NGA GLASS CONFERENCE™
ISLE OF PALMS | CHARLESTON

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NGA
NATIONAL GLASS ASSOCIATION with GANA

New Technology:

Digitizing, Measuring, and Ensuring Quality

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Digitizing, Measuring, and Ensuring Quality

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CulletScanner

Digitizing Daily Break Tests

Gage R&R Study

CulletScanner

Automatic fragmentation
image analysis

○   automatic break pattern analysis

○   the only one, which checks the entire part

○   finds best and worst areas automatically

○   prevents operator errors

○   3 sizes available

○   several norms available

○   certificates and digital images

Gage R&R Study

Based on results from fragmentation analysis tests carried out by a customer in 2017, Softsolution decided to test the CulletScanner to find out whether it meets requirements common for measuring devices
The following evaluation was done:

Planned steps:
1) Providing samples for measuring (Customer X)
2) Measuring of samples (Softsolution)
3) Data processing (Customer X)
      a) Gauge capability study (50 measurings)
      b) Capability study of other parameters (size and weight of cullet)
      c) Gauge R&R study (10 parts, 3 runs, 3 operators)
4) Presenting of report (Customer X)

Analysis 1

Gauge capability study

- Measured 1 part 50 times
- Compared to tolerance range of BS 3193
- Main parameter number of fragments (CC)

Results

- Excellent capability
- Potential ppm (parts per million < lower specification limit) = 0
- Results not influenced by device

Process Capability Report for Number of cullets

Process Data	
LSL	60
Target	*
USL	200
Sample Mean	149,2
Sample N	50
StDev(Overall)	1,42857
StDev(Within)	0,85034

LSL   USL
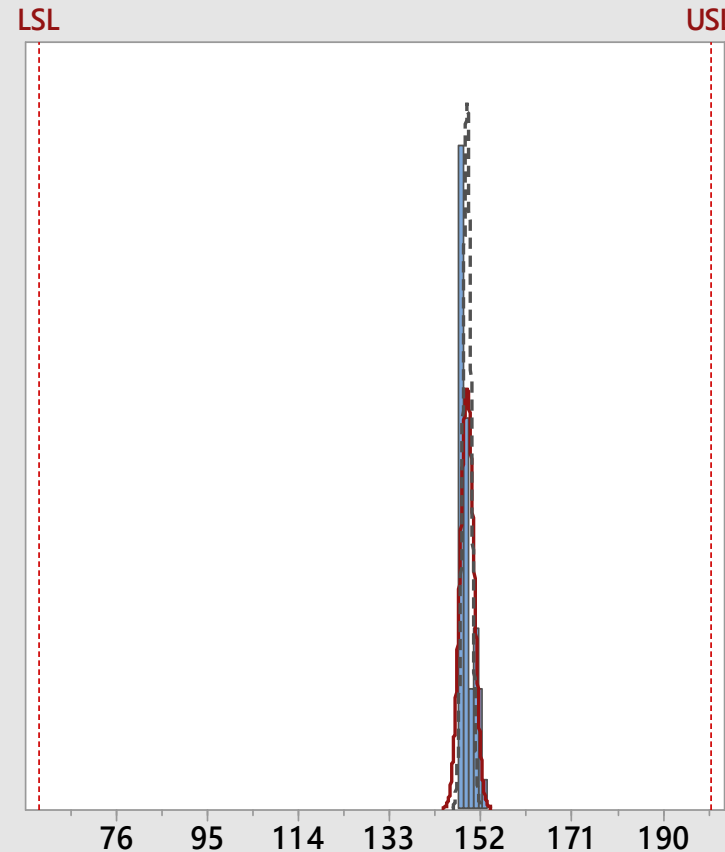
— Overall
--- Within

Overall Capability	
Pp	16,33
PPL	20,81
PPU	11,85
Ppk	11,85
Cpm	*

Potential (Within) Capability	
Cp	27,44
CPL	34,97
CPU	19,91
Cpk	19,91

76   95   114   133   152   171   190

| Performance	Observed	Expected Overall	Expected Within
PPM < LSL	0,00	0,00	0,00
PPM > USL	0,00	0,00	0,00
PPM Total	0,00	0,00	0,00

Analysis 2

- **Measuring System Analysis**

  - Measured 10 parts, each 3 times by 3 operators

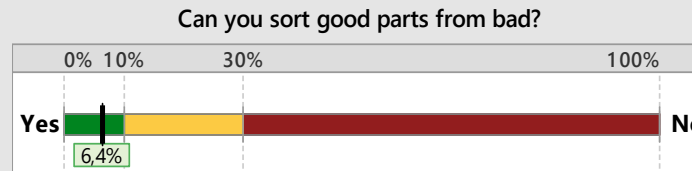 - Results compared to tolerance range

- **Results**

  - Total R&R Excellent capability 13,1%

  - Measurement system variation 6,4%
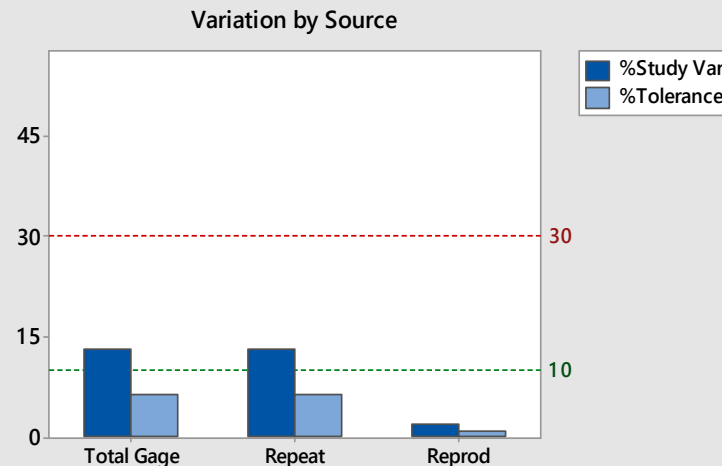
  - Measuring device is acceptable

Gage R&R Study for C7
Summary Report

Can you adequately assess process performance?

0% 10%   30%   100%

Yes | | No

13,1%
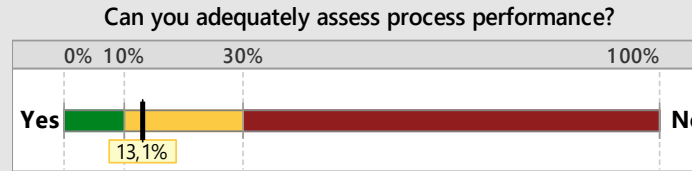
The measurement system variation equals 13,1% of the process variation. The process variation is estimated from the parts in the study.

Can you sort good parts from bad?

0% 10%   30%   100%

Yes | | No

6,4%

The measurement system variation equals 6,4% of the tolerance.

Variation by Source

| | %Study Var | %Tolerance |

Legend: %Study Var, %Tolerance

Y-axis: 45, 30, 15, 0
Reference lines: 30, 10
X-axis: Total Gage, Repeat, Reprod

Study Information

Number of parts in study	10
Number of operators in study	3
Number of replicates	3

(Replicates: Number of times each operator measured each part)

Comments

General rules used to determine the capability of the system:
  <10%: acceptable
 10% - 30%: marginal
  >30%: unacceptable

Examine the bar chart showing the sources of variation. If the total gage variation is unacceptable, look at repeatability and reproducibility to guide improvements:
• Test-Retest component (Repeatability): The variation that occurs when the same person measures the same item multiple times. This equals 99,0% of the measurement variation and is 13,0% of the total variation in the process.
• Operator component (Reproducibility): The variation that occurs when different people measure the same item. This equals 14,3% of the measurement variation and is 1,9% of the total variation in the process.
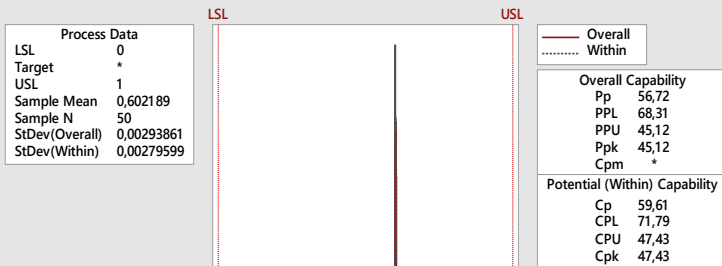
Analysis 3

- **Analysis of additional features**
  - Vizualization of measuring stability
  - Capability analysis of other parameters (Cullet Weight & Cullet Size)

- **Results**
  - Device is stable and capable also in other measured parameters
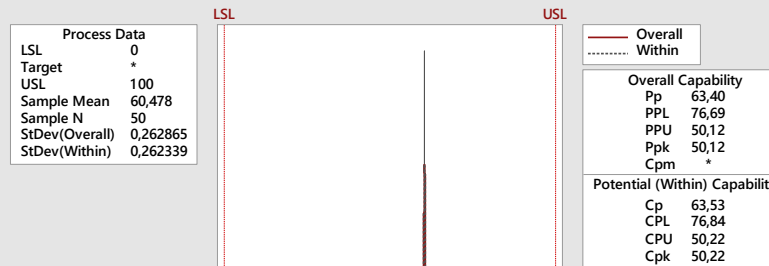

Type 1 Gage Study for C1

Gage name:
Date of study:

Reported by:
USL: 200
Misc:

Run Chart of C1
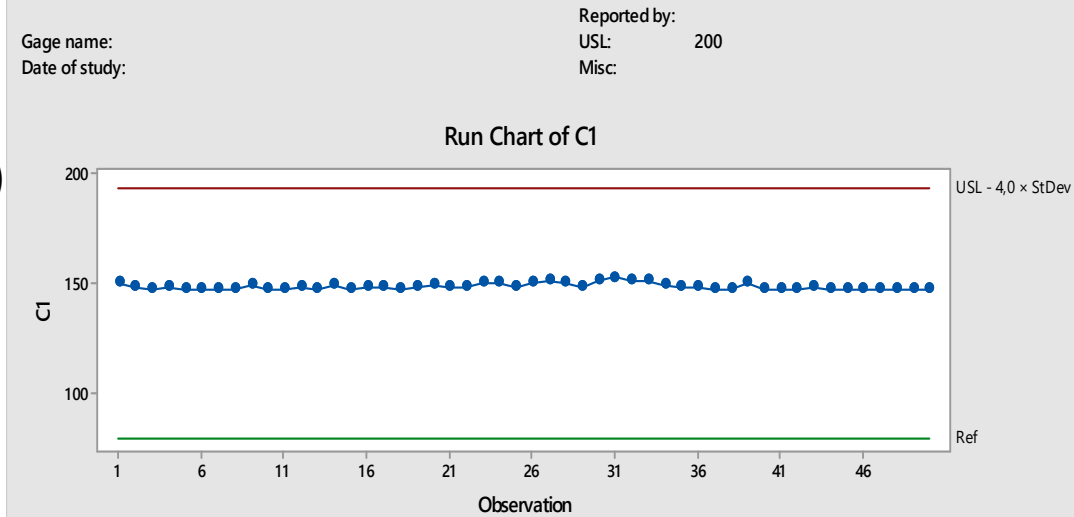
Basic Statistics			Bias	
Reference	80		Bias	69,20
Mean	149,20		T	342,523
StDev	1,429		PValue	0,000
6 × StDev (SV)	8,571		(Test Bias = 0)	
USL	200			

Process Capability Report for Cullet weight

Process Data
LSL	0
Target	*
USL	1
Sample Mean	0,602189
Sample N	50
StDev(Overall)	0,00293861
StDev(Within)	0,00279599

Overall Capability
Pp	56,72
PPL	68,31
PPU	45,12
Ppk	45,12
Cpm	*

Potential (Within) Capability
Cp	59,61
CPL	71,79
CPU	47,43
Cpk	47,43

Performance
	Observed	Expected Overall	Expected Within
PPM < LSL	0,00	0,00	0,00
PPM > USL	0,00	0,00	0,00
PPM Total	0,00	0,00	0,00

Process Capability Report for Cullet size

Process Data
LSL	0
Target	*
USL	100
Sample Mean	60,478
Sample N	50
StDev(Overall)	0,262865
StDev(Within)	0,262339

Overall Capability
Pp	63,40
PPL	76,69
PPU	50,12
Ppk	50,12
Cpm	*

Potential (Within) Capability
Cp	63,53
CPL	76,84
CPU	50,22
Cpk	50,22

Performance
	Observed	Expected Overall	Expected Within
PPM < LSL	0,00	0,00	0,00
PPM > USL	0,00	0,00	0,00
PPM Total	0,00	0,00	0,00

Conclusion

Advantages

- Gauge capability acceptable within common standards (e.g. VDA)

- Very good features for assessment of OK / NOK parts

- No influence of human factor on measuring

- Feedback to tempering process

Note

- Higher repeatability value 13,01% (target <10%) can be caused by various fragmentation behavior despite one batch is used for testing. Overal capability gives potential to reach target value.

BowScanner

NEW Inline Bow Measurement System:

First of its kind

BowScanner

Overall Bow measurement inline

- measures overall bow inline for each glass

- provides measurements of all 4 edges and both diagonals

- 60 measurements per second

- sensor accuracy +/- 0.01mm or 0.01° (at standstill)

- can be integrated into a vertical LineScanner

- real measurement, reliable and fast

BowScanner
can be integrated or standalone

BowScanner HMI
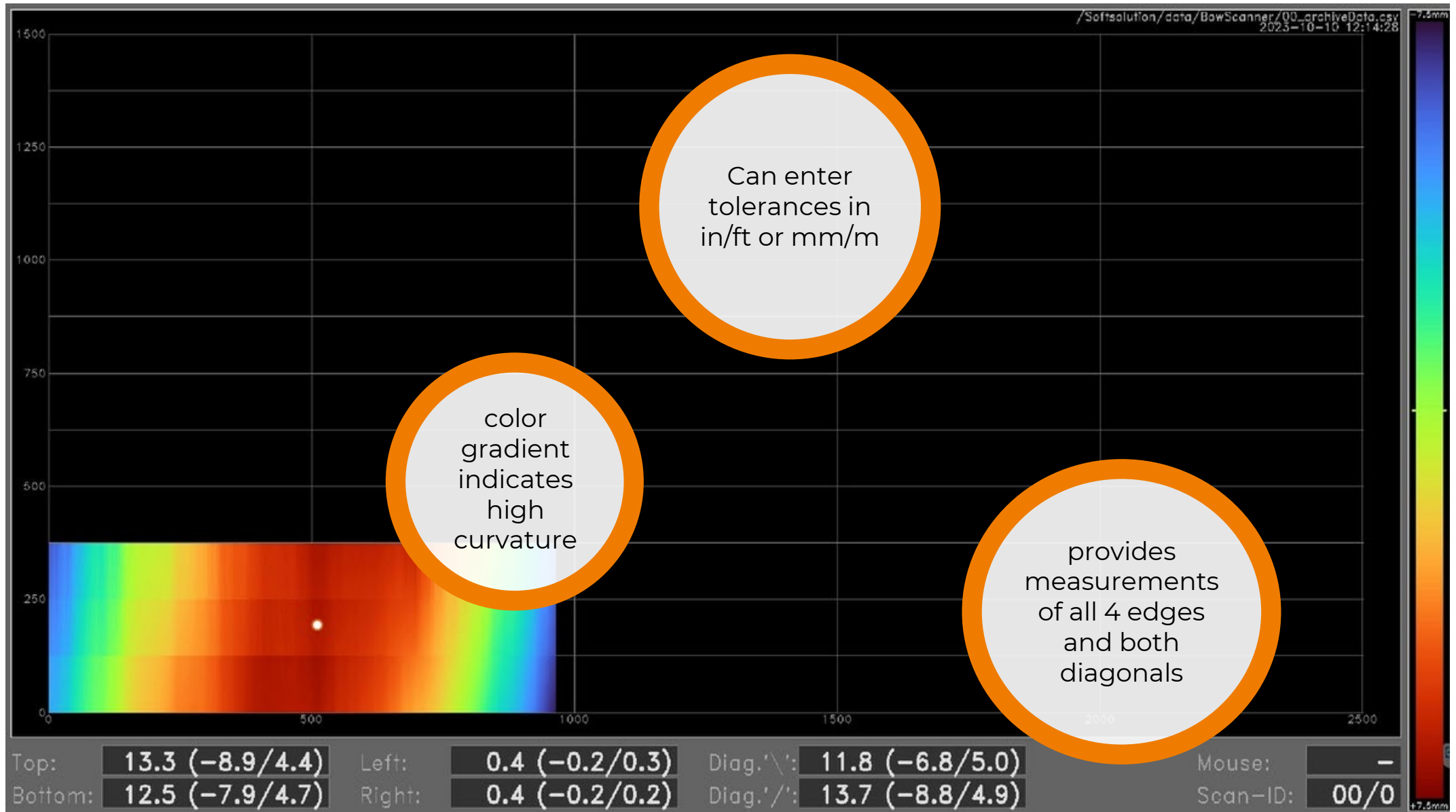
BowScanner
real production reports

TS4000 Thickness & Coating Sensor

Ensuring Quality and Granulating Data

Description /Type	TS3000	TS4000	TS4000HT	TS5000
coated or not coated (but will not discern coating type)	✓	✓	✓	✓
Thickness measurement range: 0 – 0.19.0 mm for single pane	✓	✓	✓	✓
Discern coating type & tinted glass (incl. electrochromic, pyrolytic coatings and more) on front and most back sides (depending on product transmission percentage)	✗	✓	✓	✓
with heatsink to operate in furnace rooms with higher ambient temperatures	✗	✗	✓	✗
Provide air gap for double and triple pane IG Units	✗	✗	✗	✓
identify coated surface (without discerning it) on double and triple IGU	✗	✗	✗	✓

THANK YOU!

Questions?