

PROBLEM: Single and three copies in NGR

SOLUTION: Rejection of Single and three copies in NGR

PURPOSE: To prevent counting problem and to avoid false count copies reaching customers.

IDEA: To implement a control system with sensors inspecting and rejecting the single and three copies automatically.

SPECIFICATION:

1. SENSOR SELECTION (INPUT)

To detect the keyhole of the paper in high speed. Sensitivity should be high. Response time should be as low as possible in order to detect at high speed. If Sensor can provide digital o/p, it would be more sufficient to implement.

2. OUTPUT PROCESSING

Based on the output given by sensor, Programmable Logic controller should be programmed in such a way that it should open the Gripper holding the bad copy. Otherwise, If the sensor is mounted at the skew copy position, we can use the function of skew copy rejection. We can provide the sensor output to the skew copy rejection input.

SOURCE

1. Keyence thickness sensor:

It is an analogue sensor which gives analogue output based on thickness of edges. The band of viewing is 28mm. The IG optical micrometer was used for detecting sample copy thickness but it failed to detect because of paper oscillation. Response time is very low and it requires parallelism with paper. Indeed, papers are slightly tilted hence blocking the receiver fully, so it is not able to detect the copies at high speed. This sensor is not feasible.

2. Keyence Distance sensor

This sensor senses three or single copies based on the distance from the receiver. Keyence IS-100 laser thickness detection sensor was placed in 3U chain and checked for false copy. The sensor was taught with single copy thickness and checked with simulated copies. But still, problem was not solved

3. Cognex Vision system

This application can be done by detecting the number of keyhole when seeing the side view of the paper. This application can be done by IS2000 Vision system. Based on the number of keyholes, fault copies are identified and rejected. So this is a image based rejection system based on the Count of keyholes. Response time is 20ms so it can easily capture and process each and every copy at maximum speed itself. Demo was conducted by Cognex team and we have narrowed it to Cognex system because of its high efficiency, less response time and high accuracy.

Weekly report

- 24.11.2017
 - IG optical micrometer thickness detection sensor was discussed.

- 05.12.2017
 - The IG optical micrometer was used for detecting sample copy thickness but it failed to detect because of paper oscillation.
 - Keyence IS-100 laser thickness detection sensor was placed in 3U chain and checked for false copy. The sensor was taught with single copy thickness and checked with simulated copies.

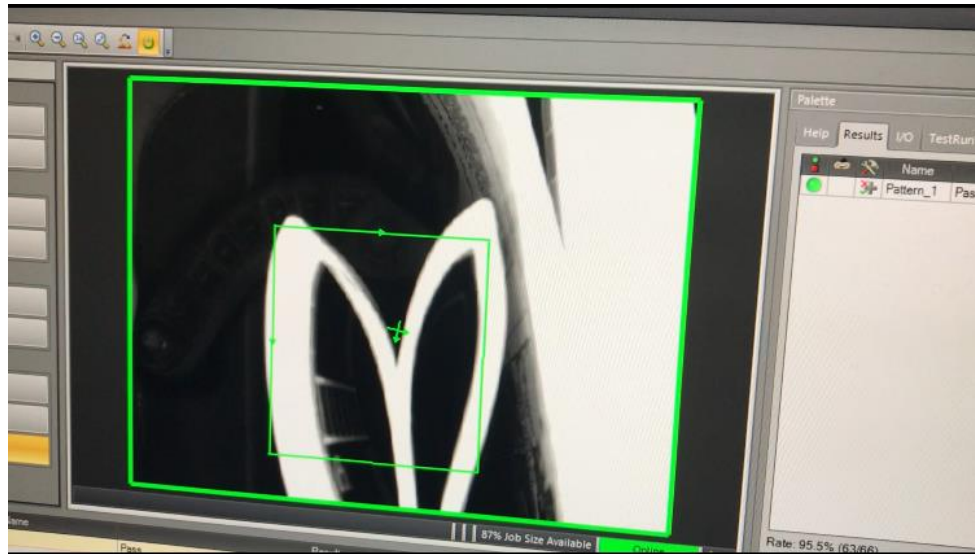
- 08.12.2017
 - Simulation for pasting copy
 - Conditional/unconditional rejection
 - Position-Skew copy or before skew copy
 - Even/odd rejection based on single copy thickness dividing method
 - Check copy chute rejection simulation
 - Rejection in NGR using external device
 - Rejection in waste station (calculation decision should be checked)

- 15.12.2017
 - 18 bolt air closed and checking for pasting simulation
 - Instead of pasting, we can simulate with gold foil sensor trigger.
 - Keyence micrometer testing at pick up

- 22.12.2017
 - Scatec – pulse amplitude any variation based on copy thickness
 - Keyence micrometer check at console position
 - Check after 2 in 1 correction 90 degree
 - IFM 01D laser sensor difference vs Keyence
 - NGR paper alignment logic using excel and program

- **Demo study**

- Demo was taken with IS2000
- The pattern of two copies was taught and run in young world edition
- The pattern of one and three copies failed whereas it passed the pattern of two copies.



2 copies pattern



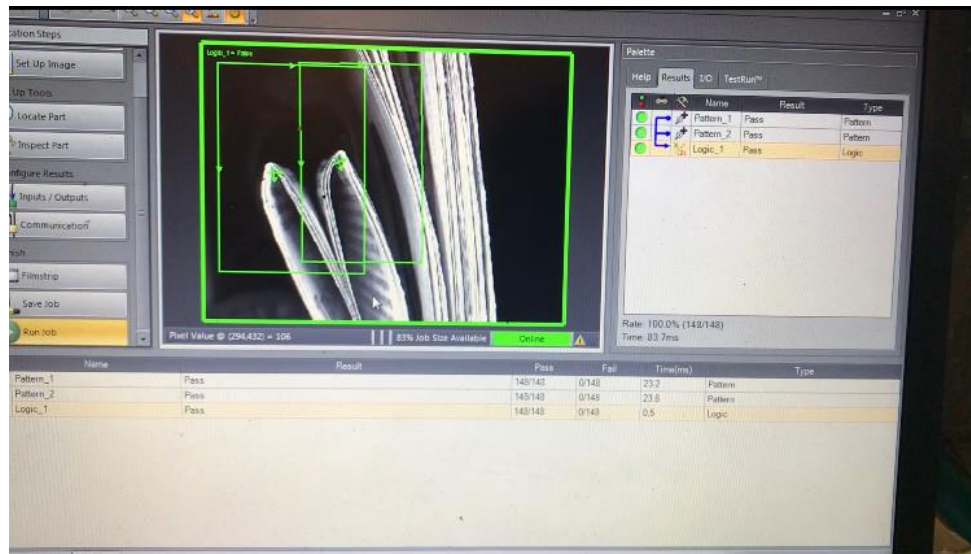
1 copy fail

- **Output testing**

- Skew copy sensor output will eject the paper in the skew copy position gripper at the tensioning station. Camera output was given to machine and tested. The skew copy gripper position was found by trial and error method. Output pulse was set at **8ms**.

- **Pattern teaching**

- Demo pattern was tested in 2 in 1 production.
- There were huge differences in the copy stream
- Hence, two patterns were taught for two loops. So if any of the loop is missing, it means the gripper contain only one paper.



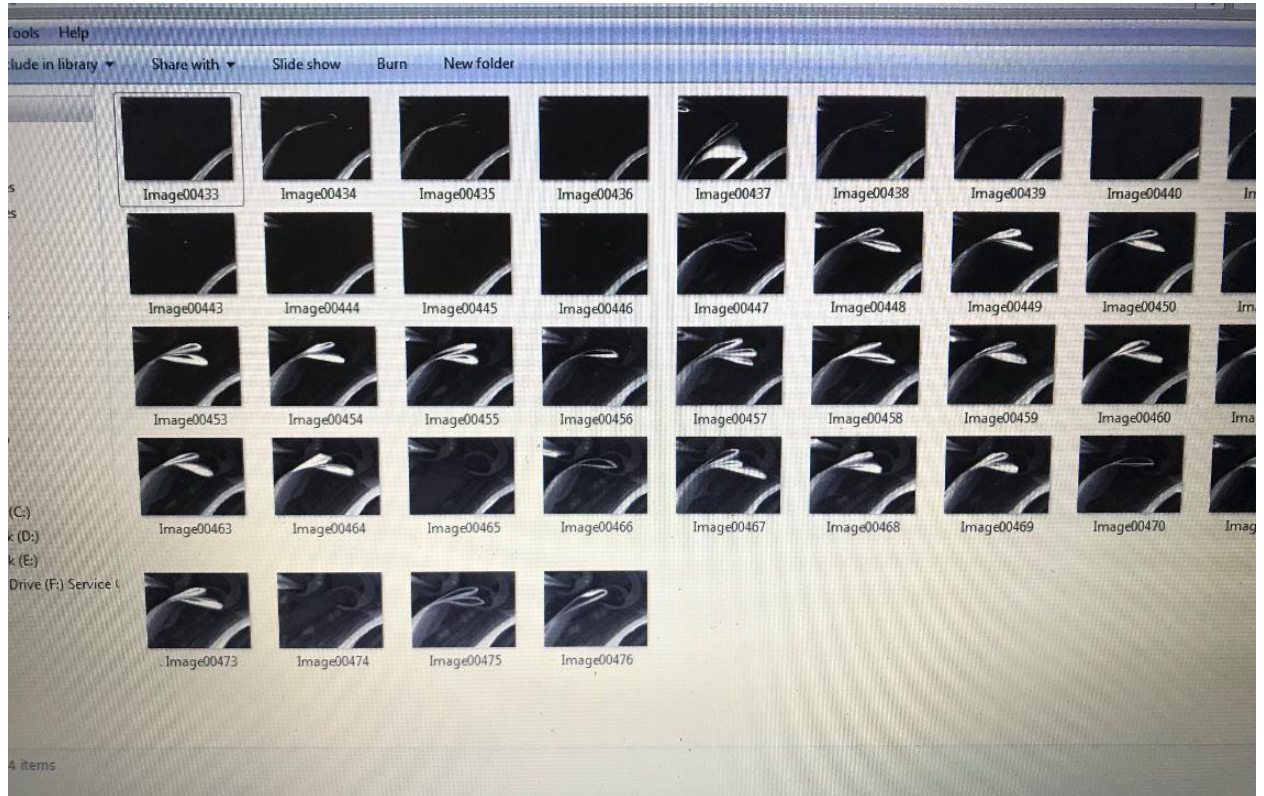
- To increase the accuracy of the pattern, it was tested above console i.e before check copy region using brightness tool.



- Readings are tabulated for testing in check copy position (above console).

Date	5/10/2018	
Edition name	MP + PP	
Page level	16+6	
Line	3U	
Analysis		
Total number of grippers observed	20000	
Grippers with paper	18995	
Grippers without paper	105	
Camera observation		
Total monitored grippers	20000	
Passed grippers	19832	
Failed grippers	178	
Accuracy rate	19832/20000	99.16%
Failure rate	178/20000	0.89%
Failed grippers observation		
No paper grippers	105	
Single copy grippers	13	
Three copy grippers	8	
Two copy grippers (False output - loose copies)	52	
Total failure	178	
False output Loose copy percentage	52/18995	0.27%

- **Sample images captured – At check copy position**



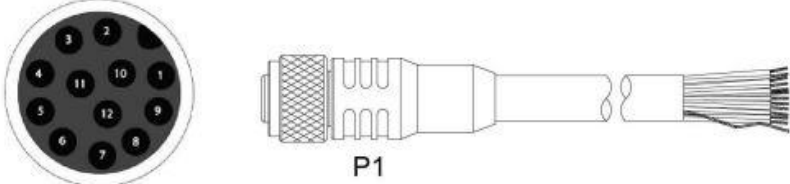
- **Future modifications**
 - Final installation have to be carried out with the help of cognex team
 - Camera automatic ON/OFF to be done based on speed.

APPENDIX – I/O CABLE specifications

Specifications

Breakout Cable Specifications

The Breakout cable provides connections to an external power supply, the acquisition trigger input, a general-purpose input, high-speed outputs, and RS-232 serial communications.

		
Pin#	Signal Name	Wire Color
1	HS OUT 2	Yellow
2	RS-232 Tx	White/Yellow
3	RS-232 Rx	Brown
4	HS OUT 3	White/Brown
5	IN 0	Violet
6	INPUT COMMON	White/Violet
7	+24VDC	Red
8	GND	Black
9	OUTPUT COMMON	Green
10	TRIGGER	Orange
11	HS OUT 0	Blue
12	HS OUT 1	Grey

Note:

- For RS-232, use the Power Supply return path for ground.



- Cables are sold separately.
- Unused wires can be clipped short or tied back using a tie made of non-conductive material. Keep all bare wires separated from the +24VDC wire.

