

GUIDANCE

IN-SERVICE INSPECTION PROCEDURES

Number: **PEC 18 b**

Prepared by: **Pressure Equipment Committee (TC1)**

Status: **Issue: 01**

Date: **26/01/2016**

Reference: **Trial: Remote visual inspection (RVI) of static storage tank**

Tank Details: Stainless Steel Storage Tank



Introduction

A trial was carried out on a flat bottomed static storage tank using RVI equipment. Unlike previous blind trials the camera operator was given a drawing of the tank and supplied photos from the previous inspection. The tank is manufactured from 316L stainless steel and was located in a bund. The camera supplier/operator came with sufficient equipment to carry out the full examination, but due to time constraints a complete examination was not possible. However the main purpose of the trial was to demonstrate RVI capabilities.

The trial was witnessed by Mr Peter Batty of LMP and Mr Martyn Maxey of Allianz who is also on the Board of the IQB panel at BINDT.

Equipment

The Supplying company was: Crimson Industrial Vision Ltd (+44 (0)1892 539503)

The price of this unit is notably less than that of equipment from other companies used in previous studies. For a unit comprising of the camera used together with the 80 mm diameter pipe inspection unit was approximately £30k and without the pipe head around £18k. This included cables and the tripod manway mount.



Figure 1 – Camera head for pipe



Figure 2 – Camera head for vessels

Note: The camera head incorporated two lights that could be adjusted manually allowing the light to cast a shadow in the same way as using a torch across the surface.



Figure 4 – The RVI kit in its box.



Figure 5 - Hand held display

Examination

The camera was fixed to the lower manway for the purpose of this test. (See Figure 6). In order to complete a full examination of the tank it would have been necessary to move the camera to the upper manway. From the lower position it was possible to examine (eventually) the upper nozzle attachments which were approximately 3.5 m above the camera entry point and also the attachments for the fill line (2.5 m above). The camera operators were untrained site staff and followed the camera supplier's basic instructions before use. Skill levels increased throughout the trial and the images produced were of very good quality.



Figure 6 – Tank entry location

Results

Whilst the trial was successful, there are still some issues to be resolved:-

1. In order to complete a full visual examination of the tank it is clearly going to be necessary to adjust the camera position a few times.
2. The video footage produced was of fair quality but could have been improved by covering the upper manway opening in order to achieve better contrast.
3. The tank would still need to be cleaned, probably more effectively than for man entry.
4. Examination of the tank floor remains an issue, particularly in the case of carbon steel tanks where the probability of corrosion from the underside needs to be addressed.
5. Checking the floor for settlement or lifting. This could possibly be assessed by flooding the lower parts of the tank with water to highlight high/low points.

Still Images from the Examination Video

Images of Upper Surfaces and Tank Walls.

Note the camera remains fixed to the lower manway.



Top View 1

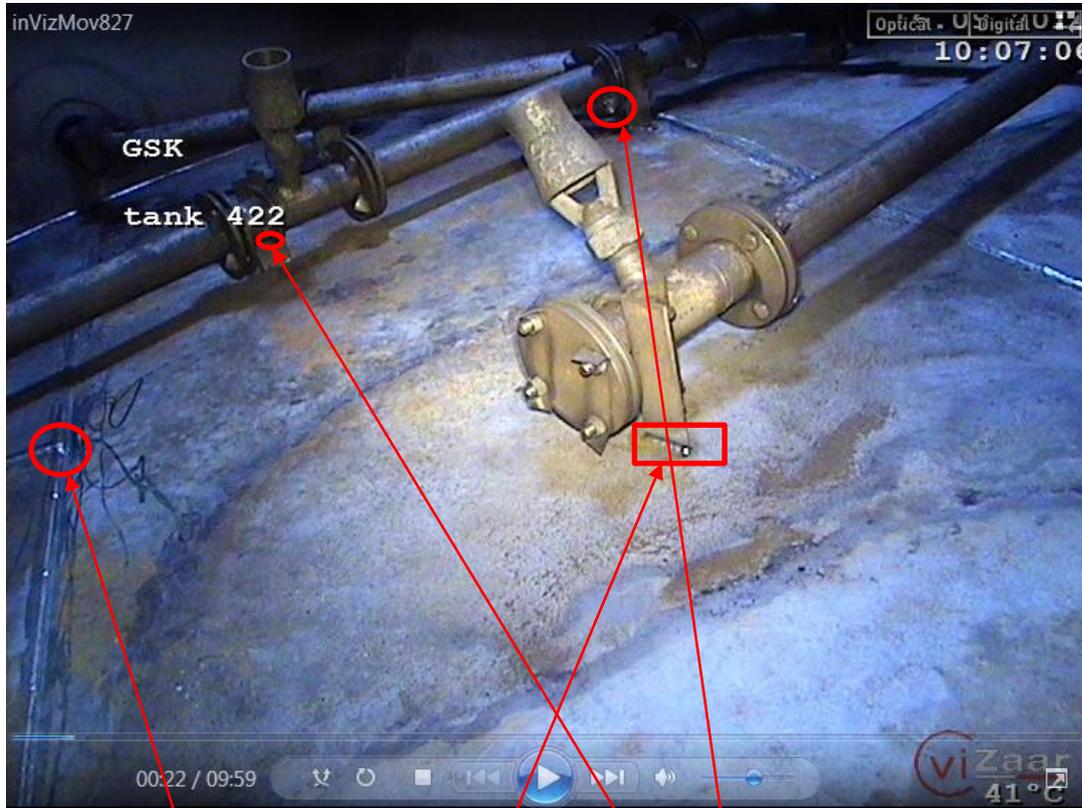


Top View 2



Images of Tank base from lower manway.

General View of Floor





Conclusion

The results have indicated that with more time and a little more development of the operator's skill in using the equipment, it may be possible to use this technique for visual examination for this type of vessel. It would probably not replace man entry entirely but may make it possible to extend the interval between a full man entries where this technique is used at an interim examination.

Considered Improvements:

1. Blank off the stray light coming from the upper manway.
2. Use the upper manway as a second camera mounting point.
3. Operator training in the use and functions of the camera as only basic functions were used during this trial.