PREPACKED PRODUCTS – CONTROL CHARTS
Procedure of ℮-marked prepacked controls

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COLLÈGE FRANÇAIS DE METROLOGIE

Context

- Product a batch at the desired nominal quantity is a major challenge in the food industry. An under-dosage leads to non-compliance with the regulations (consumer code) and an over-dosage generates economic losses for the company.
- The European regulations impose authorized shortages on the lot. The manufacturer checks the production batch using criteria on the average of the batch and the level of defective product in the batch (product for which the lack is greater than that authorized by the regulations).

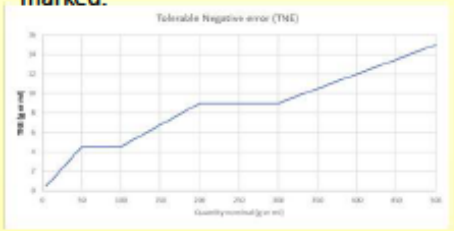
1- DEFINITION OF PREPACKED PRODUCTS & TOLERANCES

Prepacked products corresponds to all prepackages of the same nominal quantity, the same model, the same manufacture, filled in the same place and subject to the control.

℮-marked prepacked products is a "passport" to travel within the European Union and guarantees the control of prepackaged.

The Directives control products describe "Tolerable Negative Error" (TNE).

- average quantity of product of the prepackages shall not be less than the nominal quantity
- only a small number of prepackages may have a quantity of product below the nominal quantity minus the tolerable negative error (TU1-limit)
- no prepackage with a quantity of product less than the nominal quantity minus twice the tolerable negative error (TU2-limit) may be ℮-marked.



Nominal quantity, Qn (g or ml)	Tolerable Negative Error (TNE) (g or ml)
5	0,45
50	4,5
100	4,5
200	9
300	9
500	15

Fig. 1. Tolerable Negative Error (TNE) and quantity nominal

2- PROCEDURE OF ℮-MARKED PREPACKED CONTROLS

The procedure of ℮-marked prepacked controls consists to:
1/ Describe control equipment and traceability. All instruments have to be legal and suitable (Balance, ...).
2/ Definition of measurement and sampling
3/ Detection of tare's variability
4/ Calculation of process capability
5/ Using control charts

3- METHOD FOR DATA ANALYSIS

The Directives control products recommend control chart to survey the process. The objective is to follow the drift of the mean and the variability of the manufacturing process (standard deviation)

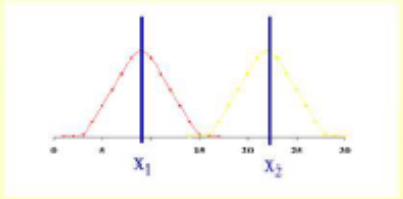


Fig. 2. Drift of the mean

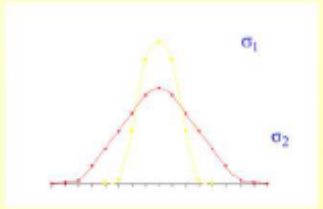


Fig. 3. Drift of the Standard deviation

Two control chart are recommended to follow mean and standard deviation.

4- PREPACKED CONTROLS RESULTS

After a preliminary period, the producer constructed a control chart using the recommendation of NF X 06-031. He built a control chart of the Mean and standard deviation.

The operator records on the control chart (fig.4) the mean and standard deviation (fig.5) of 5 samples taken from the chain.

Fig. 4. Mean Control Chart

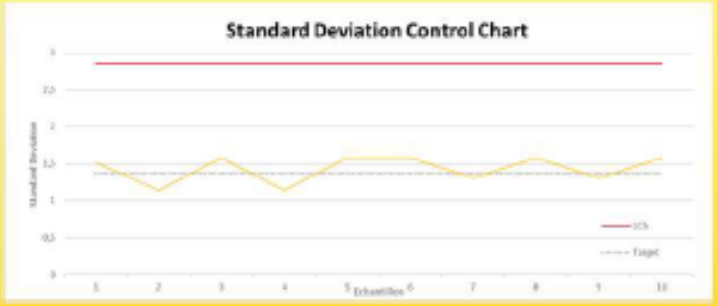


Fig. 5. Standard Deviation Control Chart

5 - DECLARATION OF BATCH'S COMPLIANCE

- The results of the samples taken make it possible to ensure that the means and standard deviations do not drift.
- The batch is declared compliant according to the following formula:

$$\bar{\bar{x}} \geq m_s + g.\bar{\bar{s}}$$

With $g = \frac{t_{(1-\alpha)}}{\sqrt{\sum n}}$

$\bar{\bar{x}}$: *cumulative average*
m_s : *centering threshold (nominal value for instance)*
$\bar{\bar{s}}$: *cumulative standard deviation*
$\sum n$: *cumulative total number*
$t_{(1-\alpha)}$: *factor at the 90% threshold*

6 - OPTIMIZING PRODUCTION CONTROLS

→ Improve the sampling plan using the operational period method specified in NF X 06-031
→ Improve the manufacturing process by reducing the standard deviation of the process
→ Improve and monitor the capability of the process

Conclusion

The results of manufacturing checks may call into question the issue of a manufacturing batch. The resumption of batches (mixture of batches under-doses and overdosed, ...) is then implemented by manufacturers.