

Ergonomic Interventions to Control Work-related Musculoskeletal Disorders in Automated Light Assembly Manufacturing System

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ABSTRACT

Ergonomic intervention techniques were adopted to assess and control potential risk factors of work-related musculoskeletal disorders(WMSDs) in the automated light assembly manufacturing system. Ten different kinds of assembly workstations implemented with a conveyor system and twelve female workers were observed and evaluated with careful video film analysis. Several close examinations using sets of checklists established by qualified safety and health organizations, such as NIOSH, OSHA, and ANSI, were conducted and every workers and staffs in the site participated in the self-report questionnaires and off-line interviews. Typical risk factors and symptoms of the upper extremity musculoskeletal disorders were found and categorized into specific parts of body. To reduce risk factors of WMSDs and improve system productivity new revised workstation standards, physical dimensions, were suggested accordant with anthropometric characteristics of workers and a heuristic decision strategy of rotating shift work schedules according to work contents has proposed to mitigate cumulative physical stress. Finally, ergonomic programs of entire company to prevent WMSDs were structured.

Keyword: Work-related musculoskeletal disorders, Ergonomics program, Work-site rotation strategy

1. (ANSI, 1996; Helander, 1995; NIOSH, 1997b).

1960

(Repetition Strain Injuries)

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가 (Fernandez, et al., 1999).

3. 가 1

3.1

가 ,

가 .

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가 가

(rotator cuff syndrome), (hand/wrist tendinitis), (carpal tunnel syndrome)

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가 (Hadler, 2005).

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가 (scia -

. 3.4 ~17.5

가 2

(NIOSH, 2004).

3.2

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가

(NIOSH: National Institute for Occupational Safety and Health, OSHA: Occupational Safety and Health Administration)

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2.

가

2

(intake manifold tuning valve) (166m²) (6, 10 12 . 12~

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(therblig unit)

(work elements)가

(Niebel,

2003).

가

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JIG 3

1)

(worker rotation strategy)

가

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가

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1

JIG 3)

1

가

3.3

1)

가

가

가

가

가 (

, 2002), NIOSH

(NIOSH, 1997a), ANSI

(ANSI, 1996)

RULA(Rapid Upper

Limb Assessment; McAtamney and Corlett, 1993)

가

가

가

1.

가

가

4.2

27

가

6

, 2002)

NIOSH

(NIOSH, 1997a)

가

가

54%가

가 가

	Gear	Plate	Spring	...	Test	Packing	sum
	23	18	24	...	6	26	181
가	24	5	8	...	0	4	84
	41	9	36	...	11	14	161
	29	9	22	...	2	35	142
	0	6	8	...	0	0	50
	0	2	1	...	13	62	160
	0	0	0	...	0	0	10
	0	0	0	...	1	4	5
sum	117	49	99	...	33	145	

3 1 (27%)

1. ()

78.5	61~85.5	
48.58	41	
36.0	46	
104~109	80~84	
46	12~38	
0~45	0~45	
10		
127~144	165	

(: cm)

4.3

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SAFE -

WORK®

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95

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(2).

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4.4.1 1

12 가 , 4가

($12P_4 = 11,880$ 가)

12 가 , 가

. 1) 12 가 ,

2) 1 4 . 3) 12 , 가

4) 1 4

가 . , 가 가

가 .

14 kg

SAFEWORK® NIOSH 가 (Waters, 1993) Snook Ciriello 가 (Snook and Ciriello, 1991)

(2~3m 가) 6.8kg

가

12가

가 가 12 가 가 12

가
가
(Franz and Miller, 1993)
(Cappanera and Gallo, 2004)
(non - deterministic polynomial complete problems)
가 (Harris and Bohle, 1998).
가 가 가
3) ()
10가 가
가
가
(column) 가 ,1
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4.4.2

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가
(Analytic Hierarchy Program: AHP) 가 10가
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	2	3	4	5	6	7	8	9	10	11	12	1	
	3	4	5	6	7	8	9	10	11	12	1	2	
	
	11	12	1	2	3	4	5	6	7	8	9	10	
	12	1	2	3	4	5	6	7	8	9	10	11	
	1	Gear											
	2	Motor											
	3	Soldering #1 - 1								/			
	4	Test								/			
			
	10	Wheel											
11	Packing								/				
12	Soldering #2 - 2								/				

2.

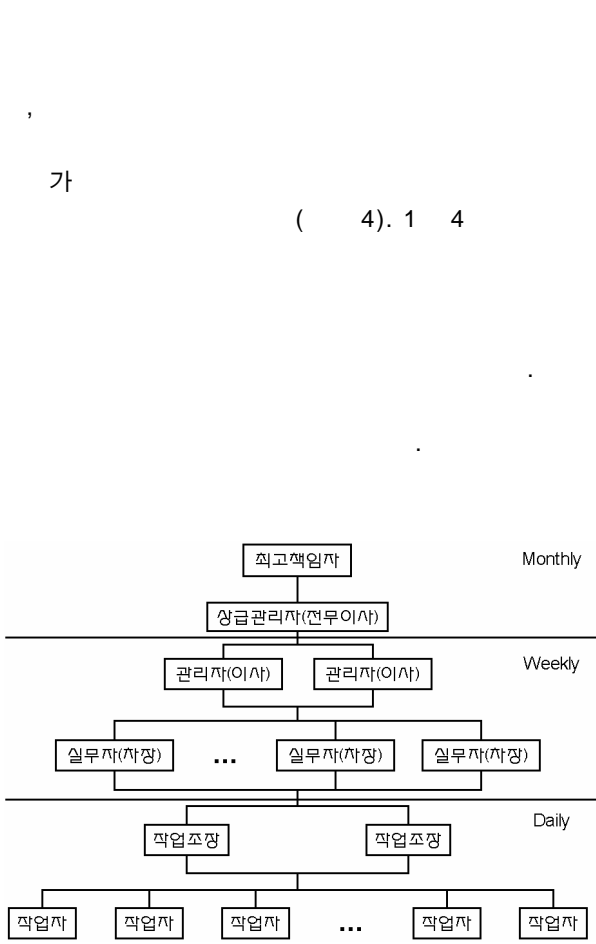
...					
0.075	0.076	...	0.058	0.147	0.103
0.376	0.379	...	0.463	0.235	0.328
0.151	0.095	...	0.077	0.176	0.140
0.019	0.063	...	0.046	0.088	0.041
0.038	0.076	...	0.046	0.088	0.055
0.301	0.189	...	0.232	0.176	0.247
0.015	0.047	...	0.039	0.029	0.025
Sum					1.000

3. ()

Gear	Plate	Spring	Motor	Screw	Soldering2	packing
21.37	6.73	18.24	9.70	7.63	11.52	15.93

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KOSHA code H - 28 - 2002

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가

가

0.5~3.5 ,

가

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가 가

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(가): KOSHA CODE H-28-2002, 2002.

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