

FOOD TECHNICAL SERVICES

TECHNICAL SUPPORT AND TRAINING FOR THE FOOD INDUSTRY

Average weight system

A surprising number of small to medium scale food businesses selling retail packs of high value product such as cured/smoked meat/fish, cheeses and confectionary are missing out on a potentially easy and legitimate gain by failing to adopt the "Average weight system". As a result they're likely to be giving away product for nothing and possibly missing out on productivity gains. Average weight packing isn't new, many packers have been using the system since the 1980s. Food Technical Services can help to determine whether or not conversion would be beneficial, and if so assist in equipment selection set up/ training.

A) Pros and cons:

- Pro: a reduction of giveaway, for example if you sell packs labelled as 100g that are on average 103g and if you sell 5,000,000 packs year at £20 per kg then you are giving away 15 tonne or £300,000 per year).
- Pro: by broadening the acceptable pack wt range (eg from 100-106g out to 96-107g) - the packing- weighing line becomes more efficient (it's faster easier & less resource intensive to pack to wider bands).
- Pro: It can be introduced as a manual recording system or as a software controlled sampling (or 100% check weighing) and recording system.
- Con: It doesn't always provide the benefit – especially on low value product low volume lines.
- Con: It cannot be applied to catchweight/variable packs (ie that those using a weigh-scale-printer to produce a label displaying the exact weight for each individual pack).

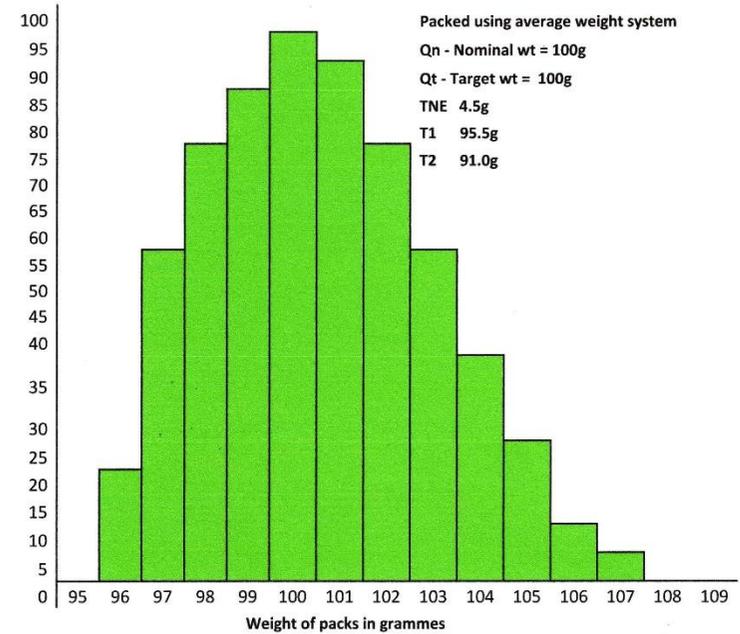
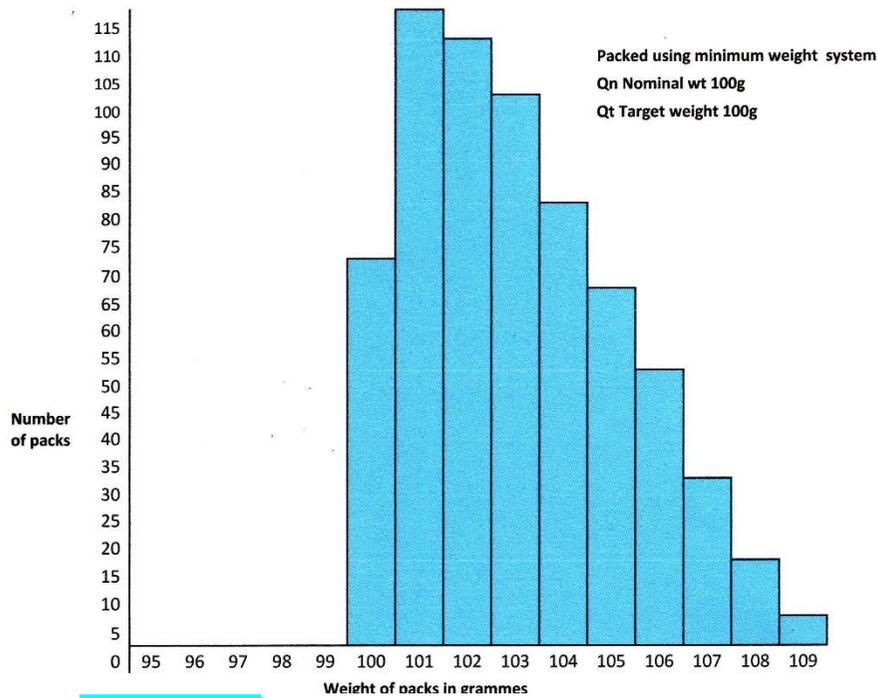
B) The basic rules (Using 100g nominal weight sealed packs to demonstrate):

- 1) The sampling regime must be deemed adequate – NMRO guidance States 50 per 10,000 packs (0.5%) eg 10 packs sampled per hour is more than enough for a factory packing 10,000 pack per 7hr shift.
- 2) The weighing equipment must be deemed adequate; the scale weight interval must be $\geq 0.2x$ the TNE (if the TNE figure is based on a % of the net wt it must be rounded up to the nearest 0.1g
(a 0.5g interval scale for a 100g nominal wt pack, and a 1g interval scale is adequate for a 110g nominal wt pack)
- 3) Packers rule 1 - The batch average (eg the days production) must be \geq nominal wt (Qn) Eg for 100g nominal wt (Qn) pack the average (x) must be \geq 100g
- 4) Packers rule 2 - There must be no packs below T2 which in the case of 100g packs is 91
- 5) Packers rule 3 - There must be no more than 2.5% (or 1/40 packs) between T2 and T1 (which in the case of 100g packs is between 91 g and 95.5g)
- 6) There must be adequate records to demonstrate that the batch (eg days production) meets the above rules.
- 7) Where there is a possibility of desiccation (weight loss) – eg packs allow air and moisture migration through the film (some types of cheese) – an allowance must be made to avoid sub T2 packs being sold.
- 8) On production lines that have large weight variance (ie large standard deviations) the target weight (Qt) must be adjusted to above the nominal weight (Qn). To check if this is necessary - assess which of the following three figures gives the highest weight – and apply that figure as the target wt (Qt): i) Qn ii) $Qn - TNE + (S)^2$ iii) $Qn - (TNE)^2 + (S)^3 \cdot 72$
- 9) It is also deemed good practice to measure and record packaging rate weights too.

This note is not a full interpretation of the legislation. For further detail/guidance - Refer to The National Measurement and Regulation Office who produce a useful guide.



C) Graphical expression for an example packing line that converted from the Minimum to the Average weight system:



Minimum Weight:

No of packs in produced in trials:	120,000
No of packs sampled in trials (N) (50 packs per 10,000)	638
Nominal Net weight (Qn)	100g
Tolerable negative error (TNE) for this wt of pack	4.5g
T1 & T2 as defined by regulations:	95.5g & 91.0g
Average Pack wt (x) in this trial (must be >=Qn)	103.1g
Std deviation (S) of the samples (measure of variance)	2.177g
Number lying below T2 (Illegal packs)	0
% lying between T2 and T1 (Max 2.5%permitted)	0%

Allowance made for weight loss from pack (Desiccation) Not required on this product

Average weight:

No of packs produced in trials:	120,000
No of packs sampled in trials (N) (50 packs per 10,000)	640
Nominal Net weight (Qn)	100g
Tolerable negative error (TNE) for this wt of pack	4.5g
T1 & T2 as defined by regulations:	95.5g & 91.0g
Average Pack wt (x) in this trial (must be >=Qn)	100.4g
Std deviation of the samples (S)(measure of variance)	2.460g
Number lying below T2 (Illegal packs)	0
% lying between T2 and T1 (Max 2.5%permitted)	0%

Allowance made for weight loss from pack (Desiccation) Not required on this product

The last step is to assess whether or not the target weight needs to be raised to account for production with large variability of weight (large standard deviations). As we can see in the above example, the Standard deviation has increased, thus we need to reassess the Target weight for production line by choosing the highest figure from these three:

- Qn	100g	- Qn	100g
- Qn-TNE+(S)2	100g	- Qn-TNE+(S)2	100g
- Qn-(TNE)2+(S)3.72	100g	- Qn-(TNE)2+(S)3.72	100g

Benefits: **Reduced giveaway** : on this product, average pack wt fell by 2.7g - which at 5,000,000 packs per year at a selling price of £20 per kg equates to £270,000pa in reclaimed "giveaway"
Increased productivity: by allowing a broader packing weight range for pack/weigh equipment (or manual packers) more packs can be packed per production shift.

D) Example of recent factory upgrades to Average weight:

1) Chocolate Packing line within a small luxury confectionary business:

Packing to minimum weight

- where each scale operator has to manually fill packs higher or equal to nominal weight of 150g.
- Selling 200,000 packs per year.
- Each pack on average is +4.4g over declared weight.
- Approximate selling price £40 per kg.
- Retail value of chocolate given away =£35200 pa

After converting to average weight system

- A manual paper recording system costing approx. £2000. -packers have a wider band and can pack quicker.
- Selling 200,000 packs per year
- Each pack on average is +0.4g over declared weight.
- Approximate selling price £40 per kg.
- Retail value of chocolate given away =£3200 pa

Savings made: On giveaway alone: £32,000 per year (1st year is £30,000 after installation cost). Labour costs and packing line capacity were also improved upon due to the wider band of acceptable weights.

2) Smoked salmon producer packing a range of nominal weights from 100g to 1000g per pack:

Packing to minimum weight – where each pack is weighed the nominal weight or higher filling manually and automatically.

- Selling 5,000,000 packs per year
- Each pack on average is + 3.1g on declared weight
- Approximate selling price to retailers £20 per kg (2020 price estimate)
- Value of smoked salmon given away =£310,000.

After converting to average weight system - With an Average weight system installed at a total cost of £50,000. Packers have a wider band and can pack quicker .

- Selling 5000,000 packs per year
- Each pack on average is now +0.4g on the declared weight
- Approximate selling price to retailer £20 per kg (2020 price estimate)
- Value of smoked salmon given away =£40,000

Savings made: On giveaway alone: £270,000 per year Labour costs and packing line capacity and speeds were also improved upon due to the wider band of acceptable weights.

E) For further detail:

For further detail contact Ian Meek on 01463 229593 or email ianmeek@foodtechnicalservices.com