

# Adoption of Recommended Quality Control Practices by Fish Processing Factories

P. N. KAUL\*, H. KRISHNA IYER and M. K. KANDORAN

*Central Institute of Fisheries Technology, Cochin - 682 029*

Responses to mailed questionnaires from 31 fish processing factories revealed that for 55 recommended practices in quality control, the percentage of adopters varied from 21.43 to 100. The adoption index was not correlated to any of five variables studied. The mean adoption index did not differ significantly between five other criteria related to fish processing. Rate of rejection or reprocessing at the factory itself was highly correlated with the amount of water used per tonne of processed material.

The fish processing industry in India is mostly export oriented and therefore, quality control forms a very important aspect of it. As a result of several studies, many recommendations have been formulated for the hygienic production of fishery products (Iyer *et al.*, 1966; Pillai *et al.*, 1969; Chaudhuri *et al.*, 1970; Mathen *et al.*, 1970; Iyer *et al.*, 1970; Iyer *et al.*, 1973; Iyer, 1973a, b; Iyer *et al.*, 1974; Iyer *et al.*, 1975; Prabhu *et al.*, 1976). As a result of these studies and related training programmes, technologists, managers and others working in fish processing establishments have been exposed to these recommendations. The present study seeks to report the extent of adoption of these recommendations under factory conditions.

## Materials and Methods

In early 1986, mailed questionnaires were sent to the technologists of all known fish processing factories in India. The questionnaires solicited information on the adoption of 55 recommended practices and related information. Responses were received from 31 fish processing factories.

## Results and Discussion

Table 1 shows the percentage of adopters of the 55 recommended practices. It is seen that the values ranged from 21.43 to 100. Obviously, there are some difficulties in the implementation of many of these recommendations. These need to be studied

Table 1. *Extent of adoption of recommended quality control practices*

| Name of practice                                                                                                   | %<br>adopters * |
|--------------------------------------------------------------------------------------------------------------------|-----------------|
| 1. The floor of the processing hall should be smooth and cemented                                                  | 100.00          |
| 2. The shape of the processing hall should be such that water always flows to the drain                            | 100.00          |
| 3. The construction of the roof of the processing hall should be such that dirt and dust accumulate to the minimum | 96.77           |
| 4. The floor-wall joints should be rounded                                                                         | 77.42           |
| 5. The wall should be cemented and well-polished to a height of at least 4 ft. from the floor                      | 87.09           |
| 6. The roof wall joint should be tight                                                                             | 100.00          |
| 7. All doors and windows should be fitted with fly control nets                                                    | 100.00          |

\* Present address: Central Institute for Research on Goats, P. O. Farah, Dist. Mathura (U P.)

Table 1. (Contd.)

|                                                                                                                                        |        |
|----------------------------------------------------------------------------------------------------------------------------------------|--------|
| 8. The drainage channels should have grills of suitable mesh size to prevent entry of rodents                                          | 96.77  |
| 9. The doors should be of self-closing type                                                                                            | 96.77  |
| 10. There should be sufficient ventilation in the processing hall                                                                      | 96.77  |
| 11. The light bulbs over the processing table should be protected                                                                      | 96.77  |
| 12. The water front should be at least 10 ft. away from the unit                                                                       | 84.00  |
| 13. The lavatories should be situated away from the plant                                                                              | 93.55  |
| 14. The doors of the lavatories should not open into the processing hall                                                               | 90.32  |
| 15. The main doors of the lavatories should be of the self-closing type                                                                | 74.19  |
| 16. The gutters should have rounded bottom                                                                                             | 73.33  |
| 17. The ground should be well-drained                                                                                                  | 96.77  |
| 18. The utensils for handling raw material and processed products should be separate                                                   | 87.09  |
| 19. All the food contact surfaces should be smooth and free from pits and crevices                                                     | 96.77  |
| 20. The food contact surfaces should be of non-absorbent type                                                                          | 96.77  |
| 21. Enamelled or wire-meshed utensils should not be used                                                                               | 63.33  |
| 22. The utensils used for waste materials should be separately identified by some marks or colour                                      | 83.87  |
| 23. Before starting each day's work, all the utensils should be cleaned with a detergent and adequately sanitized by chlorinated water | 96.77  |
| 24. The above procedure should be followed after finishing each day's work also                                                        | 96.77  |
| 25. In the operations for (23) and (24) above, the chlorinated water used should have a strength of 100 ppm                            | 31.03  |
| 26. The equipment should not be corroded                                                                                               | 100.00 |
| 27. The raw material should be stored away from the processing hall and not inside it                                                  | 72.41  |
| 28. The glaze water should be precooled                                                                                                | 100.00 |
| 29. The glaze water should be precooled to a temperature of 1°C                                                                        | 21.43  |
| 30. The glaze water should be chlorinated                                                                                              | 96.43  |
| 31. The glaze water should be chlorinated to a residual level of 5 ppm                                                                 | 82.14  |
| 32. The water used for processing should be chlorinated                                                                                | 90.32  |
| 33. The water used for (32) above should be chlorinated to a residual level of 10 ppm                                                  | 43.33  |
| 34. Chlorine level indicating paper should be used for adequately chlorinating the water for processing                                | 82.76  |
| 35. Ice should be prepared from chlorinated water only                                                                                 | 83.33  |
| 36. The factory workers should wear clean overalls and head coverings                                                                  | 96.77  |
| 37. Before starting the work, the workers should wash their hands from elbow down using soap                                           | 96.77  |
| 38. (37) above should be followed by disinfection using chlorinated water                                                              | 80.65  |
| 39. The level of chlorination in (38) above should be 100 ppm                                                                          | 31.03  |
| 40. The process (37 to 39 above) should be repeated each time the workers leave the processing hall and return for work again          | 80.00  |
| 41. Spitting in the premises should be prohibited                                                                                      | 96.77  |
| 42. Use of tobacco in the premises should be prohibited                                                                                | 93.55  |
| 43. A person known to be affected with a communicable disease should not be permitted to work in any area of the unit                  | 100.00 |
| 44. Workers with some injury in their hands should not be allowed to handle the material                                               | 100.00 |
| 45. The workers should be got examined medically                                                                                       | 93.55  |
| 46. (45) above should be done at an interval of every 3 months                                                                         | 41.94  |

Table 1. (Contd.)

|                                                                                                            |        |
|------------------------------------------------------------------------------------------------------------|--------|
| 47. Adequate advisory posters showing the importance of hygiene should be exhibited in the processing hall | 66.67  |
| 48. A sanitary survey of the factory should be conducted                                                   | 96.67  |
| 49. (48) above should be done every 3 months                                                               | 70.37  |
| 50. The cold storage should be maintained at a constant temperature of $-20^{\circ}\text{C}$               | 58.06  |
| 51. Insecticides and such other toxic materials should be kept under lock and key                          | 90.00  |
| 52. Toxic substances like insecticides etc. should be handled only by properly trained personnel           | 93.33  |
| 53. The lavatories should be disinfected daily                                                             | 60.00  |
| 54. During plant operation, the waste material should be frequently removed from working areas             | 100.00 |
| 55. The top of the processing table should be made of non-corroding and non-reacting material              | 96.77  |

\*  $n = 31$ , but there were a few cases of non-response in some practices.

Table 2. Means and standard deviations of six variables connected with quality control recommendations

| Variables                                                                      | n  | Mean  | S.D.  |
|--------------------------------------------------------------------------------|----|-------|-------|
| 1. Adoption index                                                              | 31 | 84.48 | 7.39  |
| 2. Average no. of samples examined per week                                    | 24 | 58.08 | 54.56 |
| 3. Rate of rejection or reprocessing at the factory itself (samples per tonne) | 18 | 0.15  | 0.55  |
| 4. Average quantity of raw material handled per day (tonne)                    | 31 | 3.88  | 3.75  |
| 5. Water used per day for processing ('000 litres)                             | 28 | 15.39 | 21.71 |
| 6. Kilolitres of water used per tonne of processed material                    | 28 | 8.28  | 18.44 |

Table 3. Correlation coefficients between six variables connected with quality control recommendations

| Variables                                                                                | $X_1$ | $X_2$ | $X_3$ | $X_4$ | $X_5$ |
|------------------------------------------------------------------------------------------|-------|-------|-------|-------|-------|
| 1. Adoption index (Y)                                                                    | -.03  | .16   | .11   | -.11  | -.18  |
| 2. Average no. of samples examined per week ( $X_1$ )                                    |       | -.07  | -.01  | -.32  | -.25  |
| 3. Rate of rejection or reprocessing at the factory itself (samples per tonne) ( $X_2$ ) |       |       | -.25  | .02   | .83** |
| 4. Average quantity of raw material handled per day (tonnes) ( $X_3$ )                   |       |       |       | .10   | -.22  |
| 5. Water used per day for processing ('000 litres) ( $X_4$ )                             |       |       |       |       | .79** |
| 6. Kilolitres of water used per tonne of processed material ( $X_5$ )                    |       |       |       |       |       |

\*\* significant at 1% level

Table 4. *Difference in mean adoption indices of various categories of response to different questions*

| Question and category                                                       | Mean  | S.D. | N  | t        |
|-----------------------------------------------------------------------------|-------|------|----|----------|
| 1. Do you have a separate quality control laboratory?                       |       |      |    |          |
| a. Yes                                                                      | 83.78 | 8.33 | 20 |          |
| b. No                                                                       | 85.77 | 5.01 | 11 | -0.70    |
| 2. Is your plant under self certificate scheme or any other similar scheme? |       |      |    |          |
| a. MIPQC                                                                    | 83.61 | 7.00 | 14 |          |
| b. IPQC                                                                     | 85.20 | 7.61 | 17 | -0.58    |
| 3. Is your technologist trained in quality control of fishery products?     |       |      |    |          |
| a. Yes                                                                      | 84.18 | 7.54 | 29 |          |
| b. No response                                                              | 88.88 | 0.21 | 2  | -0.85    |
| 4. Do you experience electric power failures?                               |       |      |    |          |
| a. Often                                                                    | 79.09 | 6.99 | 3  |          |
| b. Sometimes                                                                | 84.09 | 7.19 | 24 | (See '6' |
| c. Never                                                                    | 90.91 | 3.40 | 4  | below)   |
| 5. Do you experience shortage of ice?                                       |       |      |    |          |
| a. Sometimes                                                                | 82.58 | 8.58 | 15 |          |
| b. Never                                                                    | 86.27 | 5.48 | 16 | -1.39    |

6 The t value for response categories a and b is 1.10, for b and c is -1.80, and for a and c is 2.49. None of the t values reported in this Table is significant at the 5% level.

in detail and where scientific or technological problems exist the research workers should work again on these aspects. The average adoption index was 84.48 (S.D. = 7.39) which shows that on the average, the typical recommendation was fairly widely adopted. In Table 2, it can be seen that 58.08 samples were examined per week and 0.15 samples per tonne were rejected or reprocessed at the factory itself, on an average. From Table 2, it can be observed that none of the selected quantitative variables were related to adoption index. However, the rate of rejection or reprocessing at the factory itself was highly positively correlated to quantity of water used per tonne of processed material. The latter is also highly positively related to water used per day for processing which seems quite natural. It is significant to note that neither the rate of rejection/reprocessing at the factory itself, nor the quantity of water used per tonne of processed material, are correlated significantly with the average quantity of raw material handled per day. This shows that in factories where more water per tonne of processed material is used, care should be taken to ensure its quality especially with regard to chlorination.

The different characteristics of fish processing factories with respect to separate quality control laboratory MIPQC/IPQC schemes, training of technologist in quality control, experience of electric failures and shortage of ice, were studied with respect to their relationship with adoption. The results reported in Table 4 reveal that the presence or absence of these did not make significant differences in adoption. The respondents were also asked about the frequency of sampling. Out of 24 who responded, 23 said that they sampled their products 'daily,' whereas one reported 'not daily'. Only one respondent reported that there was rejection of material from his factory by the importing country, this was on account of *Salmonella* and *Arizona*.

It is suggested that the present study needs to be replicated on a larger sample coupled with other instruments of observation.

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