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Workstation assessment for packaging department: a case study

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Abstract
Introduction: A study was carried out in the packing department of Juhu Sahakari Bhandar for assessing the work station design and postures adopted during work.
Methodology: A questionnaire furnished the general information on medical history, specific and environmental aspects. The questionnaire also revealed the health problems among the workers.
Results: The results of the time study revealed that the workers spend maximum time in weighing activity (115 mins.) as compared to other sub-activities like sieving (32 mins.), filling (107 mins.), sealing (67 mins.), labeling (32 mins.), and cleaning the area (13 mins.). The different workstations dimensions were measured to design and plan the layout in the space available to perform all the activities. The findings of the study were analyzed and recommendations were made for redesigning the workstation to make it safe, healthy and to improve human efficiency and productivity.

Keywords: workstation, posture, packers, design, foodgrains

Introduction
Man, now-a-days is more or less confined into a specific built environment and spends a considerable amount of his life span, with various installed equipments, instruments, machines and live within it. Due to rapid urban development, the judicious use of land and space in terms of human comfort requirement draws our attention.
In the last few years, it has been increasingly recognized that human tasks and work situations should be in accordance with the needs, capacities and abilities of the performers of the tasks. This recognition of the significance of taking into account human factors has led - with varying success - to the re-design of a number of tasks and work situations which were felt to be unsatisfactory.
Generally, as per convenience, either work equipment or machines are purchased first and installed in a pre-built area which generally lacks proper planning and organization and where the people are forced to work in a given setup.
The basic design criteria of workplace and workspace are very much interdependent. Workplace could be defined as the immediate optimum work area required for a specific task using a machine and other work accessories, whereas workspace is a large surrounding of the workplace. It is multiple of the same type of different types of workplaces and free spaces in between together to serve a single purpose.
The design of the workplace is a very broad topic. Workplace design has been approached as an entire process and activity which leads to the birth of the workplace. The designing of a workplace is a complex and multi-dimensional task. Of course, it covers the situations where people are working. Most workplaces and jobs demonstrate a mismatch in relation to the workers involved with them (Corlett, 1988) [6].
It is important to have a workplace that is designed to accommodate the human user. The application of anthropometric data will allow the designer to "fit" the user into the design (Alexender, 1986) [1]. As the workplace design is a complex process and involves a large number of people, this can reasonably and effectively be done only as a whole process and together with these people (Launis *et al*, 1996) [13].
The task of assembling many components and putting them together into the integrated whole called as the "ergonomic workstation" is very much like solving a 'Jigsaw puzzle,

all the pieces must fit with each other.

The objective of ergonomics in workspace design is to achieve a "Transparent" interface between the user and the task such that the users are not distracted by the equipment they are using. Distractions may be due to discomfort or due to workstation usability problems i.e., the elbow rests of chair sometimes hit the leading edge of the desk if they are too long, thus restricting access to the desk. In the workstations for standing workers, lack of clear space for the feet may impede task related postural movements. Also, poorly designed sitting environment can result in poor sitting habits. Therefore, the well-designed workstations should be unobtrusive with respect to the task performance. The design of the workplace may subject the worker's anatomy and physiology to excessive and highly concentrated stresses and strains. Persistence of the stresses may lead to health disorders and deformities of the anatomy. Designers therefore need to consider task requirements as well as anatomical, physiological and anthropometric characteristics of users.

Despite rapid strides of mechanization and automation, manual work is still predominant in many occupations which are repetitive in nature. Such repetitive type of work can be seen in jobs like assembly-line work, electronic industry, diamond processing, packaging etc.

Although the energy demands of these tasks may be quite low, the repetitive use of small muscle groups and rotation around the wrist, elbow and shoulder joint may be associated with symptoms of inflammation and soreness, collectively grouped as repetitive-motion disorder (Kodak, 1986). Modification of the workstation design is an alternative approach that can be used to overcome MSDs problems faced by standing workers. (Baba Deros *et al*, 2011) [4]

One of the most important occupations involving repetitive work is packaging. Packaging may be defined as a means of protecting a product to ensure the safe delivery of the product to consumer in a sound condition at a minimum cost incurred in production (Kothari, 1977) [4].

Many researchers believe that repetitive tasks produce adverse effects on the health and well-being of the workers (Grandjean, 1973; Nag *et al*, 1986; Christensen, 1986; Rahman, 1986; Punnett *et al*, 1991). The most common adverse effects found by researchers can be categorized into physiological, psychological and performance effects. Monotony, boredom and adverse effects on the worker's life outside the workplace are also common among those involved in repetitive type of work.

Corlett's (1998) [6] investigation on repetitive operations revealed that particular postures were required to do the work and these postures were maintained over many hours with small periods of relaxation.

Mossink (1990) [14] in his study on packaging workstation observed some unfavorable working postures which were frequently adopted by the workers with recurring movements. It also indicated that there was relationship between posture, movement, as well as the arrangement of the workstation.

The adopted posture without much movement stationed in a work-demanding position, without feeling muscular fatigue, if a person can perform its task, can be said a 'good posture'. A good Posture is a basic requirement in workplace design. Today, the sitting position is the most frequent body posture in industrialized countries. It can be stated without exaggeration that the sitting position is characteristic for modern times. As people spend great of their working hours sitting on chair and using furniture that is poorly designed or improperly adjusted, they tend to adopt awkward or abnormal posture which places an undue stress on musculo-skeletal system and sensitive body tissues which in turn are hazardous to health and affect productivity. Discomforts arising from postures and workplace would be precursors of disease.

A reduction of postural stress is fundamental to workstation design in ergonomics. A multi approach is needed to arrive at appropriate workstation design for different workers. The requirement of tasks and the characteristic of users need to be considered in relation to the option for workstation design.

Alireza Choobineh *et al* (2004) studied development of guidelines for workstation design of Iranian hand-woven carpet industry. The results of multivariate analyses showed that major ergonomic factors associated with musculoskeletal symptoms were loom type, working posture, daily working time and seat type. Based on the results, some general guidelines for designing weaving workstations were developed. A prototype test showed that the new workstation was acceptable for subject tests and that it improved working posture.

The ideal design should bear the performance capability and the limitation of the user in mind and should ensure that the operator is able to work in the working area clearly. Posture must be adequate and comfortable, and control must be within reach to minimize error. To accomplish this, the designer must take into consideration the physiological, psychological, environmental and dimensional factors which will affect operator performance and well-being. Due consideration must be given to environmental factors i.e., illumination, temperature, noise and vibration Working dimension should be compatible with anthropometric characteristic of the anticipated user (Kvalseth, 1983) [12].

Alireza Choobineh *et al* (2004) investigated that head, neck and shoulder postures were influenced by weaving height. Both design parameters influenced trunk and elbows postures. The determinant factor for weavers' perception on the neck, shoulders and elbows was found to be weaving height, and on the back and knees it was seat type. Based on the results, the following guidelines were developed: (a) weaving height should be adjusted to 20 cm above elbow height; (b) a 10°forward-sloping high seat is to be used at weaving workstations. The workstation may not be able to function effectively, if there are mismatches between the users' anthropometric data and workstation dimensions (Deros *et al*., 2009; Ghazilla *et al*., 2010) [4, 10].

Considering the above facts, it was necessary to perform an in - depth ergonomic study of foodgrain packers with the objective to study and evaluate the existing workstation layout and recommend a new layout based on ergonomic principles.

Rationale

The study was focused on the problem faced by foodgrain packaging workers. Foodgrain packers work for nine long hours with one hour lunch- break. The main task of the worker is to pack the foodgrains. All the activities filling, weighing, sealing and labeling are performed at one place which lack a proper organization, the movement place is less due to which bodily movement are restricted. Also there is no proper circulation area which creates danger for accidents between food grain packers and the loader who load the godown with food grains. All these aspects necessitated a thorough evaluation of the existing workspace organization and develop a proper workplace which will be appropriate and natural for man- machine- environment system and which will also allow comfortable posture and greater efficiency by human being. This study proposed to redesign the packaging

workstation for packers considering their physiological units and nature of job to minimize any accidental situation.

Limitation of the study

The proposed layout is designed only for Juhu Sahakari Bhandar.

Methodology

Sample

All the samples were selected from Juhu Sahakari Bhandar from Mumbai city. The study was conducted on female workers only.

Sampling Method

Since the research is a case study, purposive sampling method was used for detailed study. The foodgrain packaging department of the Juhu area was selected from eleven foodgrain packaging departments from Mumbai Sahakari Bhandars.

Sample Size

Eleven female foodgrain packers from Juhu Sahakari Bhandar were considered for workstation design

Research design

- **Worker:** All the aspects related to the workers were dealt under this section.
- **General Information**: A well administered questionnaire was used as a tool for the study. The questionnaire was designed to elicit accurate responses from the workers. It consisted of two broad aspects namely, general information and specific information. The general information included age, weight, language spoken, education, marital status, health problems etc. The specific information included length of service, duration of work, type of work, psychological problems etc.
- **Body Dimensions:** Anthropometry is the science of human body dimensions in both static and dynamic conditions which are essential for work station design (Alexender, 1986) [1]. The different anthropometric measurements relevant to the design of workstation were taken using the anthropometric kit. Thirty three measurements were taken of eleven subjects belonging to Juhu Sahakari Bhandar for the study.
- **Workstation:** Workstation design reflects the design for multiple users and/or movement around and about the workplace. The workstation is more than the immediate work area because it includes: access to and from the work area, movement in work area and provisions for multiple persons at one work area. The existing workstation for the foodgrain packers is illustrated in Fig.1.

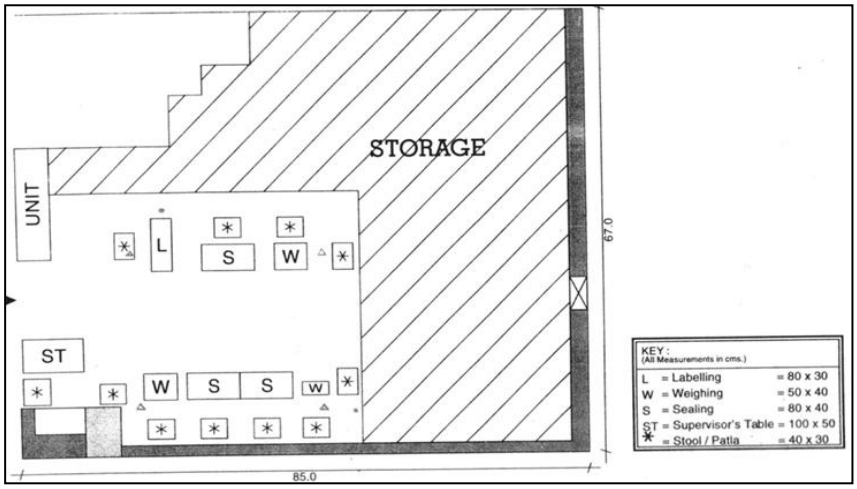

Fig. 1: Layout of the Existing Workstation (Scale: 1:50)

There are more factors to deal with and these factors interact in more ways and in more complex ways. They are as follows:

- **Equipments Required:** Foodgrain packers perform various activities which requires different tools/equipments i.e., measuring can, siever, cutter/blade, electric sealing iron, weighing machine, rubber stamp and stamp pad. To understand the use of these equipments/tools they were observed so that the workspace for them could be designed.
- **Dimensional Issue:** Foodgrain packaging involves many sub activities and each activity requires specific work area in order to perform the activity without hindering the workers performance. With a view to optimize the number of workstations which could be accommodated within the given floor space, the dimensions of the workstations were taken with a measuring tape. A questionnaire technique was used to identify the worker's problems with the existing workstation.
- **Systems Safety:** Safety engineering typically takes the approach that potential hazards leading to accidents may be due to the interaction of the task, the human, and the environment (Dale, 1981). Since safety has long been the focus of attention in any workplace design it is very necessary to know the occupational safety and health hazardas at the place of work. In order to seek information whether there were any safety system provided to the foodgrain packers a questionnaire was administered so that safety measures could be recommended.

Analysis of Data

From the data collected the information was analysed by using standard statistical methods which included mean, standard deviation, standard error, 5^{th} and 95^{th} percentiles.

Results and Discussions

The main objective of the study was to redesign the workstation for foodgrain packaging department where the job is considered as repetitive.

Time Study: The time spent by the workers on different activities involved in foodgrain packing was studied in detail. Total time spent on nine hours occupational work was studied. The active and non-active period is summarized in table 1.

Table 1: Time spent by subjects during occupational work.

Subject Code	Active (mins)	Non-Active (mins)	Total Time (mins)
001	330	210	540
002	365	175	540
003	370	170	540
004	385	155	540
005	380	160	540
006	390	150	540
007	395	145	540
008	375	165	540
009	360	180	540
010	320	220	540
011	360	180	540
Mean $\pm$ S.E.	366.4 $\pm$ 6.77	173.6 $\pm$ 6.77	540

Values are mean $\pm$ S.E.

The results of the table show that the worker spent about six hours in occupational activities and three hours in non-occupational activities like resting, personal needs having tea, lunch, etc.

Fig 2. Represents the time spent on different activities. In could be seen from the figure that maximum time is spent in weighing activity while minimum time in cleaning activity. The reason for more time being spent in weighing activity could be that they have to weigh accurately so that the item does not weigh more or less.

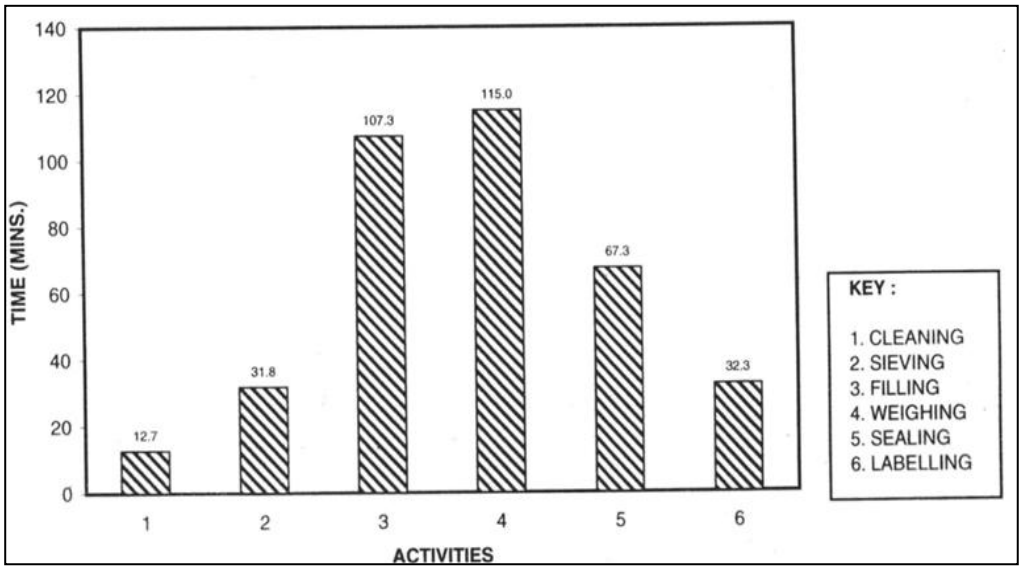

Fig 2: Time Spent in different activities involved in Foodgrain Packaging

Body Dimensions: As mentioned in the methodology thirty three measurements were taken of the workers working in Juhu Sahakari Bhandar for redesigning of workstation. These dimensions are given in table 2.

Low percentile values were considered for accommodating maximum number of people having higher values, where easy reach was concerned. Higher percentile values were considered when the maximum number of population having lower values did not wish to get reach for ensuring safety and easiness of operation without any hindrance.

Table 2: Anthropometric measurements of food grain packers

No.	Anthropometric Measurements (cms)	Mean (x)	S.D.	S.E.	5th Percentile	95th Percentile
1	Body Weight (Kg)	49.09	11.35	3.419	30.36	67.82
	Standing					
2	Body Stature	150.45	5.06	1.525	142.10	158.80
3	Eye Height	138.95	4.33	1.304	131.81	146.09
4	Acromial Height (Shoulder)	124.46	4.43	1.334	117.15	131.77
5	Vertical Reach	189.57	8.12	2.446	176.17	202.97
6	Total Arm Span	153.95	6.77	2.039	142.78	165.12
7	Forward Arm Reach	78.07	5.10	1.536	69.66	86.49
	Sitting					
8	Sitting Height	75.75	1.61	0.485	73.09	78.41
9	Eye Height	65.37	1.27	0.383	63.27	67.47
10	Shoulder Height	51.05	1.14	0.343	49.17	52.93
11	Elbow Height	19.35	1.90	0.572	16.22	22.49

12	Upper Lumbar	22.9	2.11	0.636	19.42	26.38
13	Lower Lumbar	12.7	1.46	0.440	10.29	15.11
14	Popliteal Height	37.33	1.38	0.416	35.05	39.61
15	Knee Height	45.55	1.69	0.509	42.76	48.34
16	Subscapular Height	29.05	2.18	0.657	25.45	32.65
17	Thigh Clearance	10.65	1.12	0.337	8.80	12.50
18	Shoulder Breadth	34.20	1.80	0.542	31.23	37.17
19	Shoulder Elbow Length	31.37	1.81	0.545	28.38	34.36
20	Forearm Length	40.58	1.88	0.566	37.48	43.68
21	Maximum Arm Grasp	65.34	4.08	1.229	58.61	72.07
22	Buttock Popliteal	43.27	2.35	0.708	39.39	47.15
23	Hip Breadth	30.93	3.80	1.145	24.66	37.20
24	Elbow Breadth	37.78	5.21	1.569	29.18	46.38
25	Buttock Knee Length	50.4	2.77	0.834	45.83	54.97
26	Waist Level Width	23.83	3.79	1.142	17.58	30.08
27	Thigh to Thigh	30.73	3.46	1.042	25.02	36.44
		Squatting				
28	Squatting Height	75.85	1.83	0.551	72.83	78.87
29.	Knee to Knee Length	53.93	6.51	1.961	43.19	64.67
30	Squatting Height	75.85	1.83	0.551	72.83	78.87
31	Hip Breadth	32.09	3.10	0.934	26.98	37.21
32	Maximum Arm Group	59.55	3.56	1.072	53.68	65.42
33	Knee to Floor	42.45	2.37	0.714	38.54	46.36

Workstation Evaluation: As mentioned n the methodology, the food grain packaging involves various sub-activities i.e. cleaning the area, sieving, filling, weighing, sealing, and labeling which requires specific area to perform them. Fig 1. Shows the layout of the existing workstation of the godown where the study had been carried out. There were eleven workers working in this area. The area was provided with one exhaust fan and two doors one of which led to the security and other too common entrance. Also, the room was provided with weighing scale, electrical sealing iron and siever.

The space was also provided for the supervisors table and chair. There was a common built-in wall unit (75cms x 40 cms) for the workers to keep their glasses, food, water and belongings.

The dimensions of different items belonging to different workplaces are presented in table 3.

Table 3: Space required for different work areas

Sr No.	Work area	Items	Dimensions	
			Existing	Recommended
1	Labeling	S	40 x 30 x 31	40 x 40 x 40
		T		
2	Filling	S	80 x 30 x 63	85 x 50 x 67.5
		Tr		
3	Weighing	S	40 x 30 x 7	40 x 40 x 35
		T		
4	Sealing	S	40 x 30 x 35	40 x 40 x 40
		T		
5	Supervisor	C	40 x 40 x 40	40 x 40 x 40
		T		

S = Stool; T = Table; Tr = Trolley; C = Chair.

Problems related to the existing workstation: For redesigning the workstation knowledge about the requirements of the different sub-activities performed in the workstation becomes important. Table 4 summarizes the postures adopted in different stages of food grain packaging carried out in Sahakari Bhandar where the study was done along with brief description of each posture and the problems expected to be related to the working posture in different operations.

Table 4: Analysis of postures adopted by workers at work

Sr. No.	Operations	Type of Posture	Illustration	Description of Posture	Health Problems
1	Labeling	Sitting		This activity is performed by the worker sitting on a stool with back and neck little bent forward and hands away from the Body.	As the worker bends forward with arms outstretched, there is an additional stress on the muscles of the back. Neck and shoulders and also on the wrist.
2	Sieving	Squatting		This activity is performed in a squatting posture with the subject leaning forward with the hands moving rhythmically in right and left direction.	The worker sits on the floor with forward bend of the head and trunk which puts stress on the spine and neck muscles leading to muscle cramps and fatigue.

3	Filling	Standing Stooping Sitting and Sitting-Stooping			As the activity begins, the worker adopts standing –cum-bending posture and though there is less stress on the back the arms are quite away from the body which increases stress on shoulder muscles. As the activity goes on, the worker sits erect on the stool with arms away from the body leading to low back pain and shoulder pain. By the end of the activity the worker bends fully forward with thighs and knees pressing against abdomen and chest causing fatigue and
4	Weighing	Sitting		This activity is performed while sitting on patla, with forward bending and both hands away from the body, bending sideways for picking and keeping the filled polythene bags.	The worker sits on a patla, bends forward and the arms fully outstretched in forward and sideways direction which leads to problems like nek pain, low back pain and shoulder pain.
5	Sealing	Sitting		Here the subject sits on a stool and bends on one side to pick the weighted polythene bags and place them on a wooden plank on the lap to hold the bags for sealing with hands away from the body.	As the worker bends forward with arms out stretched, there in additional stress on the muscles of the back, neck shoulders and also on the wrist.

To overcome these postural problems, the dimensions of existing workstation were studied and analyzed in order to organize the work area. The analysis of workstation was done in relation to different activities performed and the changes made in dimensions are given below.

- **Labelling:** This activity was performed in sitting posture using chair and table. As mentioned above these workers faced the problems of neck, back and shoulder pain which was due to improper work surface height and seat height. The existing dimensions of chair and table were 40 x 30 x 31 cms and 80 x 30 x 63 cms respectively. Which on analysis of anthropometric dimensions the recommendations made for chair and table were 40 x 40 x 40 cms and 90 x 50 x 67.5 cms respectively. Also the chair could be provided with a proper hand rest so that the forearm region of both the hands can be placed on it to reduce shoulder fatigue. The top surface of the hand rest and the seat can be covered with soft PU foam covering and upholstery. The height of the elbow rest can vary from 0-10 cms from the table surface level. The seat should be provided with the back rest to support the lumbar region of the body to avoid the stress on the muscles of the back. Also no facility for storage of labels, stamps and stamp pads was provided. Hence it was necessary to provide a storage cabinet adjacent to the work-area. The top of the cabinet could be adaptable as an additional work surface for placing the work accessories.
- **Sieving:** This activity was performed sitting on floor in squatting position. Here the worker should be provided with a patla (40 x 30 x 7 cms), so that they can stretch their legs and sit erect / straight to avoid muscular cramps

and fatigue. This activity was performed occasionally and for short duration.

- **Filling:** This operation was carried out in four different postures i.e., standing, standing-cum-stooping, sitting on a stool and sitting-cum-stooping. These types of postures put undue pressure on back and neck muscles. To avoid this, an adjustable trolley should be provided which would work on the principle of pulley. A platform-cum storage should also be provided next to filling place where the sloping platform (7.5cms) could be used to pass the filled bags to the weighing workstation and the storage underneath the platform could be used for storing of polythene bags and filling cans by the subjects.
- **Weighing:** In the existing workstation design this activity was performed sitting on patla of size 40 x30 x 7 cms, which puts pressure on abdominal region as there is forward bending to weigh the food grains. In order to avoid this, a chair (40 x 40 x 35 cms) could be provided and the weighing scale pan should be raised by keeping it on a stool with pull out storage to keep spoons (to be used to add/remove food grains from packets). A platform-cum-storage could be provided to keep packets after weighing which would be a common platform for sealing and weighting.
- **Sealing:** This is the last activity to be performed and it was carried in sitting posture on table and chair. Here table edge was used for sealing purpose and table top for keeping sealing iron. In existing workstation plank of size 76 x 13.5 cms is first placed on the lap on which two or three packets depending upon the weight are kept together for sealing at the edge of the table in front of the worker. But to avoid different plank to be used, the table itself should be provided with a flap which could be pulled when sealing is done and which can be replaced back when not in use. The modified dimension of the sealing table is 90 x 30 x 67.5cms according to the anthropometric dimensions of the worker.

Based on the changes suggested above, the two layouts (I and II) were proposed which are presented in Fig. 3 and Fig. 4.

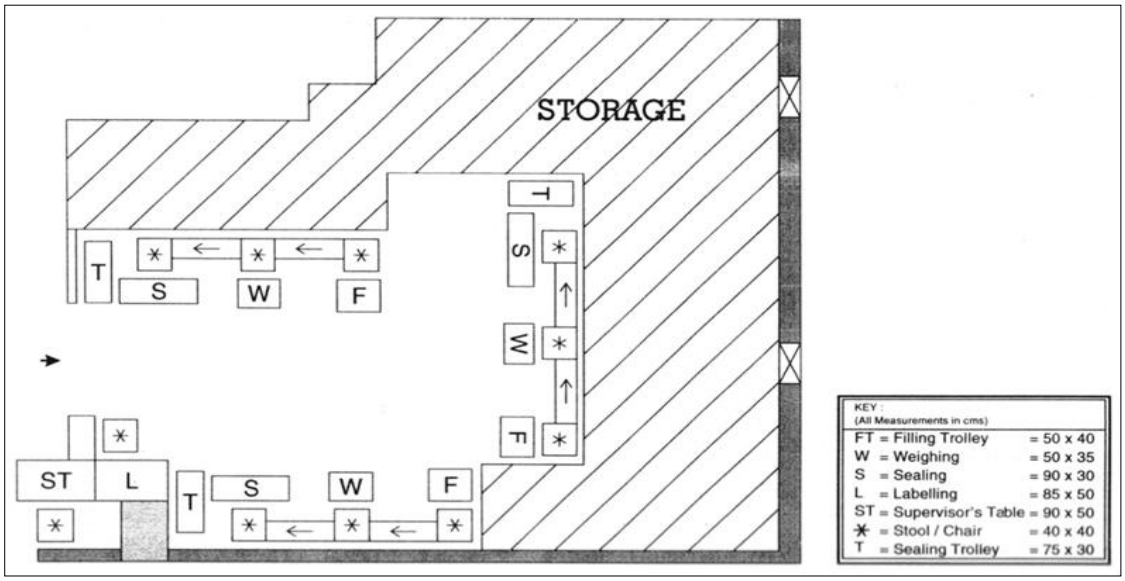

Fig. 3: Proposed Layout of the Workstation Design – I.

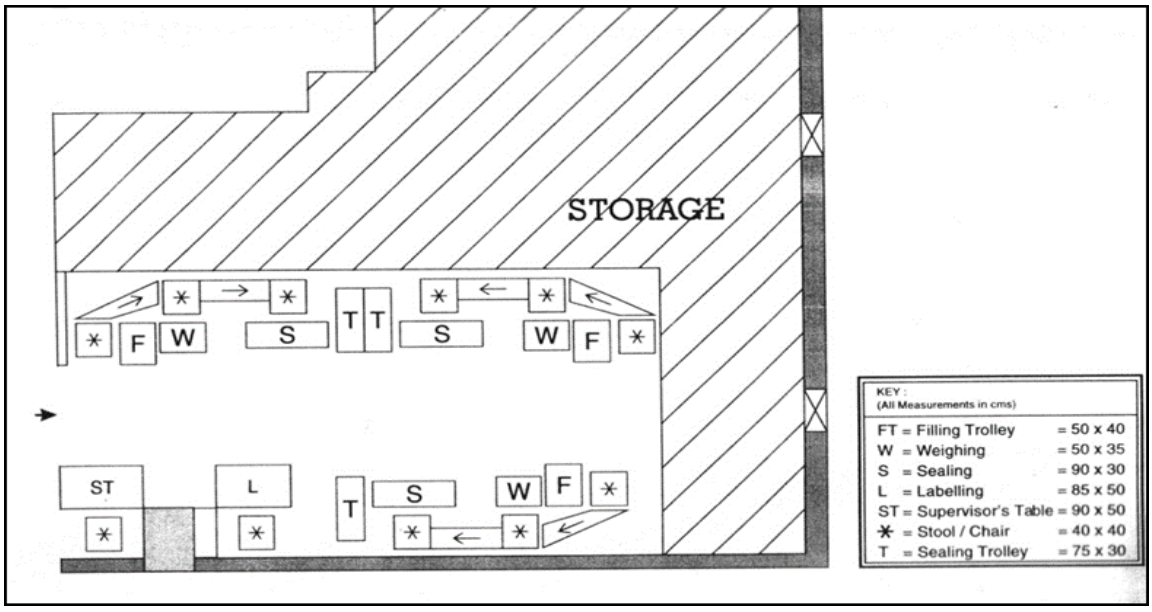

Fig 4: Proposed Layout of the Workstation Design – II.

Summary and Conclusion

Changes in technology are taking place at a rapid rate all over the world. Though most of the physical heavy work is performed by the machines, some of the jobs performed by human have become repetitive in nature. One of the most important occupations involving repetitive work is "Packaging".

Packaging is defined a coordinated system of preparing goods for transport, distribution, storage, retailing and end – use. It can also be defined as a means of ensuring safe delivery to the ultimate consumer, in sound condition at minimum overall cost.

Efficient packaging is a necessity for every kind of food, whether it is fresh or processed. It is an essential link between the food producer and the consumer, and unless performed correctly, the standing of the product suffers and customer goodwill is lost.

In recent years, independent shops have accounted for only a small scale of the total sales of groceries, while multiples and cooperatives of one kind or another dominate grocery sales. This gives the packaging buying department of the multiples and cooperatives considerable purchasing power, which in turn puts pressure on food packers to get their marketing (and hence their packaging) right.

It was noted that food grain packaging departments are not ergonomically designed. Work station geometry is an important factor in causing musculo-skeletal disorders and other problems. Packaging involves continuous sitting which leads to different types of constrained postures which are maintained for eight hours shift without much movements ultimately resulting in occupational health hazards.

The study was undertaken with the objective of studying the ergonomic job problems present in the packaging workstation of the Juhu Sahakari Bhandar and to determine the proper workplace layout. This was done with a view of promoting good health, safety and well-being of employees, decreasing monotony and increase in overall productivity. The existing workstation of the food grain packaging department of Juhu was observed to get the detailed information regarding the multiple activities carried out at the workstation. The most common ergonomic job problems were observed and studied. The dimensions of the work area were measured with a view to design a layout within the available space. The sequence of the various tasks performed was observed, to organize the workstation.

A time study was conducted to preview the sequence of job and time taken for each activity. The results of the time study revealed that maximum time was spent in the weighing activity (115 mins.) as compared to other activities. Keeping the ergonomic principles in mind, redesigned workstations were proposed.

Recommendations

Based on the present study, following recommendations can be made for improvement of working conditions.

- The dimensions of the workstation as recommended under Table 3 should be applied to design the new workstation.
- To overcome the problems of the existing workstation, two new workstation layouts were proposed as given in Fig. 3 and Fig. 4 keeping in mind the ergonomic principles.
- No low sitting (sitting on floor / patla) arrangements are given to the workers, instead the comfortable seat of height 40cms is recommended for all the activities performed by the workers. Accepting the weighing activities where the height of the seat recommended in 35 cms.
- Elbow rest is recommended for labeling activity to support forearm to reduce shoulder fatigue. The height of the elbow rest is recommended as 10 cms below the work surface area which is covered by soft foam PU covering and upholstery.
- An adjustable back rest should be designed for all the seats with special arrangement to support the lower lumbar.
- The seats of all the chairs should be upholstered since the activity is carried out in continuous static sitting position for eight hours.
- A side table with storage and partition is recommended for the labeling activity for keeping labeling accessories.
- A platform cum storage is recommended between the two workplaces, i.e., filling and weighing; weighing and sealing, with a slope of 7.5 cms for smooth sliding of bags from one workplace to another. The direction of the slope should be from filling to weighing and weighing to sealing. The space below the platform should be used for storage of the worker's personal belongings.
- A trolley of 75 cms x 30 cms should be given for the sealing activity so that the packets are directly put in the trolley after sealing.
- An ergonomically designed trolley with a pulley system to put up the gunny bags for filling activity should be provided to avoid various awkward posture adopted by the workers in the existing workstation. This activity should be performed both in standing and sitting position.
- To eliminate the use of plank on the lap for sealing activity, the table should be provided with a flap which can be pulled out when in use and pushed back after use.

References

1. Alexender DL. The Practice and Management of Industrial Ergonomics. Prentice – hall, Inc. 1986, 101-135.
2. Alireza Chhobineh, Mohammadali Lahmi, Houshang Shahnavaz, Reza Khani Jazani, Mostafa Hosseini, Musculoskeletal Symptoms as Related to Ergonomic Factors in Iranian Hand-Woven Carpet Industry and General Guidelines for Workstation Design. International Journal of Occupational Safety and Ergonomics (JOSE). 2004; 10(2):157-168.
3. Alireza Chhobineh, Mohammadali Lahmi, Mostafa Hosseini, Houshang Shahnavaz, Reza Khani Jazani. Workstation Design in Carpet Hand-Weaving Operation: Guidelines for Prevention of Musculoskeletal Disorders. ISSN: 1080-3548 (Print) 2376-9130 (Online) Journal homepage. 2015. http://www.tandfonline.com/loi/tose20.
4. Baba Md Deros, Nor Kamaliana Khamis, Ahmad Rasdan Ismail, Haris Jamaluddin, Azmi Mat Adam, Sarudin Rosli. An Ergonomic study on Assembly Line Workstaton Design. American Journal of Applied Sciences. 2011; 8(11):1195-1201.
5. Carrasco C, Coleman N, Healey S. Packing products for customers: An ergonomics evaluation of three supermarket checkouts. Applied Ergonomics. 1995; 26(2):101-108.
6. Corlett EN. The investigation and Evaluation of work and work places. IEA 88 Plenary paper, Ergonomics. 1998; 31(5):727-734.
7. Dale RH. The horizons for human factors in design.

McGraw Hills Publ. 1981, 191-225.
8. Deros BMD, Mohamad AR, Ismail OW Soon, KC Lee *et al*. Recommended chair and work surfaces dimensions of VDT tasks for Malaysian citizens. Eur. J Sci. Res., 34: 156-167. Forde, M.S. and B. Buchholz, 2004. Task content and physical ergonomic risk factors in construction ironwork. Int. J Indus. Ergon. 2009; 34: 319-333. DOI: 10.1016/j ergon. 2004.04.011
9. Ghazilla RAR, Taha Z, Kamaruddin S, Hasanuddin I. Pilot investigation on the mismatches of classroom furniture and student body dimensions in Malaysian secondary schools. J Soc. Sci. 2010; 6:287-292.
10. Juul Kristensen B, Fallentin N, Ekdahi C. Criteria for classification of posture in repetitive work by observation methods: A review. International Journal of Industrial Ergonomics. 1997; 19(5):397-411.
11. Kothari M. Redesign of Blister Pack machine. Unpublished Diploma Project, IIT, Mumbai. 1977.
12. Kvalseth TO. Ergonomics of workstation design. Butterworths and Company (Publishers) Ltd. 1983, 03-129.
13. Launis M, Vuori M, Lehtela J. Who is the workplace designer? – Towards a collaborative mode of action. Int. Journal of Industrial Ergonomics. 1996; 17:331-341.
14. Mossink JCM. Case history: Design of a packaging workstation. Ergonomics 1990; 33(4):399-406
15. Sakineh Varmazyar, Ali Safari Varyani, Isa Mohammadi Zeidi, Hasan Jahani Hashemi. Evaluation Working Posture and Musculoskeletal Disorders Prevalence in Pharmacy Packaging Workers. European Journal of Scientific Research ISSN 1450-216X. 2009; 29(1):82-88.