Equations & Definitions

$$\text{Takt Time} = \frac{\text{Available Production Time}}{\text{Rate of Customer Demand}}$$

$$\text{\# Operators} \quad \frac{\text{Value Added Time}}{\text{Takt Time}}$$

Lead Time

The time it takes to produce a product from order entry to delivery.

Cycle Time

The time it takes to process a product through an operation or machine.

Standard Work

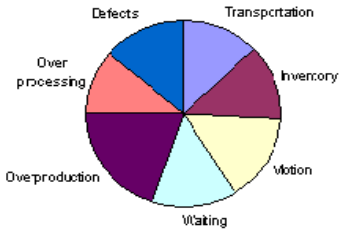
No improvement can take place without standard work first being defined. It provides a consistent routine that ensures quality and safety is the basis of all continuous improvement

Line Balancing

The even distribution of process steps among operators up to 85% of Takt

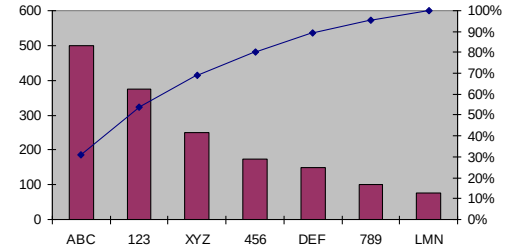
7 Wastes

Transportation
Inventory
Motion
Waiting
Overproduction
Over processing
Defects



Analysis Tools

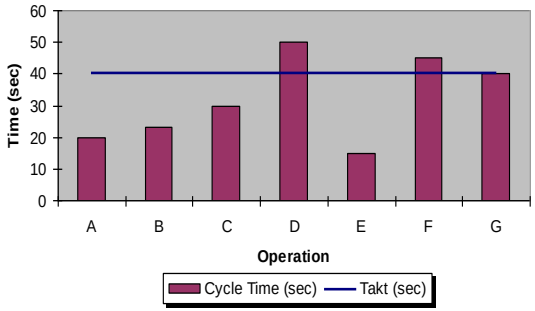
Pareto Chart



Production Control Tracking

Time	Item-number	Planned	Actual	Difference cumulative	Green: + or even Red: - or negative	# Scrap	Problem / Reason for -	Operator	Leader Sign
05h - 06h 60	XXX	150	100	-50	-	6	Line start up Missing RM	JB	
06h - 07h 60	XXX	150	170	-30	+			JB	Jake
07h - 08h 60	XXX	150	147	-33	-	3	Scrap Jam	JB	
08h - 09h 60	XXX	150	153	-30	+			JB	Jake
09h - 10h 45	XXX	112	115	-27	+	3		JB	
10h - 11h 60	X13B	200	165	-62	-	22	Long Setup time Adjustments	JB	Jake
11h - 12h 60	X13B	200	215	-47	+	1		JB	
12h - 13h 30	X13B	100	109	-38	+			JB	Jake
13h - 14h 60	X13B	200	201	-37	+	4		JB	
14h - 15h 60	X20A	120	105	-52	-	12	Setup adjustments scrap	JB	Jake
Totals		1532	1480	-52		51	Scrap and Setup times are the problem	Jake	

Cycle Time vs. Takt Time Chart



Lean Management A Quick Reference Guide

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THE LEAN ROADMAP… ELEMENTS FOR SUCCESS

5S

Sort – Remove unnecessary items
Set in Order – A place for everything and everything in its place.
Shine – Clean machines, floors, walls, etc
Standardize – Set new standards of organization for the area
Sustain – Establish cleaning and audit schedules

Visual Controls

Communication
- Floors marked
- Point of use storage
- Visual communication boards
  - Schedule
  - Performance

Being able to tell the difference between normal and abnormal conditions at a glance

SMED

(Single **M**inute **E**xchange of **D**ies)

Objective: Move internal to external and reduce both.

Internal = time when set-up activities are done while the machine is shutdown

External = time when set-up activities are done while the machine in running

TPM

(**T**otal **P**roductive **M**aintenance)
A process that maximizes the productivity of equipment for its entire life, measured with **Machine up time**.

6 Major Losses
Shift changeover
Breakdowns
Minor Stoppages
Setup & Adjustments
Startup
Reduced Speed
Quality Defects & Rework

Goal: All key machines to have Up time of >80%

Worker Flexibility

Establish cross-training matrices for key skills so employees can be easily moved where they are needed.

Focused Factory

Goal: Reduce lead time and cycle time

The Power of 3
- Value Stream Mapping
  - Current State
  - Future State
- Process Mapping
  - Pickup/Putdowns
  - Orientations
  - Travel distance
- Product Mapping
  - Visualize the process steps

- Pareto SKU's focusing on 80% of volume
- Establish Product families
- Create cells to build to Takt

Continuous Improvement

Kai (to take apart and make new) + Zen (to think about so as to help others)

Kaizen – Thoughtful acts of continuous improvement

A short burst of intense activity and effort
Biased towards action over analysis
Focused on achieving flow
Driven to resolve a specific problem
Focused on a specific area or process
Tied to the Path of Work

Production Scheduling Heijunka

Work to level load the manufacturing floor
Pull vs. Push
Kanban/supermarket systems being established to reduce inventory, tie production closer to demand and Improve Service Level.

Mistake Proofing

Devices and methods that eliminate the opportunity to produce defects
Examples:
Gauges/fixtures
Control Charts
Sensors

3P Production Preparation Process

Product simplification
Chaku Chaku lines
Design for Manufacturability

The Best Way to Predict the Future is to Create It

- ABRAHAM LINCOLN