ABMI
Association of the Beverage Machinery Industry

Method sheet: Blow Moulder
Sheet no.: 050901 – 1.02
Date: June 2008

Machine: **Blow Moulder**
Criteria: **Base section weight**

Contents:

Base section weight for Blow Moulder

1. Definition: Machine and Criteria

An important parameter of a Blow Moulder is the accuracy and consistency of the bottle section weight, specifically the base section weight throughout the different cavities in the Blow Moulder as well as over time.

Further related documents:
free

2. Inspection

2.1 Scope

Measurement of the actual base section weight.
Measurement of the station to station deviation of the base section weight.
Measurement of the averaged base section weights over all Blow Moulder stations over time.

2.2 Apparatus

Test equipment and tools

Test equipment	Instrument	Indicating accuracy
Digital scales	e.g. Mettler PJ7000	+/- 0.1g
Cutting device	Hot Wire PET Bottle Cutter	-
	Cutter	

2.3 Procedure

- The cut heights or section for the bottle base are marked on the height gauge with a water-proof pen, whereby the position of the section depends on the customer specification.
- In the base area the cut height depends on the base split level but if it does not exist, the height is defined without it.
- The cut heights are recorded.
- The setting of the cutting device and the cutting procedure itself are performed with that bottle. Then all the other bottles can be divided with that setting.
- The scales are tared and the weights of the individual sections are recorded.

3. Sampling

Reference process validation:

To check if the Blow Moulder is running at the right process, samples need to be taken from each station, proving the machine capability throughout all stations to meet the specified target weight for the base.

Samples have to be taken at nominal machine capacity, after stabilization of processing.
The suggested start of sampling is after a minimum of 15 minutes.
Take five complete rounds, i.e. 5 bottles of each station.

3.1 Calculation for reference process

Calculate the average of the results following the formula:

$$\overline{x} = \frac{1}{n} \cdot \sum_{i=1}^{n} x_i$$

Calculate the resulting standard deviation following the formula:

$$\sigma = \sqrt{\frac{1}{n-1} \cdot \sum_{i=1}^{n} (x_i - \overline{x})^2}$$

With this both results you can calculate the process capability (c_p):

$$c_p = \frac{(LSG\text{-}USL)}{6 \cdot \sigma}$$

with:
USL = Upper Specification Limit
LSL = Lower Specification Limit

3.2 Results and data sheets

3.2.1 Data sheet for reference process validation

number of station	weight [g]	weight [g]	weight [g]	weight [g]	weight [g]	Average
	sample 1	sample 2	sample 3	sample 4	sample 5	$\bar{x}$
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						
26						
27						
28						
29						
30						
31						
32						
33						
34						

number of station	weight [g]	weight [g]	weight [g]	weight [g]	weight [g]	Average
	sample 1	sample 2	sample 3	sample 4	sample 5	$\bar{x}$
35						
36						
37						
38						
39						
40						

Process consistency validation

To check if the Blow Moulder is running consistent over time, samples need to be taken from each station, proving the average base weight is meeting the required specification.
Samples have to be taken at nominal machine capacity, after stabilization of processing.
The suggested start of sampling is after a minimum of 5 minutes.
Take 1 full round every hour.

3.3 Calculation for process consistency

Calculate the average of the results following the formula:

$$\bar{x} = \frac{1}{n} \cdot \sum_{i=1}^{n} x_i$$

With n = number of stations

3.4 Results and data Sheets

3.4.1 Data sheet for process consistency part (I/III)

Date: ________________ Site: ________________ Bottle shape: ________________

3.4.2 Data sheet for process consistency part (II/III)

number of station	weight [g]	weight [g]	weight [g]	weight [g]	weight [g]	weight [g]	weight [g]	weight [g]
	sample hour 1	sample hour 2	sample hour 3	sample hour 4	sample hour 5	sample hour 6	sample hour 7	sample hour 8
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
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31								
32								
33								
34								
35								

3.4.3 Data sheet for process consistency part (III/III)

number of station	weight [g]	weight [g]	weight [g]	weight [g]	weight [g]	weight [g]	weight [g]	weight [g]
	sample hour 1	sample hour 2	sample hour 3	sample hour 4	sample hour 5	sample hour 6	sample hour 7	sample hour 8
36								
37								
38								
39								
40								
Average	$\bar{x}$ 1	$\bar{x}$ 2	$\bar{x}$ 3	$\bar{x}$ 4	$\bar{x}$ 5	$\bar{x}$ 6	$\bar{x}$ 7	$\bar{x}$ 8

4. Evaluation and Documentation

4.1 Evaluation and documentation for reference process

$C_p \geq 1,33$ → base section weight is o.k. ☐

$C_p < 1,33$ → base section weight is not o.k. ☐

Name and signature of inspector: ______________________________

4.2 Evaluation and documentation for process consistency

Prepare a chart indicating USL, LSL, x̄, +3 σ and -3 σ

$$\bar{x} = \frac{1}{n} \cdot \sum_{i=1}^{n} x_i$$

Position x̄ in this chart.

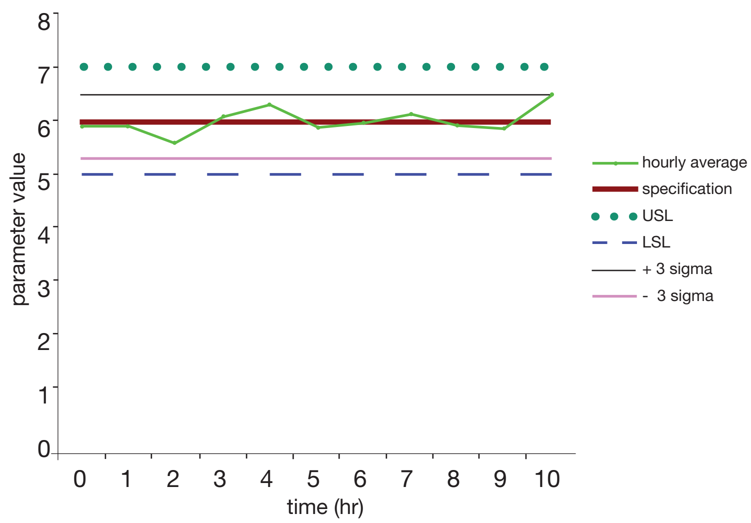

Fig. 01: Example

+3 σ ≥ x̄ ≥ -3 σ ⟶ base section weight is o.k.

USL ≥ x̄ ≥ LSL ∧(x̄ > +3 σ v x̄ < -3 σ) ⟶ base section weight is o.k.

Check for cause of drift in process!

x̄ > USL v x̄ < LSL ⟶ base section weight not is o.k.
Immediate correction is required!

Name and signature of inspector at points of drift and correction: ____________________