THICKENER SERVICE REPORT

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Customer Reference: N/A
Outotec Reference: Thk_111005_DR_Superi
Equipment Details: 12m Thickener

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INTRODUCTION

Outotec has been appointed to assess the possibility of re-using a 12m decommissioned thickener (designed and fabricated in 1995) for a new duty as a Tailings thickener at Superior Coal processing plant.

The purpose of this report is to assess the structural and mechanical parts of the thickener and to assess the possibility and extent of the repairs needed to commission the thickener for the new duty.

The thickener has been located in a storage field near Newcastle, NSW. The disassembled thickener parts have been laid down directly on the ground with and portions of some parts are sitting in water. The parts have been piled in two locations on this site.
The thickener parts observed visually generally show wear attributed to previous usage and general surface protection damage and corrosion, but not of significant nature.
1. INSPECTION CHECK

1.1 Tank

The construction of the thickener tank is – two piece bolted tank. Surface treatment is necessary; the tank shows paint cracking and general superficial corrosion. Blasting & painting necessary

![Tank Image]

The bolting flanges show some distortion and it is not possible to visually assess whether the flanges will seal following the erection. The damage and distortion can be attributed to rough handling during the dismantling. There are couple of places where the flange is torn apart from the tank plate, but the damage is not significant and reasonably easy to repair.

![Flange Images]

It would be prudent to either plan trial assembly at fabricators site or factor in the site welding of flange following the installation; bolts may be used to assist and speed up the erection. The tank shape is out of round; quantitatively is almost impossible to assess (without assembling the halves together). There are noticeable creases in the wall and launder area, the most significant ones being at the lifting lug located near the centre of each half. This damage is most probably due to lifting...
the tank halves without using a spreader bar and without temporary stiffening the tank flanged area. This is the most significant damage on the complete thickener and careful assessment on the repair procedure must be discussed with experienced tank builder.

It appears that the repair is economically viable, but the new user must accept the fact that some repair blemish will be visible, but without functional importance.

The other lifting lugs, located near the split line of the tank are in good condition and there is no noticeable damage to the wall in their vicinity.
Underflow cone is in good condition – no obvious damage has been identified.

Floor to wall welding appears sound and in general welding is visually in good condition.

Floor is conical in shape and is supported by eight radial beams. The state of the radial beams is fine with no damage observed.

1.2 Support Columns

Eight external ring support columns, four internal ring columns and four sets of ‘X’ bracing support the elevated tank.

The support structure appears in good condition.

Superficial corrosion of the surface and paint damage is observed; blasting and painting is necessary. Some of the base plates appear slightly bent and may need repair (but not replacement). Some holes in the base plates are flame cut; this is unsightly, but not of significant structural importance.

Two external ring and two internal ring support columns and five braces could not be located. Allowance is to be made for fabricating the missing components.
### 1.3 Mechanism Shaft and Rake Arms

The mechanism shaft appears structurally sound. Superficial corrosion of the surface and paint damage is observed; blasting and painting is necessary. There is some wear apparent below the deflector cone scraper. The thickness of the plate measured with ultrasonic device at the wear area is approximately 8 mm. This thickness is at the limit for the 40kNm torque design and should the process require higher torque, the shaft must be replaced. It would be advisable to have surface protection (rubber, ceramic, or equivalent) to this area of the shaft, even if the torque is not increased.

The underflow cone is slightly bent, but this is rather easy to repair. Deflector cone scraper has been cut off, possibly because it was difficult to unbolt. New scraper is required.

The rakearms are in good condition. They were piled on one of the access stair structures. Superficial corrosion of the surface and paint damage is observed; blasting and painting is necessary. Some blades are bent, probably due to transport, but are easy to repair. No wear on the rakearms or blades is visible.

One of the struts is badly bent, probably due to rough handling. This strut probably needs replacement. Tierods have not been found and will need to be replaced. The rakearms indicate that the tierods have been flame cut from the rakearms where they have been welded. Some repair will be needed to rectify this on the rakearms.

Shaft to gearbox coupling is attached to the rakelift and is in good condition.
Unusual ‘swelling’ of the bottom plate of the long rakearms is visible, but cannot be explained. The thickness of the plate is measured at this location and is 8 mm as the design plate thickness. Possible explanation is that the original fabrication is made with this slightly rolled plate. There is no structural integrity significance in this finding.

1.4 Feedpipe

Feedpipe appears in good condition externally. Superficial corrosion of the surface and paint damage is observed; blasting and painting is necessary. Internally, the pipe is heavily corroded and scoured with wear pattern particularly noticed near the mitre joint.
The thickness of the wall measured with ultrasonic device at the wear area is approximately 3-4 mm (the design pipe thickness is 12.7mm). The measurement is not very accurate, as the internal surface is very uneven, but it is indicative of highly worn area.
The wear in the feedpipe is typical for coal handling process and it is highly recommended that the feedpipe is internally lined with suitable wear protection surface.

Feedpipe flanges are in good condition.
1.5 Feedwell

Feedwell appears in good condition externally and internally. Superficial corrosion of the surface and paint damage is observed; blasting and painting is necessary. No wear has been noted on the inside surface of the feedwell wall; no wear on the baffles. Some wear at the internal bottom side of the feedpipe inlet is observable, but the measurement of wall thickness confirmed that it is insignificant.

The lifting lugs are not marked, but appear adequate for the lifting of the feedwell (1 t lug). The bridge connecting holes appear to be flame cut slotted and might require repair.

Feedwell deflector cone could not be located and a new one needs to be fabricated.
1.6 Bridge

The bridge appears structurally sound and can be reused with minor repair work.
Superficial corrosion of the surface and paint damage is observed; blasting and painting is necessary.
Some minor damage is observed – cylinder lug has been flame cut off, some handrails are bent.

Lifting lugs are not marked, but appear adequate and structurally sound.
Rakelift guide plates are in good condition.
Walkway chequered plates are bolted to the bridge structure; not welded.
1.7 Rakelift

Rakelift structural parts appear in good condition externally. Superficial corrosion of the surface and paint damage is observed; blasting and painting is necessary. Gearbox Reggiana RR3000Q visually appears good; the internal condition could not be assessed, but it looks completely sealed with no water ingress. Gearbox refurbishment needs to be accounted for.

Hydraulic motor seems reasonably preserved, but also needs planned refurbishment. The hydraulic cylinders, as well as all connectors and hoses are not reusable and have to be replaced.

The coupling between the mechanism shaft and gearbox appears intact and can be reused. The guide blocks and guide pin may be reused.
Rakelift guards could not be located and new guards will need to be fabricated.

1.8 Control Panel

Control panel appears to be in rather good condition. The box as well as the electrical installation, wiring, terminals and instrumentation appear rather clean and intact. The control panel needs detailed testing, but based on the visual presentation, it is reusable.
1.9 Powerpack

Hydraulic power pack is not in a useable condition. It is completely corroded, fittings are damaged, the hoses are destroyed. Electric motor, as well as all instrumentation (excluding control panel) is not useable and cannot be economically repaired.

New hydraulic power pack is required.

1.10 Access Stairs

Access stairs structure in reasonable condition and structurally sound. Superficial corrosion of the surface and paint damage is observed; blasting and painting is necessary. No support legs for the access stairs have been found. Some handrails are damaged during the disassembly and transport and needs to be replaced. No drawings are found in Outotec drawings library. Possibly, the stair access has been designed and supplied by plant designer, rather than Outotec.
In addition to what has been observed as the thickener bridge access stairs, there are several walkway and stairs structures that may be re-used for new thickener site access.

1.11 General Items

No lifting lugs are stamped with WLL. Compliance to site requirement to be checked and if stamping required, costing to comply to be accounted for.

All bolts need to be replaced with new unused bolts.

All instrumentation and electrical equipment would have to be replaced. The exceptions are components of the control panel, which may be salvageable, pending the inspection by the control panel builder.

All consumables (oil, grease, etc) need to be replaced.
2. CONCLUSION

The decommissioned 12m thickener can be re-furbished and reused for the new duty. The re-furbished thickener may have visible blemishes and imperfections, but functionally and structurally these imperfections would not be important for operation of the thickener at the selected duty.

The main points to note:

1. The tank repair at the lifting point needs to be completed.
2. Missing components need to be fabricated (four tank support columns, three braces, deflector cone, flocculent delivery system, hydraulic power pack, tie rods, deflector cone scraper, rakelift guards, and some other minor items).
3. Mechanism is limited to 40 kNm torque.
4. Feedpipe internal lining is needed or feedpipe replacement is necessary.
5. New rakelift cylinders are required.
6. Detailed control panel assessment and check is required by electrical personnel.
7. Gearbox assessment is required.
8. Completely new power pack with instrumentation is required.

The thickener would benefit from new technology, Outotec Vane feedwell, and may require higher torque designed into the drive.

It is important to note that this assessment is made at the end of September 2011 and will be valid for a relatively short period of time, as the thickener components are located in the ‘scrap yard’, sitting in the open field mud and exposed to elements.

Regards,

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