Operational Excellence Series

Book 5:

Quick Changeover for Printers

Kenneth E. Rizzo

Printing Industries Press
PITTSBURGH
Contents

Introduction .................................................................................................................. 1

Single-Minute Exchange of Die (SMED) ................................................................. 2

Quick Changeover ...................................................................................................... 2

Methodology .................................................................................................................. 6
  1. Identify Changeover Process Steps ............................................................... 6
  2. Separate Internal Steps to External .............................................................. 11
  3. Convert Internal Steps to External ................................................................. 20
  4. Streamline and Eliminate Adjustments .......................................................... 21

Quality at the Source ................................................................................................. 24

Best Practices—Overall Equipment Effectiveness (OEE) ......................................... 30

Kaizen: Quick Changeover ....................................................................................... 31
  Kaizen Blitz Event Steps .................................................................................... 36

About Printing Industries of America ...................................................................... 51

Printing Industries of America Affiliates ............................................................... 52

Publications of Interest from Printing Industries of America .............................. 53
INTRODUCTION

Printers today must slash setup and changeover time and cut all the costs they can. Failure to recognize and to do this can result in extinction. To survive, printers must look at and address production problems and delays in terms of process issues, not personnel or individual/personal issues. To improve the current state of affairs, system and process excellence must become the driving force for printers. Excellence begins with measuring processes, analyzing the information and data, then addressing what is found with objective and unbiased corrective and preventive actions. To accomplish system and process excellence, management must embrace Lean thinking.

Changeover is the process of changing and setting up processes or equipment from producing one job to producing the next job. In printing, changeover can also be called make-ready or setup. Today, the need to perform quick or fast changeovers is critical for printers to survive. Other industries have recognized for decades that changeover is a serious issue and have attacked it in a more methodical and systematic fashion. The most successful method is Quick Changeover, based on the breakthrough method known as Single Minute Exchange of Die (SMED) developed by Dr. Shigeo Shingo.

Dr. Shingo’s work transformed into what is known today as The Shingo Model. It details specific principles of Operational Excellence and the power of balancing efforts across all the dimensions of an organization. In North America companies can be recognized for that excellence by being awarded the Shingo Prize for Excellence in Manufacturing, which is presented annually to a company that best exemplifies world class manufacturing in the U.S., Canada, or Mexico.
SINGLE MINUTE EXCHANGE OF DIE (SMED)

Dr. Shigeo Shingo worked with Toyota as an engineer and management consultant focusing on the setup and changeover processes. Shingo developed the SMED (Single Minute Change of Die) methodology in the late 1960s. With SMED he drove changeover times from days to minutes and allowed increased flexibility through the processing of smaller batches.

Another breakthrough technique Shingo created and developed was in the area of mistake proofing. Known as Poka Yoke, it is a method of preventing errors by putting limits on how an operation can be performed in order to force the correct completion of the operation.

Four Phases of SMED
1. Identify changeover process steps.
2. Separate internal steps to external.
3. Convert internal steps to external.
4. Streamline and eliminate adjustments.

QUICK CHANGEOVER

Internal changeover steps can only be carried out when equipment is stopped. External changeover steps can be carried out when equipment is running. The goal: First good item!

The primary aim of Quick Changeover is to enable printers to make quantum improvements in prepress, printing, and postpress equipment operations. They involve:

Increased Capacity

- Increasing capacity enables reduction of overtime in processes and increased sales.
- Accelerating production throughput leads to quicker delivery and opens up production processes for increased sales.
- Lowering production costs sets up current processes to become far more competitive by:
  ✓ Reducing changeover times.
  ✓ Decreasing downtime, both scheduled and unscheduled.
  ✓ Cutting waste and spoilage, i.e., less time and raw material usage.
  ✓ Increasing production per hour, i.e., more product will be produced in the same time frames.
Improve Response to Customer Demands

• Develop the ability to respond quickly to market and customer changes.
• Improve delivery performance.
• Help your salespeople help your customer.
• Achieve a quick response system to assist in the development of new marketing strategies

Reduce Inventory Costs

• Reduce inventory costs of...
  ✓ Raw materials
  ✓ Work-in-process
  ✓ Finished goods

• Inventory is the huge cost spent for materials and processing, but no compensation has been received from customers. Dollars have been tied up, preventing their use on other company issues.

Improve Quality and Productivity—Eliminate Problems

✓ Eliminate errors from order entry, planning, and job information, which create unscheduled downtime and rework.

✓ Scheduling problems and customer complaints, which lead to pulling jobs off process before they are complete by forcing jobs into full schedules.

✓ Waste and spoilage of materials and time.

✓ Equipment failures and downtime.

✓ Longer and inconsistent setups/makercadies.

✓ Slower equipment production performance.

✓ Paperwork backlog.

The goal is to...

✓ Reduce changeover time to increase capacity.

✓ Optimize changeover effectiveness by maintaining necessary press conditions, based on manufacturer recommendations and specifications, and performing necessary blocking and tackling.

✓ Change over the machine from producing the last good product of the previous job to producing good product for the next job in less than 10 minutes. Last Good ⇔ First Good

Quick Changeover for Printers
Reasons for implementing Quick Changeover include the current state of the economy and customers’ expectations and the need for:

- Shorter run lengths (smaller batches)
- Shorter process cycle times
- Shorter value-stream lead times
- Decreased costs (less materials usage)
- On-time delivery at all times
- Quick response to customer needs
- Increased cash flow

**Equipment Setup**

- Remove and clean old components and materials for last job from machine.
- Install new components and materials for new job for machine.
- Perform necessary installation settings.
- Perform trial runs to make adjustments required to match job specifications.
- Achieve approval to run production.

**Information, Materials, and Tooling Procurement**

- Transport old materials, components, and tooling to storage.
- Attain and transport new materials, components, and tooling to machine location.
- Stage and prepare new materials, components, and tooling on machine.

Length of changeover time is based primarily on the extent of operator movement, number of machine components and materials changed, the amount of installation settings, and the magnitude of adjustments required to match job specifications.

Changeover improvement goals are achieved through reducing operator movement, decreasing components changed, the accuracy of settings, and elimination of adjustments.
Quick Changeover (QCO) is designed to improve changeover utilizing "teams."

Management Team
☐ Learn and embrace Lean thinking.
☐ Drive company-wide commitment for total project success.
☐ Delegate and enable teams to be proactive and autonomous.
☐ Develop flexible strategy.
☐ Give "total proactive support" to middle managers and production teams.
☐ Provide leadership, support, resources, and organizational structure.

Middle Management and Staff
☐ Learn and embrace Lean thinking.
☐ Identify problems and areas of opportunity.
☐ Provide leadership.
☐ Develop improved management methods.
☐ Delegate and enable teams to be proactive and autonomous.
☐ Drive and manage project implementation.
☐ Ensure project awareness.
☐ Be proactive in the development of solutions and their implementation.
☐ Give "total proactive support" to the production teams.

Process and Equipment Teams
☐ Learn and embrace Lean thinking.
☐ Conduct QCO in production areas and equipment.
☐ Identify problems and solutions to improving both internal and external obstacles to improvement.
☐ Be proactive in development of improved techniques and operating procedures.
☐ Implement improvements and QCO procedures.

Quick Changeover for Printers

NOTES

Make Note...
Reduce changeover time to increase capacity.
METHODOLOGY

The Four Phases SMED Process

1. Identify changeover process steps.
2. Separate internal steps to external.
3. Convert internal steps to external.
4. Streamline and eliminate adjustments.

1. Identify all steps to change over a machine from producing one job to producing the next job.

First the team must identify and list the essential components, parts, settings, and materials that need to be exchanged and the sequence for the specified equipment to go from running one job to running the next job. The current equipment changeover will be based on necessary mechanical requirements, conditions, and the status quo. The team also must identify and analyze current changeover tasks and activities.

Changeover Steps

☐ Remove tooling and job components: information, materials and tools.
☐ Clean up machine: tooling and equipment components.
☐ Perform settings to machine: place equipment component settings at zero.
☐ Install new tooling and components: information, new components.
☐ Run first pieces: first pulls after equipment setup.
☐ Make adjustments: adjust equipment, components, and materials to match job specifications for position, fit, color, etc.
☐ Match job to specifications: get approval to run.
☐ Start running: fine-tune machine and reach optimum production speed.

The total average time to go from last good to first good sheet/signature/item must be identified. The team must conduct investigations to determine the current state of changeover for an equipment or process. The various investigative methods include:

• Personal observations, or watching actual changeovers at the process
• Interviewing people performing changeover
• Analyzing videos of current changeovers

Document changeover events, times and responsibilities. What’s happening?
Changeover — Identify Steps

Department:

Process/Equipment:

Changeover Type
☐ Full  ☐ Partial — description

QCO team must itemize everything necessary to perform changeover

✓ Name each step
✓ Number of persons
✓ Tooling and materials
✓ Operating conditions: environment and equipment
✓ Equipment settings and measurements

<table>
<thead>
<tr>
<th>Changeover Steps</th>
<th>Components*</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td></td>
</tr>
</tbody>
</table>

* Components = information, materials, tools, operators

Quick Changeover for Printers
<table>
<thead>
<tr>
<th>Changeover Steps</th>
<th>Components</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>8.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>9.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>10.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>11.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>12.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>13.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>14.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>15.</td>
<td></td>
</tr>
<tr>
<td>Changeover Steps</td>
<td>Components</td>
</tr>
<tr>
<td>-----------------</td>
<td>------------</td>
</tr>
<tr>
<td>16.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>17.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>18.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>19.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>20.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>21.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>22.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>23.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>24.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>25.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
2. Separate all internal changeover steps being done during internal changeover that should be done during external changeover (i.e., pre-changeover).

The QCO team must examine:

- Internal changeover tasks (can only be performed when the machine is stopped)
- External changeover tasks (can be performed when the machine is running/in operation)

The primary questions to ask are:

- Why must the equipment be stopped to conduct each changeover step?
- How can steps be separated from internal time when the equipment is stopped to external time when the equipment is running?

**QCO Team Assessment**

Does equipment meet manufacturer specifications?

☐ Yes  ☐ No

If no, can it be fixed and improved.

________________________________________________________________________

________________________________________________________________________

Do materials meet specifications?

☐ Yes  ☐ No

If no, they must be process-/equipment-ready and staged all the time.

________________________________________________________________________

________________________________________________________________________

Are correct tools and items being used?

☐ Yes  ☐ No

If no, obtain extra common tools to reduce or eliminate internal adjustments.

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

Quick Changeover for Printers
Are staging locations efficient for information, materials, and tooling?
☐ Yes  ☐ No

If no, follow the 30-second rule: everything needed can be retrieved in less than 30 seconds!

Are changeover methods efficient?
☐ Yes  ☐ No

If no, best practices must be developed and implemented.

Are people utilized to their highest potential?
☐ Yes  ☐ No

If no, institute realistic training and establish cross-functional teams.

Are changeover techniques and procedures effective and efficient?
☐ Yes  ☐ No

✓ Everyone must be performing the basics well.
✓ Everyone must be blocking and tackling.
✓ Necessary conditions are being maintained.
✓ Changeover steps must be improved, modified, and streamlined to reduce changeover time.

Are standard operating procedures in place?
☐ Yes  ☐ No

If no, best practices must be established as Standard Work.
Address the following questions to separate internal changeover tasks to external changeover tasks

What is needed?

__________________________

__________________________

__________________________

__________________________

Where is it needed?

__________________________

__________________________

__________________________

__________________________

Who needs to do what?

__________________________

__________________________

__________________________

__________________________

How long should changeover/makeready take?

__________________________

__________________________

__________________________

__________________________
What are the proper operating conditions?


What are the correct settings for the next operation?


What needs to be staged beforehand?


How can everything be returned when equipment is up and running?


How can transportation of tools and materials be carried out during external changeover time?

Notes and Comments
Changeover: Separate Internal Changeover Steps to External Pre-changeover

Department:

Process/Equipment:

QCO team records changeover steps separated from internal changeover to external pre-changeover.

<table>
<thead>
<tr>
<th>Internal Changeover Step</th>
<th>Separate to External Pre-changeover</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td></td>
</tr>
<tr>
<td>8.</td>
<td></td>
</tr>
<tr>
<td>9.</td>
<td></td>
</tr>
<tr>
<td>10.</td>
<td></td>
</tr>
<tr>
<td>11.</td>
<td></td>
</tr>
<tr>
<td>Internal Changeover Step</td>
<td>Separate to External Pre-changeover</td>
</tr>
<tr>
<td>--------------------------</td>
<td>-----------------------------------</td>
</tr>
<tr>
<td>12.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>13.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>14.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>15.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>16.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>17.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>18.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>19.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>20.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>21.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>22.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>23.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>24.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>25.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>26.</td>
<td></td>
</tr>
<tr>
<td>Internal Changeover Step</td>
<td>Separate to External Pre-changeover</td>
</tr>
<tr>
<td>--------------------------</td>
<td>-----------------------------------</td>
</tr>
<tr>
<td>27.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes and Comments

---

Quick Changeover for Printers
3. Convert all of the separated internal changeover steps to external changeover steps.

The converted changeover steps now become standard operating procedures (SOPs) that are conducted by everyone operating the equipment. Necessary items are now prepared and staged when the previous job is running and include:

✓ Tooling
✓ Components
✓ Information
✓ Materials

How can the separated changeover steps be converted from an internal task to an external task?
“Offline” prepare operating conditions beforehand, including:

☐ Pre-adjust settings and alignments
☐ Pre-check information and materials
☐ Pre-mix chemicals and supplies
☐ Stage all required tools and components

Standardize and Document Converted Procedures

Staging all necessary items will reduce or eliminate many internal tasks that require the machine to be stopped.

Internal Changeover Steps Separated to External Pre-changeover

1. ______________________________________________________
2. ______________________________________________________
3. ______________________________________________________
4. ______________________________________________________
5. ______________________________________________________
6. ______________________________________________________

Make Note...

Staging all necessary items will reduce or eliminate many internal tasks that require the machine to be stopped.
4. Streamline and eliminate adjustments.

The team must now concentrate on streamlining or developing more effective and efficient techniques to perform both internal and external changeover steps. External changeover steps, or pre-changeover, must be completed on time every time. Internal steps must be done efficiently and accurately to eliminate adjustments.

Determine policies, procedures, and systems where tasks and activities need to be changed and improved.

✓ Reduce the number of tasks and activities currently being done.

✓ Eliminate number of adjustments needed to match job specifications.

✓ Simplify how tasks and activities are carried out by streamlining necessary activities.

What tools and techniques will make equipment changeover easier? Develop new techniques and initiate best practices and assign changeover tasks between crew and teams members.

✓ Who's doing what and when?

✓ What is the sequence of tasks?

✓ What are the simultaneous operations?

✓ What is the required time for each task?
Determine tasks and activities that are deemed and agreed upon as the most effective and efficient by the team.

✓ Purge wasted motion and waiting. Any time there is waiting, there is wasted opportunity.

✓ Eliminate non-value-added activities.

**Mechanize and Center-line**

☐ One-turn and one-motion installation methods include changing fasteners and locking devices to enable one to torque and snug them in one motion.

☐ Apply visual gauge marks to identify correct settings.

☐ Install fixed gauge stops for consistent component positioning.

☐ Utilize new technology tools and equipment.

☐ Take current technology to a higher level:
  ✓ Develop lifts, shelves, transport carts, staging areas, etc., to enable materials to be set up offline.
  ✓ Document all press preset data.
  ✓ Mechanize to help people.
  ✓ Upgrade power tools.
  ✓ Update measurement instruments.
  ✓ Utilize remote controls.

Automation refers to technology that enables machine to do a task itself. Benefits of automation include:

✓ Repetitive functions are eliminated; data is only entered once.

✓ It can be applied to estimating, job tickets, layout, etc.

✓ Job information is readily available.

✓ It allows you to focus on your main activity.

✓ Job waste is reduced.

✓ It provides accurate data.

✓ It delivers good/bad counts.

✓ There is no shortage in the bindery and no excessive overruns.

✓ Job costs are captured.

✓ It is extremely accurate.

✓ It allows for timely billing.

✓ Data can be used to more accurately estimate future jobs.

---

**Make Note...**

Purge wasted motion and waiting. Any time there is waiting, there is wasted opportunity.
Printing

Characterize printing systems (proofing and printing) and integrate a color management system.

✓ ISO 12647-2 standard
✓ G7® methodology

Make it easier to:

✓ Quickly remove and clean old components and materials for last job from the machine.
✓ Effectively install new components and materials for next job for machine.
✓ Accurately perform necessary installation settings.
✓ Perform trial runs to make adjustments required to match job specifications. How close to good can the first trial be?
✓ Achieve approval to run production.

Information, materials, and tooling procurement must be effective and efficient.

☐ Transport old materials, components, and tooling to storage.
☐ Attain and transport new materials, components, and tooling to machine location.
☐ Stage and prepare new materials, components, and tooling on machine.

See to it that all materials, tooling, and information are now accurate, compatible, function right, and are always there. Find more on this in the following section.
QUALITY AT THE SOURCE

*Quality at the Source* means that everyone becomes responsible for the quality of their output.

What is the current state of everything *needed* to run the process? Conduct daily assessments of operations to find out.

Determine if everything needed for a process to operate and perform are:

- **Correct**—all information, materials, tooling, etc., are designated for the job.
- **Functioning properly**—all information, materials, tooling, etc., are accurate and working right.
- **Easily accessible**—all information, materials, tooling, etc., is within arm’s length and quickly retrievable.

Management’s daily job is to ensure that everything needed for a process is correct, functioning properly, and easily accessible. If not, then corrective action must be taken immediately.

**Manager’s Daily Quality-at-the-Source Checklist**

Department: ___________________________ Date: __________

Manager/Supervisor: ___________________________

*Check, initial, and record necessary information.*

<table>
<thead>
<tr>
<th>Machine</th>
<th>Correct</th>
<th>Function Properly</th>
<th>Easily Accessible</th>
<th>Machine Log</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**Technical Checks:** Confirms that everything designated to perform changeover tasks is correct (information, tool, materials, and equipment).

Date: ____________________________

Department: ____________________________

Equipment or Process: ____________________________

Is everything need to perform changeover correct?

- [ ] Job information  [ ] Yes  [ ] No

- [ ] Materials  [ ] Yes  [ ] No

- [ ] Stock/loads  [ ] Yes  [ ] No

- [ ] Tools  [ ] Yes  [ ] No

- [ ] Cleanup components  [ ] Yes  [ ] No

- [ ] Lifts and power trucks  [ ] Yes  [ ] No

- [ ] Machine capabilities  [ ] Yes  [ ] No

*Quick Changeover for Printers*
☐ Department environment  ☐ Yes  ☐ No

☐ Operators’ skills  ☐ Yes  ☐ No

_everything needed must be right or correct at all times. For anything that is not right, corrective action must be taken immediately to make it right!

Function Checks: Confirms everything functions or works properly

Date: ________________________________

Department: ________________________________

Equipment or Process: ________________________________

Does everything needed to perform changeover function properly?

☐ Job information  ☐ Yes  ☐ No

☐ Materials  ☐ Yes  ☐ No

☐ Stock/loads  ☐ Yes  ☐ No

☐ Tools  ☐ Yes  ☐ No

Make Note...

Everything needed must be right or correct at all times. For anything that is not, corrective action must be taken immediately to make it right.
<table>
<thead>
<tr>
<th>Question</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cleanup components</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lifts and power trucks</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Machine capabilities</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Department environment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operators' skills</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Everything must work and function properly and be equipment-ready all the time. If anything is not working properly, corrective action must be taken immediately to fix it!

Examples:

Is job information accurate?  
☐ Yes ☐ No

Are proofs final and approved?  
☐ Yes ☐ No

Are tools worn out or broken?  
☐ Yes ☐ No

Does ink hue match specs?  
☐ Yes ☐ No

Does stock meet specifications?  
☐ Yes ☐ No

Are loads machine-ready?  
☐ Yes ☐ No

Is schedule up-to-date?  
☐ Yes ☐ No

Is the equipment/machine maintained and in realistic working order?  
☐ Yes ☐ No

Is the equipment/machine setup properly?  
☐ Yes ☐ No

Can machine produce acceptable quality?  
☐ Yes ☐ No
**NOTES**

**Operation Checks:** Confirms everything is in place and easily accessible. Everything must be within arm’s length or retrievable within less than thirty seconds.

Date: ____________________________

Department: _______________________

Equipment or Process: ______________

Is everything needed to perform changeover easily accessible?

- [ ] Job information  Yes  No

- [ ] Materials  Yes  No

- [ ] Stock/loads  Yes  No

- [ ] Tools  Yes  No

- [ ] Cleanup components  Yes  No

- [ ] Lifts and power trucks  Yes  No
☑ Machine capabilities  ☐ Yes  ☐ No

☐ Department environment  ☐ Yes  ☐ No

☐ Operators’ skills  ☐ Yes  ☐ No

Everything must be easily accessible at all times. Investigate everything against the “30-second rule”: anything that is not easily accessible within less than 30 seconds must be made more quickly accessible.
BEST PRACTICES—OVERALL EQUIPMENT EFFECTIVENESS (OEE)

OEE Metrics focus on a machine's total good production sheets/items/feet per minute versus running time, downtime for makeready, downtime (scheduled and unscheduled) multiplied by its factory optimum speed.

OEE provides a more balanced comparison between older and newer equipment and is a measure of how well machines are utilized in relationship to their optimal designed potential.

**Simplified OEE Calculation for 24-hour shift**

<table>
<thead>
<tr>
<th>OEE</th>
<th>=</th>
<th># of good sheets ÷ (24 hours × factory optimum rated speed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>OEE</td>
<td>=</td>
<td>Number of good sheets ÷ (120 hours × factory optimum iph)</td>
</tr>
<tr>
<td>OEE</td>
<td>=</td>
<td>905,000 sheets ÷ (120 hours × 18,000 iph)</td>
</tr>
<tr>
<td>OEE</td>
<td>=</td>
<td>905,000 ÷ 2,160,000 = 42% OEE</td>
</tr>
</tbody>
</table>

Metrics direct companies where to focus their process improvement initiatives.

The goal is increasing total good product in the current time frame.

✓ Sheets
✓ Signatures
✓ Cartons
✓ Labels

Increased OEE means increased sales and revenue because OEE metrics, coupled with process analysis, help to determine where to focus maintenance and improvement initiatives.

- Longer Production Runs:
  ✓ Reduce downtime
  ✓ Increase equipment speeds
  ✓ Reduce idling and minor stoppages
- Shorter Runs and Frequent Makereadies and Setups:
  ✓ Reduce makeready
- Older, Slower Equipment:
  ✓ Reduce downtime
  ✓ Increase equipment speeds
  ✓ Reduce idling and minor stoppages
KAIZEN: QUICK CHANGEOVER

The goal of Quick Changeover is to reduce the time it takes to change over equipment or a process from producing one job to producing the next job.

Optimize changeover effectiveness by performing the necessary Critical Cares effectively and efficiently. Planned changeover should be treated like equipment setup/makeready and running production: it must be optimized! The best way to achieve Quick Changeover efficiency is to bring people together in a team problem-solving atmosphere. The primary tool for this is the Kaizen Blitz event. Kaizen is Japanese and means to change, make good, continuous improvement.

Kaizen events are extremely intense incremental improvement initiatives. Kaizen events create a sense of urgency and energize improvement by focusing the process people on solving the problems.

To begin with, Kaizen events require a written purpose and scope.

Purpose

• What process is the event targeting?

• What issue is the event meant to overcome or improve on: downtime, changeover time, cycle time, waste, spoilage, etc.?

The Scope

• What are the dates and what is the timeline in days over which the Kaizen event is scheduled to take place?

• Determine and schedule availability of resources, including people, time, equipment, and supplies.

Safety

• It must be noted that any process improvement ideas, practices, techniques, and procedures must be safe and not put anyone at risk of personal injury. Any practices to the contrary must be avoided.

Teams

• Kaizen team membership must include people from the plant:
  ✓ Equipment operators and crew members
  ✓ Management and supervision (champion)
  ✓ Maintenance management and technicians

• Team rules state members must...
  ✓ Have equal status
  ✓ Respect each other
  ✓ Listen to input
  ✓ Keep an open mind

Quick Changeover for Printers
<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>✓</td>
<td>Reach consensus when making decisions</td>
</tr>
<tr>
<td>✓</td>
<td>Take responsibility and accountability</td>
</tr>
<tr>
<td>✓</td>
<td>Get things done</td>
</tr>
<tr>
<td>✓</td>
<td>Champion and drive change</td>
</tr>
</tbody>
</table>
Project/Event Charter

Champion Name: 

Project/Event Name: 

Department and Equipment: 

Current State: 

Project/Event Description: 

Value Driver:

☐ Safety  ☐ Product Quality
☐ Productivity Improvement  ☐ Customer Satisfaction

Start Date:  Projected End Date: 

Scope: 

Approach: 

Key Process Resources and Issues: 

Future State Goals: 

Performance Metrics: 

Quick Changeover for Printers
Project/Event Charter

Champion Name:

Time Slicer

Project/Event Name:

Makeready

Department and Equipment:

Printing Press #3

Current State:

Makeready time average is 1.7 hours

Unscheduled downtime is 24%

Project/Event Description:

Kaizen event to achieve more effective and efficient makeready press #3

Value Driver:

☐ Safety
☐ Productivity Improvement
☐ Product Quality
☐ Customer Satisfaction

Start Date: 02-03-12
Projected End Date: 02-12-12

Scope:

Utilize team problem solving

Approach:

Team to implement Kaizen, 5S, visual management, standard work methods

Key Process Resources and Issues:

Overcome skepticism

Get proper equipment, 5S tools, and supplies

Get needed corrective changeover done

Future State Goals:

Reduce breakdowns rate by 50%

Reduce downtime by 25%

Performance Metrics:

Average makeready time

Unscheduled downtime
Team members’ active participation and decisions will be based on team input, analysis, consensus, and “Sustain the Gains.” To ensure Kaizen event success, the team needs to be provided with an environment and tools that are conducive to getting things done effectively and efficiently.

Kaizen tools and equipment needed:

☐ Team meeting room and logistics

☐ Flip charts (with sticky back or masking tape for wall mounting)

☐ Markers (black, red, green, blue)

☐ Post-it Notes-style pads (multiple bright colors)

☐ Digital camera (for before-and-after pictures)

☐ Stopwatches

☐ Labeler with 1/2-in. tape cassettes (black-and-white)

☐ Cleaning materials

☐ Floor marking: white floor marking tape and paint for floor location identification

☐ Red tags

☐ Dumpster and contractor-strength garbage bags

☐ Machine locations identified by team during the event for point-of-use storage:

✓ Metric and standard tool sets (new)

✓ Drawer and trays sets, color coded (trays for supplies)

✓ Shadow boards (peg boards), peg board holders specific for various tools

✓ Bulletin board for posting makeready/preventive maintenance procedures and 5S standards

✓ Other:

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

Quick Changeover for Printers
Kaizen Blitz Event Steps

1. The Current State Changeover Process

The Starting Point

Kaizen events must have a starting point. That starting point is the current state of the process from the standpoint of who, what, and how the process accomplishes its objective. To help determine what is actually happening, the team must create a graphic representation of the process steps: a current state process map. The map needs to include the individual tasks, activities, and times using multicolor Post-it Notes. Kaizen team member's together review and confirm the current changeover tasks and activities. Separate process maps are required for daily, weekly, monthly, quarterly, and annual changeover tasks and activities.

The champion must facilitate the team with development of the current state process and map. The champion/facilitator needs to ask each process person what they do to complete each process step and how long, in minutes, they think it takes for them to complete the process. The team members must be the ones to record the activities and times on the Post-it Notes and the facilitator places them on a dry erase boards or flip charts.

Creating the current state changeover process map can be facilitated in several ways.

✦ Each person involved in changeover tasks and activities on the equipment or process must be assigned to record their changeover tasks using different-colored Post-it Notes to help differentiate each person involved.

✦ Each changeover task and activity must be recorded by the Kaizen team describing the changeover activity and how many minutes they think it takes to complete each task. The champion will place each Post-it Note on the board or flip chart, building the process from left to right (see left side of image on following page).

Note: Equipment shutdown and cleanup time must be recorded and included in the current state process map.

✦ Record and post any chronic problems and changeover issues that occur on a separate fishbone diagram: people, machine, materials, information, methods, measurement, and environment (see following image, right side). This is a “parking lot” for the planning and implementation of corrective and preventive actions.

✦ The champion adds up the times recorded for each person participating and writes the total times at the right side of the current state map for each person.

✦ The champion and team review the first phase of the current state process.

Process mapping needs to be carried out for each required changeover segment (including daily, weekly, monthly, quarterly, semiannual, and annual) for the equipment or process the team is focused on.
2. Current State Confirmation

The Kaizen Quick Changeover team must confirm the current state process they have documented, which may not be the real current state. The team must come to a consensus of what the current state really is.

- Team investigation of the current state should include making and recording personal observations and interviews with other operators during the actual changeover process.

- During personal observations, spaghetti maps should be drawn to determine the distance operators are walking to retrieve tools and equipment and going to different locations on the equipment or process.

- Current changeover documentation such as checklists, work instructions, and memos must be examined.

Is the changeover documentation clear, concise, and complete?

☐ YES

☐ NO

If no, take notes and record why.

___________________________________________________________________________________________

___________________________________________________________________________________________

___________________________________________________________________________________________

- The team also needs to perform analysis of previously videotaped daily, weekly, and monthly changeover activities.

- The analysis is to compare and validate the current state process map developed by the team to the personal observations and interviews and the videotaped changeover activities.
Are there differences between the video and the current state process map that was created and agreed upon by the team?

☐ YES

☐ NO

If yes, take notes and record the differences.


Are there differences between the various shifts operating the same equipment or process?

☐ YES

☐ NO

If yes, take notes and record the differences.


The team needs to record notes.

An agreed-upon current state process changeover map will then be developed and established based on team consensus.

3. **Create Future State Process**

The Kaizen team now must create a future state or optimized Quick Changeover process map by team brainstorming. The team must develop objective actions to the following questions for each step of the changeover process.

• “Why do it like that?”

  Ask why five times, and look for the root causes.

• Can changeover tasks be carried out during external time or when machine is in running operation?

To achieve a future state Quick Changeover process, the team champion must ask if tasks can be separated and converted from internal stopped time to external running time. Then the new internal and external tasks must be streamlined.
Separate Internal to External Tasks

Can the internal changeover steps, which are currently being carried out when the equipment or process is stopped, be separated and converted to become external activities? In other words, can the step be completed when the process equipment is in operation mode? If so, then determine how it can be completed while the equipment is in operation.

✓ Why must the equipment or process be stopped to carry out each changeover task?

✓ How can the task be completed during an external time frame?

✓ Who should be doing the task externally—management, supervisors, staff, operators, or all of the above?

Streamline Internal and External Tasks

Can the changeover tasks, whether they are done during internal or external time frames, be made easier, more simple, and quicker to do.

✓ For tasks that do require the equipment to be stopped. What is needed that will make internal changeover tasks easier to complete?

✓ Can parallel operations and simultaneous tasks be implemented?

✓ Can more than one person perform activities?

✓ Can tasks be assigned between crew and team members?

✓ In terms of sequence of tasks, who’s doing what and when?

✓ Can required times be established for each task?

✓ Can you develop new techniques and initiate best practices?

✓ Can you eliminate non-value-added activities, wasted motion, and waiting?

✓ Can you utilize new or better tools, technology, and equipment?

Note: External staff, or people who do not operate equipment, should be assigned to assist operators during planned changeover activities. At least one staff person should be a Kaizen changeover team member.

The goal of Quick Changeover is to reduce planned changeover time by more than 50%, as well as to reduce unscheduled equipment failures and downtime.

Facilitating the creation of the future state changeover process and map includes:

- Each person involved in the future state changeover tasks and activities on the equipment or process will record the new best practices changeover tasks using a different color Post-it Notes to help differentiate each person involved.

- Each future state changeover task and activity must be recorded by the Kaizen team. On new Post-it Notes they must describe the changeover best practices activities and how many minutes they think it takes to complete the best practices tasks. The champion will place each Post-it Note on the board or flip chart, building the process from left to right.
During the future state map development process, chronic problems and changeover issues recorded earlier during the current state process map must be addressed at this time. The Kaizen team must analyze the fishbone diagram with problems and issues posted under people, machine, materials, information, methods, measurement, and environment. Corrective and preventive actions must be addressed, fixed, corrected, etc.

4. Validate Future State Process

Once the new future state Quick Changeover process maps have been developed and recorded, the Kaizen team must validate it. In other words, the team must run the future state process and assess and analyze it.

- Operators are assigned to perform the future state Quick Changeover process on equipment. It is recommended that the Kaizen event for Quick Changeover initially focus on weekly and monthly changeover activities since they are the most frequently required.

- Each person performing the changeover tasks and activities will have a team member assigned to them to act as a monitor through the entire process. The monitor will measure the actual times, utilizing stopwatches, for each changeover task and activity and record the times and comments on observation sheets for each task. (See pages 44–48.)

Separate observations sheets are used for each person being monitored. The observation sheet columns should include each step in the future state changeover process (daily, weekly, monthly, etc.), the projected times agreed upon by the Kaizen team, and columns for actual recorded times, notes, and observations.

- When it comes to event validation, the event monitors will record:
  ✓ Any problems or issues that occur, such as lubrication tools not working.
  ✓ Any other best practices that may come out of the validation event process.

The other team members will observe and take notes

- Note: Observations and notes should include tool availability, whether tools are working or not, equipment and component conditions and malfunctions,
operators' abilities to carry out tasks, distances operators had to travel, and any issues observed in the equipment or process work area.

5. Kaizen Team Debrief the Event

After the future state validation phase of the event, the Kaizen team must perform a debrief of the event. The team will review the future state, how long it took, if problems occurred, and general observations. Points of discussion could include the following:

* Did the process times meet or exceed expectations? If not, why? What should be done next?

* Analyze the event findings.

  ✓ Did the desired state map achieve the planned results? If not, why? What should be done next?

  ✓ What activities took longer than projected?

  ✓ What activities actually took even less time?

  ✓ Where any unexpected issues encountered? If problems occurred, the team must develop corrective and preventive actions.

* Discuss lessons learned.

  ✓ Were there any difficulties and obstacles? If so, how were they overcome?

  ✓ How could the Kaizen event be improved before the next event?

* Update and revise future process.

  ✓ Through consensus agreement the team establishes the final future state maintenance processes.

  ✓ The final process is then documented in hard copy and/or electronic formats.

Use the sample Event Debrief form on page 49.
### Observation Sheet

<table>
<thead>
<tr>
<th>Process:</th>
<th>Tasks and Activities:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operator:</td>
<td>Equipment:</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
<th>Projected Time (minutes)</th>
<th>Actual Time (minutes)</th>
<th>Comments &amp; Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Total minutes** | 0 | 0 |
<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
<th>Projected Time (minutes)</th>
<th>Actual Time (minutes)</th>
<th>Comments &amp; Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Blanket Washers</td>
<td>15.0</td>
<td>3.0</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Dip Ink</td>
<td>10.0</td>
<td>5.0</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Install New Ink</td>
<td>5.0</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Roller Washers</td>
<td>20.0</td>
<td>7.9</td>
<td>No roller wash</td>
</tr>
<tr>
<td>5</td>
<td>Remove Trays and Install New Trays</td>
<td>2.0</td>
<td>1.0</td>
<td>Downtime (waiting) 4 minutes</td>
</tr>
<tr>
<td>6</td>
<td>Change Plates</td>
<td>20.0</td>
<td>10.5</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Close Out Old Job, Pull Up and Set New Job</td>
<td>2.0</td>
<td>2.0</td>
<td>Do at the beginning of job or now</td>
</tr>
<tr>
<td>8</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Wait for Coating Back Cylinder and Blanket</td>
<td></td>
<td>2.0</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total minutes</td>
<td>59</td>
<td>22</td>
<td></td>
</tr>
<tr>
<td>Step</td>
<td>Description</td>
<td>Projected Time (minutes)</td>
<td>Actual Time (minutes)</td>
<td>Comments &amp; Observations</td>
</tr>
<tr>
<td>------</td>
<td>------------------------------</td>
<td>--------------------------</td>
<td>-----------------------</td>
<td>-------------------------</td>
</tr>
<tr>
<td>1</td>
<td>Blanket Washers</td>
<td>20.0</td>
<td>4.3</td>
<td>Helped wash unit fountain</td>
</tr>
<tr>
<td>2</td>
<td>Dip Ink</td>
<td>100</td>
<td>0.2</td>
<td>Canister in unit problems, needs to be fixed</td>
</tr>
<tr>
<td>3</td>
<td>Install New Ink</td>
<td>5.0</td>
<td>0.2</td>
<td>Clean impression cylinder, coater</td>
</tr>
<tr>
<td>4</td>
<td>Roller Washers</td>
<td>200</td>
<td>4.4</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Remove Trays and Install New Trays</td>
<td>200</td>
<td>4.4</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Change Plates</td>
<td>200</td>
<td>4.4</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Coater Blankets</td>
<td>200</td>
<td>4.4</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Complete Machine Report</td>
<td>200</td>
<td>4.4</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Total minutes: 74**
<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
<th>Projected Time (minutes)</th>
<th>Actual Time (minutes)</th>
<th>Comments &amp; Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Blanket Washers</td>
<td>15.0</td>
<td>3.0</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Dip Ink</td>
<td>10.0</td>
<td>6.5</td>
<td>#5—old ink dried in fountain from past jobs. Dirty rag bucket overfilled, had to be partially emptied</td>
</tr>
<tr>
<td>3</td>
<td>Install New Ink</td>
<td>5.0</td>
<td>0.7</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Roller Washers</td>
<td>20.0</td>
<td>7.9</td>
<td>#5—Clean ink knife</td>
</tr>
<tr>
<td>5</td>
<td>Remove Trays and Install New Trays</td>
<td>2.0</td>
<td>4.5</td>
<td>Wait on roller rinse, clean hands, clean up area and stage trip strips</td>
</tr>
<tr>
<td>6</td>
<td>Change Coater Over</td>
<td>20.0</td>
<td>10.0</td>
<td>Get ready to change coater blanket, get rags. Wait on plates change; clean tray, wipe off table</td>
</tr>
<tr>
<td>7</td>
<td>Coater Blankets</td>
<td>15.0</td>
<td>6.8</td>
<td>Change coater blanket, stripe roller, scrape and clean back cylinder</td>
</tr>
<tr>
<td>8</td>
<td>Set Up Feeder</td>
<td>2.0</td>
<td>3.0</td>
<td>Set feeder load.</td>
</tr>
<tr>
<td>9</td>
<td></td>
<td></td>
<td></td>
<td>Roller washers; need tray blades and rollers in good shape</td>
</tr>
<tr>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td>Blanket washers—need maintenance</td>
</tr>
<tr>
<td>11</td>
<td></td>
<td></td>
<td></td>
<td>Auto-plates—had to rehang 2 plates</td>
</tr>
<tr>
<td>12</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Total minutes</strong></td>
<td>74</td>
<td>21.5</td>
<td></td>
</tr>
<tr>
<td>Step</td>
<td>Description</td>
<td>Projected Time (minutes)</td>
<td>Actual Time (minutes)</td>
<td>Comments &amp; Observations</td>
</tr>
<tr>
<td>------</td>
<td>--------------------------------</td>
<td>--------------------------</td>
<td>-----------------------</td>
<td>--------------------------------------------------------------</td>
</tr>
<tr>
<td>1</td>
<td>Blanket Washers</td>
<td>15.0</td>
<td>3.0</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Dip Ink</td>
<td>10.0</td>
<td>7.5</td>
<td>2nd pressman helped clean fountain</td>
</tr>
<tr>
<td>3</td>
<td>Install New Ink</td>
<td>5.0</td>
<td>2.5</td>
<td>3rd pressman helped install ink</td>
</tr>
<tr>
<td>4</td>
<td>Roller Washers</td>
<td>20.0</td>
<td>7.9</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Remove Trays and Install New Trays</td>
<td>2.0</td>
<td>0.2</td>
<td>1 tray, first time doing this</td>
</tr>
<tr>
<td>6</td>
<td>Clean Trays</td>
<td>20.0</td>
<td>3.5</td>
<td>1 tray, Feeder helped him with this, new man</td>
</tr>
<tr>
<td>7</td>
<td>Remove Plates</td>
<td>2.0</td>
<td>1.6</td>
<td>2 trips, 6 plates</td>
</tr>
<tr>
<td>8</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Total minutes</strong></td>
<td><strong>59</strong></td>
<td><strong>23.2</strong></td>
<td></td>
</tr>
</tbody>
</table>
Event Debrief

Date: ________________________________

Event Successful: □ Yes  □ No

Event Focus and Goals:___________________________________________________________

___________________________________________________________

Event Results:___________________________________________________________

___________________________________________________________

Lessons Learned:___________________________________________________________

___________________________________________________________

6. Sustain the Gains

Estimate the project savings in hours compared to previous times. Develop a verification mechanism, including tracking weekly and monthly changeover time efficiency and cost savings. Then post changeover time efficiency reports at the processes.

The Kaizen team must establish the methods your team will use to maintain adherence to the new changeover standards. Key issues for establishing standards include error-proofing and standard work.

Error-Proofing

Determine the sources of errors from data revealed during inspections utilizing gauges and instrument measurements. Implement effective tools and devices to eliminate errors. Error-proofing devices include:

• Instruments and gauges
• Limit switches and scales
• Process control targets
• General inspections
• Process control inspections
• Judgment inspections
Standard Work

Standard Work is the agreed-upon and documented methods that are followed by those who operate equipment or carry out processes. Standardized techniques and sequential activities are based on best practices performed within established time frames.

- Standard Work tasks are documented and posted at the process.
- Ineffective or dated standards must be revised and new standards established and documented.
- Any deviation from established Standard Work will result in out-of-control processes.
- Visual systems and documentation are posted at processes for visual use:
  - Procedures
  - Checklists
  - Diagrams
  - Pictures

Track performance metrics:

- The time the planned changeover activities (daily, weekly, monthly, quarterly, semiannual, and annual) actually take to complete
- Unscheduled downtime from mechanical and electrical failures
- Visual management concepts training
- Communication boards
- Before-and-after photos
- Visual standards and procedures
- Quarterly or semiannual assessments of actual changeover activities being carried out

If metrics indicate that changeover time is increasing by more than 10% or equipment failures increase by more than 15%, then careful examinations must be conducted and followed by corrective and preventive actions.
About Printing Industries of America

Printing Industries of America, along with its affiliates, delivers products and services that enhance the growth, efficiency, and profitability of its members and the industry through advocacy, education, research, and technical information.

Printing Industries of America developed from the 1999 merger of the Graphic Arts Technical Foundation (GATF), founded in 1924, and Printing Industries of America (PIA), founded in 1887. This consolidation brought together two powerful partners: the world's largest graphic arts trade association representing an industry with more than 1 million employees and $156 billion in sales and a nonprofit, technical, scientific, and educational organization dedicated to the advancement of the graphic communications industries worldwide.

Printing Industries of America's staff of researchers, educators, and technical specialists helps members in more than 80 countries maintain their competitive edge by increasing productivity, print quality, process control, and environmental compliance and by implementing new techniques and technologies.

In addition to striving to advance a global graphic communications community through conferences, Internet symposia, workshops, consulting, technical support, laboratory services, and publications, Printing Industries of America promotes programs, services, and an environment that helps its members operate profitably.

Many of Printing Industries' members are commercial printers, allied graphic arts firms such as electronic imaging companies, equipment manufacturers, and suppliers. Its special industry groups, sections, and councils were developed to serve the unique needs of specific segments of the print and graphic communications industries and provide members with current information on their specific segment, helping them to meet the business challenges of a constantly changing environment. These groups focus on web offset printing, label printing, binding, financial executives, sales and marketing executives, and digital printing.

Printing Industries Press publishes books on nearly every aspect of the field; training curricula; audiovisuals and digital media; and research and technology reports. It also publishes Printing Industries of America: The Magazine, providing articles on industry technologies, trends, business management practices, economics, benchmarks, forecasts, legislative and regulatory affairs, human and industrial relations issues, sales, marketing, customer service techniques, and management resources. The magazine represents the consolidation of GATFWorld and Management Portfolio, formerly bi-monthly publications of the association.

For more information about Printing Industries of America, special industry groups, sections, products, and services, visit www.printing.org.
# Printing Industries of America Affiliates

**Canadian Printing Industries Association**  
Ottawa, Ontario  
www.cpia-aci.ca

**Graphic Arts Association**  
Trevose, PA  
www.gaa1900.com

**Pacific Printing and Imaging Association**  
Portland, OR  
www.ppiassociation.org

**Printing & Graphics Association MidAtlantic**  
Columbia, MD  
www.pgama.com

**Printing & Imaging/Association of MidAmerica**  
Dallas, TX  
www.piamidam.org

**Printing & Imaging Association of Georgia**  
Smyrna, GA  
www.piaog.org

**Printing Association of Florida**  
Orlando, FL  
www.flprint.org

**Printing Industries Alliance**  
Amherst, NY  
www.pialliance.org

**Printing Industries of Arizona/New Mexico**  
Phoenix, AZ  
www.piaz.org

**Printing Industries Association of San Diego**  
San Diego, CA  
www.piasd.org

**Printing Industries Association Inc. of Southern California**  
Los Angeles, CA  
www.piasc.org

**Printing Industries of Ohio • N. Kentucky**  
Westerville, OH  
www.pianko.org

**Printing Industries of America**  
Mountain States  
Greenwood Village, CO  
www.printincolorado.org

**Printing Industries of the Gulf Coast**  
Houston, TX  
www.pigc.com

**Printing Industries of Michigan, Inc.**  
Southfield, MI  
www.print.org

**PINE**  
Southborough, MA  
www.pine.org

**Visual Media Alliance**  
San Francisco, CA  
www.visualmediaalliance.org

**Printing Industries of St. Louis, Inc.**  
Maryland Heights, MO  
www.pistl.org

**Printing Industries of Utah**  
West Jordan, UT  
www.piofutah.com

**Great Lakes Graphics Association**  
Pewaukee, WI  
www.glga.info

**Printing Industry Midwest**  
Roseville, MN  
www.pimmn.org

**The Printing Industry of the Carolinas, Inc.**  
Charlotte, NC  
www.picanet.org

**Printing Industry Association of the South**  
Nashville, TN  
www.piass.org
Publications of Interest from Printing Industries of America

* 2011 Sheeted Productivity Benchmarks, compiled by Printing Industries of America Economic and Market Research department.

* Adding Value to Print, by Manfred Breede.


* Bindery Training Curriculum, by Daniel G. Wilson and Printing Industries of America Staff.

* Binding, Finishing, and Mailing: The Final Word, by T.J. Tedesco, Dave Clossey, and Jean-Marie Hershey.

* Ergonomics Training Program, a collaboration by Printing Industries of America and others.


* Guide to Troubleshooting for the Web Offset Press, edited by Peter Oresick.

* Lean Printing: Cultural Imperatives for Success, by Kevin Cooper.

* Lean Printing: Pathway to Success, by Kevin Cooper, Dr. Malcolm Keif, and Ken Macro.

* Materials Handling for the Printer, by A. John Geis.

* Prepress Skills Training Program, by Joseph Marin.


* Printing Production Management, by Gary G. Field.

* Process Controls Prime, by Joseph Marin.


* Sheeted Offset Press Training Curriculum, by Printing Industries of America Staff.

* Sustainability Studies in Print, by Joe Deemer.


* Web Offset Press Problem-Solving Training Program, by Printing Industries of America Staff.

* Web Offset Press Training Curriculum, by Printing Industries of America Staff.

* What You Need to Know for Safe Equipment Operation, a collaboration by Printing Industries of America and others.