

## BAB 6 KESIMPULAN DAN SARAN

### 6.1. Kesimpulan

Berdasarkan hasil analisis dari penelitian yang telah dilakukan, maka didapatkan kesimpulan bahwa penggunaan alat pada proses pembuatan tali tampar terbukti dapat menurunkan risiko keluhan *musculoskeletal* setelah dilakukan analisis penilaian postur kerja dengan menggunakan metode *Rapid Upper Limb Assessment* (RULA). Hasil skor akhir RULA postur kerja operator pada proses pembuatan tali tampar dengan menggunakan Mesin Pemintal memiliki resiko yang sedang yaitu pada level 2, sedangkan tanpa menggunakan mesin pemintal hasil skor akhir RULA memiliki resiko yang tinggi yaitu 3. Penurunan risiko yang terjadi dapat mengurangi keluhan *musculoskeletal*.

### 6.2. Saran

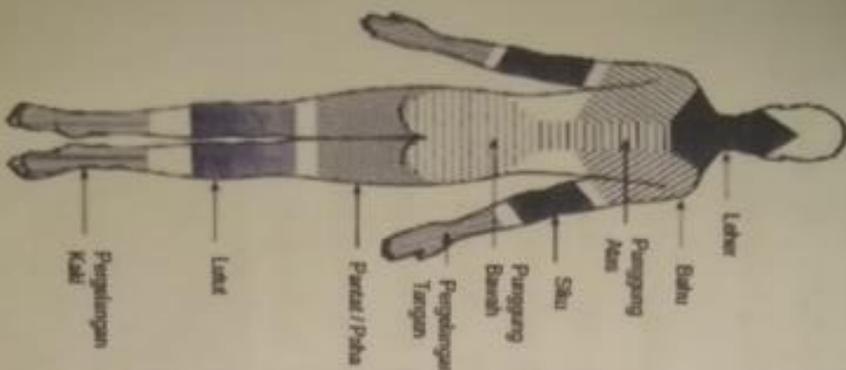
Saran yang dapat diberikan kepada penelitian selanjutnya agar perancangan selanjutnya juga dapat memberikan rancangan sistem yang dapat melakukan penarikan tali secara otomatis serta dapat menerapkan *gear box* pada mesin yang dapat mereduksi kecepatan dari mesin.

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## LAMPIRAN

Lampiran 1. Kuesioner Nordic Body Map



	Apakah anda mempunyai keluhan (nyeri, pegal atau sakit) selama 12 bulan terakhir pada anggota tubuh berikut saat bekerja?			Hanya dijawab jika jawaban pada kolom 1 "Ya"		
	Apakah dalam 12 bulan terakhir, masalah tersebut mengakibatkan Anda tidak dapat bekerja secara normal?			Apakah selama 7 hari terakhir ini mempunyai keluhan (nyeri, pegal atau sakit) pada anggota tubuh berikut saat bekerja?		
Leher	<input type="checkbox"/> Tidak	<input checked="" type="checkbox"/> Ya	<input type="checkbox"/> Tidak	<input type="checkbox"/> Tidak	<input checked="" type="checkbox"/> Ya	<input type="checkbox"/> Tidak
Bahu	<input type="checkbox"/> Tidak	<input type="checkbox"/> Ya, Sebelah Kanan	<input type="checkbox"/> Tidak	<input checked="" type="checkbox"/> Ya	<input type="checkbox"/> Tidak	<input checked="" type="checkbox"/> Ya, Sebelah Kanan
		<input type="checkbox"/> Ya, Sebelah Kiri			<input type="checkbox"/> Ya, Sebelah Kiri	
		<input checked="" type="checkbox"/> Ya, Keduanya			<input type="checkbox"/> Ya, Keduanya	
Siku	<input checked="" type="checkbox"/> Tidak	<input type="checkbox"/> Ya, Sebelah Kanan	<input checked="" type="checkbox"/> Tidak	<input type="checkbox"/> Ya	<input checked="" type="checkbox"/> Tidak	<input type="checkbox"/> Ya, Sebelah Kanan
		<input type="checkbox"/> Ya, Sebelah Kiri			<input type="checkbox"/> Ya, Sebelah Kiri	
		<input type="checkbox"/> Ya, Keduanya			<input type="checkbox"/> Ya, Keduanya	
Pergelangan Tangan	<input type="checkbox"/> Tidak	<input checked="" type="checkbox"/> Ya, Sebelah Kanan	<input type="checkbox"/> Tidak	<input checked="" type="checkbox"/> Ya	<input checked="" type="checkbox"/> Tidak	<input type="checkbox"/> Ya, Sebelah Kanan
		<input type="checkbox"/> Ya, Sebelah Kiri			<input type="checkbox"/> Ya, Sebelah Kiri	
		<input type="checkbox"/> Ya, Keduanya			<input type="checkbox"/> Ya, Keduanya	
Punggung Atas	<input type="checkbox"/> Tidak	<input checked="" type="checkbox"/> Ya	<input type="checkbox"/> Tidak	<input checked="" type="checkbox"/> Ya	<input type="checkbox"/> Tidak	<input checked="" type="checkbox"/> Ya
Punggung Bawah	<input type="checkbox"/> Tidak	<input checked="" type="checkbox"/> Ya	<input type="checkbox"/> Tidak	<input checked="" type="checkbox"/> Ya	<input type="checkbox"/> Tidak	<input checked="" type="checkbox"/> Ya
Paha atau Pantat	<input type="checkbox"/> Tidak	<input type="checkbox"/> Ya, Sebelah Kanan	<input type="checkbox"/> Tidak	<input checked="" type="checkbox"/> Ya	<input checked="" type="checkbox"/> Tidak	<input type="checkbox"/> Ya, Sebelah Kanan
		<input type="checkbox"/> Ya, Sebelah Kiri			<input type="checkbox"/> Ya, Sebelah Kiri	
		<input checked="" type="checkbox"/> Ya, Keduanya			<input type="checkbox"/> Ya, Keduanya	
Lutut	<input type="checkbox"/> Tidak	<input type="checkbox"/> Ya, Sebelah Kanan	<input type="checkbox"/> Tidak	<input checked="" type="checkbox"/> Ya	<input checked="" type="checkbox"/> Tidak	<input type="checkbox"/> Ya, Sebelah Kanan
		<input type="checkbox"/> Ya, Sebelah Kiri			<input type="checkbox"/> Ya, Sebelah Kiri	
		<input checked="" type="checkbox"/> Ya, Keduanya			<input checked="" type="checkbox"/> Ya, Keduanya	
Pergelangan Kaki	<input checked="" type="checkbox"/> Tidak	<input type="checkbox"/> Ya, Sebelah Kanan	<input checked="" type="checkbox"/> Tidak	<input type="checkbox"/> Ya	<input checked="" type="checkbox"/> Tidak	<input type="checkbox"/> Ya, Sebelah Kanan
		<input type="checkbox"/> Ya, Sebelah Kiri			<input type="checkbox"/> Ya, Sebelah Kiri	
		<input type="checkbox"/> Ya, Keduanya			<input type="checkbox"/> Ya, Keduanya	

## Lampiran 2. Worksheet RULA Manual/ Mengambil Serat/Kanan Tubuh

*Manual / mengambil serat / kanan*

### RULA Employee Assessment Worksheet

based on RULA: a survey method for the investigation of work-related upper limb disorders, McAtamney & Corlett, Applied Ergonomics 1993, 24(2): 91-99

#### A. Arm and Wrist Analysis

**Step 1: Locate Upper Arm Position:**

**Step 1a. Adjust:**  
 If shoulder is raised: +1  
 If upper arm is abducted: +1  
 If arm is supported or person is leaning: -1

**Step 2: Locate Lower Arm Position:**

**Step 2a. Adjust:**  
 If either arm is working across midline or out to side of body: Add +1

**Step 3: Locate Wrist Position:**

**Step 3a. Adjust:**  
 If wrist is bent from midline: Add +1

**Step 4: Wrist Twist:**  
 If wrist is twisted in mid-range: +1  
 If wrist is at or near end of range: +2

**Step 5: Look-up Posture Score in Table A:**  
 Using values from steps 1-4 above, locate score in Table A.

**Step 6: Add Muscle Use Score**  
 If posture mainly static (i.e. held 10 minutes), Or if action repeated occurs 4X per minute: -1

**Step 7: Add Force/Load Score**  
 If load < 4.4 lbs (intermittent): +0  
 If load 4.4 to 22 lbs (intermittent): +1  
 If load 4.4 to 22 lbs (static or repeated): +2  
 If more than 22 lbs or repeated or shocks: +3

**Step 8: Find Row in Table C**  
 Add values from steps 5-7 to obtain Wrist and Arm Score. Find row in Table C.

#### SCORES

**Table A: Wrist Posture Score**

Upper Arm	Lower Arm	Wrist		Wrist		Wrist	
		Twist	Twist	Twist	Twist		
1	1	1	2	2	3	3	3
1	2	2	2	2	3	3	3
1	3	2	3	3	3	3	4
1	4	2	3	3	3	3	4
2	1	2	3	3	3	3	4
2	2	3	3	3	3	3	4
2	3	3	3	3	3	3	4
2	4	3	3	3	3	3	4
3	1	3	3	3	3	3	4
3	2	3	3	3	3	3	4
3	3	3	3	3	3	3	4
3	4	3	3	3	3	3	4
4	1	4	4	4	4	4	5
4	2	4	4	4	4	4	5
4	3	4	4	4	4	4	5
4	4	4	4	4	4	4	5
5	1	5	5	5	5	5	6
5	2	5	5	5	5	5	6
5	3	5	5	5	5	5	6
5	4	5	5	5	5	5	6
6	1	6	6	6	6	6	7
6	2	6	6	6	6	6	7
6	3	6	6	6	6	6	7
6	4	6	6	6	6	6	7

**Table B: Neck, trunk and leg score**

Neck	Trunk		Legs			
	1	2	1	2		
1	1	2	3	4	5	6
1	2	2	3	4	4	5
1	3	3	3	4	4	5
1	4	4	4	4	4	5
1	5	5	5	5	5	6
1	6	6	6	6	6	7
1	7	7	7	7	7	8
1	8	8	8	8	8	9
1	9	9	9	9	9	10

**Table C: Neck, trunk and leg score**

Wrist and Arm Score	Neck, trunk and leg score									
	1	2	3	4	5	6	7	8	9	10
1	1	2	3	3	4	4	5	5	6	6
2	2	2	3	3	4	4	5	5	6	6
3	3	3	3	4	4	5	5	6	6	6
4	4	4	4	4	5	5	6	6	7	7
5	5	5	5	5	5	6	6	7	7	7
6	6	6	6	6	6	6	7	7	7	7
7	7	7	7	7	7	7	7	7	7	7
8	8	8	8	8	8	8	8	8	8	8

**Scoring: (final score from Table C)**  
 1 or 2 = acceptable posture  
 3 or 4 = further investigation, change may be needed  
 5 or 6 = further investigation, change soon  
 7 = investigate and implement change

**Step 9: Locate Neck Position:**

**Step 9a. Adjust:**  
 If neck is twisted: +1  
 If neck is side bending: +1

**Step 10: Locate Trunk Position:**

**Step 10a. Adjust:**  
 If trunk is twisted: +1  
 If trunk is side bending: +1

**Step 11: Legs:**  
 If legs and feet are supported: -1  
 If not: +1

**Step 12: Look-up Posture Score in Table B:**  
 Using values from steps 9-11 above, locate score in Table B.

**Step 13: Add Muscle Use Score**  
 If posture mainly static (i.e. held 10 minutes), Or if action repeated occurs 4X per minute: -1

**Step 14: Add Force/Load Score**  
 If load < 4.4 lbs (intermittent): +0  
 If load 4.4 to 22 lbs (intermittent): +1  
 If load 4.4 to 22 lbs (static or repeated): +2  
 If more than 22 lbs or repeated or shocks: +3

**Step 15: Find Column in Table C**  
 Add values from steps 12-14 to obtain Neck, Trunk and Leg Score. Find Column in Table C.

**Task name:** \_\_\_\_\_ **Reviewer:** \_\_\_\_\_ **Date:** \_\_\_\_\_

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## Lampiran 3. Worksheet RULA Manual/ Mengambil Serat/Kiri Tubuh

*Manual / mengambil serat / kiri*

### RULA Employee Assessment Worksheet

based on RULA: a survey method for the investigation of work-related upper limb disorders, McAtamney & Corlett, Applied Ergonomics 1993, 24(2): 91-99

#### A. Arm and Wrist Analysis

**Step 1: Locate Upper Arm Position:**

**Step 1a. Adjust:**  
 If shoulder is raised: +1  
 If upper arm is abducted: +1  
 If arm is supported or person is leaning: -1

**Step 2: Locate Lower Arm Position:**

**Step 2a. Adjust:**  
 If either arm is working across midline or out to side of body: Add +1

**Step 3: Locate Wrist Position:**

**Step 3a. Adjust:**  
 If wrist is bent from midline: Add +1

**Step 4: Wrist Twist:**  
 If wrist is twisted in mid-range: +1  
 If wrist is at or near end of range: +2

**Step 5: Look-up Posture Score in Table A:**  
 Using values from steps 1-4 above, locate score in Table A.

**Step 6: Add Muscle Use Score**  
 If posture mainly static (i.e. held 10 minutes), Or if action repeated occurs 4X per minute: -1

**Step 7: Add Force/Load Score**  
 If load < 4.4 lbs (intermittent): +0  
 If load 4.4 to 22 lbs (intermittent): +1  
 If load 4.4 to 22 lbs (static or repeated): +2  
 If more than 22 lbs or repeated or shocks: +3

**Step 8: Find Row in Table C**  
 Add values from steps 5-7 to obtain Wrist and Arm Score. Find row in Table C.

#### SCORES

**Table A: Wrist Posture Score**

Upper Arm	Lower Arm	Wrist		Wrist		Wrist	
		Twist	Twist	Twist	Twist		
1	1	1	2	2	3	3	3
1	2	2	2	2	3	3	3
1	3	2	3	3	3	3	4
1	4	2	3	3	3	3	4
2	1	2	3	3	3	3	4
2	2	3	3	3	3	3	4
2	3	3	3	3	3	3	4
2	4	3	3	3	3	3	4
3	1	3	3	3	3	3	4
3	2	3	3	3	3	3	4
3	3	3	3	3	3	3	4
3	4	3	3	3	3	3	4
4	1	4	4	4	4	4	5
4	2	4	4	4	4	4	5
4	3	4	4	4	4	4	5
4	4	4	4	4	4	4	5
5	1	5	5	5	5	5	6
5	2	5	5	5	5	5	6
5	3	5	5	5	5	5	6
5	4	5	5	5	5	5	6
6	1	6	6	6	6	6	7
6	2	6	6	6	6	6	7
6	3	6	6	6	6	6	7
6	4	6	6	6	6	6	7

**Table B: Neck, trunk and leg score**

Neck	Trunk		Legs			
	1	2	1	2		
1	1	2	3	4	5	6
1	2	2	3	4	4	5
1	3	3	3	4	4	5
1	4	4	4	4	4	5
1	5	5	5	5	5	6
1	6	6	6	6	6	7
1	7	7	7	7	7	8
1	8	8	8	8	8	9
1	9	9	9	9	9	10

**Table C: Neck, trunk and leg score**

Wrist and Arm Score	Neck, trunk and leg score									
	1	2	3	4	5	6	7	8	9	10
1	1	2	3	3	4	4	5	5	6	6
2	2	2	3	3	4	4	5	5	6	6
3	3	3	3	4	4	5	5	6	6	6
4	4	4	4	4	5	5	6	6	7	7
5	5	5	5	5	5	6	6	7	7	7
6	6	6	6	6	6	6	7	7	7	7
7	7	7	7	7	7	7	7	7	7	7
8	8	8	8	8	8	8	8	8	8	8

**Scoring: (final score from Table C)**  
 1 or 2 = acceptable posture  
 3 or 4 = further investigation, change may be needed  
 5 or 6 = further investigation, change soon  
 7 = investigate and implement change

**Step 9: Locate Neck Position:**

**Step 9a. Adjust:**  
 If neck is twisted: +1  
 If neck is side bending: +1

**Step 10: Locate Trunk Position:**

**Step 10a. Adjust:**  
 If trunk is twisted: +1  
 If trunk is side bending: +1

**Step 11: Legs:**  
 If legs and feet are supported: -1  
 If not: +1

**Step 12: Look-up Posture Score in Table B:**  
 Using values from steps 9-11 above, locate score in Table B.

**Step 13: Add Muscle Use Score**  
 If posture mainly static (i.e. held 10 minutes), Or if action repeated occurs 4X per minute: -1

**Step 14: Add Force/Load Score**  
 If load < 4.4 lbs (intermittent): +0  
 If load 4.4 to 22 lbs (intermittent): +1  
 If load 4.4 to 22 lbs (static or repeated): +2  
 If more than 22 lbs or repeated or shocks: +3

**Step 15: Find Column in Table C**  
 Add values from steps 12-14 to obtain Neck, Trunk and Leg Score. Find Column in Table C.

**Task name:** \_\_\_\_\_ **Reviewer:** \_\_\_\_\_ **Date:** \_\_\_\_\_

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## Lampiran 4. Worksheet RULA Manual/ Memintal Serat/Kanan Tubuh

manual / memintal serat / kanan

### RULA Employee Assessment Worksheet

Based on RULA: a survey method for the investigation of work-related upper limb disorders, McAtamney & Corlett, Applied Ergonomics 1993, 24(2), 91-99

#### A. Arm and Wrist Analysis

**Step 1: Locate Upper Arm Position:**

Step 1a. Adjust:  
If shoulder is raised: +1  
If upper arm is abducted: -1  
If arm is supported or person is leaning: -1

**Step 2: Locate Lower Arm Position:**

Step 2a. Adjust:  
If either arm is working across midline or out to side of body: Add +1

**Step 3: Locate Wrist Position:**

Step 3a. Adjust:  
If wrist is bent from midline: Add +1

**Step 4: Wrist Twist:**

If wrist is twisted in mid-range: -1  
If wrist is at or near end of range: -2

**Step 5: Look-up Posture Score in Table A:**  
Using values from steps 1-4 above, locate score in Table A.

**Step 6: Add Muscle Use Score**  
If posture mainly static (i.e. hold 10 minutes): +0  
Or if action repeated occurs 4X per minute: -1

**Step 7: Add Force/Load Score**  
If load < 4.4 lbs (intermittent): +0  
If load 4.4 to 22 lbs (intermittent): +1  
If load 4.4 to 22 lbs (static or repeated): -1  
If more than 22 lbs or repeated or blocks: -2

**Step 8: Find Row in Table C:**  
Add values from steps 5-7 to obtain Wrist and Arm Score. Find row in Table C.

#### SCORES

Upper Arm	Lower Arm	Wrist				
		Wrist Twisted	Wrist Twisted	Wrist Twisted	Wrist Twisted	
1	1	1	2	2	3	3
2	2	2	2	2	3	3
3	3	3	3	3	3	4
4	4	4	4	4	4	4
5	5	5	5	5	5	6
6	6	6	6	6	6	7

Wrist and Arm Score	Neck, trunk and leg score					
	1	2	3	4	5	6
1	1	2	3	4	5	6
2	2	3	4	4	5	6
3	3	3	4	4	5	6
4	4	4	5	6	7	7
5	5	6	6	7	7	7
6	6	6	7	7	7	7

**Scoring: (final score from Table C)**  
1 or 2 = acceptable posture  
3 or 4 = further investigation, change may be needed  
5 or 6 = further investigation, change soon  
7 = investigate and implement change

**Final Score: 5**

#### B. Neck, Trunk and Leg Analysis

**Step 9: Locate Neck Position:**

Step 9a. Adjust:  
If neck is twisted: -1  
If neck is side bending: -1

**Step 10: Locate Trunk Position:**

Step 10a. Adjust:  
If trunk is twisted: -1  
If trunk is side bending: -1

**Step 11: Legs:**  
If legs and feet are supported: +1  
If not: -2

Neck	Trunk Posture Score					
	Legs	Legs	Legs	Legs	Legs	Legs
1	1	2	2	3	3	3
2	2	3	3	4	4	4
3	3	3	4	4	5	5
4	4	4	4	5	5	5
5	5	5	5	6	6	6
6	6	6	6	6	6	6

**Step 12: Look-up Posture Score in Table B:**  
Using values from steps 9-11 above, locate score in Table B.

**Step 13: Add Muscle Use Score**  
If posture mainly static (i.e. hold 10 minutes): +0  
Or if action repeated occurs 4X per minute: -1

**Step 14: Add Force/Load Score**  
If load < 4.4 lbs (intermittent): +0  
If load 4.4 to 22 lbs (intermittent): +1  
If load 4.4 to 22 lbs (static or repeated): -1  
If more than 22 lbs or repeated or blocks: -2

**Step 15: Find Column in Table C**  
Add values from steps 12-14 to obtain Neck, Trunk and Leg Score. Find Column in Table C.

Task name: \_\_\_\_\_

Reviewer: \_\_\_\_\_

Date: \_\_\_\_\_

## Lampiran 5. Worksheet RULA Manual/ Memintal Serat/Kiri Tubuh

manual / memintal serat / kiri

### RULA Employee Assessment Worksheet

Based on RULA: a survey method for the investigation of work-related upper limb disorders, McAtamney & Corlett, Applied Ergonomics 1993, 24(2), 91-99

#### A. Arm and Wrist Analysis

**Step 1: Locate Upper Arm Position:**

Step 1a. Adjust:  
If shoulder is raised: +1  
If upper arm is abducted: -1  
If arm is supported or person is leaning: -1

**Step 2: Locate Lower Arm Position:**

Step 2a. Adjust:  
If either arm is working across midline or out to side of body: Add +1

**Step 3: Locate Wrist Position:**

Step 3a. Adjust:  
If wrist is bent from midline: Add +1

**Step 4: Wrist Twist:**

If wrist is twisted in mid-range: -1  
If wrist is at or near end of range: -2

**Step 5: Look-up Posture Score in Table A:**  
Using values from steps 1-4 above, locate score in Table A.

**Step 6: Add Muscle Use Score**  
If posture mainly static (i.e. hold 10 minutes): +0  
Or if action repeated occurs 4X per minute: -1

**Step 7: Add Force/Load Score**  
If load < 4.4 lbs (intermittent): +0  
If load 4.4 to 22 lbs (intermittent): +1  
If load 4.4 to 22 lbs (static or repeated): -1  
If more than 22 lbs or repeated or blocks: -2

**Step 8: Find Row in Table C:**  
Add values from steps 5-7 to obtain Wrist and Arm Score. Find row in Table C.

#### SCORES

Upper Arm	Lower Arm	Wrist				
		Wrist Twisted	Wrist Twisted	Wrist Twisted	Wrist Twisted	
1	1	1	2	2	3	3
2	2	2	2	2	3	3
3	3	3	3	3	3	4
4	4	4	4	4	4	4
5	5	5	5	5	5	6
6	6	6	6	6	6	7

Wrist and Arm Score	Neck, trunk and leg score					
	1	2	3	4	5	6
1	1	2	3	3	4	5
2	2	3	4	4	5	6
3	3	3	4	4	5	6
4	4	4	5	6	7	7
5	5	6	6	7	7	7
6	6	6	7	7	7	7

**Scoring: (final score from Table C)**  
1 or 2 = acceptable posture  
3 or 4 = further investigation, change may be needed  
5 or 6 = further investigation, change soon  
7 = investigate and implement change

**Final Score: 6**

#### B. Neck, Trunk and Leg Analysis

**Step 9: Locate Neck Position:**

Step 9a. Adjust:  
If neck is twisted: -1  
If neck is side bending: -1

**Step 10: Locate Trunk Position:**

Step 10a. Adjust:  
If trunk is twisted: -1  
If trunk is side bending: -1

**Step 11: Legs:**  
If legs and feet are supported: +1  
If not: -2

Neck	Trunk Posture Score					
	Legs	Legs	Legs	Legs	Legs	Legs
1	1	2	2	3	3	3
2	2	3	3	4	4	4
3	3	3	4	4	5	5
4	4	4	4	5	5	5
5	5	5	5	6	6	6
6	6	6	6	6	6	6

**Step 12: Look-up Posture Score in Table B:**  
Using values from steps 9-11 above, locate score in Table B.

**Step 13: Add Muscle Use Score**  
If posture mainly static (i.e. hold 10 minutes): +0  
Or if action repeated occurs 4X per minute: -1

**Step 14: Add Force/Load Score**  
If load < 4.4 lbs (intermittent): +0  
If load 4.4 to 22 lbs (intermittent): +1  
If load 4.4 to 22 lbs (static or repeated): -1  
If more than 22 lbs or repeated or blocks: -2

**Step 15: Find Column in Table C**  
Add values from steps 12-14 to obtain Neck, Trunk and Leg Score. Find Column in Table C.

Task name: \_\_\_\_\_

Reviewer: \_\_\_\_\_

Date: \_\_\_\_\_

## Lampiran 6. Worksheet RULA Manual/ Menggulung Tali /Kanan Tubuh

manual/ menggulung tali /kanan  
RULA Employee Assessment Worksheet

based on RULA: a survey method for the investigation of work-related upper limb disorders, McAtamney & Corlett, Applied Ergonomics 1993, 24(2), 91-99

### A. Arm and Wrist Analysis

**Step 1: Locate Upper Arm Position:**

Step 1a. Adjust:  
If shoulder is raised: -1  
If upper arm is abducted: -1  
If arm is supported or person is leaning: -1

**Step 2: Locate Lower Arm Position:**

Step 2a. Adjust:  
If either arm is working across midline or out to side of body: Add +1

**Step 3: Locate Wrist Position:**

Step 3a. Adjust:  
If wrist is bent from midline: Add +1

**Step 4: Wrist Twist:**

If wrist is twisted in mid-range: -1  
If wrist is at or near end of range: -2

**Step 5: Look-up Posture Score in Table A:**  
Using values from steps 1-4 above, locate score in Table A.

**Step 6: Add Muscle Use Score**  
If posture mainly static (i.e. held 10 minutes):  
Or if action repeated occurs 4X per minute: -1

**Step 7: Add Force/Load Score**  
If load < 4.4 lbs (intermittent): -0  
If load 4.4 to 22 lbs (intermittent): -1  
If load 4.4 to 22 lbs (static or repeated): -2  
If more than 22 lbs or repeated or blocks: -3

**Step 8: Find Row in Table C**  
Add values from steps 5-7 to obtain Wrist and Arm Score. Find row in Table C.

### SCORES

**Table A: Wrist Posture Score**

Upper Arm	Lower Arm	Wrist		Wrist		Wrist	
		Tilt	Twist	Tilt	Twist	Tilt	Twist
1	1	1	2	2	2	3	3
1	2	2	2	2	3	3	3
1	3	3	3	3	3	4	4
2	1	2	3	3	3	4	4
2	2	3	3	3	3	4	4
2	3	4	4	4	4	5	5
3	1	3	4	4	4	5	5
3	2	4	4	4	4	5	5
3	3	4	4	4	4	5	5
4	1	4	4	4	4	5	5
4	2	4	4	4	4	5	5
4	3	4	4	4	4	5	5
5	1	5	5	5	5	6	6
5	2	5	5	5	5	6	6
5	3	5	5	5	5	6	6
6	1	7	7	7	7	8	8
6	2	8	8	8	8	9	9
6	3	9	9	9	9	9	9

**Table B: Neck, Trunk and Leg Score**

Neck	Trunk		Legs		Legs		Legs	
	Tilt	Twist	Tilt	Twist	Tilt	Twist	Tilt	Twist
1	1	2	3	3	4	5	5	5
1	2	3	4	4	5	5	5	5
1	3	3	4	4	5	5	5	5
2	2	3	4	4	5	5	5	5
2	3	3	4	4	5	5	5	5
3	2	3	4	4	5	5	5	5
3	3	3	4	4	5	5	5	5
4	1	2	3	3	4	5	5	5
4	2	3	4	4	5	5	5	5
4	3	3	4	4	5	5	5	5
5	1	2	3	3	4	5	5	5
5	2	3	4	4	5	5	5	5
5	3	3	4	4	5	5	5	5
6	1	2	3	3	4	5	5	5
6	2	3	4	4	5	5	5	5
6	3	3	4	4	5	5	5	5

**Table C: Neck, trunk and leg score**

Wrist and Arm Score	Neck		Trunk		Legs	
	Tilt	Twist	Tilt	Twist	Tilt	Twist
1	1	2	3	3	4	5
1	2	3	4	4	5	5
1	3	3	4	4	5	5
2	2	3	4	4	5	5
2	3	3	4	4	5	5
3	2	3	4	4	5	5
3	3	3	4	4	5	5
4	1	2	3	3	4	5
4	2	3	4	4	5	5
4	3	3	4	4	5	5
5	1	2	3	3	4	5
5	2	3	4	4	5	5
5	3	3	4	4	5	5
6	1	2	3	3	4	5
6	2	3	4	4	5	5
6	3	3	4	4	5	5

**Scoring: (final score from Table C)**  
1 or 2 = acceptable posture  
3 or 4 = further investigation, change may be needed  
5 or 6 = further investigation, change soon  
7 = investigate and implement change

**Final Score: 4**

### B. Neck, Trunk and Leg Analysis

**Step 9: Locate Neck Position:**

Step 9a. Adjust:  
If neck is twisted: -1  
If neck is side bending: -1

**Step 10: Locate Trunk Position:**

Step 10a. Adjust:  
If trunk is twisted: -1  
If trunk is side bending: -1

**Step 11: Legs:**  
If legs and feet are supported: -1  
If not: -2

**Step 12: Look-up Posture Score in Table B:**  
Using values from steps 9-11 above, locate score in Table B.

**Step 13: Add Muscle Use Score**  
If posture mainly static (i.e. held 10 minutes):  
Or if action repeated occurs 4X per minute: -1

**Step 14: Add Force/Load Score**  
If load < 4.4 lbs (intermittent): -0  
If load 4.4 to 22 lbs (intermittent): -1  
If load 4.4 to 22 lbs (static or repeated): -2  
If more than 22 lbs or repeated or blocks: -3

**Step 15: Find Column in Table C**  
Add values from steps 12-14 to obtain Neck, Trunk and Leg Score. Find Column in Table C.

Task name: \_\_\_\_\_ Reviewer: \_\_\_\_\_ Date: \_\_\_\_\_

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## Lampiran 7. Worksheet RULA Manual/ Menggulung Tali/Kiri Tubuh

manual/ menggulung tali /kiri  
RULA Employee Assessment Worksheet

based on RULA: a survey method for the investigation of work-related upper limb disorders, McAtamney & Corlett, Applied Ergonomics 1993, 24(2), 91-99

### A. Arm and Wrist Analysis

**Step 1: Locate Upper Arm Position:**

Step 1a. Adjust:  
If shoulder is raised: -1  
If upper arm is abducted: -1  
If arm is supported or person is leaning: -1

**Step 2: Locate Lower Arm Position:**

Step 2a. Adjust:  
If either arm is working across midline or out to side of body: Add +1

**Step 3: Locate Wrist Position:**

Step 3a. Adjust:  
If wrist is bent from midline: Add +1

**Step 4: Wrist Twist:**

If wrist is twisted in mid-range: -1  
If wrist is at or near end of range: -2

**Step 5: Look-up Posture Score in Table A:**  
Using values from steps 1-4 above, locate score in Table A.

**Step 6: Add Muscle Use Score**  
If posture mainly static (i.e. held 10 minutes):  
Or if action repeated occurs 4X per minute: -1

**Step 7: Add Force/Load Score**  
If load < 4.4 lbs (intermittent): -0  
If load 4.4 to 22 lbs (intermittent): -1  
If load 4.4 to 22 lbs (static or repeated): -2  
If more than 22 lbs or repeated or blocks: -3

**Step 8: Find Row in Table C**  
Add values from steps 5-7 to obtain Wrist and Arm Score. Find row in Table C.

### SCORES

**Table A: Wrist Posture Score**

Upper Arm	Lower Arm	Wrist		Wrist		Wrist	
		Tilt	Twist	Tilt	Twist	Tilt	Twist
1	1	1	2	2	2	3	3
1	2	2	2	2	3	3	3
1	3	3	3	3	3	4	4
2	1	2	3	3	3	4	4
2	2	3	3	3	3	4	4
2	3	4	4	4	4	5	5
3	1	3	4	4	4	5	5
3	2	4	4	4	4	5	5
3	3	4	4	4	4	5	5
4	1	4	4	4	4	5	5
4	2	4	4	4	4	5	5
4	3	4	4	4	4	5	5
5	1	5	5	5	5	6	6
5	2	5	5	5	5	6	6
5	3	5	5	5	5	6	6
6	1	7	7	7	7	8	8
6	2	8	8	8	8	9	9
6	3	9	9	9	9	9	9

**Table B: Neck, Trunk and Leg Score**

Neck	Trunk		Legs		Legs		Legs	
	Tilt	Twist	Tilt	Twist	Tilt	Twist	Tilt	Twist
1	1	2	3	3	4	5	5	5
1	2	3	4	4	5	5	5	5
1	3	3	4	4	5	5	5	5
2	2	3	4	4	5	5	5	5
2	3	3	4	4	5	5	5	5
3	2	3	4	4	5	5	5	5
3	3	3	4	4	5	5	5	5
4	1	2	3	3	4	5	5	5
4	2	3	4	4	5	5	5	5
4	3	3	4	4	5	5	5	5
5	1	2	3	3	4	5	5	5
5	2	3	4	4	5	5	5	5
5	3	3	4	4	5	5	5	5
6	1	2	3	3	4	5	5	5
6	2	3	4	4	5	5	5	5
6	3	3	4	4	5	5	5	5

**Table C: Neck, trunk and leg score**

Wrist and Arm Score	Neck		Trunk		Legs	
	Tilt	Twist	Tilt	Twist	Tilt	Twist
1	1	2	3	3	4	5
1	2	3	4	4	5	5
1	3	3	4	4	5	5
2	2	3	4	4	5	5
2	3	3	4	4	5	5
3	2	3	4	4	5	5
3	3	3	4	4	5	5
4	1	2	3	3	4	5
4	2	3	4	4	5	5
4	3	3	4	4	5	5
5	1	2	3	3	4	5
5	2	3	4	4	5	5
5	3	3	4	4	5	5
6	1	2	3	3	4	5
6	2	3	4	4	5	5
6	3	3	4	4	5	5

**Scoring: (final score from Table C)**  
1 or 2 = acceptable posture  
3 or 4 = further investigation, change may be needed  
5 or 6 = further investigation, change soon  
7 = investigate and implement change

**Final Score: 5**

### B. Neck, Trunk and Leg Analysis

**Step 9: Locate Neck Position:**

Step 9a. Adjust:  
If neck is twisted: -1  
If neck is side bending: -1

**Step 10: Locate Trunk Position:**

Step 10a. Adjust:  
If trunk is twisted: -1  
If trunk is side bending: -1

**Step 11: Legs:**  
If legs and feet are supported: -1  
If not: -2

**Step 12: Look-up Posture Score in Table B:**  
Using values from steps 9-11 above, locate score in Table B.

**Step 13: Add Muscle Use Score**  
If posture mainly static (i.e. held 10 minutes):  
Or if action repeated occurs 4X per minute: -1

**Step 14: Add Force/Load Score**  
If load < 4.4 lbs (intermittent): -0  
If load 4.4 to 22 lbs (intermittent): -1  
If load 4.4 to 22 lbs (static or repeated): -2  
If more than 22 lbs or repeated or blocks: -3

**Step 15: Find Column in Table C**  
Add values from steps 12-14 to obtain Neck, Trunk and Leg Score. Find Column in Table C.

Task name: \_\_\_\_\_ Reviewer: \_\_\_\_\_ Date: \_\_\_\_\_

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## Lampiran 8. Worksheet RULA Menggunakan Mesin/ Mengambil Serat/Kanan Tubuh

men/mengambil serat / kanan  
**RULA Employee Assessment Worksheet** based on RULA: a survey method for the investigation of work-related upper limb disorders, McAtamney & Corlett, Applied Ergonomics 1993, 24(2), 91-99

### A. Arm and Wrist Analysis

**Step 1: Locate Upper Arm Position:**

Step 1a. Adjust:  
 If shoulder is raised: -1  
 If upper arm is abducted: -1  
 If arm is supported or person is leaning: -1

**Step 2: Locate Lower Arm Position:**

Step 2a. Adjust:  
 If either arm is working across midline or out to side of body: Add +1

**Step 3: Locate Wrist Position:**

Step 3a. Adjust:  
 If wrist is bent from midline: Add +1

**Step 4: Wrist Twist:**

Step 5: Look-up Posture Score in Table A:  
 Using values from steps 1-4 above, locate score in Table A.

**Step 6: Add Muscle Use Score**  
 If posture mainly static (i.e. held >10 minutes),  
 Or if action repeated occurs >5% per minute: -1

**Step 7: Add Force/Load Score**  
 If load < 4.4 lbs (intermittent): +0  
 If load 4.4 to 22 lbs (intermittent): +1  
 If load 4.4 to 22 lbs (static or repeated): +2  
 If more than 22 lbs or repeated or shocks: +3

**Step 8: Find Row in Table C**  
 Add values from steps 5-7 to obtain Wrist and Arm Score. Find row in Table C.

### SCORES

**Table A: Wrist Posture Score**

Upper Arm	Lower Arm	Wrist					
		Wrist Flex	Wrist Ext	Wrist Dev	Wrist Twist		
1	1	1	2	2	3	3	3
1	2	2	2	2	3	3	3
1	3	3	3	3	3	3	4
2	1	2	3	3	3	4	4
2	2	3	3	3	3	4	4
2	3	4	4	4	4	4	5
3	1	3	4	4	4	4	5
3	2	3	4	4	4	4	5
3	3	4	4	4	4	4	5
4	1	4	4	4	4	4	5
4	2	4	4	4	4	4	5
4	3	4	4	4	4	4	5
5	1	5	5	5	5	5	6
5	2	5	5	5	5	5	6
5	3	5	5	5	5	5	6
6	1	6	6	6	6	6	7
6	2	6	6	6	6	6	7
6	3	6	6	6	6	6	7

**Table C: Neck, trunk and leg score**

Wrist and Arm Score	1	2	3	4	5	6	7
1	1	2	3	3	4	5	5
2	2	2	3	4	4	5	5
3	3	3	3	4	4	5	5
4	4	4	4	4	5	5	6
5	4	4	5	5	6	7	7
6	4	4	5	5	6	7	7
7	5	5	5	6	6	7	7
8	5	5	5	6	7	7	7

**Scoring: (final score from Table C)**  
 1 or 2 = acceptable posture  
 3 or 4 = further investigation, change may be needed  
 5 or 6 = further investigation, change soon  
 7 = investigate and implement change

### B. Neck, Trunk and Leg Analysis

**Step 9: Locate Neck Position:**

Step 9a. Adjust:  
 If neck is twisted: -1  
 If neck is side bending: -1

**Step 10: Locate Trunk Position:**

Step 10a. Adjust:  
 If trunk is twisted: -1  
 If trunk is side bending: -1

**Step 11: Legs:**  
 If legs and feet are supported: -1  
 If not: +2

**Step 12: Look-up Posture Score in Table B:**  
 Using values from steps 9-11 above, locate score in Table B.

**Step 13: Add Muscle Use Score**  
 If posture mainly static (i.e. held >10 minutes),  
 Or if action repeated occurs >5% per minute: -1

**Step 14: Add Force/Load Score**  
 If load < 4.4 lbs (intermittent): +0  
 If load 4.4 to 22 lbs (intermittent): +1  
 If load 4.4 to 22 lbs (static or repeated): +2  
 If more than 22 lbs or repeated or shocks: +3

**Step 15: Find Column in Table C**  
 Add values from steps 12-14 to obtain Neck, Trunk and Leg Score. Find Column in Table C.

**Table B: Trunk Posture Score**

Neck Posture	Legs		Trunk		Legs	
	1	2	3	4	5	6
1	1	2	2	2	3	3
2	2	2	2	2	3	3
3	3	3	3	3	4	4
4	4	4	4	4	4	5
5	5	5	5	5	5	6
6	6	6	6	6	6	7
7	7	7	7	7	7	7
8	8	8	8	8	8	8

Task name: \_\_\_\_\_ Reviewer: \_\_\_\_\_ Date: \_\_\_\_\_

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## Lampiran 9. Worksheet RULA Menggunakan Mesin/ Mengambil Serat/Kiri Tubuh

men/mengambil serat / kiri  
**RULA Employee Assessment Worksheet** based on RULA: a survey method for the investigation of work-related upper limb disorders, McAtamney & Corlett, Applied Ergonomics 1993, 24(2), 91-99

### A. Arm and Wrist Analysis

**Step 1: Locate Upper Arm Position:**

Step 1a. Adjust:  
 If shoulder is raised: -1  
 If upper arm is abducted: -1  
 If arm is supported or person is leaning: -1

**Step 2: Locate Lower Arm Position:**

Step 2a. Adjust:  
 If either arm is working across midline or out to side of body: Add +1

**Step 3: Locate Wrist Position:**

Step 3a. Adjust:  
 If wrist is bent from midline: Add +1

**Step 4: Wrist Twist:**

Step 5: Look-up Posture Score in Table A:  
 Using values from steps 1-4 above, locate score in Table A.

**Step 6: Add Muscle Use Score**  
 If posture mainly static (i.e. held >10 minutes),  
 Or if action repeated occurs >5% per minute: -1

**Step 7: Add Force/Load Score**  
 If load < 4.4 lbs (intermittent): +0  
 If load 4.4 to 22 lbs (intermittent): +1  
 If load 4.4 to 22 lbs (static or repeated): +2  
 If more than 22 lbs or repeated or shocks: +3

**Step 8: Find Row in Table C**  
 Add values from steps 5-7 to obtain Wrist and Arm Score. Find row in Table C.

### SCORES

**Table A: Wrist Posture Score**

Upper Arm	Lower Arm	Wrist				
		Wrist Flex	Wrist Ext	Wrist Dev	Wrist Twist	
1	1	1	2	2	3	3
1	2	2	2	2	3	3
1	3	3	3	3	3	4
2	1	2	3	3	3	4
2	2	3	3	3	3	4
2	3	4	4	4	4	5
3	1	3	4	4	4	5
3	2	3	4	4	4	5
3	3	4	4	4	4	5
4	1	4	4	4	4	5
4	2	4	4	4	4	5
4	3	4	4	4	4	5
5	1	5	5	5	5	6
5	2	5	5	5	5	6
5	3	5	5	5	5	6
6	1	6	6	6	6	7
6	2	6	6	6	6	7
6	3	6	6	6	6	7

**Table C: Neck, trunk and leg score**

Wrist and Arm Score	1	2	3	4	5	6	7
1	1	2	3	3	4	5	5
2	2	2	3	4	4	5	5
3	3	3	3	4	4	5	5
4	4	4	4	4	5	5	6
5	4	4	5	5	6	7	7
6	4	4	5	5	6	7	7
7	5	5	5	6	6	7	7
8	5	5	5	6	7	7	7

**Scoring: (final score from Table C)**  
 1 or 2 = acceptable posture  
 3 or 4 = further investigation, change may be needed  
 5 or 6 = further investigation, change soon  
 7 = investigate and implement change

### B. Neck, Trunk and Leg Analysis

**Step 9: Locate Neck Position:**

Step 9a. Adjust:  
 If neck is twisted: -1  
 If neck is side bending: -1

**Step 10: Locate Trunk Position:**

Step 10a. Adjust:  
 If trunk is twisted: -1  
 If trunk is side bending: -1

**Step 11: Legs:**  
 If legs and feet are supported: -1  
 If not: +2

**Step 12: Look-up Posture Score in Table B:**  
 Using values from steps 9-11 above, locate score in Table B.

**Step 13: Add Muscle Use Score**  
 If posture mainly static (i.e. held >10 minutes),  
 Or if action repeated occurs >5% per minute: -1

**Step 14: Add Force/Load Score**  
 If load < 4.4 lbs (intermittent): +0  
 If load 4.4 to 22 lbs (intermittent): +1  
 If load 4.4 to 22 lbs (static or repeated): +2  
 If more than 22 lbs or repeated or shocks: +3

**Step 15: Find Column in Table C**  
 Add values from steps 12-14 to obtain Neck, Trunk and Leg Score. Find Column in Table C.

**Table B: Trunk Posture Score**

Neck Posture	Legs		Trunk		Legs	
	1	2	3	4	5	6
1	1	2	2	2	3	3
2	2	2	2	2	3	3
3	3	3	3	3	4	4
4	4	4	4	4	4	5
5	5	5	5	5	5	6
6	6	6	6	6	6	7
7	7	7	7	7	7	7
8	8	8	8	8	8	8

Task name: \_\_\_\_\_ Reviewer: \_\_\_\_\_ Date: \_\_\_\_\_

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Lampiran 10. Worksheet RULA Menggunakan Mesin/ Memasang Serat/Kanan Tubuh

men / memasang Serat / kanan

### RULA Employee Assessment Worksheet

based on RULA: a survey method for the investigation of work-related upper limb disorders, McAtamney & Corlett, Applied Ergonomics 1993, 24(2), 91-99

#### A. Arm and Wrist Analysis

**Step 1: Locate Upper Arm Position:**

Step 1a. Adjust...  
If shoulder is raised: -1  
If upper arm is abducted: +1  
If arm is supported or person is leaning: -1

**Step 2: Locate Lower Arm Position:**

Step 2a. Adjust...  
If either arm is working across midline or out to side of body: Add +1

**Step 3: Locate Wrist Position:**

Step 3a. Adjust...  
If wrist is bent from midline: Add +1

**Step 4: Wrist Twist:**  
If wrist is twisted in mid-range: -1  
If wrist is at or near end of range: -2

**Step 5: Look-up Posture Score in Table A:**  
Using values from steps 1-4 above, locate score in Table A.

**Step 6: Add Muscle Use Score**  
If posture mainly static (i.e. held >10 minutes), Or if action repeated occurs >X per minute: -1

**Step 7: Add Force/Load Score**  
If load < 4.4 lbs (intermittent): +0  
If load 4.4 to 22 lbs (intermittent): -1  
If load 4.4 to 22 lbs (static or repeated): -2  
If more than 22 lbs or repeated or shocks: -3

**Step 8: Find Row in Table C**  
Add values from steps 5-7 to obtain Wrist and Arm Score. Find row in Table C.

#### SCORES

**Table A: Wrist Posture Score**

Upper Arm	Lower Arm	Wrist Posture				
		Twist	Twist	Twist	Twist	
1	1	1	2	2	3	3
1	2	2	2	2	3	3
1	3	2	3	3	3	4
2	1	2	3	3	3	4
2	2	3	3	3	3	4
2	3	3	4	4	4	5
3	1	3	3	3	3	4
3	2	3	4	4	4	5
3	3	4	4	4	4	5
4	1	4	4	4	4	5
4	2	4	4	4	4	5
4	3	4	4	4	4	5
5	1	5	5	5	5	6
5	2	5	5	5	5	6
5	3	5	5	5	5	6
6	1	7	7	7	7	8
6	2	8	8	8	8	9
6	3	9	9	9	9	9

**Table B: Neck, trunk and leg score**

Neck Posture	Trunk Posture					
	Legs	Legs	Legs	Legs	Legs	Legs
1	1	2	3	4	5	6
1	2	2	2	2	2	2
2	2	3	3	3	3	3
2	3	3	3	3	3	3
3	3	3	3	3	3	3
3	4	4	4	4	4	4
4	4	4	4	4	4	4
4	4	4	4	4	4	4
5	5	5	5	5	5	5
5	5	5	5	5	5	5
6	6	6	6	6	6	6
6	6	6	6	6	6	6

**Table C: Neck, trunk and leg score**

Wrist and Arm Score	Neck, trunk and leg score					
	1	2	3	4	5	6
1	1	2	3	4	5	6
1	2	2	3	4	5	6
2	2	3	3	4	5	6
2	3	3	3	4	5	6
3	3	3	3	4	5	6
3	4	4	4	5	6	7
4	4	4	4	5	6	7
4	4	4	4	5	6	7
5	5	5	5	6	7	8
5	5	5	5	6	7	8
6	6	6	6	7	8	9
6	6	6	6	7	8	9

**Scoring: (final score from Table C)**  
1 or 2 = acceptable posture  
3 or 4 = further investigation, change may be needed  
5 or 6 = further investigation, change soon  
7 = investigate and implement change

**Final Score: 3**

#### B. Neck, Trunk and Leg Analysis

**Step 9: Locate Neck Position:**

Step 9a. Adjust...  
If neck is twisted: -1  
If neck is side bending: -1

**Step 10: Locate Trunk Position:**

Step 10a. Adjust...  
If trunk is twisted: -1  
If trunk is side bending: -1

**Step 11: Legs:**  
If legs and feet are supported: +1  
If not: -3

**Step 12: Look-up Posture Score in Table B:**  
Using values from steps 9-11 above, locate score in Table B.

**Step 13: Add Muscle Use Score**  
If posture mainly static (i.e. held >10 minutes), Or if action repeated occurs >X per minute: -1

**Step 14: Add Force/Load Score**  
If load < 4.4 lbs (intermittent): +0  
If load 4.4 to 22 lbs (intermittent): -1  
If load 4.4 to 22 lbs (static or repeated): -2  
If more than 22 lbs or repeated or shocks: -3

**Step 15: Find Column in Table C**  
Add values from steps 12-14 to obtain Neck, Trunk and Leg Score. Find Column in Table C.

**Neck Score: 3**

**Trunk Score: 2**

**Leg Score: 1**

**Posture Score B: 3**

**Muscle Use Score: +**

**Force/Load Score: +**

**Neck, Trunk & Leg Score: 3**

Task name: \_\_\_\_\_ Reviewer: \_\_\_\_\_ Date: \_\_\_\_\_

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Lampiran 11. Worksheet RULA Menggunakan Mesin/ Memasang Serat/Kiri Tubuh

men / memasang Serat / kiri

### RULA Employee Assessment Worksheet

based on RULA: a survey method for the investigation of work-related upper limb disorders, McAtamney & Corlett, Applied Ergonomics 1993, 24(2), 91-99

#### A. Arm and Wrist Analysis

**Step 1: Locate Upper Arm Position:**

Step 1a. Adjust...  
If shoulder is raised: -1  
If upper arm is abducted: +1  
If arm is supported or person is leaning: -1

**Step 2: Locate Lower Arm Position:**

Step 2a. Adjust...  
If either arm is working across midline or out to side of body: Add +1

**Step 3: Locate Wrist Position:**

Step 3a. Adjust...  
If wrist is bent from midline: Add +1

**Step 4: Wrist Twist:**  
If wrist is twisted in mid-range: -1  
If wrist is at or near end of range: -2

**Step 5: Look-up Posture Score in Table A:**  
Using values from steps 1-4 above, locate score in Table A.

**Step 6: Add Muscle Use Score**  
If posture mainly static (i.e. held >10 minutes), Or if action repeated occurs >X per minute: -1

**Step 7: Add Force/Load Score**  
If load < 4.4 lbs (intermittent): +0  
If load 4.4 to 22 lbs (intermittent): -1  
If load 4.4 to 22 lbs (static or repeated): -2  
If more than 22 lbs or repeated or shocks: -3

**Step 8: Find Row in Table C**  
Add values from steps 5-7 to obtain Wrist and Arm Score. Find row in Table C.

#### SCORES

**Table A: Wrist Posture Score**

Upper Arm	Lower Arm	Wrist Posture				
		Twist	Twist	Twist	Twist	
1	1	1	2	2	3	3
1	2	2	2	2	3	3
1	3	2	3	3	3	4
2	1	2	3	3	3	4
2	2	3	3	3	3	4
2	3	3	4	4	4	5
3	1	3	3	3	3	4
3	2	3	4	4	4	5
3	3	4	4	4	4	5
4	1	4	4	4	4	5
4	2	4	4	4	4	5
4	3	4	4	4	4	5
5	1	5	5	5	5	6
5	2	5	5	5	5	6
5	3	5	5	5	5	6
6	1	7	7	7	7	8
6	2	8	8	8	8	9
6	3	9	9	9	9	9

**Table B: Neck, trunk and leg score**

Neck Posture	Trunk Posture					
	Legs	Legs	Legs	Legs	Legs	Legs
1	1	2	3	4	5	6
1	2	2	2	2	2	2
2	2	3	3	3	3	3
2	3	3	3	3	3	3
3	3	3	3	3	3	3
3	4	4	4	4	4	4
4	4	4	4	4	4	4
4	4	4	4	4	4	4
5	5	5	5	5	5	5
5	5	5	5	5	5	5
6	6	6	6	6	6	6
6	6	6	6	6	6	6

**Table C: Neck, trunk and leg score**

Wrist and Arm Score	Neck, trunk and leg score					
	1	2	3	4	5	6
1	1	2	3	4	5	6
1	2	2	3	4	5	6
2	2	3	3	4	5	6
2	3	3	3	4	5	6
3	3	3	3	4	5	6
3	4	4	4	5	6	7
4	4	4	4	5	6	7
4	4	4	4	5	6	7
5	5	5	5	6	7	8
5	5	5	5	6	7	8
6	6	6	6	7	8	9
6	6	6	6	7	8	9

**Scoring: (final score from Table C)**  
1 or 2 = acceptable posture  
3 or 4 = further investigation, change may be needed  
5 or 6 = further investigation, change soon  
7 = investigate and implement change

**Final Score: 3**

#### B. Neck, Trunk and Leg Analysis

**Step 9: Locate Neck Position:**

Step 9a. Adjust...  
If neck is twisted: -1  
If neck is side bending: -1

**Step 10: Locate Trunk Position:**

Step 10a. Adjust...  
If trunk is twisted: -1  
If trunk is side bending: -1

**Step 11: Legs:**  
If legs and feet are supported: +1  
If not: -3

**Step 12: Look-up Posture Score in Table B:**  
Using values from steps 9-11 above, locate score in Table B.

**Step 13: Add Muscle Use Score**  
If posture mainly static (i.e. held >10 minutes), Or if action repeated occurs >X per minute: -1

**Step 14: Add Force/Load Score**  
If load < 4.4 lbs (intermittent): +0  
If load 4.4 to 22 lbs (intermittent): -1  
If load 4.4 to 22 lbs (static or repeated): -2  
If more than 22 lbs or repeated or shocks: -3

**Step 15: Find Column in Table C**  
Add values from steps 12-14 to obtain Neck, Trunk and Leg Score. Find Column in Table C.

**Neck Score: 3**

**Trunk Score: 2**

**Leg Score: 1**

**Posture Score B: 3**

**Muscle Use Score: +**

**Force/Load Score: +**

**Neck, Trunk & Leg Score: 3**

Task name: \_\_\_\_\_ Reviewer: \_\_\_\_\_ Date: \_\_\_\_\_

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Lampiran 12. Worksheet RULA Menggunakan Mesin/ Menarik Tali/Kanan Tubuh

*mesin / menarik tali / kanan*

### RULA Employee Assessment Worksheet

based on RULA: a survey method for the investigation of work-related upper limb disorders, McAtamney & Corlett, Applied Ergonomics 1993, 24(2), 91-99

#### A. Arm and Wrist Analysis

**Step 1: Locate Upper Arm Position:**

Step 1a. Adjust...  
If shoulder is raised: +1  
If upper arm is abducted: +1  
If arm is supported or person is leaning: -1

**Step 2: Locate Lower Arm Position:**

Step 2a. Adjust...  
If either arm is working across midline or out to side of body: Add +1

**Step 3: Locate Wrist Position:**

Step 3a. Adjust...  
If wrist is bent from midline: Add +1

**Step 4: Wrist Twist:**

If wrist is twisted in mid-range: -1  
If wrist is at or near end of range: -2

**Step 5: Look-up Posture Score in Table A:**  
Using values from steps 1-4 above, locate score in Table A

**Step 6: Add Muscle Use Score**  
If posture mainly static (i.e. held 10 minutes):  
Or if action repeated occurs 4X per minute: -1

**Step 7: Add Force/Load Score**  
If load < 4.4 lbs (intermittent): +0  
If load 4.4 to 22 lbs (intermittent): -1  
If load 4.4 to 22 lbs (static or repeated): -2  
If more than 22 lbs or repeated or shocks: -3

**Step 8: Find Row in Table C**  
Add values from steps 5-7 to obtain Wrist and Arm Score. Find row in Table C.

#### SCORES

**Table A: Wrist Posture Score**

Upper Arm	Lower Arm	Wrist Posture		
		Twist	Flex	Ext
1	1	1	2	3
2	2	2	3	4
3	3	3	4	5
4	4	4	5	6
5	5	5	6	7
6	6	6	7	8

**Table B: Neck, trunk and leg score**

Wrist and Arm Score	Neck, trunk and leg score				
	1	2	3	4	5
1	1	2	3	4	5
2	2	3	4	5	6
3	3	4	5	6	7
4	4	5	6	7	8
5	5	6	7	8	9
6	6	7	8	9	10

**Table C: Neck, trunk and leg score**

Wrist and Arm Score	Neck, trunk and leg score				
	1	2	3	4	5
1	1	2	3	4	5
2	2	3	4	5	6
3	3	4	5	6	7
4	4	5	6	7	8
5	5	6	7	8	9
6	6	7	8	9	10

**Table D: Trunk Posture Score**

Neck	Trunk Posture				
	Legs	Legs	Legs	Legs	Legs
1	1	2	3	4	5
2	2	3	4	5	6
3	3	4	5	6	7
4	4	5	6	7	8
5	5	6	7	8	9
6	6	7	8	9	10

**Table E: Neck, Trunk and Leg Score**

Neck	Trunk Posture				
	Legs	Legs	Legs	Legs	Legs
1	1	2	3	4	5
2	2	3	4	5	6
3	3	4	5	6	7
4	4	5	6	7	8
5	5	6	7	8	9
6	6	7	8	9	10

**Scoring: (final score from Table C)**  
1 or 2 = acceptable posture  
3 or 4 = further investigation, change may be needed  
5 or 6 = further investigation, change soon  
7 = investigate and implement change

**Final Score: 3**

Task name: \_\_\_\_\_ Reviewer: \_\_\_\_\_ Date: \_\_\_\_\_

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Lampiran 13. Worksheet RULA Menggunakan Mesin/ Menarik Tali/Kiri Tubuh

*mesin / Menarik Tali / kiri*

### RULA Employee Assessment Worksheet

based on RULA: a survey method for the investigation of work-related upper limb disorders, McAtamney & Corlett, Applied Ergonomics 1993, 24(2), 91-99

#### A. Arm and Wrist Analysis

**Step 1: Locate Upper Arm Position:**

Step 1a. Adjust...  
If shoulder is raised: +1  
If upper arm is abducted: +1  
If arm is supported or person is leaning: -1

**Step 2: Locate Lower Arm Position:**

Step 2a. Adjust...  
If either arm is working across midline or out to side of body: Add +1

**Step 3: Locate Wrist Position:**

Step 3a. Adjust...  
If wrist is bent from midline: Add +1

**Step 4: Wrist Twist:**

If wrist is twisted in mid-range: -1  
If wrist is at or near end of range: -2

**Step 5: Look-up Posture Score in Table A:**  
Using values from steps 1-4 above, locate score in Table A

**Step 6: Add Muscle Use Score**  
If posture mainly static (i.e. held 10 minutes):  
Or if action repeated occurs 4X per minute: -1

**Step 7: Add Force/Load Score**  
If load < 4.4 lbs (intermittent): +0  
If load 4.4 to 22 lbs (intermittent): -1  
If load 4.4 to 22 lbs (static or repeated): -2  
If more than 22 lbs or repeated or shocks: -3

**Step 8: Find Row in Table C**  
Add values from steps 5-7 to obtain Wrist and Arm Score. Find row in Table C.

#### SCORES

**Table A: Wrist Posture Score**

Upper Arm	Lower Arm	Wrist Posture		
		Twist	Flex	Ext
1	1	1	2	3
2	2	2	3	4
3	3	3	4	5
4	4	4	5	6
5	5	5	6	7
6	6	6	7	8

**Table B: Neck, trunk and leg score**

Wrist and Arm Score	Neck, trunk and leg score				
	1	2	3	4	5
1	1	2	3	4	5
2	2	3	4	5	6
3	3	4	5	6	7
4	4	5	6	7	8
5	5	6	7	8	9
6	6	7	8	9	10

**Table C: Neck, trunk and leg score**

Wrist and Arm Score	Neck, trunk and leg score				
	1	2	3	4	5
1	1	2	3	4	5
2	2	3	4	5	6
3	3	4	5	6	7
4	4	5	6	7	8
5	5	6	7	8	9
6	6	7	8	9	10

**Table D: Trunk Posture Score**

Neck	Trunk Posture				
	Legs	Legs	Legs	Legs	Legs
1	1	2	3	4	5
2	2	3	4	5	6
3	3	4	5	6	7
4	4	5	6	7	8
5	5	6	7	8	9
6	6	7	8	9	10

**Table E: Neck, Trunk and Leg Score**

Neck	Trunk Posture				
	Legs	Legs	Legs	Legs	Legs
1	1	2	3	4	5
2	2	3	4	5	6
3	3	4	5	6	7
4	4	5	6	7	8
5	5	6	7	8	9
6	6	7	8	9	10

**Scoring: (final score from Table C)**  
1 or 2 = acceptable posture  
3 or 4 = further investigation, change may be needed  
5 or 6 = further investigation, change soon  
7 = investigate and implement change

**Final Score: 3**

Task name: \_\_\_\_\_ Reviewer: \_\_\_\_\_ Date: \_\_\_\_\_

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# Lampiran 14. Worksheet RULA Menggunakan Mesin/ Menggulung Tali/Kanan Tubuh

*mesin / menggulung tali / kanan*

### RULA Employee Assessment Worksheet

Based on RULA: a survey method for the investigation of work-related upper limb disorders, McAtamney & Corlett, Applied Ergonomics 1993, 24(2), 91-99

#### A. Arm and Wrist Analysis

**Step 1: Locate Upper Arm Position:**

Step 1a. Adjust...  
If shoulder is raised: +1  
If upper arm is abducted: -1  
If arm is supported or person is leaning: -1

**Step 2: Locate Lower Arm Position:**

Step 2a. Adjust...  
If either arm is working across midline or out to side of body: Add +1

**Step 3: Locate Wrist Position:**

Step 3a. Adjust...  
If wrist is bent from midline: Add +1

**Step 4: Wrist Twist:**

Step 5: **Look-up Posture Score in Table A:**  
Using values from steps 1-4 above, locate score in Table A.

**Step 6: Add Muscle Use Score**  
If posture mainly static (i.e. held <math>10</math> minutes), Or if action repeated occurs <math>4X</math> per minute: -1

**Step 7: Add Force/Load Score**  
If load <math>4-8</math> lbs (intermittent): +0  
If load <math>4-4</math> to <math>22</math> lbs (intermittent): +1  
If load <math>4-4</math> to <math>22</math> lbs (static or repeated): +2  
If more than <math>22</math> lbs or repeated or shocks: +3

**Step 8: Find Row in Table C**  
Add values from steps 5-7 to obtain Wrist and Arm Score. Find row in Table C.

#### SCORES

**Table A: Wrist Posture Score**

Upper Arm	Lower Arm	Wrist Posture					
		Twist	Flex	Ext			
1	1	1	2	2	3	3	3
1	2	2	2	2	3	3	3
1	3	2	3	3	3	3	4
2	1	2	3	3	3	4	4
2	2	3	3	3	3	4	4
2	3	3	4	4	4	5	5
3	1	3	4	4	4	5	5
3	2	3	4	4	4	5	5
3	3	4	4	4	4	5	5
4	1	4	4	4	4	5	5
4	2	4	4	4	4	5	5
4	3	4	4	4	4	5	5
5	1	5	5	5	5	6	6
5	2	5	5	5	5	6	6
5	3	5	5	5	5	6	6
6	1	7	7	7	7	8	8
6	2	7	7	7	7	8	8
6	3	7	7	7	7	8	8

**Table B: Neck, trunk and leg score**

Wrist and Arm Score	Neck, trunk and leg score					
	1	2	3	4	5	6
1	1	2	3	4	5	6
2	2	3	4	4	5	6
3	3	3	4	4	5	6
4	4	4	4	5	6	7
5	4	4	5	6	7	7
6	4	4	5	6	7	7
7	5	5	6	6	7	7
8	5	5	6	7	7	7

**Table C: Neck, trunk and leg score**

Wrist and Arm Score	Neck, trunk and leg score					
	1	2	3	4	5	6
1	1	2	3	4	5	6
2	2	3	4	4	5	6
3	3	3	4	4	5	6
4	4	4	4	5	6	7
5	4	4	5	6	7	7
6	4	4	5	6	7	7
7	5	5	6	6	7	7
8	5	5	6	7	7	7

**Table D: Trunk Posture Score**

Neck	Trunk Posture Score					
	1	2	3	4	5	6
1	1	2	3	4	5	6
2	2	3	4	4	5	6
3	3	3	4	4	5	6
4	4	4	4	5	6	7
5	4	4	5	6	7	7
6	4	4	5	6	7	7
7	5	5	6	6	7	7
8	5	5	6	7	7	7

**Table E: Leg Posture Score**

Neck	Leg Posture Score					
	1	2	3	4	5	6
1	1	2	3	4	5	6
2	2	3	4	4	5	6
3	3	3	4	4	5	6
4	4	4	4	5	6	7
5	4	4	5	6	7	7
6	4	4	5	6	7	7
7	5	5	6	6	7	7
8	5	5	6	7	7	7

**Scoring: (final score from Table C)**  
1 or 2 = acceptable posture  
3 or 4 = further investigation, change may be needed  
5 or 6 = further investigation, change soon  
7 = investigate and implement change

**Step 9: Locate Neck Position:**

Step 9a. Adjust...  
If neck is twisted: -1  
If neck is side bending: -1

**Step 10: Locate Trunk Position:**

Step 10a. Adjust...  
If trunk is twisted: -1  
If trunk is side bending: -1

**Step 11: Legs:**  
If legs and feet are supported: -1  
If not: +2

**Step 12: Look-up Posture Score in Table B:**  
Using values from steps 9-11 above, locate score in Table B.

**Step 13: Add Muscle Use Score**  
If posture mainly static (i.e. held <math>10</math> minutes), Or if action repeated occurs <math>4X</math> per minute: -1

**Step 14: Add Force/Load Score**  
If load <math>4-4</math> lbs (intermittent): +0  
If load <math>4-4</math> to <math>22</math> lbs (intermittent): +1  
If load <math>4-4</math> to <math>22</math> lbs (static or repeated): +2  
If more than <math>22</math> lbs or repeated or shocks: +3

**Step 15: Find Column in Table C**  
Add values from steps 12-14 to obtain Neck, Trunk and Leg Score. Find Column in Table C.

**Task name:** \_\_\_\_\_ **Reviewer:** \_\_\_\_\_ **Date:** \_\_\_\_\_

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# Lampiran 15. Worksheet RULA Menggunakan Mesin/ Menggulung Tali/Kanan Tubuh

*mesin / menggulung tali / kiri*

### RULA Employee Assessment Worksheet

Based on RULA: a survey method for the investigation of work-related upper limb disorders, McAtamney & Corlett, Applied Ergonomics 1993, 24(2), 91-99

#### A. Arm and Wrist Analysis

**Step 1: Locate Upper Arm Position:**

Step 1a. Adjust...  
If shoulder is raised: +1  
If upper arm is abducted: -1  
If arm is supported or person is leaning: -1

**Step 2: Locate Lower Arm Position:**

Step 2a. Adjust...  
If either arm is working across midline or out to side of body: Add +1

**Step 3: Locate Wrist Position:**

Step 3a. Adjust...  
If wrist is bent from midline: Add +1

**Step 4: Wrist Twist:**

**Step 5: Look-up Posture Score in Table A:**  
Using values from steps 1-4 above, locate score in Table A.

**Step 6: Add Muscle Use Score**  
If posture mainly static (i.e. held <math>10</math> minutes), Or if action repeated occurs <math>4X</math> per minute: -1

**Step 7: Add Force/Load Score**  
If load <math>4-8</math> lbs (intermittent): +0  
If load <math>4-4</math> to <math>22</math> lbs (intermittent): +1  
If load <math>4-4</math> to <math>22</math> lbs (static or repeated): +2  
If more than <math>22</math> lbs or repeated or shocks: +3

**Step 8: Find Row in Table C**  
Add values from steps 5-7 to obtain Wrist and Arm Score. Find row in Table C.

#### SCORES

**Table A: Wrist Posture Score**

Upper Arm	Lower Arm	Wrist Posture					
		Twist	Flex	Ext			
1	1	1	2	2	3	3	3
1	2	2	2	2	3	3	3
1	3	2	3	3	3	3	4
2	1	2	3	3	3	4	4
2	2	3	3	3	3	4	4
2	3	3	4	4	4	5	5
3	1	3	4	4	4	5	5
3	2	3	4	4	4	5	5
3	3	4	4	4	4	5	5
4	1	4	4	4	4	5	5
4	2	4	4	4	4	5	5
4	3	4	4	4	4	5	5
5	1	5	5	5	5	6	6
5	2	5	5	5	5	6	6
5	3	5	5	5	5	6	6
6	1	7	7	7	7	8	8
6	2	7	7	7	7	8	8
6	3	7	7	7	7	8	8

**Table B: Neck, trunk and leg score**

Wrist and Arm Score	Neck, trunk and leg score					
	1	2	3	4	5	6
1	1	2	3	4	5	6
2	2	3	4	4	5	6
3	3	3	4	4	5	6
4	4	4	4	5	6	7
5	4	4	5	6	7	7
6	4	4	5	6	7	7
7	5	5	6	6	7	7
8	5	5	6	7	7	7

**Table C: Neck, trunk and leg score**

Wrist and Arm Score	Neck, trunk and leg score					
	1	2	3	4	5	6
1	1	2	3	4	5	6
2	2	3	4	4	5	6
3	3	3	4	4	5	6
4	4	4	4	5	6	7
5	4	4	5	6	7	7
6	4	4	5	6	7	7
7	5	5	6	6	7	7
8	5	5	6	7	7	7

**Table D: Trunk Posture Score**

Neck	Trunk Posture Score					
	1	2	3	4	5	6
1	1	2	3	4	5	6
2	2	3	4	4	5	6
3	3	3	4	4	5	6
4	4	4	4	5	6	7
5	4	4	5	6	7	7
6	4	4	5	6	7	7
7	5	5	6	6	7	7
8	5	5	6	7	7	7

**Table E: Leg Posture Score**

Neck	Leg Posture Score					
	1	2	3	4	5	6
1	1	2	3	4	5	6
2	2	3	4	4	5	6
3	3	3	4	4	5	6
4	4	4	4	5	6	7
5	4	4	5	6	7	7
6	4	4	5	6	7	7
7	5	5	6	6	7	7
8	5	5	6	7	7	7

**Scoring: (final score from Table C)**  
1 or 2 = acceptable posture  
3 or 4 = further investigation, change may be needed  
5 or 6 = further investigation, change soon  
7 = investigate and implement change

**Step 9: Locate Neck Position:**

Step 9a. Adjust...  
If neck is twisted: -1  
If neck is side bending: -1

**Step 10: Locate Trunk Position:**

Step 10a. Adjust...  
If trunk is twisted: -1  
If trunk is side bending: -1

**Step 11: Legs:**  
If legs and feet are supported: -1  
If not: +2

**Step 12: Look-up Posture Score in Table B:**  
Using values from steps 9-11 above, locate score in Table B.

**Step 13: Add Muscle Use Score**  
If posture mainly static (i.e. held <math>10</math> minutes), Or if action repeated occurs <math>4X</math> per minute: -1

**Step 14: Add Force/Load Score**  
If load <math>4-4</math> lbs (intermittent): +0  
If load <math>4-4</math> to <math>22</math> lbs (intermittent): +1  
If load <math>4-4</math> to <math>22</math> lbs (static or repeated): +2  
If more than <math>22</math> lbs or repeated or shocks: +3

**Step 15: Find Column in Table C**  
Add values from steps 12-14 to obtain Neck, Trunk and Leg Score. Find Column in Table C.

**Task name:** \_\_\_\_\_ **Reviewer:** \_\_\_\_\_ **Date:** \_\_\_\_\_

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