Murgatroyds Brine Pump

Notes on Camera Survey of Shaft 14 Dec 17

Introduction

A sonar survey of the shaft was carried out in March 2017. The results from this survey suggested that both pump riser pipes were broken, and that the shaft was blocked at about 60m from the surface.

The information derived from the survey was sufficient to raise concerns, but the resolution of the sonar scans was insufficient to give definitive answers.

A follow up inspection, using a remotely operated submarine vehicle (ROV) was carried out in on 14th December 2017. The intention was to guide the ROV close to areas of interest and take video photographs, using its on-board camera.

The ROV has a depth meter and a built-in compass, which would have permitted exact location of any features of interest.

Problems

The high density of the brine caused two problems: first, the ROV normally operates in seawater, and was insufficiently ballasted for operation in brine. After addition of extra ballast, it was possible to navigate the upper part of the shaft, but the high density of the brine overloaded the propulsion motors and caused the protection device to trip after a short time. This cut all power to the ROV, which then had to be manually lifted to the surface and re-set.

All surfaces in the shaft were found to be coated with a black flocculent deposit which, in some places, was several centimetres thick. Where the deposit was thin, it was possible to see the grain of the timber, and joints between the planks but, where it was thick, it was difficult to assess the condition of the underlying surface. When it was disturbed, either by contact or by the propeller wash, it rose up in dense clouds, reducing visibility to a few centimetres. There were also many pale coloured particles, some of which appeared to be reflective. They showed up as points of light in many of the photos.

Because of the problems with the ROV, the lower shaft was inspected using a simple drop camera lowered from above on a cable.

Observations

The video film obtained indicates that the timber shaft lining in the upper shaft is in good condition.

Pump risers can be clearly seen in some shots, but it was not possible to make a close inspection of these before the ROV was abandoned.

There is a large baulk of timber suspended in the upper shaft, but it was not possible to determine what is holding it.

An unexpected quantity of rubble was found on the step between the upper and lower shaft sections. This could not be related to any feature of the shaft or pumps, and appeared to be more like builder’s rubble.

In the lower shaft, the pump risers can be seen in several shots. At greater depths, however, these show obvious damage, with clear fractures and missing

segments. The tie rods, which are intended to reinforce riser pipe joints, are missing, or hanging loose in several frames. Because the camera had no means of indicating the depth, it is not possible to accurately estimate the location of the damage. It does, however, appear to be worse near to the shaft blockage.

As suggested by the sonar survey, the shaft is blocked with rubble at a depth of approximately 60m from the surface. (estimated by measuring the length of suspension cable as the camera was withdrawn.) This rubble does not appear to originate from the shaft itself, some of it having the appearance of reinforced concrete, with one piece being fractured, clearly showing metal rods between the two sections.

One, indistinct, image appears to show the submersible pump, still suspended from its rising main.

One unexpected feature is that the shaft appears to be timber lined for its full depth. Records indicate that only the upper section is lined, but the lining is clearly visible down to the blockage.

Apart from one place where the timber has been displaced about 50-100mm, the lining appears to be in good condition throughout.

Conclusions

Because of the damage to the rising main, it will not be possible to restore the pumps to operational condition, or to recover the pump ends for display. During restoration of the headgear, it may be possible to recover some part of the pump rods for static display on the surface.

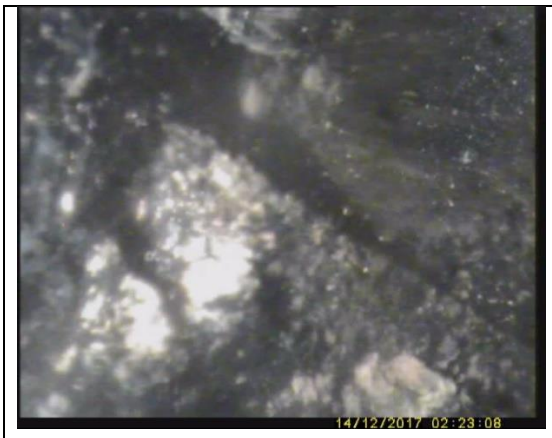
It is proposed to recover the submersible pump for static display on the surface.

Although it was not possible to inspect the full length of the shaft, nothing was seen which suggests that the shaft have collapsed, or is in danger of collapse.

It is not proposed to carry out any remedial work to the shaft, or its lining.

SRB 17 Jan 18

Stills from Video

	Rubble at 60m level
	Riser pipe (background) with broken tie rod (diagonal)
	Shaft lining boards
	Iron cleat joining shaft lining boards