7. SUMMARY

This research aimed to identify the factors that were affecting the operational efficiency of line 27, with the implementation of lean manufacturing through quality tools (Ishikawa, Matriz GUT and 5W2H), as well as the implementation of improvement opportunities to reduce or eliminate these factors. that made efficiency and waste elimination unfeasible. The practical work was carried out in one of the largest companies in Angola (Refriango Industry and General Commerce), from January 1st to March 31st, 2023 and involved bibliographical research; Characterization of the production line; Interviews with production and maintenance employees; Identification of mechanical processes that add value to the line and Assessment of the need for operational improvement of the line. In order to characterize the production line, a technical evaluation of the production process was carried out, from where it starts to where it ends. An interview (Annex) was made with the employees of the production area, they were interviewed; the line manager, line heads, and line production operators. And in the maintenance area were interviewed; the maintenance manager, the shift coordinator and the maintenance technicians, in order to first understand the process and the problems that the line presented.

In order to identify the causes that may be at the origin of this problems, the Ishikawa diagram was used, this was prepared with the help of production operators and maintenance technicians, with the objective of improving the operational efficiency of the line. The 6 M were addressed, considering the causes at the level of the production operators, that is, the method of operation and the time that maintenance technicians took to solve the faults. Causes were identified at the material level, such as the poor condition of the pallets, problems related to the environment and measures, problems related to the method of solving faults, problems at the machine level, such as problems with the bottle washer, filler, degrader and crater, and on conveyors. There was a two-week stoppage for maintenance, with the intention of eliminating all the problems or failures that the line presented as the main causes of the low efficiency of the line and finally it became clear that the periodic maintenance of the line equipment (preventive maintenance) should be done to prevent such situations of equipment breakage from happening again, therefore, it is about maintenance on the crater and degrader, on the mats, bottle washer and labeller. To assess the need for operational improvement, opportunities for improvement were identified and improvement actions were implemented, such as; implementation of the production control application (Power BI), training of production operators and planning of preventive maintenance to increase productivity, reduce costs and improve product quality.

Line 27 is a line that produces Tigra beer, it is a glass line, that is, glass containers. The line's production process starts at the depalletizer and ends at the palletizer. There are three shifts with 19 employees per shift, that is, 11 employees operating the machines, 2 line managers supervising production, 2 maintenance technicians available on the line, 4 cleaning technicians, 2 cleaning the dry part and 2 cleaning the wet part. The line is managed by a production manager and a maintenance manager and is equipped with two labelers instead of the one that is standard on a production line. Taking as a starting point the application of quality tools (Ishikawa Diagram, GUT Matrix, and 5W2H), the factors that affected operational performance were identified, using the Ishikawa diagram, and according to the analysis the main factors were; untrained staff, waste of time, lack of standardization of activities, poor state of pallets, production operators cleaning while operating, poor compliance with the production plan, delay in resolving faults, lack of preventive maintenance, bottle breakages constants in the crater and degrader, lack of synchrony of the servomotors, bottles coming out of the washer with labels (clogged showers, warped and damaged wheels) and jamming of the conveyor chains. After the previous analysis, the causes with the highest rates were visualized, that is, the problems with the greatest urgency, severity and trend. In an evaluation from 1 to 5, in which the values are evaluated in a table on Severity, Urgency and Tendency. The table is schematically shown with values attributed to the previously identified causes. Therefore, those with the highest priorities were quickly checked, so that actions can be implemented to resolve issues. The factors were presented in a graph, the factors with the highest resolution priorities were; untrained personnel (operators take turns between the machines), constant breakage of bottles in the crater and degrader, servomotors out of s synchrony, bottles leaving the washer with labels (clogged showers, warped and damaged wheels), locking of conveyor chains, lack of standardization of activities, poor state of pallets, lack of control and preventive maintenance. The 5W2H tool was used to create an action plan to solve the root cause that was found through analyzes already made with the later tools. Since most of the causes found that influence the low level of production came from equipment malfunction due to lack of preventive maintenance, the root causes of the GUT matrix were selected, based on the Ishikawa diagram. After two weeks suggested for line maintenance, in equipment (which had constant failures, with long stops) and the implementation of improvement actions, an analysis of results was carried out between the months of January and February, considering data from January before the stoppage, for equipment maintenance (January 1st to 24th) used as a comparison. The increase in operational efficiency is also one of the main objectives of this work, firstly presenting the efficiency values before the general maintenance of line 27 (prodution line number 27), to verify if there has been

a comparative increase since the day that line started to turn, that is, (February 26th) after the implementation of improvement actions (maintenance, standardization of activities, training of production operators on line 27, stop and production control, elimination of wasted time), then efficiency values will be presented, to conclude whether there was a change in efficiency, in relation to the efficiency value before the improvement actions. With the presentation of the percentage values of efficiency before and after the shutdown and implementation of improvement actions, it was found that there was indeed a percentage increase on 01/27/2023 of 8.82% in approximately 1 month. Since, the percentage value of efficiency before the implementation of improvement actions was 55.63% while after the implementation of improvement actions, 64.45% of operational efficiency was obtained.

With the presentation of these results, what is desired is to comply with the preventive maintenance plan, the production activities, the proposed improvement actions, to reduce or eliminate the problems that may affect production and so that the efficiency of the line 27 is always maintained with the percentage increase in operational efficiency.

Keyword: Lean implementation, quality tools, improvement actions, Operational efficiency