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ILLOYO SUGAR (South Africa) PTY LTD

Sezela Factory, Kwazulu Natal

March 2023

**Updated External & Lower Internal Inspection Report
Of the Existing Masonry Boiler Chimney Stack
at Illovo-Sezela Sugar Mill**



March 2022: Summary Report on the Existing Masonry Boiler Chimney Stack at Illovo-Sezela Sugar Mill

This report supercedes the previous reports dated 16th March 2022, 15th February 2021, and 9th April 2020.

The aim of this report is to provide an updated summary of the general condition of the existing Masonry Boiler stack on its third year, since the top of the stack and the external walls were repaired and strengthened.

The inner repairs carried out during the previous off-crop are detailed in item 4.2.8.

1. Scope of works

- 1.1 Young and Satharia (PTY) LTD were appointed by Illovo Sugar–SA (PTY) LTD to provide an Up-dated summary of the existing stack.
- 1.2 The appointment was confirmed in an order issued to Young and Satharia, dated 28th February 2023.

2. Information Provided

- 2.1 Illovo Sugar had appointed a company to undertake a Drone footage survey of all four sides externally. This digital information was handed to us by Mr Vuyo Madikizela and contained the following:
 - 2.1.1 Full elevations photographs of the stack walls created by stitching all the individual photographs together.

3. Site Inspections

The stack was inspected by Muhammad Manjra of Young and Satharia, Mr Carl Myers and Mr Marius Killian of Illovo Sezela on Thursday 23th February 2023.

4. Assessments

4.1 External Visual Assessment :

4.1.1 Corrosion of recently installed steelwork:

The corrosion on the steel is ongoing. There were very few notable differences from last year.

4.1.2 Deterioration of brickwork.

This is an ongoing process, and is happening on a microscopic level. It is very difficult to predict the rate of spalling and the way the brick perishes over a period of time.

The external spalling and deterioration is notable due to the vertical expansion cracks.

There are new vertical cracks on the outside created by the heat expansion of the stack.

4.2 *Internal visual Assessment*

- 4.2.1 The internal deterioration is now significant and a safety and stability concern.
- 4.2.2 It was observed that there were bulges at the bottom of the two continuous brick walls on all four sides of the stack.
- 4.2.3 The bulges indicate early signs of buckling failure, caused by heat expansion and compression failure of the bricks.
- 4.2.3 There are also vertical cracks extending upwards on the inner walls of the intake flues.
- 4.2.4 These cracks seems to create separation between the two intake walls and the outer walls.
- 4.2.5 The separation reduces the compression on the onside face and causes all the wind and notional forces on the rectangular portion of the walls.
- 4.2.6 The swaying of the stack causes even larger compression forces which when combined with the heat expansion overcomes the allowable stresses, and bulges out.
- 4.2.7 It must be recorded that there were no bulges in any wall during the 2022 Inspection. This year the bulges were on all corners of the continuous walls.
- 4.2.8 The repair work carried out last year has delaminated in some areas and was ineffective.

5. Conclusion

The internal deterioration is significant and a cause for concern. This is the first time that expansion failure and buckling were recorded together, and it has occurred at all four corners of the structure.

In the previous report, the writer elaborated that the top of the stack was potentially unsafe. We have seen the degradation escalate to the lowest part of the stack, where buckling (swelling of the walls) is visible. Some of the repair work carried out last year by Illovo, has delaminated and is ineffective.

The collapse of the flue opening walls is also a possibility, judging from the number of vertical cracks along the side walls.

From a health and safety aspect the stack is deemed as unsafe to use.

6. Recommendations

- 6.1 ***The stack must be cordoned off and demolished immediately.***
- 6.2 ***The failure of any wall could collapse the whole stack, and be catastrophic to the staff, plant and buildings around it.***

Sincerely

Muhammad E Manjra Pr Tech Eng.

Young + Satharia (PTY) LTD