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ILLOVO SUGAR (South Africa) PTY LTD

Sezela Factory, Kwazulu Natal

March 2022

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

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

This report supercedes the previous reports dated 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 Masonary Boiler stack on its second year, since the top of the stack and the external walls were repaired and strengthened.

Illovo Sugar Sezela management had also carried out some grouting repairs on the inner lower sections of the stack walls.

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 4th February 2022.

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 Thomas Gibbs and contained the following :

2.1.1 Drone footage photographs

2.1.2 Full elevations photographs of the stack walls created from stitching all the individual photographs together.

2.1.3 Video footage

3. Site Inspections

The stack was inspected by Muhammad Manjra and Thomas Gibbs on Tuesday 15th February 2022.

4. Assessments

4.1 External Visual Assessment :

4.1.1 **Corrosion of recently installed steelwork**: Corrosion was noted on the top reinforced galvanised tie bars and corner fixing plates.

These galvanised steel elements were installed in 2020 to stabilise and secure the loose brickwork temporarily at the top of the stack.

The corrosion has started on these stabilising elements, after the galvanised coatings were stripped of the steelwork by wind blown abrasion, and the continuous sulphate and chloride attacks on the zinc oxide coating.

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4.1.2 **Spalling of brickwork**.

This is an ongoing process, and is happening on a very microscopic level. It is very difficult to predict the rate of spalling and the way the brick perishes.
It is important that the deterioration of the brickwork be understood from the inside and outside, as similar processes, but different chemicals.

4.1.2.1. ***External Spalling***

The external face of the walls are subjected to salty air, better known as sodium chloride. This form of attack is known as chloride attacks.
These vapours dry out and forms salts on the inside of the small cavities created by abrasion, carbonation etc.
Due to the crystallisations of the salts, in the pores, and the repeated cycles of wetting and drying, the clay material in the bricks start to break-down.

During high humidity, the salts become hydroscopic, resulting in an increase in volume and starts the leaching of the parent material. The leaching weakens the bonds in the parent material, which eventually spalls.

It is difficult to comment on the condition of the brickwork, visually because the deterioration is taking place at the microscopic level, but it is safe to say that the three most effected faces are the east, north and south faces. (main prevailing winds). These faces have been subjected to most of the chloride attacks.
They also have the largest exposure to the elements, and the most spalling.

4.1.2.2 ***Internal Spalling***

The internal faces of the stack were originally covered with a heat resistant mortar. This mortar also formed a protective barrier against chemical attacks on the brickwork. Most of this mortar has since worn off or fallen off.

The internal temperature of the stack varies greatly from the outside, and the differential between the two temperatures has caused the walls to bow outward resulting in the central vertical cracks on the external faces.
These hot internal gasses have a high concentration of sulphur, which when mixed with water becomes sulphuric acid. The acid attacks the composition of the masonary,

The external chloride attacks and internal sulphate attacks, coupled with the heat differential are ongoing and without a costly intervention, as per our previous recommendations cannot be stopped.

5. Conclusion

The drone footage photos has helped greatly to check the condition of the walls in all four directions. It is recommended that the process be continued.

The internal repair work of filling the cracks and spalled brickwork has been cosmetic repair and does not appear to have strengthened any facet of the brick walls.

The repairs to strengthen the intake walls on the east and west faces were not undertaken. The cracks were only grouted up. These faces must be monitored consistently for cracks as they are the weakest points at the base, having the highest stresses and collapse potential.

Externally the structure has not shown any new evidence of distress, namely new cracks or movements.
The section repaired in 2020, does not appear to have moved, and the only notable defect item being the corrosion on the corner steel members and the tie bars. This corrosion will accelerate due to the high corrosive environment.

The structure uses its mass, gravity and profile to give it stability. The breakdown of the structure will accelerate when the hard burned (stronger) outer face weathers away totally, and exposes the inner weaker (lower strength) bricks.

6. Recommendations

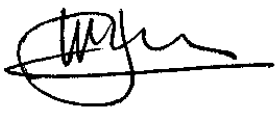
The stack has in many ways exhausted its service lifespan admirably. It needs to be replaced. The top half of the stack (even though stabilised) ***must be considered as potentially unsafe***.

As an interim measure, and to ensure continued stability of the top of the shaft strengthening, we recommend that galvanized steelwork be coated with a "surface tolerant epoxy resin "
Eg "CARBOMASTIC 15" or equal approved surface tolerant mastic.

The recently internal repair grouting at the bottom of the stack must be regularly inspected for cracking. This will indicate the present intactness and stability of the wall matrix.

This report strongly recommends that the management of Illovo Sugar ***invest in a new steel stack with the same capacity of the existing.***

Alternatives will be to plan, and erect a new stack near the existing, (in season) then connect from the old to the new during the off-crop period.



Muhammad E Manjra Pr Tech Eng.

Young + Satharia (PTY) LTD