

PART I

GENERAL

ON CONTROL OF DRAINED WEIGHTS IN
SOME FISHERY PRODUCTS *

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INTRODUCTION

Fishery products are gaining importance as earners of foreign exchange. Frozen and canned prawns are by far the most important of the exported fishery products. In the year 1969, the earnings of foreign exchange from these were 28.5 crores of rupees, constituting over four-fifths of the total from all the fishery products together. Their markets extend over the countries of U. S. A., U. K., Germany, Japan, Australia etc.

Compulsory pre-shipment inspection of fishery products was introduced in India in the year 1965, under the Export (Quality Control and Inspection) Act of 1963. The Fish Products (Inspection) Rules of 1965 cover the country's export trade of frozen and canned prawns. One of the specifications therein is the compliance of the product with its declared drained weight. Canned prawns are usually packed in 8 oz fluid cans with the declared drained weights of 128 g and 142 g respectively depending on whether it is a $4\frac{1}{2}$ oz or 5 oz pack. Frozen prawns are normally packed in blocks with a declared drained weight of 2.27 kg each. There are size-grade specifications for both the products. Three types of pack of fro-

zen prawns are exported viz; peeled and deveined, headless shell-on and cooked.

VARIATIONS IN DRAINED WEIGHTS

As the raw material used is of biological origin, the drained weights in the different packs are bound to undergo a high degree of variation at different stages of processing. It is effected by a number of variables, controllable and otherwise. To leave a safe margin over the declared drained weight, lest the product should be rejected or re-labelled to the actual short weight at the time of pre-shipment inspection, the processor adds an arbitrary, additional quantity of the material at the processing stage, which results in non-uniform drained weights, often on the higher side.

VARIABLES IN THE PROCESSING OF PRAWNS

The canning and freezing of prawns involve a few stages of processing, with varying degrees of influence on the drained weights of the product. Considering minor fluctuations in the weight as uncontrollable, it is necessary to keep the major causes under check so that the resultant drained weight of the pack is neither too high nor too low. The raw material for pro-

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cessing viz; prawns, is received at the processing factories from different centres along the coast which are scattered upto a distance of 160 km and more. The raw material is iced and despatched from these centres and thus the period of icing also varies. Seasonal changes and difference in species also are matters of importance concerning the raw material. For canning, the prawns are cooked in brine of known salt concentration for a fixed time, cooled, size-graded and weighed into the cans followed by hot brine. The cans are then exhausted, sealed and sterilized. For freezing, the prawns are size-graded, weighed into trays and kept in freezer after filling the trays with glaze water. Some of the above factors have been shown to influence the drained weight to varying extents. However, it is necessary to know which of them are operating on the line so as to evaluate and control them before the out of control situation is reached.

DETERMINATION OF DRAINED WEIGHTS ON THE LINE

One handicap in controlling the drained weights on the processing line is the destructive and time consuming procedures involved in their determination. In canned prawns, the can has to be cut open after sterilization which means a good deal of time after it is actually canned. A knowledge of out of control situation at this stage is not helpful because a major number, if not all, cans of that particular batch has already come out of the line. Besides, the opened cans are unusable and the material is to be discarded. This destructive process seriously limits the frequency of sampling. In frozen prawns, though the material can be reprocessed, the time involved in the determination of drained weight is considerable and expensive and thus limits the scope for tracing an out of control situation.

CORRELATED VARIABLE WITH THE DRAINED WEIGHT

In view of the above, it was necessary to find a variable correlated with the drained weights of these products which could be made use of in controlling them (the drained weights) with advantage. A recent study has shown that there is significant correlation between gross weights and drained weights in canned prawns (Rao *et al*, 1969). The relevant results reproduced in Table I give an indication of the extent of correlation between the different variables. A similar result has been found to exist in the frozen prawns (Rao, 1971). The data on correlation coefficients from this work are reproduced in Table II.

From the tables it can be seen that drained weights are significantly correlated with the gross weights in the case of both the products. The correlation between the gross weight and the factor which accounts for the difference between gross weights and the corresponding drained weights is considerably high. These correlations indicate that any significant change in the gross weights as revealed by out of control points on the control charts will have some relation with out of control situation in drained weights also. Thus control charts for gross weights can be relied upon to trace the sources of variation in drained weights. Since the process variables are more, some having effect and some having no effect on drained weights, the isolation of disturbing factors has to be done step by step. After tracing and rectifying the major source of variation, further application of the chart may reveal the other disturbing factors.

The main advantage in the application of control charts for gross weights is that it does not involve destructive sampling. Hence sampling can be done more liberally

TABLE I CORRELATION CO-EFFICIENTS IN THE CASE OF CANNED PRAWNS

Size-grade	Factors	Correlation Coefficient	df	Level of Significance
1. Small	XY	-0.413	178	0.1%
	YZ	0.332	"	"
	ZX	0.722	"	"
2. Small	XY	-0.475	188	"
	YZ	0.322	"	"
	ZX	0.680	"	"
3. Medium	XY	-0.500	38	1%
	YZ	0.459	"	"
	ZX	0.540	"	0.1%
4. Tiny	XY	-0.407	58	"
	YZ	0.555	"	"
	ZX	0.534	"	"
5. Tiny	XY	-0.637	248	"
	YZ	0.120	"	Not significant
	ZX	0.689	"	0.1%
6. Tiny	XY	-0.590	328	"
	YZ	0.463	"	"
	ZX	0.442	"	"

X: Volume of brine from the processed can.

Y: Drained weight of the material.

Z: Gross weight of the can.

TABLE II CORRELATION COEFFICIENTS IN THE CASE OF FROZEN PRAWNS.

Factors	df	Correlation coefficient	Significance
i) Headless shell-on prawns:			
XY	202	0.240	<1% level
YZ	"	-0.267	"
ZX	"	0.872	"
ii) Peeled and deveined prawns:			
XY	248	0.550	"
YZ	"	-0.245	"
ZX	"	0.675	"

X: Gross weight.

Y: Drained weight.

Z: Difference between the gross and drained weights.

at narrower intervals involving a larger number of cans. Since the gross weight is unaffected by further stages of processing, the sampling need not be postponed till the final processing of the product, but can be taken at a convenient stage where a knowledge of out of control situation would be helpful.

Many food products have drained weight specifications. Since the procedure involved raises the same difficulties as explained in this case, they are usually passed over as uncontrollable. If a similar situation as in prawn products exists in them, ie; if gross weights are correlated, the possibility of application of control charts for gross weights to control the drained weights can be studied.

SUMMARY

Canned and frozen prawns are subjected to compulsory pre-shipment inspection, during which compliance of the products with their declared drained weights is verified. The material used in the processing of these products being biological in origin, the drained weights are suscep-

tible to variation due to a number of factors. Since determination of the drained weights involves destructive and time consuming procedures, application of control chart for drained weights on the processing line is not possible. The present study has shown that gross weights of the products are significantly correlated with their drained weights and since the determination of the former does not have the disadvantages of determination of the latter, the drained weights can be controlled through the application of control chart for the gross weights.

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