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Verification of LPG Cylinder using Image Processing

Prof. C.M. Gaikwad¹, Miss. T.S. Mahadik², Miss. K.V. Mane³, Miss. M. J. Patil.⁴

^{1, 2, 3, 4}BE (ENTC)

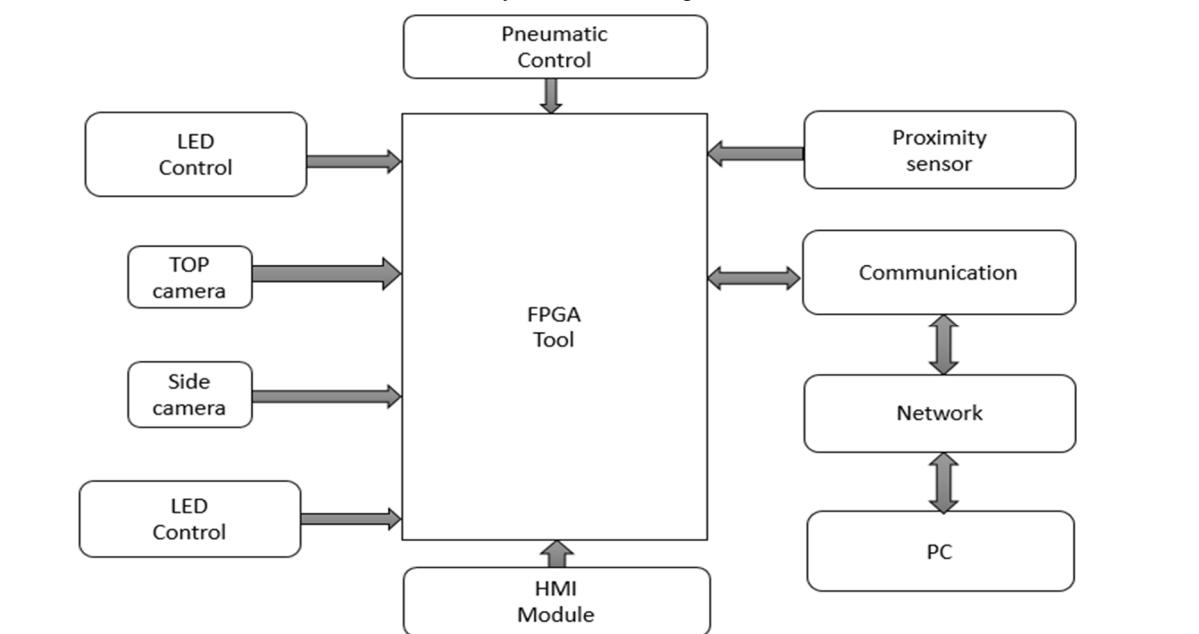
Abstract: The proposal is to develop the electronic solution using the image processing technique to improve the process quality and reduce human error, which is responsible for the system down time. In this solution we are going to target the problems relevant LPG cylinder. In this method the cylinder varied by the conveyor belt. IR sensor detect the cylinder and send the signal to FPGA tool. Then it will create the enclosed area around the cylinder then top and side camera will take the perfect snap if there is any problem using the PWM dimming technique we will fine tune the lightning system to achieve the most accurate results and send the data to FPGA. We are going to use the HMI module to manually over-ride the system. In case, system will not able to detect the feature due to pure cylinder conditions (due to dirt on cylinder). User will have provision of bypass the system and can start next cycle. For remote monitoring purpose we are going to send the top and side view of the cylinder along with its feature that we have extracted. Here we are going to use TCP/IP communication interface to communicate with the server. System will push the image along with generated parameter for log and archival purpose. Application module will receive the data from unit and display for monitoring purpose. Also it will store the data in database for future reference.

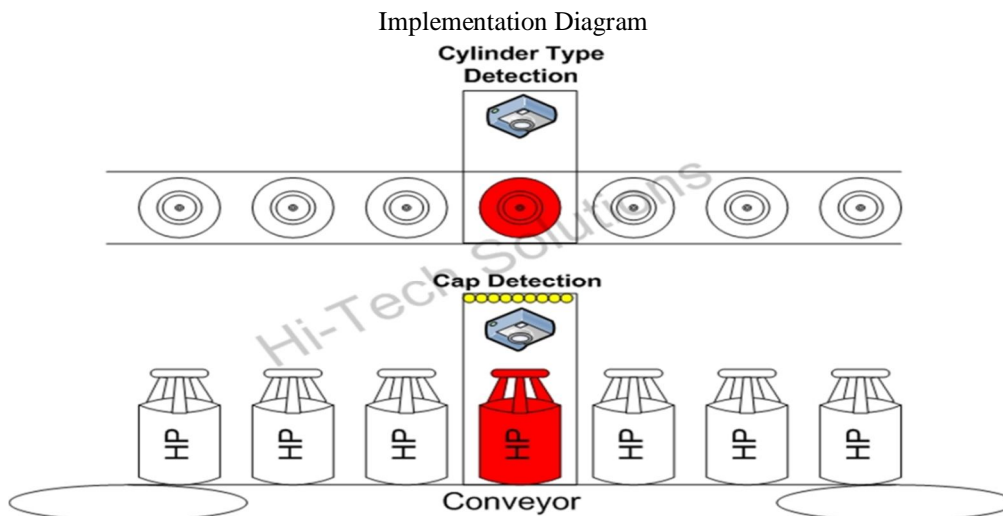
I. INTRODUCTION

In this solution we are going to target the below points for system design consideration.

- 1) Identification of the Cap on the cylinders :Present Challenges – At present, during the unloading process the security person from HP will verify the cylinder cap present or not , based on the counting HP will debit the difference from the supplier. Human error may cause while counting the number of cylinders with cap and without cap. So if there is an error, either HP or Supplier will suffer for loss of caps.
- 2) Type of Cylinder - Present Challenges – At present, type of cylinders is counting manually and this manual process may have errors.
- 3) Total Cylinder Count – Manual Process to count total number of cylinder unloaded from the truck to loading station

System Block Diagram





System workflow

- 1) System will detect the LPG cylinder in Detection Area using the proximity sensor
- 2) System will hold the Conveyor
- 3) Camera 1 will take a snap and calculate the Image parameters – For Cap detection
- 4) Camera 2 will take a snap and calculate the Image parameters - For Type of Cylinder
- 5) Vision system will identify the presence of cap and type of cylinder based on the machine learning.
- 6) Once the System has identified features from Images, data will be pushed to server for monitoring and Image archival purpose.
- 7) If system is not able to identify the cap and type of cylinder due to any reason, system will ask for the manual override. In this case audio visual alarm will be generated to get workman's attention.
- 8) After successful detection or after manual override, system will release that cylinder. And process will continue as before.

II. MODULES

A. Machine Vision

This system will capture image using the high quality CCD camera and process using parallel processing to extract feature from the image to identify the required cylinder parameters. Here we are using the FPGA to process the images in parallel way to achieve the critical time constraint of the cycle time. As per Voice Of the Customer we are targeting the 800 ms to complete one cycle with 25% of the safety margin.

B. LED Controller

To make system more robust we are going to develop our own lighting system that will generate the persistent illumination for image capture system. Using the PWM dimming technique we will fine tune the lighting system to achieve the most accurate results.

C. HMI Module

We are going to use the HMI module to manually over-ride the system. In case, system will not able to detect the feature due to poor cylinder conditions (due to dirt on cylinders), User will have provision of bypass the system and can start next cycle.

D. Communication Interface for Remote Monitoring

Purpose we are going to send the top and side view of the cylinder along with its features that we have extracted. Here we are going to use TCP/IP communication interface to communicate with the server. System will push the image along with generated parameter for log and archival purpose.

E. Application Module

Application Module will receive the data from unit and display for monitoring purpose. Also it will store the data in database for future reference.

III. CONCLUSION

In this project we are using the high quality image processing technique. Because of this we can easily detect the any error according to cylinder gas and this system will also indicate the error using buzzer system.

So adding all this advantages we concluded that we can overcome the human error and this system helps us to avoid any accident related to LPG cylinder.

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