

# **Single Minute Exchange of Dies (SMED) and Single Piece Flow/ Batch Reduction**

Paul Klein CSSBB, CMQ/OE,  
CQA

Paul\_T\_Klein@hotmail.com

# Single Minute Exchange of Dies (SMED) and Single Piece Flow/ Batch Reduction

## Pro

Response time to customer can improve  
Faster feed-back to earlier processes of issues  
Lower Inventories  
JIT inventories level loaded  
Less Inventory obsolesces  
Improved communication between processes

## Con

Less time with process running  
“Tuned”  
Higher frequency of changeovers  
EOQ calculation violations  
Processes require talking with each other

## Requirements

Better visual management  
Different supervisor and manager tools  
Proficiency in changeovers  
Those involved to KNOW their process.  
Trained personnel

# Single Minute Exchange of Dies (SMED)

The definition for over a decade ago is the “Single Minute Exchange of Dies” means that the changeover takes less than **10 minutes to perform (Single Digit of minutes)**. This seemed aggressive and state of the art in 1990 to allow for machine downtime to be minimized.

Today we are approaching the less than a minute standard that SMED infers for “machine off” changeovers.

Machine On changeovers surround us every day in manufacturing.

CNC vertical machines change tools routinely in 20 seconds without operator interaction once programmed properly.

Tombstone fixtures allow for the changeover of parts to be machined from blanks while the machine works on the other fixture.

Pick and place units routinely put new parts precisely while the processed units get autopackaged at the exit end.

# Single Minute Exchange of Dies (SMED)

When a machine needs to be changed over or replaced the techniques to changeover show off the consideration and communication between operators, engineers and designers.

Examples:

## Replace

- Multi-threaded bolts
- Multiple fixture hard fasteners
- Measuring and adjusting position
- 2 dimensional pins
- Multiple sized connectors
- Incomplete standard toolkits
- Interchangeable connectors
- Shut machine down then verify tools

## With

- ¼ turn clamps
- hydraulic clamps
- Pin locators
- Conical alignment pins.
- Small, Medium and Large color coded bolts
- Shadow boarded tool kits
- Single method connectors.
- RFID to verify all parts/tools are in service truck

# Single Minute Exchange of Dies (SMED)

Glass plant Tableware manufacturing.

Carousal style machine with 12 station primary forming machine and 18 station secondary forming.

Primary machine revolves at 4-5 RPM and is 12 foot diameter.

There is a cup that receives the molten glass with a lid.

Primary plunger hits the glass and pushes it up the cup mold. Alignment is 0.010"

Top lid holds glass and top plunger and lid move vertically out of the way.

Side mold pieces (typically 2) and base move into place as well as the top pressure cap. Pressurize and spin.

Die parts once again move away and takeout transfers to the burn-off machine.

Burn off top grip.

# Single Minute Exchange of Dies (SMED)

Glass plant Tableware manufacturing.

Carousal style machine with 12 station primary forming machine and 18 station secondary forming.

New Die parts are brought on cart with two operators who position themselves 120 degrees apart (machine limitations).

Machine is never shut off.

Top plunger. Long shafted item slotted into tapered hole and conically pinned (spring loaded) from the side.

Bottom Cup Tapered base able to be dropped in with tongs.

Side molds On U shaped hanger with tapered slot to align on pin.

Bottom plate slot with spring clip to hold position.

Burn-off

2 spring loaded hoses to seal gasses and "Window Lock" to hold.

# Single Minute Exchange of Dies (SMED)

Glass plant Tableware manufacturing.

Burner design:

Tips have conical pins.

Top and bottom are  $\frac{1}{4}$  turn x 3 bolts

Each piece had slot.

A piece of shim stock is placed between

Top and bottom to create ports.

Once burner is removed.

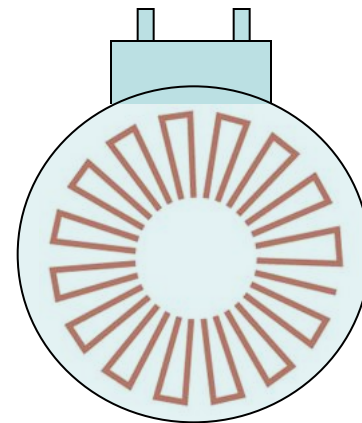
$\frac{1}{4}$  turn bolts removed

Shim removed and discarded

Emery top and bottom.

Ultrasonic clean

Reassemble and stock



# Single Minute Exchange of Dies (SMED)

Ford Transit van now offers an in dash computer.

The computer is RFID enabled and inventories the tools in the truck automatically before the truck leaves for the installation site.

The truck also identifies what parts are reloaded onto the truck returning from the installation.

No leaving without the proper tools.

No departing the site and leaving your tools behind.

The next step is to auto-bill for items used.

<http://www.fordworksolutions.com/ToolLinkVideo>

# Single Minute Exchange of Dies (SMED)

Change-over time:

## **Primary forming machine**

1 die part per revolution of machine.

15 seconds between die parts.

6 die parts on each of 12 positions

3 minutes for 60 die parts.

2 Operators on primary machine change

## **Secondary forming machine**

18 stations

2 ½ - 3 minutes

1 Operator on secondary machine change

1979

# Changeovers streamlined: Now Push for batch reduction heading for Single Piece Flow

Roll inventory (overseas shipments EOQ and shipping costs apply)

Large printers color change - 1.5 hour change over, pattern change 1.5 hour change over.

4 hour run time normal.

Changeover is 27 percent of total time.

Reduced changeover time from 3 hours to 1.5 hours.

Old machines, no longer made, mechanisms wearing, alignments between screens ... inaccurate

40 FPM 100+ inches wide.

Decision of roll change or not

Queue Pleater

10x300 curing racks Oven

Stretch Inspection

Box Storage

Cut table Assemble

Box Ship

Time to respond: typically 2 days

Inventory

4-6 weeks average inventory of 200 colors but orders can pull 7 weeks overnight.

Colors Offered 200

Fastest time through process (emergency) 9.5 hours

Typical time through process (Typical) 40 hours

# Incremental Process Change

Roll inventory (overseas shipments EOQ and shipping costs apply)  
Large printers color change - 1.5 hour change over, pattern change 1.5 hour change over.  
4 hour run time normal.

Changeover is 27 percent of total time.

Reduced changeover time from 3 hours to 1.5 hours.

Old machines, no longer made, mechanisms wearing, alignments between screens ...  
inaccurate

40 FPM 100+ inches wide.

Decision of roll change or not

Queue Pleater

1x300 curing RF

Oven

Stretch

Inspection

Box

Storage

Cut table

Assemble

Box

Ship

Time to respond: typically 1.5 days

4-6 weeks average inventory of 200 colors but orders can pull 7 weeks overnight.

Colors Offered 200

Fastest time through process (emergency) 8.5 hours

Typical time through process (Typical) 30 hours

# Revolutionary Change 1

Slit Roll inventory  
Single piece flow printers  
Assemble  
Box  
Ship

Time to respond  
10-20 minutes

Single Piece flow with no printing inventory  
2000 Colors Offered

Fastest time through process (emergency) 40 minutes  
Typical time through process (Typical) 2 hours

Slowest step in customer satisfaction is FEDEX RED who takes 40X the remainder process time.

# Office Brochure ordering

71+% reduction in shipping costs.

## Original

Web Site listing by Publisher

Pdf ordering form that does not allow data entry

Print and hand fill in info

Fax handwritten form

Prioritize order fulfillment

Interpret form and locate without inv. locators

Box and bulk mail

## Incremental

Web Site listing by title

Pre-filled item order form

Electronically send form with inv locators

Box and bulk mail

36% Labor  
time  
remaining

All Rights reserved 2010  
Paul Klein

## Revolutionary

Web Site listing  
Allows  
For on-line  
pod cast  
Or PDF  
download

If additional  
Required  
See process 2.

12% Labor  
time  
Remaining

(2/3 of time  
on line fills  
customer  
Need)

# Thanks!

## Single Minute Exchange of Dies (SMED) and Single Piece Flow/ Batch Reduction

Paul Klein CSSBB, CMQ/OE, CQA

Paul\_T\_Klein@hotmail.com

All Rights reserved 2010

Paul Klein