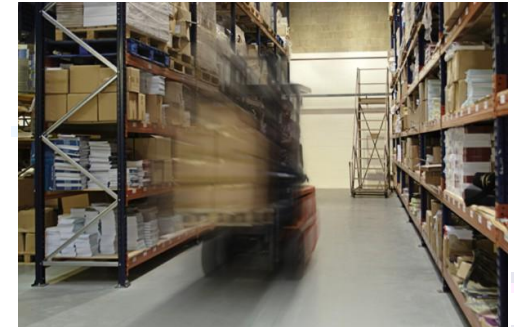


Using Tracking and Traceability Technology to Avoid Being Put Out of Business While Improving Operational Efficiency



October 2, 2007
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BellHawk
Systems Corporation



Innovative Tracking and Control Solutions

“Watching Your Operations like a Hawk and Ringing the Bell when Problems Occur”

Vendors ship bad materials

- Defective or Contaminated materials
- Wrongly labeled materials

Employees make mistakes

- Use wrong materials
- Use wrong processes
- Ship wrong goods

Mandated Identification and Traceability

- FDA – Bioterrorism ACT
- Dept. of Defense
- Automotive and Aerospace

Result can be:

- Massive recall
- Expensive lawsuits
- Penalties
- Loss of business or bankruptcy



Use Technology to:

Collect Traceability Data

→ Minimize risks from recall

Prevent Mistakes

→ Reduce wastage

Improve Operations

→ Real-time management oversight

Reduce Inventory

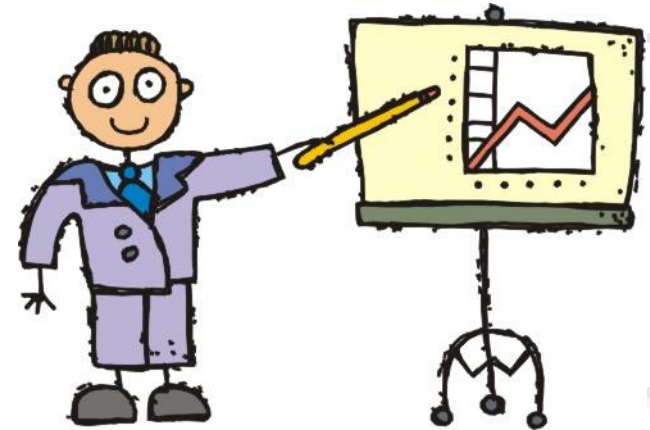
→ Better tracking

Improve Customer Satisfaction

→ Get correct orders out on time

Pay for Itself in Six Months

→ Improvements in Operations



Use pencil and paper:

- Manually record vendor lots received
- Manually record mix or assembly of components
- Track finished goods by lot
- No tracking of which lot was shipped to which customer



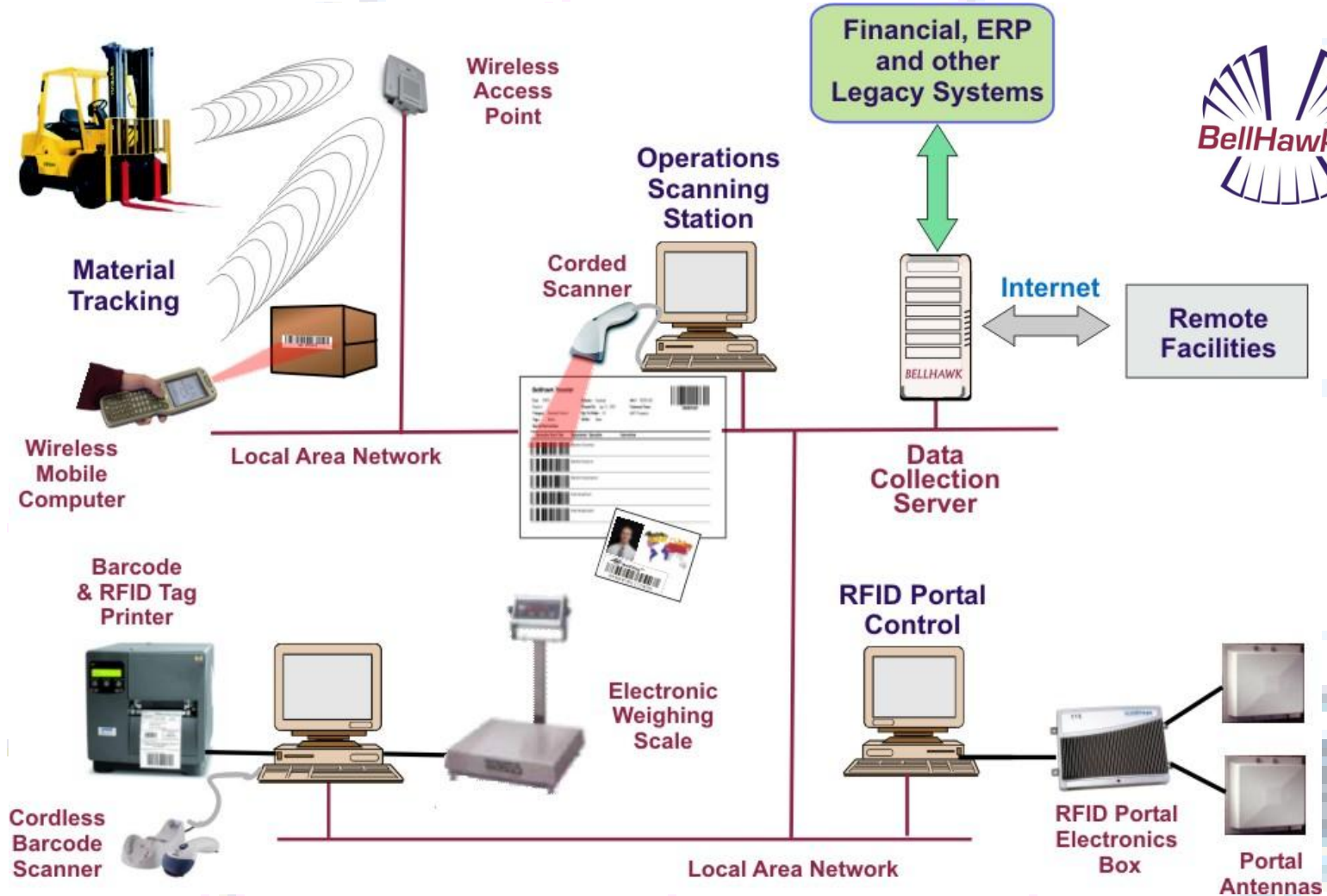
Problems:

- Very difficult to detect problems
- Cannot prevent mistakes in real-time by warning employees
- No real-time management oversight
- Difficult to recall traceability information
- Difficult to limit recall

1. Barcode Scanning and Label printing
 - ➔ To track and identify jobs, people and materials
2. RFID Tag Encoding and Scanning
 - ➔ Automated scanning of materials and vehicles
3. Wireless Mobile Computing
 - ➔ To enable mobile data collection
4. Real-Time Distributed Computing
 - ➔ To links many distributed PCs to a central database
5. The Internet
 - ➔ For linking Manufacturing Plants and Warehouses
6. Artificial Intelligence techniques
 - ➔ To generate warnings when problems occur



Typical Systems Architecture



Types of Barcode Scanner



Tethered Laser Scanner



Tethered Imaging Scanner



Omni Directional Hands Free



Bluetooth Cordless



Wireless Mobile Computers with Integral Barcode Scanner



Uses Microwave Frequencies

- IEEE 802.11b/g - 2.4 GHz

Wireless waves travel in straight line

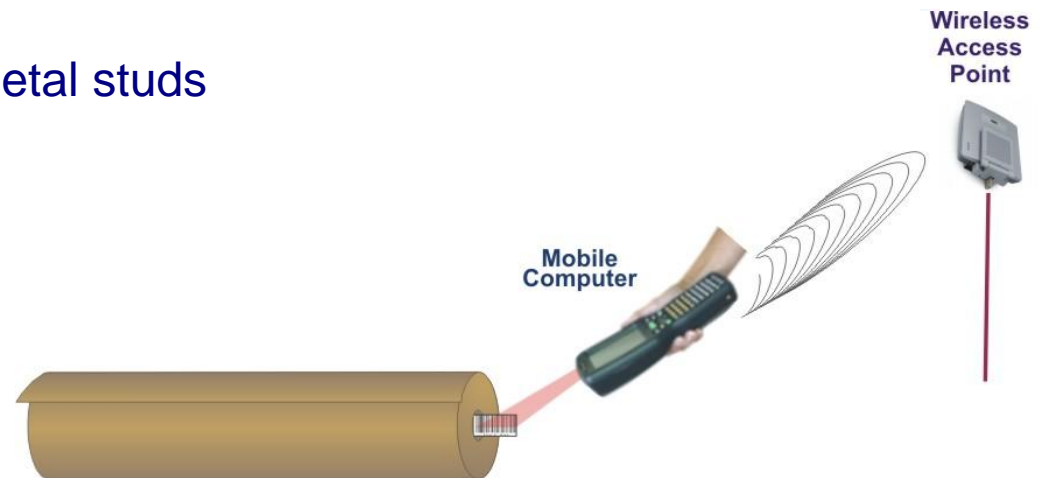
- Between mobile computer and access point antenna
- About 300 foot open-air range

Wireless waves blocked by conducting material

- Metal racking
- Walls with rebar or metal studs
- Containers of liquid
- Conducting solids
- Fork-lift trucks
- People

Interference from Equipment

- Welding
- Electrical Machinery
- Other RF Equipment



Two Alternatives

- Terminal Mode
- Store and Forward

Terminal Mode

- Works as Terminal to ERP System
- Needs Complete Wireless Coverage
- Slow in Response
- Security Issues



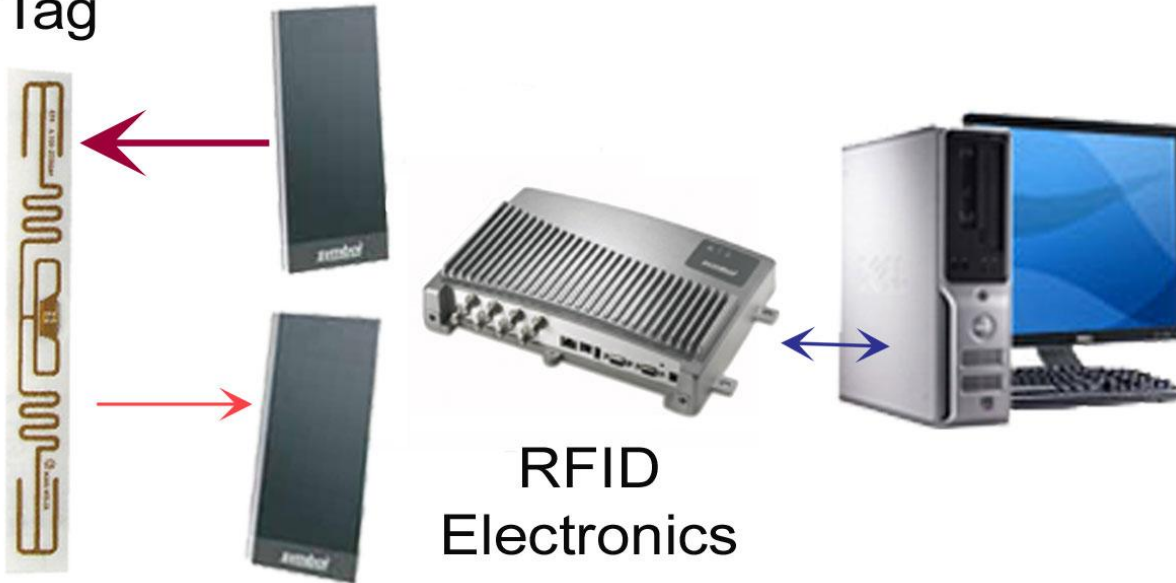
Store and Forward – used by BellHawk

- Has local database in Mobile Computer
- Runs in batch and wireless mode
- Update when access point “visible”
- Rapid response to user inputs
- Secure encrypted packets





Tag



Prevents Mistakes by Automating Scanning
Works Reliably when Single Tag Scanned

➔ Pallet or Carton or Vehicle

Limited Range

➔ About Six Feet



1. Use barcodes with Meaning

- ➔ Part Number
- ➔ Quantity
- ➔ Lot Number



2. Use “License Plate” Tracking Barcode or RFID Tag

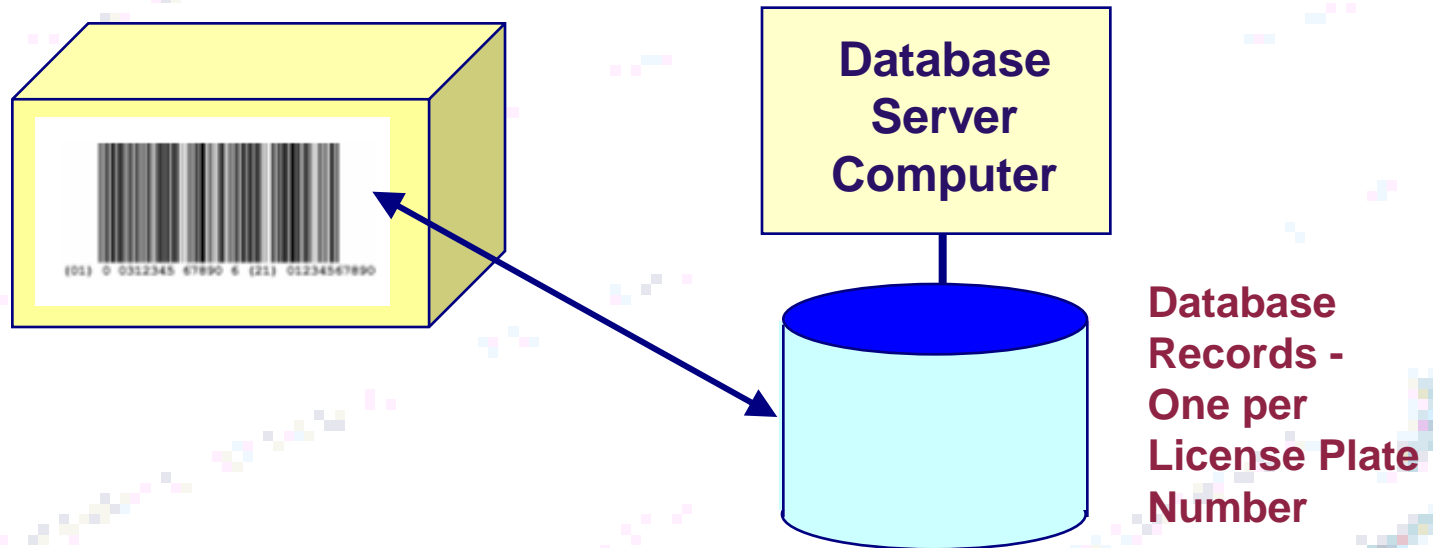
- ➔ Random Number
- ➔ Data kept Electronically in Database
- ➔ Or Sent between Computers

License Plate Tracking is Now
the World-Wide Standard
for Material Tracking



License Plate barcode or RFID tag is placed on every container, box, barrel, reel, roll, and individually barcoded item

Barcode or RFID Tag is an Identifier - Information is contained in Database



Database record contains Part Number, Quantity, Vendor, Lot Number, Container Type, Location, Age, QC Status, Cost

Use Location Barcodes

- On Shelves
- On Bins and Racks
- Over Floor Locations
- On Pillars

Location is recorded whenever container is moved by scanning location barcode

Loose/bulk material can be stored at a location and removed from a location by scanning location barcode

Location barcode can be scanned for Inventory Validation



Put Tracking Barcode on

- Mix Container
- Trolley
- Totes

Scan Out of Job Step

Scan Whenever Moved

- Know where materials are
- At all times

Scan Into Job Step

Track QC Status



Receiving Materials



Open POs

Receipts



Purchase Order



P.O. Date : Jan 2, 2004 **P.O. Number :** P2345

Bill To : The Host Company
45 Primary/Gilling Rd
Milbury, MA 01527 *Specify Purchase Order number on all correspondence, invoices, shipping papers and packages.*

Vendor : PC-1
Sam's Supply
1246 Evergreen Rd
Suite 40
Warren, MA 01435 **Ship To :** The Host Company
The Host Company
297 Primary/Shipping Lane
Canton, MA 01468

Buyer	Ship Via	FOB	Terms
Lisa A. Clark	Brown's Shipping & Trucking		

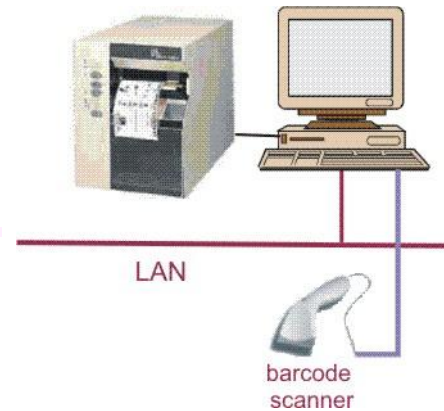
Line #	Order Qty	UOM	Part #	Unit Cost	Total Cost	Date Expected
1	10	lb	P101 Roll of White Paper	1.5	\$15.00	Jan 8, 2004
2	2	Gal	P102 Green Coating Material	13	\$26.00	Jan 8, 2004



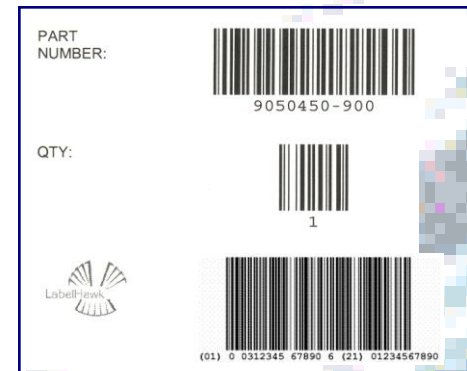
Attach and scan pre-printed tracking barcode to each container – best done with mobile computers



Print out label for each container with tracking barcode plus part and lot description in human readable form



Have vendor attach label with tracking barcode to each container.



Track Put-Away of

- Loose Materials in Bins
- Serialized Items on Shelves
- Boxes on Shelves

Same Part can be stored in Multiple Locations

- Standard Location
- Overflow Locations

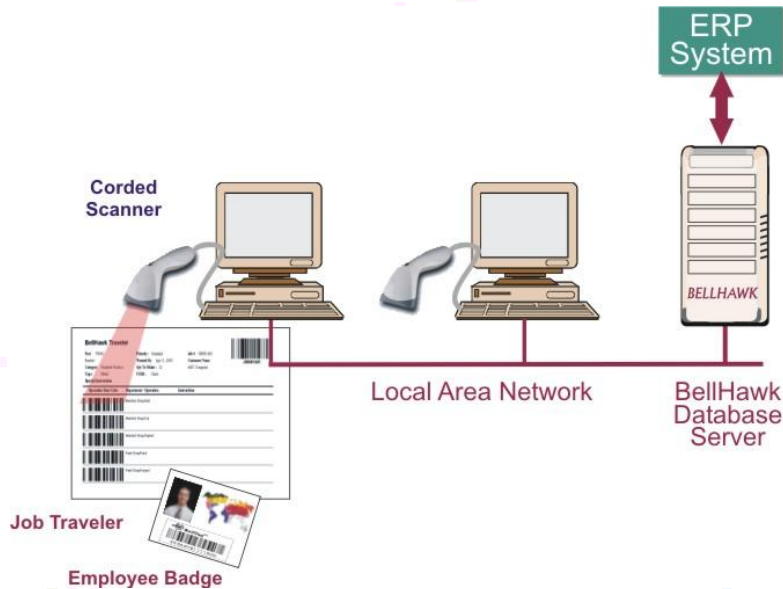
Tracks Inventory Withdrawals

- For jobs and shipments
- Locations shown on Mobile Computer

Can Use Dynamic Binning

- For Efficient use of Warehouse Space





BellHawk Traveler

Part : P0002 Priority : Rush Job # : TEST2
 Bracket Wanted By : Aug 4, 2001 Customer Name :
 Category : Finished Goods Qty To Make : 30 Gen'n Company :
 Type : Assembly UOM : Each

Special Instructions :

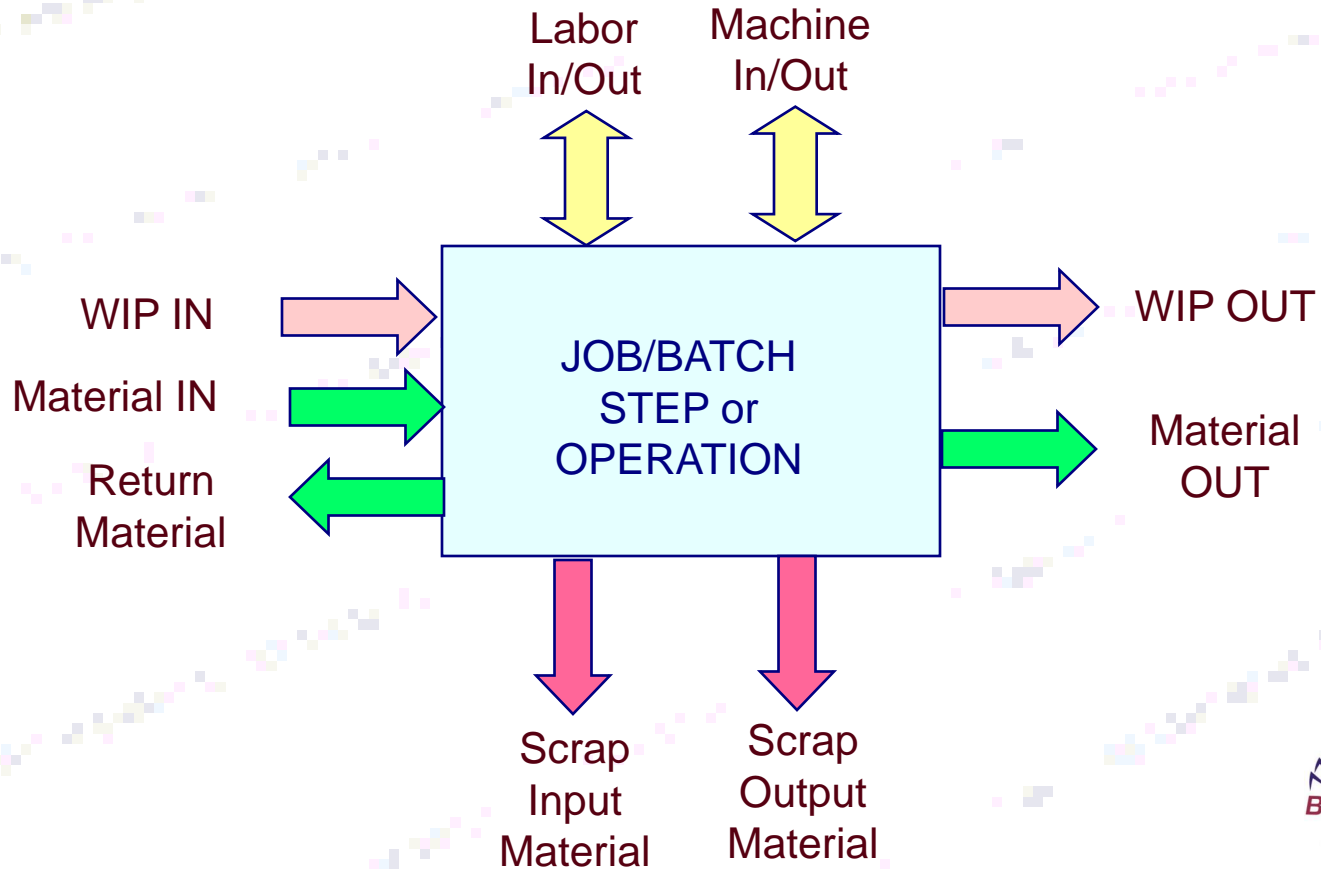
Operation Start Code	Department / Operation	Instructions
	Machine Shop/Get from Inventory	
	P0001	Sheet Steel 180 4x8 Sheet Qty: 2 Ea
	Machine Shop/Panel Cutting	
	Machine Shop/Welding	
	Machine Shop/Inspecting	
	Paint Shop/Painting	Blue Paint
	P0003	Paint Blue 1Gallon Can Qty: 1 Gals
	Paint Shop/Inspection	

Barcoded Traveler is Basis of Traceability

Can scan materials in

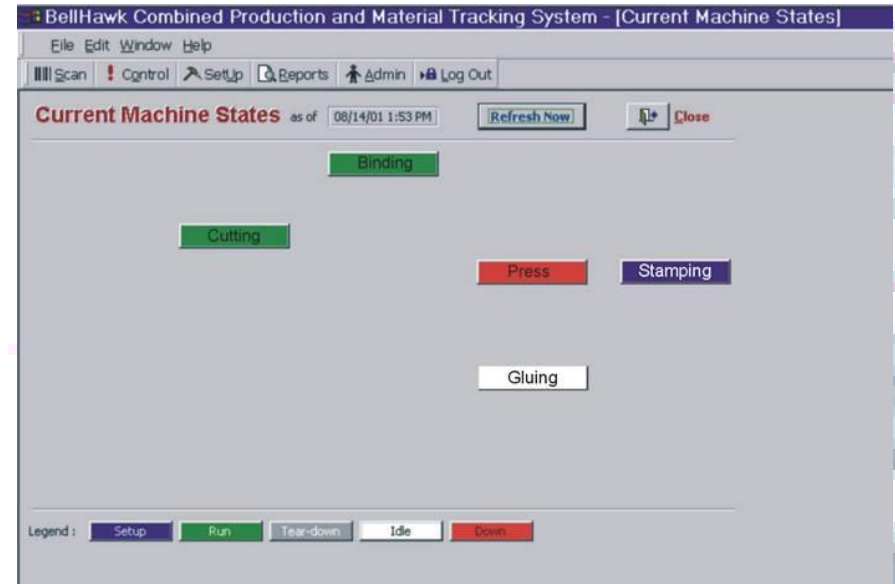
- ➔ Checks for Correct Materials
- ➔ Checks for Passed QC Inspection

Some Job Step Scanning Transactions





Use Barcode Scanning to Track:
Setup Time
Run Time
Down Time
Cleanup Time



Track QC Status of

- Lots
- Material in Containers
- Serialized Items

Receiving

- Selective QC Depending on Part
- Statistical Control

Quarantined Areas

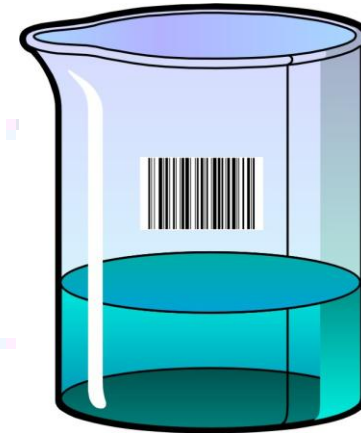
- Restrict Material Movement

QC Approval or Failure

- Using PC or Mobile Computer

Production and Shipping

- Checks for Approved Status



Picking is typically done using Mobile Computers
 Packing is typically done on bench with PCs
 Builds Nested Container Description for ASNs



Pick Order P000033



Employee:	Customer Name: XYZ Builders
Ship Date: 12/11/2008	Contract Number: 0000000
Ship Time: 10:00:00	Ship Order Number: 5000042

Pick Line Barcode	Part #	Qty To Pick	Qty Picked	Status
	T101 Red Roofing Tile	100	0	Released
	T102 Gray Roofing Tile	50	0	Released

Shipment Planning and Tracking

- Associate Orders with Shipment
- Associate Truck/Trailer with Dock

Track What is Loaded

- Scan pallet barcode or read RFID tag at time of loading
- Warn if wrong material is being loaded
- Record what container went to which customer
- Check that all materials for orders are loaded

Generate Paperwork

- Generate ASN
- Generate Bill of Lading and Manifest



1. From Vendor to Containers of Raw Material
2. From Containers of Raw Material to Products where used
3. From Intermediate Products to Finished Goods
4. From Finished goods to Customer
5. Who worked on Each Job Step
6. What Equipment was Used
7. QC, Process, and Test Parameters
8. By Lot, Container or Serialized Item



1. Trace Back: From finished goods
2. Find problem
3. Trace Forward to where used
4. Recall products



Very Difficult to do Rapidly and Accurately with Pencil and Paper

Benefits of Using an Automated Data Collection Solution



1. Can Detect Problems
 - ➔ in real-time as they occur
2. Prevents Mistakes
 - ➔ By warning employees
3. Minimizes Recalls and Lawsuits
 - ➔ By Closely Tracking Materials and Processes
4. Enables Compliance
 - ➔ With Customer and Government Mandates
5. Enhances Management Control
 - ➔ Gives real-time view of operations
6. Prevents loss of business
 - ➔ Get correct orders out on time



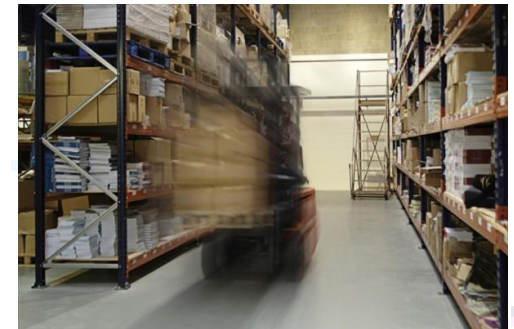
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