QUICK Change Over

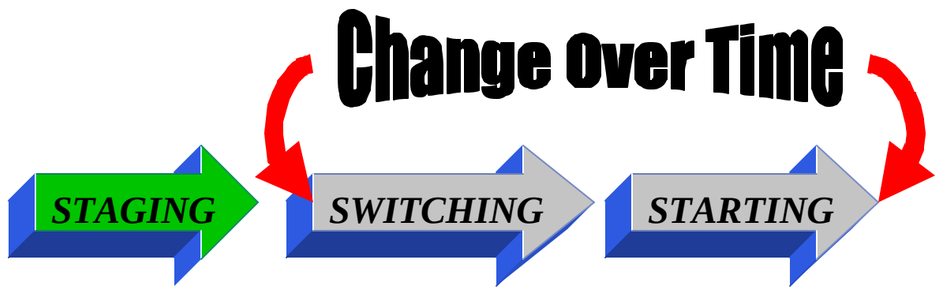
A Principles and Practice Outline

Provided by:
STS International, Inc.
Burlington, NC. 27215

NOTES:

Quick Change Over

3 Stages of Planning and Execution



Quick Change Over has become an art in many organizations. One particular methodology for Quick Changeover – SMED or Single Minute Exchange of Die comes from the concept that if everything is ready, positioned, accessible, quick to disconnect and reconnect, and easy to "align" to the operating settings – then a changeover should be accomplished in a single minute.

For most of us – a "minute" seems like something out of the twilight zone – but could we. Could we cut our time in half, then in half again? That is significant productive time gained – and in today's world, the customer wants us to change the product when he wants it.

There are 3 stages we use to improve Quick Changeover. Staging, Switching and Start-up. Naturally, we won't make improvements unless we add "debrief" and "plan" to the end of each changeover during our improvement process. But soon the process should really focus on these three.

Staging:

Prior to seeing that last unit of production move through our product line, we should have prepared every detail of the upcoming change over. **Everything that can be done during Staging – must be done there.** In a way – this is a "free throw" zone. The process is running, product is being made, and the operation is being prepared for a quick change. Activities which are included in Staging are:

- Staging all the necessary parts at the exact location where they will be installed.

- Planning area for the old parts to be staged or stored for removal following their disassembly.
- Having all tools ready and at their needed location.
- Having components pre-assembled to the greatest degree possible.
- Having lifting or positioning equipment in place and ready to use.
- Having the people assigned, knowing their specific role and the steps of the process.
- Having all the necessary locks, tags, or other visual safety tools ready for disabling the machinery.
- Having any guards or equipment changes ready or partially disassembled and ready for a quick exchange when the machinery is off.
- Having quick-couplers on changeable hoses or other connections where possible.
- Having automatic rail positioning systems in place or other fixed point change systems.
- Having visual instructions, settings, or other information readily available and posted at key points to facilitate correct placement during the changeover.

Switching

At the time the machinery is disabled and the actual switching of components or resetting of parameters is to be done – we need a specific process for making the change. This really involves:

- What is the sequence of switch out –switch in
- Who does what and when
- How – what is the correct, fastest and most effective method for making the shift.
- What tools are necessary and where are they.

Effective switching depends strongly on effective staging. This is where the actual gains are seen and results demonstrated.

Starting

This too is a process piece and requires the following be checked

- Check key set-up points for proper setting
- Check power and prepare to initiate
- Run test and insure process is working to standard
- Insure proper lubrication, settings, alignment, guarding, etc. prior and until standardization of process flow.

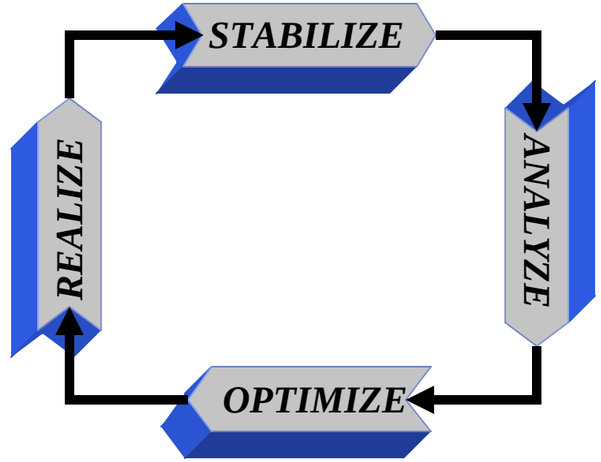
This is a great opportunity. Often we start a line and then "Tweak" it until it runs pretty well. All this "Tweaking" time is part of the changeover. Our goal should be to know the equipment so well that all parts can be positioned, set, gauged, and calibrated for full operation first time, every time. Then we have truly optimized the startup.

Each of these areas has a potential gain available. Mapping the current process, using video tape to capture it all, and evaluate what steps can be placed in which category will IMMEDIATELY impact the length and loss of the changeover.

Improvement Process

One additional set of process steps is essential in our understanding of Quick Changeover – or any improvement process. Improvement requires discipline, focus and adherence to process rather than simply being satisfied with a few "quick fixes" to parts of the process.

In general, the improvement process has 4 continuous steps:



- ***Stabilize*** the current process

  If everyone is doing the change-over differently, creatively, or "artistically" it is almost impossible to know identify any new process which will shorten and optimize the process. This may mean adhering to the ISO process which was already established for this changover. It may mean mapping the process and agreeing to follow the "as is" for one changeover. Regardless, we must be able to define and

- ***Analyze*** – Evaluate the value and flow

  If we can make all the steps and activities of the process "visible" to the analyzing team, then we can do several things which will help us optimize the process. First, we will know "who is doing what – when." We will know how long that activity currently takes and the value or cost of that step in our process. Seeing these activities mapped in order and by responsibility immediately helps the group see connections that will shorten, improve or lower cost of the project.

- ***Optimize*** – Re fine the process

  Now the "value adding" parts of the process can be "re-ordered" and "re-assigned" for improved process flow and efficiency. Any component of the process which can be moved "before" the "START CO" time frame must be moved there. This preparation automatically shortens the actual changeover time. Also, this gives us a chance to look at deeper issues. The use of quick connect couplers or quick release anchors. The availability and type of tools. The sharing or reassigning of tasks. Etc. During this phase we cannot do "everything" but if we change a significant number of key activities or equipment issues, then try it – we can re-stabilize the process and move toward a deeper optimization next time.

- ***Realize*** – DO IT!!

  This step is often left out. We often "plan" a new process, then fail to prepare ourselves so we actually make the changes next time. Realizing the changes builds our ability to make more changes in the future and changing to a "new and more deliberate" process actually builds discipline during the changing. Remember, the next time we "do it" we begin the process again and as soon as this new process is stabilized – lets make it better!!!!

Sample Format – Quick Change Summary and check Sheet

Equipment:		Change Description:	
Standard Time:		Target Time:	

	STAGING		SWITCHING/ CHANGE-OUT		STARTING /STABILIZE
Ö	***MATERIALS/ COMPONENTS***	Ö	***TOOLS REQUIRED***	Ö	***SET POINTS/ TOOLS/ BASELINES***
Ö	***STAGING PROCESS –*** *WHAT/WHERE/ COMPONENT ASSEMBLIES, ETC*	Ö	***SWITCHING PROCESS STEPS*** *BEST ORDER BELOW*	Ö	***STARTING/ STABILIZE PROCESS*** *BEST ORDER BELOW*

Notes:

Quick Changeovers

EXERCISE - WHAT WOULD QUICK CHANGEOVERS DO?

Take 3 minutes and name what it would do for your customers, your company and the people if changeover times could be reduced by 50%, or more.

Goals for Quick Changeovers

- Make operators/set-ups job easier to perform a changeover
- Make changeover safer for all involved
- Reduce changeover time
- Reduce number of tools needed to complete a changeover
- Reduce clutter around work area
- Increase scheduling flexibility
- Improve delivery time to customer
- Improve quality
- Reduce cost to the customer

How to Reduce Changeover Time

- Eliminate non-value added tasks
- Question why all actions are taken.
- Eliminate or reduce non-value added motion in machinery and people (Shorten path)
- Move as much “During Changeover” to “Before Changeover” as possible.
- After moving “During to Before”, move as much “During Changeover” activity to “After Machinery Starts” as possible
- Institute “Pre-flight Checklists” to insure everything is ready and working for the changeover
- Move more people to line during a changeover
- Make a plan for who will do what, when
  Eliminate need of adjustments through visual or numeric control .

Notes:

QUICK CHANGEOVER VIDEO

With the help of a video camera – complete the following:

_____ ***Take video tape of the full changeover process***. Be sure to turn on the clock so it is always displayed on the screen. This will allow you to fast forward through processes which are time consuming and still know how much time it took. "Narration" of the changeover is most helpful.

____ ***Gather all team members together and record visibly (wall chart, etc.) every step that <u>everyone</u> did to perform the changeover.*** These steps must be completed in detail. (Your team might want to use the "Changeover Cheat Sheet" provided on the next page). It is likely that every step is not captured on tape; therefore, it is important that all team members are present and are involved in discussing all changeover steps each one completes during a changeover. Be sure to include all activity which takes place during a changeover which may include things such as movement of material, communication made by any team member, documentation completed, etc.

____ ***Summarize the total time it took to perform Changeover*** (Start time is determined when the last part <u>starts</u> through the line. End time of a changeover is determined when <u>ALL</u> minor adjustments are completed - even if the line is back up and running)

____ ***Determine your goal for completing the changeover next time.*** *(Most operations can obtain at least a 50% reduction)*.

____ ***Eliminate non-value adding activities.*** Discuss your team on the activities which are non-value added and may simply be able to be eliminated. Be sure that you clearly understand that a task is truly non-value added before eliminating it. (A task might be done for a safety, quality or cost reason which may not be understood, it is important to gather this type of information).

____ ***Look at people and machinery movement.*** Discuss how movement of people and machinery can be cut to a minimum. Shorten paths through use of tool or machinery relocation.

____ ***Review the process Steps.*** Discuss with your team on how you will move "During" activities to "Before" and if not possible moving them to "Before" how you will move them to "After". Note what will get done and by who, on paper, in correct order.

____ ***Review Tools.*** Discuss how you might eliminate or reduce the tools needed to perform a changeover. Consider how they might be placed and stored in a neat, orderly fashion.

____ ***Review duties of individuals.*** Discuss how you might move other personnel around to provide additional support during a changeover to save precious time.

____ ***Develop Checklists for Staging, Switching and Start-up.*** This includes all the items which should be checked before the changeover begins.

____ ***Use Visual Controls.*** Determine what additional "visual controls" your team may need to assist in the changeover process. Use of shadow boards for tools, baseline marks, lexan, etc.

Changeover Cheat Sheet/Time Study

Step No.	Action taken	Who	Start Time	End Time	Task Time	Before, During or After
1						

Step No.	Action taken	Who	Start Time	End Time	Task Time	Before, During or After

Comments - **Include type of Changeover, Total time of changeover, Goal for changeover time and when goal can be accomplished, etc.**

Notes:

Change-Over Analysis and Planning Forms

These are offered as helps and should be adjusted to fit your specific needs and requirements.

The first three (3) forms are for the initial analysis of the process in Staging, Switching and Starting.

The next three (3) forms are for the re-design of the process and stabilization.

Each form includes the process steps, equipment layout, and notes. The equipment layout format should be used for travel diagramming (spaghetti diagrams of people movement around the equipment) and locations of tools, equipment and materials.

Change-Over Analysis Staging -- Brainstorming

As a group: Identify all the possible Staging activities which you see from the film and observation which could be moved to the staging Sequence

Brainstorm	Currently in Staging	Should move to Staging	Must stay in Switching	Responsibility

Change-Over Analysis Staging – Process Map

Map the Current equipment and process. Identify where all materials, tools, parts, etc. were positioned prior to the start of the changeover. Use the "spaghetti diagram" approach to show travel and positioning required in order to make the switching.

Identify all Equipment and Tools utilized in this portion of the process:

Change-Over Analysis Switching -- Brainstorming

As a group: Identify all the observed switching activities and the order in which they were accomplished. Then identify the order in which they should be done and by whom.

Brainstorm	Current Step in Process	Current Responsibility	Future Step in Process	Future Responsibility

Change-Over Analysis Switching – Process Map

Map the Current equipment and process. Use the "spaghetti diagram" approach to show travel and positioning required in order to make the switching.

Identify all Equipment and Tools utilized in this portion of the process:

Change-Over Analysis Starting -- Brainstorming

As a group: Identify all the observed Starting activities and the order in which they were accomplished. Then identify the order in which they should be done and by whom.

Brainstorm	Current Step in Process	Current Responsibility	Future Step in Process	Future Responsibility

Change-Over Analysis Starting – Process Map

Map the Current equipment and process. Use the "spaghetti diagram" approach to show travel and positioning required in order to make the switching.

Identify all Equipment and Tools utilized in this portion of the process:

Change-Over Analysis -- Staging – Re-Defined Process

As a group: Decide the best order and positioning of all equipment, tools and materials necessary for an effective staging process. Identify the order in which they will be accomplished and by whom.

Staging Activities, Tools or Equipment	New Step in Process	Responsibility	Comments and Instructions Future Responsibility

Change-Over Analysis Staging – Re-Defined Map

Map the Re-Defined equipment and processes. Use the "spaghetti diagram" approach to show travel and positioning required in order to make Staging Effective..

Change-Over Analysis Switching – Re-Defined Process

As a group: Decide the best order and positioning of all equipment, tools and materials necessary for an effective switching process. Identify the order in which they will be accomplished and by whom.

Switching Steps, equipment and processes	Step in Process	Responsibility	Comments and Instructions

Change-Over Analysis Sheet Switching – Re-Defined Map

Map the new equipment and process. Use the "spaghetti diagram" approach to show travel and positioning required in order to make the switching effective.

Change-Over Analysis Sheet Starting -- Re-Defined Process

As a group: Decide the best order and positioning of all equipment, tools and materials necessary for an effective starting process. Identify the order in which they will be accomplished and by whom.

Starting Activity, tools necessary, processes	Current Step in Process	Current Responsibility	Future Step in Process	Future Responsibility

Change-Over Analysis Sheet Starting – Re-Defined Map

Map the new equipment and process. Use the "spaghetti diagram" approach to show travel and positioning required in order to make the starting effective.

Quick Change-over Accounting – the Score Sheet

Change-Over (CO) Step	Value	Initial Test Benchmark Date--	Test 2 Date--	Test 3 Date --
Begin CO – End Production run.	Clock Time			
Clearing and Cleaning	Measured			
Switching	Measured			
Re-starting	Measured			
Ramp-up time	Measured			
End CO – Enter full Production	Clock Time			
TOTAL CO TIME	Measured			
Production Value of time	Units/min			
Lost Production	Units Total			
Production Savings after planning	Units			
VALUE PER MINUTE	$$			
COST OF CO	$$			
SAVINGS	$$			

Quick Change Summary and Check Sheet – New Standard

Equipment: Change Description:

Standard Time: Target Time:

	STAGING		SWITCHING/ CHANGE-OUT		STARTING /STABILIZE
Ö	MATERIALS/ COMPONENTS	Ö	TOOLS REQUIRED	Ö	SET POINTS/ TOOLS/ BASELINES
Ö	STAGING PROCESS – WHAT/WHERE/ COMPONENT ASSEMBLIES, ETC	Ö	SWITCHING PROCESS STEPS BEST ORDER BELOW	Ö	STARTING/ STABILIZE PROCESS BEST ORDER BELOW

Key Learnings and Opportunities:

Action Plan – Next steps

Action required	Target Date	Person Responsible	Comment