

Metrology under water

Photogrammetry accuracy



Formerly Blom Maritime AS

Measure a distance of 50 meters underwater with accuracy better than +/- 10 millimeters!

BP will install the Deep Water Gunashli DWG platforms DUQ and PCWU jackets in Azerbaijan in 2006 without using mud mats. Instead, four pin piles are driven before each jacket installation and the jacket docked onto them at a later stage.

The pile positions are at the corner legs of the jackets, defining a rectangle of dimensions 90m by 70m. The water depth is 175m.

The distances between the piles have to be measured accurately.

In addition to the acoustic BP wanted a second metrology method for verification and invited Blom Maritime AS to perform the survey using the 3D Singlecam photogrammetry system (Blom 3DS) developed by Blom.

Blom, now Parker Maritime, claims to obtain an accuracy of 1/5000 or better for the surveyed length at one sigma confidence level. A survey length of 50 meter should then have accuracy better than +/-10 mm.

To verify this, BP arranged for a trial to be performed on a 54 meter spool in Baku in April 2006.



Image 1 - Test spool with survey control targets (52 meters between the end targets)

95 survey control targets were attached to the spool and surveyed onshore using a traditional Dimensional Control (DC) method with a point accuracy of +/- 2mm.



Image 2 - Rubber target mats and two survey control targets shown attached to the spool

The targets were surveyed several times by Fugro, twice after they had been attached, after a test lifting and then again after the spool had been lifted on to the transportation barge. This was done for QC and to check for parameters that might alter the comparison between the onshore and under water survey results.

The survey onshore result was kept by BP/Fugro and not released to Blom.

After the photogrammetry results had been forwarded to BP/Fugro, the onshore survey results were issued to Blom.

The error budget from the Blom 3DS survey shows that the total error should be within +/- 4 mm at one sigma confidence level. A comparison between the DC and Blom 3DS survey shows a difference of maximum 8 mm as shown in Figure 1.

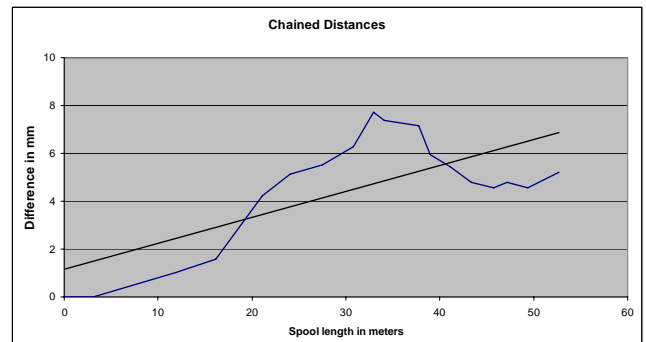


Figure 1 - Deviations based on chained segments with trend line

The comparison has been done by calculating the distances between each segment of survey control targets, a total of seventeen segments. The segment lengths have been chained from one end of the spool, and the difference between the DC and Blom 3DS survey is plotted in Figure 1. In addition all distances from one end of the spool to each segment have been calculated and the differences between the DC and Blom 3DS survey show the same results.

The shape of the plot may indicate that a combination of a minor scaling error from Blom 3DS and possibly temperature correction error from DC may have influenced the results. Controlling these two factors better in the future may prove that even better accuracy may be achieved.

The BP requirements for the jacket survey were

Pile center coordinates (Plan)	+/- 40mm
Pile center to center dimensions	+/- 50mm

The test shows that the claimed accuracy was obtained and that the diagonal of 114 meters could be surveyed within the required accuracy.

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