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PIGGING OF THE LOBETHAL RISING MAIN



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PIGGING OF THE LOBETHAL RISING MAIN

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ABSTRACT

A 7.5 km long sewer rising main often burst at environmentally sensitive points. Although sections of the main were programmed to be replaced, pigging was a short term solution to relieve pressure in the main. There were numerous considerations during the planning of the pigging project.

1.0 INTRODUCTION

The small town of Lobethal (population 5,000) is sewered with the wastewater collected at one pump station and pumped 7.5 kilometres to the lagoon-based wastewater treatment plant. There were frequent failures of the main leading to significant environmental incidents.

1.1 The Infrastructure

The main is 200 mm cast iron, rubber jointed, laid in 1964. The diameter increases to 250 mm where it becomes a gravity main some three quarters of the way to the treatment plant.

The line volume of the main is 238 kL. Design pressure of the pump station is static; 74 metres head, operating: 105 metres head and surge 154 metres head.

The environment

The lowest points of the main are at the creeks and drainage lines traversed by the main, the most significant being the Onkaparinga River, one of Adelaide's major catchment Rivers. The low points are where pipe failures occur. See attached map. Approximately seven bursts occurred annually.

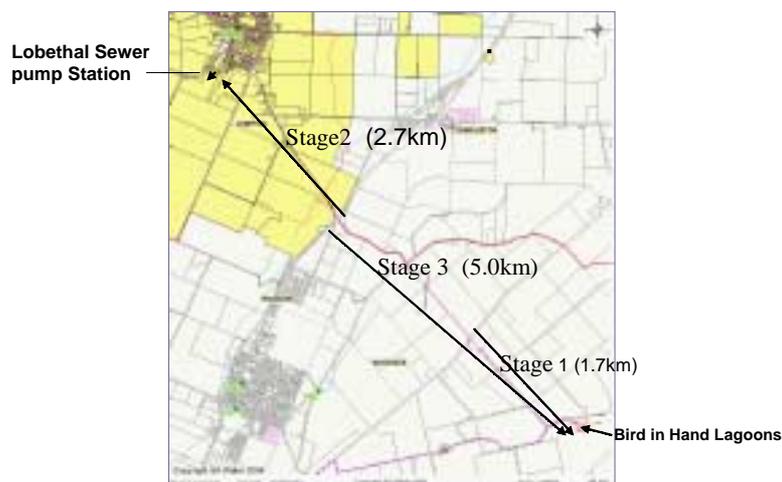


Figure 1: Pigging Stages

1.2 Diagnosis of the problem

Sections removed during repair revealed the internal mortar of the cast/cement lined pipe a soft, sandy, with no residual alkalinity varying from 0 to 6 mm in thickness. The internal diameter of the pipe was also found to be severely restricted as a result of build up of sludge and corrosion products. The pipe failures were a result of local external corrosion and pressure surges which caused the pipe to crack longitudinally at its weakest point.



Figure 2: *Sludge Build-up in Sewer*

1.3 Possible solutions

An extreme solution to the problem of bursts is replacement of sections of the main however due to the sludge build up it was decided to pig the main. Additionally we fitted a pressure sensor on the main so when a burst occurred the drop in pipe pressure would cause pump station shut down thus minimising environmental spillage.

2.0 PIGGING

Planning: There were numerous considerations to be taken into account when the decision to pig was made. Issues for which we had a contingency were:

- Volume of potable water needed to push the pig/s the entire 7.5 kilometres.
- We had to break the job into sections and do the pigging in 3 stages.
- We also took the opportunity to install valves where we broke into the main so that the whole rising main did not drain back to the pump station or the location of a burst if a burst did occur.

Storage of raw wastewater during a pigging exercise. Obviously when we were pushing the pig up the main with potable water (to minimise environmental damage if a burst occurred) we had to store raw incoming wastewater. The pump station is a decommissioned wastewater treatment where 5 hours raw sewage could be stored in the 750 kL total emergency storage. We couldn't plan to fill the entire storage in case there was a burst during pigging and we had to factor in the time taken to repair a burst in the past.

Could the treatment plant handle the extra sludge loads? We had planned to desludge lagoons so factored the extra loads in. Based on the thickness of the coating on the main, we estimated 85 cubic metres of solids would be pushed to the treatment plant.

We also notified all land owners who had the main through their property and local Council. Following all the planning we submitted the plans to EPA. They were advised of the dates and came to have a look at the job when it was underway

3.0 THE JOB

We undertook the pigging with pigging experts, a company based in Adelaide called Macro One.

The pumps in dry well configuration could not supply the pressure to push pigs through the network, so we used a fire truck pump.

Since we needed a considerable volume of water to push the pig through, we decided to break the whole job into stages, starting at the farthest third from the pump station then going back towards the pump station away from the Onkaparinga River.

Stage one Quarry Road to the WWTP had least environmental risk but there was no reticulated water so we had to use a sealed container supplied by Macro One for water to push the pig. We used this container to supply water for all the stages.

Launch sites were chosen for ease of access and location of stop valves so not too much of the line had to be drained when we broke into it to install a pig launcher. Note stage 2 was back to the pump station from Onkaparinga Valley Road. This made it easier to retrieve the pigs.

Macro One gave us a quote for the job and undertook the risk analysis and developed procedures in conjunction with us. We had three meetings with Macro One and drove the length of the main which traversed private properties.

The job continued over a period of eight days since there had to be a gap between stages when the stored wastewater could be cleared to allow an empty storage for each stage since the pump station pumps had to be off when the pigs were in the system pushed by fire truck pump. Each stage consisted of two to three piggings whereby we started with soft pigs then graduated to pigs with a more scouring effect. A liquid waste removalist was used to dispose of the wastewater and refill the water container. They were placed on-call for the duration of the pigging.



Figure 3 *Examples of the Pigs Used in the Project*

4.0 OUTCOMES

- Flows increased by more than 20%
- Lower operational pressures
- Project partially completed within budget (\$22k for Pigging Contractor as per Quote) but SA Water component of \$15 k Labour and materials was over by \$7k due to the amount of time we had between stages and the fact that it went over a weekend
- No pipe failures due to corrosion /pressure surges in the last 14 months since pigging of main
- No environmental incidents
- Improvement in pumping operation efficiency
- Savings in operating costs
- Conservation in electrical energy etc.