Case Study: SMED

AT WEZMANN TOOLS PVT. LTD.

Nashik Industrial Components and Equipment Manufacturer's Cluster 2 (DPG4)
LMC: ANIKET BAGDE, AB ASSOCIATES

Cluster, Unit & LMC Details

Cluster Name	Nashik Industrial Components and Equipments Manufacturer's Cluster 2 (DPG4)
DPG Address	E-43, MIDC, Satpur MIDCm Nashik – 422007.
Unit Name	Wezmann Tools Pvt.ltd. Nashik
Unit owners name and designation	1. Mr. Avinash K. Desai, Director 2. Mr. Manoj Desai, Director 3. Mr. Abhay Naik, Director
Unit Address	S-23, Ambad, Nashik-422010
Contact Number	9823086865
Email address	wezmannind@gmail.com
Business Activity	Precision Component Manufacturing

LMC	Aniket Bagde, AB Associates
Contact details	+91 99755 94771 abassociates.in@gmailcom AB Associates, Shop No. 13-14, Madhura Towers, Near Untwadi Bridge, Nasik – 422009. Maharashtra, India.

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Project Title: To Reduce Tool Changeover time

Introduction of the project:

Background & Context

Wezmann Tools Pvt. Ltd. Is a precision part manufacturer and hence precise quality and timely delivery to the client is of utmost importance. Unit produces more than 110 varieties of components and thus to be responsive to customer demand and ensure timely delivery it is required to preparation time, tool Changeover time & other such activities.

Before implementation of SMED Time required for Tool Preparation, Tool Change over, loading and unloading time & other internal as well as external activities were more affecting OTD (On Time Delivery) Performance.

Scope:

Implement SMED tool to reduce Changeover time for setup of our most running item Stirrer Bracket on VMC Machine.

Selection of project:

Our main Objectives behind selection of Projects are:

1] To reduce Cycle Time

2] To reduce loading & unloading time

3] To improve productivity

4] To reduce tool changeover time

5] To avoid delay in delivery due to long cycle time

6] To reduce Rejection/ Rework

7] To avoid customer dissatisfaction

8] To utilise resources effectively

9] To eliminate time required for Tool searching

10] To avoid misplacing of Tools, Re-purchasing of Tools in spites of availability

11] To improve machine utilization

To carry out project following machine and job was selected.

Machine Selected: VMC
Job Selected: Stirrer Bracket

Project team:

Wezmann Tools Pvt. Ltd.

1] Mr Avinash Desai   2] Mr Manoj Desai   3] Mr Abhay Naik

4] Mr Akhilesh Yadav   5] Mr Pankaj Dhok

AB Associates (LMC):

1] Mr Aniket Bagde   2] Mr Anant Bagde

Details of the project:

Training on SMED was given to the team of Wezmann Tools Pvt. Ltd. Setup experts from the unit and key operators also attended the training.

Steps of implementation of SMED tool were explained to the team and exercise was started under the guidance of LMC.

Steps involved:

Before SMED

Step 1] video shooting of **changeover process** for a part called Stirrer Bracket-112352.

Step 2] during this video shoot, (pain areas) & weak areas from production point of view were identified along with the

Step 3] team recorded videos was analysed to segregate internal and external activities

Step 4] brainstorming was conducted on how to eliminate external activities and how to convert internal activities to external activities

Step 5] ideas and solutions were identified and were selected for step by step implementation

Step 6] responsibilities for the improvements were assigned.

Step 7] before SMED Report prepared**.**

NO.	CHANGEOVER ACTIVITIES ON MACHINE - (VMC Stunner) ACTIVITY	ASSOCIATED TIME TAKEN IN SECONDS	ACTIV CLASSIFICATION INT/EXT	Whether the Activity can be Converted to External? (I/E)	ASSOCIATED TIME TAKEN IN SECONDS (Phase I)	ASSOCIATED TIME TAKEN IN SECONDS (Phase II)	If Activity can not be external, can we reduce time taken	Action Plan / Improvement (Combine, Rearrange, Simplify)	Status
1	Unloading of previous fixture/setup	00:01:25	I	I	00:01:25	00:01:25			
2	Removing jammed bolt	00:04:22	I	I	00:04:22	00:04:22	Yes	Standardisation of bolts and clamps	
3	Cleaning the bed	00:00:50	I	I	00:00:50	00:00:50			
4	Removal of tools from machine	00:02:58	I	I	00:02:58	00:02:58			
5	Keeping tools back in place	00:01:29	I	E	-	-		This is to be done after setup completion	
6	Keeping back clamps and accessories	00:02:16	I	E	-	-			
7	Removing tools from shank	00:03:25	I	E	-	-			
8	Keeping tools back in storage	00:02:15	I	E	-	-		To be done after setup	
9	Instruction to operator	00:00:10	I	E	-	-		Instructions to be given in morning meeting	
10	Instruction to operator	00:00:10	I	E	-	-			
11	Getting the card(Program loading from comp)	00:00:50	I	E	-	-		Card should be availble with operator or on trolley before starting changeover	Implemented
12	Searching program on m/c from card	00:00:42	I	E	-	-			
13	Locate & download program on m/c	00:00:28	I	E	-	-		To be done parallel	
14	Required tool search from program	00:02:09	I	E	-	-			
15	Searching for required fixtures	00:01:16	I	E	-	-		Keep required material ready on SMED trolley	
16	Getting clamps, spanners and allen key	00:00:45	I	E	-	-			
17	Loading fixture and clamps on machine	00:01:40	I	I	00:01:40	00:01:40	Yes	Standardisation of clamps	
18	Getting required spanners	00:00:20	I	E	-	-		Keep required material ready on SMED trolley	Implemented
19	Getting drill chuck	00:01:00	I	E	-	-			
20	X-Y coordinate level(Dialing)	00:05:18	I	I	00:05:18	00:05:18	Yes		
21	Time added after discussion with owner, supervisor and operator as usually time taken for XY coordinate setting is much higher	00:49:12	I	E	-	-			
22	Loading job again	00:02:07	I	I	00:02:07	00:02:07		Prior preparation is to be done on tool preparation table	Implemented
23	Geeting clamps and packing	00:04:00	I	E	-	-			
24	Loading job again	00:01:29	I	I	00:01:29	00:01:29		Prior preparation is to be done on tool preparation table	Implemented
25	Getting cutting tools	00:00:46	I	E	-	-		These activities to be carried out before starting changeover	Implemented
26	Preparing tools on shanks	00:07:00	I	E	-	-			
27	Preparing tools on shanks	00:03:30	I	E	-	-			
28	Time added after discussion with owner, supervisor and operator as usual time takento set tools on shank is much higher	00:40:00	I	E	-	-			
29	Loading 08 cutting tool on magzine with Z axis setting	00:22:42	I	I	00:22:42	00:22:42		Keep tools ready on SMED trolley	Implemented
30	Base line cut	00:07:20	I	I	00:07:20	00:07:20			
31	Getting spanner	00:01:15	I	E	-	-			
32	Unbolting job	00:01:00	I	I	00:01:00	00:01:00			
33	Inspection of job (setting piece)	00:08:25	I	I	00:08:25	00:08:25			
34	Clearing program variation	00:01:10	I	I	00:01:10	00:01:10			
35	Loading next job	00:00:50	I	I	00:00:50	00:00:50			
36	Machining job	00:10:28	I	I	00:10:28	00:10:28			
37	1st piece inspection	00:05:02	I	I	00:05:02	00:05:02			
	Total	03:20:04			01:17:06	01:17:06			

Fig. SMED Report

Process Description and Measurement Plan

Setup time for the machines was monitored by supervisors and reported on regular basis. This mechanism was set as part of measurement of key parameters by the AB Associates team.

Sr. No.	Machine Name	Operator Name	Part Name	Op. No.	Setting Time in min.	Cycle Time in min.	Loading / Unloading Time in	TARGET QTY	Prod Qty	TIME	Rej/ Rew.	Remarks / Problems / Time Wasters / Setting Broken for Urgency
			Datewise Daily Activity Register for All			Wezmann at a Glance			Date	15-02-2018	DAY	Shift :-
	A	B	C	D	E	F	G	H	I	J	K	L	M
1	Agni	ROYAN	MAIN SHAFT ROUND	1 ST			1 MIN		20 NOS	8:30/1:00		
2	AGNI	ROYAN	MAIN SHAFT ROUND	2 ND					51 NOS			
4	XTRON	NIRAJ	HOLDER BASE	4RTH	8:30/11:00		3 MIN		15 NOS	11:00/5:30		
5	XTRON	NIRAJ	SCISSER SUPPORT		6:40/7:00							
6	AKSHARA	VIKAS	CILYENDER	SLOT		12.46 SEC	2 MIN		14 NOS	8:30/3:40		
6	AKSHARA	VIKAS	CILYENDER	DEGREE	3:40/6:30	16.43 SEC	1.30 SEC		06 NOS	6:30/8:30		
7	GAURAV -1	RAJAN	PHOTO METER BOX	6 TH	9:00/10:45	2 MIN	1 MIN		100 NOS	10:45/6:30		
8	GAURAV -1	RAJAN	STIRRER BRACKET	5TH	6:30/8:15	13.14 SEC	2 MIN		01 NOS	8:15/8:45		
6	GAURAV -2	SATENDER	STIRRER BRACKET	5TH		13.37 SEC	2 MIN		10 NOS	8:30/10:45		
10	GAURAV -2	SATENDER	SCISSER SUPPORT	1ST	11:30/2:35	3.26	2 MIN			2:30/9:00	23 NOS	

Fig. Date wise Daily activity register

Above data was collected on daily basis by the team and maintained in an excel sheet. Same was used to calculate the SMED Index (Index defined to measure the performance of SMED Tool)

SMED Index		Feb-17	Mar-17	Apr-17	May-17	Jun-17	Jul-17	Aug-17	Sep-17	Oct-17	Nov-17	Dec-17	Jan-18	Feb-18
Spot	No of tool change overs in the month	328	407	268	242	236	240	242	246	209	237	116	342	110
	Average time for change over before improvements (min,	210	210	210	210	210	210	210	210	210	210	210	210	210
	Average time for change over after improvements (min, hrs)	210	210	210	210	210	120	120	120	120	150	120	120	150.433
	Total time for tool changeover before improvements in the month	68880	85470	56280	50820	49560	50400	50820	51660	43890	49770	24360	71820	23100
	Total time for tool changeover after improvements in the	68880	85470	56280	50820	49560	28800	29040	29520	25080	35550	13920	41040	16547.63
Ratio - %	FTM	0.00	0.00	0.00	0.00	0.00	42.86	42.86	42.86	42.86	28.57	42.86	42.86	28.37
Cumulative	Total time for tool changeover before improvements (Cum.)	68880	154350	210630	261450	311010	361410	412230	463890	507780	557550	581910	653730	676830
	Total time for tool changeover after improvements (Cum.)	68880	154350	210630	261450	311010	339810	368850	398370	423450	459000	472920	513960	530507.63
Ratio - %	YTD	0.00	0.00	0.00	0.00	0.00	5.98	10.52	14.12	16.61	17.68	18.73	21.38	21.62
	Target	30	30	30	30	30	30	30	30	30	30	30	30	30
	Data for graph	Feb-17	Mar-17	Apr-17	May-17	Jun-17	Jul-17	Aug-17	Sep-17	Oct-17	Nov-17	Dec-17	Jan-18	Feb-18
Ratio - %	FTM	0.00	0.00	0.00	0.00	0.00	42.86	42.86	42.86	42.86	28.57	42.86	42.86	28.37
Ratio - %	YTD	0.00	0.00	0.00	0.00	0.00	5.98	10.52	14.12	16.61	17.68	18.73	21.38	21.62
	Target	30	30	30	30	30	30	30	30	30	30	30	30	30

Fig. SMED Index

Data was graphically presented to the top management and displayed on the shop floor on a regular basis.
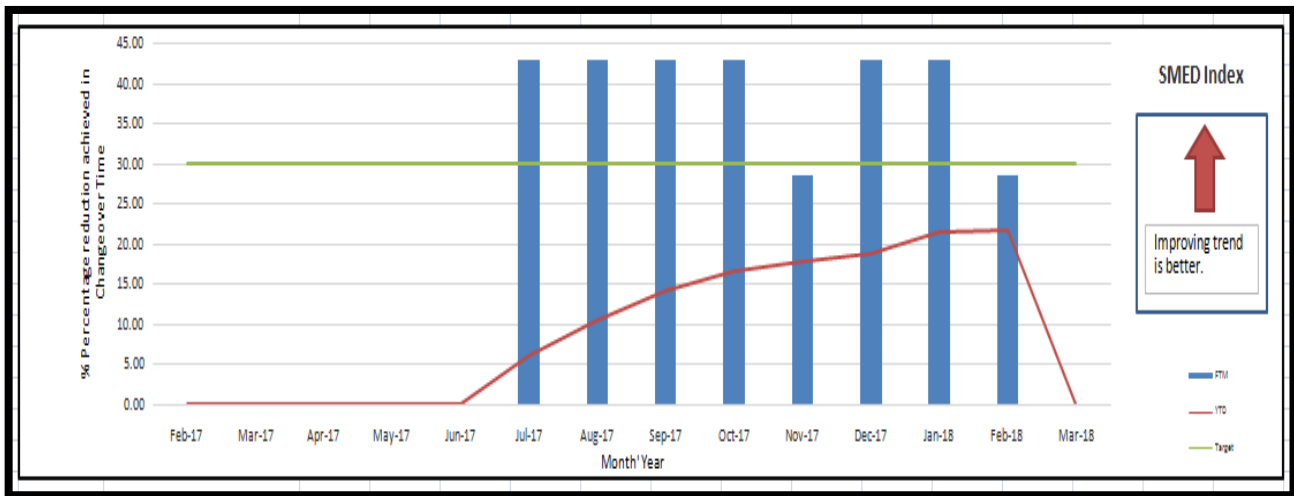

Fig. Graph of SMED Index

Situational Analysis

Approach used for analysis of process performance:

Brainstorming was the key for collection of ideas, alternative solutions.

Focused on existing activities like tool location, its movement.

Factors used for analysis:

- Component Loading & Unloading time
- Part Cycle Time
- Setting Time
- No. Of Tool Changeover per Machine / Day
- Existing Fixtures
- Tool Preparation Method
- Availability of tool
- Tool Movement method
- Storage of Tools
- competency level

Tools use for analysis

- Brain storming

- Fishbone Diagram
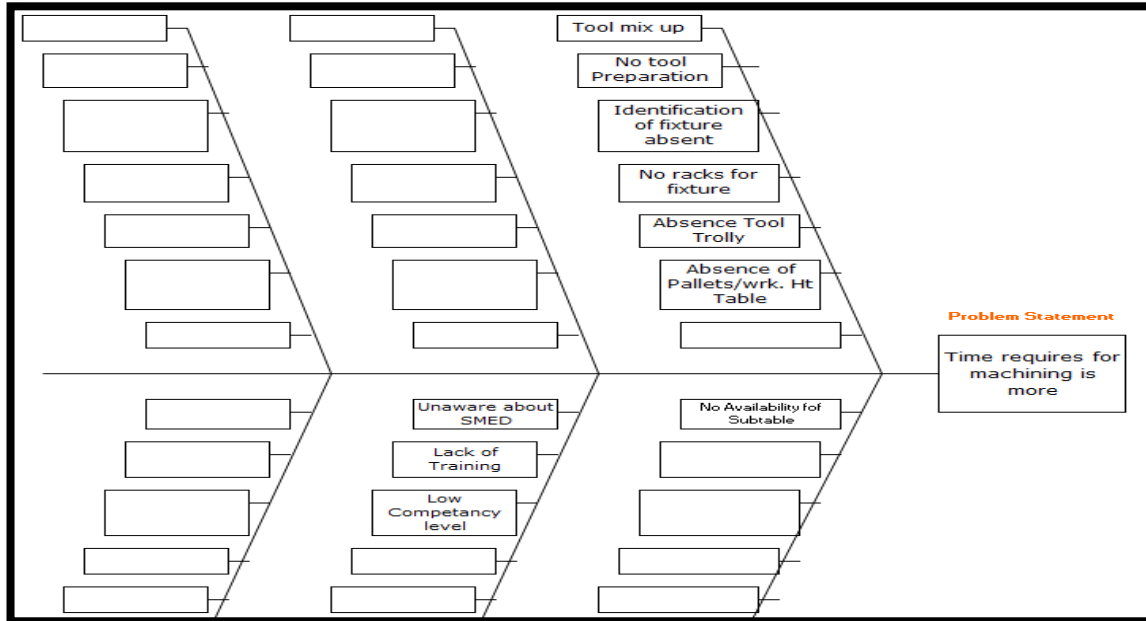- Video Shoot done of entire machining set up
- SMED Report

Fig. Fishbone Diagram

NO.	CHANGEOVER ACTIVITIES ON MACHINE - (VMC Stunner) ACTIVITY	ASSOCIATED TIME TAKEN IN SECONDS	ACTIV CLASSIFI CATION INT/EXT	Whether the Activity can be Converted to External ? (I/E)	ASSOCIATED TIME TAKEN IN SECONDS (Phase I)	ASSOCIATED TIME TAKEN IN SECONDS (Phase II)	If Activity can not be external, can we reduce time taken	Action Plan / Improvement (Combine, Rearrange, Simplify)	Status
1	Unloading of previous fixture/setup	00:01:25	I	I	00:01:25	00:01:25			
2	Removing jammed bolt	00:04:22	I	I	00:04:22	00:04:22	Yes	Standardisation of bolts and clamps	
3	Cleaning the bed	00:00:50	I	I	00:00:50	00:00:50			
4	Removal of tools from machine	00:02:58	I	I	00:02:58	00:02:58			
5	Keeping tools back in place	00:01:29	I	E	-	-		This is to be done after setup completion	
6	Keeping back clamps and accessories	00:02:16	I	E	-	-			
7	Removing tools from shank	00:03:25	I	E	-	-			
8	Keeping tools back in storage	00:02:15	I	E	-	-		To be done after setup	
9	Instruction to operator	00:00:10	I	E	-	-		Instructions to be given in morning meeting	
10	Instruction to operator	00:00:10	I	E	-	-			
11	Getting the card(Program loading from comp)	00:00:50	I	E	-	-		Card should be availble with operator or on trolley before starting changeover	Implemented
12	Searching program on m/c from card	00:00:42	I	E	-	-			
13	Locate & download program on m/c	00:00:28	I	E	-	-		To be done parallel	
14	Required tool search from program	00:02:09	I	E	-	-			
15	Searching for required fixtures	00:01:16	I	E	-	-		Keep required material ready on SMED trolley	
16	Getting clamps, spanners and allen key	00:00:45	I	E	-	-			
17	Loading fixture and clamps on machine	00:01:40	I	I	00:01:40	00:01:40	Yes	Standardisation of clamps	
18	Getting required spanners	00:00:20	I	E	-	-		Keep required material ready on SMED trolley	Implemented
19	Getting drill chuck	00:01:00	I	E	-	-			
20	X-Y coordinate level(Dialing)	00:05:18	I	I	00:05:18	00:05:18	Yes		
21	Time added after discussion with owner, supervisor and operator as usually time taken for XY coordinate setting is much higher	00:49:12	I	E	-	-			
22	Loading job again	00:02:07	I	I	00:02:07	00:02:07		Prior preparation is to be done on tool preparation table	Implemented
23	Geeting clamps and packing	00:04:00	I	E	-	-			

Fig. SMED Report

Finding of main causes

- Unaware about SMED
- Tool Mix Up Issues
- No Data available i.e. Tool Change Over time, Setting time etc.
- Tool storage location is quite away from station & Operator used to visit tool room more frequently.
- No Tool Preparation
- Lack of Planning

Improvement Plan

What Improvements to be made

After performing Root cause analysis we came to know that we need to go through following improvements:

- Tools as per designation, sizes need to be sorted out.
- Tool Trolley needs to be provided.
- Tool preparation time needs to be reduced.
- Tools must be available at stations.
- Tool change over time, Setting time, Cycle time, loading & unloading Time is to be monitored & recorded so effects of Improvements can be analysed.
- Planning for next set up must be ready so Tools can be arranged accordingly and tool changeover time will be less.

Conclusion

Close to 80% reduction in Changeover Time achieve through SMED project. Project status after each phase of implementation is stated below.

After Phase I Implementation				
PRODCUTIVITY MEASURES	**BEFORE IMPROVEMENTS**	**AFTER IMPROVEMENTS**	**IMPROVEMENT**	
			Time	**%**
SETUP TIME / SETUP (MIN.)	03:20:04	01:17:06	02:02:58	61.46%
PRODCUTIVITY MEASURES	**BEFORE IMPROVEMENTS** (No of setups in the month*setup time)/Cycle time	**AFTER IMPROVEMENTS** (No of setups in the month*setup time)/Cycle time	**IMPROVEMENT**	
			JOBS	**%**
PRODUCTION LOSS DUE TO SETUP (JOBS/MONTH)	4286.571429	1651.285714	2635.29	61.48%
PRODCUTIVITY MEASURES	**BEFORE IMPROVEMENTS** (No of setups in the month*setup time)	**AFTER IMPROVEMENTS** (No of setups in the month*setup time)	**IMPROVEMENT**	
			TIME	**%**
PRODUCTION TIME LOSS DUE TO SETUP (MIN/MONTH)	30006	11559	18447.00	61.48%

After Phase II Implementation				
PRODCUTIVITY MEASURES	**BEFORE IMPROVEMENTS**	**AFTER IMPROVEMENTS**	**IMPROVEMENT**	
			Time	**%**
SETUP TIME / SETUP (MIN.)	03:20:04	01:17:06	02:02:58	61.46%
PRODCUTIVITY MEASURES	**BEFORE IMPROVEMENTS** (No of setups in the month*setup time)/Cycle time	**AFTER IMPROVEMENTS** (No of setups in the month*setup time)/Cycle time	**IMPROVEMENT**	
			JOBS	**%**
PRODUCTION LOSS DUE TO SETUP (JOBS/MONTH)	4286.571429	1651.285714	2635.29	61.48%
PRODCUTIVITY MEASURES	**BEFORE IMPROVEMENTS** (No of setups in the month*setup time)	**AFTER IMPROVEMENTS** (No of setups in the month*setup time)	**IMPROVEMENT**	
			TIME	**%**
PRODUCTION TIME LOSS DUE TO SETUP (MIN/MONTH)	30006	11559	18447.00	61.48%

After Phase IV Implementation				
PRODCUTIVITY MEASURES	**BEFORE IMPROVEMENTS**	**AFTER IMPROVEMENTS**	**IMPROVEMENT**	
			Time	**%**
SETUP TIME / SETUP (MIN.)	03:20:04	00:36:32	02:43:32	81.74%
PRODCUTIVITY MEASURES	**BEFORE IMPROVEMENTS** (No of setups in the month*setup time)/Cycle time	**AFTER IMPROVEMENTS** (No of setups in the month*setup time)/Cycle time	**IMPROVEMENT**	
			JOBS	**%**
PRODUCTION LOSS DUE TO SETUP (JOBS/MONTH)	4286.571429	778.2857143	3508.29	81.84%
PRODCUTIVITY MEASURES	**BEFORE IMPROVEMENTS** (No of setups in the month*setup time)	**AFTER IMPROVEMENTS** (No of setups in the month*setup time)	**IMPROVEMENT**	
			TIME	**%**
PRODUCTION TIME LOSS DUE TO SETUP (MIN/MONTH)	30006	5448	24558.00	81.84%

Tangible & Intangible benefits we received through the SMED Project are as per below:

SMED Project Benefits		
Sr. No.	**Tangible benefits**	**Intangible benefits**
1	Projected annual saving - Rs.307500	Less Painful
2	No overproduction	Due to identification, semi or unskilled operator can find out fixture easily.
3	It saves tool Preparation time	Improved responsiveness to customer requirement
4	Improvement in On Time Deliver performance	It eliminates 'Motion' waste as all tools are available at one location and before next set up.
5		Time saving due to rack availability, identification.

Standardization of the activities

Use of Trolley

Fig. Trolley

To reduce Tool movement time and to enhance safety trolley was introduced. All required tools, holders etc. can be moved on the trolley easily.

Improved tool storage

Before

After

Fig. Tools Sorted out as per designation & Sizes

Sorting and identification of tools and inserts completed to eliminate the searching time.

Fig.1 Before SMED - No Rack for fixture   Fig.2 Fixture Rack with Identification

Ergonomic working table

Fig. Working Height Table

Due to absence of working height table operator has to bow down every time to pick up a part and that was painful & time consuming too. Also there was no space available to keep all instruments Drawings and other things, but working height table made it possible.

Sr. No.	Part Name	Part No.	Programme Name	Set up No.	Programme No.	Cycle Time	Loading/ UnLoading Time	List of required Tools
1	ASP Container	103052	(CONTAINER ASP CNC 1ST NEW)	1	1	11MIN 25SEC		TNMG 0.4
								32.0MM BORING BAR 115.0 OUT
								FACE GROOVE 5.0MM INSART
								25.0MM DCGT 0.4
								20.0MM DCGT 0.4
2	ASP Outer Rim	105141	(ASP OUTER RIM CNC 1ST)	1	1	1MIN		25.0MM CCGT 0.4
			(ASP OUTER RIM CNC 2ND)	2	1			TNMG 0.4
			(ASP OUTER RIM CNC 3RD)	3	1	4MIN 20SEC		TCGT 0.4
								25.0 MM DCGT 0.4
								25.0MM DCGT 0.4
3	ASP Tray Resting Hub	100158	ASP TRAY RESTING HUB CNC 1ST			2MIN 25SEC		TNMG 0.4 ALLUMINIUM GRADE
								14.0 DRILL
								10.0MM BORING BAR CCMT0.4
								TNMG 0.4 ALLUMINIUM GRADE
								OD U CUT VBMT 0.4
								10.0MM BORING BAR CCMT0.4

Above table header:
Wezmann Tools Pvt. Ltd.
CNC TOOLING DETAILS AS PER SET UP - TRANSASIA BIOMEDICALS LTD.

Fig. Tooling Details as per set up

Requirement of tools as per set up now available so tool preparation time has been saved.

Use of Sub Table

Fig. Sub Table

Concept of sub table is to match P.C.D. of sub Table with P.C.D. of fixtures so loading unloading time & setting time will be very less. Due to use of sub table huge amount of time was saved in the initial machine setting.

Horizontal Deployment:

Improvements done directly helped to reduce the Changeover time for other machines and other products as well.

Remarks by LMC

With the help of Wezmann Tools team, SMED project was identified for VMC machine and job that they could get maximum benefit from this activity.

Unit's team performed really well throughout the project.

As they took keen interest right from beginning and carried out improvements in the right spirit, such huge improvement (more than 80% reduction in changeover time) could be achieved.

I am sure team is now well prepared to horizontally deploy the improvements and carry out more SMED exercises on their own.