Hydratec

HYDRAULIC SCENIC LIFTS

DIRECT ACTING BOREHOLE – WATER INGRESSION

BACKGROUND

Originally installed in the early 1990s, the four scenic lifts were all experiencing problems with water ingress into the boreholes, resulting in lift breakdowns due to overheating (despite 12kW oil coolers being fitted).

The building owners had become concerned about the level of water ingress into two of the four boreholes and the high energy consumption. The lifts are situated in pairs at each end of the atrium and the water ingress problem affected all four lifts, however, the problem was most acute on the two lifts which diagonally opposed each other.

OUR BRIEF

Hydratec was tasked with replacing the liner. Over the years, Hydratec has re-lined several boreholes using MDPE piping where there has been a problem with water ingress.

The process is straightforward, the water in the borehole is pumped out, the new liner is installed in sections which screw together with silicone to seal the joints. The liner is then weighted with water and once fully assembled, it is plumbed. Bentonite pellets are filled around the annulus (between the old and new liners) and left to swell overnight to seal the liner in position. Once the bentonite has sealed, the water holding the liner in position can be pumped out of the liner and the new cylinder can be installed.

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OUR SOLUTION

Of the four liners, the first one went down to the required depth and the second one stopped 2m short. The lift jack cylinder casing Hydratec removed was 11,460mm long, so something had stopped the MDPE liner at 10,500 mm. The MDPE liner was removed and a plumb tape was dropped into the borehole which gave an audible signal when the water level was reached. Water was found at 7000mm below the pit floor level, at 10,600mm the tape stopped and checking around the perimeter of the borehole liner, it showed the liner was blocked. A decision was made to agitate the silt in the bottom of the liner and remove it using high power suction. Initially, this proved successful but then a problem was experienced with silt refilling rapidly as soon as the suction stopped.

Initially, our site engineers could not understand why the silt kept refilling the liner. However, the problem was quickly identified after some investigation – the issue was the original liner material. Normally a liner will be manufactured from 6-10mm thick steel tube. This liner was manufactured from galvanised spiral wrap ducting, the sort used for air movement. Over the years this had corroded to virtually non existence, meaning the original cylinders on two of the four lifts were sitting in silt.

The task was how to replace the liner. The original ducting, in part, was still there and we had discovered small pieces of duct sucked up through the suction pipe and could see them in the settlement tank. As there were limited options, together with our client and the building owners, the decision was made to use a hydraulic tunnelling press to push a new steel sleeve made up of 500mm sections, into the ground.

After this, a new steel liner would be lowered down and welded together until the required depth was reached.

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The methodology used would be to press the sleeve down into the ground until it stopped, agitate the silt and then push again. The sleeve had a hardened steel cutting edge ground into it to enable it to cut into the soil. The possible problem we envisaged related to the remains of the existing liner compressing under the sleeve. To overcome this, Hydratec engineers designed a pneumatic grab to pick up any debris/old pieces of the liner to clear the way. What we hadn't envisaged was the possibility of large pieces of rubble stopping the liner. The hydraulic press we had selected for this job was capable of exerting 6000kg of force but even with this load the rubble stopped it. So, an attempt to drill the borehole with a tracked drilling rig was made, but again this proved unsuccessful as the wire from the old liner kept fouling the drill.

Our next option was to use high pressure water jetting, and after discussions with the specialist contractor, a decision was made to use the jetting with the press. This proved to be a success and the new liner was installed. The modernisation was completed and the lifts are all now running reliably, much to everyone's delight.

THE FINAL OUTCOME

The equipment Hydratec fitted was ALGI VVVFs with specially designed cylinders to ensure the weight was high enough to achieve the minimum pressure required. The VVVF system has proven to be very reliable and the objective of removing the heat problems has been achieved despite the lifts being used more regularly due to them once again being reliable.

top image Steel sleeve pressed into place, liner being readied for lowering into sleeve · bottom image Steel liner welded and ready for lowering into the sleeve

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Electronic Control Boards
Oil changes
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Spares

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