# CASE STUDY

## Magnetite recovery from process plant sumps using geotextile dewatering tubes

Coal Mine, South Africa
September 2019

## ABOUT ZEBRATUBE®

ZebraTube® has its origins in the manufacturing of large dewatering bags for the deepest mines in the world. We have more than two decades of experience in retaining solids and percolating liquids through our woven geotextile bags.

ZebraTube® products are designed and manufactured in South Africa. Our geotextiles are produced and woven locally by experienced weavers and thereafter converted to dewatering bags. Our complete control over the manufacturing process allows for design flexibility and speed of delivery. We cater for both large and small projects and our ease of deployment means ZebraTube is ideal for emergency dewatering projects.

Each roll of geotextile goes through a comprehensive set of tests at our factory to ensure absolute quality and traceability. Extruded strands are tested before weaving for tensile strength and, once woven, each roll of geotextile is tested for tensile strength and permeability.

*Figure 1: Sumps filled with spilt magnetite*

*Figure 2: Dewatered material being removed from the bag*

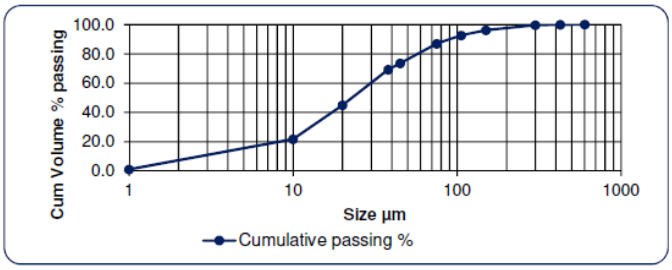


*Figure 3: Particle Size Distribution – Dewatering Bag Filtrate*

# BACKGROUND

The containment sumps at coal process plant have been filled with spilt magnetite over a period of time (See Figure 1).

It is estimated that the sumps at the plant contains in the order of 1800 $m^3$ of sludge. Xtreme Pumps, together with ZebraTube®, initiated a trial that aimed at pumping the magnetite-containing sludge into a ZebraTube® geotextile dewatering bag, allowing for fast and efficient dewatering and containment of the material.

For the trial a 5 m circumference x 10 m length dewatering bag was used. No filter aid or flocculant was added and the flowrate was limited to ensure sufficient settling.

The feed material was expected to be mostly magnetite, with some fine coal present in the sample.

# TRIAL RESULTS

It was expected that, due to the high specific gravity of the feed material, rapid settling would occur within the bag, leading to improved containment and dewatering and a reduced need for a filter aid.

The bag was filled over a period of two days, with some fines passing through the textile, especially during the initial pumping period. Filtration occurs through the blinding of the textile and formation of a filter cake on the surface of the textile. During initial pumping stages one can expect a fair amount of fines to pass until this filter cake has formed.

Figure 3 shows the particle size distribution (PSD) of the filtrate, analysed using laser diffraction. This shows that 80% of the particles in the filtrate are in the -59 µm fraction. One can therefore expect some fines to pass through the geotextile. The filtrate was analysed for total suspended solids and results showed that the filtrate sample contained 4290 mg/L of suspended solids.

Figure 2 shows the material being removed from the dewatering bag after one week of standing time and passive dewatering. A sample from both the front and middle of the bag was analysed for PSD and moisture content.

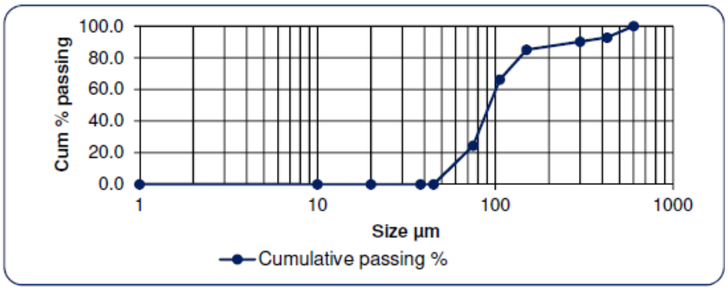


*Figure 4: Particle size distribution dewatered material (Front of bag)*

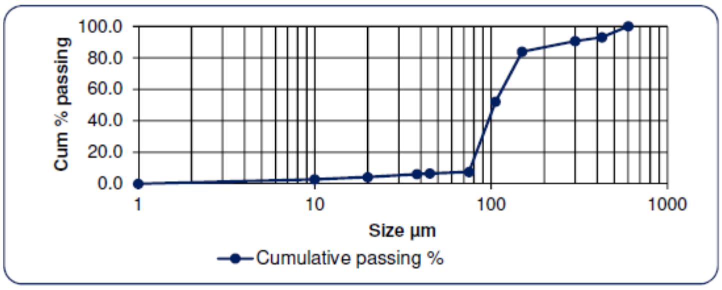


*Figure 5: Particle size distribution dewatered material (Middle of bag)*

*Figure 6: Dewatered and consolidated material after one week standing time*


## CONTACT

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*Assuming 70% of the material is magnetite at an SG of 4,8 and a value of R1500/ton

# DEWATERING EFFICIENCY

The moisture content of the dewatered material was established by drying the sample overnight at 110 °C and recording the mass before and after drying. The moisture content of the dewatered material removed from the bag after one week of standing time was 10.7%.

It is estimated that the feed slurry was pumped at 20% solids. Therefore, at a final solids concentration of 89.3%, dewatering efficiency was 347 %.

The PSD for each of the two samples taken from the bag after one week of standing time is shown in Figure 4 and Figure 5. The middle sample contained slightly more fines, with the majority of the particle size for both samples reporting above 100 µm. The hydrometer method used here is less accurate than the laser diffraction method used for the filtrate. The filtrate results are therefore a better indication of the fines passing to be expected. The SG of the contained material was measured as 3.49 for the front sample and 3.98 for the middle sample. The high SG is an indication that a high concentration of magnetite is present.

The trial bag was pumped to 0.3 m filling height. This equates to an approximate contained volume of 6.6 $m^3$. At a solids concentration of 89.3%, this represents a maximum contained value of R 29 705*.

# CONCLUSION

The high specific gravity of the material contained within the sumps allowed for rapid settling and therefore highly efficient dewatering without the addition of a filter aid. The dewatered material contained only 10.7% moisture after one week of standing time.

Some fines will pass through the textile, as indicated by the filtrate containing 4290 mg/L of suspended solids, with 80% in the – 59 µm fraction. Fines retention can be improved with the addition of a filter aid, if required.

Efficient dewatering and containment of the material allows for recovery and re-use within the process plant and represents a significant cost saving for the customer.