LENS GLUE DISPENSE/ATTACH IMPROVEMENT THROUGH FLUID PRESSURE OPTIMIZATION TO COMPENSATE HIGHER VISCOSITY AND TO MEET REQUIRED PRODUCTION OUTPUT

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ABSTRACT

This paper discussed the approach used to resolve the capacity issue during the production of Atlantis package. Bottleneck happens at Lens Glue dispense wherein the current fluid pressure is at optimum setting already while speed cannot utilize to increase more output, speed parameter range is 1.4mm/s~3.8mm/s, and average speed used at the line is at 2.3mm/s. During the development, glue viscosity plays a big role in setting this parameter, however, MP stage, glue viscosity increased at a higher with a range of 19kcps~23kcps compared to 17kcps during development.

Using DMAIC methodology, engineering evaluations through design of experiment (DOEs) including statistical and reliability test were performed to assess the whole project. Using these methodologies, the team was able to down select the best machine parameter to be used for the involved process.

With this breakthrough improvement, an evident increase in the daily production output was realized just by increasing fluid pressure, moreover, surpassing the required daily production output as well as improvement on yield.

1. 0 INTRODUCTION

Lens Glue Dispense station is the process of dispensing glue on the cap using Asymtek twin machines. There are several parameters to consider running the machine thus affecting the outcome especially in terms of production output.

During the startup of the operation, a problem with production occurred wherein production output was not met. It was observed that the speed of the machine setting parameter was not optimized to produce more output. It was realized that our fluid pressure setting is already in the maximum setup, and speed cannot set on a higher side. It was observed also that our glue viscosity is also on a higher side (19kcps~23kcps).

The main objective of this project is to come up with a new parameter setting that will benefit production. Considering this scenario, speed cannot maximize due to fluid pressure is already at maximum level, with high viscosity we are receiving from supplier. This time, we will focus on Fluid pressure since we are lock on this parameter.

Material preparation and assembly are part of the project scope. All glue batches must be recorded together with viscosity measurement coming from supplier. The selected machine will be identified and will proceed with the evaluation. This will be closely monitored and will provide samples for the reliability test so as to give us more confidence in the changes we are proposing.

2. 0 REVIEW OF RELATED WORK

The relation between viscosity and pressure is known as the pressure-viscosity coefficient. This coefficient describes how the viscosity of a fluid changes as the pressure changes.

In general, as pressure increases, the viscosity of a fluid increases as well. This is due to the fact that increased pressure can cause molecules in the fluid to come closer together, resulting in stronger intermolecular forces and increased resistance to flow.

The pressure-viscosity coefficient is an important factor to consider in applications where pressure changes are significant, such as in hydraulic systems, lubrication systems, and high-pressure processes. It can affect the performance and durability of the system or equipment, as well as the accuracy of viscosity measurements.

It's worth noting that the pressure-viscosity coefficient can vary depending on the type of fluid and the temperature, so it's important to consult the manufacturer's specifications or conduct experiments to determine the appropriate viscosity for a particular application.

3.0 METHODOLOGY

3.1 Identification of Problem

To fully understand the encountered output delta at Lens dispense due to low setting of Dispense speed at maximum fluid pressure (POR: 18-31psi) to compensate high glue viscosity.

3.2 Validation of factors:

Validation of factors focus on the pressure increase evaluation matrix in Fig 1.

Output		Specs/ Target	POR / Baseline	High Dispense Pressure
		16.7 kd	<16.7 kd	>16.7 - 21 kd
Mc Assist (Dispense Quality: Inconsistent, Missing, Clogged Nozzle)			11.1%	5.1%
Yield	ASTI	99.60%	99.56%	99.80%
	Test	99.40%	99.73%	99.77%
FR	Missing Lens FR	0.32%	7486 / 1111953 0.65%	10169 / 2110089 0.48%
	Rotated Lens FR		1272 / 1111953 0.11%	1135 / 2110089 0.05%
IPQC	Glue Height ST Dev		0.013	0.004
	Glue Weight ST Dev		0.021	0.012
Push Test	Time Zero (T0)	RX = min 1.3kgf TX = min 0.3kgf	RX = 1.89kgf TX = 1.38kgf	RX = 1.94kgf TX = 1.32kgf
	Post Rel		HS8585 RX = 1.87kgf TX = 1.42kgf	HS8585 RX = 1.82kgf TX = 1.54kgf
			REL TCB RX = 1.91kgf TX =1.54kgf	REL TCB RX = 1.62kgf TX =1.16kgf
			WF Shock RX = 1.73kgf TX =1.22kgf	WF Shock RX = 1.63kgf TX =1.25kgf
UPH	Low Speed (2.2)	897 (2.3) (1.8-3.8)	807	
	High Speed (2.6)			967

Fig.1. Evaluation Matrix

4.0 RESULTS AND DISCUSSION

After selecting the best parameter with regards to the current glue viscosity we are receiving, a positive result was obtained.

A comparable output response in terms of glue width and height between our POR in Fig 2.

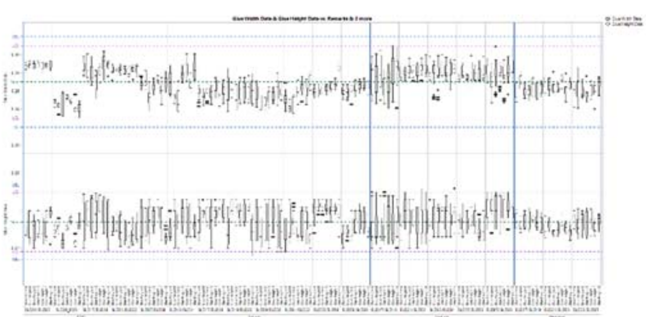

Fig.2. IPQC monitoring for Glue Width and Height

An increase on machine daily output was observed, and it surpassed also the daily production output plan in Fig 3.

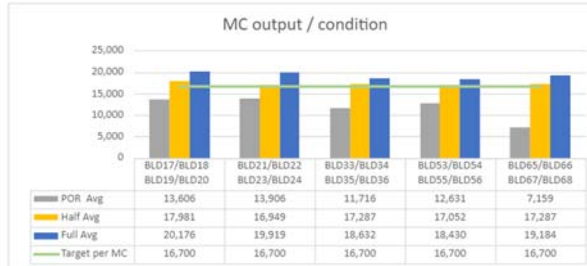

Fig.3. Machine output after implementation of project

Moreover, Lens attached yield also improved and defect rate related to glue application decreased in Fig 4.

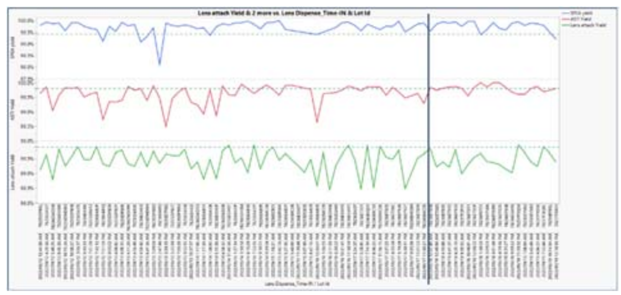

Fig.4. Yield monitoring after project implementation.

For Push test criteria, there was no significant difference on the push test data between lots processed with optimize fluid pressure vs. our POR setting. Data are all within specification in Fig 5.

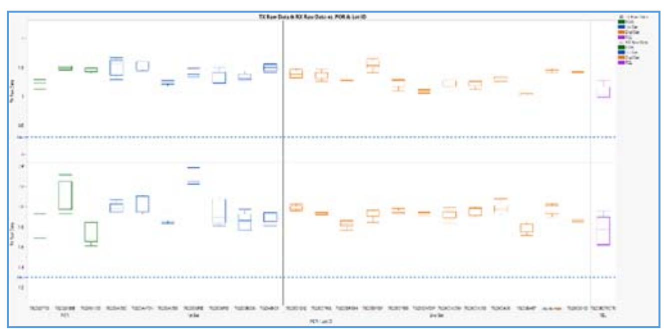

Fig.5. Lens Push Test comparison with optimize vs. POR setting.

In summary, favorable results are reflected on Fig 6.

Output		Specs/ Target 16.7 kd	POR / Baseline <16.7 kd	High Dispense Pressure >16.7 - 21 kd	Remarks
Mc Assist (Dispense Quality: Inconsistent, Missing, Clogged Nozzle)			11.1%	5.1%	Improved machine assist
Yield	ASTI	99.60%	99.56%	99.80%	Improved ASTI Yield
	Test	99.40%	99.73%	99.77%	Improved Test Yield
FR	Missing Lens FR	0.32%	7486 / 1111953 0.65%	10169 / 2110089 0.48%	Improved FR
	Rotated Lens FR		1272 / 1111953 0.11%	1135 / 2110089 0.05%	
IPQC	Glue Height ST Dev		0.013	0.004	Reduced variation
	Glue Weight ST Dev		0.021	0.012	
Push Test	Time Zero (T0)	RX = min 1.3kgf TX = min 0.3kgf	RX = 1.89kgf TX = 1.38kgf	RX = 1.94kgf TX = 1.32kgf	Comparable result
	Post Rel		HS8585 RX = 1.87kgf TX = 1.42kgf	HS8585 RX = 1.82kgf TX = 1.54kgf	Comparable result
			REL TCB RX = 1.91kgf TX =1.54kgf	REL TCB RX = 1.62kgf TX =1.16kgf	Comparable result
			WF Shock RX = 1.73kgf TX =1.22kgf	WF Shock RX = 1.63kgf TX =1.25kgf	Comparable result
UPH	Low Speed (2.2)	897 (2.3) (1.8-3.8)	807		Improved UPH
	High Speed (2.6)			967	

Fig.6 Overall results and summary.

In addition, reliability and lens push test results will be available in the appendix section.

5.0 CONCLUSION

A solution to low production output was addressed in this project. Using the DOEs methodology and supported with statistical and reliability reports, the optimization on Fluid pressure with utilization of speed parameter to optimum setting greatly improves the machine capacity surpassing the required daily production plan. This project has also positive effect in terms of our yield, thus decreasing our failure rate related to glue dispense.

6.0 RECOMMENDATIONS

The implementation of Fluid pressure optimization was highly recommended to fully utilized the speed parameter. A fluid pressure range was set to have a better option in time when viscosity shift to lower cps, recommended parameter will be 18psi~51psi Moreover, output response on glue should also be considered in setting parameters such as glue width and length as well as lens push test.

7.0 ACKNOWLEDGMENT

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8.0 REFERENCES

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9.0 ABOUT THE AUTHORS

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10.0 APPENDIX

Appendix A
Reliability Results

Evaluation Results & Reliability results

Stress	Config1-D5
	78233B3T0C
Preconditioning, T1 Hotplate 193.2°CCompression → 2 KgF	0F/260
OpHS 6590, T168 65°C, 90% RH	0F/14
Non-Op Heat Soak, T168 65° C/90%RH	0F/49
Non-Op Heat Soak, T168 85° C/85%RH	7F/28
Non-Operational Thermal Cycle B, 125 cyc -40C / 85C	0F/27
Temp Humidity Cycling, 6 cyc -20C / 65C - 90%RH	0F/22
Damp Heat Cycling, 8 cyc 30~65° C/93%RH	0F/28
Waterfall Shock, 15 kG Shock level: 15kG; Pulse width: 0.14ms; Orientation: ±X, ±Y, ±Z, 18x + 25kG, ±Z only, 6x	0F/18
Random Vibration Vibration profile: 3G RMS; Orientation: X, Y, Z; Duration: 400 min/axis repeated	0F/18
HS6590 + Shock 168h , 15kG waterfall	0F/12
TCB + Shock 100cyc, 15kg waterfall	0F/12

Non-Op Heat Soak, T168
85° C/85%RH

OTPW::MOD_PO_20MW_I_OP
FWP235317F624Y916 – Snowflakes, FR3
FWP235317PG24Y916 – Snowflakes, FR3

CTSE::MOD_CLAMP_IDDT_130MA – celestis related
FWP234713TW24Y955

OPSH::MOD_SCL_GND_V – celestis related
FWP23531E6824Y91Q
FWP23531G6S24Y914
FWP23531DWV24Y910

OPSH::MOD_SDA_GND_V – celestis related
FWP23531DE424Y915

Note: Failing units not related on fluid pressure that is being evaluated.

Appendix B
Lens push Test Results

POR Break mode

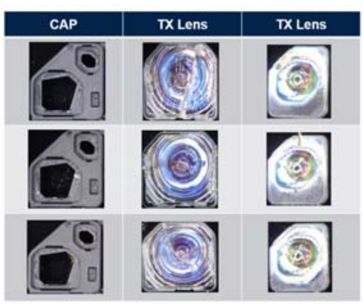
Sample	TCB125 cycle	
	RX Push Test	TX Push Test
1	1479.5	1037.1
2	1742	1014.8
3	1690.6	1503.3
4	1504.9	1092.2
5	1484	1324.2
6	1815.9	1080.2
7	1387.7	1125.2
8	1629.6	1051.4
9	1336.9	1207.4
10	1411.7	1257.5
Min	**1336.9**	**1014.8**
Max	**1815.9**	**1503.3**
Average	**1548.28**	**1169.33**

Push Test

POR Break mode

Sample	HS6590	
	RX Push Test	TX Push Test
1	1974.5	1355.7
2	1724.8	991.43
3	1847.4	1060.5
4	1955.7	1089
5	1380.3	1150.1
6	1576.4	1296.2
7	1610.2	1119.7
8	1798.1	1192.8
9	1997.2	1578.9
10	1342.7	983.35
Min	**1342.7**	**983.35**
Max	**1997.2**	**1578.9**
Average	**1720.73**	**1181.768**

Push Test



POR Break mode

Sample	HS8585	
	RX Push Test	TX Push Test
1	1912	1620.1
2	1927.8	2137.5
3	1891.1	1702.5
4	1779.2	1520.2
5	1819.3	1688.9
6	1842.9	1879.6
7	1628.5	914.98
8	1722.9	1613.9
9	2008.9	1181.1
10	1634	1091.6
Min	**1628.5**	**914.98**
Max	**1816.66**	**1535.038**
Average	**2008.9**	**2137.5**

Push Test