



## Work Environment of Seafood Industry

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### Abstract

Modern fish processing industry developed in India during the 1960s. Prior to that, traditional processing facilities comprised largely of sun drying, 'wet' (drip) drying or dry curing with or without salt. Prawns were mashed into pulp and sometimes partially dried and packed in sealed tins. While a portion of the processed products found a domestic market supported by low-income consumers, the rest was exported to Burma, Malaysia, Singapore, Hongkong, Sri Lanka, the UK and some other European countries. The dried products included fish like Bombay duck, ribbon fish, silver bellies, shark, tuna, catfish, mackerel and prawns. The seafood processing industry has experienced tremendous growth in recent years. In India it is almost entirely export-oriented and is spread across all the maritime states of the country. Aim of our study was to investigate the work environment of seafood industry at Tuticorin district.

Keywords: Fish; Prawns; Noise; Frequency

### Introduction

The seafood processing industry has experienced tremendous growth in recent years. In India it is almost entirely export-oriented and is spread across all the maritime states of the country. India has a 2.02 million square kilometre of Exclusive Economic Zone and 0.5 million square kilometer of continental shelf. There are about 3,937 fishing villages, 189 fish landing centers, 59 minor fishing harbours and six major fishing harbours. The contribution of fisheries to national GDP is about 1.21 % (2007-08), which formed about 5.37% of the agricultural GDP (Sathiadhas *et al.*, 2011). The fish production in the country has increased from 0.75 million tonnes (1950-51) to 7.85 million tonnes (2010-2011). India plays a major role in the global seafood export among the Asian countries. The marine products exports from India reached 8 lakh tonnes worth 2.8 billion US \$ in 2010-2011 and registered an impressive double digit growth rate since 2007-2008 (Salim and Narayanakumar, 2012). The quantum of work in the seafood industry is directly related to the availability of raw material and tends to be seasonal. The fishes must be processed in cold conditions, where air temperatures in the working area have to be kept below 10<sup>0</sup>C and sometimes even in freezers.

## **Methodology**

### **Study Area and Description**

The study area chosen for the present study is Tuticorin district coastal area in Tamilnadu, India has a coastline of about 7,500 km. Gulf of Mannar extends from Tuticorin to Rameswaram Island in the SW-NE direction, lies between 78°5' & 79°30' E longitudes and 8°47' & 9°15' N latitudes, to a length of about 140 km. Gulf of Mannar is endowed with a rich variety of marine organisms because its biosphere includes ecosystems of coral reefs, rocky shores, sandy beaches, mud flats, estuaries, mangrove forests, seaweed stretches and sea grass beds. A port town Tuticorin with several industries and saltpan activity, its population is around 0.4 million. The coastline of Tuticorin has a length of about 163.5 km – 25 km wide. Major Industries such as Southern Petrochemical Industrial Corporation, Thermal Power Plant, Tuticorin Alkali Chemicals and Heavy Water Plant are also present in this area. Due to the accelerated development activities the coastal area experience significant changes.

As per the recent statistics from Marine Products Export Development Authority (MPEDA), there are 91 registered export units and 33 seafood processing plants in the chosen area. Out of these, five seafood processing units in Tuticorin district were selected for the present study. Permission to conduct the research was obtained from the five seafood processing units for elucidating information regarding the work environment in the different seafood processing units.

### **Job description**

The fish processing task were predominantly performed manually. The fishes were washed in chlorinated water. Workers stand or sit on the floor to perform the activities in the seafood processing. The workers were employed in three sections namely peeling, grading and setting. The nature of activity in the peeling section was deveining shrimp, removal of head from shrimp, pulled vein shrimp, peeled and deveined shrimp, peeled and undeveined shrimp and cleaning of cuttlefish. Grading was categorising the type of seafoods into different varieties and grades which requires higher technical skills. Workers who were experienced in the seafood units were employed in this section. Setting section included preparation of final products such as individual quick (IQF) freezing of shrimp and cuttlefish, shrimp frozen and cuttlefish frozen and are packed as per the buyer requirements. The final products were the whole fishes are packed in boxes, squids hardened and cut into rings using sharp knives, process for ready-to-cook products and individual quick freezing. They were packed and transferred to cold storage and subsequently dispatched to consignments. The whole activity is done at a low temperature and hands are frequent contact with ice and ice cold water and most of them not using personal protective equipment.

### **Assessment of work environment**

The work environment includes all the parameters such as lighting, temperature and humidity. Thus to assess the work environment, all these parameters were studied to arrive at valid conclusions.

### Measurement of lighting

The illumination level was measured with a hand held digital light meter (Lutron - TES 1332). All the readings were taken at the point of operation. The activity areas were divided into grids and readings were taken at each grid point to arrive at the average values.

### Measurement of sound

Noise is an aspect of the working environment which has received much attention for many decades. Noise is conveniently and frequently defined as “unwanted sound”. Noise basically has two characteristics; frequency expressed in cycles per second, Hertz (Hz) and intensity expressed in Decibels (dBA). A decibel is a dimensional unit used to express the logarithm of the ratio of a measured quantity to a reference quantity. The human ear responds to a wide range of intensities from about 1-120 (dBA). The sound may be uncomfortable at 100-120 (dBA) and becomes painful above 120 (dBA). Sound levels of this seafood processing units were measured with a sound level meter (Quest technologies-1100/2100). The permissible limit of daily noise level by Occupational Safety and Health Administration (OSHA, 2012) is given in Table 1.

Table 1 Permissible limits of noise level

S.No.	Duration (Hr)	Sound level (dBA)
1	8	90
2	6	92
3	4	95
4	3	97
5	2	100
6	1.5	102
7	1	105
8	0.5	110
9	0.25 or less	115

### Measurement of temperature and humidity of the work environment

Maxwell (1871) stated that the temperature is a physical quantity that is a measure of hotness and coldness on a numerical scale. It is a measure of the thermal energy per particle of matter or radiation. Humidity is the amount of water vapor in the air. Water vapor is the gas phase of water and is invisible. The temperature in the seafood processing units was recorded using a wet and dry bulb thermometer. Hygrometer was used to measure the humidity levels in the seafood processing units.

### Result and Discussions

Table 2 gives the features prevailing in the work environment of selected seafood processing units.

Table 2 Details of work environment in the selected seafood processing unit

S.No	Particulars	Mean values
1	Sound level (dBA)	
	Receiving chute	83
	Pre processing hall	90
	Processing hall	92
	Freezer hall	97
	Chill room	83
	Individual quick freezing hall	101
	Packing hall	101
2	Light illumination (Lux)	
	Receiving chute	79
	Pre processing hall	152
	Processing hall	199
	Freezer hall	95
	Chill room	39
	Individual quick freezing hall	123
	Packing hall	94
3	Temperature ( $^{\circ}$ C)	
	Receiving chute	24
	Pre processing hall	27
	Processing hall	
	Grading	26
	Setting	22
	Freezer hall	22
	Chill room	25
	Individual quick freezing hall	25
	Packing hall	25
4	Humidity (%)	
	Receiving chute	73
	Pre processing hall	77
	Processing hall	
	Grading	73
	Setting	77
	Freezer hall	77
	Chill room	70
	Individual quick freezing hall	66
	Packing hall	79

Work environment encompasses lighting, noise temperature and humidity. If the work environment is comfortable, the productivity of the individual workers will also be enhanced while uncomfortable environment will have deleterious effects on the workers. It was observed that the noise level exceeds 90 decibels in all the places except the receiving chute. As per the OSHA standards, worker can be exposed

to a noise level of only upto 90 decibel during eight hours of work. As the levels of noise increase the exposure time need to be reduced.

The higher level of sound in the IQF hall and packing hall was 101dBA. This may be due to the operation of modern freezer. However, women workers in the IQF hall went to other section after the lunch hour, which lead to lesser exposure to higher level of sound. The noise exposure was associated with several adverse pathophysiological effects such as acute and chronic hearing loss, hypertension and cardiovascular diseases (Melamed *et al.*, 1999). Chronic exposure to noise levels, typical of many workplaces, was associated with excess risk for acute myocardial infarction death (Davies *et al.*, 2005). Willich *et al.*, (2006) reported that the exposure to noise was unavoidable in many industries and the vast majority of labour forces suffered from its side effects.

Required amount of lighting is essential for any work environment. Under or over illumination level resulted in visual fatigue among the workers. The general lighting level in the industry is 90 Lux. However, certain sections had increased lighting level as per the task demands. It was found to be in the range of 115 to 200 Lux. Higher level of light in the seafood processing unit is essential to maintain good quality seafood products. But light intensity was higher than normal level (90 Lux) it led to headache. Since all the units were export oriented, the temperature in different seafood sections were maintained as per the requirements of condition of seafoods processing. Slightly higher level of humidity was observed in the packing hall (79%), followed by pre processing hall (77%), setting hall (77%) and freezing hall (77%). The grading hall had 73 per cent of humidity and rest of the section had less than 70 per cent of humidity.

*Authors' contributions: Amaravathi,T., (Ph.D Scholar) is perform the experiment, data analysis and also is corresponding author of menuscrypt. P.Parimalam, (Professor and Head) and A.K. Ganguli(Senior Deputy General Manager) are contributed in editing and correction of menuscrypt.*

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