

## A Proposed REBA on Small Scale Forging Industry

Er. Surinder Singh, Er. Amanjot Singh, Er. Harvinder Lal,

Department of Mechanical engineering, CT group of institutions, Jalandhar, India, Department of Mechanical engineering,  
Ramgharia polytechnic college, phagwara, India, 9914806868.  
Department of Mechanical engineering, RIET, Phagwara, India,

**Abstract:** Musculoskeletal disorders (MSDs) are common health problem throughout the world. Work related musculoskeletal disorders are group of painful disorders of muscles, tendons and nerves. The low back or lumber area, serves a number of important functions for the men in working area many occupational tasks in industrial area still associated with strenuous working postures and movement. Assessment of exposure levels to MSD risk factors can be an appropriate base for planning and implementing interventional ergonomics programs in the workplace. Combined with a heavy physical workload, it results in a high frequency of work-related musculoskeletal disorders. The present study was aimed to evaluate the musculoskeletal disorder (MSD) of workers engaged in Small scale forging industries. Study was conducted on 102 workers of a forging industry using the posture analysis tool REBA Method. A video showing the different activities of the workers was shot and the snapshots were taken from it for the analysis. The results of REBA showed that about 7.63% of the workers were under very high risk levels and required immediate change. About 44.6% of the workers were at high risk levels which required changes soon and 45.03% of the workers were at medium risk levels. About 2.67% of the workers were at lower risk levels. The present Study recommended the awareness and proper ergonomics training to the workers.

**Keywords:** Musculoskeletal disorders, men, forging industry, REBA.

### I. Introduction

There has been an increasing effort in recent years to investigate the causes of musculoskeletal disorders (MSDs) and to take action to prevent them. This has led to increasing recognition from workers, employers and government agencies that a strong relationship exists between factors within the working environment and the development of MSDs, and that these conditions result in significant sickness absence and reduced productivity. Musculoskeletal Disorders (MSD) are injuries affecting muscles, tendons, ligaments and nerves. They are sometimes called Repetitive Strain Injuries (RSI), Cumulative Trauma Disorders (CTD) and Repetitive Motion Injuries (RMI). MSD develop due to the effects of repetitive, forceful or awkward movements on injuries include Low Back Strain, Neck Strain, Tendonitis, Carpal Tunnel Syndrome (CTS) Rotator Cuff Joints, ligaments and other soft tissues. The objective of this study is to analyse the working postures of workers engaged in various processes of small scale forging industry. The study used assessment tool REBA (Rapid entire body Assessment), was developed by Hignett, S. and McAtamney, L. 2000, to provide a quick and easy observational postural analysis tool for whole body activities (static and dynamic giving musculoskeletal risk action level [1]. J.N.Saraji et al. (2004) were evaluation of WMSDs risk factors among the crew of the Iranian Ports and shipping organization's vessels. This paper clarify the WMSDs are major problem in almost all countries and are important causes of work incapacity and loss of work days. The aim of their studies is evaluation of WMSDs symptoms among the workers by using Nordic Musculoskeletal Questionnaire (NMQ) and determination of WMSDs risk factors by application of OWAS. After determination of risk factors, the OWAS methods can be used to identify any possible correction in working posture that leads to a better and less harmful posture [2]. Cleaning is associated with high physical and psychosocial workloads and musculoskeletal disorders related to it were studied. A few studies concern equipment design, working environments and factors affecting individual workers. A need to conduct research on cleaning tools and equipment, working environments and individual risk factors is apparent [3]. The study used assessment tool RULA (Rapid Upper Limb Assessment), REBA was developed by McAtamney, L. and Corlett, to provide a rapid objective measure of musculoskeletal risk caused by mainly sedentary tasks where upper body demands were high; where work related upper limb disorders are reported [4]. The relationship between the subjective ride comfort in a vehicle seat and whole-body vibration can be modeled using frequency weightings and rms averaging. From the results obtained in this study, it was clear that the alternative approach could give superior predictions of comfort than the method used in ISO 2631-1 [5]. Musculoskeletal disorders (MSDs) are common health problem throughout the world. Work related musculoskeletal disorders are group of painful disorders of muscles, tendons and nerves, recommended the awareness and proper ergonomics training to the workers [6]. A significant proportion of the works are working in very bad postures. The study recommended proposed that there is dire need of implementation of ergonomics intervention with proper awareness among worker[7].

### II. Material And Methods

The study was done in small scale forging industries in Ludhiana and Jalandhar Region. A video of different sections like forging, punching, Trimming Furnace, broaching and grinding etc. showing different movements of the workers during an activity was recorded. Snapshots of 102 workers working in different sections were obtained. The snapshots were analyzed to fill the scores in REBA.

### III. Reba Method

REBA Method is a quick and easy to use observational postural analysis tool for whole body activities and giving a musculoskeletal risk action level. The method is similar to RULA tool where the assessor assigns scores to postures and body alignment based on body part diagram. Load, Force and coupling scores are added to calculation for the body and then final score for both groups are summated to form the final action score .The REBA method evaluate the ergonomics risk factor by observation the posture of employees while they working at their workstation directly (Hignett, S. and McAtamney, L. 2000).Postural and biomechanical loading was assessed on the entire body by valid REBA method. We used several score in this method with the help of REBA score sheet, that the scores evaluate the posture of different body parts Neck, Trunk and Legs give posture score A with the help of standard Table and Upper Arm, Lower Arm, Wrist, and Wrist twist give the posture score B with the help of standard Table . The loading or coupling scores were added to posture scores A and posture score B to obtain scores A and B, respectively (McAtamney and Corlett 1993). Combination of scores A and score B give the Grand score with the use of standard Table and table score C is obtained. After this the activity score is added in the table score C the final REBA score is obtained. The range of Grand scores varies from 1 to 11 and reflects the musculoskeletal loading associated with the worker's posture. Whereas low scores of 1 indicate that the work posture is acceptable if not maintained or repeated for long time (action level 1), For low score of 2 to 3, further investigation is needed and changes may be necessary (action level 2). Investigation and changes are required for scores of 4 to 7 (action level 3). Further investigation and changes are required soon for score of 8 to 10 (action level 4). Further investigation and the changes required immediately for the score of 11 and onward. REBA action level is shown in Table -1. REBA score 1 show the negligible risk level, REBA score 2 to 3 shows the low level risk, REBA score 4 to 7 shows the medium level risk, REBA score 8 to 10 shows the high level risk. REAB score 11 to 12 shows very high level risk. Figure 2 to 5 shows the work of worker at different processes in awkward posture like shearing, furnace unloading, forging process, grinding process and picking or placing.

Table 1. Analysis of REBA

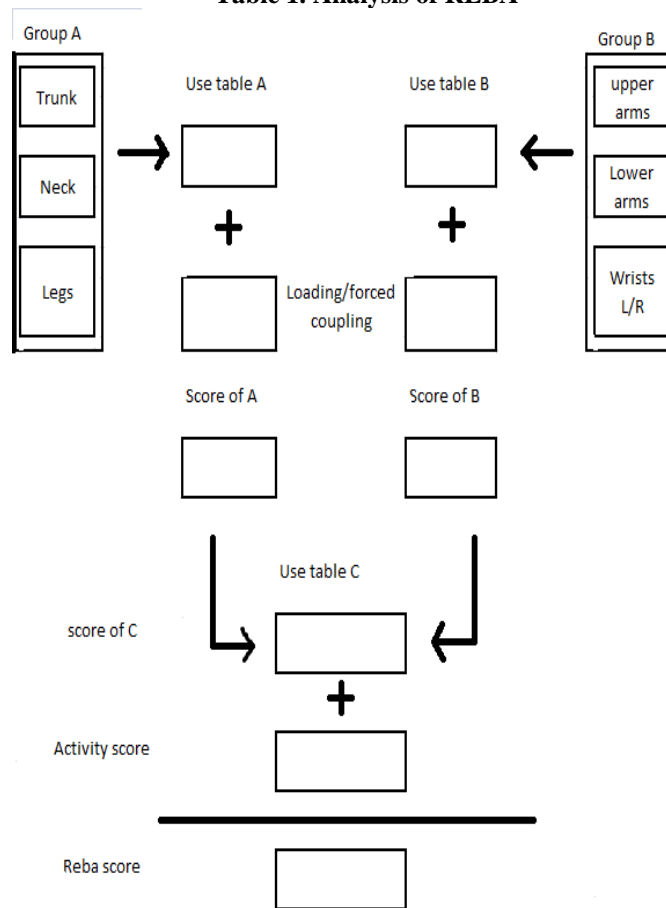


Figure-1 REBA Score Sheet

REBA SCORE	Risk level	ACTION LEVEL
1	Negligible	Corrective action including further assessment is <b>not necessary</b>
2 to 3	Low	Corrective action including further assessment <b>may be necessary</b>
4 to 7	medium	Corrective action including further assessment is <b>necessary</b>
8 to 10	High	Corrective action including further assessment is <b>necessary soon</b>
11 to 15	Very high	Corrective action including further assessment is <b>necessary now</b>



Figure 2: Odd posture in Picking and placing



Fig 3: Odd posture in Cutting



Fig: 4 : Odd posture in Furnance loading/ unloading



Fig: 5: Odd posture in Grinding

#### IV. RESULTS

The results of the REBA assessment of the Workers are shown in Table 2, 3. According to this technique of posture analysis 2.67 % of workers are working in Low Risk Level Posture and requires further investigation and changes may not be required. About 45.03 % workers were found be at medium level and require Investigation and changes are necessary. Around 44.6% workers are working in posture of high risk level and require corrective action required very soon. Around 7.63% workers are working in posture of very high risk level and require corrective action required immediately. These results reveal that all categories of the risk levels exist in jobs postures from left to right positions. In first category i.e. Blanking, Cutting and Shearing as shown in table 2. 47% of this category is of Medium level risk in which investigation is required and changes are necessary. 50% of this category is calculated to be as high level risk and rest 2.9% is of very high level risk, Investigations are to be done immediately and changes are needed as soon as possible. Next category in the table no.2 is of Furnace Loading in this category 16.9% of the postures fall under medium level risk, 64% comes under high risk and 18.8 % fall under High level risk. Investigations are required for all level of risks and changes are to be done according to the need.

**Table.2 No. of posture with REBA score in each section and Abbreviations are L=Left, R=Right & T=Total**

Process	REBA SCORE														
	1			2 to 3			4 to 7			8 to 10			11 to 12		
	L	R	T	L	R	T	L	R	T	L	R	T	L	R	T
Blanking, Cutting, Shearing	0	0	0	0	0	0	1	6	16	1	6	17	1	0	1
Furnace loading	0	0	0	0	0	0	3	6	9	1	2	34	3	7	10
Hammering	0	0	0	1	1	2	1	13	26	3	9	12	0	0	0
Punching & Trimming	0	0	0	0	0	0	1	10	20	7	9	16	1	0	1
Grinding & Drilling	0	0	0	0	0	0	7	7	14	4	8	12	2	0	2
Broaching, Chamfering & Heat Treatment	0	0	0	1	1	2	4	1	5	0	0	0	0	0	0
Inspection	0	0	0	0	0	0	0	6	6	2	0	2	0	0	0
Picking & Placing	0	0	0	3	0	3	1	2	15	1	1	22	5	1	6
Lathe & Welding	0	0	0	0	0	0	2	5	7	2	0	2	0	0	0
<b>TOTAL</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>4</b>	<b>2</b>	<b>7</b>	<b>6</b>	<b>56</b>	<b>118</b>	<b>5</b>	<b>6</b>	<b>11</b>	<b>12</b>	<b>8</b>	<b>20</b>

Third category of the table is Hammering, Hammering is the main operation of the forging as the power hammer is dropped and the shape and size of the product is changed, so by the calculations 5 % of the postures are in the low level risks , 65% are in the medium level risks and rest 18.8% is under high risk. Investigations are required for all level of risks and changes are to be done according to the need. Further comes the process of the Punching and Trimming as from the table is that 52% is of medium level risks, 42% is of high level risks and remaining 2.6% is very high risk. Next is Grinding and Drilling 50% is medium level, 42.8% is high risks and 7% is very high risks, scope of improvement is always there so changes are to be made. Whereas in the next category broaching, chamfering and heat treatment there is only 28% of low level and 71% of medium risks as there is no high risks in these processes. Inspection is the most important aspect of any field which determines the quality of the product. but during there is always posture failures as no low level, 75% is of high level and 25% is of very high risks. Then comes the material handling or Picking and placing, in this category postures calculations are 6% of low level risks, 33% of medium and 48% of high risks and 13% is very high level risk. Investigations are to be made for better material handling methods. Last category of the table is Lathe and Welding. In this processes there is also scope of improvement as calculated as 77% of medium level risks and 22% of high risks are involved. As mentioned in the above processes examinations are to be made to check whether the methods can be improved to reduce the load on the worker and he could perform his duties with full efforts. Table-2 shows the No. of posture with REBA score in each section and. No. of posture left hand and right hand with percentage and risk level shown in Table-3.

**Table.3 No. of posture left hand and right hand with percentage and risk level**

REBA score	Risk level	No. of worker's posture		%age of worker's posture	
		Left	Right	Left	Right
1	Negligible	0	0	0	0
2 to 3	Low level	5	2	3.7	1.5
4 to 7	Medium level	62	56	46.9	43
8 to 10	High level	53	64	40.1	49.2
11 to 12	very high level	12	8	9	6.1
	Total	132	130		

## V. DISCUSSIONS

After visiting various small scale industries, It was observed that in the small scale industries the ergonomics is hardly given preferences and the space provided to the workers is not appropriate. Workers are performing the operations under great difficulties and bear stress on their bodies. This is due to several reasons as justified by the photographs taken of the workers performing the operations. By using REBA method, it was observed that in every category of processes taken into consideration, each worker is under muscular stress. This has been shown by the percentage calculated from the REBA Score Sheet which is based on the posture analysis of photographs of the worker taken from different small scale industries. It is mandatory to make some urgent improvement in the industries for the betterment of the workers to perform their operations/tasks with minimum load and stress on their bodies. During the calculations of the postures, it was observed that the workers are subjected to different muscular disorders while performing different tasks. In the blanking, cutting and shearing operations the worker has to lift the heavy loads and to hold them for certain time while operation is to be performed. As in the furnace operation, the worker has to bend and the stress is observed on the back and neck. Hence the necessary and requisite improvement should be done in every operation. The owners of the industries must concentrate on the ergonomics to increase the productivity of the worker and to get the best results.

## VI. CONCLUSION

REBA methods of postural analysis closely co-relate with the awkward postures adopted by the male workers. According to REBA Method the postures adopted by workers in these small scale forging industries have been categorized as having high to very high risk level. Blanking, Cutting, Shearing, Picking and placing or furnace loading workers are at very high risk of musculoskeletal disorders hence the ergonomically interventions are required in these sections. Proper training of workers and awareness may reduce the risk of musculoskeletal disorders. The results show that the operators are working in an inadequate working environment with awkward postures the results are supported by the subjective assessment of discomfort.

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#### **Er. Surinder Singh**



I have done my B-Tech in Mechanical Engineering from CT group of Institution, shahpur, jalandhar, under Punjab Technical University Jalandhar INDIA. Currently I am pursuing M.Tech from RIET Phagwara under Punjab Technical University Jalandhar INDIA. From three year I am lecturer in Department of Mechanical engineering, CT group of Institution, shahpur, jalandhar .

#### **Er. Amanjot Singh**



I have done my B-Tech in Mechanical Engineering from lovely institute of engineering and technology jalandhar, under Punjab Technical University Jalandhar INDIA. Currently I am pursuing M.Tech from RIET Phagwara under Punjab Technical University Jalandhar INDIA. From three year I am lecturer in Department of Mechanical engineering, Ramgharia polytechnic college, phagwara

#### **Er. Harvinder Lal**



I have done my B.E in Mechanical Engineering from G.Z.S.C.E.T. Bathinda, Punjab, INDIA. And I had completed my M.Tech in Industrial engineering from Dr. Ambedkar National Institute of Technology. Now I m HOD in RIET Phagwara. I have seven year experience in teaching field.  
Qualification: B.E in Mechanical engineering, M.Tech in Industrial engineering