Operational Excellence Series

Book 2:

Finding Printers' Hidden Waste

Kenneth E. Rizzo

Printing Industries Press
PITTSBURGH

Printing Industries of America Catalog No. 17942
International Standard Book Number: 978-0-88362-712-9
Printed in the United States of America

Printing Industries Press books are widely used by companies, associations, and schools for training, marketing, and resale. Quantity discounts are available by contacting the Printing Industries of America Member Central department at the number below.

Printing Industries Press
Printing Industries of America
200 Deer Run Road
Sewickley, PA 15143
Phone: 412-741-6860
Toll-Free: 1-800-910-4283 x770
Fax: 412-741-2311
Email: membercentral@printing.org
Online: www.printing.org

Contents

INTRODUCTION

Typically, printers identify where their waste is coming from through assumptions.

Waste is the cost of time and materials that consumes resources but doesn't add any value to the product or which result in product that is unacceptable to the customer and which they are not paying for.

When a printing job is scheduled to run there are only two activities that occur: value-added and non-value-added. ***Value-added (VA) activities*** are process actions and steps that actually convert the form, fit, or function of materials and information into items and products. VA activities are those which the customer specifies and pays for.

Non-value-added (NVA) activities are actions that consume resources but do not add any values or convert the form, fit, or function of materials and information into items and product. Customers don't care about and do not pay extra for NVA activities.

THE TEN FORMS OF WASTE

Remember with the phrase **I**ndustries **P**rinting **DOWNTIME:**

1. ***Ignorance of the Current State:*** When management really does not know the existing capabilities and conditions of equipment and processes. Ignorance of the current state is typically based on assumptions, word of mouth, and tribal knowledge.

2. ***Process Instability:*** When equipment and process conditions and capabilities are below manufacturer and accepted conditions due to poor or lack of effective maintenance and process control.

3. ***Defective product:*** The costs of time and material wasted producing defective product.

   - Includes the costs to sort/handle/rerun defective printed product, as well as inspection and rerun of work-in-process (WIP) goods, goods in inventory, and returned goods and related costs

   - Leads to loss of customer confidence due to defects

NOTES

4. ***Overproduction:*** Producing more than is needed and faster or earlier than the next process or customer can handle. Overproduction is the most common waste found in most printers and is the root cause of many of the other wastes.

5. ***Waiting:*** Processes and people waiting for other processes and people. Hold ups in the process due to a variety of reasons:

   - Slower changeover/setups
   - Incomplete information and instructions
   - Waiting for materials to arrive at the facility
   - Material handling (people, machines, locations)
   - Tools and components
   - Waiting on equipment that is down
   - Chronic schedule changes

6. ***Non-utilized people:*** The waste of not using human resources effectively. People's knowledge, experience, and insights into how to improve the process are not utilized. Reasons for these losses are due to:

   - Antiquated thinking
   - Company politics
   - Resistance to change
   - Departmental silos
   - Lack of timely feedback
   - Poor hiring practices
   - Poor training or lack of training
   - Fear of repercussion to new ideas
   - Lack of teamwork

7. ***Transportation:*** Moving anything around the facility; distance is the enemy. Cost of time, equipment, and resources spent moving materials, tooling, and supplies around the facility.

   - Transporting information, stock, ink, coating, plates, tools, and materials around the plant
   - Moving jobs between processes, when one-piece flow is possible
   - Moving material and jobs stored in front of, on top of or under the material needed

Make Note...

Overproduction is the most common waste found in most printers and is the root cause of many of the other wastes.

8. ***Inventory:*** Excessive raw materials, work-in-process, or finished goods have numerous causes.

- Excess Raw Materials:
  - ✓ Purchased too early due to vendor problems
  - ✓ Purchased in too-large quantities for price discounts
  - ✓ Just-in-case inventory (safety stock)
- Excess Work-in-Process:
  - ✓ Large job sizes
  - ✓ Jobs accumulating in advance of the enxt process faster than they can be processed
  - ✓ Inventory planned to protect from inefficiency and problems in production
  - ✓ Efficiency-in-isolation, created by reward system or pitting one shift against another shift
- Excessive Finished Goods:
  - ✓ Goods produced too early (sooner than needed to ship)
  - ✓ Goods produced in addition to needed ship quantity
  - ✓ Inventory kept and stored "just-in-case the customer wants more someday"

9. ***Motion:*** Any movement of people or machines that does not add value to the product or service. Excess motion can be due to:

- Searching (for tools, materials, information, etc.)
- Making numerous adjustments during setups and changeovers
- Working around (tweaking) to compensate for the processes' current conditions and capabilities.
- Poor process work area organization
- Poor plant layout
- Inconsistent work methods and lack of procedures
- Lack of teamwork

10. ***Extra Processing:*** Tasks and actions that are not planned or quoted in the job. Extra time spent on jobs that add no value to the product or service from the customer's perspective. Extra processing due to:

    1. Lack of effective communication
    2. Product changes without process changes
    3. True customer requirements not defined

NOTES

NOTES

4. Overprocessing to fix errors and mistakes
5. Redundant approvals
6. Checker-checking-the-checker
7. Lack of standard operating procedures
8. Extra copies and excessive information

The waste and non-value-added activities that occur all day long are known as the "Printers' Hidden Waste Factory." Printers must learn how ***to see*** in order to be able to discover the magnitude of waste in their operations. ***What can we do about it?***

FINDING WASTE

There are several primary tools available to search for waste:

- Technical and Production Assessments
- OPEX (Operational Excellence) Ratio
- OEE (Overall Equipment Effectiveness) Ratio
- Value Stream Mapping

TECHNICAL AND PRODUCTION ASSESSMENT

A Technical and Production Assessment is a thorough examination of effectiveness of the operation and its processes. First, the assessment looks for key wastes and non-value-added activities that typically occur throughout printing companies.

1. Ignorance of the current state
2. Process instability
3. Defective product
4. Overproduction
5. Waiting by people and processes
6. Non-utilization of people
7. Transporting things around the facility
8. Inventory waste: raw materials, WIP, and finished goods
9. Motion of people
10. Extra processing

Make Note...

Printers must learn how ***to see*** in order to be able to discover the magnitude of waste in their operations—and then determine what can be done about it.

Second, the current state of individual processes and equipment within preproduction, preprinting, printing, through post printing must be examined.

- Current capabilities
- Performance
- Methods, techniques, and procedures
- Quality output
- Skills, knowledge, and training of people

NOTES

The Print Production Process

Printers purchase raw materials, move them through a series of processes in a particular sequence, package the finished product, and ship them to the customer. This process is called manufacturing. The printers series of processes include:

- ***Planning and Scheduling***
  - ✓ Planning and estimating of costs: This is the essential first step for print production jobs.
  - ✓ Procurement: Raw materials are purchased, including the substrate (paper, plastic, foil, etc.), inks and coatings, and plates.
- ***Preprinting Process***
  - ✓ The next step in print production is producing the medium to apply ink to the substrate.
  - ✓ Prepress prepares files and, for analog print processes, outputs plates for the press.
- ***Print Press Processes***
  - ✓ Press equipment applies the ink to the substrate. The various printing process include: offset lithography, flexography, gravure, and digital.
- ***Postpress Processes***
  - ✓ Bindery and finishing converts the printed substrate to final product.
  - ✓ Shipping packages and has the job delivered to the customer.

Technical and Production Assessment: Preproduction Processes

Planning and Scheduling

The essential first step for print production jobs is the planning and estimating of costs. Poor or inaccurate planning can lead to mistakes and errors resulting in rework and late deliveries.

Make Note...

The essential first step for print production jobs is the planning and estimating of costs.

NOTES

It is necessary that people planning and estimating jobs possess the necessary skills and knowledge to do it right. There must be effective documented standard operating procedures that people clearly understand and follow.

The printer's responsibility is to provide finished product and output quality to meet the needs and expectations of its customers. In order to produce this quality first and foremost, an establishment of what their customers' expectations are must be determined.

Customer satisfaction is dependent on every job starting off on the right foot. Printers must clarify the quality level of the product that is output. In order to ensure the quality level of the artwork, files, or any original supplied by the client for reproduction meets or exceeds the quality level needed to produce the finished product, the following issues must be under control.

1. Job planning and information on job tickets or job jackets must be accurate for each and every job. Job information must have all the pertinent information to enable the printer to meet the customer needs and expectations. The job ticket is the communication link throughout the production operation, and all necessary information must be available within each of the subprocesses in the graphic arts company.

2. Estimating must know the current state of process and capabilities to provide accurate proposal quotes to customers.

   - Are processes capabilities outdated?
   - Is planned waste too low or too high?
   - Are extra costs not considered?
   - What is the average time for quote turnaround to customers?

Without true knowledge of the current state, estimating could provide misleading costing and delivery dates to customers.

3. Customer service must know customer requirements and be able to effectively follow up and communicate with customers for timely proof approvals.

   - Are raw materials and supplies purchased based on quality and compatibility or costs alone?
   - What is the average time to achieve proof approvals?

4. Scheduling must plan production only when job information and materials are ready for production. "Guess scheduling" or scheduling by parking spaces (hoping that materials and component will be ready) will frequently lead to missed deliveries and pulling jobs off equipment to leverage hot or late jobs into production.

Make Note...

The printer's responsibility is to provide finished product and output quality to meet the needs and expectations of its customers—but first, you must establish what your customers' expectations are.

Technical and Production Assessment: Preprinting Process

- The next step in print production is producing the medium to apply ink to the substrate.
- Procurement; raw materials are purchased including; the substrate (paper, plastic, foil, etc.), inks and coatings, and plates.

Printing Industries of America **Technical and Production Assessment**

Company/Facility: _____

Department: _____

Date: _____

Preproduction

Process	Skills and Knowledge	Methods	Issues and Comments

NOTES

NOTES

- File preparation must be accurate and done in a timely manner.
- Making proofs include setup time, cycle time, and accuracy to standards.
- Outputs plates for the printing include setup time, cycle time, and accuracy to standards.

Assess Process: Proofing, Platemaking, Processor, and Auxiliary Equipment

- Conditions and Capabilities: Do they meet manufacturer design and specifications?
- Quality Output: What is the number of proof and plate remakes?
- Process Controls: Are quality assurance tasks and activities in place and followed?
- Standard Operating Procedures: Are procedures for maintenance calibration and process control established, documented, and posted at the processes?
- Maintenance: Is it done regularly? According to manufacturer specifications?

Proofing

- Image proof with a proof comparator target.
  - ✓ Measure target for accuracy and consistency to manufacturer specifications.
    - Color
    - Gray Balance
  - ✓ Time how long it takes to output proofs to determine production cycle time performance.

❒ Date: _____

❒ Proof Materials Manufacturer: _____

❒ Proofing Device Manufacturer: _____

❒ Exposure Time: _____

❒ Curve:

- ❒ Yes:
  - K 50% _____
  - C 50% _____
  - M 50% _____
  - Y 50% _____
- ❒ No: linear

❒ Resolution: _____

Printing Industries of America **Technical and Production Assessment**

Preprinting

Company/Facility: _____

Department: _____

Date: _____

Prepress Process	Conditions & Output Quality	Process Control & Standard Operating Procedures	Issues and Comments

NOTES

NOTES

❒ Tone Value Area: _____

❒ Processor Maintenance Frequency: _____

Platemaking

- Image Position and Fit
  - ✓ Utilize a grid plate with fine lines and 10% screens
  - ✓ Expose a plate and remove from CTP device, place plate back into CTP device and expose a 2nd time then process and examine. The plate with two exposures should look virtually identical the plate with only one exposure.
  - ✓ The fit should be near perfect.
  - ✓ Factory representatives can assist with this testing.
- Halftone and Stochastic Dot Reproduction
  - ✓ All production plates imaged with a plate control target.
  - ✓ Measure the target scale with a plate reader the results should be ±1% at the 50% dots.
- Note: Manufacturer technical representative can assist with this testing and analysis.
- Time how long it takes to output plates to determine production performance capabilities.

❒ Date: _____

❒ Plate Manufacturer: _____

❒ Platemaking Device Manufacturer: _____

❒ Exposure Time: _____

❒ Plate Curve: _____

❒ Yes:

- K 50% _____
- C 50% _____
- M 50% _____
- Y 50% _____

❒ No: linear

❒ Resolution: _____

❒ Tone Value Area: _____

❒ Minimum Dot: _____

❒ Maximum Dot: _____

Proofing

Manufacturer: _____ **Date:** _____

Brand: _____ **Plant/Facility:** _____

Type:

Color	L*a*b Target			Delta E	Actual Proof			Delta E
	L*	a*	b*		L*	a*	b*	
Black								
Cyan								
Magenta								
Yellow								
Proof Curves	No							
	Standard							
	Spec							
	House							
Cycle Time								
Maintenance	Contract				Self			
Comments:								

❒ Processor Specs: _____

❒ Processing Time: _____

❒ Developer Temperature: _____

❒ Processor Maintenance and Chemistry Change Frequency: _____

_____

Technical and Production Assessment: Print Processes

Press equipment applies the ink to the substrate. The various printing process include: offset lithography, flexography, gravure, and digital.

Sheetfed Offset Press Conditions

Press components must be properly cleaned, lubricated, and operating at the manufacturer's designed capabilities.

- Feeding and Infeed Components:
  - ✓ Feeder mechanism and suckers
  - ✓ Vacuum and blast hose lines
  - ✓ Feed transport table tapes and vacuum

Make Note...

Notice that a prerequisite for each area in this section is that components must be properly cleaned, lubricated, and operating at the manufacturer's designed capabilities.

Printing Industries of America **Plate Control Target Test**

IMPORTANT: Compare current state operations, quality, and performance to manufacturer-designed capabilities, best industry practices, and industry print and quality standards.

Date: _____

Plant/Facility: _____

Plant Mfr./Brand: _____

Exposure Test ❒ Vacuum ❒ CTP

Plate #	Solid/ Ghost	2	3	4	5	6	7	8	9

Microline Resolution

Plate #	Microline	4u	6u	8u	10u	12u	15u	20u

Screen Tint Patches

Plate #	10%	20%	25%	30%	40%	50%	60%	70%	75%	80%	90%

Min/Max Dot

Plate #	1%	2%	3%	4%	5%	95%	96%	98%	99%

Plate Mft.:			
Bake:	No	Yes	
Processor			
Plate Curves	No	Yes	If yes, what is standard or specification?
		Standard	
		Spec	
		House	

Comments:

✓ Side guide

- Unit-to-unit Sheet Control Components:

✓ Infeed, impression, and transfer

  - Grippers, shafts, and cam followers

- Print Unit:

✓ Fountain solution

✓ Rollers

✓ Plate-to-blanket

✓ Blanket-to-impression

- Delivery Section Components:

✓ Chains, rails, grippers, and cam followers

Web Offset Press Conditions

Press components must be properly cleaned, lubricated, and operating at the manufacturer's designed capabilities.

- Feeding and Infeed Components:

✓ Roll stand

✓ Web alignment

✓ Web tensions

- Unit-to-unit Web Control Components:

✓ Blanket-to-blanket pressure

✓ Web tensions

- Print Units:

✓ Fountain solution

✓ Rollers

✓ Plate-to-blanket

✓ Blanket-to-blanket pressure

- Heat oven temperatures

- Delivery Section Components:

✓ Folder (cut and fold)

✓ Sheeter

NOTES

NOTES

Web Flexo Press Conditions

Press components must be properly cleaned, lubricated, and operating at the manufacturer's designed capabilities.

- Feeding and Infeed Components:
  - ✓ Roll Stand
  - ✓ Web alignment
  - ✓ Web tensions
- Unit-to-unit Web Control Components:
  - ✓ Blanket-to-blanket pressure
  - ✓ Web tensions
- Print Unit:
  - ✓ Chamber or rollers
  - ✓ Anilox rollers
  - ✓ Plate cylinders
- Delivery Section Components:
  - ✓ Folder (cut and fold)
  - ✓ Sheeter

Materials and Tools: Must Be Correct, Function Right, and Be Easily Accessible

Key: the suppliers must be active members of the printing process.

- Ink
  - ✓ Matches color hue specifications
  - ✓ Effective runnability (tack and viscosity)
  - ✓ Enough to run job
- Coating
  - ✓ Meets specifications for gloss, rub, and coefficient of friction (COF)
  - ✓ Stock
  - ✓ Compatible with the ink and coating

Abbreviation key for worksheets:

MIR — makeready
QC — quality control
SID — solid ink density
TVI — tone value increase
NPDC — neutral print density curve
DT — downtime
C/T — cycle time

Printing Industries of America **Technical and Production Assessment**

Printing

Plant/Facility: _____

Department: _____

Date: _____

Press	**SOPs** Maintenance, M/R, QC	**Print Quality** SID, Lab, TVI, RGB, NPDC	**Operational Efficiency** DT, M/R, C/T, Spoilage	**Issues and Comments**

NOTES

- Plates
  - ✓ Meet plate manufacturer's specifications
- Proofs
  - ✓ Calibrated to acceptable standard or the printing process
  - ✓ Customer approved
- Press materials and supplies
  - ✓ Compatible and effective
- Tools and Wrenches
  - ✓ Not worn out or broken
- Pallets

Technical and Production Assessment: Postpress Processes

Bindery and finishing converts the printed substrate to final product. Shipping packages and gets the job delivered to the customer

Bindery Equipment Conditions for Guillotine and Diecutters, Folders, Collator Stitcher Trimmers, Bookbinding Equipment, Etc.

Equipment components must be properly cleaned, lubricated, and operating at the manufacturer's designed capabilities.

- Feeding and Infeed Section:
  - ✓ Feeder mechanism and suckers
  - ✓ Vacuum and blast hose lines
  - ✓ Feed transport table tapes and vacuum
  - ✓ Side guide mechanism
- Applications Section:
  - ✓ Fasteners will snug properly
  - ✓ Plates chains operate properly
- Delivery Section:
  - ✓ Chains
  - ✓ Rails
  - ✓ Belts
  - ✓ Bearings
  - ✓ Stops

Printing Industries of America **Offset Press Components**

Date: _____

Plant/Facility: _____

Press #: _____

Fountain Solution Chemistry

Fountain Solution Mfr.: _____

Unit	pH	Conductivity	Temp.	Conditions
1				
2				
3				
4				
5				
6				
7				
8				
Water				
Automix				

Dosage	Source	1 oz.	2 oz.	3 oz.	4 oz.	5 oz.	6 oz.	7 oz.	8 oz.
pH									
COND									

_____

_____

_____

Roller Settings and Conditions

Stripe Settings and Hardness

Roller Mfr. _____

Specifications: _____

Print Unit	Water F	Water M	#1 F	#2 F	#3 F	#4 F	Dist	Dist	Dist
1									
2									
3									
4									
5									
6									
7									
8									

Comments:

_____

_____

Plate to Blanket Squeeze

Blanket Mfr. _____

Plate and blanket measurements are plus or minus to bearer height.

Print Unit	Plate-Blanket	Blanket-Blanket	P/B	B/B	Status
1					
2					
3					
4					
5					
6					
7					
8					

Plate-to-Blanket Total Printing Pressure Specifications:

Compressible:	See Manufacturer Manual	Conventional	See Manufacturer Manual

Comments:

_____

_____

_____

Printing Industries of America

Materials and Equipment Integrity

Top management, middle management, and staff are responsible for ensuring all required information, materials, components, and tooling are ready and at process location.

Date: _____

Department: _____

Equipment/Process: _____

Are necessary items or components at all times:

Correct? ❒Yes ❒No

Funtioning properly? ❒Yes ❒No

Easily accessible? ❒Yes ❒No

Item and Component	Correct	Function Right	Easily Accessible

Notes _____

Post-Printing Equipment

✓ Sheeters

✓ Cutters, Guillotine

✓ Cutters, Die

✓ Folders

✓ Drills

✓ Stitchers

✓ Collators

✓ Coaters

✓ Gluers

✓ Perfect binders

✓ Film laminators

✓ Windowers

✓ Weight scale/counter

✓ Foil stampers

✓ Embosser

NOTES

Printing Industries of America **Technical and Production Assessment**

Post Printing

Plant/Facility: _____

Department: _____

Date: _____

Equipment	**SOPs** Maintenance, M/R, QC	**Quality**	**Operational Efficiency** DT, M/R, C/T, Spoilage	**Issues and Comments**

Printing Industries of America

Materials and Equipment Integrity

Top management, middle management, and staff are responsible for ensuring all required information, materials, components, and tooling are ready and at process location.

Date: ____________________

Department: ____________________

Equipment/Process: ____________________

Are necessary items or components at all times:

Correct? ☐Yes ☐No

Funtioning properly? ☐Yes ☐No

Easily accessible? ☐Yes ☐No

Item and Component	Correct	Function Right	Easily Accessible

Notes ____________________

NOTES

BEST PRACTICES—OPERATIONAL EXCELLENCE (OPEX)

Achieving Operational Excellence is contingent on the efficacy of the system, the accumulated processes of preproduction, preprinting, printing, and post printing. For printers to know how effective and efficient their system is operating, they must measure and track it. Metric data and information helps reveal where Lean applications and continuous improvement initiatives must be targeted to achieve operational excellence.

Metrics for Tracking Operational Excellence

- ***Throughput:*** The speed or velocity the system takes to produce product and generate sales dollars (money). Throughput lead time starts when money is spent purchasing raw materials and goes through when the customer pays for the job. Throughput must be accelerated and lead time shortened.
- ***Inventory:*** The costs of raw materials, work-in-process (WIP), and final product, but no payment has been received from the customer. Inventories must decrease for raw materials, WIP, and finished product.
- ***Day-to-Day Operations Costs:*** All of the operating costs for administration, equipment and processes, building, property, and tax costs minus materials and supplies. Day-to-day operating costs and time must be reduced.
- ***Customer Satisfaction Ratio (CSR):*** The primary issues that determine if a printer is meeting or exceeding their customers' expectations: frequency of customer complaints, number of job rejections, and on-time delivery rate for both the company and by customers. The CSR formula includes total number of jobs produced in a given period (month, quarter, semi-annual, annual) minus the total number of quality incidences (customer complaints, jobs rejected, jobs not delivered on time) divided by the total number of jobs produced.

Jobs shipped	(–)	Quality Incidents	=	Total
150		11		139
139	÷	150	=	0.93 CSR

When there are no customer complaints or job rejections and on-time delivery is 100%, then customer satisfaction is 1.00.

The Operational Excellence measurement formula, or OPEX, includes throughput, inventory, day-to-day operation costs, and customer satisfaction. The OPEX ratio provides system performance on gross revenue.

OPEX provides a balanced comparison of system performance and is a measure of how well the system is generating money.

Make Note...

For printers to know how effective and efficient their system is operating, they must measure and track it.

NOTES

OPEX Calculation for One Month

OPEX = (Throughput* ÷ [inventory costs + day-to-day operation costs]) × customer satisfaction ratio

OPEX = (Sales dollars ÷ Total costs) × customer satisfaction ratio = OPEX Ratio

($540,000 ÷ $475,000) = 1.137 (gross revenue variance) × 0.97 CSR = 1.10 OPEX

* the amount of money the system generates

To raise the OPEX ratio, printers must focus on the key metrics for throughput, inventory, day-to-day operation costs, and customer satisfaction.

- Increase throughput, or the system generating money
- Raise customer satisfaction ratio
- Reduce inventory costs
- Reduce day-to-day operation costs

What Should Your OPEX Ratio Be?

Obviously the higher the OPEX ratio is the better. Systems above 1.10 OPEX will be generating a satisfactory positive cash flow. Systems below 1.00 OPEX will be experiencing a negative cash flow and be in serious trouble. These companies must change and utilize Lean applications and continuous improvement initiatives for future survival.

Example OPEX Ratios

OPEX = (Throughput* ÷ [inventory costs + day-to-day operation costs]) × customer satisfaction

* the amount of money the system generates

OPEX = (Throughput dollars ÷ Total costs) × customer satisfaction ratio = OPEX Ratio

Time Frame:	January	Month, quarter, annual
Throughput Dollars Generated:	$540,000.00	Total sales
Inventory Costs:	$240,000.00	Raw materials
Day-to-day Operation Costs	$235,000.00	Salaries, utilities, insurance, etc.
Customer Satisfaction Ratio:	0.97 jobs shipped w/no quality incidents	Total jobs shipped minus total incidents of customer complaints, rejections, late deliveries

OPEX Ratio

Throughput $		Total Costs		Total		CSR		**OPEX**
$540,000	÷	$475,000	=	1.137	×	0.97	=	**1.10**

NOTES

Your OPEX Ratios

OPEX = (Throughput ÷ [inventory costs + day-to-day operation costs]) × customer satisfaction ratio

OPEX = (Throughput dollars ÷ Total costs) × Customer Satisfaction Ratio = OPEX Ratio

Time Frame (month, quarter, annual): _____

Throughput Dollars Generated (total sales): _____

Inventory Costs (raw materials): _____

Day-to-day Operation Costs
(salaries, utilities, insurance, etc.): _____

Customer Satisfaction (total jobs shipped
minus total number of customer complaints,
rejections, late deliveries incidence): _____

OPEX

Throughput Dollars _____ ÷ Total Costs _____

= Total _____ × CSR _____ = OPEX Ratio _____

BEST PRACTICES—OVERALL EQUIPMENT EFFECTIVENESS (OEE)

NOTES

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

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

Simplified OEE Calculation for 24-hour shift

OEE = # of good sheets ÷ (24 hours X factory optimum rated sheets)

OEE = Number of good sheets ÷ (120 hours X factory optimum iph)

OEE = 905,000 sheets ÷ (120 hours X 18,000 iph)

OEE = 905,000 ÷ 2,160,000 = 42% OEE

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:
  - ✓ Downtime reduction
  - ✓ Increase equipment speeds
  - ✓ Reduce idling and minor stoppages
- Shorter Runs and Frequent Makereadies and Setups:
  - ✓ Makeready reduction
- Older, Slower Equipment:
  - ✓ Downtime reduction
  - ✓ Increase equipment speeds
  - ✓ Reduce idling and minor stoppages

NOTES

Reducing the five key metrics will raise OEE and process and departmental performance.

- Downtime—scheduled and unscheduled
- Setup/changeover time (time to go from last good to first good)
- Cycle time (time to produce one item)
- Waste—planned (startup and running waste)
- Spoilage—unplanned (defective product)

What Should Your OEE Ratio Be?

Obviously the higher the OEE ratio is the better. Depending on job run lengths and number of setups/changeovers that occur, an OEE above 50% would be considered good. Equipment and processes experiencing OEE below 30% are prime candidates for Lean applications and continuous improvement initiatives.

Example OEE

OEE = # of good items ÷ (Total hours X factory optimum rated speed)

OEE =

Total Scheduled Operation Time:	120 hours	Week, month, and annual time frame; total downtime, setup/ changeover time, running time
Equipment Optimum Speed:	18,000 iph	Manufacturer-designed/rated speed
Total Good Pieces Produced:	905,000	Sheets, signatures, cartons, or labels

OEE
Ratio

Total good pieces	÷	(Total sched. time X mfr.-designed speed)	=	**OEE Total**
905,000	÷	2,160,000	=	**42%**

The press runs as many makereadies a shift

Downtime accounts for nearly 25% of the total time scheduled

Your OEE

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

# of good items ÷ (XX hours × factory optimum rated speed) = OEE

Total Scheduled Operation Time
(week, month, and annual time frame;
total downtime, setup/changeover time;
running time): _____

Equipment Optimum Speed (manufacturer-
designed/rated speed): _____

Total good pieces produced (sheets,
signatures, cartons, or labels): _____

OEE

Total Good Pieces Produced _____

÷ (Total scheduled time _____

× manufacturer's designed speed _____)

= OEE _____

NOTES

NOTES

Availability—Equipment Failure and Downtime

Downtime is the first critical issue to improving OEE. Other OEE factors can not be addressed if the process is down.

Equipment failure and downtime are influenced by:

✓ Tooling failures

✓ Equipment failures: mechanical and electrical

✓ Unscheduled corrective maintenance

✓ Unscheduled downtime (numerous causes)

Availability—Equipment Changeover (Setup and Makeready)

Changeover is measured as last good item of one job to the first good item of the next job, "Last Good First Good."

Equipment Changeover is influenced by:

✓ Information and materials accuracy and availability

✓ Tooling and equipment conditions and availability

✓ Number of setup components changed

✓ Amount of setup adjustments to match job specifications

Performance—Idling and Minor Stoppages

Typically includes stops that are under a few minutes and require operator intervention and not maintenance staff to address.

Minor stops are usually frequent and include: component jams, misfeeds, delivery blockage, and product quality problems.

Typical idling and minor stop influences include:

✓ Materials conditions

✓ Equipment conditions

✓ Inconsistent equipment setup

✓ Operators skills and knowledge

Performance—Slower Equipment Speeds

When equipment is run during production at below its designed optimum speed or factory-rated speed.

Typical reasons for slower equipment speeds include:

✓ Materials conditions

✓ Equipment conditions

✓ Equipment setup

✓ Equipment operation

✓ Operators skills and knowledge

Quality

Defective product (unplanned spoilage) is all product run during production that is unacceptable to the customer. Defective product is a loss due to cost of processing time and materials that have been consumed but no payment will ever be received.

Defective product is influenced by:

✓ Information accuracy

✓ Materials conditions

✓ Equipment conditions

✓ Manager and operator skills, knowledge, and teamwork

✓ Customer quality requirements

Startup and running waste (planned waste) is all product run during equipment startup and during production that is unacceptable to the customer due to tweaking and adjustment to bring the equipment process to balanced running but is planned cost for the customer.

Equipment changeover is influenced by:

✓ Materials conditions

✓ Equipment conditions

✓ Equipment setup

✓ Operator skills and knowledge

Enabling processes to increase good product, various types of specialized Lean tools will have varied impacts and quantifiable results:

- 5S
- Single Minute Exchange of Die (SMED)
- Kaizen blitz (intense process improvement initiative)

NOTES

Make Note...

Enabling processes to increase good product, various types of specialized Lean tools will have varied impacts and quantifiable results.

NOTES

- Color management
- Total Production Maintenance (TPM)

OEE metrics enable targeting the right initiatives to receive the quickest bang for the buck.

Types of Lean improvement initiatives include:

- Makeready time (Availability)
  - ✓ 5S
  - ✓ Single Minute Exchange of Die (SMED)
  - ✓ Kaizen blitz (intense process improvement initiative)
  - ✓ Color management
- Downtime (Availability)
  - ✓ 5S
  - ✓ Total Production Maintenance (TPM)
  - ✓ Kaizen blitz (Intense Process Improvement Initiative)
- Run time and production speeds (Performance)
  - ✓ Total Production Maintenance (TPM)
- Total good sheets produced (Quality)
  - ✓ Total Production Maintenance (TPM)
  - ✓ Color management

Availability

- Reduced downtime will increase run time.
- Decreased makeready time will increase run time.

Performance

- Increased production per hour (decreased cycle time) will produce more sellable product.

Quality

- Decreased waste and spoilage will produce more sellable product.

Identify a process's problem areas or issues:

1. Exploit the press process by systematically eliminating all forms of waste and non-value-added activities through makeready and downtime reduction, increase production speeds, and improve quality output.
2. Subordinate all support activities to optimize the print production processes: job planning, scheduling, prepress, information, and materials.

Everything **needed** to run production equipment must be…

✓ Correct

✓ Functioning properly

✓ Easily accessible

3. Elevate print production processes to highest level of priority. All focus must be on processes, not individuals.

Anytime there are …

✓ Constraint processes

✓ Waiting by customers, processes, and people

✓ Complaints by customers, both internal and external

… there are opportunities to eliminate waste and improve performance.

The strategy is to drive key initiatives consistent with business strategy, with a specific focus on:

✓ Implementing a long-lasting process improvement initiative with significant bottom-line results and significant impact on customer satisfaction

✓ Investing in employees

✓ Leveraging all possible resources

To survive and succeed, there must be relentless improvement and high performance.

NOTES

NOTES

BEST PRACTICES—VALUE STREAM MAPPING

Note: Some additional research and reading to understand and prepare for the process of Value Stream Mapping may be required before undertaking the process outlined in this workbook. There are industry experts available who can consult with you to help with the Value Stream Mapping process, and two Printing Industries Press books provide basic information on the topic: *Lean Printing: Pathway to Success* and *Total Production Maintenance: A Guide for the Printing Industry.* More information on these titles available at the back of this book.

Value Stream Mapping (VSM) creates a visual map of all the current state of processes in a value stream displaying value-added and non-value-added activities, performance metrics in each process, inventory, and throughput time. Then a future state map is created to show were Lean tools are to be targeted to eliminate the waste that is found.

The purpose of Value Stream Mapping is to develop the ability to ***"SEE the FLOW."***

What Is a Value Stream Map?

A Value Stream Map enables you to:

✓ Create a current-state value stream

✓ Trace all of the actions currently required to manufacture a product through all necessary processes

✓ Follow production flow from raw materials to customer delivery

✓ Design flow from concept to launch

✓ Design future-state value streams

✓ Follow a product's manufacturing path from beginning to end

✓ Draw a map or graphic representation (utilizing icons) for current state material and information flow for every process

VSM—The Essential Tool

The Value Stream Map:

- Visualizes more than a single process
- Sees more than waste—VSMs show the sources of waste
- Provides common language about processes
- Bonds together Lean concepts and techniques
- Forms the basis for implementation initiatives
- Shows how information and material flow connect

Next draw a future state map for how the value stream should flow.

As a tool, a Value Stream Map is a major component to finding waste and system constraints. Utilize it to understand how the current-state workflow currently operates as the foundation for the future-state Lean print workflow.

Operational Excellence (OPEX) is an effort that seeks to optimize our value-creating processes, which will allow us to become the best in our industry at providing products at the lowest price, with hassle-free services, while always delighting the customer. In order to achieve Operational Excellence in everything we do, we first have to measure how we are doing in the value-creating processes that affect the concepts of "faster, cheaper, better." Thus, there is a balanced scorecard of: Quality (Customer), Business, Sales, and Operations.

First and foremost, plants are to use these metrics internally for their own goal setting, benchmarking, and continuous improvement. In addition, plants will have a resource of information to tap into for a division-wide benchmarking perspective.

First, determine product family. Group by:

- Similar equipment and process steps
- Product family analysis

NOTES

Job Type	Process	Process	Process	Process	Process	Process	Process	Process
Customer & Type	*Plate Making*	*Printing Sheetfed*	*Printing Web*	*Cutting*	*Folding*	*Collating*	*Stitching*	
ABC Brochure	X	X		X	X	X	X	
ABC Market	X	X		X				
ABC Announce	X	X		X	X	X	X	
ABC Mailer	X	X	X			X	X	
ABC Catalog	X	X		X	X	X	X	

Job Type	Process	Process	Process	Process	Process	Process	Process	Process
Customer & Type								

Follow a print product's path from beginning to end, and draw a current-state graphic visual of every process in material and information flow. Then draw a future- (desired) state map to show how the value stream should flow.

Each value stream map ***needs*** a Value Stream Manager:

- For product ownership beyond process functions
- To assign responsibility for future-state mapping and implementing Lean Value Stream to process managers

Process Managers are then change agents. The managers must have the capabilities to make change happen across functional and departmental boundaries.

What is the current state? That is the starting point to:

✓ Understand how the print shop currently operates in regard to information and materials flow

✓ Draw utilizing icons

✓ Begin with door-to-door production flow

✓ Walk the print shop and get the actual flow

✓ Do not use standard time

✓ Draw current state by hand (don't use computers)

This is the foundation for future state.

What Is Lead and Cycle Time?

Lead time is the time it takes a product to go from raw materials procurement (spending money) through preproduction, preprinting, printing, and post printing through shipping and delivery to the customer and receiving payment. More than 97% of lead time is non-value-added or waste.

Cycle time is the time it takes a process to produce one part or product. For printers that can be the following:

✓ Proofer making one proof

✓ Platemaker making one plate

✓ Press prints one sheet or signature

✓ Cutter cuts a sheet

✓ Folder folds a sheet

✓ Collator-stitcher-trimmer produces one book

✓ Shipping prepares a job for shipment

Inventory is any material, part, or product that is not immediately needed and must wait in raw material inventory, a work-in-process location, or the finished goods warehouse.

NOTES

NOTES

Process Delays—"The fast shall eat the slow"

Batch delays are the cycle or time the first items in a batch have to wait for a process to complete the balance of the batch. The longer the run length, the longer the production time or batch delay.

Process delays are the time it takes a batch to wait in work-in-process inventory. The longer the wait, the longer the process delay.

Accelerate Cycle

The shorter the cycle time, the faster the product moves, the faster the throughput, and the faster the cash flows.

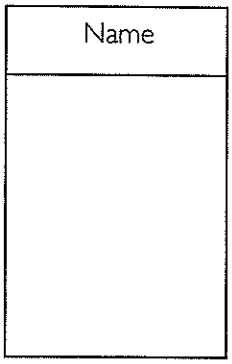
25–2–20 Rule: Every 25% reduction in throughput delays can result in nearly doubling throughput, or the speed the product moves through processes and generates sales dollars.

Value Stream Map symbols are basically visual icons that help provide a standard way to identify equipment, processes, materials, and activities and to quantify performance.

Since Value Stream Maps are chock full of information and data, they can be more useful than basic process maps, which may just show the flow of activities but not necessarily the performance and inventory waste.

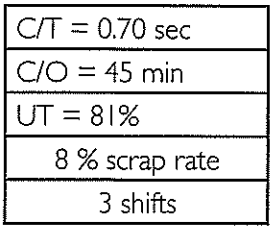
Process Data Box

Process and data boxes provide a piece of equipment's average performance information. Process and data boxes provide information to determine where process constraints and bottlenecks exist in a value stream.



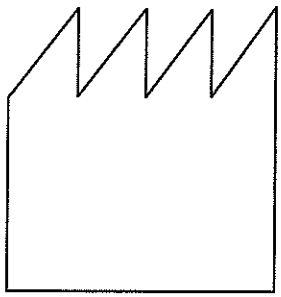
Process

- **Cycle Time (CT):** The time the equipment or process takes to produce one item.
- **Changeover (CO):** The time lapse on a piece of equipment (or work area) between the time when the last good piece from the last job was completed until the first ***good*** piece from the next job is completed and verified as good.
- **Uptime (UT):** The time when equipment is scheduled to operate and is not in changeover or production mode.
- **Spoilage Rate (SR):** The percentage of defective product.



Data Box

The ***Vendor/Supplier*** icon identifies various suppliers, the amounts of materials, and how long it takes from order to delivery.



Vendor

✓ Stock (paper or plastic)

✓ Ink

✓ Coating

✓ Rollers

✓ Blankets

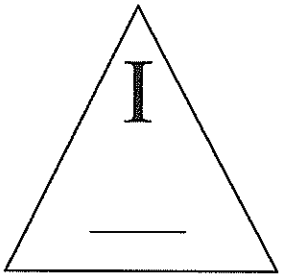
✓ Fountain solutions

✓ Glue and adhesives

✓ Tape

✓ Supplies

The ***Inventory*** icon identifies the types of inventory and how long, in days, they usually are stuck there.



Inventory

✓ Raw materials

✓ Work-in-process

✓ Finished goods

Inventory time is how Lean focuses on run lengths or batch sizes. The longer the inventory time, typically the larger the job run lengths or batch sizes.

NOTES

Step 1

❒ Identify customer requirements

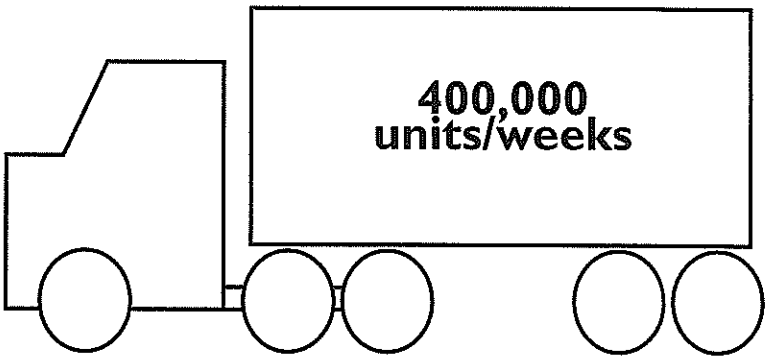
- ❒ Amounts per day and week
- ❒ Turnaround time from order to delivery

❒ Define method of delivery

- ❒ Freight
- ❒ Priority
- ❒ Overnight

❒ Define typical quantity requirements and specifications

- ❒ Printing
- ❒ Bindery



NOTES

✓ It is OK that more than one customer is served by this value stream, but make sure that the primary processes used are similar

✓ Use a pencil rather than computer

XYZ
200,000 pamphlets
100,000 brochures 100,000 manuals
Recyclable

Step 2

Perform an upstream walk through each process step, visually observing and documenting as much of the following as possible:

❒ Cycle time (operator and machine cycle time)

❒ Changeover times

❒ Average amount and time in days for raw materials inventory

❒ Average amount and time in days work-in-process waits between processes

❒ Average production batch size

❒ Number of operators at each process

❒ Package or container size

❒ Available time (take out breaks and lunches)

❒ Scrap rate

❒ Machine uptime (availability)

❒ Number of product variations

Step 3

NOTES

Record as much information as is pertinent in the process description box:

❒ C/T cycle time (how long it takes to produce one sheet or item)

❒ C/O changeover time

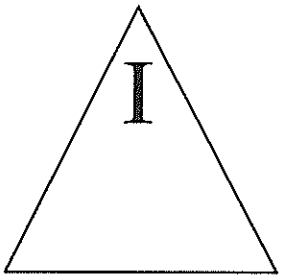
❒ Waste percent rejected product

❒ Uptime: total time minus downtime

❒ Total number of shifts

❒ Total number of operators per shift

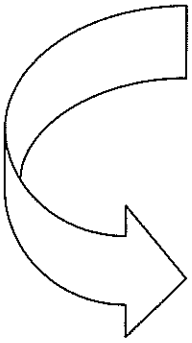
The triangle symbol identifies inventory; this can be expressed in pieces or in time (how many hours, days, or weeks of inventory).



The arrow connects to the next process.

- Straight arrows can stand for a push.

- A curved arrow can symbolize a physical pull from a kanban (visual-trigger system) location, or a "supermarket" (the small amount of inventory within the value stream).



NOTES

Process Description
Crew size: Output: Run Speed:
C/T
C/O
Uptime:
Waste %
Sec available

Step 4

Dream about perfection and think outside the box.

Develop alternatives to the current-state map—Muda free (Muda is Japanese term for "waste").

Focus on velocity.

❒ Test each idea against **TOP**— in other words, does it support:

✓ **T**akt time (takt can be related to "cycle time")

✓ **O**ne-piece flow

✓ **P**ull

❒ Develop a "future-state" map that visually describes the goal.

❒ Break down the future-state map into manageable steps.

❒ Develop a Gantt chart (time-phased project plan).

❒ Identify the kaikaku ("radical change") and kaizen events that will need to take place.

Tips for Current-State Drawing

❒ Assign a Value Stream Manager:

- Who will take responsibility for managing the mapping process?
- Who will champion the improvement activity?

❒ Select a product family:

- Identify one or more high-volume products or families of products.
- Choose the highest-volume products that go through the same, or mostly the same, processes.
- Develop a matrix of product/processes to look for similarities if necessary.

Make Note...

If you map just one department, you lose sight of how the products in that department affect the timeline of the whole.

NOTES

❒ Select production measurement units before beginning the map:

- Select production measurement units before beginning the map, for example: pieces, pounds, etc.
- Ensure units are consistently applied throughout map.

❒ Determine the best scope for your map:

- Most companies begin by mapping a product family as the information and material flow through a single facility.
- This is called a ***"door-to-door" Value Stream Map.***
- If you map just one department, you lose sight of how the products in that department affect the timeline of the whole.
- If you map multiple plants, you can "big-picture" supply chain information.
- These maps will assist in determining which plant has problem areas.

Value Stream Map

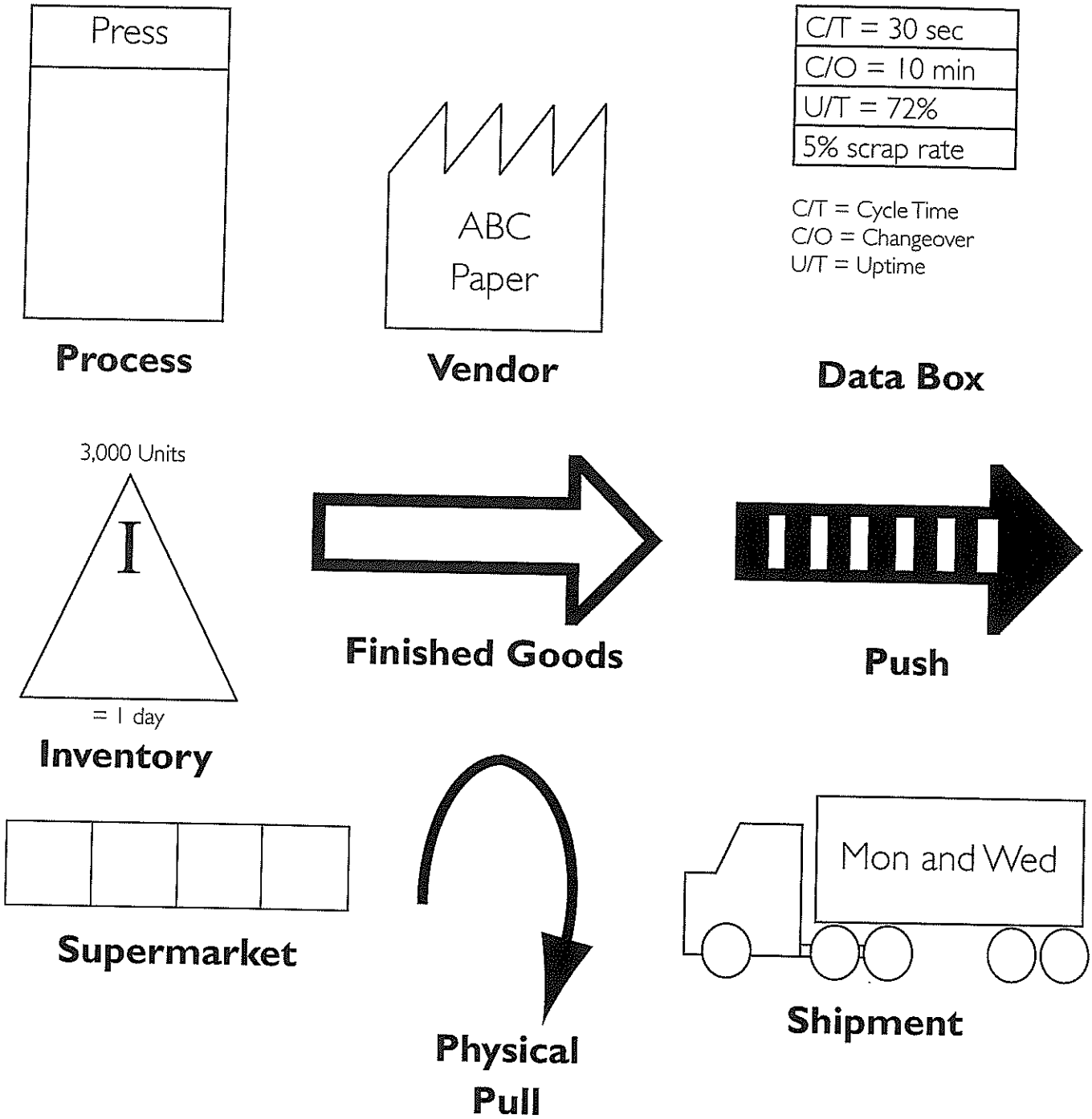
To recap, Value Stream Map symbols are basically visual icons that help provide a standard way to identify equipment, processes, materials, and activities and to quantify performance.

Since Value Stream Maps are chock full of information and data, they can be more useful than basic process maps, which may just show the flow of activities, but not necessarily the performance and inventory waste.

Symbols

- **Process and Data Boxes:** Provide an equipment's average performance information. Process and data boxes provide information to determine where process constraints and bottlenecks exist in a value stream.
  - ***Cycle Time (CT):*** The time a piece of equipment or process takes to produce one item.
  - ***Changeover (CO):*** The time lapse on a piece of equipment (or work area) between when the last good piece from the last job was completed until the first good piece from the next job is completed, and verified as good..
  - ***Uptime (UT):*** The time when equipment is scheduled to operate and is not in changeover or production mode.
  - ***Spoilage Rate (SR):*** The percentage of defective product.
- **Vendor/Supplier:** Identifies various suppliers, the amounts of materials, and how long it takes from order to delivery.
- **Inventory:** Raw materials, work-in-process, and finished goods not shipped to the customer.
- **Push:** Produce to stock in which the production is not based on actual demand.

- **Pull:** Means Make-to-Order in which the production is based on actual demand.
- **Supermarket (Kanban):** System that signals when to order materials or make more product.
- **Shipment:** Deliver to customer.



LET'S DEVELOP A VALUE STREAM MAP

NOTES

From data provided let's draw a current-state Value Stream Map of a printer's primary customer.

We will develop from data for ...

Each process's:

✓ Cycle time

✓ Downtime

✓ Setup time

✓ Waste/spoilage

✓ Number of people

Inventory (in average days in warehouse and between processes):

✓ Raw materials

✓ Work in process (WIP)

✓ Finished goods

Print production processes

✓ Suppliers

✓ Preprinting

✓ Printing

✓ Cutting

✓ Folding

✓ Collate/stitch/trim

✓ Warehouse

✓ Shipping

Raw Materials Inventory in days

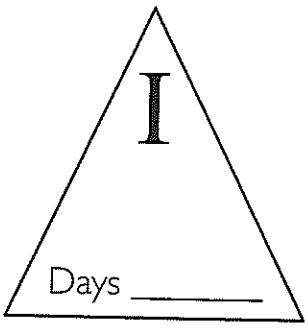
❒ Plates

❒ Paper

❒ Ink

❒ Coating

❒ Supplies



NOTES

Processes—Preprinting

❒ WIP to next process

We will develop from data for each process:

❒ Cycle time

❒ Uptime or downtime

❒ Setup time

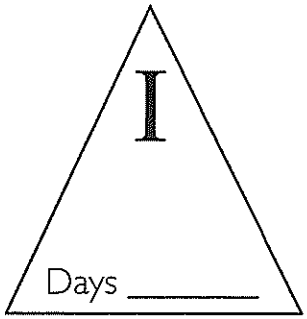
❒ Waste/spoilage

❒ Manpower

Inventory in average days in warehouse and between processes:

❒ Work in process (WIP)

Preprinting
Crew size:
C/T:
C/O:
U/T:
Waste %



Processes—Printing

❒ WIP to next process

From data provided let's draw a current-state Value Stream Map of a printer's primary customer.

We will develop from data for each process:

❒ Cycle time

❒ Uptime or downtime

❒ Setup time

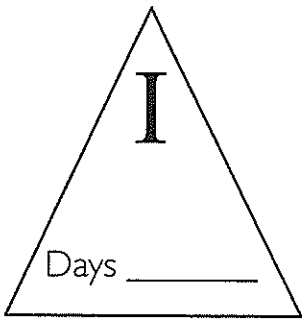
❒ Waste/spoilage

❒ Manpower

Inventory in average days in warehouse and between processes:

❒ Work in process (WIP)

Printing
Crew size:
C/T:
C/O:
U/T:
Waste %



Processes—Cutting

❒ WIP to next process

From data provided let's draw a current-state Value Stream Map of a printer's primary customer.

We will develop from data for each process:

❒ Cycle time

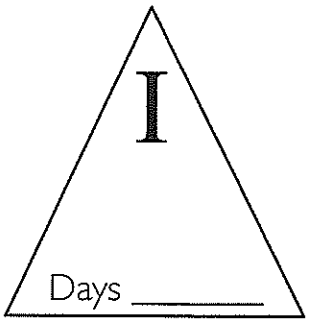
❒ Uptime or downtime

❒ Setup time

❒ Waste/spoilage

❒ Manpower

Cutting
Crew size:
C/T:
C/O:
U/T:
Waste %



NOTES

NOTES

Inventory in average days in warehouse and between processes:

❒ Work in process (WIP)

Processes—Folding

❒ WIP to next process

From data provided let's draw a current-state Value Stream Map of a printer's primary customer.

We will develop from data for each process:

❒ Cycle time

❒ Uptime or downtime

❒ Setup time

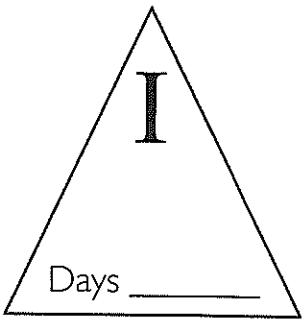
❒ Waste/spoilage

❒ Manpower

Inventory in average days in warehouse and between processes:

❒ Work in process (WIP)

Folding
Crew size:
C/T:
C/O:
U/T:
Waste %



Processes—Collate/Stitch/Trim

❒ WIP to next process

From data provided let's draw a current-state Value Stream Map of a printer's primary customer.

We will develop from data for each process:

❒ Cycle time

❒ Uptime or downtime

❒ Setup time

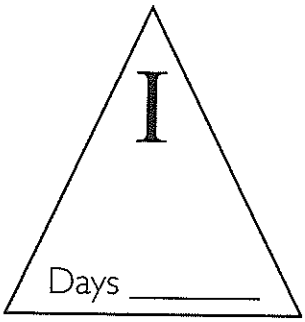
❒ Waste/spoilage

❒ Manpower

Inventory in average days in warehouse and between processes:

❒ Work in process (WIP)

Collate/Stitch Trim
Crew size:
C/T:
C/O:
U/T:
Waste %



Processes

Name: _____

❒ WIP to next process

From data provided let's draw a current-state Value Stream Map of a printer's primary customer.

We will develop from data for each process:

❒ Cycle time

❒ Uptime or downtime

❒ Setup time

❒ Waste/spoilage

❒ Manpower

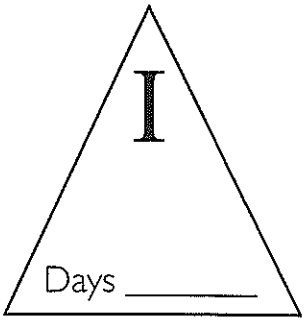
Inventory in average days in warehouse and between processes:

❒ Work in process (WIP)

NOTES

NOTES

Crew size:
C/T:
C/O:
U/T:
Waste %



Processes—Warehouse/Shipping

From data provided let's draw a current-state Value Stream Map of a printer's primary customer.

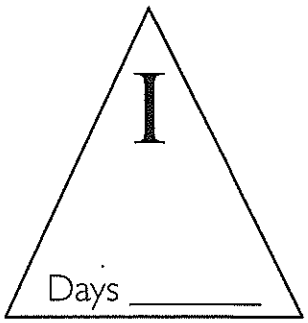
We will develop from data for each process:

- ❒ Cycle time
- ❒ Uptime or downtime
- ❒ Setup time
- ❒ Waste/spoilage
- ❒ Manpower

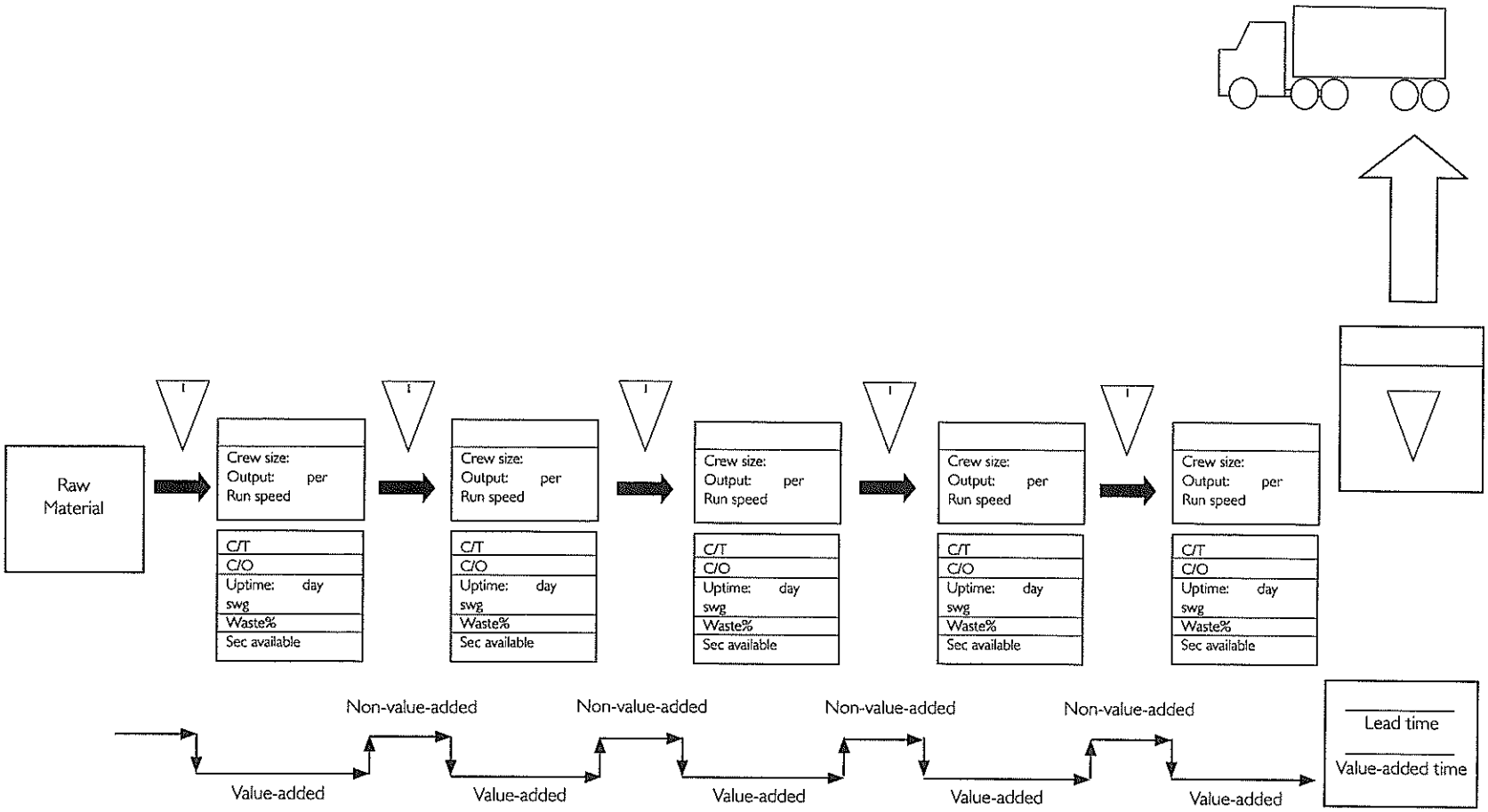
Inventory in average days in warehouse and between processes:

- ❒ Work in process (WIP)

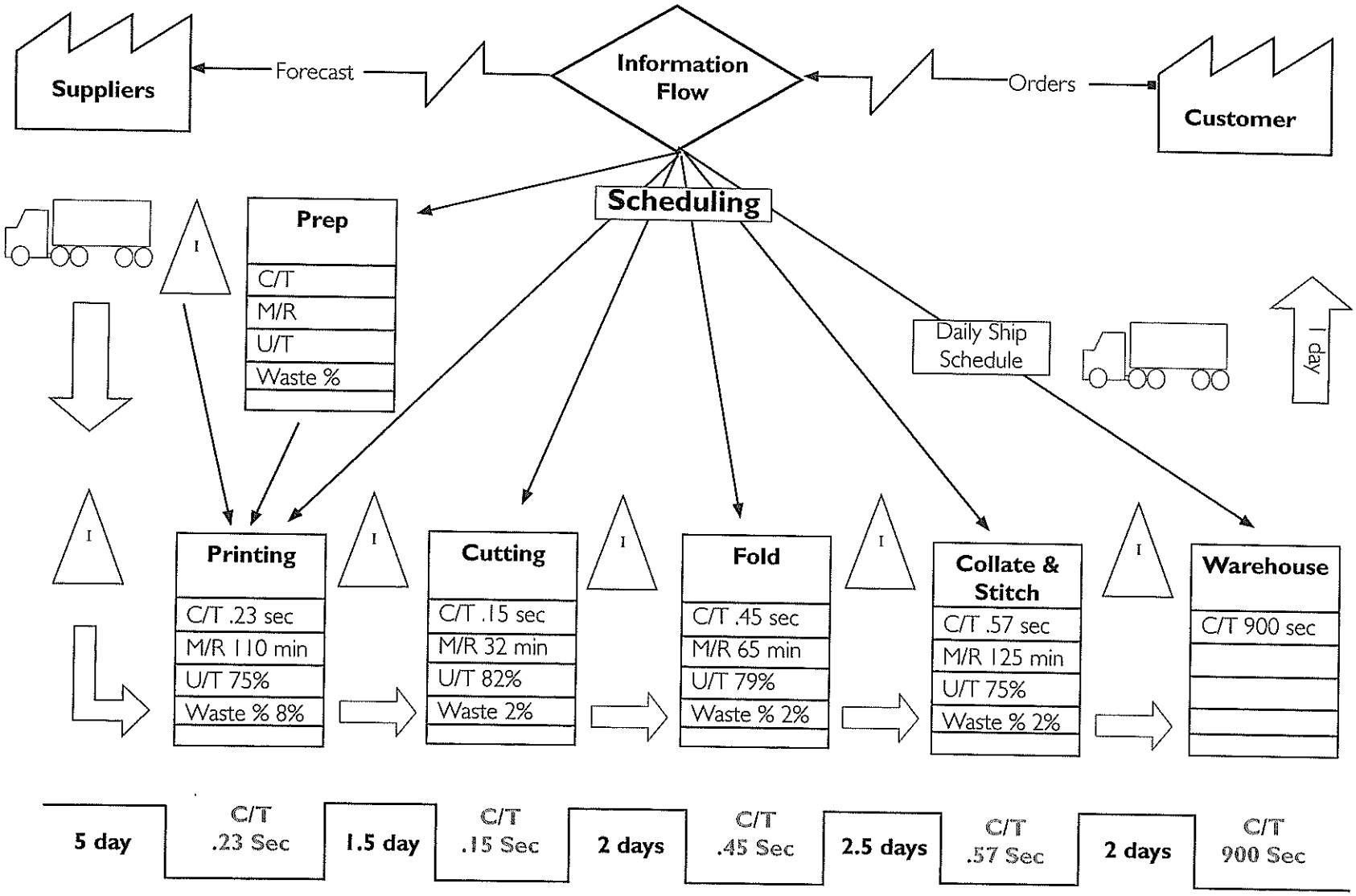
Shipping
Crew size:
C/T:
C/O:
U/T:
Waste %



Blank Generic Value Stream Map

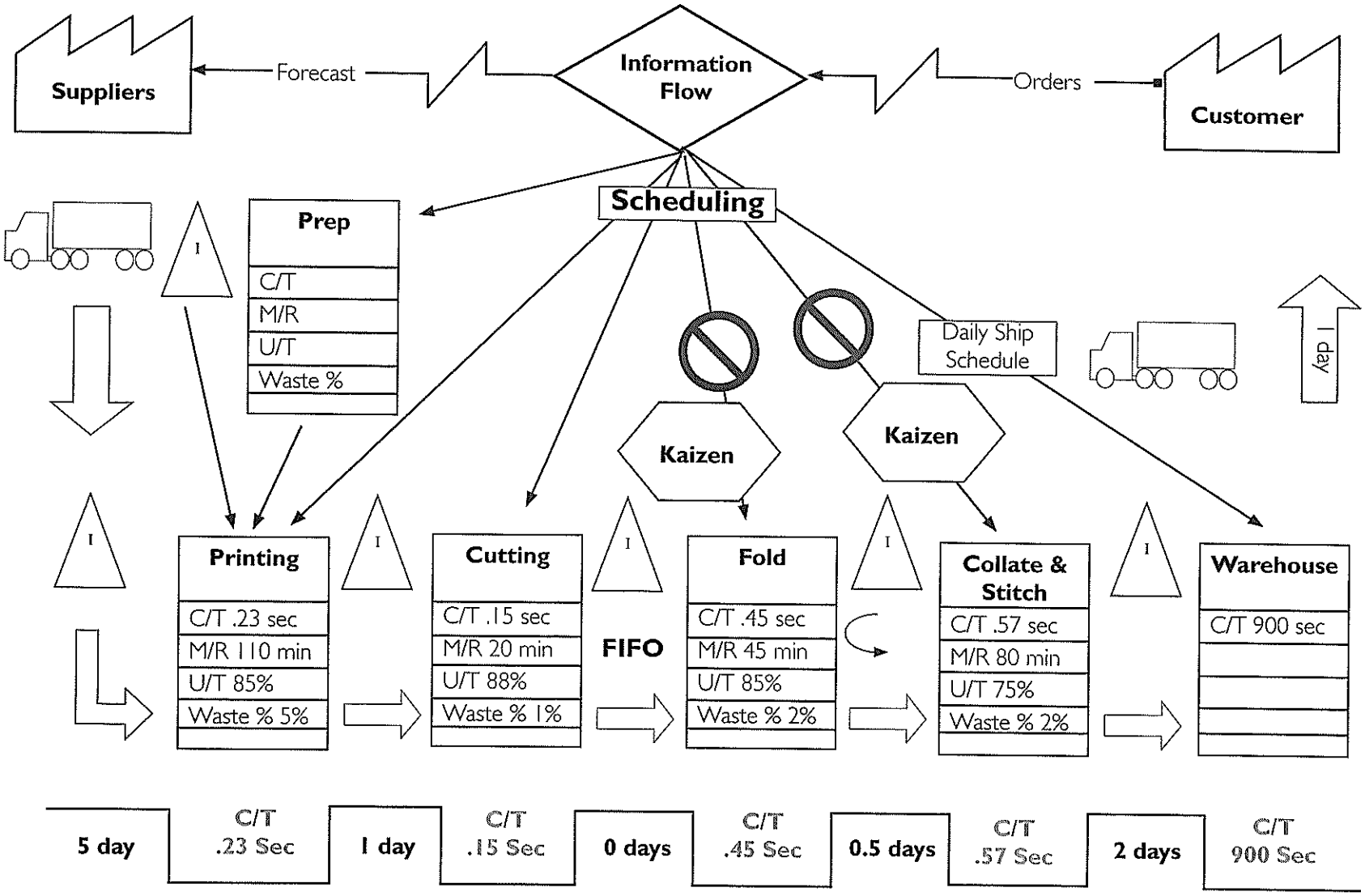


Printer A: Current-State Value Stream Map



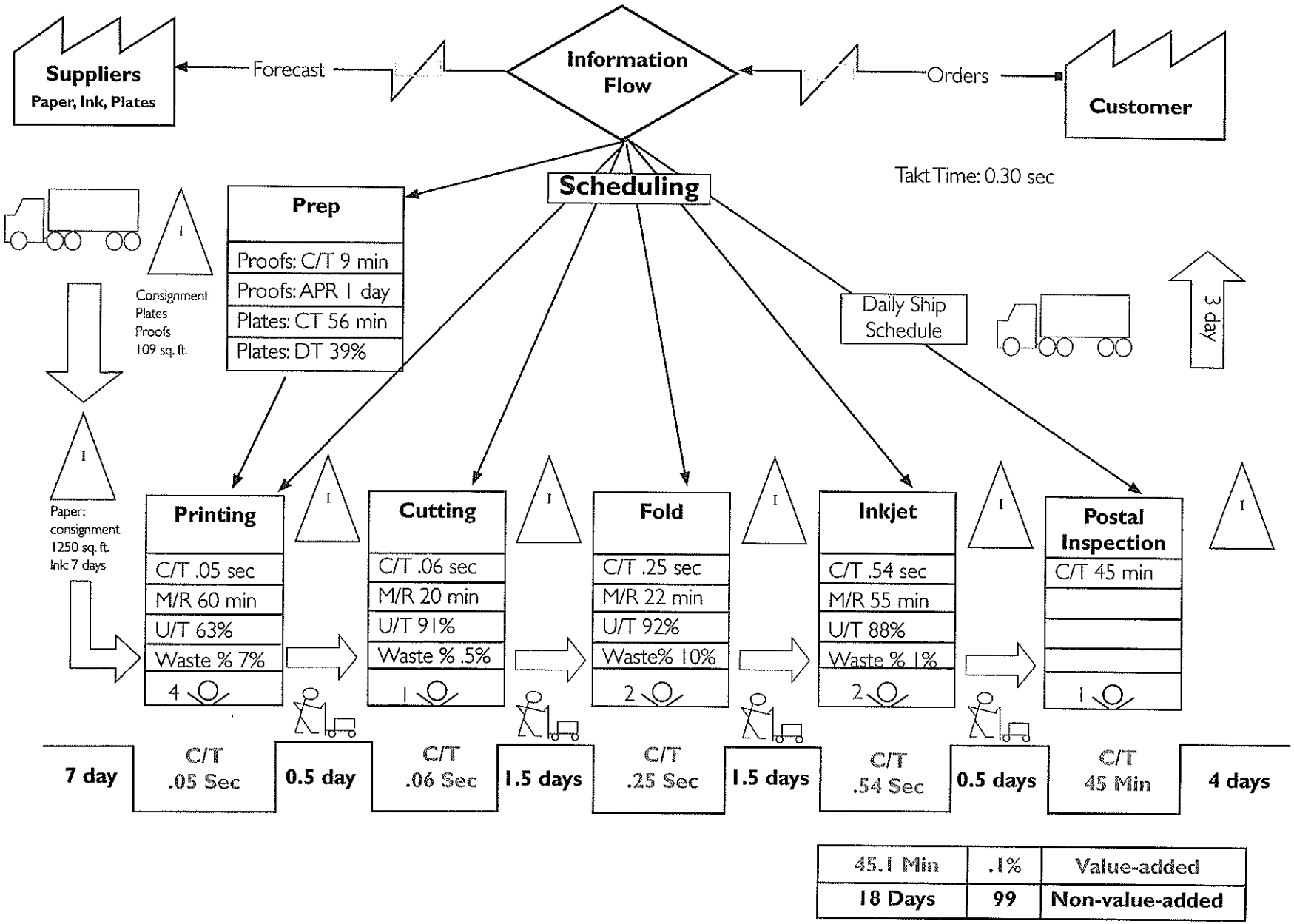
901.38	5	Value-added
14 Days	99	Non-value-added

Printer A: Future-State Value Stream Map



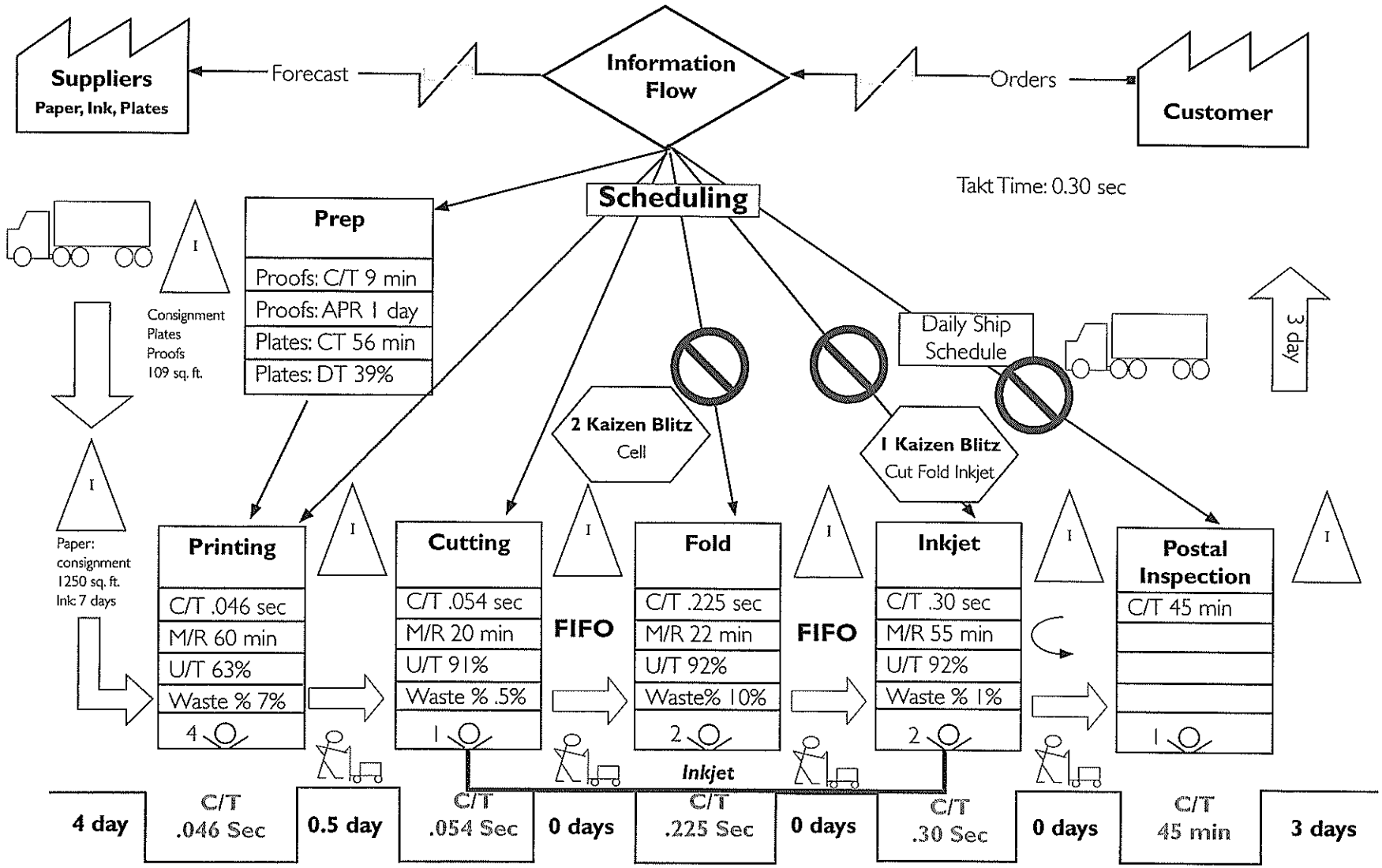
901.38	5	Value-added
6.5 Days	**98**	**Non-value-added**

Printer B: Current-State Value Stream Map



45.1 Min	.1%	Value-added
18 Days	99	Non-value-added

Printer B: Future-State Value Stream Map



45 Min	.2%	Value-added
10.5 Days	**99**	**Non-value-added**

Value Stream Map **Plant Facility:** _____ **Customer Family:** _____ **Date:** _____

CONCLUSION

NOTES

Printers can accelerate their production throughput and slash non-value-added waste by looking for waste and the constraints processes or the weakest link in their value stream. The constraint process could be anywhere in the value stream: preproduction, preprinting, printing, post printing, or shipping. Printers must focus on their processes, not just the results or outcome of the processes.

1. ***Search*** and find the constraint process. Identify where work-in-process inventory or bottlenecks are clogging up in front of a process.
   - Measure and track system throughput with Operational Excellence (OPEX) and process performance with Overall Equipment Effectiveness (OEE) data metrics.
   - Conduct a Technical and Production Assessment to determine if equipment and processes are operating and performing at manufacturer and industry specifications and best industry practices. Assessments also enable visual observations of production processes to actually see the constraint processes in action.
   - Develop and analyze a Value Stream Map (Lean manufacturing tool which relies on process and inventory data) to establish where the constraint process truly is.
2. ***Exploit or Optimize*** by getting the most out of the constraint process. Employ Lean tools to maximize operations; decrease waiting and downtime, shrink changeovers and setups, accelerate production cycle time, and slash errors and spoilage.
3. ***Subordinate or Delegate*** all support activities and decisions to optimize the constraint process and operations. Decisions must be based on data and information, not personal issues, departmental politics, or "tribal knowledge."
4. ***Elevate or Raise*** the constraint process to the highest level of priority by the lifting production load off to other processes.
5. ***Start Over*** by searching and isolating the new constraint process.

The Shingo Model and Lean thinking and manufacturing utilizes a systematic methodology which identifies and removes all forms of waste and non-value-added activities. Any activity that does not add value to the printed product or service is waste. Lean goals are achieved through constantly adding value and achieving continuous flow through a printer's value stream. Lean has a board full of tools to find and eliminate waste.

Lean Application Tools

- Lean Teams
- Training and Education
- Kaizen Blitz

NOTES

- Visual Systems Management
- Standard Work
- Error Proofing
- Process Control
- Quality at the Source
- Policy Deployment (Lean Strategic Tool)

Lean—Tools to Search for Waste

- Technical and Production Assessments
- Value Stream Mapping
- OEE (Overall Equipment Effectiveness)

Lean—Tools to Eliminate Waste

- 5S (Sort, Straighten, Shine, Standardize, Sustain)
- Point-of-Use Storage
- TPM (Total Productive Maintenance)
- Quick Changeover (Single Minute Exchange of Die)
- Batch Reduction
- Manufacturing Cells (Cellular Flow)
- Plant Layout
- Kanban Pull Systems

Everyone must recognize the magnitude of non-value-added waste and production constraints and create the necessary sense of urgency needed to overcome them to achieve process excellence. The rewards from eliminating the majority of non-value-added activities can be enormous.

Operational Excellence integration continues with *Book 3: Cleaning and Organizing—5S for Printers, Book 4: Pit Stop Maintenance with TPM,* and *Book 5: Quick Changeover for Printers.* Also available: *Book 1: Operational and Performance Excellence: The Shingo Model.*

ABOUT THE AUTHOR

Kenneth Rizzo was director of Technical and Lean Services at Printing Industries of America. Ken supported and headed the Center for Technology and Research's testing and analysis laboratories, process control products, and highly regarded team of experts and educators. A highly experienced process improvement specialist, certified in Six Sigma, ISO 9000, and Lean Manufacturing, Rizzo possessed forty years of commercial and packaging experience. In the mid 1980s as a printing manager Ken underwent training in the Toyota Production System and then coordinated improvement initiatives in a printing plant environment.

Rizzo was a noted industry speaker, experienced trainer, and educator, instructing on various topics including: extreme offset production, printing UV, troubleshooting printing and production problems, and ten steps to Operational Excellence.

A best-selling author, Ken wrote numerous articles for leading industry publications covering technical, operational, and Lean practices. Rizzo was a frequent seminar speaker at major industry events and noted lecturer and trainer. Rizzo also authored *Total Production Maintenance: A Guide to the Printing Industry*, 3rd Edition (April 2008) (based on Japanese manufacturing Total Productive Maintenance) for printers seeking to optimize uptime through TPM, equipment analysis, equipment critical cares, effective maintenance, process control, and practices for printing Lean.

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.piag.org

Printing Association of Florida
Orlando, FL
www.pafgraf.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 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

Printing Industries of Virginia
Ashland, VA
www.piva.com

Printing Industries of Wisconsin
Pewaukee, WI
www.piw.org

Printing Industry of Illinois/Indiana Association
Chicago, IL
www.pii.org

Printing Industry Midwest
Roseville, MN
www.pimn.org

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

Printing Industry Association of the South
Nashville, TN
www.pias.org

Publications of Interest from Printing Industries of America

- *Adding Value to Print,* by Manfred Breede.
- *Color Management Handbook: A Practical Guide,* by Dr. Richard M. Adams, Dr. Abhay Sharma, and Joseph Suffoletto.
- *Bindery Training Curriclum,* 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.
- *Digital Production Excellence Accreditation Program Guidelines Booklet,* by Printing Industries of America Staff.
- *Ergonomics Training Program,* a collaboration by Printing Industries of America and others.
- *Guide to Troubleshooting for the Sheetfed Offset Press,* edited by Thomas M. Destree.
- *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.
- *Print Production Excellence Accreditation Program Guidelines Booklet,* by Printing Industries of America Staff.
- *Printing Plant Layout and Facility Design,* by A. John Geis.
- *Printing Production Management,* by Gary G. Field.
- *Process Controls Primer,* by Joseph Marin.
- *Sheetfed Offset Press Operating,* by Lloyd P. DeJidas and Thomas M. Destree.
- *Sheetfed Offset Press Training Curriculum,* by Printing Industries of America Staff.
- *Total Production Maintenance: A Guide for the Printing Industry,* by Kenneth E. Rizzo.
- *Web Offset Press Operating,* by Daniel G. Wilson and Printing Industries Staff.
- *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