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Case Study on Beam Gaiting Down Time Reduction.

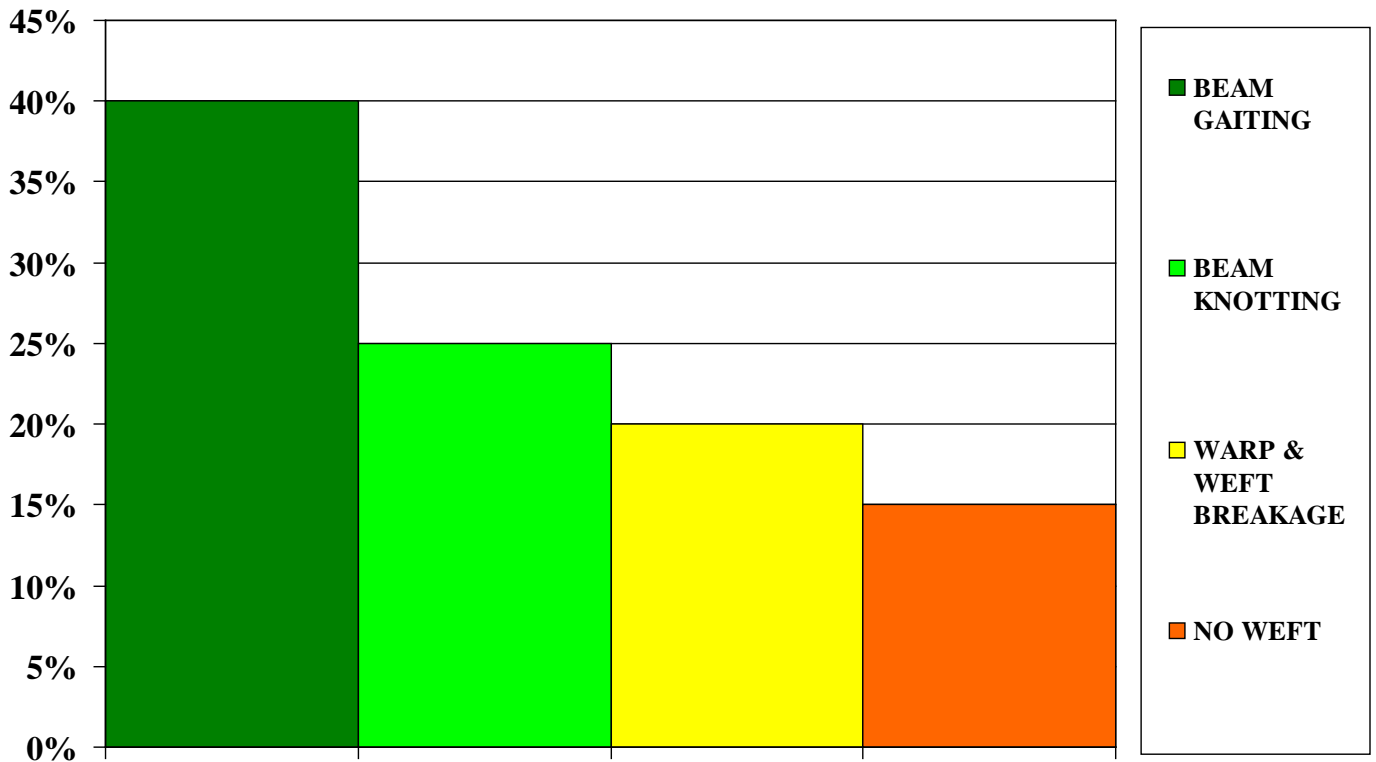
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Loom Down Time Reduction.

It has been observed that day by day Loom technology is improving at rapid speed resulting into very high-speed machines. There are many units installing such highspeed machines & unable to get desire production due to high machine down time.

Please find below Loom downtime analysis which has been carried out in one of modern weaving unit. The highest downtime is due to BEAM GAITTING & hence I would like to present my paper on simple method of reduction of down time known as SMED.



What is S.M.D.

It is known as SINGLE MINUTE EXCHANGE OF DIES & its Japanese technology developed by Mr. Shigeo Shingo. It is one of the lean methods for drastic reduction in changing time in production process.

It provides a rapid & efficient way of converting current product to next product in shortest time. It is "REVOLUTIONIZES BASIC CONCEPT OF 'SET-UP CHANGE'.

Before explaining how it can be used in Beam Gaïting activities to reduce downtime, I would like to give you very common example of above method.

Generally, we require 5 to 10 mins to change car flat tire but in car race such as Formula One we observe all four tires & other activities are carried out by group of experts in few seconds. It is same method they are adopting known as SMED.

· *From the above it is very clear that we cannot afford to waste the time in a race. The operations are fast, tools are in its place and also man power*

· *Replacing the Flat Tyre of Car*

- *1. Find Jack, Tommy bar, spanner, in short tools.*
- *2. Place & locate Jack below the car and lift the jack.*
- *3. Loosen the nuts.*
- *4. Remove the wheel*
- *5. Bring another wheel*
- *6. Locate & insert new wheel*
- *7. Tighten the nuts.*
- *8. Remove the jack & collect the tools.*
- *9. Place it back in the car*
- *10. Final tightening of the nuts*
- *ABILITY TO DISTINGUISH: -*

It is very important to master the distinction between Internal & External activities. Please find chart of Internal & External activities of tire changing activities.

Distinguish Internal & External Activity

Sr no	Activity	Internal	External
1	Find Jack, spanner, tools.		x
2	Place & locate below the car		x
3	Loosen the nuts.	x	
4	Remove the wheel	x	
5	Bring another wheel		x
6	Locate & mount new wheel	x	
7	Tighten the nuts.	x	
8	Remove jack & tools.		x
9	Final tightening of nuts	x	
10	Place them back in the car		x
	Total	5	5

If you observe above chart you will notice that 50% activities are external which can be carried out in advance & kept ready to complete in actual changing time. The same method can be adopted in case of Beam Gaiting as mentioned below.

SMED FOR BEAM GAITING

Please find below case study taken in one of modern textile unit having rapier looms with 20 shafts. Initially beam gaiting actual operations recorded in Video - noting step by step timings. Then the chart is prepared as mentioned below.

ACTIVITIES RECORDED In Video Shooting -

<i>no.</i>	<i>START</i>	<i>END</i>	<i>TOTAL</i>	<i>activity</i>
1				<i>LOOM STOP</i>
2				<i>TENSION RELEASE/PKG REMOVAL/COVER OPENING</i>

3				<i>BEAM CUT/CLOTH WINDING/ TEMPLE LIFTING</i>
4				<i>REED REMOVAL</i>
5				<i>EMPTYING BEAM</i>
6				<i>BEAM UNLOADED</i>
7				<i>HEAD FRAME SUPPORT REMOVAL</i>
8				<i>REMOVING LENO AND MOUNTING ON STAND</i>
9				<i>TAKING AWAY EMPTY BEAM</i>
10				<i>TAKING OUT DROP PIN BARS</i>
11				<i>HEAD FRAME REMOVAL</i>
12				<i>SUCTION CLEANING STARTS</i>
13				<i>TAKING AWAY HEAD FRAME/ DROP PIN BAR AND REED</i>
14				<i>BRINGING CURTAIN</i>
15				<i>AIR CLEANING</i>
16				<i>WIDTH SETTING</i>
17				<i>FIXING REED PIECES</i>
18				<i>TAKING OUT OPENER</i>
19				<i>MAINTENANCE</i>
20				<i>SETTING TAPE GUIDE</i>
21				<i>REMOVING CURTAIN</i>
22				<i>MEASURING REED LENGTH / GREASING</i>
23				<i>TEMPLE PLATE SETTING / RAPIER HOOK FIXING</i>
24				<i>STROKE SETTING</i>
25				<i>CHECKING ALIGNMENT</i>
26				<i>BRINGING BEAM TROLLEY</i>
27				<i>BEAM LOADING STARTS</i>
28				<i>RAPIER FIXING(RH)</i>

29				<i>DROP-PIN FIXING / COVER FIXING(RH RAPIER STROKE), FIXING BOTTOM H/F SUPPORT</i>
30				<i>ENDS STRAIGHTENING / TRANSFER TROLLEY OUT FROM LOOM</i>
31				<i>FIXING OF BEAM BARREL SUPPORT ROLLERS</i>
32				<i>PARALLELISING OF ENDS</i>
33				<i>BEAM LOCKED</i>
34				<i>REED FIXING</i>
35				<i>THREADING OF BEAM GAITING CLOTH</i>
36				<i>TYING OF KNOTS</i>
37				<i>HEALD FRAME TOP SUPPORT FIXING</i>
38				<i>PULLING OF WARP SHEET</i>
39				<i>RELOCKING OF BEAM</i>
40				<i>TEMPLE SETTING / THUMB ENDS FIXING / FEEDER THREADING</i>
41				<i>COVER FIXING (RH OPENER)/ BOTTOM H/F SUPPORT / SUCTION PIPE FIXING</i>
42				<i>MAIN MOTOR START / DESIGN FEEDING(PLAIN)</i>
43				<i>ENDS DRAWING STARTED</i>
44				<i>LOOM STARTED (PICKS INSERTED)</i>
45				<i>LENO FIXING (SPOOL)</i>
46				<i>LENO DEVICE FIXING</i>
47				<i>LENO SETTING</i>
48				<i>ENDS DRAWING STARTED IN HEALD WIRE</i>
49				<i>SPOOL ENDS DRAWING / DESIGN FEEDING / WEFT APPLIED AS PER PATTERN</i>
50				<i>THREADING OF FALSE SEVEDGE</i>

51				<i>MISSING HEALD WIRE FIXING</i>
52				<i>LOOM STARTED / DROP PIN SUPPORT FIXING</i>
53				<i>DOUBLE END AND PATTERN CHECKING (HEALD FRAME LIFTED IN SEQUENCE)</i>
54				<i>LOOM STARTED</i>
55				<i>CLOTH TORN</i>
56				<i>WRONG DRAWN ATTENDED</i>
57				<i>SAMPLE WORKED (FOR STOP MARKS)</i>
58				<i>CONTRAST COLOUR SAMPLE WORKED</i>
59				<i>LOOM RUNNING IN</i>
60				<i>SAMPLE CHECKING ON SCREEN</i>
61				<i>LOOM STARTED FOR PRODUCTION</i>
62				

Then all above activities are separated as Internal & External with time taken to complete those activities. The recorded shooting is shown in slow motion to team of loom shed beam gaiters', fitters & supervisors. We had very long session of brain storming for how to carry out external activities in advance & execute at time of change in minimum time same as Formula 1 race video.

Finally, we carried out changes as per following chart & carried out following steps.

STEPS-1-PRESENT STATUS

- VIDEO SHOOTING*

STEP 2-

- INTERNAL & EXTERNAL SET UP TIME*

1. INTERNAL SET-UP.

- *THOSE ACTIVITIES WHICH NEED STOPPING THE EQUIPMENT,*
- *LIKE, REMOVAL AND MOUNTING OF*
- *BEAM.*

2. *EXTERNAL SET-UP.*

- *THOSE ACTIVITIES WHICH CAN BE CARRIED OUT WITHOUT STOPPING THE EQUIPMENT i.e. LOOM.*
 - *Please find table below showing segregating Internal & External activities just for your information.*

ANALYSIS OF FILM - FOR INTERNAL & EXTERNAL ACTIVITIES.

CHRONIC LEVEL- MONTH - AVG TIME- 594 MINS

TARGET SET PHASE I ----45 MINS

No.	NOW	PLN	II	MEN	TOTAL	activity	%	cum	%	EXT	INT	REMARK	Chronic level
1	78.0	0.0		1	78.0	MAINTENANCE	29	78	29	X		WITH PREVENTIVE SCHEDULE & OFF-LINE MAINTENANCE	Chronic level of
2	21.0	5.0	P	4	21.0	BROKEN ENDS DRAWING STARTED IN HEALD WIRE	8	99	37		X		594 minutes
3	18.0	3.0	P	2	18.0	SUCTION CLEANING STARTS	7	117	43	X		WITH TWO SUCTION UNITS	calculated after
4	15.0	0.0	P	2	15.0	BRING BEAM FROM DRAWING IN DEPT	6	132	49	X			collecting previous
5	15.0	0.0	P	2	15.0	COVER FIXING(RH OPENER)/BOTTOM H/F SUPPORT / SUCTION PIPE FIXING	6	147	55	X			six months data from
6	12.0	3.0	P	2	12.0	WIDTH SETTING	4	159	59		X		Weaving.
7	10.0	4.0	P	2	10.0	SETTING TAPE GUIDE	4	169	63		X		
8	8.0	3.0	P	2	8.0	STROKE SETTING	3	177	66		X		
9	6.0	0.0	P	2	6.0	TENSION RELEASE/PKG REMOVAL/COVER OPENING	2	183	68	x			
10	6.0	0.0		2	6.0	DROP-PIN FIXING / COVER FIXING(RH RAPIER STROKE), FIXING BOTTOM H/F SUPPORT	2	189	70		x	EXT & PARALLEL WITH MODIFICATION IN TROLLEY	
11	6.0	6.0		0	6.0	LOOM RUNNING IN FOR SAMPLE PRODUCTION	2	195	72		X		
12	5.0	3.0	P	4	5.0	TYING OF KNOTS	2	200	74		X		
13	5.0	0.0		2	5.0	SPOOL ENDS DRAWING / DESIGN FEEDING / WEFT APPLIED AS PER PATTERN	2	205	76		X	INT. PALL. CLUBBED WITH ACTIVITY 2	
14	5.0	5.0			5.0	CONTRAST COLOUR SAMPLE WORKED	2	210	78		X	LOOM RUNNING	
15	4.0	2.0	P	2	4.0	REED REMOVAL	1	214	80		X	PARALLEL ACTIVITY	
16	4.0	3.0	P	2	4.0	AIR CLEANING	1	218	81		X	PARALLEL WITH TWO PEOPLE	
17	4.0	0.0			4.0	CLOTH TORN	1	222	83	X			
18	3.0	0.0	P	2	3.0	CHECKING ALIGNMENT	1	225	84				
19	3.0	0.0			3.0	MISSING HEALD WIRE FIXING	1	228	85			WITH Q. IMP. IN PREPARATORY DEPT.	
20	3.0	2.0			3.0	DOUBLE END AND PATTERN CHECKING (HEALD FRAME LIFTED IN SEQUENCE)	1	231	86				
21	2.0	0.0	P		2.0	ENDS STRAIGHTENING / TRANSFER TROLLEY OUT FROM LOOM	1	233	87		X	PARALLEL WITH STROKE SETTING	
22	2.0	2.0			2.0	REED FIXING	1	235	87		X		
23	2.0	0.0	P	1	2.0	HEALD FRAME TOP SUPPORT FIXING	1	237	88			PARALLEL WITH REED FIXING	
24	2.0	2.0			2.0	PULLING OF WARP SHEET	1	239	89		X		
25	2.0	2.0	P		2.0	TEMPLE SETTING / THUMB ENDS FIXING / FEEDER THREADING	1	241	90	X			
26	2.0	0.0	P	2	2.0	LENO DEVICE FIXING	1	243	90			INT. PARALLEL WITH BROKEN ENDS DRAWING	
27	2.0	0.0	P	2	2.0	THREADING OF FALSE SEVEDGE	1	245	91			INT. PARALLEL WITH BROKEN ENDS DRAWING	
28	2.0	2.0			2.0	SAMPLE WORKED (FOR STOP MARKS)	1	247	92		X		
29	2.0	0.0			2.0	SAMPLE CHECKING ON SCREEN	1	249	93	X			
30	1.0	0.0	P		1.0	EMPTYING BEAM	0	250	93	X			
31	1.0	0.0	P	1	1.0	REMOVING LENO AND MOUNTING ON STAND	0	251	93	X			
32	1.0	0.0	P	1	1.0	TAKING OUT DROP PIN BARS	0	252	94		X		
33	1.0	0.0	P	2	1.0	HEALD FRAME REMOVAL	0	253	94		X		
34	1.0	0.0	P	1	1.0	TAKING OUT OPENER	0	254	94		X		
35	1.0	0.0	P	2	1.0	THREADING OF BEAM GAITING CLOTH	0	255	95		X		
36	1.0	0.0	P	1	1.0	MAIN MOTOR START / DESIGN FEEDING(PLAIN)	0	256	95	X			
37	1.0	0.0		1	1.0	ENDS DRAWING STARTED	0	257	96	X			
38	1.0	1.0			1.0	LENO FIXING (SPOOL)	0	258	96		X		
39	1.0	1.0			1.0	LENO SETTING	0	259	96		X		
40	1.0	0.0	P		1.0	LOOM STARTED / DROP PIN SUPPORT FIXING	0	260	97	X			
41	1.0	0.0	P		1.0	WRONG DRAWN ATTENDED	0	261	97	X			
42	0.5	0.0	P		0.5	BEAM UNLOADED	0	262	97	X			
43	0.5	0.0	P		0.5	HEALD FRAME SUPPORT REMOVAL	0	262	97	X			
44	0.5	0.0	P		0.5	TAKING AWAY EMPTY BEAM	0	263	98	X			
45	0.5	0.0	P		0.5	TAKING AWAY HEALD FRAME/ DROP PIN BAR AND REED	0	263	98	X			
46	0.5	0.0	P		0.5	BRINGING CURTAIN	0	264	98	X			
47	0.5	0.0	P		0.5	FIXING REED PIECES	0	264	98	X			
48	0.5	0.0	P		0.5	REMOVING CURTAIN	0	265	98	X			
49	0.5	0.0	P		0.5	MEASURING REED LENGTH / GREASING	0	265	99	X			
50	0.5	0.0	P		0.5	TEMPLE PLATE SETTING / RAPIER HOOK FIXING	0	266	99	X			
51	0.5	0.0	P		0.5	BRINGING BEAM TROLLEY	0	266	99	X			
52	0.5	0.0	P		0.5	BEAM LOADING STARTS	0	267	99	X			
53	0.5	0.0	P		0.5	RAPIER FIXING(RH)	0	267	99	X			
54	0.5	0.0	P		0.5	FIXING OF BEAM BARREL SUPPORT ROLLERS	0	268	99	X			
55	0.5	0.0	P		0.5	PARALLELISING OF ENDS	0	268	100	X			
56	0.5	0.0	P		0.5	BEAM LOCKED	0	269	100	X			
57	0.5	0.0	P		0.5	RELOCKING OF BEAM	0	269	100	X			
58	0.0	0.0	P		0.0	LOOM STOP	0	269	100	X			
59	0.0	0.0	P		0.0	BEAM CUT/CLOTH WINDING/ TEMPLE LIFTING	0	269	100	X			
60	0.0	0.0	P		0.0	LOOM STARTED (PICKS INSERTED)	0	269	100	X			
61	0.0	0.0	P		0.0	LOOM STARTED	0	269	100	X			
62	0.0	0.0	P		0.0	LOOM STARTED FOR PRODUCTION	0	269	100	X			
9		49.0			269.0			269					594 min.

After conducting many trails, we could get following result with one-month summary. The earlier time for beam gating of 594 mins gradually reduced step by stem ...

Step 1 594 Mins.

Step 2 269 Mins.

Step 3 112 Mins.

Final 49 Mins.

Saving 545 Mins. (9 Machine Hrs for every beam gating.)

SUMMARY

BEFORE AFTER

<i>SR.NO</i>	<i>AVG.TIME</i>	<i>594</i>	<i>45</i>
<i>1</i>	<i>INTERNAL ACTIVITY</i>	<i>60</i>	<i>22</i>
<i>2</i>	<i>EXTERNAL ACTIVITY</i>	<i>7</i>	<i>45</i>
<i>3</i>	<i>PARALLEL</i>	<i>30</i>	<i>47</i>
	<i>TIME</i>	<i>112</i>	<i>49</i>

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- What is Beam Gaïting ?
- *Beam Gaïting is a way of changing style*
- *on looms i.e sort change.*
- Why we choose Beam Gaïting ?
- *After data analysis we found that major portion of Loom detention was due to Gaïting activity i.e 7 TO 9 Hours detention per Gaïting*
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How to implement SMED activity?

1. Data collection for past three months.
 2. Training on SMED.
 3. Internal TQM Cell.
 4. Formation of cross functional teams.
 5. Video shooting of existing Beam Gaiting process.
 6. Viewing of video with team members.
 7. Brainstorming- Continuous by all team members including HOD.
 8. Time bound, Action Plans.
 9. Recording Formats.
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