

C.L.I.C.

Carton label integrity Check

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1.0 Executive Summary

The design, engineering and preliminary testing of an automatic carton label integrity checking system to be implemented in line on a factory floor.

2.0 Introduction

Quality assurance for the labelling of finished product in an export factory requires heavy manpower time and training investment whilst human error insures that a large amount of risk remains unmitigated. Furthermore, label errors are often identified sometime after production and are normally batches by nature leading to large and expensive reworks to fix. As more importing countries place higher value on the product label the repercussions for mislabelled and damaged or incomplete labels rises.

This generated a demand for a more comprehensive and automatic system to verify the accuracy and integrity of labels as they are printed and applied. This would help mitigate the risk of damaged and mislabelled product, raise the quality and professionalism of production in the process and reduce tedious manpower consuming jobs.

Project Goals:

1. Barcode readability.
2. Top label present and matches side label product id.
3. Main label matches product ID label.
4. Individual country specific label object checks.
5. Individual country specific label character checks.

3.0 Project Objectives

The preliminary objective of this project was to assemble a prototype station as a proof of concept and to gauge the general viability of available technologies for factory conditions, establishing what would be the limiting factors and constraints.

3.1 Design, engineer, build and test a prototype C.L.I.C

At its core the system consists of a camera in sync the label printer, which passes the image onto a pattern recognizing software. This software will need to be able to handle a multitude of different label types and as such needs a way to identify which pattern or template to check the label against. Finally the system needs a way to divert failed labels from the production lines and ideally alert production staff to the precise issue with the label.

3.1.1 Software

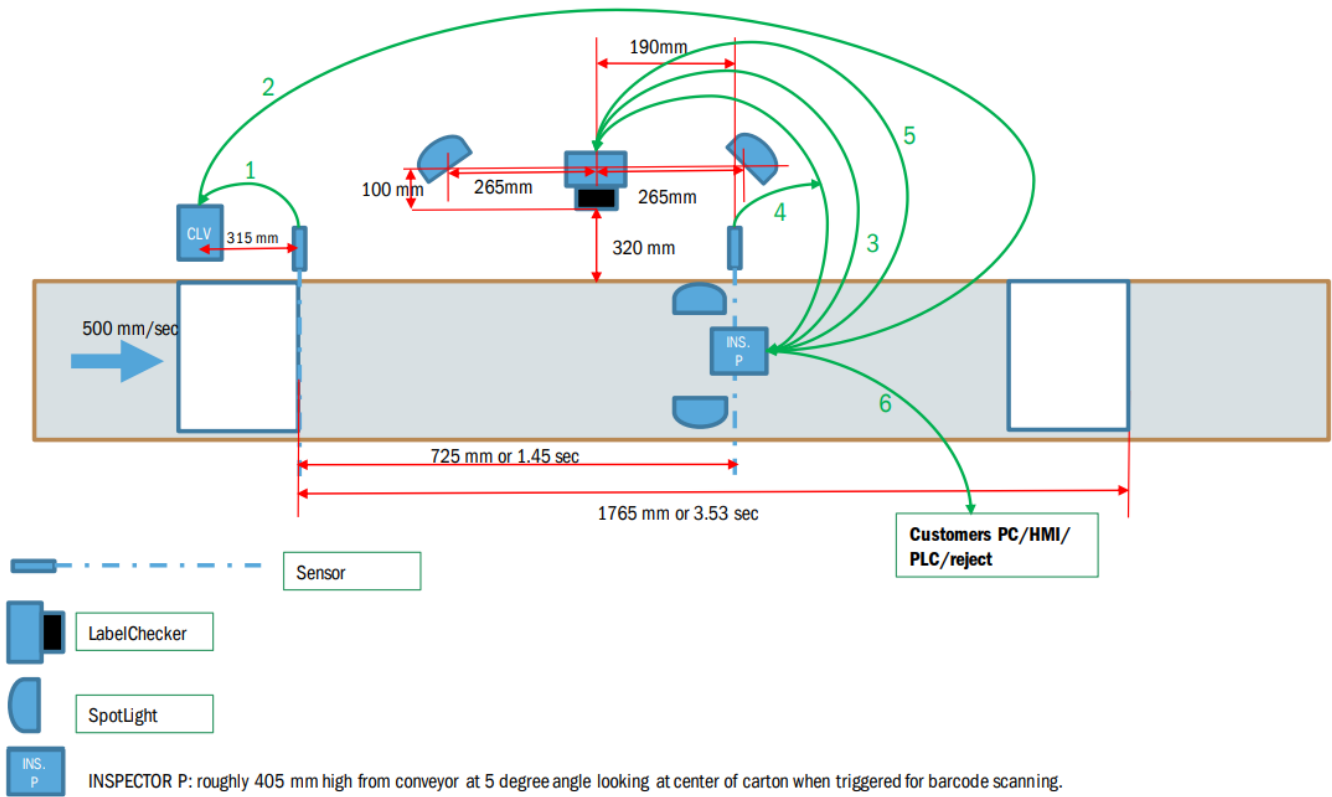
Professional expertise was sought to write a program that could compare images to templates after being told by our existing label printing software which template the label is based on. The company chosen produced a promising viability trial with only slight label changes required to avoid fields looked at by the program overlapping, something that would produce a fail result for the label check.

3.1.2 Hardware

Initially intended to be fully in house the necessity to use the company's equipment such as their cameras for the software meant parts of the station design where outsourced to the company's in order to facilitate the software

correctly. Still the conveyor system, device mounts and label printer communication needed to be designed by in-house personnel to specification.

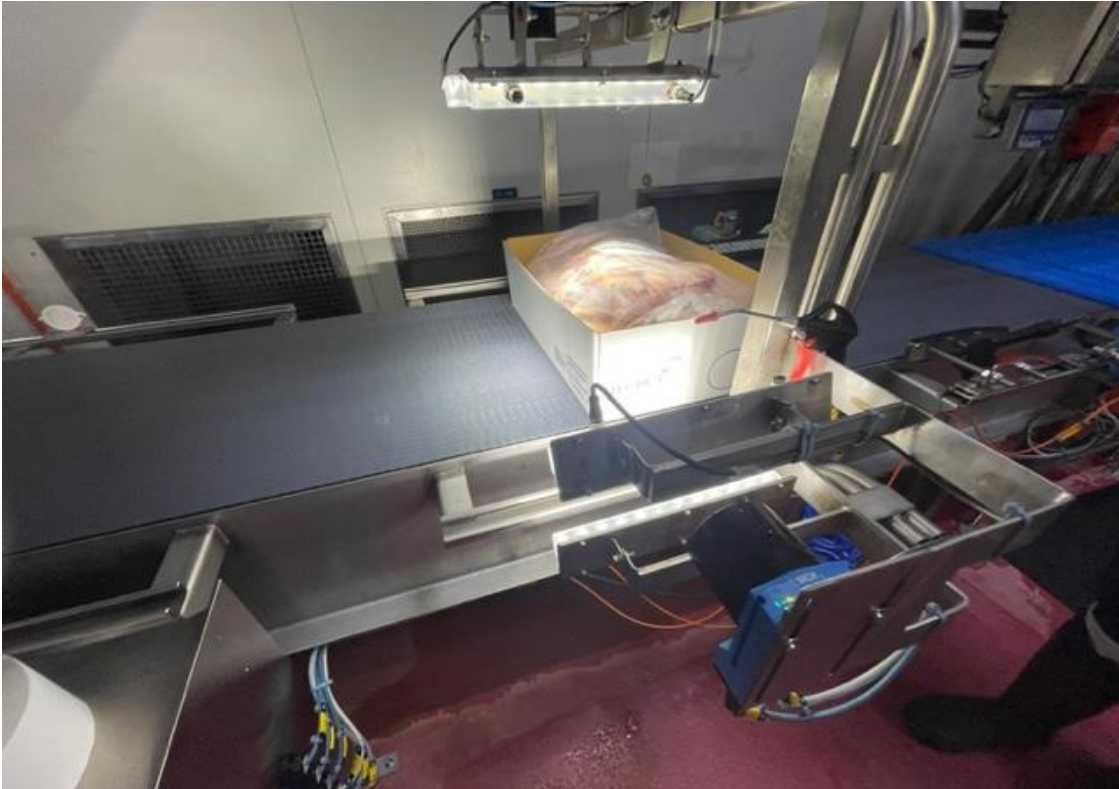
Diagram of the label checking system



Photos of the label checking system







3.1.3 Trial

Once completed the system will be extensively trialled making the necessary modifications where needed. The majority of the trialling will involve tweaking the cameras and software.

Steps

- Design the software.
 - Build the conveyor and infrastructure.
 - Trial the system
-

4.0 Methodology

One of the biggest issues which was identified was the inconsistency of the label application. The label is applied by an operator at the cedar creek station and even the most precise operator still at times didn't apply the labels correctly.

In the company's most recent visit they were able to modify the label inspections to try to compensate for the inaccurate label application.

To achieve this most of the character recognition has been removed and replaced by pixel counting checks, which gives us indication that the required text is in place, however it cannot guarantee that the text is accurate or complete.

In discussion with the company's representatives, we have come up with a new implementation of the system.

Rather than reject any carton found to have labelling errors at the labelling station, it is proposed to allow for a daily check of all cartons produced.

The label checking system has the ability to record the image of each label, plus an error code and barcode reading of each carton.

It is our proposal that we access this information via an in house program create a screen where an employee anywhere on site could quickly review the label production for the day.

These images would be able to be filtered, for example the employee could bring up:

- Specific countries labels only
- Specific countries labels that did not pass inspection
- Specific countries labels that did not pass a particular inspection such as no top label. (The top label image would also be available to confirm the label is or is not present.)

Any cartons deemed suspect could then be placed on a QA hold in the plants inventory system.

If found to be reliable this system would enable one person to check all daily production of cartons for the entire plant, assuming a label checking system is in place for all carton labelling stations.

Its estimated that one person could check a minimum of 20 cartons per minute, so if the system is flagging 10% of cartons to be checked, at 4000 cartons per day that would take 20 minutes to review.

In addition to this, any printer errors detected that may be of concern can be tracked back to the exact point they started by reviewing the images, and only affected cartons can be flagged for relabelling.

5.0 Project Outcomes

In tests performed in conjunction with the inventory system and stations, the label checking system was able to consistently achieve the stated project goals, with the exception of small character checks.

Due to the inconsistent presentation of the cartons, in particular, small variable text on some labels applied to cartons that were bulging due to over packing or weak carton wall size were not able to be read consistently.

However the overall performance was satisfactory and it was decided to further fund this venture.

6.0 Discussion

6.1.1 Full Scale Plant Implementation

To implement this system across the plant it would be necessary to install a label checking system on each possible entry to the lidding machines, and in a location where there is sufficient gap between the cartons to enable the system to check the label correctly.

For the plant, this would mean one system in the Cold Fabrication room, and 2 in the Hot Fabrication room.

If the inventory system operator places more than one carton on the label checking system conveyor the second carton label will not be checked as the system requires at least 5 seconds per label check. This equates to 12 cartons per minute. This maximum label check figure is at times not achievable due to the room producing more cartons per minute than 12.

Modifying pre-existing in-house software to allow for quick and efficient label checking is straight forward and can be done in house.

6.1.2 Future Expansion

The company's representatives demonstrated one of their latest products which enables the product within the carton to be verified as containing what is stated on the label.

If installed before the carton liner is folded across the product, this product in conjunction with the label checker could eliminate the need for the product to be visually inspected by an employee at the entrance to each lidding machine.

7.0 Conclusions / Recommendations

The label checking system is functioning as expected and is checking the labels on the cartons. Due to inconsistency of the label application causing a lot of false positives the label checking system is not rejecting the carton onto the reject conveyor.

Another issue which has arisen is if the inventory system operators push the cartons too close together the label checking system does not have time to check the second carton and will ultimately miss checking this carton. This is not always operator error as the Hot Fabrication Department pass a lot of cartons through the inventory system and when the chain speed is increased it is a struggle to keep up.

All the cartons have a photo taken of the label and a log file is kept showing if the label check passed or failed.

This log file will be accessible by anyone and will most likely be monitored by the label checking QA's.

8.0 Bibliography

No referring was made. All data and comments are from in house personnel or the company's representatives.

9.0 Appendices

None.