. (Image courtesy of TWWA)

## THE BENEFITS

The technology offers significant benefits which are being realised at present and translated into cost savings and HSE improvements.

### HSE Benefits

- Reduced offshore surveys minimise exposure of personnel to risks associated with travelling and working offshore.
- Emergency Response Centres can train for and respond to emergency scenarios using the images.
- Accident investigation, particularly if part of the facility has been damaged.
- HSE evaluation of projects and the facility from the desktop.
- Accurate visual image records to support the facility Safety Case.

### Improvements in quality and efficiency of work

- Desktop dimensional measurement and verification of offshore facilities.
- Can be used to 'as-build' the plant in 3D CAD.
- Significant reduction in offshore surveys and associated scaffolding access requirements.
- Fast reaction to project scope changes without the need for a site trip.
- The images are used by estimators to

provide faster and more accurate estimates.

- Clash elimination by interaction with 3D CAD models.

### General Benefits

- Facility familiarisation for all personnel.
- Improved offshore planning and installation sequencing without the need for a site visit.
- Visualisation of facilities for shutdown planning, project or area and familiarisation and inductions.
- Future interfaces with Engineering, Operations and Maintenance applications and databases via desktop browsers as part of the TWWA Engineering Data Management initiative.
- Improved morning calls and other site communication with both parties using the same images for discussion.
- Faster learning curve on projects for new personnel unfamiliar with the facilities.
- Images provide easy to use 'fly-through' for onshore problem solving and 'What-if' scenarios on projects.
- 3rd party vendors and Government inspectors may use the images to prepare for or even reduce offshore inspection visits.

### COSTS SAVINGS

The most obvious area of savings is the reduction in offshore surveys, analysis of

which revealed that TWWA conduct an average of 457 personnel visits per annum to Goodwyn A and North Rankin A platforms. Of these 378 are day trips or one night stays and are the most likely to be space and dimensional survey orientated. If Hazmap technology is eventually deployed over the whole of these installations and conservatively 50% of these surveys are eliminated, the savings will amount to around \$500 000 per annum.

It is, however, the less obvious benefit areas, detailed above, that produce the majority of the savings. Probabilistic analysis of these benefits results in projected savings of around \$1 million per annum. The total prize therefore is worth in the region of \$1 500 000 each year.

## HAZMAP STRATEGIES IN A CHANGING ENVIRONMENT

Deployment of the technology requires careful consideration of its use over time. The images are not 'live' and are correct only from the time of the survey until new construction or maintenance activities take place. Hence a strategy needs to be developed for refreshing the Hazmap images and paying for those subsequent surveys.

In areas of low construction and maintenance activity on the plant the need to refresh the images will be low compared with areas of higher activity. At TWWA a large number of projects are completed each year and range from simple changes and like-for-like replacements right up to major projects costing hundreds of millions of dollars. The larger projects affect all disciplines and result in significant physical changes to the plant. The cumulative affect of the smaller projects also produces similar levels of change. Every time a new structure, piping run, cable tray or light fitting is installed the images become out of date. To what degree the images need refreshing is a matter of interpretation and deciding how best to maintain the system requires differing strategies depending on the size of the modifications.

AT TWWA, the Hazmap system will be used as an operational tool for both the Transfield Worley and Woodside personnel so the images need to be reasonably up to date. Major projects need to budget for a new Hazmap survey at the end of the

implementation to refresh the system for its ongoing use. For smaller projects it is not practical from a budgetary perspective to do this so TWWA is developing a strategy of providing an annual budget either as a single budget line item or as a levy against all projects. These funds can then be used to conduct the refresher surveys.

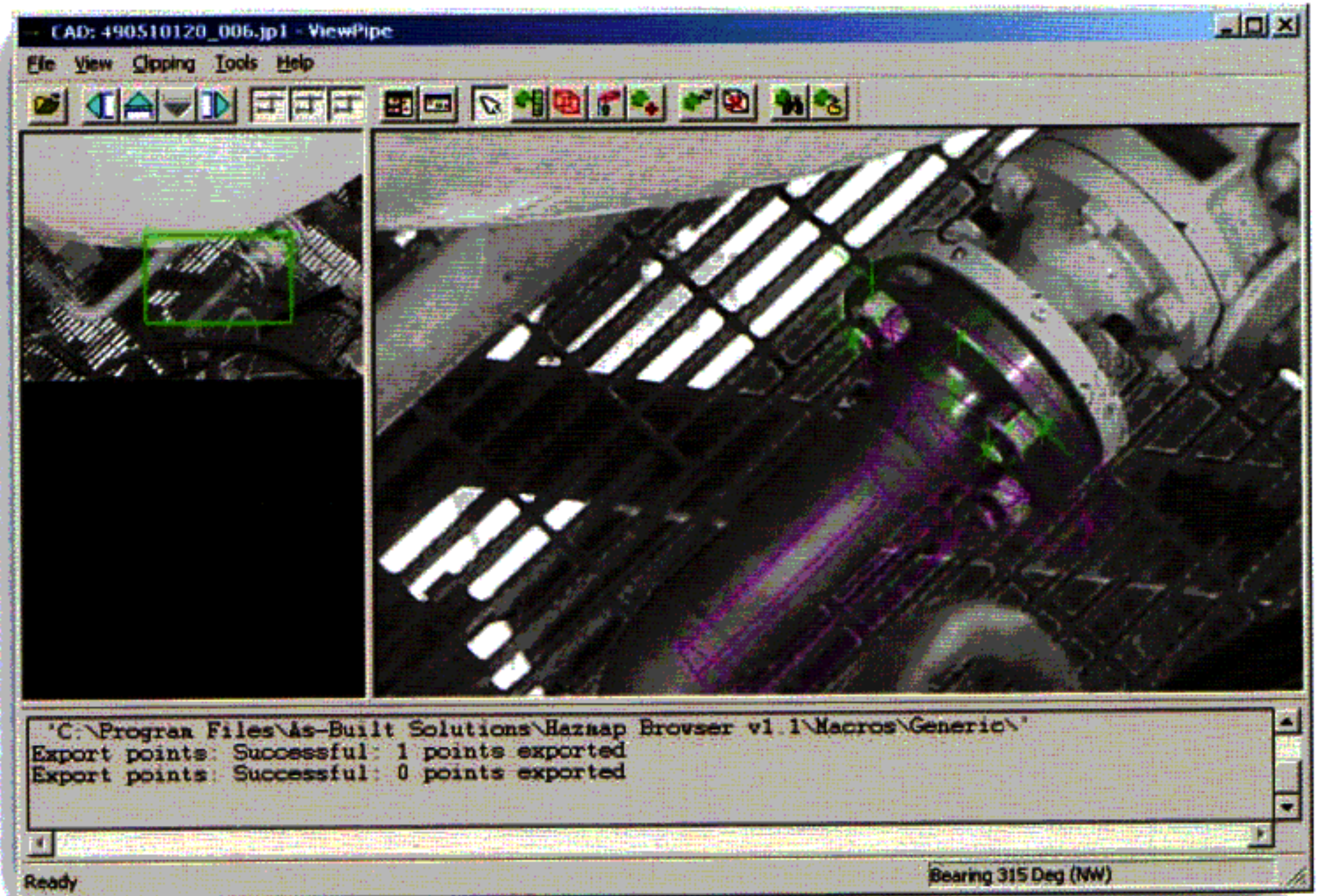
As an alternative method for small areas of change, new digital images can be captured with conventional or specialised digital cameras, which can then be embedded into the Hazmap database. Depending upon the type of equipment used these can be calibrated and used for measurement purposes thus saving the costs of mobilising a team of Hazmap surveyors.

Finally, the 3D CAD model of the installation can be used as an overlay with the Hazmap images which allows the user to compare the two sets of combined information and provides an excellent project design and review tool.

## CONDUCTING THE SURVEY

TWWA completed two surveys on the Goodwyn platform, an initial pilot and then a second survey of specific areas that covered around 50% of the production module areas. The total survey time was 3 weeks with the same time post-survey to deliver the images to the users.

On the Goodwyn platform the equipment required an area hotwork permit with



This image shows the interaction with the 3D CAD model that picked up a 9 mm misalignment of this part of the CAD model with the datum. (Image courtesy of TWWA)

appropriate gas detectors in the location to operate, but once this had been obtained the survey ran very well.

## THE FUTURE OF HAZMAP AT TWWA

The full impact of Hazmap in our working environment has yet to be assessed; however, the indications are that the expected benefits are being realised and that this system is already a welcome addition to the engineer's toolbox. The images received were verified against existing survey markers with an accuracy of 0 to 3 mm.

## THE TRANSFIELD WORLEY WOODSIDE ALLIANCE

Transfield Worley was established in 1995 as a 50:50 joint venture between Transfield Services and Worley to provide integrated engineering and implementation services to Woodside for the North West Shelf Oil and Gas Joint Venture.

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Goodwyn 'A' Platform (image of courtesy of Woodside Energy.)